State of Rhode Island and Providence Plantations

**DEPARTMENT OF ATTORNEY GENERAL**
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*Patrick C. Lynch, Attorney General*

August 13, 2008

***VIA ELECTRONIC FILING***

Luly E. Massaro, Commission Clerk
Public Utilities Commission
89 Jefferson Boulevard
Warwick RI 02889-1046

**Re: National Grid Rhode Island**
**Request for Change in Gas Distribution Rates**
**Docket No. 3943**

Dear Ms. Massaro:

In accordance with Rule 1.18(c)(5), I am enclosing three copies of the Division's responses to National Grid's First Set of Data Requests.

Very truly yours,

Paul J. Roberti
Assistant Attorney General
Chief, Regulatory Unit

PJR/kz
Enclosures

cc: Thomas F. Ahern, Administrator
Service List

NGRID 1-1 Please provide an electronic copy of the direct testimony of James A. Rothschild in Microsoft Word or WordPerfect format.

RESPONSE: Please see email dated August 12, 2008, containing the MSWord format of James A. Rothschild Direct Testimony. A copy of the email is attached for reference.

## Kelly Zelano

**From:** Kelly Zelano
**Sent:** Tuesday, August 12, 2008 11:43 AM
**To:** 'Thomas.teehan@us.ngrid.com'; 'Peter.Czekanski@us.ngrid.com'; 'Joanne.scanlon@us.ngrid.com'; 'ckimball@keeganwerlin.com'; 'lindas@keeganwerlin.com'; 'Lmassaro@puc.state.ri.us'; 'Tmassaro@puc.state.ri.us'; 'Anault@puc.state.ri.us'
**Cc:** Paul Roberti; Kelly Zelano; Meghan Tobin
**Subject:** Docket No. 3943 National Grid's Standard Offer Rate Adjustmwent Filing

James A. Rothschild
Direct Tes...

ood Morning Everyone!!

Attached please find the Direct Testimony of James A. Rothschild in MSWord format, as requested, in response to NGRID 1-1. If you have any questions or cannot open the attachment, please do not hesitate to contact me.

Kelly Zelano
Legal Assistant, Regulatory Unit
Rhode Island Department of Attorney General
150 South Main Street
Providence, RI 02903-2907
Tel: (401) 274-4400 x 2309
Fax: (401) 222-3016

NGRID 1-2 Referring to the Rothschild Direct Testimony at page 13 line 16. Please state the reason that the complex method for the DCF was not submitted in this case. If one was prepared but not submitted, please provide a copy including an electronic spreadsheet copy with all formulas intact.

RESPONSE: Mr. Rothschild did not present the complex DCF method in this case because it would have made the testimony unnecessarily long. He did not prepare any drafts of a complex method in preparation for this case.

NGRID 1-3 Referring to the Rothschild Direct Testimony at page 21 lines 18-22. Please provide the basis used to assemble the group of gas companies employed by Mr. Rothschild.

RESPONSE: Please refer to page 21, lines 21-22 of Mr. Rothschild's Direct Testimony for this response.

NGRID 1-4 Referring to the Rothschild Direct Testimony at page 27 lines 10. Please provide the annual return by company by year, the identities of each company in each of the 10 groups of companies, and the regression statistics (i.e., coefficient of determination, standard error of the estimate, confidence internal and similar) shown on Graph #1. These data should be provided in hard copy and electronically in spreadsheet format with all formulas intact.

RESPONSE: Mr. Rothschild used a study from Ibbotson SBBI 2008 Classic Year Book. The study involves over 3,000 companies and Mr. Rothschild does not have the returns of individual companies from this study.

NGRID 1-5 Referring to the Rothschild Direct Testimony at page 32 lines 4-5. Please provide a copy of the documents, which show the yield on 30-year Treasury bonds (footnote 3) and the yield on inflation-indexed bonds (footnote 4).

RESPONSE: Please see attached.

Rates & Bonds





Key Rates

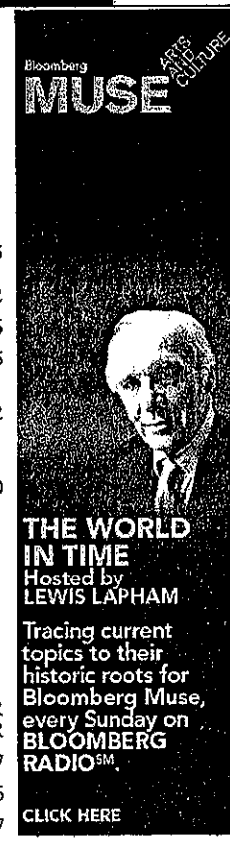
| | CURRENT | 1 MONTH PRIOR | 3 MONTH PRIOR | 6 MONTH PRIOR | 1 YEAR PRIOR |
|---|---|---|---|---|---|
| Federal Reserve Target Rate | 2.00 | 2.25 | 3.00 | 4.50 | 5.25 |
| 1-Month Libor | 2.46 | 2.83 | 3.11 | 5.22 | 5.32 |
| 3-Month Libor | 2.68 | 2.87 | 3.06 | 5.12 | 5.36 |
| Prime Rate | 5.00 | 5.25 | 6.00 | 7.50 | 8.25 |
| 5-Year AAA Banking & Finance | 4.67 | 4.63 | 4.13 | 4.62 | 5.32 |
| 10-Year AAA Banking & Finance | 5.58 | 5.62 | 5.32 | 5.40 | 5.60 |

View additional rates

Mortgage Rates provided by Bankrate.com Rates may include points.

| | CURRENT | 1 MONTH PRIOR | 3 MONTH PRIOR | 6 MONTH PRIOR | 1 YEAR PRIOR |
|---|---|---|---|---|---|
| 15-Year Mortgage | 5.52 | 5.48 | 5.28 | 5.35 | 5.67 |
| 30-Year Mortgage | 5.95 | 5.87 | 5.88 | 5.79 | 5.96 |
| 1-Year ARM | 5.92 | 5.82 | 4.83 | 5.52 | 5.67 |

View additional rates



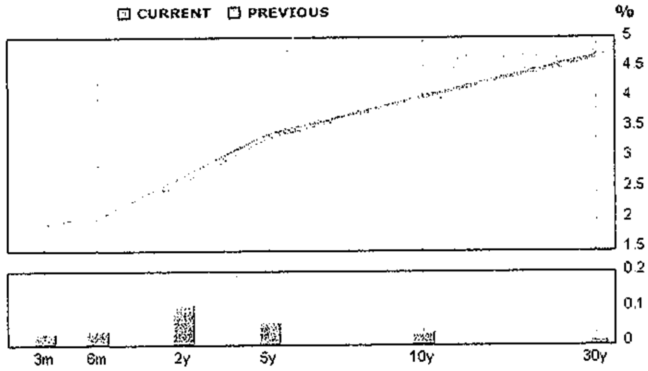

U.S. Treasuries

Bills

| | MATURITY DATE | DISCOUNT/YIELD | DISCOUNT/YIELD CHANGE | TIME |
|---|---|---|---|---|
| 3-Month | 08/28/2008 | 1.87 / 1.91 | 0.02 / .020 | 08:28 |
| 6-Month | 11/28/2008 | 1.98 / 2.03 | 0.04 / .036 | 08:18 |

Notes/Bonds

| | COUPON | MATURITY DATE | CURRENT PRICE/YIELD | PRICE/YIELD CHANGE | TIME |
|---|---|---|---|---|---|
| 2-Year | 2.625 | 05/31/2010 | 99-26¾ / 2.71 | -0-03½ / .057 | 08:39 |
| 5-Year | 3.125 | 04/30/2013 | 98-24+ / 3.40 | -0-08 / .056 | 08:38 |
| 10-Year | 3.875 | 05/15/2018 | 98-23 / 4.03 | -0-07 / .027 | 08:38 |
| 30-Year | 4.375 | 02/15/2038 | 94-26+ / 4.70 | -0-05 / .010 | 08:38 |




Inflation Indexed Treasury

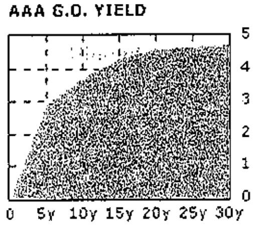
| | COUPON | MATURITY DATE | CURRENT PRICE/YIELD | PRICE/YIELD CHANGE | TIME |
|---|---|---|---|---|---|
| 5-Year | 0.625 | 04/15/2013 | 98-09 / .98 | -0-06 / .040 | 08:38 |
| 10-Year | 1.625 | 01/15/2018 | 100-23 / 1.54 | -0-05 / .019 | 08:38 |
| 20-Year | 1.750 | 01/15/2028 | 94-17 / 2.09 | -0-04 / .009 | 08:38 |
| 30-Year | 3.375 | 04/15/2032 | 125-00 / 2.05 | -0-07 / .010 | 08:38 |

Municipal Bonds

National Municipal Bond Yields:
Triple-A Rated, Tax-Exempt Insured Revenue Bonds

| | CURRENT YIELD | PREVIOUS YIELD | CHANGE IN YIELD | 28% EQ YIELD | 1 WEEK PRIOR YIELD | 1 MONTH PRIOR YIELD | 6 MONTH PRIOR YIELD |
|---|---|---|---|---|---|---|---|
| 2-Year | 2.40% | 2.38% | 0.02% | 3.33% | 2.40% | 2.37% | 3.39% |
| 5-Year | 3.13% | 3.13% | 0.00% | 4.35% | 3.14% | 3.15% | 3.53% |
| 7-Year | 3.36% | 3.35% | 0.01% | 4.67% | 3.36% | 3.43% | 3.70% |
| 10-Year | 3.86% | 3.86% | 0.00% | 5.36% | 3.86% | 3.95% | 3.98% |
| 15-Year | 4.51% | 4.49% | 0.02% | 6.26% | 4.52% | 4.66% | 4.41% |
| 20-Year | 4.68% | 4.67% | 0.01% | 6.50% | 4.71% | 4.80% | 4.61% |
| 30-Year | 4.71% | 4.68% | 0.03% | 6.54% | 4.72% | 4.90% | 4.65% |

AAA G.O. YIELD

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Unless indicated otherwise: intraday data is at least 15 minutes delayed; mutual fund NAVs are updated at the close of every market day; all prices are in the local currency; Time is ET.

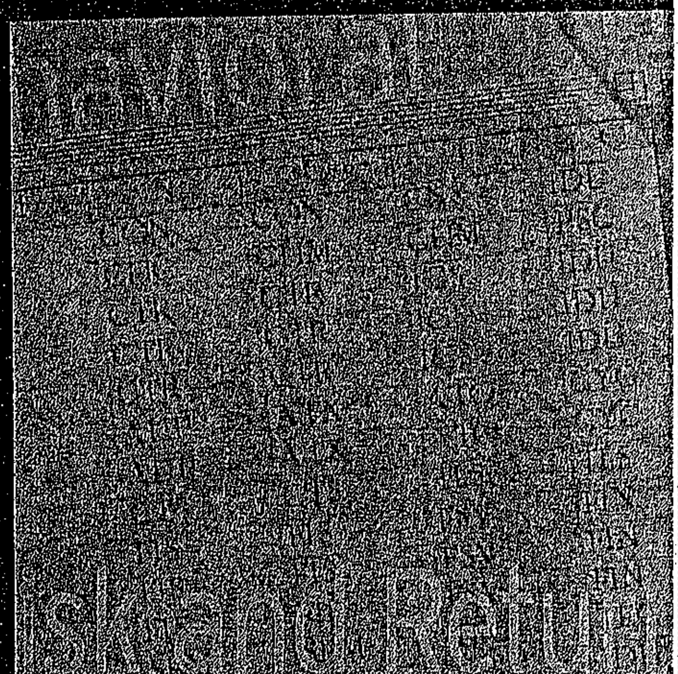
NGRID 1-6 Referring to the Rothschild Direct Testimony at page 32 line 12. Please provide a copy of the chapter from the textbook Investments from which the quote was taken.

RESPONSE: Please see attached.

C H A P T E R   N I N E

# THE CAPITAL ASSET PRICING MODEL

The capital asset pricing model, almost always referred to as the CAPM, is a centerpiece of modern financial economics. The model gives us a precise prediction of the relationship that we should observe between the risk of an asset and its expected return. This relationship serves two vital functions. First, it provides a benchmark rate of return for evaluating possible investments. For example, if we are analyzing securities, we might be interested in whether the expected return we forecast for a stock is more or less than its "fair" return given its risk. Second, the model helps us to make an educated guess as to the expected return on assets that have not yet been traded in the marketplace. For example, how do we price an initial public offering of stock? How will a major new investment project affect the return investors require on a company's stock? Although the CAPM does not fully withstand empirical tests, it is widely used because of the insight it offers and because its accuracy suffices for important applications.



## 9.1 THE CAPITAL ASSET PRICING MODEL

The capital asset pricing model is a set of predictions concerning equilibrium expected returns on risky assets. Harry Markowitz laid down the foundation of modern portfolio management in 1952. The CAPM was developed 12 years later in articles by William Sharpe,[1] John Lintner,[2] and Jan Mossin.[3] The time for this gestation indicates that the leap from Markowitz's portfolio selection model to the CAPM is not trivial.

We will approach the CAPM by posing the question "what if," where the "if" part refers to a simplified world. Positing an admittedly unrealistic world allows a relatively easy leap to the "then" part. Once we accomplish this, we can add complexity to the hypothesized environment one step at a time and see how the conclusions must be amended. This process allows us to derive a reasonably realistic and comprehensible model.

We summarize the simplifying assumptions that lead to the basic version of the CAPM in the following list. The thrust of these assumptions is that we try to ensure that individuals are as alike as possible, with the notable exceptions of initial wealth and risk aversion. We will see that conformity of investor behavior vastly simplifies our analysis.

1. There are many investors, each with an endowment (wealth) that is small compared to the total endowment of all investors. Investors are price-takers, in that they act as though security prices are unaffected by their own trades. This is the usual perfect competition assumption of microeconomics.
2. All investors plan for one identical holding period. This behavior is myopic (short-sighted) in that it ignores everything that might happen after the end of the single-period horizon. Myopic behavior is, in general, suboptimal.
3. Investments are limited to a universe of publicly traded financial assets, such as stocks and bonds, and to risk-free borrowing or lending arrangements. This assumption rules out investment in nontraded assets such as education (human capital), private enterprises, and governmentally funded assets such as town halls and international airports. It is assumed also that investors may borrow or lend any amount at a fixed, risk-free rate.
4. Investors pay no taxes on returns and no transaction costs (commissions and service charges) on trades in securities. In reality, of course, we know that investors are in different tax brackets and that this may govern the type of assets in which they invest. For example, tax implications may differ depending on whether the income is from interest, dividends, or capital gains. Furthermore, actual trading is costly, and commissions and fees depend on the size of the trade and the good standing of the individual investor.
5. All investors are rational mean-variance optimizers, meaning that they all use the Markowitz portfolio selection model.
6. All investors analyze securities in the same way and share the same economic view of the world. The result is identical estimates of the probability distribution of future cash flows from investing in the available securities; that is, for any set of security prices, they all derive the same input list to feed into the Markowitz model. Given a set of security prices and the risk-free interest rate, all investors use the same expected returns and covariance matrix of security returns to generate the

[1] William Sharpe, "Capital Asset Prices: A Theory of Market Equilibrium," *Journal of Finance*, September 1964.
[2] John Lintner, "The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets," *Review of Economics and Statistics*, February 1965.
[3] Jan Mossin, "Equilibrium in a Capital Asset Market," *Econometrica*, October 1966.

efficient frontier and the unique optimal risky portfolio. This assumption is often referred to as **homogeneous expectations** or beliefs.

These assumptions represent the "if" of our "what if" analysis. Obviously, they ignore many real-world complexities. With these assumptions, however, we can gain some powerful insights into the nature of equilibrium in security markets.

We can summarize the equilibrium that will prevail in this hypothetical world of securities and investors briefly. The rest of the chapter explains and elaborates on these implications.

1. All investors will choose to hold a portfolio of risky assets in proportions that duplicate representation of the assets in the **market portfolio** ($M$), which includes all traded assets. For simplicity, we generally refer to all risky assets as *stocks*. The proportion of each stock in the market portfolio equals the market value of the stock (price per share multiplied by the number of shares outstanding) divided by the total market value of all stocks.
2. Not only will the market portfolio be on the efficient frontier, but it also will be the tangency portfolio to the optimal capital allocation line (CAL) derived by each and every investor. As a result, the *capital market line* (CML), the line from the risk-free rate through the market portfolio, $M$, is also the best attainable capital allocation line. All investors hold $M$ as their optimal risky portfolio, differing only in the amount invested in it versus in the risk-free asset.
3. The risk premium on the market portfolio will be proportional to its risk and the degree of risk aversion of the representative investor. Mathematically,

$$E(r_M) - r_f = \bar{A}\sigma_M^2 \times .01$$

where $\sigma_M^2$ is the variance of the market portfolio and $\bar{A}$ is the average degree of risk aversion across investors.[4] Note that because $M$ is the optimal portfolio, which is efficiently diversified across all stocks, $\sigma_M^2$ is the systematic risk of this universe.

4. The risk premium on *individual* assets will be proportional to the risk premium on the market portfolio, $M$, and the *beta coefficient* of the security relative to the market portfolio. Beta measures the extent to which returns on the stock and the market move together. Formally, beta is defined as

$$\beta_i = \frac{\text{Cov}(r_i, r_M)}{\sigma_M^2}$$

and the risk premium on individual securities is

$$E(r_i) - r_f = \frac{\text{Cov}(r_i, r_M)}{\sigma_M^2}[E(r_M) - r_f] = \beta_i[E(r_M) - r_f]$$

We will elaborate on these results and their implications shortly.

## Why Do All Investors Hold the Market Portfolio?

What is the market portfolio? When we sum over, or aggregate, the portfolios of all individual investors, lending and borrowing will cancel out (since each lender has a corresponding borrower), and the value of the aggregate risky portfolio will equal the entire wealth of the economy. This is the market portfolio, $M$. The proportion of each stock in this portfolio equals the market value of

[4] As we pointed out in Chapter 8, the scale factor .01 arises because we measure returns as percentages rather than decimals.

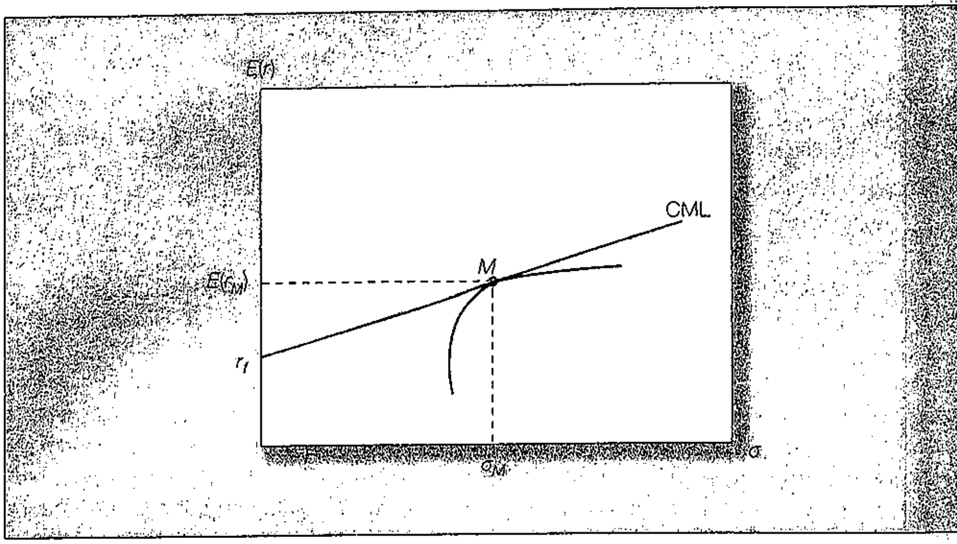



**Figure 9.1 The efficient frontier and the capital market line**

the stock (price per share times number of shares outstanding) divided by the sum of the market values of all stocks.[5] The CAPM implies that as individuals attempt to optimize their personal portfolios, they each arrive at the same portfolio, with weights on each asset equal to those of the market portfolio.

Given the assumptions of the previous section, it is easy to see that all investors will desire to hold identical risky portfolios. If all investors use identical Markowitz analysis (Assumption 5) applied to the same universe of securities (Assumption 3) for the same time horizon (Assumption 2) and use the same input list (Assumption 6), they all must arrive at the same determination of the optimal risky portfolio, the portfolio on the efficient frontier identified by the tangency line from T-bills to that frontier, as in Figure 9.1. This implies that if the weight of GM stock, for example, in each common risky portfolio is 1%, then GM also will comprise 1% of the market portfolio. The same principle applies to the proportion of any stock in each investor's risky portfolio. As a result, the optimal risky portfolio of all investors is simply a share of the market portfolio in Figure 9.1.

Now suppose that the optimal portfolio of our investors does not include the stock of some company, such as Delta Airlines. When all investors avoid Delta stock, the demand is zero, and Delta's price takes a free fall. As Delta stock gets progressively cheaper, it becomes ever more attractive and other stocks look relatively less attractive. Ultimately, Delta reaches a price where it is attractive enough to include in the optimal stock portfolio.

Such a price adjustment process guarantees that all stocks will be included in the optimal portfolio. It shows that *all* assets have to be included in the market portfolio. The only issue is the price at which investors will be willing to include a stock in their optimal risky portfolio.

This may seem a roundabout way to derive a simple result: If all investors hold an identical risky portfolio, this portfolio has to be *M*, the market portfolio. Our intention, however, is to demonstrate a connection between this result and its underpinnings, the equilibrating process that is fundamental to security market operation.

[5] As noted previously, we use the term "stock" for convenience; the market portfolio properly includes all assets in the economy.

## The Passive Strategy Is Efficient

In Chapter 7 we defined the CML (capital market line) as the CAL (capital allocation line) that is constructed from a money market account (or T-bills) and the market portfolio. Perhaps now you can fully appreciate why the CML is an interesting CAL. In the simple world of the CAPM, $M$ is the optimal tangency portfolio on the efficient frontier, as shown in Figure 9.1.

In this scenario the market portfolio that all investors hold is based on the common input list, thereby incorporating all relevant information about the universe of securities. This means that investors can skip the trouble of doing specific analysis and obtain an efficient portfolio simply by holding the market portfolio. (Of course, if everyone were to follow this strategy, no one would perform security analysis and this result would no longer hold. We discuss this issue in greater depth in Chapter 12 on market efficiency.)

Thus the passive strategy of investing in a market index portfolio is efficient. For this reason, we sometimes call this result a **mutual fund theorem**. The mutual fund theorem is another incarnation of the separation property discussed in Chapter 8. Assuming that all investors choose to hold a market index mutual fund, we can separate portfolio selection into two components—a technological problem, creation of mutual funds by professional managers—and a personal problem that depends on an investor's risk aversion, allocation of the *complete* portfolio between the mutual fund and risk-free assets.

In reality, different investment managers do create risky portfolios that differ from the market index. We attribute this in part to the use of different input lists in the formation of the optimal risky portfolio. Nevertheless, the practical significance of the mutual fund theorem is that a passive investor may view the market index as a reasonable first approximation to an efficient risky portfolio.

**CONCEPT CHECK ☞ QUESTION 1**

**If there are only a few investors who perform security analysis, and all others hold the market portfolio, *M*, would the CML still be the efficient CAL for investors who do not engage in security analysis? Why or why not?**

## The Risk Premium of the Market Portfolio

In Chapter 7 we discussed how individual investors go about deciding how much to invest in the risky portfolio. Returning now to the decision of how much to invest in portfolio $M$ versus in the risk-free asset, what can we deduce about the equilibrium risk premium of portfolio $M$?

We asserted earlier that the equilibrium risk premium on the market portfolio, $E(r_M) - r_f$, will be proportional to the average degree of risk aversion of the investor population and the risk of the market portfolio, $\sigma_M^2$. Now we can explain this result.

Recall that each individual investor chooses a proportion $y$, allocated to the optimal portfolio $M$, such that

$$y = \frac{E(r_M) - r_f}{.01 \times A\sigma_M^2} \tag{9.1}$$

In the simplified CAPM economy, risk-free investments involve borrowing and lending among investors. Any borrowing position must be offset by the lending position of the creditor. This means that net borrowing and lending across all investors must be zero, and in consequence the average position in the risky portfolio is 100%, or $\bar{y} = 1$. Setting $y = 1$ in equation 9.1 and rearranging, we find that the risk premium on the market portfolio is related to its variance by the average degree of risk aversion:

$$E(r_M) - r_f = .01 \times \bar{A}\sigma_M^2 \tag{9.2}$$

**CONCEPT CHECK ☞ QUESTION 2**

Data from the period 1926 to 2002 (see Table 5.2) for the S&P 500 index yield the following statistics: average excess return, 8.2%; standard deviation, 20.6%.

*a.* To the extent that these averages approximated investor expectations for the period, what must have been the average coefficient of risk aversion?

*b.* If the coefficient of risk aversion were actually 3.5, what risk premium would have been consistent with the market's historical standard deviation?

## Expected Returns on Individual Securities

The CAPM is built on the insight that the appropriate risk premium on an asset will be determined by its contribution to the risk of investors' overall portfolios. Portfolio risk is what matters to investors and is what governs the risk premiums they demand.

Remember that all investors use the same input list, that is, the same estimates of expected returns, variances, and covariances. We saw in Chapter 8 that these covariances can be arranged in a covariance matrix, so that the entry in the fifth row and third column, for example, would be the covariance between the rates of return on the fifth and third securities. Each diagonal entry of the matrix is the covariance of one security's return with itself, which is simply the variance of that security. We will consider the construction of the input list a bit later. For now we take it as given.

Suppose, for example, that we want to gauge the portfolio risk of GM stock. We measure the contribution to the risk of the overall portfolio from holding GM stock by its covariance with the market portfolio. To see why this is so, let us look again at the way the variance of the market portfolio is calculated. To calculate the variance of the market portfolio, we use the bordered covariance matrix with the market portfolio weights, as discussed in Chapter 8. We highlight GM in this depiction of the $n$ stocks in the market portfolio.

| Portfolio Weights | $w_1$ | $w_2$ | ... | $w_{GM}$ | ... | $w_n$ |
|---|---|---|---|---|---|---|
| $w_1$ | $\text{Cov}(r_1, r_1)$ | $\text{Cov}(r_1, r_2)$ | ... | $\text{Cov}(r_1, r_{GM})$ | ... | $\text{Cov}(r_1, r_n)$ |
| $w_2$ | $\text{Cov}(r_2, r_1)$ | $\text{Cov}(r_2, r_2)$ | ... | $\text{Cov}(r_2, r_{GM})$ | ... | $\text{Cov}(r_2, r_n)$ |
| ⋮ | ⋮ | ⋮ | | ⋮ | | ⋮ |
| $w_{GM}$ | $\text{Cov}(r_{GM}, r_1)$ | $\text{Cov}(r_{GM}, r_2)$ | ... | $\text{Cov}(r_{GM}, r_{GM})$ | ... | $\text{Cov}(r_{GM}, r_n)$ |
| ⋮ | ⋮ | ⋮ | | ⋮ | | ⋮ |
| $w_n$ | $\text{Cov}(r_n, r_1)$ | $\text{Cov}(r_n, r_2)$ | ... | $\text{Cov}(r_n, r_{GM})$ | ... | $\text{Cov}(r_n, r_n)$ |

Recall that we calculate the variance of the portfolio by summing over all the elements of the covariance matrix, first multiplying each element by the portfolio weights from the row and the column. The contribution of one stock to portfolio variance therefore can be expressed as the sum of all the covariance terms in the row corresponding to the stock, where each covariance is first multiplied by both the stock's weight from its row and the weight from its column.[6]

[6] An alternative approach would be to measure GM's contribution to market variance as the sum of the elements in the row *and* the column corresponding to GM. In this case, GM's contribution would be twice the sum in equation 9.3. The approach that we take in the text allocates contributions to portfolio risk among securities in a convenient manner in that the sum of the contributions of each stock equals the total portfolio variance, whereas the alternative measure of contribution would sum to twice the portfolio variance. This results from a type of double-counting, because adding both the rows and the columns for each stock would result in each entry in the matrix being added twice.

For example, the contribution of GM's stock to the variance of the market portfolio is

$$w_{GM}[w_1\text{Cov}(r_1, r_{GM}) + w_2\text{Cov}(r_2, r_{GM}) + \cdots + w_{GM}\text{Cov}(r_{GM}, r_{GM}) + \cdots + w_n\text{Cov}(r_n, r_{GM})] \tag{9.3}$$

Equation 9.3 provides a clue about the respective roles of variance and covariance in determining asset risk. When there are many stocks in the economy, there will be many more covariance terms than variance terms. Consequently, the covariance of a particular stock with all other stocks will dominate that stock's contribution to total portfolio risk. We may summarize the terms in square brackets in equation 9.3 simply as the covariance of GM with the market portfolio. In other words, we can best measure the stock's contribution to the risk of the market portfolio by its covariance with that portfolio:

$$\text{GM's contribution to variance} = w_{GM}\text{Cov}(r_{GM}, r_M)$$

This should not surprise us. For example, if the covariance between GM and the rest of the market is negative, then GM makes a "negative contribution" to portfolio risk: By providing returns that move inversely with the rest of the market, GM stabilizes the return on the overall portfolio. If the covariance is positive, GM makes a positive contribution to overall portfolio risk because its returns amplify swings in the rest of the portfolio.

To demonstrate this more rigorously, note that the rate of return on the market portfolio may be written as

$$r_M = \sum_{k=1}^{n} w_k r_k$$

Therefore, the covariance of the return on GM with the market portfolio is

$$\text{Cov}(r_{GM}, r_M) = \text{Cov}\left(r_{GM}, \sum_{k=1}^{n} w_k r_k\right) = \sum_{k=1}^{n} w_k\text{Cov}(r_{GM}, r_k) \tag{9.4}$$

Notice that the last term of equation 9.4 is precisely the same as the term in brackets in equation 9.3. Therefore, equation 9.3, which is the contribution of GM to the variance of the market portfolio, may be simplified to $w_{GM}\,\text{Cov}(r_{GM}, r_M)$. We also observe that the contribution of our holding of GM to the risk premium of the market portfolio is $w_{GM}\,[E(r_M) - r_f]$.

Therefore, the reward-to-risk ratio for investments in GM can be expressed as

$$\frac{\text{GM's contribution to risk premium}}{\text{GM's contribution to variance}} = \frac{w_{GM}[E(r_{GM}) - r_f]}{w_{GM}\,\text{Cov}(r_{GM}, r_M)} = \frac{E(r_{GM}) - r_f}{\text{Cov}(r_{GM}, r_M)}$$

The market portfolio is the tangency (efficient mean-variance) portfolio. The reward-to-risk ratio for investment in the market portfolio is

$$\frac{\text{Market risk premium}}{\text{Market variance}} = \frac{E(r_M) - r_f}{\sigma_M^2} \tag{9.5}$$

The ratio in equation 9.5 is often called the **market price of risk**[7] because it quantifies the extra return that investors demand to bear portfolio risk. Notice that for *components* of the efficient portfolio, such as shares of GM, we measure risk as the *contribution* to portfolio

[7] We open ourselves to ambiguity in using this term, because the market portfolio's reward-to-variability ratio

$$\frac{E(r_M) - r_f}{\sigma_M}$$

sometimes is referred to as the market price of risk. Note that since the appropriate risk measure of GM is its covariance with the market portfolio (its contribution to the variance of the market portfolio), this risk is measured in percent squared. Accordingly, the price of this risk, $[E(r_M) - r_f]/\sigma^2$, is defined as the percentage expected return per percent square of variance.

variance. In contrast, for the efficient portfolio itself, its variance is the appropriate measure of risk.

A basic principle of equilibrium is that all investments should offer the same reward-to-risk ratio. If the ratio were better for one investment than another, investors would rearrange their portfolios, tilting toward the alternative with the better trade-off and shying away from the other. Such activity would impart pressure on security prices until the ratios were equalized. Therefore we conclude that the reward-to-risk ratios of GM and the market portfolio should be equal:

$$\frac{E(r_{GM}) - r_f}{\text{Cov}(r_{GM}, r_M)} = \frac{E(r_M) - r_f}{\sigma_M^2} \tag{9.6}$$

To determine the fair risk premium of GM stock, we rearrange equation (9.6) slightly to obtain

$$E(r_{GM}) - r_f = \frac{\text{Cov}(r_{GM}, r_M)}{\sigma_M^2}[E(r_M) - r_f] \tag{9.7}$$

The ratio $\text{Cov}(r_{GM}, r_M)/\sigma_M^2$ measures the contribution of GM stock to the variance of the market portfolio as a fraction of the total variance of the market portfolio. The ratio is called **beta** and is denoted by $\beta$. Using this measure, we can restate equation 9.7 as

$$E(r_{GM}) = r_f + \beta_{GM}[E(r_M) - r_f] \tag{9.8}$$

This **expected return–beta relationship** is the most familiar expression of the CAPM to practitioners. We will have a lot more to say about the expected return–beta relationship shortly.

We see now why the assumptions that made individuals act similarly are so useful. If everyone holds an identical risky portfolio, then everyone will find that the beta of each asset with the market portfolio equals the asset's beta with his or her own risky portfolio. Hence everyone will agree on the appropriate risk premium for each asset.

Does the fact that few real-life investors actually hold the market portfolio imply that the CAPM is of no practical importance? Not necessarily. Recall from Chapter 8 that reasonably well-diversified portfolios shed firm-specific risk and are left with mostly systematic or market risk. Even if one does not hold the precise market portfolio, a well-diversified portfolio will be so very highly correlated with the market that a stock's beta relative to the market will still be a useful risk measure.

In fact, several authors have shown that modified versions of the CAPM will hold true even if we consider differences among individuals leading them to hold different portfolios. For example, Brennan[8] examined the impact of differences in investors' personal tax rates on market equilibrium, and Mayers[9] looked at the impact of nontraded assets such as human capital (earning power). Both found that although the market portfolio is no longer each investor's optimal risky portfolio, the expected return–beta relationship should still hold in a somewhat modified form.

If the expected return–beta relationship holds for any individual asset, it must hold for any combination of assets. Suppose that some portfolio $P$ has weight $w_k$ for stock $k$, where $k$ takes on values $1, \ldots, n$. Writing out the CAPM equation 9.8 for each stock, and multiplying each equation by the weight of the stock in the portfolio, we obtain these equations, one for each stock:

[8] Michael J. Brennan, "Taxes, Market Valuation, and Corporate Finance Policy," *National Tax Journal*, December 1973.
[9] David Mayers, "Nonmarketable Assets and Capital Market Equilibrium under Uncertainty," in *Studies in the Theory of Capital Markets*, ed. M. C. Jensen (New York: Praeger, 1972).

$$
\begin{aligned}
& w_1E(r_1) = w_1r_f + w_1\beta_1[E(r_M) - r_f] \\
+\ & w_2E(r_2) = w_2r_f + w_2\beta_2[E(r_M) - r_f] \\
+\ & \quad \cdots = \cdots \\
+\ & w_nE(r_n) = w_nr_f + w_n\beta_n[E(r_M) - r_f] \\
\hline
& E(r_P) = r_f + \beta_P[E(r_M) - r_f]
\end{aligned}
$$

Summing each column shows that the CAPM holds for the overall portfolio because $E(r_P) = \sum_k w_k E(r_k)$ is the expected return on the portfolio, and $\beta_P = \sum_k w_k \beta_k$ is the portfolio beta. Incidentally, this result has to be true for the market portfolio itself,

$$E(r_M) = r_f + \beta_M[E(r_M) - r_f]$$

Indeed, this is a tautology because $\beta_M = 1$, as we can verify by noting that

$$\beta_M = \frac{\text{Cov}(r_M, r_M)}{\sigma_M^2} = \frac{\sigma_M^2}{\sigma_M^2}$$

This also establishes 1 as the weighted-average value of beta across all assets. If the market beta is 1, and the market is a portfolio of all assets in the economy, the weighted-average beta of all assets must be 1. Hence betas greater than 1 are considered aggressive in that investment in high-beta stocks entails above-average sensitivity to market swings. Betas below 1 can be described as defensive.

A word of caution: We are all accustomed to hearing that well-managed firms will provide high rates of return. We agree this is true if one measures the *firm's* return on investments in plant and equipment. The CAPM, however, predicts returns on investments in the *securities* of the firm.

Let us say that everyone knows a firm is well run. Its stock price will therefore be bid up, and consequently returns to stockholders who buy at those high prices will not be excessive. Security prices, in other words, already reflect public information about a firm's prospects; therefore only the risk of the company (as measured by beta in the context of the CAPM) should affect expected returns. In a rational market investors receive high expected returns only if they are willing to bear risk.

Of course, investors do not directly observe or determine expected returns on securities. Rather, they observe security prices and bid those prices up or down. Expected rates of return are determined by the prices investors must pay compared to the cash flows those investments might garner. The connection between security expected returns and the market-price equilibrium process is described in more detail in the Appendix to this chapter.

**CONCEPT CHECK ☞ QUESTION 3**

**Suppose that the risk premium on the market portfolio is estimated at 8% with a standard deviation of 22%. What is the risk premium on a portfolio invested 25% in GM and 75% in Ford, if they have betas of 1.10 and 1.25, respectively?**

## The Security Market Line

*We can view the expected return–beta relationship as a reward–risk equation.* The beta of a security is the appropriate measure of its risk because beta is proportional to the risk that the security contributes to the optimal risky portfolio.

Risk-averse investors measure the risk of the optimal risky portfolio by its variance. In this world we would expect the reward, or the risk premium on individual assets, to depend on the *contribution* of the individual asset to the risk of the portfolio. The beta of a stock measures the stock's contribution to the variance of the market portfolio. Hence we expect, for any asset or portfolio, the required risk premium to be a function of beta. The CAPM confirms this intuition, stating further that the security's risk premium is directly proportional to both the beta and the risk premium of the market portfolio; that is, the risk premium equals $\beta[E(r_M) - r_f]$.

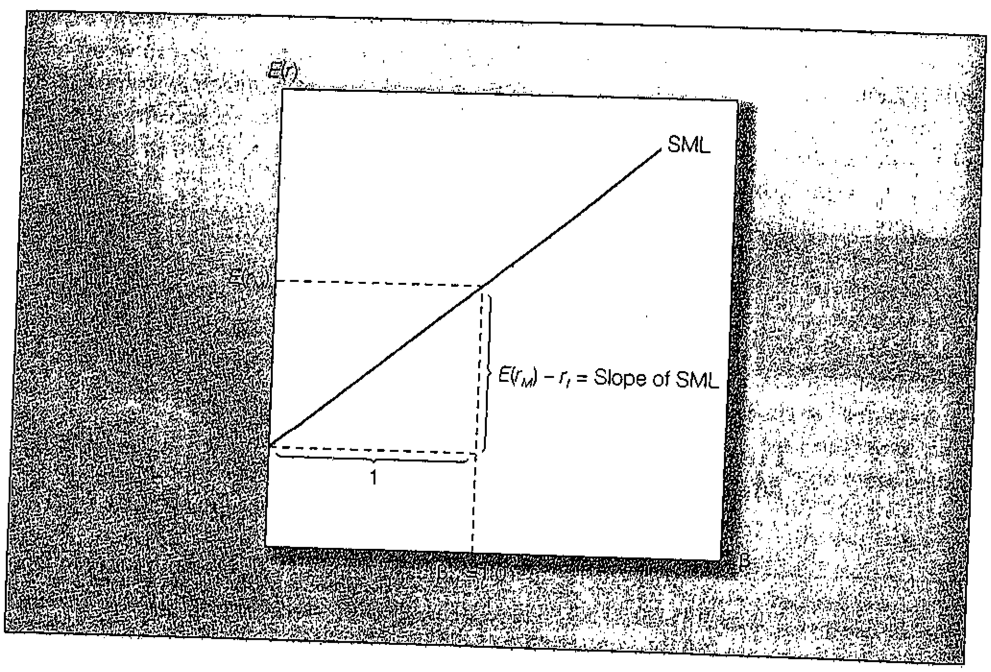
The expected return–beta relationship can be portrayed graphically as the **security market line (SML)** in Figure 9.2. Because the market beta is 1, the slope is the risk premium of the market portfolio. At the point on the horizontal axis where $\beta = 1$ (which is the market portfolio's beta) we can read off the vertical axis the expected return on the market portfolio.

It is useful to compare the security market line to the capital market line. The CML graphs the risk premiums of *efficient* portfolios (i.e., portfolios composed of the market and the risk-free asset) as a function of portfolio standard deviation. This is appropriate because standard deviation is a valid measure of risk for efficiently diversified portfolios that are candidates for an investor's overall portfolio. The SML, in contrast, graphs *individual asset* risk premiums as a function of asset risk. The relevant measure of risk for individual assets held as parts of well-diversified portfolios is not the asset's standard deviation or variance; it is, instead, the contribution of the asset to the portfolio variance, which we measure by the asset's beta. The SML is valid for both efficient portfolios and individual assets.

The security market line provides a benchmark for the evaluation of investment performance. Given the risk of an investment, as measured by its beta, the SML provides the required rate of return necessary to compensate investors for both risk as well as the time value of money.

Because the security market line is the graphic representation of the expected return–beta relationship, "fairly priced" assets plot exactly on the SML; that is, their expected returns are commensurate with their risk. Given the assumptions we made at the start of this section, all securities must lie on the SML in market equilibrium. Nevertheless, we see here how the CAPM may be of use in the money-management industry. Suppose that the SML relation is used as a benchmark to assess the fair expected return on a risky asset. Then security analysis is performed to calculate the return actually expected. (Notice that we

**Figure 9.2**
**The security market line**



depart here from the simple CAPM world in that some investors now apply their own unique analysis to derive an "input list" that may differ from their competitors'.) If a stock is perceived to be a good buy, or underpriced, it will provide an expected return in excess of the fair return stipulated by the SML. Underpriced stocks therefore plot above the SML: Given their betas, their expected returns are greater than dictated by the CAPM. Overpriced stocks plot below the SML.

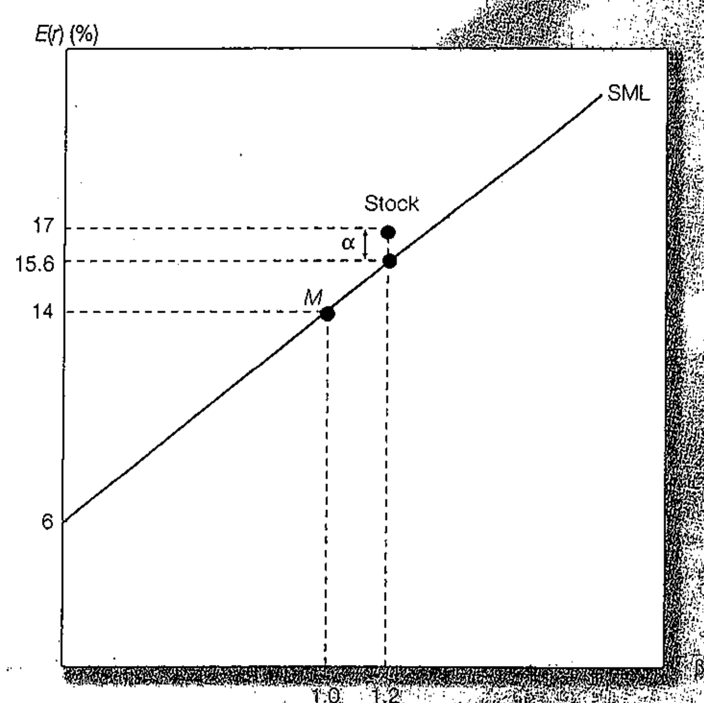
The difference between the fair and actually expected rates of return on a stock is called the stock's **alpha**, denoted $\alpha$. For example, if the market return is expected to be 14%, a stock has a beta of 1.2, and the T-bill rate is 6%, the SML would predict an expected return on the stock of $6 + 1.2(14 - 6) = 15.6\%$. If one believed the stock would provide an expected return of 17%, the implied alpha would be 1.4% (see Figure 9.3).

One might say that security analysis (which we treat in Part 5) is about uncovering securities with nonzero alphas. This analysis suggests that the starting point of portfolio management can be a passive market-index portfolio. The portfolio manager will then increase the weights of securities with positive alphas and decrease the weights of securities with negative alphas. We show one strategy for adjusting the portfolio weights in such a manner in Chapter 27.

The CAPM is also useful in capital budgeting decisions. For a firm considering a new project, the CAPM can provide the *required rate of return* that the project needs to yield, based on its beta, to be acceptable to investors. Managers can use the CAPM to obtain this cutoff internal rate of return (IRR), or "hurdle rate" for the project.

The box on page 294 describes how the CAPM can be used in capital budgeting. It also discusses some empirical anomalies concerning the model, which we address in detail in Chapters 12 and 13. The article asks whether the CAPM is useful for capital budgeting in

**Figure 9.3**
**The SML and a positive-alpha stock**



**E-INVESTMENTS**
**Beta and Security Returns**

Fidelity provides data on the risk and return of its funds at **www.fidelity.com**. Find the annual return and beta of one of Fidelity's equity funds over the last year (look under *Snapshot*). Use the CAPM to estimate the required rate of return and calculate the alpha of the fund over the most recent annual period. You can find recent performance of several market indexes at **finance.yahoo.com**. Yahoo! also contains current Treasury rates (click on *Bonds—Rates*). What market risk premium seems reasonable to you? You will want to look back at Chapter 5. How have the Fidelity funds done for their investors?

light of these shortcomings; it concludes that even given the anomalies cited, the model still can be useful to managers who wish to increase the fundamental value of their firms.

**EXAMPLE 9.1**

### Using the CAPM

Yet another use of the CAPM is in utility rate-making cases.[10] In this case the issue is the rate of return that a regulated utility should be allowed to earn on its investment in plant and equipment. Suppose that the equityholders have invested $100 million in the firm and that the beta of the equity is .6. If the T-bill rate is 6% and the market risk premium is 8%, then the fair profits to the firm would be assessed as $6 + .6(8) = 10.8\%$ of the $100 million investment, or $10.8 million. The firm would be allowed to set prices at a level expected to generate these profits.

**CONCEPT CHECK QUESTION 4 and QUESTION 5**

**Stock XYZ has an expected return of 12% and risk of $\beta = 1$. Stock ABC has expected return of 13% and $\beta = 1.5$. The market's expected return is 11%, and $r_f = 5\%$.**

**a. According to the CAPM, which stock is a better buy?**

**b. What is the alpha of each stock? Plot the SML and each stock's risk–return point on one graph. Show the alphas graphically.**

**The risk-free rate is 8% and the expected return on the market portfolio is 16%. A firm considers a project that is expected to have a beta of 1.3.**

**a. What is the required rate of return on the project?**

**b. If the expected IRR of the project is 19%, should it be accepted?**

## 9.2 EXTENSIONS OF THE CAPM

The assumptions that allowed Sharpe to derive the simple version of the CAPM are admittedly unrealistic. Financial economists have been at work ever since the CAPM was devised to extend the model to more realistic scenarios.

There are two classes of extensions to the simple version of the CAPM. The first attempts to relax the assumptions that we outlined at the outset of the chapter. The second acknowledges the fact that investors worry about sources of risk other than the uncertain value of their securities, such as unexpected changes in relative prices of consumer goods. This idea involves the introduction of additional risk factors besides security returns, and we discuss it further in Chapter 11.

[10] This application is fast disappearing, as many states are in the process of deregulating their public utilities and allowing a far greater degree of free market pricing. Nevertheless, a considerable amount of rate setting still takes place.

## The CAPM with Restricted Borrowing: The Zero-Beta Model

The CAPM is predicated on the assumption that all investors share an identical input list that they feed into the Markowitz algorithm. Thus all investors agree on the location of the efficient (minimum-variance) frontier, where each portfolio has the lowest variance among all feasible portfolios at a target expected rate of return. When all investors can borrow and lend at the safe rate, $r_f$, all agree on the optimal tangency portfolio and choose to hold a share of the market portfolio.

However, when borrowing is restricted, as it is for many financial institutions, or when the borrowing rate is higher than the lending rate because borrowers pay a default premium, the market portfolio is no longer the common optimal portfolio for all investors.

When investors no longer can borrow at a common risk-free rate, they may choose risky portfolios from the entire set of efficient frontier portfolios according to how much risk they choose to bear. The market is no longer the common optimal portfolio. In fact, with investors choosing different portfolios, it is no longer obvious whether the market portfolio, which is the aggregate of all investors' portfolios, will even be on the efficient frontier. If the market portfolio is no longer mean-variance efficient, then the expected return–beta relationship of the CAPM will no longer characterize market equilibrium.

An equilibrium expected return–beta relationship in the case of restrictions on risk-free investments has been developed by Fischer Black.[11] Black's model is fairly difficult and requires a good deal of facility with mathematics. Therefore, we will satisfy ourselves with a sketch of Black's argument and spend more time with its implications.

Black's model of the CAPM in the absence of a risk-free asset rests on the three following properties of mean-variance efficient portfolios:

1. Any portfolio constructed by combining efficient portfolios is itself on the efficient frontier.
2. Every portfolio on the efficient frontier has a "companion" portfolio on the bottom half (the inefficient part) of the minimum-variance frontier with which it is uncorrelated. Because the portfolios are uncorrelated, the companion portfolio is referred to as the **zero-beta portfolio** of the efficient portfolio.

   The expected return of an efficient portfolio's zero-beta companion portfolio can be derived by the following graphical procedure. From any efficient portfolio such as $P$ in Figure 9.4 on page 296 draw a tangency line to the vertical axis. The intercept will be the expected return on portfolio $P$'s zero-beta companion portfolio, denoted $Z(P)$. The horizontal line from the intercept to the minimum-variance frontier identifies the standard deviation of the zero-beta portfolio. Notice in Figure 9.4 that different efficient portfolios such as $P$ and $Q$ have different zero-beta companions.

   These tangency lines are helpful constructs only. They do *not* signify that one can invest in portfolios with expected return–standard deviation pairs along the line. That would be possible only by mixing a risk-free asset with the tangency portfolio. In this case, however, we assume that risk-free assets are not available to investors.
3. The expected return of any asset can be expressed as an exact, linear function of the expected return on any two frontier portfolios. Consider, for example, the minimum-variance frontier portfolios $P$ and $Q$. Black showed that the expected return on any asset $i$ can be expressed as

$$E(r_i) = E(r_Q) + [E(r_P) - E(r_Q)]\,\frac{\mathrm{Cov}(r_i, r_P) - \mathrm{Cov}(r_P, r_Q)}{\sigma_P^2 - \mathrm{Cov}(r_P, r_Q)} \qquad (9.9)$$

[11] Fischer Black, "Capital Market Equilibrium with Restricted Borrowing," *Journal of Business*, July 1972.

# TALES FROM THE FAR SIDE

**Financial markets' evaluation of risk determines the way firms invest. What if the markets are wrong?**

Investors are rarely praised for their good sense. But for the past two decades a growing number of firms have based their decisions on a model which assumes that people are perfectly rational. If they are irrational, are businesses making the wrong choices?

The model, known as the "capital-asset pricing model," or CAPM, has come to dominate modern finance. Almost any manager who wants to defend a project—be it a brand, a factory or a corporate merger—must justify his decision partly based on the CAPM. The reason is that the model tells a firm how to calculate the return that its investors demand. If shareholders are to benefit, the returns from any project must clear this "hurdle rate."

Although the CAPM is complicated, it can be reduced to five simple ideas:

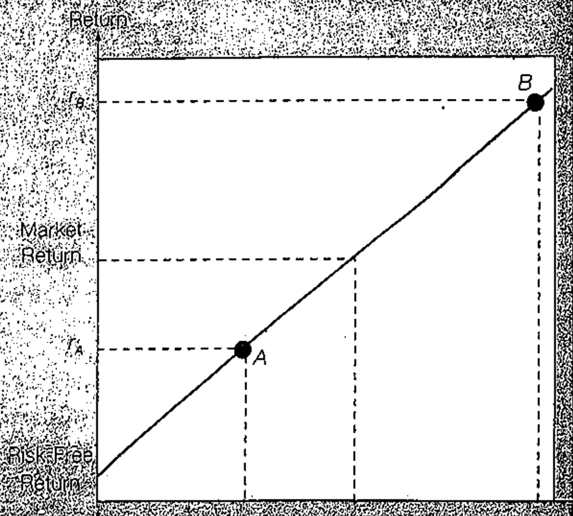
- Investors can eliminate some risks—such as the risk that workers will strike, or that a firm's boss will quit—by diversifying across many regions and sectors.
- Some risks, such as that of a global recession, cannot be eliminated through diversification. So even a basket of all of the stocks in a stock market will still be risky.
- People must be rewarded for investing in such a risky basket by earning returns above those that they can get on safer assets, such as Treasury bills.
- The rewards on a specific investment depend only on the extent to which it affects the market basket's risk.
- Conveniently, that contribution to the market basket's risk can be captured by a single measure—dubbed "beta"—which expresses the relationship between the investment's risk and the market's.

Beta is what makes the CAPM so powerful. Although an investment may face many risks, diversified investors should care only about those that are related to the market basket. Beta not only tells managers how to measure those risks, but it also allows them to translate them directly into a hurdle rate. If the future profits from a project will not exceed that rate, it is not worth shareholders' money.

The diagram shows how the CAPM works. Safe investments, such as Treasury bills, have a beta of zero. Riskier investments should earn a premium over the risk-free rate which increases with beta. Those whose risks roughly match the market's have a beta of one, by definition, and should earn the market return.

So suppose that a firm is considering two projects, *A* and *B*. Project *A* has a beta of ½: when the market rises or falls by 10%, its returns tend to rise or fall by 5%. So its

Beta Power




Note that Property 3 has nothing to do with market equilibrium. It is a purely mathematical property relating frontier portfolios and individual securities.

With these three properties, the Black model can be applied to any of several variations: no risk-free asset at all, risk-free lending but no risk-free borrowing, and borrowing at a rate higher than $r_f$. We show here how the model works for the case with risk-free lending but no borrowing.

Imagine an economy with only two investors, one relatively risk averse and one risk tolerant. The risk-averse investor will choose a portfolio on the CAL supported by portfolio $T$ in Figure 9.5, that is, he will mix portfolio $T$ with lending at the risk-free rate. $T$ is the tangency portfolio on the efficient frontier from the risk-free lending rate, $r_f$. The risk-tolerant investor is willing to accept more risk to earn a higher-risk premium; she will risk premium is only half that of the market. Project $B$'s risk premium is twice that of the market, so it must earn a higher return to justify the expenditure.

### Never Knowingly Underpriced

But there is one small problem with the CAPM. Financial economists have found that beta is not much use for explaining rates of return on firms' shares. Worse, there appears to be another measure which explains these returns quite well.

That measure is the ratio of a firm's book value (the value of its assets at the time they entered the balance sheet) to its market value. Several studies have found that, on average, companies that have high book-to-market ratios tend to earn excess returns over long periods, even after adjusting for the risks that are associated with beta.

The discovery of this book-to-market effect has sparked a fierce debate among financial economists. All of them agree that some risks ought to carry greater rewards. But they are now deeply divided over how risk should be measured. Some argue that since investors are rational, the book-to-market effect must be capturing an extra risk factor. They conclude, therefore, that managers should incorporate the book-to-market effect into their hurdle rates. They have labeled this alternative hurdle rate the "new estimator of expected return," or NEER.

Other financial economists, however, dispute this approach. Since there is no obvious extra risk associated with a high book-to-market ratio, they say, investors must be mistaken. Put simply, they are underpricing high book-to-market stocks, causing them to earn abnormally high returns. If managers of such firms try to exceed those inflated hurdle rates, they will forgo many profitable investments. With economists now at odds, what is a conscientious manager to do?

In a new paper,* Jeremy Stein, an economist at the Massachusetts Institute of Technology's business school, offers a paradoxical answer. If investors are rational, then beta cannot be the only measure of risk, so managers should stop using it. Conversely, if investors are irrational, then beta is still the right measure in many cases. Mr. Stein argues that if beta captures an asset's fundamental risk—that is, its contribution to the market basket's risk—then it will often make sense for managers to pay attention to it, even if investors are somehow failing to.

Often, but not always. At the heart of Mr. Stein's argument lies a crucial distinction—that between (*a*) boosting a firm's long-term value and (*b*) trying to raise its share price. If investors are rational, these are the same thing: any decision that raises long-term value will instantly increase the share price as well. But if investors are making predictable mistakes, a manager must choose.

For instance, if he wants to increase today's share price—perhaps because he wants to sell his shares, or to fend off a takeover attempt—he must usually stick with the NEER approach, accommodating investors' misperceptions. But if he is interested in long-term value, he should usually continue to use beta. Showing a flair for marketing, Mr. Stein labels this far-sighted alternative to NEER the "fundamental asset risk"—or FAR—approach.

Mr. Stein's conclusions will no doubt irritate many company bosses, who are fond of denouncing their investors' myopia. They have resented the way in which CAPM—with its assumption of investor infallibility—has come to play an important role in boardroom decision-making. But it now appears that if they are right, and their investors are wrong, then those same far-sighted managers ought to be the CAPM's biggest fans.

*Jeremy Stein, "Rational Capital Budgeting in an Irrational World," *The Journal of Business*, October 1996.
Source: "Tales from the FAR Side," *The Economist*, November 16, 1996, p. 8.

choose portfolio $S$. This portfolio lies along the efficient frontier with higher risk and return than portfolio $T$. The aggregate risky portfolio (i.e., the market portfolio, $M$) will be a combination of $T$ and $S$, with weights determined by the relative wealth and degrees of risk aversion of the two investors. Since $T$ and $S$ are each on the efficient frontier, so is $M$ (from Property 1).

From Property 2, $M$ has a companion zero-beta portfolio on the minimum-variance frontier, $Z(M)$, shown in Figure 9.5. Moreover, by Property 3 we can express the return on any security in terms of $M$ and $Z(M)$ as in equation 9.9. But, since by construction $\text{Cov}[r_M, r_{Z(M)}] = 0$, the expression simplifies to

$$E(r_i) = E[r_{Z(M)}] + E[r_M - r_{Z(M)}]\,\frac{\text{Cov}(r_i, r_M)}{\sigma_M^2} \tag{9.10}$$

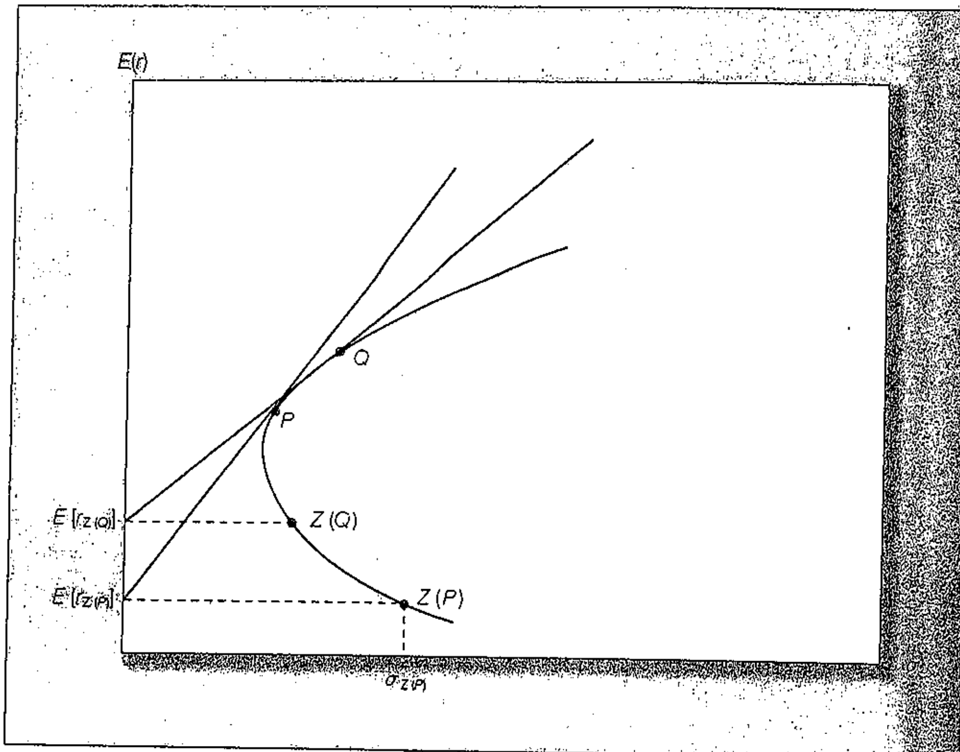



**Figure 9.4**
**Efficient portfolios and their zero-beta companions**

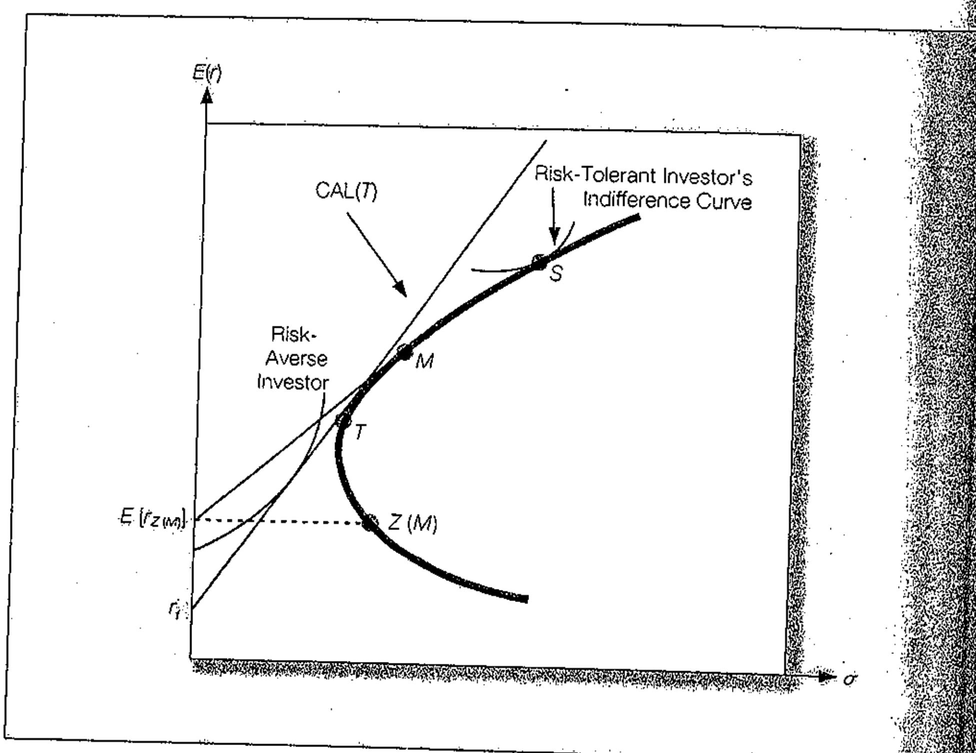



**Figure 9.5**
**Capital market equilibrium with no borrowing**

where $P$ from equation 9.9 has been replaced by $M$ and $Q$ has been replaced by $Z(M)$. Equation 9.10 may be interpreted as a variant of the simple CAPM, in which $r_f$ has been replaced with $E[r_{Z(M)}]$.

The more realistic scenario, where investors lend at the risk-free rate and borrow at a higher rate, was considered in Chapter 8. The same arguments that we have just employed can also be used to establish the zero-beta CAPM in this situation. Problem 18 at the end of this chapter asks you to fill in the details of the argument for this situation.

**CONCEPT CHECK ☞ QUESTION 6**

**Suppose that the zero-beta portfolio exhibits returns that are, on average, greater than the rate on T-bills. Is this fact relevant to the question of the validity of the CAPM?**

### Lifetime Consumption and the CAPM

One of the restrictive assumptions for the simple version of the CAPM is that investors are myopic—they plan for one common holding period. Investors actually may be concerned with a lifetime consumption plan and a desire to leave a bequest to children. Consumption plans that are feasible for them depend on current wealth and future rates of return on the investment portfolio. These investors will want to rebalance their portfolios as often as required by changes in wealth.

However, Eugene Fama[12] showed that, even if we extend our analysis to a multiperiod setting, the single-period CAPM still may be appropriate. The key assumptions that Fama used to replace myopic planning horizons are that investor preferences are unchanging over time and the risk-free interest rate and probability distribution of security returns do not change unpredictably over time. Of course, this latter assumption is also unrealistic. A variant of the CAPM that allows for such unpredictability is presented in Chapter 11.

## 9.3 THE CAPM AND LIQUIDITY

**Liquidity** refers to the cost and ease with which an asset can be converted into cash, that is, sold. Traders have long recognized the importance of liquidity, and some evidence suggests that illiquidity can reduce market prices substantially. For example, one study[13] finds that market discounts on closely held (and therefore nontraded) firms can exceed 30%. The nearby box focuses on the relationship between liquidity and stock returns.

A rigorous treatment of the value of liquidity was first developed by Amihud and Mendelson.[14] Several studies show that liquidity plays an important role in explaining rates of return on financial assets.[15] Chordia, Roll, and Subrahmanyam[16] find commonality across stocks in the variable cost of liquidity: quoted spreads, quoted depth, and effective spreads covary with the market and industrywide liquidity. Hence, liquidity risk is systematic and therefore difficult to diversify. We believe that liquidity will become an

[12] Eugene F. Fama, "Multiperiod Consumption-Investment Decisions," *American Economic Review* 60 (1970).

[13] Shannon P. Pratt, *Valuing a Business: The Analysis of Closely Held Companies*, 2nd ed. (Homewood, IL: Dow Jones–Irwin, 1989).

[14] Yakov Amihud and Haim Mendelson, "Asset Pricing and the Bid–Ask Spread," *Journal of Financial Economics* 17 (1986), pp. 223–49.

[15] For example, Venkat Eleswarapu, "Cost of Transacting and Expected Returns in the NASDAQ Market," *Journal of Finance* 2, no. 5 (1993), pp. 2113–27.

[16] Tarun Chordia, Richard Roll, and Avanidhar Subrahmanyam, "Commonality and Liquidity," *Journal of Financial Economics*, April 2000.

## STOCK INVESTORS PAY HIGH PRICE FOR LIQUIDITY

Given a choice between liquid and illiquid stocks, most investors, to the extent they think of it at all, opt for issues they know are easy to get in and out of.

But for long-term investors who don't trade often—which includes most individuals—that may be unnecessarily expensive. Recent studies of the performance of listed stocks show that, on average, less-liquid issues generate substantially higher returns—as much as several percentage points a year at the extremes.

### Illiquidity Payoff

Among the academic studies that have attempted to quantify this illiquidity payoff is a recent work by two finance professors, Yakov Amihud of New York University and Tel Aviv University, and Haim Mendelson of the University of Rochester. Their study looks at New York Stock Exchange issues over the 1961–1980 period and defines liquidity in terms of bid–asked spreads as a percentage of overall share price.

Market makers use spreads in quoting stocks to define the difference between the price they'll bid to take stock off an investor's hands and the price they'll offer to sell stock to any willing buyer. The bid price is always somewhat lower because of the risk to the broker of tying up precious capital to hold stock in inventory until it can be resold.

If a stock is relatively illiquid, which means there's not a ready flow of orders from customers clamoring to buy it, there's more of a chance the broker will lose money on the trade. To hedge this risk, market makers demand an even bigger discount to service potential sellers, and the spread will widen further.

The study by Profs. Amihud and Mendelson shows that liquidity spreads—measured as a percentage discount from the stock's total price—ranged from less than 0.1% fo widely held International Business Machines Corp., to a much as 4% to 5%. The widest-spread group was dom nated by smaller, low-priced stocks.

The study found that, overall, the least-liquid stocks av eraged an 8.5 percent-a-year higher return than the mos liquid stocks over the 20-year period. On average, a on percentage point increase in the spread was associate with a 2.5% higher annual return for New York Stock Ex change stocks. The relationship held after results were ad justed for size and other risk factors.

An extension of the study of Big Board stocks done a *The Wall Street Journal*'s request produced similar finding It shows that for the 1980–85 period, a one percentag point-wider spread was associated with an extra averag annual gain of 2.4%. Meanwhile, the least-liquid stocks ou performed the most-liquid stocks by almost six percentag points a year.

### Cost of Trading

Since the cost of the spread is incurred each time the sto is traded, illiquid stocks can quickly become prohibitive expensive for investors who trade frequently. On the oth hand, long-term investors needn't worry so much abo spreads, since they can amortize them over a longer perio

In terms of investment strategy, this suggests that th small investor should tailor the types of stocks he or sh buys to his expected holding period," Prof. Mendelson say If the investor expects to sell within three months, he say it's better to pay up for the liquidity and get the lowe spread. If the investor plans to hold the stock for a year more, it makes sense to aim at stocks with spreads of 3% more to capture the extra return.

Source: Barbara Donnelly, *The Wall Street Journal*, April 28, 1987, p. 37. Reprinted by permission of *The Wall Street Journal*. 

important part of standard valuation, and therefore present here a simplified version of th model.

Recall Assumption 4 of the CAPM, that all trading is costless. In reality, no securit perfectly liquid, in that all trades involve some transaction cost. Investors prefer more li uid assets with lower transaction costs, so it should not surprise us to find that all el equal, relatively illiquid assets trade at lower prices or, equivalently, that the expected r turn on illiquid assets must be higher. Therefore, an **illiquidity premium** must be im pounded into the price of each asset.

We start with the simplest case, in which we ignore systematic risk. Imagine a wor with a large number of uncorrelated securities. Because the securities are uncorrela well-diversified portfolios of these securities will have standard deviations near zero a the market portfolio will be virtually as safe as the risk-free asset. In this case, the mar risk premium will be zero. Therefore, despite the fact that the beta of each security is 1.0, the expected rate of return on all securities will equal the risk-free rate, which we will take to be the T-bill rate.

Assume that investors know in advance for how long they intend to hold their portfolios, and suppose that there are $n$ types of investors, grouped by investment horizon. Type 1 investors intend to liquidate their portfolios in one period, Type 2 investors in two periods, and so on, until the longest-horizon investors (Type $n$) intend to hold their portfolios for $n$ periods.

We assume that there are only two classes of securities: liquid and illiquid. The liquidation cost of a class L (more liquid) stock to an investor with a horizon of $h$ years (a Type $h$ investor) will reduce the per-period rate of return by $c_L/h\%$. For example, if the combination of commissions and the bid–asked spread on a security resulted in a liquidation cost of 10%, then the per-period rate of return for an investor who holds stock for 5 years would be reduced by approximately 2% per year, whereas the return on a 10-year investment would fall by only 1% per year.[17] Class I (illiquid) assets have higher liquidation costs that reduce the per-period return by $c_I/h\%$, where $c_I$ is greater than $c_L$. Therefore, if you intend to hold a class L security for $h$ periods, your expected rate of return *net* of transaction costs is $E(r_L) - c_L/h$. There is no liquidation cost on T-bills.

The following table presents the expected return investors would realize from the risk-free asset and class L and class I stock portfolios *assuming* that the simple CAPM is correct and all securities have an expected return of $r$:

| Asset: | Risk-Free | Class L | Class I |
|---|---|---|---|
| Gross rate of return: | $r$ | $r$ | $r$ |
| One-period liquidation cost: | 0 | $c_L$ | $c_I$ |
| **Investor Type** | | **Net Rate of Return** | |
| 1 | $r$ | $r - c_L$ | $r - c_I$ |
| 2 | $r$ | $r - c_L/2$ | $r - c_I/2$ |
| $\vdots$ | $\vdots$ | $\vdots$ | $\vdots$ |
| $n$ | $r$ | $r - c_L/n$ | $r - c_I/n$ |

These net rates of return would be inconsistent with a market in equilibrium, because with equal gross rates of return all investors would prefer to invest in zero-transaction-cost T-bills. As a result, both class L and class I stock prices must fall, causing their expected returns to rise until investors are willing to hold these shares.

Suppose, therefore, that each gross return is higher by some fraction of liquidation cost. Specifically, assume that the gross expected return on class L stocks is $r + xc_L$ and that of class I stocks is $r + yc_I$. The *net* rate of return on class L stocks to an investor with a horizon of $h$ will be $(r + xc_L) - c_L/h = r + c_L(x - 1/h)$. In general, the rates of return to investors will be:

---

[17] This simple structure of liquidation costs allows us to derive a correspondingly simple solution for the effect of liquidity on expected returns. Amihud and Mendelson used a more general formulation, but then needed to rely on complex and more difficult-to-interpret mathematical programming. All that matters for the qualitative results below, however, is that illiquidity costs be less onerous to longer-term investors.

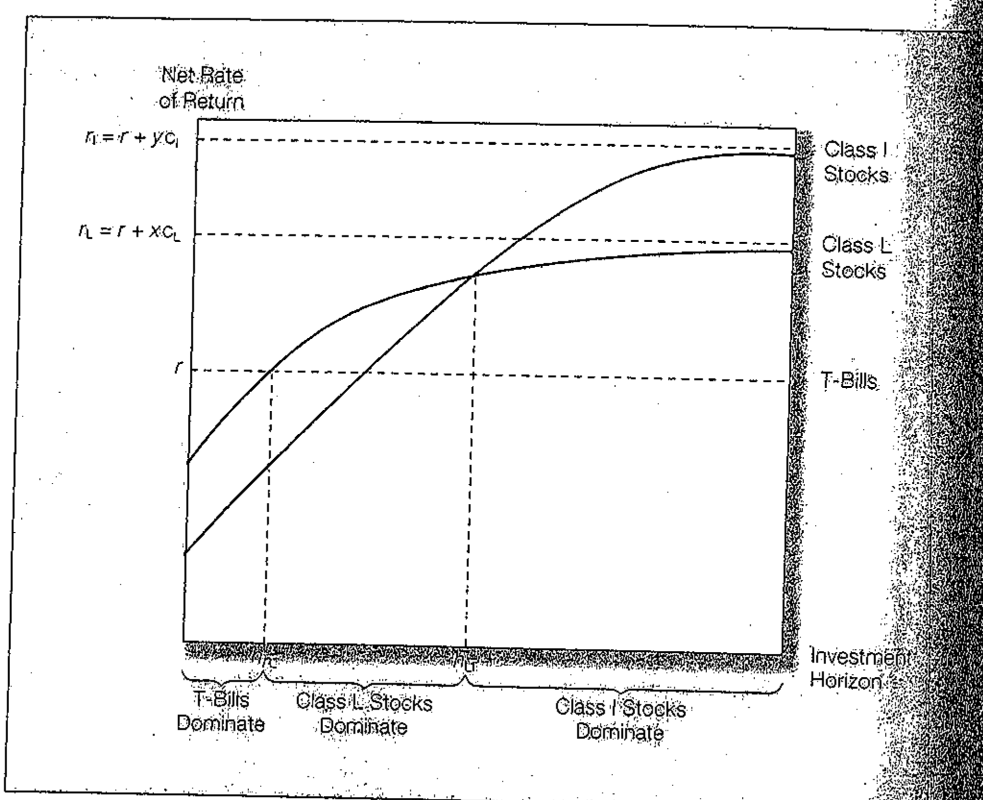
| Asset: | Risk-Free | Class L | Class I |
|---|---|---|---|
| Gross rate of return: | $r$ | $r + xc_L$ | $r + yc_I$ |
| One-period liquidation cost: | 0 | $c_L$ | $c_I$ |

| Investor Type | | Net Rate of Return | |
|---|---|---|---|
| 1 | $r$ | $r + c_L(x - 1)$ | $r + c_I(y - 1)$ |
| 2 | $r$ | $r + c_L(x - 1/2)$ | $r + c_I(y - 1/2)$ |
| ⋮ | ⋮ | ⋮ | ⋮ |
| $n$ | $r$ | $r + c_L(x - 1/n)$ | $r + c_I(y - 1/n)$ |

Notice that the liquidation cost has a greater impact on per-period returns for shorter-term investors. This is because the cost is amortized over fewer periods. As the horizon becomes very large, the per-period impact of the transaction cost approaches zero and the net rate of return approaches the gross rate.

Figure 9.6 graphs the net rate of return on the three asset classes for investors of differing horizons. The more illiquid stock has the lowest net rate of return for very short investment horizons because of its large liquidation costs. However, in equilibrium, the stock must be priced at a level that offers a rate of return high enough to induce some investors to hold it, implying that its gross rate of return must be higher than that of the more liquid stock. Therefore, for long enough investment horizons, the net return on class I stocks will exceed that on class L stocks.

**Figure 9.6 Net returns as a function of investment horizon**



Both stock classes underperform T-bills for very short investment horizons, because the transactions costs then have the largest per-period impact. Ultimately, however, because the *gross* rate of return of stocks exceeds $r$, for a sufficiently long investment horizon, the more liquid stocks in class L will dominate bills. The threshold horizon can be read from Figure 9.6 as $h_{rL}$. Anyone with a horizon that exceeds $h_{rL}$ will prefer class L stocks to T-bills. Those with horizons below $h_{rL}$ will choose bills. For even longer horizons, because $c_I$ exceeds $c_L$, the net rate of return on relatively illiquid class I stocks will exceed that on class L stocks. Therefore, investors with horizons greater than $h_{LI}$ will specialize in the most illiquid stocks with the highest gross rate of return. These investors are harmed least by the effect of trading costs.

Now we can determine equilibrium illiquidity premiums. For the marginal investor with horizon $h_{LI}$, the *net* return from class I and L stocks is the same. Therefore,

$$r + c_L(x - 1/h_{LI}) = r + c_I(y - 1/h_{LI})$$

We can use this equation to solve for the relationship between $x$ and $y$ as follows:

$$y = \frac{1}{h_{LI}} + \frac{c_L}{c_I}\left(x - \frac{1}{h_{LI}}\right)$$

The expected gross return on illiquid stocks is then

$$r_I = r + c_I y = r + \frac{c_I}{h_{LI}} + c_L\left(x - \frac{1}{h_{LI}}\right) = r + c_L x + \frac{1}{h_{LI}}(c_I - c_L) \tag{9.11}$$

Recalling that the expected gross return on class L stocks is $r_L = r + c_L x$, we conclude that the illiquidity premium of class I versus class L stocks is

$$r_I - r_L = \frac{1}{h_{LI}}(c_I - c_L) \tag{9.12}$$

Similarly, we can derive the liquidity premium of class L stocks over T-bills. Here, the marginal investor who is indifferent between bills and class L stocks will have investment horizon $h_{rL}$ and a net rate of return just equal to $r$. Therefore, $r + c_L(x - 1/h_{rL}) = r$, implying that $x = 1/h_{rL}$, and the liquidity premium of class L stocks must be $xc_L = c_L/h_{rL}$. Therefore,

$$r_L - r = \frac{1}{h_{rL}} c_L \tag{9.13}$$

There are two lessons to be learned from this analysis. First, as predicted, equilibrium expected rates of return are bid up to compensate for transaction costs, as demonstrated by equations 9.12 and 9.13. Second, the illiquidity premium is *not* a linear function of transaction costs. In fact, the incremental illiquidity premium steadily declines as transaction costs increase. To see that this is so, suppose that $c_L$ is 1% and $c_I - c_L$ is also 1%. Therefore, the transaction cost increases by 1% as you move out of bills into the more liquid stock class, and by another 1% as you move into the illiquid stock class. Equation 9.13 shows that the illiquidity premium of class L stocks over no-transaction-cost bills is then $1/h_{rL}$, and equation 9.12 shows that the illiquidity premium of class I over class L stocks is $1/h_{LI}$. But $h_{LI}$ exceeds $h_{rL}$ (see Figure 9.5), so we conclude that the incremental effect of illiquidity declines as we move into ever more illiquid assets.

The reason for this last result is simple. Recall that investors will self-select into different asset classes, with longer-term investors holding assets with the highest gross return but that are the most illiquid. For these investors, the effect of illiquidity is less costly because trading costs can be amortized over a longer horizon. Therefore, as these costs increase, the investment horizon associated with the holders of these assets also increases, which mitigates the impact on the required gross rate of return.

**CONCEPT CHECK ☞ QUESTION 7**

**Consider a very illiquid asset class of stocks, class V, with $c_V > c_I$. Use a graph like Figure 9.6 to convince yourself that there is an investment horizon, $h_{IV}$, for which an investor would be indifferent between stocks in illiquidity classes I and V. Analogously to equation 9.12, in equilibrium, the differential in gross returns must be**

$$r_V - r_I = \frac{1}{h_{IV}}(c_V - c_I)$$

Our analysis so far has focused on the case of uncorrelated assets, allowing us to ignore issues of systematic risk. This special case turns out to be easy to generalize. If we were to allow for correlation among assets due to common systematic risk factors, we would find that the illiquidity premium is simply additive to the risk premium of the usual CAPM. Therefore, we can generalize the CAPM expected return–beta relationship to include a liquidity effect as follows:

$$E(r_i) - r_f = \beta_i[E(r_M) - r_f] + f(c_i)$$

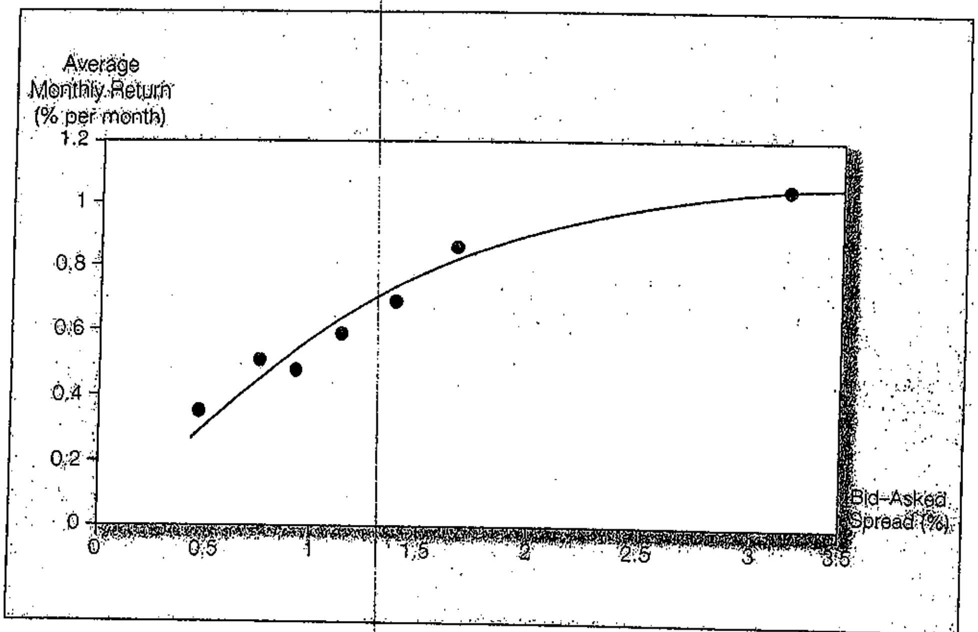
where $f(c_i)$ is a function of trading costs that measures the effect of the illiquidity premium given the trading costs of security $i$. We have seen that $f(c_i)$ is increasing in $c_i$ but at a decreasing rate. The usual CAPM equation is modified because each investor's optimal portfolio is now affected by liquidation cost as well as risk–return considerations.

The model can be generalized in other ways as well. For example, even if investors do not know their investment horizon for certain, as long as investors do not perceive a connection between unexpected needs to liquidate investments and security returns, the implications of the model are essentially unchanged, with expected horizons replacing actual horizons in equations 9.12 and 9.13.

Amihud and Mendelson provided a considerable amount of empirical evidence that liquidity has a substantial impact on gross stock returns. We will defer our discussion of most of that evidence until Chapter 13. However, for a preview of the quantitative significance of the illiquidity effect, examine Figure 9.7, which is derived from their study. It shows that average monthly returns over the 1961–1980 period rose from .35% for the group of stocks with the lowest bid–asked spread (the most liquid stocks) to 1.024% for the highest-spread stocks. This is an annualized differential of about 8%, nearly equal to the historical average risk premium on the S&P 500 index! Moreover, as their model predicts, the effect of the spread on average monthly returns is nonlinear, with a curve that flattens out as spreads increase.

[18] The only assumption necessary to obtain this result is that for each level of beta, there are many securities within that risk class with a variety of transaction costs. (This is essentially the same assumption used by Modigliani and Miller in their famous capital structure irrelevance proposition.) Thus our earlier analysis could be applied within each risk class, resulting in an illiquidity premium that simply adds on to the systematic risk premium.

**Figure 9.7**
**The relationship between illiquidity and average returns**




Source: Derived from Yakov Amihud and Haim Mendelson, "Asset Pricing and the Bid–Ask Spread," *Journal of Financial Economics* 17 (1986), pp. 223–49.

## SUMMARY

1. The CAPM assumes that investors are single-period planners who agree on a common input list from security analysis and seek mean-variance optimal portfolios.
2. The CAPM assumes that security markets are ideal in the sense that:
   *a.* They are large, and investors are price-takers.
   *b.* There are no taxes or transaction costs.
   *c.* All risky assets are publicly traded.
   *d.* Investors can borrow and lend any amount at a fixed risk-free rate.
3. With these assumptions, all investors hold identical risky portfolios. The CAPM holds that in equilibrium the market portfolio is the unique mean-variance efficient tangency portfolio. Thus a passive strategy is efficient.
4. The CAPM market portfolio is a value-weighted portfolio. Each security is held in a proportion equal to its market value divided by the total market value of all securities.
5. If the market portfolio is efficient and the average investor neither borrows nor lends, then the risk premium on the market portfolio is proportional to its variance, $\sigma_M^2$, and to the average coefficient of risk aversion across investors, $A$:

$$E(r_M) - r_f = .01 \times \bar{A}\sigma_M^2$$

6. The CAPM implies that the risk premium on any individual asset or portfolio is the product of the risk premium on the market portfolio and the beta coefficient:

$$E(r_i) - r_f = \beta_i[E(r_M) - r_f]$$

where the beta coefficient is the covariance of the asset with the market portfolio as a fraction of the variance of the market portfolio

$$\beta_i = \frac{\text{Cov}(r_i, r_M)}{\sigma_M^2}$$

7. When risk-free investments are restricted but all other CAPM assumptions hold, then the simple version of the CAPM is replaced by its zero-beta version. Accordingly, the risk-free rate in the expected return–beta relationship is replaced by the zero-beta portfolio's expected rate of return:

$$E(r_i) = E[r_{Z(M)}] + \beta_i E[r_M - r_{Z(M)}]$$

8. The simple version of the CAPM assumes that investors are myopic. When investors are assumed to be concerned with lifetime consumption and bequest plans, but investors' tastes and security return distributions are stable over time, the market portfolio remains efficient and the simple version of the expected return–beta relationship holds.
9. Liquidity costs can be incorporated into the CAPM relationship. When there is a large number of assets with any combination of beta and liquidity cost $c_i$, the expected return is bid up to reflect this undesired property according to

$$E(r_i) - r_f = \beta_i[E(r_M) - r_f] + f(c_i)$$

## KEY TERMS

homogeneous expectations
market portfolio
mutual fund theorem
market price of risk
beta
expected return–beta relationship
security market line (SML)
alpha
zero-beta portfolio
liquidity
illiquidity premium

## WEBSITES

finance.yahoo.com (Enter the ticker symbol, then link to the *Profile* report.)
moneycentral.msn.com/investor/home.asp (Enter the ticker symbol, then link to the *Company Report* from the *Research* menu on the left.)
www.wallpost.com (see *Profiles*)
www.411stocks.com
www.thomsoninvest.net (enter ticker symbol)

The sites listed above contain estimates of beta coefficients for individual securities and mutual funds.

www.efficientfrontier.com

This site contains practical information related to modern portfolio theory and portfolio allocation.

www.moneychimp.com/articles/valuation/capm.htm

Try the CAPM calculator at Moneychimp.com.

## PROBLEMS

1. What is the beta of a portfolio with $E(r_P) = 18\%$, if $r_f = 6\%$ and $E(r_M) = 14\%$?
2. The market price of a security is \$50. Its expected rate of return is 14%. The risk-free rate is 6% and the market risk premium is 8.5%. What will be the market price

of the security if its correlation coefficient with the market portfolio doubles (and all other variables remain unchanged)? Assume that the stock is expected to pay a constant dividend in perpetuity.

3. You are a consultant to a large manufacturing corporation that is considering a project with the following net after-tax cash flows (in millions of dollars):

| Years from Now | After-Tax Cash Flow |
|---|---|
| 0 | −40 |
| 1–10 | 15 |

The project's beta is 1.8. Assuming that $r_f = 8\%$ and $E(r_M) = 16\%$, what is the net present value of the project? What is the highest possible beta estimate for the project before its NPV becomes negative?

4. Are the following true or false? Explain.
   *a.* Stocks with a beta of zero offer an expected rate of return of zero.
   *b.* The CAPM implies that investors require a higher return to hold highly volatile securities.
   *c.* You can construct a portfolio with beta of .75 by investing .75 of the investment budget in T-bills and the remainder in the market portfolio.

5. Consider the following table, which gives a security analyst's expected return on two stocks for two particular market returns:

| Market Return | Aggressive Stock | Defensive Stock |
|---|---|---|
| 5% | −2% | 6% |
| 25 | 38 | 12 |

   *a.* What are the betas of the two stocks?
   *b.* What is the expected rate of return on each stock if the market return is equally likely to be 5% or 25%?
   *c.* If the T-bill rate is 6% and the market return is equally likely to be 5% or 25%, draw the SML for this economy.
   *d.* Plot the two securities on the SML graph. What are the alphas of each?
   *e.* What hurdle rate should be used by the management of the aggressive firm for a project with the risk characteristics of the defensive firm's stock?

If the simple CAPM is valid, which of the following situations in problems 6 to 12 are possible? Explain. Consider each situation independently.

6.

| Portfolio | Expected Return | Beta |
|---|---|---|
| *A* | 20 | 1.4 |
| *B* | 25 | 1.2 |

7.

| Portfolio | Expected Return | Standard Deviation |
|---|---|---|
| *A* | 30 | 35 |
| *B* | 40 | 25 |

8.

| Portfolio | Expected Return | Standard Deviation |
|---|---|---|
| Risk-free | 10 | 0 |
| Market | 18 | 24 |
| *A* | 16 | 12 |

9.

| Portfolio | Expected Return | Standard Deviation |
|---|---|---|
| Risk-free | 10 | 0 |
| Market | 18 | 24 |
| *A* | 20 | 22 |

10.

| Portfolio | Expected Return | Beta |
|---|---|---|
| Risk-free | 10 | 0 |
| Market | 18 | 1.0 |
| *A* | 16 | 1.5 |

11.

| Portfolio | Expected Return | Beta |
|---|---|---|
| Risk-free | 10 | 0 |
| Market | 18 | 1.0 |
| *A* | 16 | 0.9 |

12.

| Portfolio | Expected Return | Standard Deviation |
|---|---|---|
| Risk-free | 10 | 0 |
| Market | 18 | 24 |
| *A* | 16 | 22 |

In problems 13 to 15 assume that the risk-free rate of interest is 6% and the expected rate of return on the market is 16%.

13. A share of stock sells for $50 today. It will pay a dividend of $6 per share at the end of the year. Its beta is 1.2. What do investors expect the stock to sell for at the end of the year?
14. I am buying a firm with an expected perpetual cash flow of $1,000 but am unsure of its risk. If I think the beta of the firm is .5, when in fact the beta is really 1, how much *more* will I offer for the firm than it is truly worth?
15. A stock has an expected rate of return of 4%. What is its beta?
16. Two investment advisers are comparing performance. One averaged a 19% rate of return and the other a 16% rate of return. However, the beta of the first investor was 1.5, whereas that of the second was 1.
    *a.* Can you tell which investor was a better selector of individual stocks (aside from the issue of general movements in the market)?
    *b.* If the T-bill rate were 6% and the market return during the period were 14%, which investor would be the superior stock selector?
    *c.* What if the T-bill rate were 3% and the market return were 15%?

17. Suppose the rate of return on short-term government securities (perceived to be risk-free) is about 5%. Suppose also that the expected rate of return required by the market for a portfolio with a beta of 1 is 12%. According to the capital asset pricing model (security market line):
    *a.* What is the expected rate of return on the market portfolio?
    *b.* What would be the expected rate of return on a stock with $\beta = 0$?
    *c.* Suppose you consider buying a share of stock at \$40. The stock is expected to pay \$3 dividends next year and you expect it to sell then for \$41. The stock risk has been evaluated at $\beta = -.5$. Is the stock overpriced or underpriced?
18. Suppose that you can invest risk-free at rate $r_f$ but can borrow only at a higher rate, $r_f^B$. This case was considered in Chapter 8, Section 8.6.
    *a.* Draw a minimum-variance frontier. Show on the graph the risky portfolio that will be selected by defensive investors. Show the portfolio that will be selected by risk tolerant investors.
    *b.* What portfolios will be selected by investors who neither borrow nor lend?
    *c.* Where will the market portfolio lie on the efficient frontier?
    *d.* Will the zero-beta CAPM be valid in this scenario? Explain. Show graphically the expected return on the zero-beta portfolio.
19. Consider an economy with two classes of investors. Tax-exempt investors can borrow or lend at the safe rate, $r_f$. Taxed investors pay tax rate $t$ on all interest income, so their net-of-tax safe interest rate is $r_f(1 - t)$. Show that the zero-beta CAPM will apply to this economy and that $(1 - t)r_f < E[r_{Z(M)}] < r_f$.
20. Suppose that borrowing is restricted so that the zero-beta version of the CAPM holds. The expected return on the market portfolio is 17%, and on the zero-beta portfolio it is 8%. What is the expected return on a portfolio with a beta of .6?

CFA® PROBLEMS

21. The security market line depicts:
    *a.* A security's expected return as a function of its systematic risk.
    *b.* The market portfolio as the optimal portfolio of risky securities.
    *c.* The relationship between a security's return and the return on an index.
    *d.* The complete portfolio as a combination of the market portfolio and the risk-free asset.

CFA® PROBLEMS

22. Within the context of the capital asset pricing model (CAPM), assume:
    - Expected return on the market = 15%.
    - Risk-free rate = 8%.
    - Expected rate of return on XYZ security = 17%.
    - Beta of XYZ security = 1.25.

    Which one of the following is correct?
    *a.* XYZ is overpriced.
    *b.* XYZ is fairly priced.
    *c.* XYZ's alpha is −.25%.
    *d.* XYZ's alpha is .25%.

CFA® PROBLEMS

23. What is the expected return of a zero-beta security?
    *a.* Market rate of return.
    *b.* Zero rate of return.
    *c.* Negative rate of return.
    *d.* Risk-free rate of return.

CFA® PROBLEMS

24. Capital asset pricing theory asserts that portfolio returns are best explained by:
    *a.* Economic factors
    *b.* Specific risk
    *c.* Systematic risk
    *d.* Diversification

CFA® PROBLEMS

25. According to CAPM, the expected rate of return of a portfolio with a beta of 1.0 and an alpha of 0 is:
    *a.* Between $r_M$ and $r_f$.
    *b.* The risk-free rate, $r_f$.
    *c.* $\beta(r_M - r_f)$.
    *d.* The expected return on the market, $r_M$.

The following table shows risk and return measures for two portfolios.

| Portfolio | Average Annual Rate of Return | Standard Deviation | Beta |
|---|---|---|---|
| R | 11% | 10% | 0.5 |
| S&P 500 | 14% | 12% | 1.0 |

CFA® PROBLEMS

26. When plotting portfolio *R* on the preceding table relative to the SML, portfolio *R* lies:
    *a.* On the SML.
    *b.* Below the SML.
    *c.* Above the SML.
    *d.* Insufficient data given.

CFA® PROBLEMS

27. When plotting portfolio *R* relative to the capital market line, portfolio *R* lies:
    *a.* On the CML.
    *b.* Below the CML.
    *c.* Above the CML.
    *d.* Insufficient data given.

CFA® PROBLEMS

28. Briefly explain whether investors should expect a higher return from holding Portfolio A versus Portfolio B under capital asset pricing theory (CAPM). Assume that both portfolios are fully diversified.

| | Portfolio A | Portfolio B |
|---|---|---|
| Systematic risk (beta) | 1.0 | 1.0 |
| Specific risk for each individual security | High | Low |

CFA® PROBLEMS

29. Joan McKay is a portfolio manager for a bank trust department. McKay meets with two clients, Kevin Murray and Lisa York, to review their investment objectives. Each client expresses an interest in changing his or her individual investment objectives. Both clients currently hold well-diversified portfolios of risky assets.
    *a.* Murray wants to increase the expected return of his portfolio. State what action McKay should take to achieve Murray's objective. Justify your response in the context of the Capital Market Line.
    *b.* York wants to reduce the risk exposure of her portfolio but does not want to engage in borrowing or lending activities to do so. State what action McKay should

take to achieve York's objective. Justify your response in the context of the Security Market Line.

30. *a.* A mutual fund with beta of .8 has an expected rate of return of 14%. If $r_f = 5\%$, and you expect the rate of return on the market portfolio to be 15%, should you invest in this fund? What is the fund's alpha?

*b.* What passive portfolio comprised of a market-index portfolio and a money market account would have the same beta as the fund? Show that the difference between the expected rate of return on this passive portfolio and that of the fund equals the alpha from part (*a*).

CFA® PROBLEMS

31. Karen Kay, a portfolio manager at Collins Asset Management, is using the capital asset pricing model for making recommendations to her clients. Her research department has developed the information shown in the following exhibit.

**Forecast Returns, Standard Deviations, and Betas**

| | Forecast Return | Standard Deviation | Beta |
|---|---|---|---|
| Stock X | 14.0% | 36% | 0.8 |
| Stock Y | 17.0 | 25 | 1.5 |
| Market index | 14.0 | 15 | 1.0 |
| Risk-free rate | 5.0 | | |

*a.* Calculate expected return and alpha for each stock.

*b.* Identify and justify which stock would be more appropriate for an investor who wants to

i. add this stock to a well-diversified equity portfolio.

ii. hold this stock as a single-stock portfolio.

STANDARD &POOR'S

Enter the Market Insight database at **www.mhhe.com/business/finance/edumarketinsight** and link to *Company*, then *Population*. Select a company of interest to you and link to the Company Research page with a menu of company information reports on the left. Go to the *Excel Analytics, Valuation Data*, and review the *Profitability* report. Based on current risk-free rates (available at **finance.yahoo.com**), and the historical risk premiums discussed in Chapter 5, estimate the expected rate of return on your company's stock by using the CAPM.

**E-INVESTMENTS**
**Beta Comparisons**

For each of the companies listed below, obtain the beta coefficients from **moneycentral.msn.com** and **finance.yahoo.com**. Betas from msn can be found at the *Research* link under *Company Report*. Betas on the Yahoo site can be found by using the *Key Statistics* link.

IBM, PG, HWP, AEIS, INTC

Compare the betas reported by these two sites. Are there any significant differences in the reported beta coefficients? What factors could lead to these differences?

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**SOLUTIONS TO CONCEPT CHECKS**

1. We can characterize the entire population by two representative investors. One is the "uninformed" investor, who does not engage in security analysis and holds the market portfolio, whereas the other optimizes using the Markowitz algorithm with input from security analysis. The uninformed investor does not know what input the informed investor uses to make portfolio purchases. The uninformed investor knows, however, that if the other investor is informed, the market portfolio proportions will be optimal. Therefore, to depart from these proportions would constitute an uninformed bet, which will, on average, reduce the efficiency of diversification with no compensating improvement in expected returns.

2. *a.* Substituting the historical mean and standard deviation in equation 9.2 yields a coefficient of risk aversion of

$$\bar{A} = \frac{E(r_M) - r_f}{.01 \times \sigma_M^2} = \frac{8.2}{.01 \times 20.6^2} = 1.93$$

*b.* This relationship also tells us that for the historical standard deviation and a coefficient of risk aversion of 3.5 the risk premium would be

$$E(r_M) - r_f = .01 \times \bar{A}\sigma_M^2 = .01 \times 3.5 \times 20.6^2 = 14.9\%$$

3. For these investment proportions, $w_{\text{Ford}}$, $w_{\text{GM}}$, the portfolio $\beta$ is

$$\begin{aligned}\beta_P &= w_{\text{Ford}}\beta_{\text{Ford}} + w_{\text{GM}}\beta_{\text{GM}} \\ &= (.75 \times 1.25) + (.25 \times 1.10) = 1.2125\end{aligned}$$

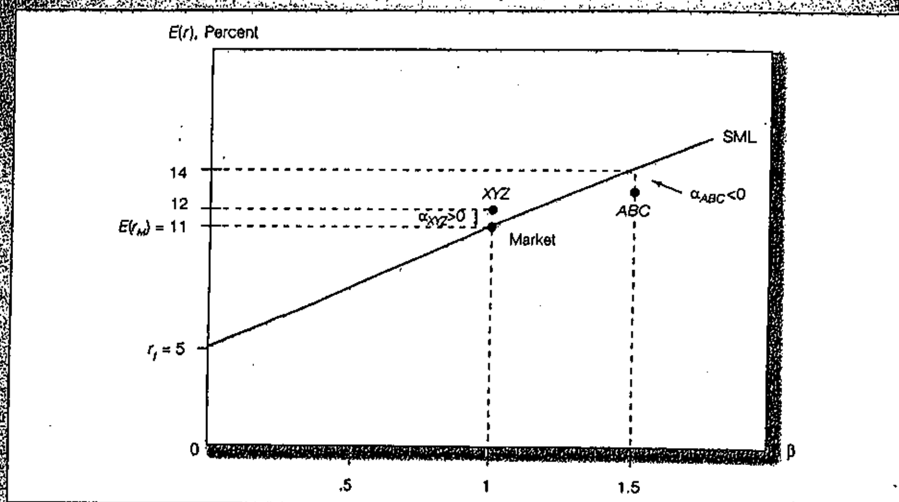
As the market risk premium, $E(r_M) - r_f$, is 8%, the portfolio risk premium will be

$$\begin{aligned}E(r_P) - r_f &= \beta_P[E(r_M) - r_f] \\ &= 1.2125 \times 8 = 9.7\%\end{aligned}$$

4. The alpha of a stock is its expected return in excess of that required by the CAPM.

$$\begin{aligned}\alpha &= E(r) - \{r_f + \beta[E(r_M) - r_f]\} \\ \alpha_{XYZ} &= 12 - [5 + 1.0(11 - 5)] = 1\% \\ \alpha_{ABC} &= 13 - [5 + 1.5(11 - 5)] = -1\%\end{aligned}$$

5. *ABC* plots below the SML, while *XYZ* plots above.



**SOLUTIONS TO CONCEPT CHECKS** *(Concluded)*

5. The project-specific required return is determined by the project beta coupled with the market risk premium and the risk-free rate. The CAPM tells us that an acceptable expected rate of return for the project is

$$r_f + \beta[E(r_M) - r_f] = 8 + 1.3(16 - 8) = 18.4\%$$

which becomes the project's hurdle rate. If the IRR of the project is 19%, then it is desirable. Any project with an IRR equal to or less than 18.4% should be rejected.

6. If the basic CAPM holds, any zero-beta asset must be expected to earn on average the risk-free rate. Hence the posted performance of the zero-beta portfolio violates the simple CAPM. It does not, however, violate the zero-beta CAPM. Since we know that borrowing restrictions do exist, we expect the zero-beta version of the model is more likely to hold, with the zero-beta rate differing from the virtually risk-free T-bill rate.

7. Consider investors with time horizon $h_{IV}$, who will be indifferent between illiquid (I) and very illiquid (V) classes of stock. Call $x$ the fraction of liquidation cost by which the gross return of class V stocks is increased. For these investors the indifference condition is

$$[r_I + x c_I] - c_I/h_{IV} = [r_V + x c_V] - c_V/h_{IV}$$

This equation can be rearranged to show that

$$[r_V + x c_V] - [r_I + x c_I] = (c_V - c_I)/h_{IV}$$

## APPENDIX: DEMAND FOR STOCKS AND EQUILIBRIUM PRICES

In this section, we will make more explicit the links between the quest for efficiently diversified portfolios, which drives investor demand for securities, and the process by which equilibrium expected rates of return are established. To understand how market equilibrium is formed we need to connect the determination of optimal portfolios with security analysis and the actual buy/sell transactions of investors. We will show how the quest for efficient diversification leads to a demand schedule for shares. In turn, the supply and demand for shares determine equilibrium prices and expected rates of return.

Imagine a simple world with only two corporations: Bottom Up Inc. (BU) and Top Down Inc. (TD). Stock prices and market values are shown in Table 9A.1. Investors can also invest in a money market fund (MMF) which yields a risk-free interest rate of 5%.

Sigma Fund is a new actively managed mutual fund that has raised \$220 million to invest in the stock market. The security analysis staff of Sigma believes that neither BU nor TD will grow in the future and therefore, that each firm will pay level annual dividends for

**Table 9A.1 Share Prices and Market Values of Bottom Up (BU) and Top Down (TD)**

| | BU | TD |
|---|---|---|
| Price per share (\$) | 39.00 | 39.00 |
| Shares outstanding | 5,000,000 | 4,000,000 |
| Market value (\$ millions) | 195 | 156 |

**Table 9A.2 Capital Market Expectations of Portfolio Manager**

| | BU | TD |
|---|---|---|
| Expected annual dividend ($/share) | 6.40 | 3.80 |
| Discount rate = Required return* (%) | 16 | 10 |
| Expected end-of-year price† ($/share) | 40 | 38 |
| Current price | 39 | 39 |
| Expected return (%): Capital gain | 2.56 | −2.56 |
| Dividend yield | 16.41 | 9.74 |
| Total expected return for the year | 18.97 | 7.18 |
| Standard deviation of rate of return | 40% | 20% |
| Correlation coefficient between rates of return on BU and TD | .20 | |

*Based on assessment of risk.
†Obtained by discounting the dividend perpetuity at the required rate of return.

the foreseeable future. This is a useful simplifying assumption because, if a stock is expected to pay a stream of level dividends, the income derived from each share is a perpetuity. Therefore, the present value of each share—often called the *intrinsic value* of the share—equals the dividend divided by the appropriate discount rate. A summary of their report of the security analysts appears in Table 9A.2.

The expected returns in Table 9A.2 are based on the assumption that next year's dividends will conform to Sigma's forecasts, and share prices will be equal to intrinsic values at year-end. The standard deviations and the correlation coefficient between the two stocks were estimated by Sigma's security analysts from past returns and assumed to remain at these levels for the coming year.

Using these data and assumptions Sigma easily generates the efficient frontier shown in Figure 9A.1 and computes the optimal portfolio proportions corresponding to the tangency portfolio. These proportions, combined with the total investment budget, yield the fund's buy orders. With a budget of $220 million, Sigma wants a position in BU of $220,000,000 × .8070 = $177,540,000, or $177,540,000/39 = 4,552,308 shares, and a position in TD of $220,000,000 × .1930 = $42,460,000, which corresponds to 1,088,718 shares.

## Sigma's Demand for Shares

The expected rates of return that Sigma used to derive its demand for shares of BU and TD were computed from the forecast of year-end stock prices and the current prices. If, say, a share of BU could be purchased at a lower price, Sigma's forecast of the rate of return on BU would be higher. Conversely, if BU shares were selling at a higher price, expected returns would be lower. A new expected return would result in a different optimal portfolio and a different demand for shares.

We can think of Sigma's demand schedule for a stock as the number of shares Sigma would want to hold at different share prices. In our simplified world, producing the demand for BU shares is not difficult. First, we revise Table 9A.2 to recompute the expected return on BU at different current prices given the forecast year-end price. Then, for each price and associated expected return, we construct the optimal portfolio and find the implied position in BU. A few samples of these calculations are shown in Table 9A.3. The first four columns in Table 9A.3 show the expected returns on BU shares given their current price. The optimal proportion (column 5) is calculated using these expected returns. Finally, Sigma's investment budget, the optimal proportion in BU and the current price of a BU share

**Figure 9A.1 Sigma's efficient frontier and optimal portfolio**

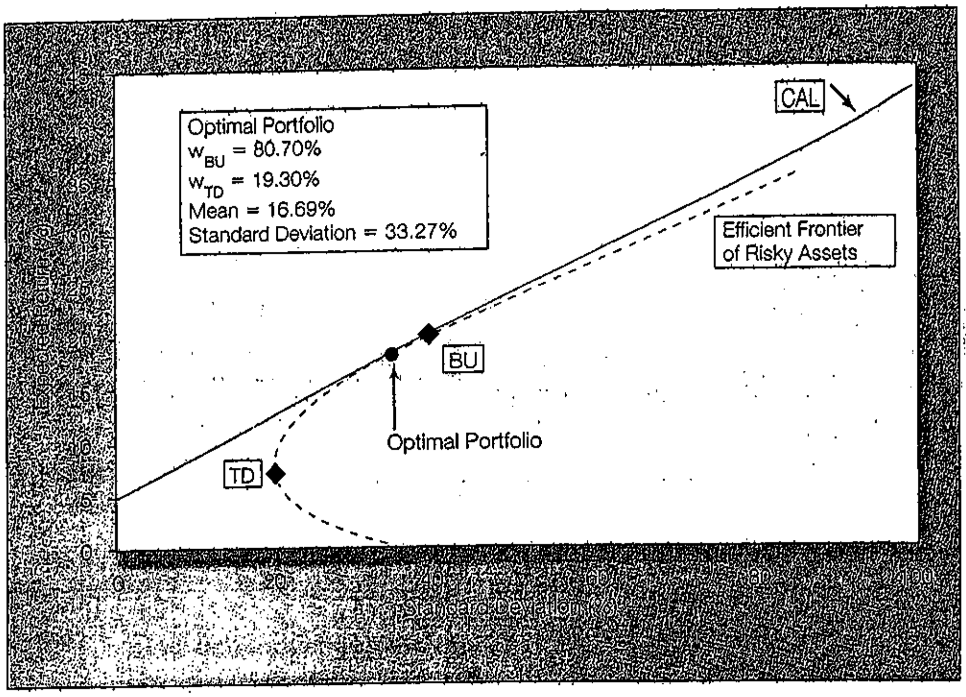



**Table 9A.3 Calculation of Sigma's Demand for BU Shares**

| Current Price ($) | Capital Gain (%) | Dividend Yield (%) | Expected Return (%) | BU Optimal Proportion | Desired BU Shares |
|---|---|---|---|---|---|
| 45.0 | −11.11 | 14.29 | 3.17 | −.4113 | −2,010,582 |
| 42.5 | −5.88 | 15.06 | 9.18 | .3192 | 1,652,482 |
| 40.0 | 0 | 16.00 | 16.00 | .7011 | 3,856,053 |
| 37.5 | 6.67 | 17.07 | 23.73 | .9358 | 5,490,247 |
| 35.0 | 14.29 | 18.29 | 32.57 | 1.0947 | 6,881,225 |

determine the desired number of shares. Note that we compute the demand for BU shares *given* the price and expected return for TD. This means that the entire demand schedule must be revised whenever the price and expected return on TD is changed.

Sigma's demand curve for BU stock is given by the Desired Shares column in Table 9A.3 and is plotted in Figure 9A.2. Notice that the demand curve for the stock slopes downward. When BU's stock price falls, Sigma will desire more shares for two reasons: (1) an income effect—at a lower price Sigma can purchase more shares with the same budget, and (2) a substitution effect—the increased expected return at the lower price will make BU shares more attractive relative to TD shares. Notice that one can desire a negative number of shares, that is, a short position. If the stock price is high enough, its expected return will be so low that the desire to sell will overwhelm diversification motives and investors will want to take a short position. Figure 9A.2 shows that when the price exceeds $44, Sigma wants a short position in BU.

The demand curve for BU shares assumes that the price and therefore expected return of TD remain constant. A similar demand curve can be constructed for TD shares given a

Figure 9A.2 Supply and demand for BU shares

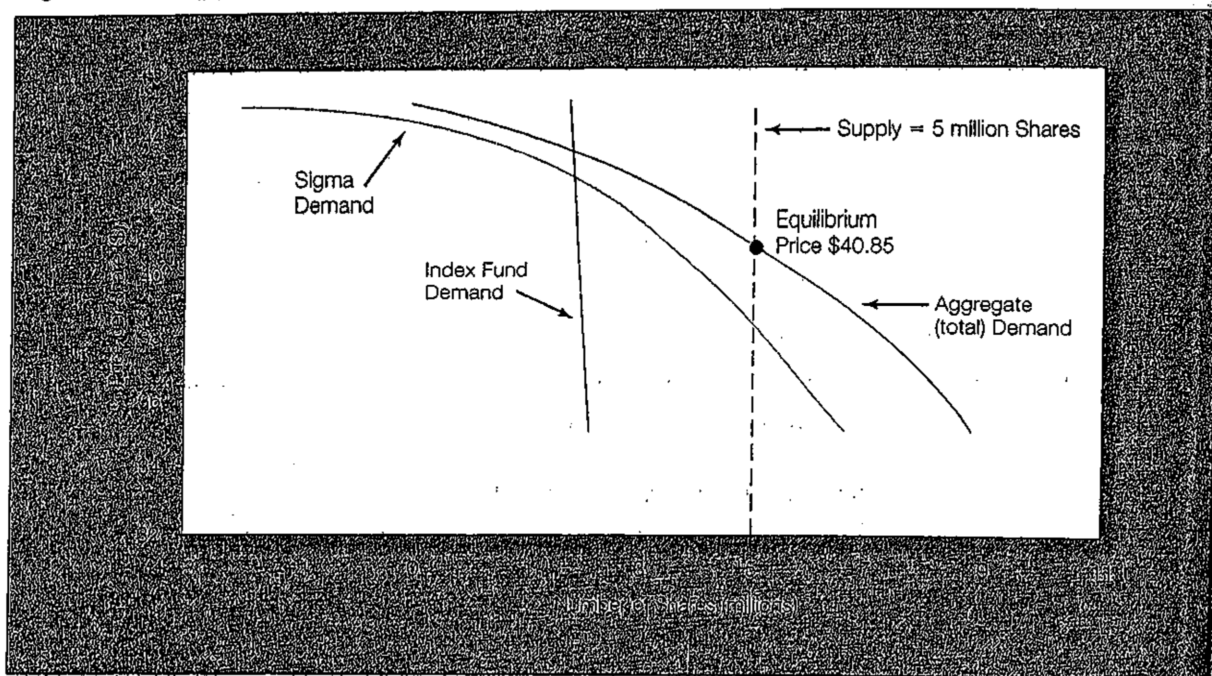
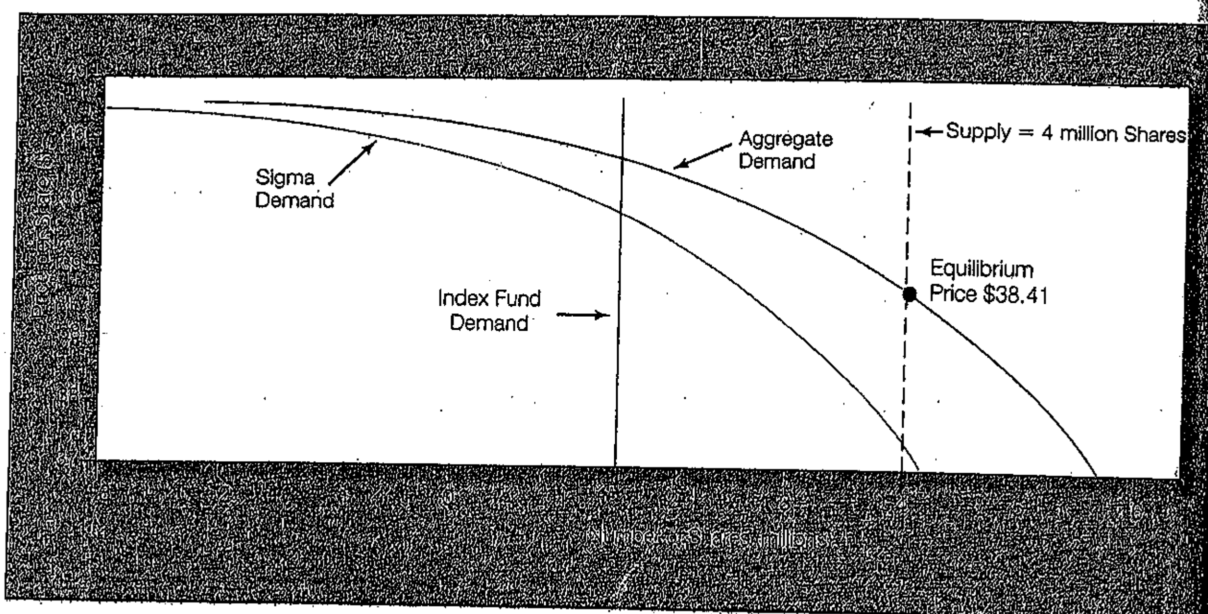



Figure 9A.3 Supply and demand for TD shares




price for BU shares. As before, we would generate the demand for TD shares by revisi
Table 9A.2 for various current prices of TD, leaving the price of BU unchanged. We use
revised expected returns to calculate the optimal portfolio for each possible price of TD
timately obtaining the demand curve shown in Figure 9A.3.

**Table 9A.4 Calculation of Index Demand for BU Shares**

| Current Price | BU Market Value Proportion | Dollar Investment* ($ million) | Shares Desired |
|---|---|---|---|
| $45.00 | .5906 | 76.772 | 1,706,037 |
| 42.50 | .5767 | 74.966 | 1,763,906 |
| 40.00 | .5618 | 73.034 | 1,825,843 |
| **39.00** | **.5556** | **72.222** | **1,851,852** |
| 37.50 | .5459 | 70.961 | 1,892,285 |
| 35.00 | .5287 | 68.731 | 1,963,746 |

*Dollar investment = BU proportion × $130 million.

## Index Funds' Demands for Stock

We have seen that index funds play an important role in portfolio selection, so let's see how an index fund would derive its demand for shares. Suppose that $130 million of investor funds in our hypothesized economy are given to an index fund—named Index—to manage. What will it do?

Index is looking for a portfolio that will mimic the market. Suppose current prices and market values are as in Table 9A.1. Then the required proportions to mimic the market portfolio are:

$$w_{BU} = 195/(195 + 156) = .5556\ (55.56\%);\ w_{TD} = 1 - .5556 = .4444\ (44.44\%)$$

With $130 million to invest, Index will place .5556 × $130 million = $72.22 million in BU shares. Table 9A.4 shows a few other points on Index's demand curve for BU shares. The second column of the table shows the proportion of BU in total stock market value at each assumed price. In our two-stock example, this is BU's value as a fraction of the combined value of BU and TD. The third column is Index's desired dollar investment in BU and the last column shows shares demanded. The bold row corresponds to the case we analyzed in Table 9A.1, for which BU is selling at $39.

Index's demand curve for BU shares is plotted in Figure 9A.2 next to Sigma's demand, and in Figure 9A.3 for TD shares. Index's demand is smaller than Sigma's because its budget is smaller. Moreover, the demand curve of the index fund is very steep, or "inelastic," that is, demand hardly responds to price changes. This is because an index fund's demand for shares does not respond to expected returns. Index funds seek only to replicate market proportions. As the stock price goes up, so does its proportion in the market. This leads the index fund to invest more in the stock. Nevertheless, because each share costs more, the fund will desire fewer shares.

## Equilibrium Prices and the Capital Asset Pricing Model

Market prices are determined by supply and demand. At any one time, the supply of shares of a stock is fixed, so supply is vertical at 5,000,000 shares of BU in Figure 9A.2 and 4,000,000 shares of TD in Figure 9A.3. Market demand is obtained by "horizontal aggregation," that is, for each price we add up the quantity demanded by all investors. You can examine the horizontal aggregation of the demand curves of Sigma and Index in Figures 9A.2 and 9A.3. The equilibrium prices are at the intersection of supply and demand.

However, the prices shown in Figures 9A.2 and 9A.3 will likely not persist for more than an instant. The reason is that the equilibrium price of BU ($40.85) was generated by demand curves derived by assuming that the price of TD was $39. Similarly, the equilibrium price of TD ($38.41) is an equilibrium price only when BU is at $39, which also is not the case. A full equilibrium would require that the demand curves derived for each stock be consistent with the actual prices of all other stocks. Thus, our model is only a beginning. But it does illustrate the important link between security analysis and the process by which portfolio demands, market prices, and expected returns are jointly determined. The CAPM treats the problem of finding a set of mutually consistent equilibrium prices and expected rates of return across all stocks. The model here illustrates the process that underlies the adjustment of market expected returns to demand pressures.

One might wonder why we originally posited that Sigma expects BU's share price to increase only by year-end when we have just argued that the adjustment to the new equilibrium price ought to be instantaneous. The reason is that when Sigma observes a market price of $39, it must assume that this *is* an equilibrium price based on investor beliefs *at the time*. Sigma believes that the market will catch up to its (presumably) superior estimate of intrinsic value of the firm by year-end, when its better assessment about the firm becomes widely adopted. In our simple example, Sigma is the only active manager, so its demand for "low-priced" BU stock would move the price immediately. But more realistically, since Sigma would be a small player compared to the entire stock market, the stock price would barely move in response to Sigma's demand, and the price would remain around $39 until Sigma's assessment was adopted by the average investor.

NGRID 1-7 Referring to the Rothschild Direct Testimony at page 33 line 1. Please provide the missing footnote number 5, and provide the associated data source if appropriate.

RESPONSE: Please see attachment for NGRID 1-6.

NGRID 1-8 Referring to the Rothschild Direct Testimony at page 34 line 16. Please provide a copy of the chapter from the book Stock for the Long Run from which the quote was taken.

RESPONSE: Please see attached.

CHAPTER 1

# STOCK AND BOND RETURNS SINCE 1802

*I know of no way of judging the future but by the past.*

PATRICK HENRY, 1775[1]

## "EVERYBODY OUGHT TO BE RICH"

In the summer of 1929, a journalist named Samuel Crowther interviewed John J. Raskob, a senior financial executive at General Motors, about how the typical individual could build wealth by investing in stocks. In August of that year, Crowther published Raskob's ideas in a *Ladies' Home Journal* article with the audacious title, "Everybody Ought to Be Rich."

In the interview, Raskob claimed that America was on the verge of a tremendous industrial expansion. He maintained that by putting just $15 a month into good common stocks, investors could expect their wealth to grow steadily to $80,000 over the next 20 years. Such a return—24 percent per year—was unprecedented, but the prospect of effortlessly amassing a great fortune seemed plausible in the atmosphere of the 1920s bull mar-

[1]Speech in Virginia Convention, March 23, 1775.

ket. Stocks excited investors, and millions of people put their savings into the market seeking a quick profit.

On September 3, 1929, a few days after Raskob's ideas appeared, the Dow Jones Industrial Average hit a historic high of 381.17. Seven weeks later, stocks crashed. The next 34 months saw the most devastating decline in share values in U.S. history.

On July 8, 1932, when the carnage was finally over, the Dow stood at 41.22. The market value of the world's greatest corporations had declined an incredible 89 percent. Millions of investors' life savings were wiped out, and thousands of investors who borrowed money to buy stocks were forced into bankruptcy. America was mired in the deepest economic depression in its history.

Raskob's advice was ridiculed and denounced for years to come. It was said to represent the insanity of those who believed that the market could rise forever and the foolishness of those who ignored the tremendous risks inherent in stocks. Indiana's Senator Arthur Robinson publicly held Raskob responsible for the stock crash by urging common people to buy stock at the market peak.[2] In 1992, 63 years later, *Forbes* magazine warned investors of the overvaluation of stocks in its issue headlined, "Popular Delusions and the Madness of Crowds." In a review of the history of market cycles, *Forbes* fingered Raskob as the "worst offender" of those who viewed the stock market as a guaranteed engine of wealth.[3]

Conventional wisdom holds that Raskob's foolhardy advice epitomizes the mania that periodically overruns Wall Street. However, is this verdict fair? The answer is decidedly no. If you were to calculate the value of the portfolio of an investor who followed Raskob's advice, patiently putting $15 a month into stocks, you would find that his or her accumulation would exceed that of someone who placed the same money in Treasury bills after less than 4 years! After 20 years, his or her stock portfolio would have accumulated to almost $9,000, and after 30 years, over $60,000. Although not as high as Raskob had projected, $60,000 still represents a fantastic 13 percent return on invested capital, far exceeding the returns earned by conservative investors who switched their money to Treasury bonds or bills at the market peak. Those who never bought stock, citing the great crash as the vindication of their caution, eventually

[2] Irving Fisher, *The Stock Market Crash and After* (New York: Macmillan, 1930), p. xi.
[3] "The Crazy Things People Say to Rationalize Stock Prices," *Forbes*, April 27, 1992, p. 150.

found themselves far behind investors who had patiently accumulated equity.[4]

John Raskob's infamous prediction illustrates an important theme in the history of Wall Street. This theme is not the prevalence of foolish optimism at market peaks; rather, it is that over the last century, accumulations in stocks have always outperformed other financial assets for the patient investor. Even such calamitous events as the great stock crash of 1929 did not negate the superiority of stocks as long-term investments.

## FINANCIAL MARKET RETURNS FROM 1802

This chapter analyzes the returns on stocks and bonds over long periods of time in both the United States and other countries. This two-century history is divided into three subperiods. In the first subperiod, from 1802 through 1870, the United States made a transition from an agrarian to an industrialized economy, comparable with the "emerging markets" of Latin America and Asia today.[5] In the second subperiod, from 1871 through 1925, the United States became the foremost political and economic power in the world.[6] The third subperiod, from 1926 to the present, contains the 1929–1932 stock collapse, the Great Depression, and the postwar expansion. The data from this period have been analyzed extensively by academics and professional money managers and have served as a benchmark for historical returns.[7] Figure 1-1 tells the story. It depicts the total return indexes for stocks, long- and short-term bonds, gold, and commodities from 1802 through 2001. *Total returns* means that all returns, such as interest and dividends and capital gains, are automatically reinvested in the asset and allowed to accumulate over time.

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[4]Raskob succumbed to investors in the 1920s who wanted to get rich quickly by devising a scheme by which investors borrowed $300, adding $200 of personal capital, to invest $500 in stocks. Although in 1929 this was certainly not as good as putting money gradually in the market, even this plan beat investment in Treasury bills after 20 years.

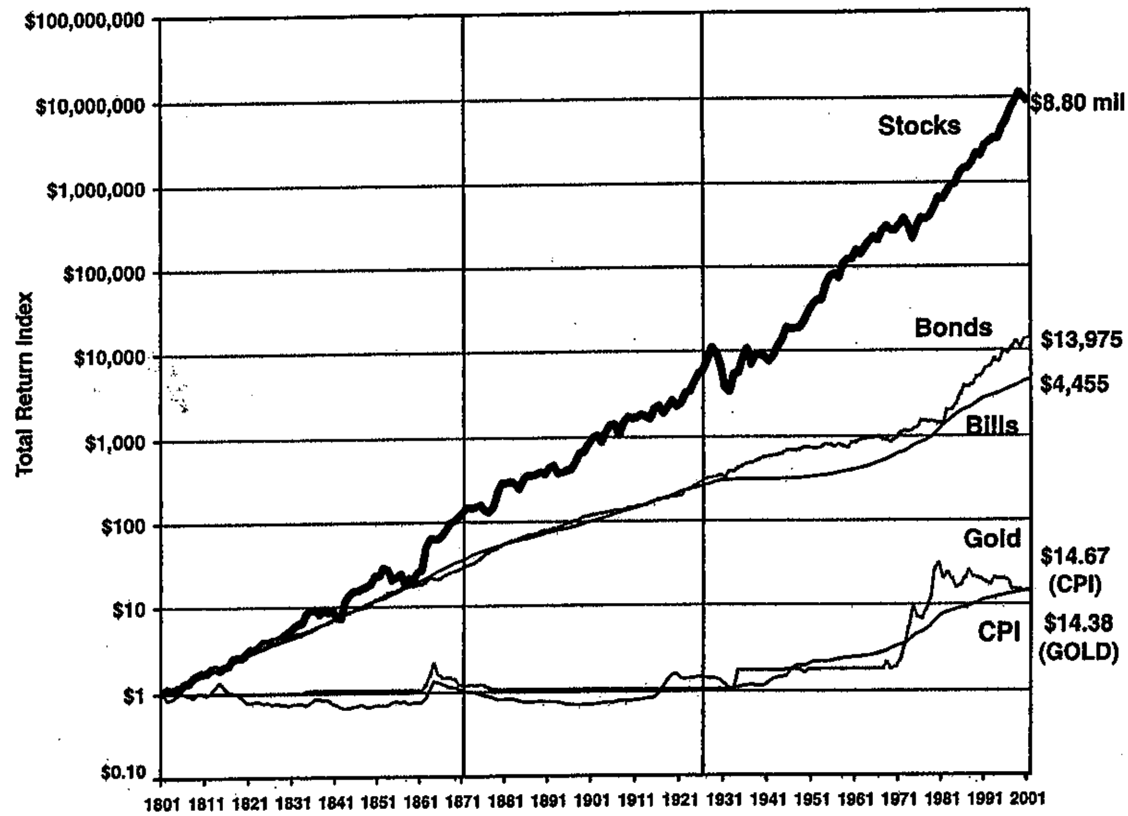
[5]A brief description of the early stock market is found in Appendix 1. The stock data during this period are taken from Schwert (1990), although I have inserted my own dividend series. G. William Schwert, "Indexes of United States Stock Prices from 1802 to 1987," *Journal of Business* 63(1990):399–426.

[6]The stock series used in this period are taken from Cowles indexes as reprinted in Shiller (1989). Robert Shiller, *Market Volatility* (Cambridge, MA: M.I.T. Press, 1989). The Cowles indexes are capitalization-weighted indexes of all New York Stock Exchange stocks and include dividends.

[7]The data from the third period are taken from the Center for Research in Stock Prices (CRSP) capitalization-weighted indexes of all New York stocks and, starting in 1962, American and Nasdaq stocks.

FIGURE 1–1

Total Nominal Return Indexes, 1802–2001




It can be easily seen that the total return on equities dominates all other assets. Even the cataclysmic stock crash of 1929, which caused a generation of investors to shun stocks, appears as a mere blip in the stock return index. Bear markets, which so frighten investors, pale in the context of the upward thrust of total stock returns. One dollar invested and reinvested in stocks since 1802 would have accumulated to nearly $8.80 million by the end of 2001. This sum can be realized by an investor holding the broadest possible portfolio of stocks in proportion to their market value and does not depend on how many of these companies survive or not.[8]

By extension, the preceding analysis indicates that $1 million invested and reinvested during these 200 years would have grown to the

[8]Analysis of the survivorship issue in computing returns is discussed in Chapter 3.

incredible sum of $8.80 trillion by the end of 2001, nearly 70 percent of the entire capitalization of the U.S. stock market!

One million dollars in 1802 is equivalent to roughly $15 million in today's purchasing power. This was certainly a large, though not overwhelming, sum of money to the industrialists and landholders of the early nineteenth century.[9] However, total wealth in the stock market, or in the economy for that matter, does not accumulate as fast as the total return index. This is so because investors consume most of their dividends and capital gains, enjoying the fruits of their past saving.

It is rare for anyone to accumulate wealth for long periods of time without consuming part of his or her return. The longest period of time investors typically plan to hold assets without touching principal and income is when they are accumulating wealth in pension plans for their retirement or in insurance policies that are passed on to their heirs. Even those who bequeath fortunes untouched during their lifetimes must realize that these accumulations often are dissipated in the next generation. The stock market has the power to turn a single dollar into millions by the forbearance of generations—but few will have the patience or desire to let this happen.

## HISTORICAL SERIES ON BONDS

Bonds are the most important financial assets competing with stocks. Bonds promise fixed monetary payments over time. In contrast to equity, the cash flows from bonds have a maximum monetary value set by the terms of the contract and, except in the case of default, do not vary with the profitability of the firm.

The bond series shown in Figure 1-1 are based on long- and short-term government bonds, when available; if not, similar highly rated securities were used. Default premiums were removed from all interest rates in order to obtain a comparable series over the entire period.[10]

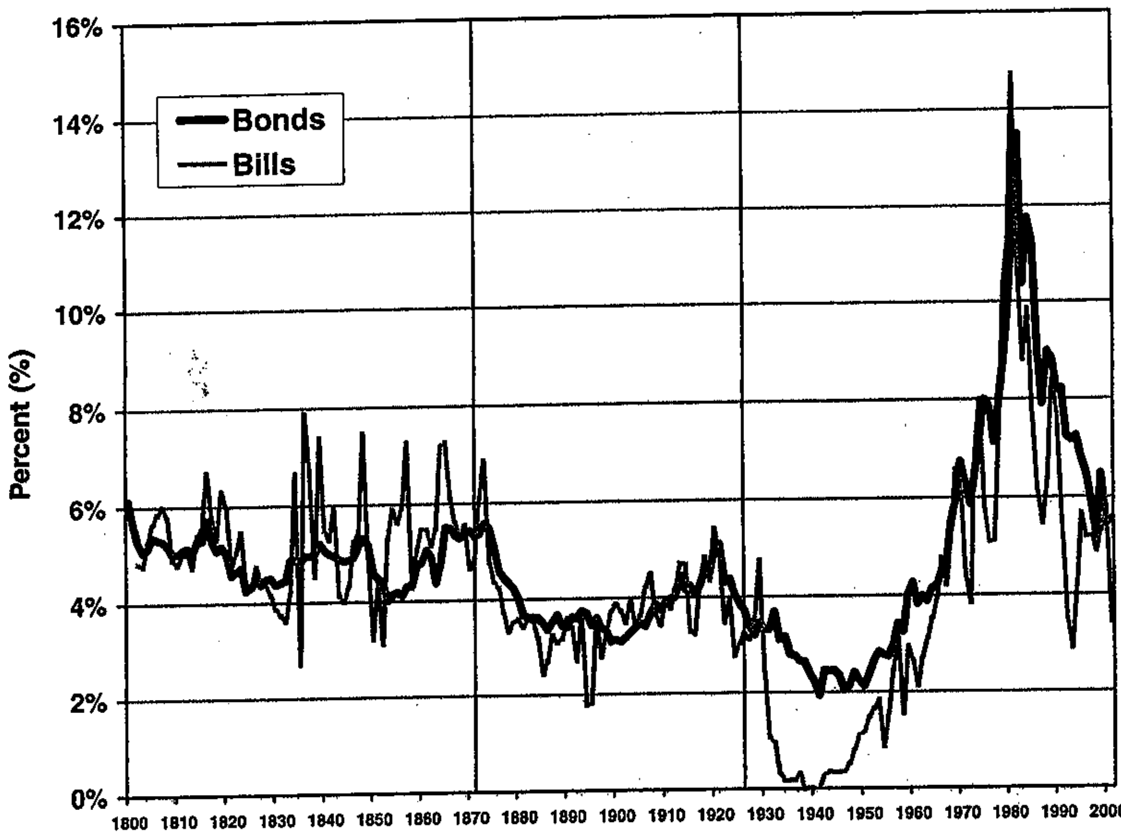
Figure 1-2 displays the interest rates on long- and short-term bonds, called *bills*, over the 200-year period. Interest-rate fluctuations during the nineteenth and twentieth centuries remained within a narrow range. But from 1926 to the present, the behavior of both long- and

[9] Blodget, an early nineteenth-century economist, estimated the wealth of the United States at that time to be nearly $2.5 billion, so $1 million would be only about 0.04 percent of the total wealth. S. Blodget, Jr., *Economica: A Statistical Manual for the United States of America*, 1806 edition, p. 68.

[10] See Jeremy Siegel, "The Real Rate of Interest from 1800–1990: A study of the U.S. and U.K.," *Journal of Monetary Economics* 29(1992):227–252, for a detailed description of the process by which a historical yield series was constructed.

FIGURE 1-2

U.S. Interest Rates, 1800–2001




short-term interest rates changed dramatically. During the Great Depression of the 1930s, short-term interest rates fell nearly to zero, and yields on long-term government bonds fell to a record-low 2 percent. In order to finance record wartime borrowings, the government maintained low rates during World War II and the early postwar years. Deposit rates also were kept low by strict limits (known as Regulation Q[11]) imposed by the Federal Reserve on bank deposit rates through the 1950s and 1960s.

The 1970s marked an unprecedented change in interest-rate behavior. Inflation reached double-digit levels, and interest rates soared to

[11]Regulation Q was a provision in the Banking Act of 1933 that imposed ceilings on interest rates and time deposits.

heights that had not been seen since the debasing of continental currency in the early years of the republic. Never before had inflation been so high for so long.

The public clamored for government action to slow rising prices. Finally, by 1982, the restrictive monetary policy of Paul Volcker, chairman of the Federal Reserve System since 1979, brought inflation and interest rates down to more moderate levels. One can see that the level of interest rates is closely tied to the level of inflation. Understanding the returns on fixed-income assets therefore requires knowledge of how the price level is determined.

## THE PRICE LEVEL AND GOLD

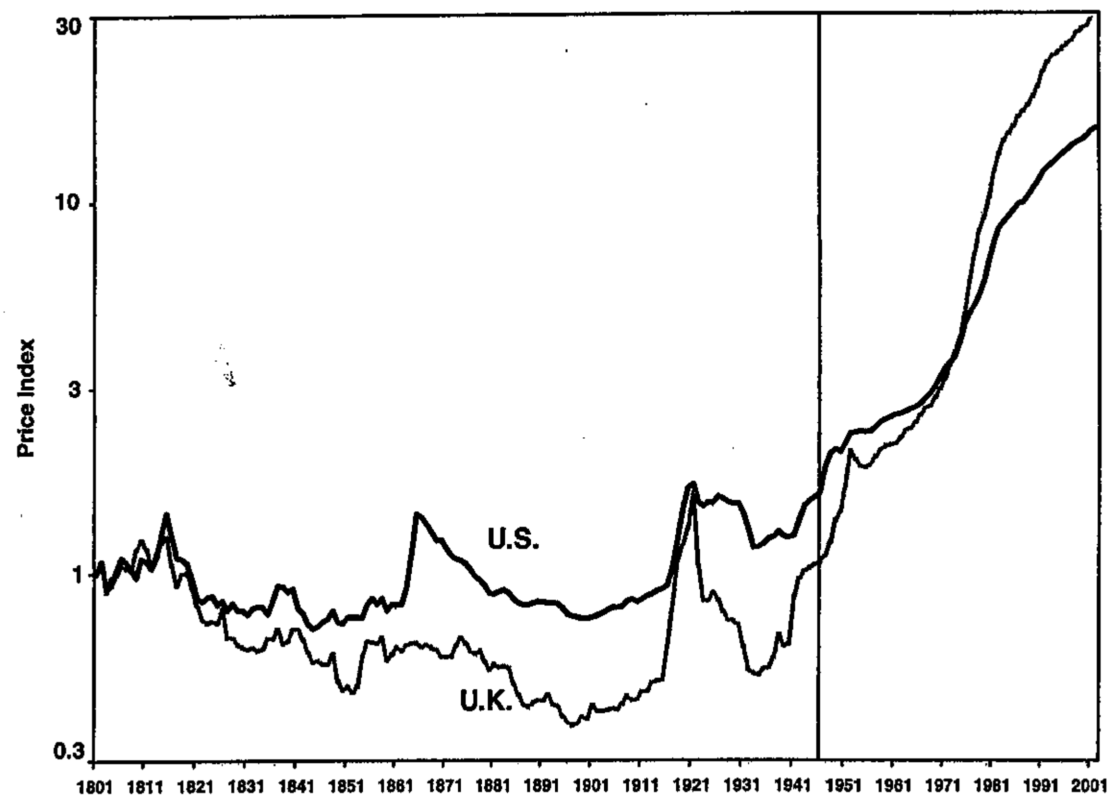
Figure 1-3 depicts consumer prices in the United States and the United Kingdom over the past 200 years. In each country, the price level at the end of World War II was essentially the same as it was 150 years earlier. Since World War II, however, the path of inflation changed dramatically. The price level rose almost continuously over the past 55 years, often gradually but sometimes at double-digit rates, as in the 1970s. Excluding wartime, the 1970s witnessed the first rapid and sustained inflation ever experienced in U.S. history.

The dramatic changes in the recent inflationary trend should not come as a surprise. During the nineteenth and early twentieth centuries, the United States, the United Kingdom, and the rest of the industrialized world were on a gold standard. As described in detail in Chapter 11, a gold standard restricts the supply of money and hence the inflation rate. From the Great Depression through World War II, however, the world shifted to a paper money standard. Under a paper money standard, there is no legal constraint on the issuance of money, so inflation is subject to political as well as economic forces. Price stability depends on the ability of the central banks to limit the supply of money and control the inflationary policies of the federal governments.

The chronic inflation that the United States and other developed economies have experienced since World War II does not mean that the gold standard was superior to the current paper money standard. The gold standard was abandoned because of its inflexibility in the face of economic crises, particularly the banking collapse of the 1930s. The paper money standard, if administered properly, can avoid the banking panics and severe depressions that plagued the gold standard. However, the cost of this stability is a bias toward chronic inflation.

FIGURE 1–3

U.S. and U.K. Price Indexes, 1800–2001 (1800 = $1)




It is not surprising that the price of gold has followed the trend of overall inflation closely over the past two centuries. The price of gold soared to $850 per ounce in January 1980, following the rapid inflation of the preceding decade. When inflation was brought under control, the price of gold fell. One dollar of gold bullion purchased in 1802 was worth $14.38 at the end of 2001. That is actually less than the change in the overall price level! In the long run, gold offers investors some protection against inflation but little else. Whatever hedging property precious metals possess, these assets will exert a considerable drag on the return of a long-term investor's portfolio.[12]

[12]Ironically, despite the inflationary bias of a paper money system, well-preserved paper money from the early nineteenth century is worth many times its face value on the collectors' market, far surpassing gold bullion as a long-term investment. An old mattress found containing nineteenth-century paper money is a better find for the antique hunter than an equivalent sum hoarded in gold bars!

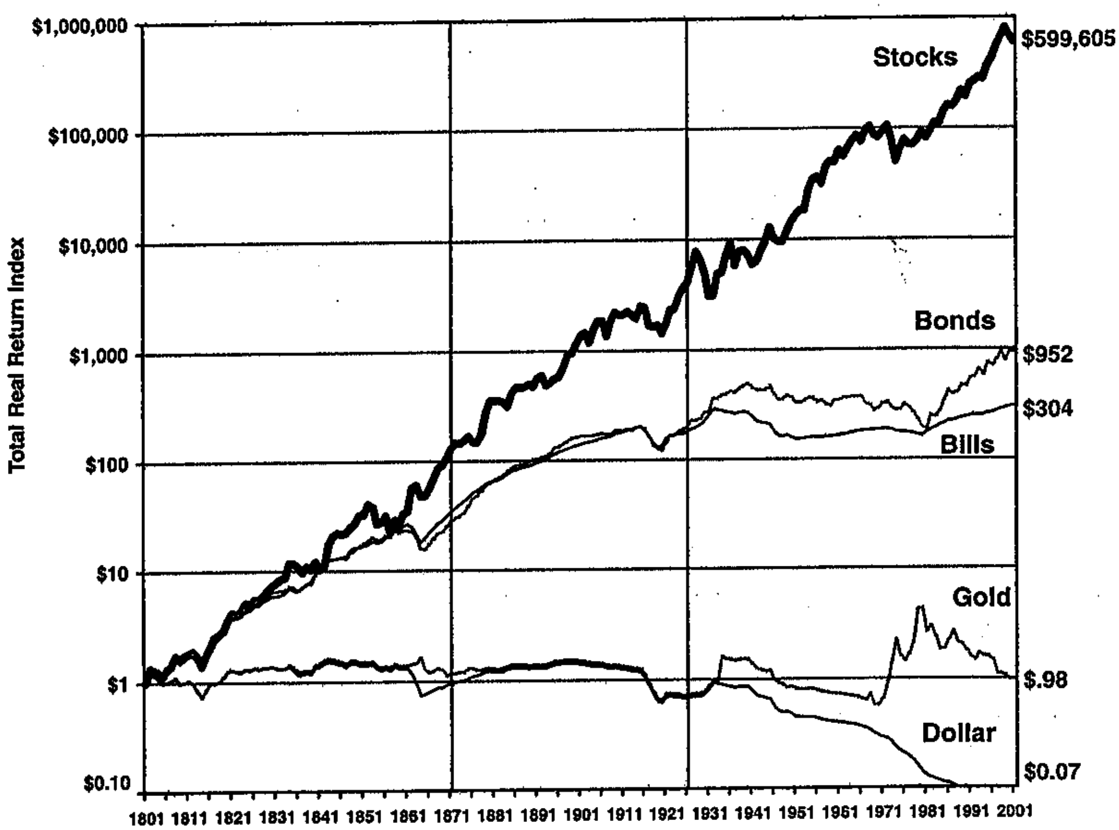
## TOTAL REAL RETURNS

The focus of every long-term investor should be the growth of purchasing power—monetary wealth adjusted for the effect of inflation. Figure 1-4 shows the growth of purchasing power, or total real returns, in the same assets that were graphed in Figure 1-1: stocks, bonds, bills, and gold. These data are constructed by taking the dollar returns and correcting them by the changes in price level shown in Figure 1-3.[13]

[13]Total returns are graphed on a ratio, or logarithmic, scale. Economists use this scale to graph virtually all long-term data because equal vertical distances anywhere in the chart represent equal percentage changes in return. As a result, a constant slope represents a constant after-inflation rate of return.

FIGURE 1-4

Total Real Return Indexes, 1802–2001



The growth of purchasing power in equities not only dominates all other assets but also shows remarkable long-term stability. Despite extraordinary changes in the economic, social, and political environments over the past two centuries, stocks have yielded between 6.6 and 7.0 percent per year after inflation in all major subperiods.

The wiggles on the stock return line represent the bull and bear markets that equities have suffered throughout history. The long-term perspective radically changes one's view of the risk of stocks. The short-term fluctuations in the stock market, which loom so large to investors when they occur, are insignificant when compared with the upward movement of equity values over time.

In contrast to the remarkable stability of stock returns, real returns on fixed-income assets have declined markedly over time. In the first and even second subperiods, the annual returns on bonds and bills, although less than those on equities, were significantly positive. Since 1926, however, and especially since World War II, fixed-income assets have returned little after inflation.

## INTERPRETATION OF RETURNS

### Long-Period Returns

Table 1-1 summarizes the annual returns on U.S. stocks over the past two centuries.[14] The shaded column represents the real after-inflation, compound annual rate of return on stocks. The real return on equities has averaged 6.9 percent per year over the past 200 years. This means that purchasing power has, on average, doubled in the stock market every 10 years. If past trends persist, inflation averages 3 percent, and equities offer a 7 percent real return, this would translate into a 10.2 percent per year nominal or money return on stocks.

Note the extraordinary stability of the real return on stocks over all major subperiods: 7.0 percent per year from 1802 through 1870, 6.6 percent from 1871 through 1925, and 6.9 percent per year since 1926. Even

[14]The dividend yield for the first subperiod has been estimated by statistically fitting the relation of long-term interest rates to dividend yields in the second subperiod, yielding results that are closer to other information we have about dividends during the period. See Walter Werner and Steven Smith, *Wall Street* (New York: Columbia University Press, 1991), for a description of some early dividend yields. See also recent papers by William Goetzmann and Phillipe Jorion, "A Longer Look at Dividend Yields," *Journal of Business* 68(4)(1995):483–508, and by William Goetzmann, "Patterns in Three Centuries of Stock Market Prices," *Journal of Business* 66(2)(1993):249–270.

**TABLE 1–1**

Annual Stock Market Returns, 1802–2001

Comp = compound annual return
Arith = arithmetic average of annual returns
Risk = standard deviation of arithmetic returns
All Data in Percent (%)

| | | Total Nominal Return | | | Nominal Capital Appreciation | | | Div Yld | Total Real Return | | | Real Capital Appreciation | | | Real Gold Retn | Consumer Price Inflation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Comp | Arith | *Risk* | Comp | Arith | *Risk* | | Comp | Arith | *Risk* | Comp | Arith | *Risk* | | |
| Periods | 1802-2001 | 8.3 | 9.7 | *17.5* | 3.0 | 4.4 | *17.5* | 5.2 | 6.9 | 8.4 | *18.1* | 1.6 | 3.2 | *17.9* | 0.0 | 1.4 |
| | 1871-2001 | 9.0 | 10.6 | *18.5* | 4.2 | 5.8 | *18.3* | 4.6 | 6.8 | 8.5 | *18.8* | 2.1 | 3.8 | *18.6* | -0.1 | 2.0 |
| Major Sub-Periods | I 1802-1870 | 7.1 | 8.1 | *15.5* | 0.7 | 1.8 | *15.5* | 6.4 | 7.0 | 8.3 | *16.9* | 0.6 | 1.9 | *16.6* | 0.2 | 0.1 |
| | II 1871-1925 | 7.2 | 8.4 | *15.7* | 1.9 | 3.1 | *16.1* | 5.2 | 6.6 | 7.9 | *16.8* | 1.3 | 2.7 | *17.1* | -0.8 | 0.6 |
| | III 1926-2001 | 10.2 | 12.2 | *20.3* | 5.8 | 7.8 | *19.6* | 4.1 | 6.9 | 8.9 | *20.3* | 2.7 | 4.6 | *19.6* | 0.4 | 3.1 |
| Post-War Periods | 1946-2001 | 11.6 | 12.8 | *16.8* | 7.5 | 8.7 | *16.2* | 3.8 | 7.1 | 8.6 | *17.4* | 3.2 | 4.6 | *16.8* | -0.3 | 4.1 |
| | 1946-1965 | 13.1 | 14.3 | *19.5* | 8.2 | 9.2 | *18.7* | 4.6 | 10.0 | 11.4 | *18.7* | 5.2 | 6.5 | *18.1* | -2.7 | 2.8 |
| | 1966-1981 | 6.6 | 8.3 | *17.2* | 2.6 | 4.3 | *16.6* | 3.9 | -0.4 | 1.4 | *17.1* | -4.1 | -2.4 | *16.7* | 8.8 | 7.0 |
| | 1982-1999 | 17.3 | 18.0 | *12.5* | 13.8 | 14.5 | *12.4* | 3.1 | 13.6 | 14.3 | *12.6* | 10.2 | 10.9 | *12.6* | -4.9 | 3.3 |
| | 1982-2001 | 14.1 | 15.0 | *14.9* | 10.9 | 11.8 | *14.4* | 2.9 | 10.5 | 11.5 | *14.7* | 7.4 | 8.3 | *14.3* | -4.8 | 3.2 |

since World War II, during which all the inflation that the United States has experienced over the past 200 years occurred, the average real rate of return on stocks has been 7.1 percent per year. This is virtually identical to the preceding 125 years, which saw no overall inflation. This remarkable stability of long-term real returns is a characteristic of *mean reversion,* a property of a variable to offset its short-term fluctuations so as to produce far more stable long-term returns.

The long-term stability of these returns is all the more surprising when one reflects on the dramatic changes that have taken place in our society during the last two centuries. The United States evolved from an agricultural to an industrial economy and now to a postindustrial service- and technology-oriented economy. The world shifted from a gold standard to a paper money standard. And information, which once took weeks to cross the country, can now be transmitted instantaneously and broadcast simultaneously around the world. Yet, despite mammoth changes in the basic factors generating wealth for shareholders, equity returns have shown an astounding persistence.

### Short-Period Returns

The long-term stability of real equity returns does not deny that short-term returns can be quite variable. In fact, there are a number of periods when stock returns differ from their long-term average. Samples of such episodes after World War II are reported at the bottom of Table 1-1.

The bull market from 1982 through 1999 gave investors an after-inflation return of 13.6 percent per year, which is nearly double the historical average. However, the superior equity returns over this period have barely compensated investors for the dreadful stock returns realized in the preceding 15 years, from 1966 through 1981, when the real rate of return was –0.4 percent. In fact, during the 15-year period that preceded the current bull market, stock returns were more below their historical average than they have been above their average during the 1982–1999 great bull market run.

The bull market since 1982 has brought stocks back from the extremely undervalued state that they reached at the beginning of the 1980s. Certainly the superior performance of stocks over the last decade is extremely unlikely to persist, but this does not necessarily imply that stock returns over the next decade must be below average in order to offset the bull market from 1982. Chapter 7 will analyze future returns on stocks in light of the great bull market of the past two decades.

## REAL RETURNS ON FIXED-INCOME ASSETS

As stable as the long-term real returns have been for equities, the same cannot be said of fixed-income assets. Table 1-2 reports the nominal and real returns on both short- and long-term bonds over the same time periods as in Table 1-1. The real return on bills has dropped precipitously from 5.1 percent in the early part of the nineteenth century to a bare 0.7 percent since 1926, a return only slightly above inflation.

The real return on long-term bonds has shown a similar pattern. Bond returns fell from a generous 4.8 percent in the first subperiod to 3.7 percent in the second and then to only 2.2 percent in the third. If the returns from the last 75 years were projected into the future, it would take nearly 33 years to double one's purchasing power in bonds and over 100 years to do so in Treasury bills in contrast to the 10 years it takes in stocks.

The decline in the average real return on fixed-income securities is striking. In any 30-year period beginning with 1889, the average real rate of return on short-term government securities has exceeded 2 percent only three times. Since the late nineteenth century, the real return on

**TABLE 1–2**

Fixed-Income Returns, 1802–2001

Comp = compound annual return
Arith = arithmetic average of annual returns
Risk = standard deviation of arithmetic returns
All Data In Percent (%)

| | | Long-Term Governments | | | | | | | Short-Term Governments | | | | Consumer Price Inflation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Coupon Rate | Nominal Return | | | Real Return | | | Nominal Rate | Real Return | | | |
| | | | Comp | Arith | *Risk* | Comp | Arith | *Risk* | | Comp | Arith | *Risk* | |
| Periods | 1802-2001 | 4.8 | 4.9 | 5.1 | *6.3* | 3.5 | 3.9 | *8.9* | 4.3 | 2.9 | 3.1 | *6.1* | 1.4 |
| | 1871-2001 | 4.7 | 4.9 | 5.1 | *7.5* | 2.8 | 3.2 | *9.1* | 3.8 | 1.7 | 1.9 | *4.6* | 2.0 |
| Major Sub-Periods | I 1802-1870 | 4.9 | 4.9 | 4.9 | *2.8* | 4.8 | 5.1 | *8.3* | 5.2 | 5.1 | 5.4 | *7.7* | 0.1 |
| | II 1871-1925 | 4.0 | 4.3 | 4.4 | *3.0* | 3.7 | 3.9 | *6.4* | 3.8 | 3.2 | 3.3 | *4.8* | 0.6 |
| | III 1926-2001 | 5.2 | 5.3 | 5.7 | *9.5* | 2.2 | 2.7 | *10.7* | 3.9 | 0.7 | 0.8 | *4.1* | 3.1 |
| Post-War Periods | 1946-2001 | 6.0 | 5.5 | 6.0 | *10.7* | 1.3 | 1.9 | *11.5* | 4.9 | 0.6 | 0.7 | *3.3* | 4.1 |
| | 1946-1965 | 3.1 | 1.6 | 1.7 | *7.1* | -1.2 | -1.0 | *8.1* | 2.0 | -0.8 | -0.7 | *2.1* | 2.8 |
| | 1966-1981 | 7.2 | 2.5 | 2.8 | *12.3* | -4.2 | -3.9 | *13.2* | 6.9 | -0.2 | -0.1 | *2.4* | 7.0 |
| | 1982-1999 | 8.4 | 12.0 | 12.8 | *14.4* | 8.4 | 9.3 | *14.2* | 6.3 | 2.9 | 2.9 | *1.8* | 3.3 |
| | 1982-2001 | 8.1 | 12.0 | 12.8 | *13.8* | 8.5 | 9.3 | *13.6* | 6.1 | 2.8 | 2.8 | *1.7* | 3.2 |

bonds and bills over any 30-year horizon has seldom matched the average return of 4.5 to 5 percent reached during the first 70 years of our sample. From 1880, the real return on long-term bonds over every 30-year period has never reached 4 percent, and it exceeded 3 percent during only 17 such periods.

You have to go back more than 1½ centuries to the period from 1831 through 1861 to find any 30-year period where the return on either long- or short-term bonds exceeded that on equities. The dominance of stocks over fixed-income securities is overwhelming for investors with long horizons.

## THE FALL IN FIXED-INCOME RETURNS

Although the returns on equities have fully compensated stock investors for the increased inflation since World War II, the returns on fixed-income securities have not. The change in the monetary standard from gold to paper had its greatest effect on the returns of fixed-income assets. It is clear that the buyers of long-term bonds in the 1940s, 1950s, and early 1960s did not recognize the inflationary consequences of the change in monetary regime. How else can you explain why investors voluntarily purchased 30-year bonds with 3 and 4 percent coupons, ignoring a government policy that was determined to avoid deflation and in fact favored inflation?

However, there must have been other reasons for the decline in real returns on fixed-income assets. Theoretically, the unanticipated inflation of the postwar period should have had a significantly smaller effect on the real return on short-term bonds such as Treasury bills. This is so because short-term rates may be reset frequently to capture expected inflation. As noted previously, however, the decline in the real return on short-term bonds actually exceeded the decline in the real return on long-term bonds.

Another explanation for the fall in bond returns is investors' reactions to the financial turmoil of the Great Depression. The stock collapse of the early 1930s caused a whole generation of investors to shun equities and invest in government bonds and newly insured bank deposits, driving their return downward. Finally, many investors bought bonds because of the widespread (but incorrect) prediction that another depression would follow the war.

However, it was not just the risk preferences of investors that kept fixed rates low. The Federal Reserve actively supported the bond market through much of the 1940s to keep the government's interest expense low. This support policy was abandoned in 1951 because it led to interest rates that were inconsistent with one of the Fed's primary goals of maintaining low inflation.

And finally, one should not ignore the transformation of a highly segmented market for short-term instruments in the nineteenth century into one of the world's most liquid markets. Treasury bills satisfy certain fiduciary and legal requirements that no other asset can match. The premium paid for these services, however, has translated into a meager return for investors.

## EQUITY PREMIUM

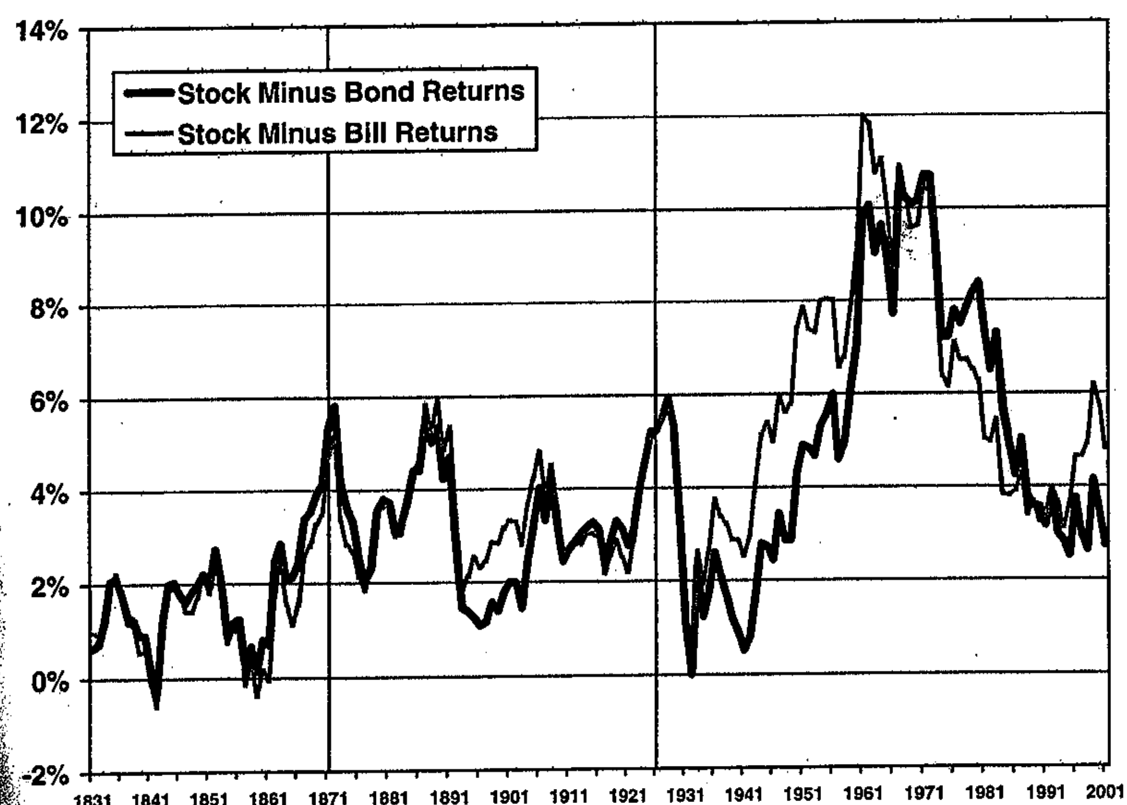
Whatever the reasons for the decline in the real return on fixed-income assets over the past century, it is almost certain that the real returns on bonds will be higher on average in the future than they have been over the last 70 years. As a result of the inflation shock of the 1970s, bondholders have incorporated a significant inflation premium in the coupon on long-term bonds. In most major industrialized nations, if inflation does not increase appreciably from current levels, real returns of about 2 to 3 percent will be realized from government bonds whose nominal rate is between 5 and 6 percent. These projected real returns are not much lower than the 3½ percent average compound real return on U.S. long-term government bonds over the past 200 years. Moreover, they are comparable with the yields of the newly floated inflation-linked bonds issued by the U.S. Treasury in 1997.

The excess return for holding equities over short-term bonds is referred to as the *equity risk premium*, or simply the *equity premium*, and is plotted in Figure 1-5.[15] The equity premium, calculated as the difference

[15]For a rigorous analysis of the equity premium, see Jeremy Siegel and Richard Thaler, "The Equity Premium Puzzle," *Journal of Economic Perspectives* 11(1)(Winter 1997):191–200.

FIGURE 1-5

Equity Risk Premium (30-Year Compound Annual Moving Average, 1831–2001)



in 30-year compound annual real returns on stocks and bills, averaged 1.9 percent in the first subperiod, 3.4 percent in the second subperiod, and 6.5 percent since 1926.

The abnormally high equity premium since 1926 is certainly not sustainable. It is not a coincidence that the highest 30-year average equity return occurred in a period marked by very low real returns on bonds. Since firms finance a large part of their capital investment with bonds, the low cost of obtaining such funds increased returns to shareholders. The 1930s and 1940s marked an extremely undervalued period for equities and overvalued period for government bonds, leading to unusually high returns for stocks and low returns for bonds. As stocks and bonds become more correctly priced, the equity premium certainly will shrink. Chapter 7 will discuss the equity premium and its implications for future returns in more detail.

## INTERNATIONAL RETURNS

Some economists have maintained that the superior returns to equity are a consequence of choosing data from the United States, a country that has been transformed from a small British colony to the world's greatest economic power over the last 200 years.[16] However, equity returns in other countries also have substantially outpaced those on fixed-income assets.

Figure 1-6 displays the total real stock return index for the United States, the United Kingdom, Germany, and Japan from 1926 to the present.[17] It is striking that the cumulative real returns on German and U.K. stocks over the 76-year period from 1926 through 2001 come so close to those of the United States. The compound annual real returns on stocks in each of these three countries are all within about 1 percentage point of each other.

The collapse of Japanese stocks during and after World War II was far greater than occurred in its defeated ally, Germany. In Japan, the breakup of the *Zaibatsu* industrial cartel, the distribution of its shares to the workers, and the hyperinflation that followed the war caused a 98 percent fall in the real value of equities.[18]

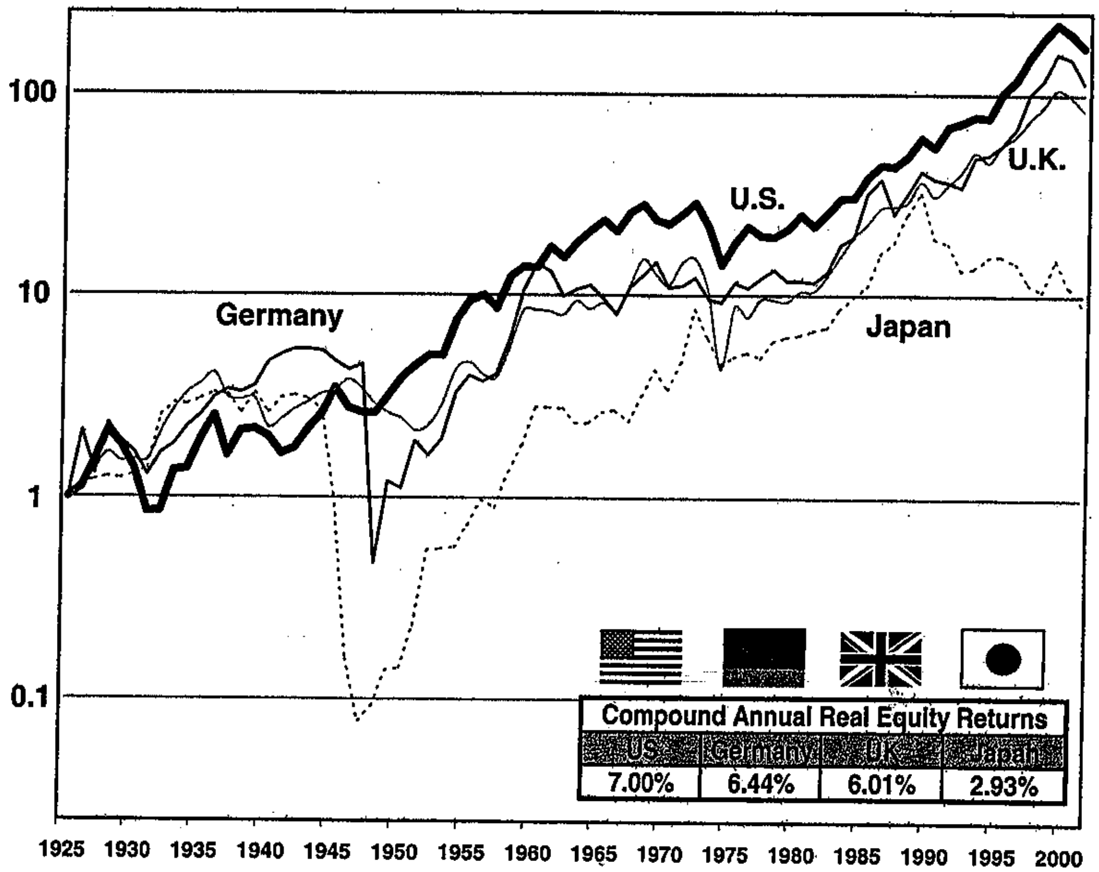
[16]See S. J. Brown, W. N. Goetzmann, and S. A. Ross, "Survival," *Journal of Finance* 50(1995):853–873.

[17]The German returns are obtained from Gregor Gielen, *Können Aktienkurse Noch Steigen? Langfristige Trendanalyse des deutschen Aktienmarktes* (Berlin: Gabler, 1994). British returns are from Shiller (1989) and updated from various sources.

[18]T. F. M. Adams and Iwao Hoshii, *A Financial History of the New Japan* (Tokyo: Kodansha International, 1972), p. 39.

FIGURE 1–6

International Real Stock Returns in the United States, Germany, the United Kingdom, and Japan, 1926–2001




Despite the collapse of the equity market, Japanese stocks regained almost all the ground they lost to the Western countries by the end of the 1980s. From 1948 through 1989, the real return on the Japanese market has exceeded 10.4 percent per year, nearly 50 percent higher than the U.S. market. Even including its recent bear market, Japan's real equity returns since 1926 have been 2.9 percent per year. Moreover, because the yen has appreciated in real terms relative to the dollar, the average annual real-dollar returns in the Japanese market have been 3.15 percent per year. Measured in *any* currency, the real returns in *every* one of these major countries from 1926 through 2001 have exceeded the real returns on fixed-income assets in *any* of these countries.

## Germany

Despite the fact that World War II resulted in a 90 percent drop in real German equity prices, investors were not wiped out. Those who patiently held equity were rewarded with tremendous returns in the postwar period.[19] By 1958, the total returns for German stocks had surpassed its prewar level. In the 12 years from 1948 through 1960, German stocks rose by over 30 percent per year in real terms. Indeed, from 1939, when the Germans invaded Poland, through 1960, the real returns on German stocks nearly matched those in the United States and exceeded those in the United Kingdom. Despite the devastation of the war, the recovery of German markets powerfully attests to the resilience of stocks in the face of seemingly destructive political, social, and economic forces.

## United Kingdom

Over the long run, the returns on British equities are almost as impressive as those in the American market. In contrast to the U.S. experience, the greatest stock decline in Great Britain occurred in 1973 and 1974, not the early 1930s. In 1973–1974, rampant inflation as well as political and labor turmoil caused the British market to lose over 70 percent of its value. The capitalization of the British market fell to a measly $50 billion. This is less than the market value of many individual Internet stocks during the height of the dot-com mania in 1999–2000 or the yearly profits of the OPEC oil-producing nations, whose increase in oil prices contributed to the decline in share values.[20]

In fact, the OPEC nations could have purchased a controlling interest in every publicly traded British corporation in the 1970s with less than 1 year's oil revenues! It is lucky for the British that they did not. The British market has increased dramatically since the 1974 crash and has outstripped the dollar gains in all other major world markets. Again,

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[19] Of course, not everyone in Germany was able to realize the German postwar miracle. The stock holdings of many who resided in the eastern sector, controlled by the Soviet Union, were totally confiscated. Despite reunification with West Germany, many of these claims were never recovered.

[20] "The défi Opec" (no author), *The Economist*, December 7, 1974, p. 85. OPEC stands for "Organization of Petroleum Exporting Countries," a cartel that attempts to regulate the supply of oil.

these rewards went to those who held onto British stocks through this crisis.

## Japan

Despite Japan's recent bear market, the postwar rise in Japanese stocks is quite remarkable. The Nikkei Dow Jones Stock Average, patterned after the U.S. Dow Jones Average and containing 225 stocks, was first published on May 16, 1949. The day marked the reopening of the Tokyo Stock Exchange, which had been officially closed since August 1945. On the opening day, the value of the Nikkei was 176.21—virtually identical to the U.S. Dow Jones Industrials at that time. By December 1989, the Nikkei soared to nearly 40,000, more than 15 times that of the Dow. Japan's bear market brought the Nikkei below 10,000 following the terrorist attacks in September 2001, just above the level reached by the American Dow. On February 1, 2002, the Nikkei closed at 9,791, below the Dow for the first time in 45 years.

However, comparing U.S. and Japanese Dow indexes overstates the extent of the Japanese decline. The gain in the Japanese market measured in *dollars* far exceeds that measured in *yen*. The yen was set at 360 to the dollar 3 weeks before the opening of the Tokyo Stock Exchange—a rate that was to hold for more than 20 years. Since then, the dollar has fallen to about 130 yen. In dollar terms, therefore, the Nikkei climbed to over 100,000 in 1989 and is currently over 30,000, three times its American counterpart, despite the great bear market that has enveloped Japan in the past decade.

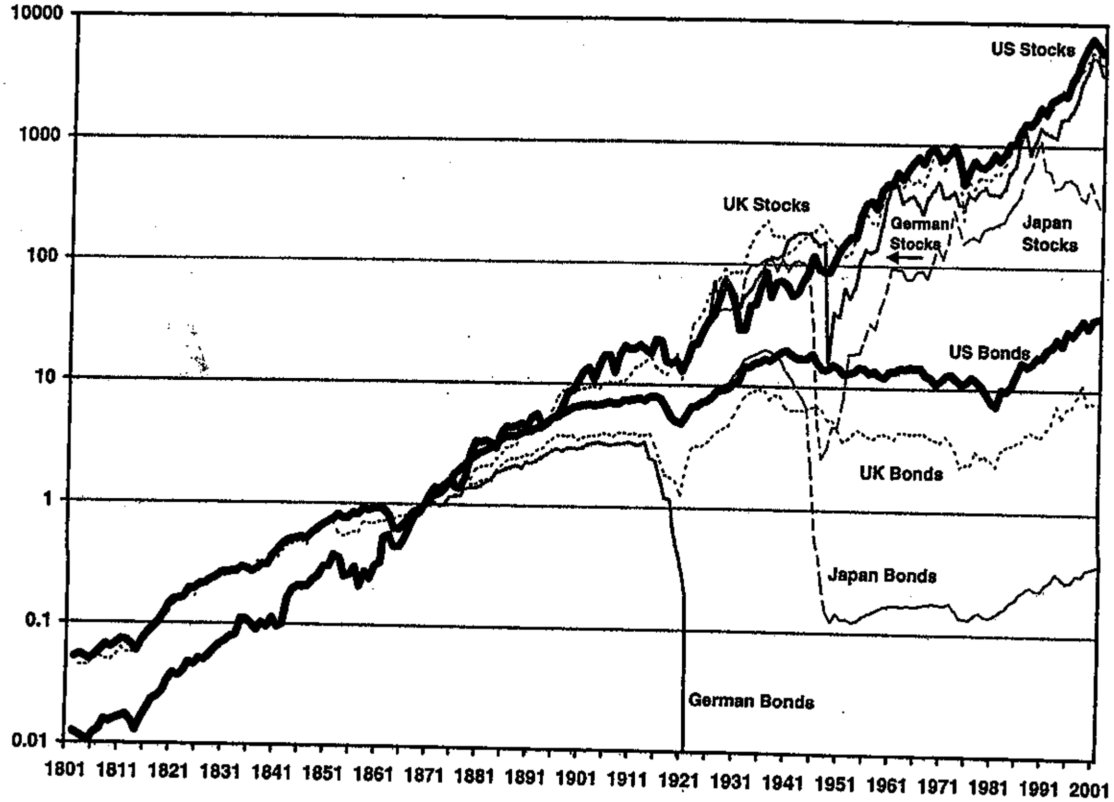
## Foreign Bonds

The story for foreign countries remains the same as that of the United States: Stocks dominate bonds over all long-term periods. The postwar hyperinflation, when the yen was devalued from 4 to the dollar to 360 to the dollar, wiped out Japanese bondholders. However, nothing compares with the devastation experienced by German bondholders during the 1922–1923 hyperinflation, when the reichsmark was devalued by more than 10 billion to one. All German fixed-income assets were rendered worthless, yet stocks, which represented claims on real land and capital, weathered the crisis.

Figure 1-7 summarizes the return on international bonds as well as stocks. The superiority of stocks to fixed-income investments over the

**FIGURE 1-7**

International Total Real Stock and Bond Returns, 1802–2001




long run is indisputable. Stocks not only outperform bonds on the basis of return but also display far greater stability of purchasing power.

## CONCLUSION

Over the past 200 years, the compound annual real return on a diversified portfolio of common stock is nearly 7 percent in the United States and has displayed a remarkable constancy over time. The reasons for the persistence and long-term stability of stock returns are not well understood. Certainly the returns on stocks depend on the quantity and quality of capital, productivity, and the return to risk taking. However, the ability to create value also springs from skillful management, a stable political system that respects property rights, and the capacity to provide value to consumers in a competitive environment. Swings in investor sentiment resulting from political or economic crises can throw stocks off their long-term path, but the fundamental forces producing economic growth enable equities to regain their long-term trend. Perhaps this is why long-term stock returns have displayed such stability despite the radical political, economic, and social changes that have affected the world over the past two centuries.

The superior returns to equity over the past two centuries might be explained by the growing dominance of nations committed to free-market economics. Who might have expected the triumph of market-oriented economies 50 or even 30 years ago? The robustness of world equity prices in recent years might reflect the emergence of the golden age of capitalism—a system in ascendancy today but whose fortunes could decline in the future. Yet, even if capitalism declines, it is unclear which assets, if any, will retain value. In fact, if history is any guide, government bonds in our paper-money world may fare far worse than stocks in any political or economic upheaval. As the next chapter shows, the risks in bonds actually outweigh those in stocks over long horizons.

## APPENDIX 1: STOCKS FROM 1802 TO 1871

The first actively traded U.S. stocks, floated in 1791, were two banks: the Bank of New York and the Bank of the United States.[21] Both offerings were enormously successful and were quickly bid to a premium. However, they collapsed the following year when Alexander Hamilton's assistant at the Treasury, William Duer, attempted to manipulate the market and precipitated a crash. It was from this crisis that the antecedents of the New York Stock Exchange were born on May 17, 1792.

Joseph David, an expert on the eighteenth-century corporation, claimed that equity capital was readily forthcoming not only for every undertaking likely to be profitable but, in his words, "for innumerable undertakings in which the risk was very great and the chances of success were remote."[22] Although over 300 business corporations were chartered by the states before 1801, fewer than 10 had securities that traded on a regular basis. Two-thirds of those chartered before 1801 were connected with transportation: wharves, canals, turnpikes, and bridges. However,

[21]The oldest continuously operating firm is Dexter Corp., founded in 1767, a Connecticut maker of special materials; the second is Bowne & Co. (1775), which specializes in printing; the third is CoreStates Financial Corp., founded in 1782 as the First National Bank of Pennsylvania; and the fourth is the Bank of New York Corp., founded in 1782, which was involved in the successful 1791 stock offering with the Bank of the United States that eventually was involved in the crash of 1792.

[22]Werner and Smith (1991), p. 82.

the important stocks of the early nineteenth century were financial institutions: banks and, later, insurance companies. Banks and insurance companies held loans and equity in many of the manufacturing firms that, at that time, did not have the financial standing to issue equity. The fluctuations in the stock prices of financial firms in the nineteenth century reflected the health of the general economy and the profitability of the firms to whom they lent. The first large nonfinancial venture was the Delaware and Hudson Canal, which issued stock in 1825 and also became an original member of the Dow Jones Industrial Average 60 years later. In 1830, the first railroad, the Mohawk and Hudson, was listed, and for the next 50 years, railroads dominated trading on the major exchanges.

## APPENDIX 2: ARITHMETIC AND GEOMETRIC RETURNS

The average arithmetic return $r_A$ is the average of each yearly return. If $r_1$ to $r_n$ are the $n$ yearly returns, $r_A = (r_1 + r_2 \ldots + r_n)/n$. The average geometric or compound return $r_G$ is the $n$th root of the product of 1-year total returns minus 1. Mathematically, this is expressed as $r_G = [(1 + r_1)(1 + r_2) \ldots (1 + r_n)]^{1/n} - 1$. An asset that achieves a geometric return of $r_G$ will accumulate to $(1 + r_G)^n$ times the initial investment over $n$ years. The geometric return is approximately equal to the arithmetic return minus one-half the variance $\sigma^2$ of yearly returns, or $r_G \approx r_A - ½\sigma^2$.

Investors can be expected to realize geometric returns only over long periods of time. The average geometric return is always less than the average arithmetic return except when all yearly returns are exactly equal. This difference is related to the volatility of yearly returns.

A simple example demonstrates the difference. If a portfolio falls by 50 percent in the first year and then doubles (up 100 percent) in the second year, "buy and hold" investors are back to where they started, with a total return of zero. The compound or geometric return $r_G$, defined earlier as $(1 - 0.5)(1 + 1) - 1$, accurately indicates the zero total return of this investment over the 2 years.

The average annual arithmetic return $r_A$ is +25 percent = (–50 percent + 100 percent)/2. Over 2 years, this average return can be turned into a compound or total return only by successfully "timing" the market, specifically increasing the funds invested in the second year and hoping for a recovery in stock prices. Had the market dropped again in the second year, this strategy would have been unsuccessful and would have resulted in lower total returns than achieved by the buy-and-hold investor.

NGRID 1-9 Referring to the Rothschild Direct Testimony at page 59 line 6. Please provide a copy of the Alan Greenspan document referred to in footnote 12.

RESPONSE: Please see attached.

TWENTY-FIVE

# THE DELPHIC FUTURE

People have always been enthralled by the notion that it is possible to peer into the future. Ancient Greek generals sought audiences with the oracle at Delphi to guide their military adventures. Fortunetellers thrive to this day. Modern Wall Street employs phalanxes of very smart people to read what the entrails of market performance say about future stock prices.

To what extent *can* we anticipate what lies ahead? Inbred within all of us is the capacity to weigh probabilities, a gift that helps to guide our actions in everything from the mundane to matters of life and death. These judgments are not always right, but they have manifestly been good enough to enable humans to survive and multiply. Modern economic policymakers formalize such decision making in mathematical terms, but humans were judging probabilities long before we invented the math to explain them.

Fortunately for policymakers, there is a degree of historical continuity in the way democratic societies and market economies function. This enables us to reach back into the past to infer inherently persistent stabilities that, while not having the certainty we attach to physical laws, nonetheless offer a window on the future that is more certain than the random outcome of a coin toss. There is indeed much that we can infer about the U.S. economy and the world at large in the decades ahead, especially if we adopt Winston Churchill's insight: "The further backward you look, the further forward you can see."

Most legal and economic institutions change slowly enough to facilitate anticipating future outcomes with some reasonable degree of probability. Nonetheless, a large body of academic literature exists that questions how successfully people can forecast financial outcomes. Proponents of "efficient-market theory" have famously argued that all publicly available information that would induce a stock-price change is efficiently factored by the market into the current price of the stock. Hence, unless an investor has special or inside knowledge not available to the market at large, he or she cannot anticipate price changes. As evidence, they point to the well-known inability of managed equity mutual funds to outperform the S&P 500 consistently. The evidence that some investors do consistently beat the market year after year is not surprising. It's just what one would expect. Even if investment results are purely a matter of chance, a small number of investors will do exceptionally well—as well as the lucky coin tosser who turns up heads ten straight times. The probability of ten consecutive heads is 0.1 percent; thus, when you have millions of coin tossers, or investors, in the end there will be thousands of very successful practitioners of coin tossing, or stock picking.

Yet the theory of efficient markets cannot explain stock-market crashes. How does one make sense of the unprecedented drop (involving the loss of more than a fifth of the total value of the Dow Jones Industrial Average) on October 19, 1987? As a newly anointed Fed chairman, I was watching the markets very closely. What new piece of information surfaced between the market's close at the end of the previous trading day and its close on October 19? I am aware of none. As prices careened downward all that day, human nature, in the form of unreasoning fear, took hold, and investors sought relief from pain by unloading their positions regardless of whether it made financial sense. No financial information was driving those prices. The fear of continued loss of wealth had simply become unbearable.* And while the economy and corporate profits subsequently advanced, it took nearly two years for the Dow to recover fully.

When markets are behaving rationally, as they do almost all the time, they appear to engage in a "random walk": the past gives no better indication than a coin flip of the future direction of the price of a stock. But sometimes that walk is interrupted by a stampede. When gripped by fear, people rush to disengage from commitments, and stocks will plunge. And when people are driven by euphoria, they will drive up prices to nonsensical levels.

So the key question remains, as I summarized it in a 1996 reflection I shall never live down, "How do we know when irrational exuberance has unduly escalated asset values, which then become subject to unexpected and prolonged contractions?" It is often suggested that the richest investors are those best at gauging shifts in human psychology rather than at forecasting earnings per share of ExxonMobil. A whole school of stock-market psychologists has arisen around this thesis. They call themselves Contrarians. They trade on the view that irrational exuberance eventually ends up in falling stock prices, as shares get bid up for no plausible reason, and then, when that becomes evident, fear grips the market and prices unravel. Contrarians pride themselves on trading against crowd psychology. Since stock prices are cyclical, some do succeed by trading contrary to the crowd. But you rarely hear about those who try this approach and lose their shirts. I also never hear much from coin tossers who lose.

Perhaps someday investors will be able to gauge when markets veer from the rational and turn irrational. But I doubt it. Inbred human propensities to swing from euphoria to fear and back again seem permanent: generations of experience do not appear to have tempered those propensities. I would think that we learn from experience, and, in one sense, we do. I, for example, when asked what worrisome imbalances and problems lie over the forecast horizon, invariably respond that financial crises that are foreseeable by market participants rarely happen. If a stock-market bulge is perceived to be the precursor of a crash, speculators and investors will try to sell out earlier. That defuses the nascent bubble and a crash is avoided. The sudden eruptions of

*I find the oft-quoted explanation that it was program trading unconvincing. As prices tumbled, sellers could have turned off the program-trading switch.

fear or euphoria are phenomena that nobody anticipates. The horrendous decline in stocks on "Black Monday" came out of the dark.

Successful investing is difficult. Some of history's most successful investors, such as my friend Warren Buffett, were early to understand the now well-documented anomaly that the rate of return on stocks, even adjusted for risk, exceeds that on less-risky bonds and other debt instruments, provided one is willing to buy and *hold* equities for the very long run. "My favorite holding period is forever," said Buffett in an interview. The market pays a premium to those willing to endure the angst of watching their net worth fluctuate beyond what Wall Streeters call the "sleeping point."

The lessons of stock-market investing apply to the forecasting of whole economies. Because markets tend to steady themselves, a market economy turns out to be more stable and forecastable over the long run than in the short run—assuming, of course, that the society and institutions upon which it rests remain stable. Long-term economic forecasting is grounded in two sets of historically stable data: (1) population, which is the most forecastable statistic with which economists deal, and (2) productivity growth, the consequence of the incremental buildup of knowledge and the source of sustainable growth. Since knowledge is never lost, productivity will always rise.*

What, then, can we reasonably project for the U.S. economy for, say, the year 2030? Little, unless we first specify certain assumptions. I need affirmative answers to the following questions to get started. Will the rule of law still be firm in 2030? Will we still adhere to the principle of globalized free markets, with protectionism held in check? (By protectionism, I mean not just barriers to international trade and finance but governmental restrictions against competition in domestic markets as well.) Will we have fixed our dysfunctional elementary and secondary school systems? Will the consequences of global warming emerge slowly enough so as not to significantly affect U.S. economic activity by 2030? And finally, will we have kept terrorist attacks in the United States at bay? Unsaid are those possibilities, such as a wider war or a pandemic, that could upset any forecast. This is a rather long list of preconditions, but unless I can assume them, it is futile to venture very far over the horizon.

*Output per hour, the conventional proxy for productivity, can and does decline at times.

In my experience, the most important is the nature of our rule of law. I do not believe most Americans are aware of how critical the Constitution of the United States has been, and will continue to be, to the prosperity of our nation. To have had, for more than two centuries, unrivaled protection of individual rights, and especially property rights, for all participants in our economy, both native-born and immigrant, is a profoundly important contributor to our adventuresomeness and prosperity. To be largely free of fear of a secret police arbitrarily hauling us off for interrogation for "crimes" we never knew existed is something not to be taken for granted. Nor is freedom from the threat of arbitrary confiscation of a business to which we have devoted much of our life. The principle of individual freedom touches a deep cultural chord in Americans: the belief embodied in our Constitution of the basic equality of all citizens before the law. Reality has not always matched this ideal, and discrimination against African Americans in particular forces us periodically to revisit the early constitutional debates about slavery and its violent resolution in the Civil War; we've come a long way, but we have a distance yet to travel.

America's unrivaled protection of property rights has long attracted foreign investment to our shores. Some investors come in order to participate in a vibrant, open economy; others simply view the United States as a safe haven for their savings that is not available in their home country. As I shall explain, the ability of the American legal system to extend those cherished property rights to an economy predominantly driven by intellectual property will be a major challenge. And, of course, most detrimental of all to our standard of living would be a reemergence of protectionism and other policies that seek stability by preventing the change that is necessary for growth. Economic reregulation would be a distinct step backward in our quest for a prosperous future.

The impact that fixing our school system would have on our future levels of economic activity may not be easy to measure, but unless we do so and begin to reverse a quarter century of increases in income inequality, the cultural ties that bind our society could become undone. Disaffection, breakdowns of authority, even large-scale violence could ensue, jeopardizing the civility on which growing economies depend.

The timing of global warming's impact is even harder to foretell. Today's scientific consensus focuses on effects that are likely to emerge in the second half of this century—a millisecond in climatological time but beyond our forecast period. There is as yet little we can anticipate for the years immediately ahead. Nonetheless, I would expect the markets to respond even before the answers become clear—already insurers are rethinking storm and flood coverage, for example. The prospect of climate change is affecting energy markets as well.

Finally, there is the risk of a renewal of terrorist attacks. When engulfed in fear, people disengage from the normal daily market interaction that is an integral part of an economy based on the division of labor and specialization. The terrorism of 9/11 was a defining moment that underscored the critical value of our highly flexible, largely unregulated economy, which weathered the shock with minimal longer-run consequences. We could probably absorb terrorist attacks like those being experienced today in the Middle East and Europe. But larger-scale attacks* or more widespread warfare would surely be destabilizing.

I have been encouraged by the ability of market economies to persevere through violence and the threats of violence. World Bank data indicate that Israel has managed to create a per capita national income at nearly half the level of that of the United States and roughly equal to per capita incomes recorded in Greece and Portugal.† Lebanon's GDP for 2006, despite the confrontation between Hezbollah and the Israeli military, was down only 4 percent. Even Iraq has managed to maintain a semblance of a functioning economy through all its turmoil of recent years.

The long list of caveats does not inordinately tie our forecasting hands. After all, such a list has always existed in one form or another, and yet the record of *long-term* forecasting of the U.S. economy overall in my experience has been reasonably impressive.

So given the presumed base of global, flexible markets protected by the rule of law, what can we project as our most likely future? What is the most likely level of overall activity we can expect in our arbitrarily chosen 2030 forecast year? We can project real GDP as long as we have projections of

*A nuclear detonation on U.S. soil, I fear, could temporarily unhinge our economy.
†U.S. aid accounts for only a small part of Israel's economy.

hours worked and productivity, proxied by real GDP per hour. We know with some degree of certainty the size of our population age sixteen and over in 2030. Most of them have already been born. The proportion of the population, especially the part under sixty-five years of age, that participates in our labor force is high and reasonably stable. Our population older than sixty-five years is expected to almost double by 2030, and the current 15 percent participation rate for that part of the labor force will rise as well, thus adding a more than usual number of elderly workers by 2030. The size of immigration within the politically and culturally feasible range of possibilities does not matter much to the overall labor force forecast. Our next step is to set the proportion of the total labor force that will likely be employed in 2030 (or in a contiguous year if 2030 happens to be a year of recession). Given our assumptions and the economy's historical record, it is difficult to imagine the employment rate of the civilian labor force being outside the rather narrow range of 90 to 96 percent (that is, an unemployment rate between 4 and 10 percent). America's fifty-year average is more than 94 percent, with nonrecession years (the assumption for 2030) near 95 percent. Combining labor force participation rates, population projections, a near 5 percent unemployment rate, and a stable workweek yields an annual growth rate in hours worked in the United States through 2030 of 0.5 percent.*

The most encouraging aspect of productivity growth is how remarkably stable it has been for the last century and more. Over much of that period, a substantial boost in U.S. productivity reflected the shift of workers from farms to urban factories and service establishments.† But gains in national productivity owing to farmworkers moving into higher-productivity nonfarm jobs are essentially over. Less than 2 percent of the U.S. workforce remains on farms, and that number is not likely to change much. Thus, future national productivity growth will closely mirror the growth in nonfarm productivity. Output per hour is the best measure we have of that growth.

*After a long decline from sixty-hour workweeks a couple of centuries ago, factory average weekly hours settled at forty just after World War II and have held steady ever since. The shift of the employment share to the service sector (where the workweek is shorter) has been reflected in a slight overall decline in the weekly average.

†Even to this day output per hour on farms is less than in nonfarm regions, despite the remarkable gains in crop and livestock yields achieved since the end of World War II.

All gains in efficiency are the result of new ideas in the way people organize their physical reality. To be sure, twenty-first-century human beings are physically taller and stronger than earlier generations, thanks to improved nutrition and health. But that has added very little to our ability to produce. Over the generations it has been new ideas embodied in newly built plant and equipment that better leverage and multiply human effort. From the development of the textile loom two centuries ago to today's Internet, output per hour has increased fiftyfold.

Statisticians usually attribute the growth in output per hour to three primary economic "causes": the quantity of physical plant and equipment, which they call "capital deepening"; the quality of labor input, which is a reflection of education; and the otherwise unexplained, which they infer results from organizational restructuring and new insights in how to generate the nation's output. In all categories, productivity growth results from ideas translated into valued goods and services. The quality of raw materials used in the production process adds only modestly.

If we smooth through the raw data on output per hour, a remarkably stable pattern of growth emerges, going back to 1870. Annual growth of nonfarm business output per hour has averaged close to 2.2 percent since then. Even without adjusting for the business cycle, wars, and other crises, the range of overlapping consecutive fifteen-year averages of the annual increase in output per hour stays consistently between 1 and 3 percent.* I suspect that a good deal of even that modest volatility is statistical "noise," random aberrations resulting from the uncertain quality of the data, especially for the years preceding World War II.

There is little doubt, however, that the burst of U.S. nonfarm productivity growth from 1995 to 2002 has given way to a lessened pace of growth. Output per hour, for example, after the large surge in growth peaked at 4 percent (a four-quarter rate of change) and above in 2002 and 2003, slipped to a 1 percent rate by the first quarter of 2007. Profitable opportunities for further advance appear to have temporarily dwindled, as

*Growth rates slowed following the sharp increase in energy costs in the 1970s and presumably because of it. The technology boom of the past decade has accelerated growth in output per hour, restoring it to its long-term trend.

has often occurred in the past. Innovative expansion seems to come in waves. New products and new companies were major factors in the surge of new issues of stock between 1997 and 2000, and the apparent fall-off in applications of innovation since then has been reflected in the decline in stock issuance. The slowdown in innovation is particularly evident in the dramatic swing in corporations' use of their internal cash flow (the result of earlier gains in the application of new technologies) from fixed investment to buybacks of company common stock and cash disbursed to shareholders in the process of implementing mergers and acquisitions. Such return of cash to shareholders of nonfinancial corporations rose from $180 billion in 2003 to more than $700 billion in 2006. Fixed investment, on the other hand, rose only from $748 billion in 2003 to $967 billion in 2006. A corporation returns equity capital to shareholders when it cannot find opportunities for prospective risk-adjusted rates of return superior to the rate of return that the corporation obtains from existing assets. Large cash disbursements to shareholders are usually a signal of lowered prospective rates of return on fixed investments available to the corporation, the likely result of a slowed pace of profitable new applications of innovation.*

Similar signals are reflected in price trends in high-tech equipment, which had been the driving force in rising overall nonfarm productivity growth between 1998 and 2002. At the Federal Reserve, we monitored those price trends as one proxy of the rate of growth of productivity in the high-tech equipment sector itself, a significant part of recent overall productivity gains. Falling prices are generally possible over protracted periods only if unit labor costs are falling in tandem, a trend that is not likely unless productivity is rising fast. And thus the rate of productivity advance should be reflected, and readily observable, in the rate of decline in price. Prices of information-processing equipment and software, for example, fell by more than 4 percent in 2002, but by less than 1 percent at an annual rate by the first quarter of 2007. Prices of information-processing equipment (and software) have fallen every quarter since 1991. But declines were especially

*The withdrawal of shareholder capital from corporations with less promising investment opportunities for investment in companies with cutting-edge technologies is an important example of the financing of creative destruction.

rapid during periods of surging innovation, like 1998, when prospective PC buyers often hesitated because prices were dropping rapidly; waiting afforded the opportunity to obtain a cheaper and better PC. The recent slowing of high-tech price decline is thus further confirmation of a decline in the availability of new, cutting-edge technological applications that can be exploited to increase the rate of growth of overall productivity.

As this book goes to press (June 2007), evidence of a rebound in measured productivity growth or the rate of price decline for high-tech equipment is lacking. But history tells us that such a turn will take place. It always has.

Our historical experience strongly suggests that as long as the United States remains at technology's cutting edge, annual productivity growth over the long run should range between 0 and 3 percent. As I've noted, since 1870, growth in nonfarm business output per hour has averaged slightly more than 2 percent per year, which implies that real GDP per hour has risen slightly less.* The near century and a half of data encompasses periods of war, crises, protectionism, inflation, and unemployment. I do not believe it is too great a stretch to assume that the same fundamental forces that governed the United States over the past two centuries will govern this country between now and 2030. That 2 percent is probably not a bad approximation of how fast, on average, humans can advance the frontier of innovation, and it seems our best forecast for the next quarter century.

But why not higher—say, 4 percent per year or more? After all, in much of the developing world, annual output per hour has been averaging growth of far more than 2 percent. But those nations have been able to "borrow" the proved technologies of the developed world and have not themselves had to undertake the slow step-by-step effort to advance cutting-edge technologies.

U.S. productivity in 2005 was 2.8 times higher than in 1955. That is because we knew so much more in 2005 than a half century earlier about how our physical world operates. Every year, millions of innovations incrementally improved overall productivity. This process has become particularly

*Much of the GDP excluding nonfarm business is measured by input, not output, and therefore is implicitly assumed to have no productivity growth.

It is conceivable that by 2030 economists will have devised a new means of measuring an economy's productivity directly, rather than through its proxy, output per hour.

evident since the discovery of the exceptional electrical properties of silicon semiconductors following World War II. Gordon Moore, a founder of Intel, suggested in 1965 that the complexity of an integrated circuit, with respect to cost, doubled every year.* He proved prophetic. The persistent downsizing of all electronic applications has enabled the large, bulky walkie-talkies of World War II to morph into today's tiny cell phones, and the boxy original television tubes and computer display screens to go flat. All machinery output, from textile looms and motor vehicles to the routers and servers of the Internet, embodies progressively smaller microprocessors. We have turned light waves into lasers that, when joined with digital technology, dramatically improved data and voice communication and helped create a whole new world of information. It enabled business to adopt just-in-time inventorying, to lower scrap rates, and to reduce the need for backup employment to ensure against production and supply snafus.

Yet why hasn't productivity growth been even faster? Couldn't what we knew in 2005 have been figured out by, say, 1980, thereby doubling the rate of productivity gains (and increases in standard of living) between 1955 and 1980? The simple answer is that human beings are not smart enough. Our history suggests that the ceiling on the productivity growth of an economy over the long term at the cutting edge of technology is at the most 3 percent per year. It takes time to apply new ideas and often decades before those ideas show up in productivity levels. Paul David, a professor of economic history at Stanford, wrote a seminal article in 1989 that addressed the puzzle of why, in the famous words of Nobel laureate economist and then–MIT professor Robert Solow, computers were "everywhere but in the productivity statistics."

It was David's article that heightened my interest in long-term productivity trends. He pointed out that it often took decades for a new invention to be diffused sufficiently widely to affect the levels of productivity. As an

*Ten years later, in 1975, Moore revisited his analysis and reported, "I had no idea this was going to be an accurate prediction, but amazingly enough instead of ten doubling[s], we got nine over the ten years." He added that he thought the rate of doubling from then on would slow to a still-amazing once every two years. Moore's basic insight has now held true for more than four decades.

example, he offered the U.S. experience of the gradual displacement of the steam engine with the electric motor.

Following Thomas Edison's spectacular illumination of lower Manhattan in 1882, it took some four decades for even half of the nation's factories to be electrified. Electric power did not fully exhibit its superiority over steam power until a whole generation of multistory factories was displaced after World War I. David explains vividly what caused the delay. The best factories of the day were poorly designed to take advantage of the new technology. They ran on so-called group drives, elaborate arrangements of pulleys and shafts that transferred power from a central source—a steam engine or water turbine—to machines throughout the plant. To avoid power losses and breakdowns, the lengths of the shared drive shafts had to be limited. This was best achieved when factories rose vertically, with one or more shafts per floor, each driving a group of machines.*

Simply substituting large electric motors to power the existing drive shafts, even when feasible, did not improve productivity very much. Factory owners realized that electricity's revolutionary potential would require far more dramatic change: power delivered by wire made central power sources, group drives, and the very buildings that housed them obsolete. Because electricity opened the way to equipping each production machine with its own small, efficient motor, sprawling single-story plants came into vogue. In them, machinery could readily be arranged and rearranged for greatest efficiency, and materials could be moved about with ease. But abandoning city factories and moving to the wider spaces of the countryside was a slow, capital-intensive process. That was why, David explains, electrifying America's factories took dozens of years. But eventually millions of acres of one-story plants embedding electric-motor-driven power dotted America's Midwest industrial belt, and growth in output per hour finally began to accelerate.

The low-inflation, low-interest-rate period of the early 1960s, as best I can judge, was owing to the application for commercial use of World War II military technology, as well as the large backlog of invention built up during

*I recall visiting in the 1960s a tall and narrow stamping plant built at the turn of the century. I was struck by its unusual shape. But it was only decades later that I learned that I had entered one of the last surviving relics of a certain aspect of America's industrial history.

the 1930s.* Decades later, the delayed emergence of accelerating productivity repeated itself: computers (and the Internet) are now everywhere, *including the productivity statistics.*†

Which brings us to our bottom line. Coupled with the projected 0.5 percent annual increase in hours worked between 2005 and 2030 that follows from the demographic assumptions cited earlier, a slightly less than 2 percent annual average growth in GDP per hour implies a real GDP growth rate of slightly less than 2.5 percent per year, on average, between now and 2030. That compares with 3.1 percent per year, on average, over the past quarter century, when labor force growth was considerably faster.

Arriving at a credible forecast for the level of real GDP for 2030 is a start, but it doesn't tell us much about the nature of the dynamic that will be driving U.S. economic activity a quarter century in the future, or about the quality of our lives. For superimposed on these powerful trends will be the consequences of an inevitable completion of major aspects of globalization.

At some point, globalization's vast economic migration—the epoch-making shift of fully half of the world's three-billion-person labor force from behind the walls of economies that were centrally planned, in part or in whole, to competitive world markets—will be complete, or as complete as it can possibly get.

*Low inflation reflected flat nonfarm business unit labor cost, the result of solid growth in productivity, which in turn was the result of increased investment in, but especially the delayed application of, the earlier technologies. Professor David demonstrated the extraordinary lag from technological advance to its consequence in rapidly rising total factor productivity, a measure of applied technology and other insights. That disinflationary episode lasted only a few years, coming to an end with the Vietnam military buildup. A much larger continuing disinflation was to come as a consequence of the end of the cold war.

†Recent decades' productivity growth derives largely from the continuous improvement and filling out of networks of interrelated technologies. Innovation renders parts of existing networks obsolete, as new technologies sprout up to replace them. Efficiency and productivity improve. But at any point in the process, only part of what is technologically known has had time to be applied. Purchasing managers year after year consistently identify only half their facilities as embodying state-of-the-art technology. There is always a lot of existing network construction in progress, implying that a higher level of productivity will emerge upon its completion. Whether those uncompleted networks fill out, for example, over two years or four years significantly affects the *rate of growth* of productivity.

The continuing *acceleration* of the flow of workers to competitive markets during the past decade has been a potent disinflationary force. That acceleration has depressed wage growth and held down inflation virtually uniformly across the globe. Leaving aside Venezuela, Argentina, Iran, and Zimbabwe, inflation during 2006 in all developed and major developing nations was clustered between 0 and 7 percent.* Similarly narrow ranges describe long-term interest rates. Such globally subdued price and interest-rate pressures are exceptionally rare in my experience.

For the former centrally planned economies of Eastern Europe, the transition is already largely complete. But that is not the case in China, by far the largest player in the transition. There the movement of workforces from the rural provinces to the highly competitive factories of the Pearl River delta has been gradual and controlled. Of China's nearly 800-million-person labor force, approximately half are now resident in urban areas most subject to competitive forces.†

The rate of flow of workers to competitive labor markets will eventually slow, and as a result, disinflationary pressures should start to lift. China's wage-rate growth should mount, as should its rate of inflation. The first signs are likely to be a rise of export prices, best measured by the prices of Chinese goods imported into the United States.‡ Falling import prices from China have had a powerful ripple effect. They have suppressed the prices of competing U.S.-made goods and contained the wages of the workers who produce them—as well as the wages of any who compete against the workers who produce the goods that vie with the Chinese imports.§ Accordingly,

*These rates are as measured by the consumer price index.

†In India, while call centers and a burgeoning high-tech industry garner headlines, the vast bulk of employment remains rural. I expect the rate of migration from the rural areas to cities that produce exportable goods and services to rise, but the numbers do not yet seem large.

‡Export prices reported by China, which have been rising, appear to reflect a significant change in the composition of exports toward higher-pried goods. U.S. import price indexes have fixed quantity weights.

§This process is highly leveraged for imports that compete with domestically produced goods, and especially so for those imports that have substantially different labor costs. If an importer offers a 10 percent discount from prevailing market prices, failure to follow implies a consequent loss of market share. If I am a domestic producer with a modest share of the market, the loss of share could be devastating if I hold prices firm and all other domestic producers meet the importer's price. The risks of such an outcome are often too high to contemplate. Thus, an easing of disinflationary pressures should foster a pickup of price inflation and wage growth in the United States. It should be noted that import prices from China rose markedly in spring 2007 for the first time in years.

The burden of managing this shift will fall on the Federal Reserve. The final arbiter of inflation is monetary policy. How significant—and how corrosive—these price pressures will become for the American economy will depend in large part on the Fed's ability to respond. When the underlying disinflationary pressures and excess world saving propensities begin to ease—or what amounts to the same thing, when inflationary pressures and real long-term interest rates rise—the degree of monetary restraint required to contain any given rate of inflation will increase.

How the Federal Reserve responds to a reemergence of inflation and expected falling world saving propensities will have a profound effect not only on how the U.S. economy of 2030 turns out but also, by extension, on our trading partners worldwide. The Federal Reserve's pre-1979 track record in heading off inflationary pressures, as Milton Friedman often pointed out, was not a distinguished one. In part, that earlier history was a consequence of poor forecasting and analysis, but it also reflected pressures from populist politicians inherently biased toward lower interest rates. (Friedman was less critical of the Fed's post-1979 performance.) During my eighteen-and-a-half-year tenure, I cannot remember many calls from presidents or Capitol Hill for the Fed to *raise* interest rates. In fact, I believe there was none. As recently as August 1991, Senator Paul Sarbanes, in response to what he considered intolerably high interest rates, sought to remove voting authority on the FOMC from what he perceived were the "inherently hawkish" presidents of the Federal Reserve banks.* Interest rates declined with the 1991 recession, and the proposal was shelved.

I regret to say that Federal Reserve independence is not set in stone. FOMC discretion is granted by statute and can be withdrawn by statute. I fear that my successors on the FOMC, as they strive to maintain price sta-

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small amounts of imports have often had the effect of bringing prices down for a whole domestic U.S. market.

*Historical tabulations had indicated the bank presidents were more inclined to tighten than were Board members. And the bank presidents are not confirmed by the Senate; Federal Reserve governors are.

bility in the coming quarter century, will run into populist resistance from Congress, if not from the White House. As Fed chairman, I was largely spared such pressures because long-term interest rates, especially mortgage interest rates, declined persistently throughout my tenure.

It is possible that Congress has observed the remarkable prosperity that emerged in the United States and elsewhere as a consequence of low inflation and has learned from this happy circumstance. But I fear that containing inflation through higher interest rates will be as unpopular in the future as it was when Paul Volcker did it more than twenty-five years ago. "You're high on the hit parade for lynching," Senator Mark Andrews told Volcker bluntly in October 1981; Senator Dennis DeConcini complained in 1983 that Volcker had "almost single-handedly caused one of the worst economic crises" in American history. In December 1982, more ominously, *BusinessWeek* reported, "There are a number of bills in the hopper that would severely limit the Fed's vaunted independence by giving Capitol Hill and the Administration a more direct voice in making monetary policy." When it became apparent that the Fed was on the right course, such criticism disappeared virtually overnight—but sadly, so did the collective memory that there had been such shortsighted and counterproductive criticism. Unless politicians remember that events proved such criticism of Fed policy to have been wrong, how does understanding of monetary policy by our political leadership advance? A key question regarding the future is the political environment that the Fed will have to confront in its quest to preserve the low inflation rates of the past quarter century.

This brings us back to globalization. If my suppositions about the nature of the current grip of disinflationary pressure are anywhere near accurate, then wages and prices are being suppressed by a massive shift of low-cost labor, which, by its nature, must come to an end. A lessening in the degree of disinflation suggested by the upturn in prices of U.S. imports from China in spring 2007 and the firming of real long-term interest rates as this book goes to the press raise the possibility that the turn may be upon us sooner rather than later. So at some point in the next few years, unless contained, inflation will return to a higher long-term rate.

But what is that rate? Price levels, as economic historians can best estimate them, did not materially change in the United States or much of Europe between the eighteenth century and World War II. Prices were defined in terms of gold or other precious metals, and paper money was supposed to be convertible into precious metals on demand at a fixed price. While cyclically variable, prices of goods and services exhibited no persistent trend. During wars, governments might print money not convertible into gold or silver, and prices consequently temporarily spiked. Hence the phrase during our Revolutionary War of "not worth a continental," the name of the wartime currency. During our Civil War, the "greenbacks" met a similar fate. Fiat money—paper money created by government decree—was in deep disrepute.

In those years, governments were perceived as unable to affect the business cycle, and few tried. Inflation expectations, as we understand them today, were nil. Money was backed by gold or silver, and price levels over the long run rose or fell owing largely to changes in the supply of gold or silver. The inflation rate over the long run was essentially zero. Moreover, there is ample evidence that interest rates (effectively on borrowed gold) in centuries past were not significantly different from those of the early twentieth century.* All this suggests that for centuries, inflation was quiescent, and therefore so were inflation premiums.

The monetary landscape in the United States changed beginning in the late nineteenth century, when stagnant prices for agricultural produce fostered the free silver movement, which advocated the coinage of silver in a way that would have inflated overall prices. There was deep popular concern over the straitjacket the gold standard placed on prices, most famously expressed in William Jennings Bryan's "Cross of Gold" speech in 1896.

The monetary orthodoxy that defined the gold standard was beginning to crack. Fabian socialism in Britain and later the La Follette Progressive movement in the United States were reordering the priorities of democratic governments. Prices spiked in World War I and fell sharply in its aftermath. But pre-1914 levels were never fully reestablished. Central banks had

*British "consols," which were the nineteenth-century equivalent of today's U.S. long-term treasuries, yielded a steady rate of approximately 3 percent from 1840 until World War I. For interesting background, see Sidney Homer and Richard Sylla's *A History of Interest Rates*.

found ways to circumvent gold standard rules. And after the Great Depression of the 1930s, the gold standard was effectively abandoned virtually worldwide.

I have always harbored a nostalgia for the gold standard's inherent price stability—a stable currency was its primary goal. But I've long since acquiesced in the fact that the gold standard does not readily accommodate the widely accepted current view of the appropriate functions of government—in particular the need for government to provide a social safety net. The propensity of Congress to create benefits for constituents without specifying the means by which they are to be funded has led to deficit spending in every fiscal year since 1970, with the exception of the surpluses of 1998 to 2001 generated by the stock-market boom. The shifting of real resources required to perform such functions has imparted a bias toward inflation. In the political arena, the pressure to make low-interest-rate credit generally available and to use fiscal measures to boost employment and avoid the unpleasantness of downward adjustments in nominal wages and prices has become nearly impossible to resist. For the most part, the American people have tolerated the inflation bias as an acceptable cost of the modern welfare state. There is no support for the gold standard today, and I see no likelihood of its return.

Price levels rose sharply during World War II, and although the rate of inflation slowed at the end of the war, it never turned sufficiently negative to restore anything close to the price levels of 1939. The rate of inflation has varied ever since, yet for almost every year during the past seven decades, the rate has been positive, meaning the *level* of prices has continued to rise. In 2006, consumer prices in the United States were almost fifteen times higher than they were in 1939. In fact, the price patterns have much in common with evidence of global warming in recent decades. Both accelerations bear the imprint of human intervention.

We know that the average inflation rate under the gold and earlier commodity standards was essentially zero. At the height of the gold standard between 1870 and 1913, just prior to World War I, the cost of living in the United States, as calculated by the Federal Reserve Bank of New York, rose by a scant 0.2 percent per annum on average. From 1939 to 1989, the year of the fall of the Berlin Wall and before the onset of the post–cold war wage-price disinflation, the CPI rose ninefold, or 4.5 percent per year.* This reflects the fact that there is no inherent anchor in a fiat-money regime. What constitutes its "normal" inflation rate is a function solely of a country's culture and history. In the United States, modest amounts of inflation are politically tolerated, but inflation rates close to double digits create a political storm. Indeed, Richard Nixon felt the political need to impose wage and price controls in 1971 even though the inflation rate was below 5 percent. Thus, while political considerations mean that the gold standard can be ruled out as a way to suppress a forthcoming rise in inflationary pressures, ironically, politics driven by an irate populace just might accomplish the same purpose. But that is unlikely before inflation moves above 5 percent at least. The 4.5 percent inflation rate, on average, for the half century following the abandonment of the gold standard is not necessarily the norm for the future. Nonetheless, it is probably not a bad first approximation of what we will face.

An inflation rate of 4 to 5 percent is not to be taken lightly—no one will be happy to see his or her saved dollars lose half their purchasing power in fifteen years or so. And while it is true that such a rate has not proved economically destabilizing in the past, an inflation projection in that range assumes a generally benign impact of retirement of the baby boomers, at least through the year 2030. As we have seen, today's relative fiscal quiescence masks a pending tsunami. It will hit as a significant proportion of the nation's highly productive population retires to become recipients of our federal pay-as-you-go health and retirement system, rather than contributors to it. Over time, unless this is addressed, it could add massively to the demand for economic resources and heighten inflationary pressures.

Thus, without a change of policy, a higher rate of inflation can be anticipated in the United States. I know that the Federal Reserve, left alone, has the capacity and perseverance to effectively contain the inflation pressures I foresee. Yet to keep the inflation rate down to a gold standard level

*Included in this period was the seemingly anomalous low-inflation, low-interest-rate period of the early 1960s, which had many of the characteristics of today's global disinflation. As I noted earlier, its cause was in a way similar to the aftermath of the cold war, in that it was noneconomic: the delayed application for commercial use of gains in military technology during World War II and the large backlog of invention built up during the 1930s.

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of under 1 percent, or even a less draconian 1 to 2 percent range, the Fed, given my scenario, would have to constrain monetary expansion so drastically that it could temporarily drive up interest rates into the double-digit range not seen since the days of Paul Volcker. Whether the Fed will be allowed to apply the hard-earned monetary policy lessons of the past four decades is a critical unknown. But the dysfunctional state of American politics does not give me great confidence in the short run. We could instead see a return of populist, anti-Fed rhetoric, which has lain dormant since 1991.

My fear is that as Washington strives to make good on the implicit promises made in the social contract that characterizes contemporary America, CPI inflation rates by 2030 will be some 4½ percent or higher. The "higher" is meant to reflect whatever inflation premium might arise as a consequence of the inadequate funding for health and retirement benefits for baby boomers. In the end, I see a positive fiscal outcome, as I note in chapter 22. But I suspect it is likely that to restore policy sanity we will first have to trudge through economic and political minefields before we act decisively. I am reminded of Winston Churchill's perception of Americans, who "can always be counted on to do the right thing—after they have exhausted all other possibilities." The trip through the minefields is a major source of risk for my forecast, and it could be manifested in higher paths for interest rates and inflation.

An elevated inflation rate, if allowed to develop, will create a different financial environment than currently prevails. In part, this is because its emergence is likely to parallel a decline in the developing world's currently above-normal propensity to save. As noted earlier, developing-country savings rates have historically averaged only a few percentage points higher than those of developed countries. But owing to the combination of a surging China, with its historically high savings rate,* and OPEC's recent huge accumulation of liquid assets,† savings rates in developing countries ballooned to 32 percent in 2006, while the rates in developed countries averaged less than 20 percent.

*China's savings rate is the result both of low government provisions for health and retirement and of soaring business savings.

†Oil-exporting nations reported $349 billion in foreign exchange at the end of 2006, compared with only $140 billion at the end of 2002.

As China continues its trek toward Western consumerism, its savings rate will fall. And though oil prices are more likely than not to go higher, any increase in OPEC's savings rates is likely to be far less than has occurred since 2001. Implicit in such a scenario is a consequent removal of an excess of saving intentions over investment intentions and, therefore, the lifting of that important factor that has helped suppress real interest rates since early this decade. Moreover, having largely bestowed its benefits, globalization will slow its pace. The recent frenetic pace of world economic growth will decline. The World Bank estimates that annual global GDP growth at market exchange rates will slow to 3 percent over the next quarter century. Global GDP grew at a 3.7 percent annual rate between 2003 and 2006.

The dispersion of current account balances, a function of the pace of the globalized division of labor and specialization, should also slow. The U.S. current account is thus likely to shrink, though aggregate world imbalances may not. Other countries could eventually replace the United States as the major absorber of cross-border saving flows.

With real interest rates and expected inflation likely to rise on average over the next quarter century, so would nominal long-term rates. The order of magnitude of interest rate change is difficult to pin down because of the uncertainties that a quarter century can bring. But for illustrative purposes, if real rates on ten-year U.S. Treasury notes were to rise by 1 percentage point from today's 2.5 percent (owing to a fall in global saving intentions) and if fiat-money inflation expectations added the 4.5 percentage points it has implied in the past, that would create a nominal yield for the ten-year note of 8 percent. Again, this excludes whatever premium is required to fund the obligations to baby-boomer retirees. But we can take this level as illustrative: sometime before 2030 the world is likely to be trading ten-year U.S. treasuries at a rate of at least 8 percent. This level is only a baseline—an oil crisis, a major terrorist attack, or an impasse in the U.S. Congress over future budget problems could send long-term rates significantly higher for brief periods.

There are other threats to the long-term financial stability of the United States and the rest of the world besides a rise in riskless interest rates. A hallmark of the past two decades has been a persistent fall in risk premiums. It is difficult to discern whether investors believe underlying risks have diminished and hence they do not require the yield premiums over riskless treasuries that were prevalent in the past, or whether it is a need for additional interest income that is pushing them to reach for higher-yielding debt instruments. Spreads over U.S. treasuries of CCC-rated corporate bonds (so-called junk bonds) in mid-2007 were mind-bogglingly low. For example, this spread declined from 23 percentage points amid a plethora of junk bond defaults at the end of the recession in October 2002 to little more than 4 percentage points in June 2007, despite a large rise in issuance of CCC bonds. Spreads of emerging-market bond yields over those of U.S. treasuries have declined from 10 percentage points in 2002 to less than 1½ percentage points in June 2007. This compression of risk premiums is global. I am uncertain whether in periods of euphoria people reach for an amount of risk that is at the outer limits of human tolerance, irrespective of the institutional environment in which they live. The prevailing financial infrastructure perhaps merely leverages this risk tolerance. For decades prior to the Civil War, banks had to hold capital well in excess of 40 percent to secure their notes and deposits. By 1900, national banks' capital cover was down to 20 percent of assets, to 12 percent by 1925, and below 10 percent in recent years. But owing to financial flexibility and far greater sources of liquidity, the fundamental risk borne by the individual banks, and presumably investors generally, may not have changed much over that time period.

It may not matter. As I noted in my farewell remarks to the Federal Reserve Bank of Kansas City's Jackson Hole Symposium in August 2005, "History has not dealt kindly with the aftermath of protracted periods of low risk premiums."

At a minimum, as riskless interest rates rise and risk premiums are purged of the unsustainable optimism they now embody, prices of income-earning assets will surely grow far more slowly than during the past six years. As a consequence of the decline in long-term nominal and real interest rates since 1981, asset prices worldwide have risen faster than nominal world GDP in every year, with the exceptions of 1987 and 2001–2 (the years of the dot-com bubble collapse). This surge in the value of stocks, real estate deeds, and other claims on income-earning assets—that is, direct and indirect claims on assets, whether physical or intellectual—is what I designate an increase in liquidity. These paper claims represent purchasing power that can quite readily be used to buy a car, say, or a company.

The market value of stock and the liabilities of nonfinancial corporations and governments is the source of investments and hence the creation of liabilities by banks and other financial institutions. This process of financial intermediation is a major cause of the overwhelming sense of liquidity that has suffused financial markets for a quarter century. If interest rates start to rise and asset prices broadly fall, "excess" liquidity will dry up, possibly fairly quickly. Remember, the market value of an income-earning security is its *expected* future income leavened by a discount factor that changes according to euphoria and fear as well as more rational assessments of the future. It is those judgments that determine the value of stock and other income-earning assets. It is those judgments that determine how much wealth a society has. Large manufacturing plants, office towers, even homes, have value only to the extent that market participants value their future use. If the world were to come to an end in an hour, all symbols of wealth would be judged worthless. Something far short of doomsday—say, a dollop more of uncertainty added to the mix of our future outcomes—and market participants will lower their bids and will value real assets less. Nothing has to be happening outside our heads. Value is what people perceive it to be. Hence liquidity can come or go with the appearance of a new idea or fear.

A related concern in financial markets is the large and continuing accumulation of U.S. Treasury securities by foreign central banks, mainly in Asia. Market participants fear an impact on dollar interest and exchange rates if and when those central banks stop purchasing U.S. securities or, worse, try to sell off large blocks of holdings. The accumulations are largely the result of endeavors mainly by China and Japan to suppress their exchange rates to foster exports and economic growth. Between the end of 2001 and March 2007, China and Japan combined accumulated $1.5 trillion of foreign exchange, of which four-fifths appears to be in dollar claims—that is, holdings of U.S. Treasury and agency securities and other short-term claims, including Eurodollars.*

*China has embarked on an announced program to diversify part of its huge foreign-exchange reserves (1.2 trillion in dollars and the dollar equivalent of nondollar assets).

Should the rate of accumulation slow or turn to liquidation, there will surely be some downward pressure on the U.S. dollar exchange rate and upward pressure on U.S. long-term interest rates. But the foreign-exchange markets for the major currencies have become so liquid that the currency transactions required to implement large international transfers of U.S. dollar deposits can be accomplished with only modest disturbance to markets. For interest rates, the extent of a rise is likely to be less than many analysts fear, certainly less than a percentage point and conceivably much less. Liquidation of U.S. Treasury securities by central banks (or any other market participant) does not change the total amount outstanding of U.S. Treasury debt. Nor does the outstanding amount of securities or other assets that the central banks purchase with the proceeds of their sales. Such transactions are swaps, which affect the spread between two securities but need not affect the overall level of interest rates. It is similar to an exchange of currencies.*

The impact on interest rate spreads of a swap involving a large block of U.S. treasuries by a central bank (or anyone else) depends on the size of the portfolios of the world's other investors, and, importantly, the proportions of those investments that are close substitutes of treasuries with respect to maturity, the currency of denomination, liquidity, and credit risk. Holders of close substitutes such as AAA corporate bonds and mortgage-backed securities can be induced to swap for treasuries without undue disturbance to markets.

The international financial market has become so large and liquid† that sales of tens of billions of U.S. treasuries, perhaps hundreds of billions, can be transacted without crisis-causing shocks to markets. We have had much evidence of the market's capability to absorb major transfers of U.S. treasuries in recent years. For example, Japanese monetary authorities, after having accumulated nearly $40 billion a month of foreign exchange, pre-

*Such swaps are quite different from the liquidation of equities whose values are falling because the discounted expectations of future earnings are falling. In that case, the overall value of equities declines. There is no offset. It is not a swap.

†Aggregate holdings of foreign exchange by central banks and world private-sector portfolios of foreign cross-border liquid assets approached $50 trillion in early 2007, according to the BIS and IMF. Domestic nonfinancial corporate liabilities are also available as substitutes for U.S. treasuries, probably at modest price concessions. Such liabilities net of foreign holdings of the United States and Japan alone amounted to $33 trillion at the end of 2006.

dominantly in U.S. treasuries, between the summer of 2003 and early 2004, abruptly ended that practice in March 2004. Yet it is difficult to find significant traces of that abrupt change in either the prices of the U.S. Treasury ten-year note or the dollar-yen exchange rate. Earlier, Japanese authorities purchased $20 billion of U.S. treasuries *in one day,* with little result.

While it is conceivable that as part of a financial crisis brewing for other reasons, major liquidations in holdings of U.S. treasuries by foreign central banks could cause havoc, I see even that as a stretch.

But that is not the end of financial fears. Along with the dramatic rise in liquidity since the early 1980s has come the development of technologies that have enabled financial markets to revolutionize the spreading of risk, as we have seen. Three or four decades ago, markets could deal only with plain vanilla stocks and bonds. Financial derivatives were simple and few. But with the advent of the ability to do around-the-clock business real-time in today's linked worldwide markets, derivatives, collateralized debt obligations, and other complex products have arisen that can distribute risk across financial products, geography, and time. Although the New York Stock Exchange has become a lesser presence in world finance, its trading volume has risen from several million shares a day in the 1950s to nearly two billion shares a day in recent years. Yet, with the exceptions of financial spasms such as the stock market crash in October 1987 and the crippling crises of 1997–98, markets seem to adjust smoothly from one hour to the next, one day to the next, as if guided by an "international invisible hand," if I may paraphrase Adam Smith. What is happening is that millions of traders worldwide are seeking to buy undervalued assets and sell those that appear overpriced. It is a process that continually improves the efficiency of directing scarce savings to their most productive investment. This process, far from its characterization by populist critics as blind speculation, is a major contributor to a nation's growth in productivity and its standard of living. Nonetheless, the never-ending jockeying for advantage among traders is continuously rebalancing supply and demand at a pace that is too fast for human comprehension. The trades, of necessity, are thus becoming increasingly computerized, and traditional "outcry" trading on the floors of stock and commodity exchanges is rapidly being replaced by computer algorithms. As information costs drop, the nature of the U.S.

economy will change. With investment banks, hedge funds, and private equity funds all seeking niche or above risk-adjusted rates of return, the distinctions between these institutions will gradually blur. So will the defining line between nonfinancial businesses and commercial banks, as the distinction between what constitutes finance and commerce largely disappears.

Markets have become too huge, complex, and fast-moving to be subject to twentieth-century supervision and regulation. No wonder this globalized financial behemoth stretches beyond the full comprehension of even the most sophisticated market participants. Financial regulators are required to oversee a system far more complex than what existed when the regulations still governing financial markets were originally written. Today, oversight of these transactions is essentially by means of individual-market-participant counterparty surveillance. Each lender, to protect its shareholders, keeps a tab on its customers' investment positions. Regulators can still pretend to provide oversight, but their capabilities are much diminished and declining.

For over eighteen years, my Board colleagues and I presided over much of this process at the Fed. Only belatedly did I, and I suspect many of my colleagues, come to realize that the power to regulate administratively was fading. We increasingly judged that we would have to rely on counterparty surveillance to do the heavy lifting. Since markets have become too complex for effective human intervention, the most promising anticrisis policies are those that maintain maximum market flexibility—freedom of action for key market participants such as hedge funds, private equity funds, and investment banks. The elimination of financial market inefficiencies enables liquid free markets to address imbalances. The purpose of hedge funds and others is to make money, but their actions extirpate inefficiencies and imbalances, and thereby reduce the waste of scarce savings. These institutions thereby contribute to higher levels of productivity and overall standards of living.

Many critics find this reliance on the invisible hand to be unsettling. As a precaution and backup, they wonder, should not the world's senior financial officers, such as the finance ministers and central bankers of major nations, seek to regulate this huge new global presence? Even if global regulation can't do much good, at least, it is argued, it cannot do any harm. But in fact it can. Regulation, by its nature, inhibits freedom of market action, and that freedom to act expeditiously is what rebalances markets.

Undermine this freedom and the whole market-balancing process is put at risk. We never, of course, know all the many millions of transactions that occur every day. Neither does a U.S. Air Force B-2 pilot know, *or need to know*, the millions of automatic split-second computer-based adjustments that keep his aircraft in the air.

In today's world, I fail to see how adding more government regulation can help. Collecting data on hedge fund balance sheets, for example, would be futile, since the data would probably be obsolete before the ink dried. Should we set up a global reporting system of the positions of hedge and private equity funds to see if there are any dangerous concentrations that could indicate potential financial implosions? I have been dealing with financial market reports for almost six decades. I would not be able to judge from such reports whether concentrations of positions reflected markets in the process of doing what they are supposed to do—remove imbalances from the system—or whether some dangerous trading was emerging. I would truly be surprised if *anyone* could.

To be sure, the "invisible hand" presupposes that market participants act in their self-interest, and there are occasions when they do take demonstrably stupid risks. For example, I was shaken by the recent revelation that dealers in credit default swaps were being dangerously lax in keeping detailed records of the legal commitments that stemmed from their over-the-counter transactions. In the event of a significant price change, disputes over contract language could produce a real but unnecessary crisis.* This episode was a problem not of market price risk but of operational risk—that is, the risks associated with a breakdown in the infrastructure that enables markets to function.

Superimposed on the longer-term forces I've discussed, it is important to remember, is the business cycle. It is not dead, even though it has been muted for the past two decades. There is little doubt that the emergence of just-in-time inventory programs and increasing service output has markedly diminished the amplitude of fluctuations in GDP. But human nature does not change. History is replete with waves of self-reinforcing enthu-

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siasm and despair, innate human characteristics not subject to a learning curve. Those waves are mirrored in the business cycle.

Taken together, the financial problems confronting the next quarter century do not make a pretty picture. Yet we have lived through far worse. None of them will permanently undermine our institutions, or even likely topple the U.S. economy from its place of world leadership. Indeed there are currently a number of feared financial imbalances that are likely to be resolved with far less impact on U.S. economic activity than is generally supposed. I indicated in chapter 18 that the unwinding of our current account deficit is not likely to have a major impact on economic activity or employment. The fear that a liquidation of much of China's and Japan's huge foreign-exchange reserves will drive U.S. interest rates sharply higher and dollar exchange rates lower is also exaggerated.

There is little we can do to avoid the easing of global disinflationary forces. I view that as a return to fiat-money normalcy, not a new aberration. What is more, we have it within our power to sharply mitigate some of the more dire features of the scenario I have outlined above. First, the president and Congress must not interfere with the Federal Open Market Committee's efforts to contain the inevitable inflationary pressures that will eventually emerge (the members will need no encouragement). Monetary policy can simulate the gold standard's stable prices. Episodes of higher interest rates will be required. But the Volcker Fed demonstrated that it can be done.

Second, the president and Congress must make certain that the economic and financial flexibility that enabled the U.S. economy to absorb the shock of 9/11 is not impaired. Markets should remain free to function without the administrative constraints—particularly those on wages, prices, and interest rates—that have disabled them in the past. This is especially important in a world of massive movements of funds, huge trading volumes, and markets rendered inevitably opaque by their increasing complexity. Economic and financial shocks will occur: human nature, with its fears and its foibles, remains a wild card. The resulting shocks will, as always, be difficult to anticipate, so the ability to absorb them is a paramount requirement for stability of output and employment.

Hands-on supervision and regulation—the twentieth-century financial model—is being swamped by the volume and complexity of twenty-first-century finance. Only in areas of operational risk and business and consumer fraud do the principles of twentieth-century regulation remain intact. Much regulation will continue to be aimed at ensuring that rapid-fire, risk-laden dealings are financed by wealthy professional investors, not by the general public. Efforts to monitor and influence market behavior that is proceeding at Mach speeds will fail. Public-sector surveillance is no longer up to the task. The armies of examiners that would be needed to maintain surveillance on today's global transactions would by their actions undermine the financial flexibility so essential to our future. We have no sensible choice other than to let markets work. Market failure is the rare exception, and its consequences can be assuaged by a flexible economic and financial system.

However we get to 2030, the U.S. economy should end up much larger, absent unexpectedly long crises—three-fourths larger in real terms than that in which we operate today. What's more, its output will be far more conceptual in nature. The long-standing trend away from value produced by manual labor and natural resources and toward the intangible value-added we associate with the digital economy can be expected to continue. Today it takes a lot less physical material to produce a unit of output than it did in generations past. Indeed, the physical amount of materials and fuels either consumed in the production of output or embodied in the output has increased very modestly over the past half century. The output of our economy is not quite literally *lighter*, but it is close.

Thin fiber-optic cable, for instance, has replaced huge tonnages of copper wire. New architectural, engineering, and materials technologies have enabled the construction of buildings enclosing the same space with far less physical material than was required fifty or one hundred years ago. Mobile phones have not only downsized but also morphed into multipurpose communication devices. The movement over the decades toward production of services that require little physical input has also been a major contributor to the marked rise in the ratio of constant dollars of GDP to tons of input.

If you compare the dollar value of the gross domestic product—that is, the market value of all goods and services produced—of 2006 with the GDP of 1946, after adjusting for inflation, the GDP of the country over which George W. Bush presides is seven times larger than Harry Truman's. The weight of the inputs of materials required to produce the 2006 output, however, is only modestly greater than was required to produce the 1946 output. This means that almost all of the real-value-added increases in our output reflect the embodiment of ideas.

The dramatic shift during the past half century toward the less tangible and more conceptual—the amount of weight the economy has lost, as it were—stems from several causes. The challenge of accumulating physical goods in an ever more crowded geographical environment has clearly resulted in pressures to economize on size and space. Similarly, the prospect of increasing costs of discovering, developing, and processing ever-larger quantities of physical resources in less amenable terrain has raised marginal costs and shifted producers toward downsized alternatives. Moreover, as the technological frontier has moved forward and pressed for information processing to speed up, the laws of physics have required microchips to become ever more compact.

The new downsized economy operates differently from its predecessors. In the typical case of a manufactured good, the incremental cost of increasing output by one unit ultimately rises as production expands. In the realm of conceptual output, however, production is often characterized by constant, and often negligible, marginal cost. Though the setup cost of creating an online medical dictionary, for instance, may be huge, the cost of reproduction and distribution may be near zero if the means of distribution is the Internet. The emergence of an electronic platform for the transmission of ideas at negligible marginal cost is doubtless an important factor explaining the most recent increased conceptualization of the GDP. The demand for conceptual products is clearly impeded to a much lesser degree by rising marginal cost and, hence, price, than is the demand for physical products.

The high cost of developing software and the negligible production and, if online, distribution costs tend to suggest a natural monopoly—a good or service that is supplied most efficiently by one firm. A stock exchange is an obvious example. It is most efficient to have all the trading of a stock concentrated in one market. Bid-asked spreads narrow and transaction costs decline. In the 1930s, Alcoa was the sole U.S. producer of raw aluminum. It kept its monopoly by passing on, in ever-lower prices, almost all its increases in efficiency. Potential competitors could not envision an acceptable rate of return if they had to match Alcoa's low prices.*

Today's version of that aspiring natural monopoly is Microsoft, with its remarkable dominance in personal computer operating systems. Getting into a market early with the capability to define a new industry's template fends off potential competitors. Creating and cultivating this lock-in effect is thus a prime business strategy in our new digital world. Despite this advantage, Microsoft's natural monopoly has proved far from absolute. The dominance of its Windows operating system has been eroded by competition from Apple and open-source Linux. Natural monopolies, in the end, are displaced by technological breakthroughs and new paradigms.

Strategies come and go, but the ultimate competitive goal remains: gaining the maximum rate of return, adjusted for risk. Competition effectively works, whatever the strategy, provided free and open markets prevail. Antitrust policy, never in my judgment an effective procompetition tool, is going to find its twentieth-century standards far out of date for the new digital age, in which an innovation can turn an eight-hundred-pound gorilla into a baby chimpanzee overnight.†

The trend toward conceptual products is irreversibly increasing the emphasis on intellectual property and its protection—a second area of the law that is likely to be challenged. The president's Council of Economic Advisors in early 2006 cited output by industries "highly dependent on patent . . . and copyright protection," such as pharmaceuticals, informa-

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*It is often said that many companies do lower prices in an attempt to drive competitors out of business. But unless their costs are persistently lower than competitors', this is a losing strategy. To raise prices after potential competitors retire from the market is decidedly short-sighted. Despite claims that it is a common practice, I have seen very little of it in my six decades observing business. It is an effective way to lose customers.

†Antitrust policy in the United States was born in the nineteenth century and evolved in twentieth-century law in reaction to allegations of price fixing and other transgressions contrary to then current views of how markets should work. I have always thought the competitive model employed by the courts to judge infractions was not one that maximized economic efficiency. I fear that applying that twentieth-century model to markets of the twenty-first century will be even more counterproductive. Freeing up markets by withdrawing subsidies and anticompetition regulation, in my judgment, has always been the most effective antimonopoly policy.

tion technology, software, and communications, as accounting for almost a fifth of U.S. economic activity in 2003. The council also estimated that a third of market value of publicly traded U.S. corporations in September 2005 ($15 trillion) was attributable to intellectual property; of that third, software and other copyright-protected materials represented nearly two-fifths, patents a third, and trade secrets the remainder. It is almost certainly the case that intellectual property's share of stock-market value is much larger than its share of economic activity. Industries with disproportionately large shares of intellectual property are also the most rapidly growing industries in the U.S. economy. I see no obstacle to intellectual property's share of GDP rising into 2030.*

Before World War I, markets in the United States were essentially uninhibited by government regulations, but were supported by rights to property, which in those years largely meant physical property. Intellectual property—patents, copyrights, and trademarks—represented a far less important aspect of the economy. One of the most significant inventions of the nineteenth century was the cotton gin: perhaps it was a sign of the times that the cotton gin design was never effectively protected.

Only in recent decades, as the economic product of the United States has become so predominantly conceptual, have issues related to the protection of intellectual property rights come to be seen as significant sources of legal and business uncertainty. In part, this uncertainty derives from the fact that intellectual property is importantly different from physical property. Because physical assets have a material existence, they are more capable of being defended by police or private security forces. By contrast, intellectual property can be stolen by an act as simple as publishing an idea without the permission of the originator. Significantly, one individual's use of an idea does not make that idea unavailable to others for their own simultaneous use.

Even more to the point, new ideas—the building blocks of intellectual

*The major loser of GDP share by 2030 is likely to be U.S. manufacturing (excluding high tech). Moreover, continued productivity growth will further shrink the number of jobs in manufacturing property—almost invariably build on old ideas in ways that are difficult or impossible to trace. From an economic perspective, this provides a rationale for making calculus, developed initially by Newton and Leibniz, freely available, despite the fact that the insights of calculus have immeasurably increased wealth over the generations. Should the law have protected Newton's and Leibniz's claims in the same way that we do those of owners of land? Or should the law allow their insights to be more freely available to those who would build on them, with the aim of maximizing the wealth of the society as a whole? Are all property rights inalienable, or must they conform to the reality that conditions them?

These questions bedevil economists and jurists, for they touch on fundamental principles governing the organization of a modern economy and, hence, its society. Whether we protect intellectual property as an inalienable right or as a privilege vouchsafed by the sovereign state, such protection inevitably entails making choices that have crucial implications for the balance we strike between the interests of those who innovate and those who would benefit from innovation.

My libertarianism draws me to the initial conclusion that if somebody creates an idea, he or she has the right of ownership. Yet the creator of an idea automatically has its use. So the question is: should others be restricted from using the idea? It is at least conceivable that if the right to exclusive use of ideas cumulated through enough generations, some far future newly born generation would find all ideas necessary for survival already legally spoken for, and off-limits without the permission of those holding the rights to the ideas. Clearly the protection of one person's right cannot be at the expense of another's right to life (as it would be in such an instance), or the magnificent edifice of individual rights would harbor an internal contradiction. While far-fetched, this scenario nonetheless demonstrates that if state protection of *some* intellectual creations possibly violates others' rights and hence should be invalid, then some intellectual creations cannot be protected. Once a general principle is breached, where does it end? In practice, of course, only a very small segment of intellectual creation has been chosen for protection under the legal constructs of patents, copyrights, and trademarks.

In the case of physical property, we take it for granted that the ownership right should have the potential of persisting as long as the physical object itself.* In the case of an idea, however, we have chosen to strike a different balance in recognition of the chaos that could follow from having to trace back all the insights implicit in one's current undertaking and pay a royalty to the originator of each one. Rather than adopting that obviously unworkable approach, Americans have chosen instead to follow the lead of British common law and place time limits on intellectual property rights.

But are we striking the right balance? Most participants in the intellectual property debate apply a pragmatic standard: Are the protections sufficiently broad to encourage innovation but not so broad as to shut down follow-on innovations? Are such protections so vague that they produce uncertainties that raise risk premiums and the cost of capital?

Almost four decades ago, a young Stephen Breyer summed up the dilemma by quoting *Hamlet*. Writing in the *Harvard Law Review*, the future Supreme Court justice noted,

> It is difficult to do other than take an ambivalent position on the question of whether current copyright protection—considered as a whole—is justified. One might compare this position with that of Professor Machlup, who, after studying the patent system, concluded, "None of the empirical evidence at our disposal and none of the theoretical arguments presented either confirms or confutes the belief that the patent system has promoted the progress of the technical arts and the productivity of the economy." The position suggests that the case for copyright in books rests not upon proven need, but rather upon uncertainty as to what would happen if protection were removed. One may suspect that the risk of harm is small, but the world without copyright is nonetheless an "undiscover'd country" which "puzzles the will, / And makes us rather bear those ills we have / Than fly to others that we know not of."

*In practice, British common law allows the bestowing of property to living people but not to future generations, which could in effect tie up property in perpetuity.

How appropriate is our current system—developed for a world in which physical assets predominated—for an economy in which value increasingly is embodied in ideas rather than tangible capital? Arguably, the single most important economic decision our lawmakers and courts will face in the next twenty-five years is to clarify the rules of intellectual property.

In summary, what can we glean from this attempt to peer into the future? Setting aside the wild cards on which no one has much of a handle—a nuclear detonation on U.S. soil, a flu pandemic, a dramatic revival of protectionism, or a failure to agree on a noninflationary solution to Medicare's fiscal imbalance are just some examples—the United States in 2030 is likely to be characterized by:

1. A real GDP three-fourths higher than that of 2006
2. A continuation of the conceptualization of U.S. GDP and the increased prominence of intellectual property rights legislation and litigation
3. A Federal Reserve System that will be confronted with the challenge of inflation pressures and populist politics that have been relatively quiescent in recent years

If the Fed is prevented from constraining inflationary forces, we could be faced with:

4. A core inflation rate markedly above the 2.2 percent of 2006
5. A ten-year treasury note flirting with a double-digit yield sometime before 2030, compared with under 5 percent in 2006
6. Risk spreads and equity premiums significantly larger than in 2006, and
7. Therefore, yields on stocks greater than in 2006 (the result of a projected quarter century of subdued asset price increases through 2030), and, consonant with that, lower ratios of real estate capitalization

Turning to the outlook for the rest of the world, the United Kingdom has had a remarkable renaissance since Margaret Thatcher's decisive freeing up of market competition in Britain starting in the 1980s. The success was dramatic, and to its credit, "New Labour" under the leadership of Tony Blair and Gordon Brown embraced the new freedoms, tempering their party's historical Fabian socialist ethos with a fresh emphasis on opportunity. Britain has welcomed foreign investment and takeovers of British corporate icons. The current government recognized that aside from issues of national security and pride, the nationality of British corporate shareholders has little impact on the standard of living of the average citizen.

Today London is arguably the world's leader in cross-border finance, though New York, by financing much of the vast economy of the United States, remains the financial capital of the world. London's restoration of its nineteenth-century dominance of international markets began in 1986 with the "Big Bang" that significantly deregulated British finance, and there has been no turning back. Inventive technologies have dramatically improved the effectiveness with which global savings have been employed to finance global investment in plant and equipment. That improved productivity of capital has engendered increased incomes for financial expertise, and UK finance has prospered. The large tax revenues that have emerged have been used by the Labour government to counter the income inequality that is an inevitable by-product of increasing technologically oriented financial competition.

The per capita GDP of the United Kingdom has recently outdistanced those of Germany and France. Britain's demographics are not so dire as those of the Continent, though its education of its children has many of the shortcomings of the American system. If Britain continues its new openness (a highly reasonable expectation), it should do well in the world of 2030.

Continental Europe's outlook will remain unclear until it concludes it cannot maintain a pay-as-you-go welfare state that requires a growing population to finance it. With its birth rate well below its natural replacement rate and few forecasters anticipating a recovery, continental Europe's workforce, unless heavily augmented with new immigrant workers, is set to decline, and its elderly dependency ratio to rise. Europe's appetite for increased immigration, however, seems limited. To counter all this, Europe's productivity growth rate would have to accelerate to a pace that to date has seemed out of reach. Recognizing this problem, the European Council in 2000 advanced an ambitious program, the Lisbon Agenda, to bring the continent's state of technology to world leadership. But the program languished and has since been put on hold. Without an increase in productivity growth, it is difficult to see how Europe can maintain the dominant role it has played in the world economy since the end of World War II. But the emergence of new leaders in France, Germany, and Great Britain may be a signal that Europe will strengthen its commitment to the goals of Lisbon. The seeming convergence of many of the economic perspectives of Nicolas Sarkozy, Angela Merkel, and Gordon Brown makes a European resurgence appear more likely.

Japan's demographic future, if anything, appears even less promising than that of Europe. Japan is strongly resisting immigration, except by those of Japanese ancestry. Its level of technology is already world-class, so its upside potential for productivity growth is presumably as limited as that of the United States. Many forecasters see Japan losing its status as the world's second-largest economy (valued at market exchange rates) sometime before 2030. The Japanese are not likely to find that outcome to their preference and may well take steps to counter it. In any event, Japan will remain wealthy, a formidable force in both technology and finance.

Russia has vast natural resources, but it is plagued by a declining population, and as I noted in chapter 16, the nonenergy sections of its economy are at risk from the effects of the Dutch disease. Its encouraging embrace of the rule of law and respect for property rights has given way under Vladimir Putin to selective enforcement of the law based on nationalist expediency, a negation of the very basis of the rule of law. Because of its energy resources, Russia will remain a formidable player on the global economic scene. But unless it fully restores the rule of law, the nation is unlikely to create a world-class economy. As long as Russia's energy resources remain abundant and their prices high, per capita GDP will likely continue to rise. But Russia's per capita GDP is less than a third (measured by purchasing power parity) of that of the United States, and thus Russia has a long way to go before it joins the club of developed nations.

India has great potential if it can end its embrace of the Fabian socialism that it inherited from Britain. It has done so for its export-oriented, world-class high-tech services. But this kernel of modernity is only a small part of the sprawling economy of India. Even as tourism-associated service industries prosper, fully three-fifths of India's workforce toil in unproductive agriculture. While India is an admirable democracy—the largest in the world—its economy, despite important reforms since 1990, remains heavily bureaucratic. Its economic growth rate in recent years is among the highest in the world, but that is off a very low base. Indeed, India's per capita GDP four decades ago was equal to that of China, but is now less than half of China's and still losing ground. It is conceivable that India can undergo as radical a reform as China and become world-prominent. But at this writing, its politics appear to be leading India in a discouraging direction. Fortunately, though India's twenty-first-century service enclave is small, its glitter is just too evident to dismiss. Ideas do matter. And the nation is bound to be attracted by twenty-first-century ideas as well as twenty-first-century technology. India may find it useful to follow the British, whose evolution seems to have melded the free-market notions of the Enlightenment with the sensibilities of the Fabians.

Among the challengers to America's world economic leadership, that leaves populous China as the major competitor in 2030. China was more prosperous than Europe in the thirteenth century. It lost its way for many centuries, only to embark on a remarkable renaissance as it transformed itself on a vast scale virtually overnight. China's embrace of free-market competition, first in agriculture, then in industry, and finally in opening itself to international trade and finance, has placed this ancient society on the path to greater political freedom. No matter what official rhetoric may be, the tangible lessening of power from one generation of leaders to the next gives hope that a more democratic China will displace the authoritarian Communist Party. While some authoritarian states have for a time successfully adopted competitive market policies, over the longer term the correlation between democracy and open trade is too stark to ignore.

I do not pretend to be able to foresee with certainty whether China will remain on its current path toward greater political freedom and increasing prominence as a world economic power, or whether, to retain the political control it is losing day by day to market forces, the Communist Party will seek to reestablish the economic rigidity that prevailed prior to Deng Xiaoping's bold reforms. Much of how the world will look in 2030 rests on this outcome. If China continues to press ahead toward free-market capitalism, it will surely propel the world to new levels of prosperity.

Even as nations as mighty as the United States and China vie for economic supremacy in that new world, they may find themselves partially bending to a force more powerful still: full-blown market globalization. The control of governments over the daily lives of their citizens has dramatically waned as market capitalism has expanded. Gradually, without fanfare, the voluntary promptings of individuals in the marketplace have displaced many of the powers of the state.* Much regulation promulgating limits to commercial transactions has quietly been dismantled in favor of capitalism's market self-regulation. The underlying principle is simple: You cannot have both the markets and a government edict setting the price of copper, for example. One displaces the other. The deregulation of the U.S. economy starting in the 1970s, Britain's freeing of enterprise under Thatcher, Europe's partial efforts in 2000 to start building a world-class competitive market, the embrace of markets by most of the former Soviet bloc, India's struggle to disengage from its stifling bureaucracy, and, of course, China's remarkable resurgence—all have reduced governments' administrative sway over their economies, and hence their societies.

I have learned to view economic outcomes over the long run as being determined largely, but not wholly, by the innate characteristics of people working through the institutions we build to govern the division of labor. The original idea of people's specializing to their mutual benefit is buried too far back in antiquity to identify its source, but such practices inspired John Locke and others of the Enlightenment to articulate notions of inalienable rights as the basis of the rule of law to govern societies. From that hotbed of liberated thought came the insights of Adam Smith and his colleagues, who discovered the basic principles of human behavior that still govern the workings of the productive forces of the marketplace.

*A significant segment of postwar government *political* control has been implemented through economic measures.

The last decade of unprecedented economic growth in much of both the developed and the developing world is the ultimate proof of the dysfunction of a more than seventy-year-long economic experiment. The Soviet bloc's stunning collapse led to or accelerated the abandonment of central planning throughout the world, with China and India in the vanguard. The evidence of increasing property rights, and the rule of law more generally, leading to increasing levels of material well-being is extraordinarily persuasive. Formal statistical proof is inhibited by the difficulty of measuring quantitatively subtle changes in the rule of law. But the qualitative evidence is hard to deny. The widespread dismantling of much of the apparatus of state control and its replacement with market-based institutions appears invariably to improve economic performance. Over the past six decades, such improvement has been striking in China, India, Russia, West Germany, and Eastern Europe, to name only the major examples. In fact, the instances in which expansion of free markets, property rights, and the rule of law didn't contribute to economic well-being, and instances where increased central planning enhanced economic well-being, are few. Nonetheless, the rule of law is only a necessary condition, not a sufficient one, for sustained prosperity. Culture, education, and geography each may play a crucial role.

Why is this relationship between the rule of law and material well-being seemingly so immutable? In my experience, it is rooted in a key aspect of human nature. In life, unless we take action, we perish. But action risks unforeseen consequences. The extent to which people are willing to take risks depends on the rewards they think they may gain. Effective property and individual rights in general decrease uncertainty and open a wider scope for risk taking and the actions that can produce material well-being. Inaction produces nothing.

Rational risk taking is indispensable to material progress. When it is impaired or nonexistent, only the most necessary actions are taken. Economic output is minimal, driven not by the calculated willingness to take risks but often as a result of state coercion. The evidence of human history strongly suggests that positive incentives are far more effective than fear and force. The alternative to individual property rights is collective ownership, which has failed time and time again to produce a civil and prosperous society. It did not work for Robert Owen's optimistically named New Harmony in

1826, or for Lenin and Stalin's communism, or for Mao's Cultural Revolution. It is not working today in North Korea or Cuba.

The evidence, as best I can read it, suggests that for any given culture and level of education, the greater the freedom to compete and the stronger the rule of law, the greater the material wealth produced.* But, regrettably, the greater the degree of competition—and, consequently, the more rapid the onset of obsolescence of existing capital facilities and the skills of the workers who staff them—the greater the degree of stress and anxiety experienced by market participants. Many successful companies in Silicon Valley, arguably the poster child of induced obsolescence, have had to reinvent large segments of their businesses every couple of years.

Confronted with the angst of the baneful side of creative destruction, virtually all of the developed world and an ever-increasing part of the developing world have elected to accept a lesser degree of material well-being in exchange for a reduction of competitive stress.

In the United States, Republicans and Democrats have long shared a general consensus in support of Social Security, Medicare, and other programs that emerged from Roosevelt's New Deal and Lyndon Johnson's Great Society, even though there is much disagreement about the details. Virtually all aspects of our existing social safety net would be reauthorized by large majorities of Congress, were they subject to renewal. I do not doubt that, with time and changing economic circumstances, the consensus will evolve, but probably within relatively narrow bounds.

Social safety nets exist virtually everywhere, to a greater or lesser extent. By their nature, they inhibit the full exercise of laissez-faire, mainly through labor laws and income redistribution programs. But it has become evident that in a globally competitive world, there are limits to the size and nature of social safety nets that markets can tolerate without severely negative economic consequences. Continental Europe, for example, is currently struggling to find an acceptable way to scale back retirement benefits and worker protections against job loss.

*I am also coming around to the conclusion that the success of five- and ten-year economic forecasts is as much dependent on a forecast of the degree of the rule of law as on our most sophisticated econometrics.

As awesomely productive as market capitalism has proved to be, its Achilles' heel is a growing perception that its rewards, increasingly skewed to the skilled, are not distributed justly. Market capitalism on a global scale continues to require ever-greater skills as one new technology builds on another. Given that raw human intelligence is probably no greater today than in ancient Greece, our advancement will depend on additions to the vast heritage of human knowledge accumulated over the generations.

A dysfunctional U.S. elementary and secondary education system has failed to prepare our students sufficiently rapidly to prevent a shortage of skilled workers and a surfeit of lesser-skilled ones, expanding the pay gap between the two groups. Unless America's education system can raise skill levels as quickly as technology requires, skilled workers will continue to earn greater wage increases, leading to ever more disturbing extremes of income concentration. As I've noted, education reform will take years, and we need to address increasing income inequality now. Increasing taxes on the rich, a seemingly simple remedy, is likely to prove counterproductive to economic growth. We can immediately both damp skilled-worker income and enhance the skill level of our workforce by opening our borders to large numbers of immigrants with the vital skills our economy needs. On the success of these seemingly quite doable reforms involving education and immigration will likely rest popular acceptance of capitalist practice in the United States for years to come.

It is not an accident that human beings persevere and advance in the face of adversity. Adaptation is in our nature, a fact that leads me to be deeply optimistic about our future. Seers from the oracle of Delphi to today's Wall Street futurists have sought to ride this long-term positive trend that human nature directs. The Enlightenment's legacy of individual rights and economic freedom has unleashed billions of people to pursue the imperatives of their nature—to work toward better lives for themselves and their families. Progress is not automatic, however; it will demand future adaptations as yet unimaginable. But the frontier of hope that we all innately pursue will never close.

NGRID 1-10 Referring to the Rothschild Direct Testimony at page 62 line 21. Please provide a copy of the Alan Greenspan document referred to in footnote 13.

RESPONSE: Please see response to NGRID 1-9.

NGRID 1-11 Referring to the Rothschild Direct Testimony at Schedules JAR 1 through JAR 8, inclusive. Please provide an electronic copy in spreadsheet format (i.e., Microsoft Excel, Lotus 1-2-3, etc.) with all formulas intact for each page in each schedule.

RESPONSE: This response has been provided.

NGRID 1-12 Referring to the Rothschild Direct Testimony at Schedule JAR 2. Please provide both a hard copy and electronic spreadsheet copy with all formulas intact for the 0.04% value shown in footnote [C]. Further, please provide all source documents and references that were used in the development of this value.

RESPONSE: Please see attached.

Risk Premium

File c:\studies\regress\sdat.sav
Created: 28 Jun 93 14:24:16 - 37 variables and 508 cases

Preceding task required .27 seconds elapsed.

There are 521,672 bytes of memory available.
The largest contiguous area has 520,696 bytes.

2044 bytes of memory required for REGRESSION procedure.
0 more bytes may be needed for Residuals plots.

**** MULTIPLE REGRESSION ****

Listwise Deletion of Missing Data

Equation Number 1 Dependent Variable.. DCFCOST

Block Number 1. Method: Enter TRES30YR SV

Variable(s) Entered on Step Number
1.. SV
2.. TRES30YR

| | |
|---|---|
| Multiple R | .68025 |
| R Square | .46274 |
| Adjusted R Square | .46035 |
| Standard Error | .01150 |

Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 2 | .05113 | .02556 |
| Residual | 449 | .05936 | .00013 |

F = 193.36128 Signif F = .0000

------------------ Variables in the Equation ------------------

| Variable | B | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| SV | -.588760 | .088562 | -.239610 | -6.648 | .0000 |
| TRES30YR | 1.331227 | .083752 | .572895 | 15.895 | .0000 |
| (Constant) | -.002363 | .006904 | | -.342 | .7323 |

End Block Number 1 All requested variables entered.

Preceding task required 2.36 seconds elapsed.

There are 521,672 bytes of memory available.
The largest contiguous area has 520,696 bytes.

2044 bytes of memory required for REGRESSION procedure.

0 more bytes may be needed for Residuals plots.

**** MULTIPLE REGRESSION ****

Listwise Deletion of Missing Data

Equation Number 1 Dependent Variable.. DCFCOST

Block Number 1. Method: Enter SV TRES5YR

Variable(s) Entered on Step Number
1.. TRES5YR
2.. SV

| | |
|---|---|
| Multiple R | .67867 |
| R Square | .46060 |
| Adjusted R Square | .45820 |
| Standard Error | .01152 |

Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 2 | .05089 | .02545 |
| Residual | 449 | .05960 | .00013 |

F = 191.70235 Signif F = .0000

------------------ Variables in the Equation ------------------

| Variable | B | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| TRES5YR | .657086 | .041569 | .573145 | 15.807 | .0000 |
| SV | -.570641 | .089094 | -.232236 | -6.405 | .0000 |
| (Constant) | .055813 | .003292 | | 16.956 | .0000 |

End Block Number 1 All requested variables entered.

Preceding task required .33 seconds elapsed.

There are 521,672 bytes of memory available.
The largest contiguous area has 520,696 bytes.

2044 bytes of memory required for REGRESSION procedure.
0 more bytes may be needed for Residuals plots.

**** MULTIPLE REGRESSION ****

Listwise Deletion of Missing Data

Equation Number 1 Dependent Variable.. DCFCOST

Block Number 1. Method: Enter SV TRES1YR

Variable(s) Entered on Step Number
1.. TRES1YR
2.. SV

Multiple R .66741
R Square .44543
Adjusted R Square .44296
Standard Error .01168

Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 2 | .04921 | .02461 |
| Residual | 449 | .06127 | .00014 |

F = 180.31902 Signif F = .0000

------------------ Variables in the Equation ------------------

| Variable | B | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| TRES1YR | .385295 | .025364 | .559468 | 15.190 | .0000 |
| SV | -.573006 | .090498 | -.233199 | -6.332 | .0000 |
| (Constant) | .080481 | .001849 | | 43.535 | .0000 |

End Block Number 1 All requested variables entered.

Preceding task required .33 seconds elapsed.

There are 521,672 bytes of memory available.
The largest contiguous area has 520,696 bytes.

2044 bytes of memory required for REGRESSION procedure.
0 more bytes may be needed for Residuals plots.

**** MULTIPLE REGRESSION ****

Listwise Deletion of Missing Data

Equation Number 1 Dependent Variable.. DCFCST80

Block Number 1. Method: Enter SV TRES30YR

Variable(s) Entered on Step Number
1.. TRES30YR
2.. SV

Multiple R .77599
R Square .60217
Adjusted R Square .59995
Standard Error 6.78890E-03

Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 2 | .02504 | .01252 |

| | | | |
|---|---|---|---|
| Residual | 359 | .01655 | .00005 |

F = 271.69554 Signif F = .0000

------------------ Variables in the Equation ------------------

| Variable | B | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| TRES30YR | 1.166026 | .055670 | .722616 | 20.945 | .0000 |
| SV | -.308652 | .070605 | -.150820 | -4.372 | .0000 |
| (Constant) | .009125 | .004581 | | 1.992 | .0471 |

End Block Number 1 All requested variables entered.

Preceding task required .39 seconds elapsed.

There are 521,672 bytes of memory available.
The largest contiguous area has 520,696 bytes.

2044 bytes of memory required for REGRESSION procedure.
0 more bytes may be needed for Residuals plots.

**** MULTIPLE REGRESSION ****

Listwise Deletion of Missing Data

Equation Number 1 Dependent Variable.. DCFCST80

Block Number 1. Method: Enter SV TRES5YR

Variable(s) Entered on Step Number
1.. TRES5YR
2.. SV

Multiple R .76889
R Square .59119
Adjusted R Square .58891
Standard Error 6.88195E-03

Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 2 | .02459 | .01229 |
| Residual | 359 | .01700 | .00005 |

F = 259.57674 Signif F = .0000

------------------ Variables in the Equation ------------------

| Variable | B | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| TRES5YR | .569884 | .027898 | .717096 | 20.427 | .0000 |
| SV | -.292631 | .071842 | -.142991 | -4.073 | .0001 |
| (Constant) | .060508 | .002202 | | 27.478 | .0000 |

End Block Number 1 All requested variables entered.

Preceding task required .39 seconds elapsed.

There are 521,672 bytes of memory available.
The largest contiguous area has 520,696 bytes.

2044 bytes of memory required for REGRESSION procedure.
0 more bytes may be needed for Residuals plots.

**** MULTIPLE REGRESSION ****

Listwise Deletion of Missing Data

Equation Number 1 Dependent Variable.. DCFCST80

Block Number 1. Method: Enter SV TRES1YR

Variable(s) Entered on Step Number
1.. TRES1YR
2.. SV

Multiple R .74134
R Square .54958
Adjusted R Square .54707
Standard Error 7.22367E-03

Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 2 | .02286 | .01143 |
| Residual | 359 | .01873 | .00005 |

F = 219.01758 Signif F = .0000

------------------ Variables in the Equation ------------------

| Variable | B | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| TRES1YR | .326395 | .017558 | .685452 | 18.589 | .0000 |
| SV | -.307266 | .075461 | -.150143 | -4.072 | .0001 |
| (Constant) | .082431 | .001273 | | 64.739 | .0000 |

End Block Number 1 All requested variables entered.

Preceding task required .33 seconds elapsed.

| | name | recordno | date | book | price | qdiv | futroe |
|---|---|---|---|---|---|---|---|
| 1 | Allegheny Power | 1.00 | 03/24/89 | 29.250 | 37.00 | .770 | .135 |
| 2 | Amer. Elec. Pwr | 2.00 | 03/24/89 | 21.840 | 26.00 | .580 | .135 |
| 3 | Atlantic Energy | 3.00 | 03/24/89 | 27.200 | 33.00 | .690 | .145 |
| 4 | Boltimore G.&E. | 4.00 | 03/24/89 | 23.770 | 30.00 | .500 | .135 |
| 5 | Boston Edison | 5.00 | 03/24/89 | 19.360 | 16.00 | .455 | .105 |
| 6 | Carolina Power | 6.00 | 03/24/89 | 28.670 | 36.00 | .710 | .135 |
| 7 | Central Hudson | 7.00 | 03/24/89 | 21.240 | 21.00 | .440 | .125 |
| 8 | Central Maine | 8.00 | 03/24/89 | 15.500 | 18.00 | .380 | .125 |
| 9 | Cent. Vermont P | 9.00 | 03/24/89 | 19.500 | 25.00 | .495 | .140 |
| 10 | Com'w'th Energy | 10.00 | 03/24/89 | 30.450 | 31.00 | .700 | .135 |
| 11 | Con. Edison | 11.00 | 03/24/89 | 36.900 | 45.00 | .860 | .135 |
| 12 | Delmarva Power | 12.00 | 03/24/89 | 13.280 | 18.00 | .375 | .135 |
| 13 | Dominion Res. | 13.00 | 03/24/89 | 32.860 | 41.00 | .800 | .130 |
| 14 | Duke Power | 14.00 | 03/24/89 | 34.010 | 44.00 | .740 | .135 |
| 15 | Duquesne Light | 15.00 | 03/24/89 | 18.000 | 18.00 | .320 | .115 |
| 16 | East'n. Utils. | 16.00 | 03/24/89 | 22.570 | 31.00 | .600 | .150 |
| 17 | Fpl Group, Inc. | 17.00 | 03/24/89 | 24.890 | 30.00 | .550 | .135 |
| 18 | Florida Progres | 18.00 | 03/24/89 | 25.800 | 34.00 | .640 | .145 |
| 19 | Gen. Pub. Util. | 19.00 | 03/24/89 | 32.250 | 38.00 | .450 | .140 |
| 20 | Green Mountain | 20.00 | 03/24/89 | 18.600 | 23.00 | .480 | .135 |
| 21 | L.I. Lighting | 21.00 | 03/24/89 | 22.450 | 14.00 | .000 | .130 |
| 22 | New England EL. | 22.00 | 03/24/89 | 18.520 | 23.00 | .510 | .130 |
| 23 | N.Y. State E. & | 23.00 | 03/24/89 | 20.710 | 23.00 | .500 | .135 |
| 24 | Niagara Mohawk | 24.00 | 03/24/89 | 13.870 | 12.00 | .300 | .135 |
| 25 | N.E. Utilities | 25.00 | 03/24/89 | 16.900 | 19.00 | .440 | .135 |
| 26 | Orange & R'KL'D | 26.00 | 03/24/89 | 23.220 | 28.00 | .565 | .125 |
| 27 | Penna. P. & L. | 27.00 | 03/24/89 | 27.240 | 35.00 | .715 | .135 |
| 28 | Potomac EL. Pwr | 28.00 | 03/24/89 | 13.220 | 20.00 | .365 | .180 |
| 29 | P.S. Enterprise | 29.00 | 03/24/89 | 19.110 | 24.00 | .510 | .140 |
| 30 | Pub. Serv. N.H. | 30.00 | 03/24/89 | . | 3.90 | .000 | . |
| 31 | Rocheser G . & | 31.00 | 03/24/89 | 17.690 | 18.00 | .375 | .120 |
| 32 | Scana Corp | 32.00 | 03/24/89 | 22.230 | 30.00 | .600 | .140 |

| | comeq | afcpft | acteps | tres1yr | tres5yr | tres30yr | pricebk | anndiv |
|---|---|---|---|---|---|---|---|---|
| 1 | .450 | .015 | 3.96 | .10 | .10 | .09 | 1.26 | 3.08 |
| 2 | .407 | .241 | 3.24 | .10 | .10 | .09 | 1.19 | 2.32 |
| 3 | .460 | .059 | 3.68 | .10 | .10 | .09 | 1.21 | 2.76 |
| 4 | .465 | .093 | 3.47 | .10 | .10 | .09 | 1.26 | 2.00 |
| 5 | .380 | .240 | 1.86 | .10 | .10 | .09 | .83 | 1.82 |
| 6 | .431 | .016 | 3.93 | .10 | .10 | .09 | 1.26 | 2.84 |
| 7 | .369 | .023 | 2.63 | .10 | .10 | .09 | .99 | 1.76 |
| 8 | .410 | .050 | 1.83 | .10 | .10 | .09 | 1.16 | 1.52 |
| 9 | .480 | .000 | 2.58 | .10 | .10 | .09 | 1.28 | 1.98 |
| 10 | .550 | .540 | 3.89 | .10 | .10 | .09 | 1.02 | 2.80 |
| 11 | .550 | .020 | 4.93 | .10 | .10 | .09 | 1.22 | 3.44 |
| 12 | .462 | .065 | 1.70 | .10 | .10 | .09 | 1.36 | 1.50 |
| 13 | .396 | .004 | 4.52 | .10 | .10 | .09 | 1.25 | 3.20 |
| 14 | .502 | .137 | 4.36 | .10 | .10 | .09 | 1.29 | 2.96 |
| 15 | .355 | .079 | 1.86 | .10 | .10 | .09 | 1.00 | 1.28 |
| 16 | .333 | 1.450 | 2.85 | .10 | .10 | .09 | 1.37 | 2.40 |
| 17 | .453 | .036 | 3.10 | .10 | .10 | .09 | 1.21 | 2.20 |
| 18 | .506 | .021 | 3.52 | .10 | .10 | .09 | 1.32 | 2.56 |
| 19 | .475 | .055 | 4.75 | .10 | .10 | .09 | 1.18 | 1.80 |
| 20 | .600 | .015 | 2.41 | .10 | .10 | .09 | 1.24 | 1.92 |
| 21 | .325 | .700 | 2.02 | .10 | .10 | .09 | .62 | . |
| 22 | .398 | .028 | 2.20 | .10 | .10 | .09 | 1.24 | 2.04 |
| 23 | .370 | .168 | 2.81 | .10 | .10 | .09 | 1.11 | 2.00 |
| 24 | .344 | .053 | 1.21 | .10 | .10 | .09 | .87 | 1.20 |
| 25 | .346 | .455 | 2.07 | .10 | .10 | .09 | 1.12 | 1.76 |
| 26 | .460 | .014 | 3.18 | .10 | .10 | .09 | 1.21 | 2.26 |
| 27 | .385 | .047 | 3.73 | .10 | .10 | .09 | 1.28 | 2.86 |
| 28 | .486 | .042 | 2.14 | .10 | .10 | .09 | 1.51 | 1.46 |
| 29 | .470 | .050 | 2.57 | .10 | .10 | .09 | 1.26 | 2.04 |
| 30 | . | . | . | .10 | .10 | .09 | . | .00 |
| 31 | .367 | .050 | 2.25 | .10 | .10 | .09 | 1.02 | 1.50 |
| 32 | .475 | .048 | 3.00 | .10 | .10 | .09 | 1.35 | 2.40 |

| | actpo | sustpo | sustbr | divyld | divtobk | dcfcost | ratiofc | futm1yrt |
|---|---|---|---|---|---|---|---|---|
| 1 | .778 | .780 | .0297 | .0832 | .1053 | .1129 | 1.20 | .0359 |
| 2 | .716 | .787 | .0288 | .0892 | .1062 | .1180 | 1.14 | .0359 |
| 3 | .750 | .700 | .0435 | .0836 | .1015 | .1272 | 1.14 | .0459 |
| 4 | .576 | .623 | .0509 | .0667 | .0841 | .1175 | 1.15 | .0359 |
| 5 | .978 | .895 | .0110 | .1138 | .0940 | .1247 | .84 | .0059 |
| 6 | .723 | .734 | .0359 | .0789 | .0991 | .1148 | 1.18 | .0359 |
| 7 | .669 | .663 | .0421 | .0838 | .0829 | .1259 | .99 | .0259 |
| 8 | .831 | .785 | .0269 | .0844 | .0981 | .1114 | 1.12 | .0259 |
| 9 | .767 | .725 | .0385 | .0792 | .1015 | .1177 | 1.19 | .0409 |
| 10 | .720 | .681 | .0430 | .0903 | .0920 | .1334 | 1.01 | .0359 |
| 11 | .698 | .691 | .0418 | .0764 | .0932 | .1182 | 1.14 | .0359 |
| 12 | .882 | .837 | .0220 | .0833 | .1130 | .1054 | 1.28 | .0359 |
| 13 | .708 | .749 | .0326 | .0780 | .0974 | .1107 | 1.17 | .0309 |
| 14 | .679 | .645 | .0480 | .0673 | .0870 | .1152 | 1.17 | .0359 |
| 15 | .688 | .618 | .0439 | .0711 | .0711 | .1150 | 1.00 | .0159 |
| 16 | .842 | .709 | .0437 | .0774 | .1063 | .1211 | 1.24 | .0509 |
| 17 | .710 | .655 | .0466 | .0733 | .0884 | .1199 | 1.13 | .0359 |
| 18 | .727 | .684 | .0458 | .0753 | .0992 | .1211 | 1.20 | .0459 |
| 19 | .379 | .399 | .0842 | .0474 | .0558 | .1316 | 1.06 | .0409 |
| 20 | .797 | .765 | .0318 | .0835 | .1032 | .1153 | 1.17 | .0359 |
| 21 | . | . | . | . | . | . | . | .0309 |
| 22 | .927 | .847 | .0198 | .0887 | .1102 | .1085 | 1.20 | .0309 |
| 23 | .712 | .715 | .0384 | .0870 | .0966 | .1254 | 1.08 | .0359 |
| 24 | .992 | .641 | .0485 | .1000 | .0865 | .1485 | .91 | .0359 |
| 25 | .850 | .771 | .0309 | .0926 | .1041 | .1235 | 1.09 | .0359 |
| 26 | .711 | .779 | .0277 | .0807 | .0973 | .1084 | 1.15 | .0259 |
| 27 | .767 | .778 | .0300 | .0817 | .1050 | .1117 | 1.21 | .0359 |
| 28 | .682 | .614 | .0696 | .0730 | .1104 | .1426 | 1.26 | .0809 |
| 29 | .794 | .763 | .0333 | .0850 | .1068 | .1183 | 1.18 | .0409 |
| 30 | . | . | . | . | .0000 | . | . | . |
| 31 | .667 | .707 | .0352 | .0833 | .0848 | .1185 | 1.01 | .0209 |
| 32 | .800 | .771 | .0320 | .0800 | .1080 | .1120 | 1.25 | .0409 |

| | futm5yrt | futm30yt | premcor | precor5y | yldcrv | ln30yrt | beta | sv |
|---|---|---|---|---|---|---|---|---|
| 1 | .0386 | .0428 | -.028 | .046 | .96 | -2.38 | .70 | .0020 |
| 2 | .0386 | .0428 | -.028 | .046 | .96 | -2.38 | .75 | .0000 |
| 3 | .0486 | .0528 | -.028 | .046 | .96 | -2.38 | .65 | .0040 |
| 4 | .0386 | .0428 | -.028 | .046 | .96 | -2.38 | .70 | .0000 |
| 5 | .0086 | .0128 | -.028 | .046 | .96 | -2.38 | .70 | -.0035 |
| 6 | .0386 | .0428 | -.028 | .046 | .96 | -2.38 | .70 | .0001 |
| 7 | .0286 | .0328 | -.028 | .046 | .96 | -2.38 | .55 | -.0001 |
| 8 | .0286 | .0328 | -.028 | .046 | .96 | -2.38 | .75 | .0034 |
| 9 | .0436 | .0478 | -.028 | .046 | .96 | -2.38 | .60 | .0002 |
| 10 | .0386 | .0428 | -.028 | .046 | .96 | -2.38 | .75 | .0001 |
| 11 | .0386 | .0428 | -.028 | .046 | .96 | -2.38 | .70 | .0002 |
| 12 | .0386 | .0428 | -.028 | .046 | .96 | -2.38 | .65 | .0046 |
| 13 | .0336 | .0378 | -.028 | .046 | .96 | -2.38 | .70 | .0043 |
| 14 | .0386 | .0428 | -.028 | .046 | .96 | -2.38 | .70 | .0000 |
| 15 | .0186 | .0228 | -.028 | .046 | .96 | -2.38 | .70 | .0000 |
| 16 | .0536 | .0578 | -.028 | .046 | .96 | -2.38 | .75 | .0047 |
| 17 | .0386 | .0428 | -.028 | .046 | .96 | -2.38 | .75 | .0009 |
| 18 | .0486 | .0528 | -.028 | .046 | .96 | -2.38 | .70 | .0006 |
| 19 | .0436 | .0478 | -.028 | .046 | .96 | -2.38 | .75 | -.0023 |
| 20 | .0386 | .0428 | -.028 | .046 | .96 | -2.38 | .55 | .0031 |
| 21 | .0336 | .0378 | -.028 | .046 | .96 | -2.38 | .90 | -.0044 |
| 22 | .0336 | .0378 | -.028 | .046 | .96 | -2.38 | .70 | .0043 |
| 23 | .0386 | .0428 | -.028 | .046 | .96 | -2.38 | .70 | .0016 |
| 24 | .0386 | .0428 | -.028 | .046 | .96 | -2.38 | .85 | -.0034 |
| 25 | .0386 | .0428 | -.028 | .046 | .96 | -2.38 | .75 | .0001 |
| 26 | .0286 | .0328 | -.028 | .046 | .96 | -2.38 | .65 | .0018 |
| 27 | .0386 | .0428 | -.028 | .046 | .96 | -2.38 | .70 | .0006 |
| 28 | .0836 | .0878 | -.028 | .046 | .96 | -2.38 | .65 | .0002 |
| 29 | .0436 | .0478 | -.028 | .046 | .96 | -2.38 | .75 | .0000 |
| 30 | . | . | -.028 | .046 | .96 | -2.38 | .95 | . |
| 31 | .0236 | .0278 | -.028 | .046 | .96 | -2.38 | .75 | .0000 |
| 32 | .0436 | .0478 | -.028 | .046 | .96 | -2.38 | .70 | .0000 |

| | dcfsv | dcfvle | dcfvld | dcfvlb | dcfvla3 | dcfcst80 |
|---|---|---|---|---|---|---|
| 1 | .1150 | .108 | .123 | .118 | .117 | .1129 |
| 2 | .1180 | .119 | .114 | .124 | .119 | .1180 |
| 3 | .1312 | .119 | .114 | .109 | .114 | .1272 |
| 4 | .1175 | .102 | .122 | .127 | .117 | .1175 |
| 5 | .1212 | .094 | .129 | .114 | .112 | .1247 |
| 6 | .1150 | .119 | .104 | .114 | .112 | .1148 |
| 7 | .1258 | .079 | .084 | .089 | .084 | .1259 |
| 8 | .1148 | .129 | .114 | .134 | .126 | .1114 |
| 9 | .1178 | .069 | .109 | .089 | .089 | .1177 |
| 10 | .1335 | .120 | .115 | .115 | .117 | . |
| 11 | .1184 | .116 | .146 | .106 | .123 | .1182 |
| 12 | .1099 | .108 | .113 | .108 | .110 | .1054 |
| 13 | .1149 | .123 | .113 | .133 | .123 | .1107 |
| 14 | .1153 | .117 | .112 | .117 | .116 | .1152 |
| 15 | .1150 | .111 | .061 | .126 | .099 | .1150 |
| 16 | .1258 | .132 | .122 | .127 | .127 | .1211 |
| 17 | .1208 | .128 | .118 | .118 | .122 | .1199 |
| 18 | .1216 | .130 | .115 | .130 | .125 | .1211 |
| 19 | .1293 | .177 | .047 | .117 | .114 | . |
| 20 | .1183 | .108 | .113 | .123 | .115 | .1153 |
| 21 | . | . | . | . | . | . |
| 22 | .1128 | .089 | .124 | .099 | .104 | .1085 |
| 23 | .1270 | .072 | .097 | .087 | .085 | .1254 |
| 24 | .1451 | .140 | .080 | .110 | .110 | . |
| 25 | .1260 | .098 | .123 | .113 | .111 | .1235 |
| 26 | .1102 | .106 | .101 | .116 | .107 | .1084 |
| 27 | .1123 | .117 | .112 | .117 | .115 | .1117 |
| 28 | .1428 | .153 | .153 | .138 | .148 | . |
| 29 | .1183 | .115 | .115 | .120 | .117 | .1183 |
| 30 | . | . | . | . | . | . |
| 31 | .1186 | .083 | .083 | .073 | .080 | .1185 |
| 32 | .1120 | .110 | .105 | .115 | .110 | .1120 |

| | name | recordno | date | book | price | qdiv | futroe |
|---|---|---|---|---|---|---|---|
| 33 | Southern Co. | 33.00 | 03/24/89 | 21.200 | 23.00 | .535 | .125 |
| 34 | Teco Energy, In | 34.00 | 03/24/89 | 14.590 | 23.00 | .355 | .140 |
| 35 | United Illum. | 35.00 | 03/24/89 | 34.100 | 25.00 | .580 | .140 |
| 36 | Cms Energy Corp | 36.00 | 01/20/89 | 21.350 | 24.00 | .000 | .135 |
| 37 | Centerior En'gy | 37.00 | 01/20/89 | 22.750 | 16.00 | .400 | .120 |
| 38 | Gentral & S.W | 38.00 | 01/20/89 | 28.200 | 32.00 | .610 | .135 |
| 39 | Cent. Ill. P.S. | 39.00 | 01/20/89 | 17.450 | 22.00 | .440 | .130 |
| 40 | Central LA. El | 40.00 | 01/20/89 | 26.250 | 32.00 | .580 | .130 |
| 41 | Cilcorp, Inc. | 41.00 | 01/20/89 | 24.800 | 33.00 | .600 | .135 |
| 42 | Cicinnati Gas | 42.00 | 01/20/89 | 22.900 | 26.00 | .560 | .120 |
| 43 | Commonw. Ed. | 43.00 | 01/20/89 | 30.400 | 33.00 | .750 | .140 |
| 44 | Dpl Inc. | 44.00 | 01/20/89 | 20.900 | 25.00 | .540 | .150 |
| 45 | Detroit Edison | 45.00 | 01/20/89 | 15.250 | 18.00 | .420 | .125 |
| 46 | El Paso Elec. | 46.00 | 01/20/89 | 16.550 | 15.00 | .380 | .135 |
| 47 | Empire District | 47.00 | 01/20/89 | 21.150 | 28.00 | .560 | .140 |
| 48 | Gulf St. Utils. | 48.00 | 01/20/89 | 19.350 | 8.10 | .000 | .095 |
| 49 | Houston Inds. | 49.00 | 01/20/89 | 29.000 | 28.00 | .740 | .140 |
| 50 | Ie Industries | 50.00 | 01/20/89 | 19.150 | 23.00 | .510 | .145 |
| 51 | Illinois Power | 51.00 | 01/20/89 | 19.800 | 20.00 | .660 | .120 |
| 52 | Interstate Pwr. | 52.00 | 01/20/89 | 18.850 | 22.00 | .490 | .120 |
| 53 | Iowa-Ill G. & E | 53.00 | 01/20/89 | 31.350 | 38.00 | .795 | .130 |
| 54 | Iowa Resources | 54.00 | 01/20/89 | 15.850 | 18.00 | .415 | .125 |
| 55 | Iowa Southern | 55.00 | 01/20/89 | 21.650 | 28.00 | .520 | .135 |
| 56 | Ipalco Ent. | 56.00 | 01/20/89 | 17.950 | 23.00 | .410 | .135 |
| 57 | Kansas City Pwr | 57.00 | 01/20/89 | 26.450 | 31.00 | .610 | .130 |
| 58 | Kansas G. & E. | 58.00 | 01/20/89 | 19.850 | 21.00 | .400 | .100 |
| 59 | Kansas P. & L. | 59.00 | 01/20/89 | 17.700 | 24.00 | .430 | .140 |
| 60 | Kentucky Utils. | 60.00 | 01/20/89 | 13.000 | 18.00 | .335 | .135 |
| 61 | Louisville G.&E | 61.00 | 01/20/89 | 28.000 | 34.00 | .680 | .120 |
| 62 | Mdu Resources | 62.00 | 01/20/89 | 14.800 | 20.00 | .355 | .135 |
| 63 | Middle So. Util | 63.00 | 01/20/89 | 23.750 | 16.00 | .200 | .105 |
| 64 | Midwest Energy | 64.00 | 01/20/89 | 12.400 | 19.00 | .390 | .150 |

| | comeq | afcpft | acteps | tres1yr | tres5yr | tres30yr | pricebk | anndiv |
|---|---|---|---|---|---|---|---|---|
| 33 | .403 | .277 | 2.72 | .10 | .10 | .09 | 1.08 | 2.14 |
| 34 | .523 | .022 | 2.13 | .10 | .10 | .09 | 1.58 | 1.42 |
| 35 | .329 | .584 | 7.54 | .10 | .10 | .09 | .73 | 2.32 |
| 36 | .345 | .010 | 3.30 | .09 | .09 | .09 | 1.12 | . |
| 37 | .425 | .660 | 2.15 | .09 | .09 | .09 | .72 | 1.60 |
| 38 | .470 | .310 | 4.00 | .09 | .09 | .09 | 1.13 | 2.44 |
| 39 | .505 | .016 | 2.45 | .09 | .09 | .09 | 1.26 | 1.76 |
| 40 | .445 | .050 | 3.65 | .09 | .09 | .09 | 1.22 | 2.32 |
| 41 | .465 | .005 | 3.40 | .09 | .09 | .09 | 1.33 | 2.40 |
| 42 | .420 | .460 | 4.30 | .09 | .09 | .09 | 1.14 | 2.24 |
| 43 | .465 | .265 | 3.35 | .09 | .09 | .09 | 1.09 | 3.00 |
| 44 | .430 | .310 | 3.45 | .09 | .09 | .09 | 1.20 | 2.16 |
| 45 | .295 | .010 | 2.15 | .09 | .09 | .09 | 1.18 | 1.68 |
| 46 | .425 | .260 | 1.70 | .09 | .09 | .09 | .91 | 1.52 |
| 47 | .532 | .495 | 3.20 | .09 | .09 | .09 | 1.32 | 2.24 |
| 48 | .390 | 1.600 | .65 | .09 | .09 | .09 | .42 | . |
| 49 | .465 | .590 | 3.65 | .09 | .09 | .09 | .97 | 2.96 |
| 50 | .450 | .030 | 2.50 | .09 | .09 | .09 | 1.20 | 2.04 |
| 51 | .340 | .390 | 2.20 | .09 | .09 | .09 | 1.01 | 2.64 |
| 52 | .405 | .020 | 2.25 | .09 | .09 | .09 | 1.17 | 1.96 |
| 53 | .500 | .030 | 4.20 | .09 | .09 | .09 | 1.21 | 3.18 |
| 54 | .480 | .090 | 1.50 | .09 | .09 | .09 | 1.14 | 1.66 |
| 55 | .540 | .012 | 3.10 | .09 | .09 | .09 | 1.29 | 2.08 |
| 56 | .520 | .030 | 2.55 | .09 | .09 | .09 | 1.28 | 1.64 |
| 57 | .435 | .000 | 3.40 | .09 | .09 | .09 | 1.17 | 2.44 |
| 58 | .460 | .000 | 2.15 | .09 | .09 | .09 | 1.06 | 1.60 |
| 59 | .510 | .010 | 2.45 | .09 | .09 | .09 | 1.36 | 1.72 |
| 60 | .510 | .000 | 1.94 | .09 | .09 | .09 | 1.38 | 1.34 |
| 61 | .445 | .000 | 3.65 | .09 | .09 | .09 | 1.21 | 2.72 |
| 62 | .515 | .000 | 1.85 | .09 | .09 | .09 | 1.35 | 1.42 |
| 63 | .415 | .580 | 2.05 | .09 | .09 | .09 | .67 | .80 |
| 64 | .380 | .010 | 1.80 | .09 | .09 | .09 | 1.53 | 1.56 |

| | actpo | sustpo | sustbr | divyld | divtobk | dcfcost | ratiofc | futm1yrt |
|---|---|---|---|---|---|---|---|---|
| 33 | .787 | .808 | .0241 | .0930 | .1009 | .1171 | 1.07 | .0259 |
| 34 | .667 | .695 | .0427 | .0617 | .0973 | .1044 | 1.34 | .0409 |
| 35 | .308 | .486 | .0720 | .0928 | .0680 | .1648 | .85 | .0409 |
| 36 | . | . | . | . | . | . | . | .0449 |
| 37 | .744 | .586 | .0497 | .1000 | .0703 | .1497 | .80 | .0299 |
| 38 | .610 | .641 | .0485 | .0763 | .0865 | .1247 | 1.08 | .0449 |
| 39 | .718 | .776 | .0291 | .0800 | .1009 | .1091 | 1.19 | .0398 |
| 40 | .636 | .680 | .0416 | .0725 | .0884 | .1141 | 1.14 | .0398 |
| 41 | .706 | .717 | .0382 | .0727 | .0968 | .1110 | 1.22 | .0449 |
| 42 | .521 | .815 | .0222 | .0862 | .0978 | .1083 | 1.11 | .0299 |
| 43 | .896 | .705 | .0413 | .0909 | .0987 | .1322 | 1.06 | .0499 |
| 44 | .626 | .689 | .0467 | .0864 | .1033 | .1331 | 1.13 | .0599 |
| 45 | .781 | .881 | .0148 | .0933 | .1102 | .1082 | 1.16 | .0349 |
| 46 | .894 | .680 | .0432 | .1013 | .0918 | .1445 | .93 | .0449 |
| 47 | .700 | .757 | .0341 | .0800 | .1059 | .1141 | 1.23 | .0499 |
| 48 | . | . | . | . | . | . | . | .0049 |
| 49 | .811 | .729 | .0379 | .1057 | .1021 | .1436 | .97 | .0499 |
| 50 | .816 | .735 | .0385 | .0887 | .1065 | .1272 | 1.14 | .0549 |
| 51 | 1.200 | 1.111 | -.0133 | .1320 | .1333 | .1187 | 1.01 | .0299 |
| 52 | .871 | .866 | .0160 | .0891 | .1040 | .1051 | 1.14 | .0299 |
| 53 | .757 | .780 | .0286 | .0837 | .1014 | .1122 | 1.16 | .0398 |
| 54 | 1.107 | .838 | .0203 | .0922 | .1047 | .1125 | 1.11 | .0349 |
| 55 | .671 | .712 | .0389 | .0743 | .0961 | .1132 | 1.19 | .0449 |
| 56 | .643 | .677 | .0436 | .0713 | .0914 | .1149 | 1.17 | .0449 |
| 57 | .718 | .710 | .0378 | .0787 | .0922 | .1165 | 1.12 | .0398 |
| 58 | .744 | .806 | .0194 | .0762 | .0806 | .0956 | 1.05 | .0099 |
| 59 | .702 | .694 | .0428 | .0717 | .0972 | .1145 | 1.22 | .0499 |
| 60 | .691 | .764 | .0319 | .0744 | .1031 | .1064 | 1.27 | .0449 |
| 61 | .745 | .810 | .0229 | .0800 | .0971 | .1029 | 1.17 | .0299 |
| 62 | .768 | .711 | .0391 | .0710 | .0959 | .1101 | 1.23 | .0449 |
| 63 | .390 | .321 | .0713 | .0500 | .0337 | .1213 | .87 | .0149 |
| 64 | .867 | .839 | .0242 | .0821 | .1258 | .1063 | 1.41 | .0599 |

| | futm5yrt | futm30yt | premcor | precor5y | yldcrv | ln30yrt | beta | sv |
|---|---|---|---|---|---|---|---|---|
| 33 | .0286 | .0328 | -.028 | .046 | .96 | -2.38 | .75 | .0005 |
| 34 | .0436 | .0478 | -.028 | .046 | .96 | -2.38 | .60 | .0010 |
| 35 | .0436 | .0478 | -.028 | .046 | .96 | -2.38 | .80 | -.0023 |
| 36 | .0435 | .0463 | -.031 | .041 | .97 | -2.42 | 1.05 | -.0003 |
| 37 | .0285 | .0313 | -.031 | .041 | .97 | -2.42 | .70 | -.0004 |
| 38 | .0435 | .0463 | -.031 | .041 | .97 | -2.42 | .75 | -.0001 |
| 39 | .0385 | .0413 | -.031 | .041 | .97 | -2.42 | .70 | .0000 |
| 40 | .0385 | .0413 | -.031 | .041 | .97 | -2.42 | .65 | .0008 |
| 41 | .0435 | .0463 | -.031 | .041 | .97 | -2.42 | .70 | .0000 |
| 42 | .0285 | .0313 | -.031 | .041 | .97 | -2.42 | .75 | .0021 |
| 43 | .0485 | .0513 | -.031 | .041 | .97 | -2.42 | .75 | .0003 |
| 44 | .0585 | .0613 | -.031 | .041 | .97 | -2.42 | .70 | .0005 |
| 45 | .0335 | .0363 | -.031 | .041 | .97 | -2.42 | .75 | .0000 |
| 46 | .0435 | .0463 | -.031 | .041 | .97 | -2.42 | .65 | -.0002 |
| 47 | .0485 | .0513 | -.031 | .041 | .97 | -2.42 | .50 | .0055 |
| 48 | .0035 | .0063 | -.031 | .041 | .97 | -2.42 | .85 | .0000 |
| 49 | .0485 | .0513 | -.031 | .041 | .97 | -2.42 | .80 | -.0003 |
| 50 | .0535 | .0563 | -.031 | .041 | .97 | -2.42 | .70 | .0037 |
| 51 | .0285 | .0313 | -.031 | .041 | .97 | -2.42 | .65 | .0001 |
| 52 | .0285 | .0313 | -.031 | .041 | .97 | -2.42 | .65 | .0010 |
| 53 | .0385 | .0413 | -.031 | .041 | .97 | -2.42 | .60 | .0001 |
| 54 | .0335 | .0363 | -.031 | .041 | .97 | -2.42 | .65 | .0000 |
| 55 | .0435 | .0463 | -.031 | .041 | .97 | -2.42 | .60 | .0003 |
| 56 | .0435 | .0463 | -.031 | .041 | .97 | -2.42 | .70 | .0000 |
| 57 | .0385 | .0413 | -.031 | .041 | .97 | -2.42 | .70 | .0000 |
| 58 | .0085 | .0113 | -.031 | .041 | .97 | -2.42 | .75 | -.0014 |
| 59 | .0485 | .0513 | -.031 | .041 | .97 | -2.42 | .65 | .0000 |
| 60 | .0435 | .0463 | -.031 | .041 | .97 | -2.42 | .60 | .0000 |
| 61 | .0285 | .0313 | -.031 | .041 | .97 | -2.42 | .65 | .0071 |
| 62 | .0435 | .0463 | -.031 | .041 | .97 | -2.42 | .70 | .0000 |
| 63 | .0135 | .0163 | -.031 | .041 | .97 | -2.42 | .85 | .0000 |
| 64 | .0585 | .0613 | -.031 | .041 | .97 | -2.42 | .60 | .0001 |

| | dcfsv | dcfvle | dcfvld | dcfvlb | dcfvla3 | dcfcst80 |
|---|---|---|---|---|---|---|
| 33 | .1176 | .098 | .113 | .123 | .111 | .1171 |
| 34 | .1054 | .112 | .122 | .112 | .115 | .1044 |
| 35 | .1625 | .118 | .113 | .148 | .126 | . |
| 36 | . | .000 | .000 | .045 | .015 | . |
| 37 | .1493 | .070 | -.005 | .105 | .057 | . |
| 38 | .1246 | .126 | .141 | .146 | .138 | .1247 |
| 39 | .1091 | .125 | .110 | .105 | .113 | .1091 |
| 40 | .1149 | .098 | .118 | .118 | .111 | .1141 |
| 41 | .1110 | .133 | .108 | .113 | .118 | .1110 |
| 42 | .1105 | .086 | .106 | .136 | .109 | .1083 |
| 43 | .1325 | .081 | .106 | .091 | .093 | . |
| 44 | .1335 | .121 | .121 | .146 | .130 | . |
| 45 | .1082 | .043 | .093 | .068 | .068 | .1082 |
| 46 | .1443 | .111 | .126 | .121 | .120 | . |
| 47 | .1196 | .115 | .130 | .125 | .123 | .1141 |
| 48 | . | . | . | . | . | . |
| 49 | .1434 | .106 | .126 | .111 | .114 | . |
| 50 | .1309 | .154 | .109 | .099 | .120 | . |
| 51 | .1187 | .067 | .072 | .107 | .082 | .1187 |
| 52 | .1062 | .114 | .104 | .099 | .106 | .1051 |
| 53 | .1123 | .099 | .129 | .114 | .114 | .1122 |
| 54 | .1125 | .127 | .107 | .107 | .114 | .1125 |
| 55 | .1135 | .144 | .114 | .109 | .123 | .1132 |
| 56 | .1149 | .131 | .106 | .121 | .120 | .1149 |
| 57 | .1165 | .099 | .124 | .089 | .104 | .1165 |
| 58 | .0942 | .106 | .101 | .101 | .103 | . |
| 59 | .1145 | .107 | .122 | .117 | .115 | .1145 |
| 60 | .1063 | .114 | .104 | .104 | .108 | .1064 |
| 61 | .1100 | .105 | .100 | .110 | .105 | .1029 |
| 62 | .1101 | .116 | .101 | .106 | .108 | .1101 |
| 63 | .1213 | .085 | .050 | .085 | .073 | .1213 |
| 64 | .1064 | .122 | .112 | .097 | .110 | .1063 |

## COST OF EQUITY INDICATED BY INFLATION RISK PREMIUM METHOD

| | | | | | |
|---|---|---|---|---|---|
| 1 Interest rate on 30 year treasury bonds | Feb-31 | 5.07% [A] | | | |
| 2 Interest rate on inflation indexed 30 year treasury bonds | Apr-32 | 2.24% [B] | | | |
| 3 Difference | | 2.83% Line 1 minus Line 2 | | | |
| 4 Round to | | 3.00% | | | |
| **RISK PREMIUM** | | | | | |
| 5 Historic Return on Common Stocks Net of Inflation | 6.60% | to | 7.00% | [C] | |
| 6 Inflation expectation | 3.00% | | 3.00% | Line 4 | |
| 7 Inflation Risk Premium Indicated Cost of Equity for Company of Average Risk | 9.60% | to | 10.00% | | |
| Mid-point | | 9.80% | | | |

Sources:
[A] Wall Street Journal, 1/2/04. Bond Matures Feb 2031
[B] Wall Street Journal, 1/2/04. Bond Matures April 2032
[C] Page 12 of Stocks for the Long Run, Third Edition, by Jeremy J. Siegel, 2002, McGraw Hill.

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| | name | recordno | date | book | price | qdiv | futroe |
|---|---|---|---|---|---|---|---|
| 65 | Minnesota Pwr. | 65.00 | 01/20/89 | 17.050 | 24.00 | .430 | .145 |
| 66 | Nipsco Inds. | 66.00 | 01/20/89 | 13.750 | 14.00 | .210 | .125 |
| 67 | No. States Pwr. | 67.00 | 01/20/89 | 23.000 | 33.00 | .530 | .135 |
| 68 | Ohio Edison | 68.00 | 01/20/89 | 17.500 | 19.00 | .490 | .135 |
| 69 | Oklahoma G. & E | 69.00 | 01/20/89 | 21.050 | 33.00 | .595 | .150 |
| 70 | Otter Tail Pwr. | 70.00 | 01/20/89 | 13.600 | 19.00 | .370 | .145 |
| 71 | Psi Holdings I | 71.00 | 01/20/89 | 9.100 | 14.00 | .000 | .180 |
| 72 | St. Joe L. & P. | 72.00 | 01/20/89 | 16.800 | 20.00 | .350 | .130 |
| 73 | So. Ind. G. & E | 73.00 | 01/20/89 | 19.050 | 28.00 | .425 | .140 |
| 74 | S.W. Pub. Serv. | 74.00 | 01/20/89 | 15.260 | 27.00 | . | .160 |
| 75 | Tnp Enterprises | 75.00 | 01/20/89 | 19.400 | 20.00 | .367 | .125 |
| 76 | Texas Utilities | 76.00 | 01/20/89 | 33.550 | 29.00 | .720 | .135 |
| 77 | Union Electric | 77.00 | 01/20/89 | 18.700 | 24.00 | .500 | .135 |
| 78 | Utilicorp Utd | 78.00 | 01/20/89 | 15.500 | 19.00 | .275 | .140 |
| 79 | Wpl Holdings | 79.00 | 01/20/89 | 15.650 | 23.00 | .405 | .135 |
| 80 | Wisconsin Energ | 80.00 | 01/20/89 | 18.800 | 27.00 | .385 | .135 |
| 81 | Wisconsin P.S. | 81.00 | 01/20/89 | 16.200 | 22.00 | .395 | .135 |
| 82 | Hawaiian Elec. | 82.00 | 03/03/89 | 21.750 | 30.00 | .510 | .140 |
| 83 | Idaho Power | 83.00 | 03/03/89 | 16.810 | 23.00 | .450 | .130 |
| 84 | Montana Power | 84.00 | 03/03/89 | 31.950 | 35.00 | .690 | .100 |
| 85 | Nevada Power | 85.00 | 03/03/89 | 13.950 | 20.00 | .380 | .130 |
| 86 | Pacific G. & E. | 86.00 | 03/03/89 | 17.250 | 18.00 | .350 | .135 |
| 87 | Pacificorp | 87.00 | 03/03/89 | 27.200 | 34.00 | .660 | .135 |
| 88 | Pinnacle West | 88.00 | 03/03/89 | 25.700 | 16.00 | .400 | .110 |
| 89 | Portland Genera | 89.00 | 03/03/89 | 19.100 | 23.00 | .490 | .125 |
| 90 | P.S. Of Colorad | 90.00 | 03/03/89 | 16.550 | 21.00 | .500 | .140 |
| 91 | P.s. N. Mexico | 91.00 | 03/03/89 | 22.850 | 13.00 | .380 | .115 |
| 92 | Puget Sound P & | 92.00 | 03/03/89 | 15.980 | 18.00 | .440 | .110 |
| 93 | Sce Corp | 93.00 | 03/03/89 | 24.250 | 32.00 | .620 | .140 |
| 94 | San Diego G. & | 94.00 | 03/03/89 | 22.000 | 38.00 | .650 | .145 |
| 95 | Sierra Pac. Res | 95.00 | 03/03/89 | 17.350 | 23.00 | .450 | .120 |
| 96 | Tucson Elec.Pwr | 96.00 | 03/03/89 | 32.200 | 48.00 | .975 | .150 |

| | comeq | afcpft | acteps | tres1yr | tres5yr | tres30yr | pricebk | anndiv |
|---|---|---|---|---|---|---|---|---|
| 65 | .460 | .010 | 2.15 | .09 | .09 | .09 | 1.41 | 1.72 |
| 66 | .405 | .000 | 1.30 | .09 | .09 | .09 | 1.02 | .84 |
| 67 | .465 | .050 | 3.20 | .09 | .09 | .09 | 1.43 | 2.12 |
| 68 | .430 | .008 | 2.05 | .09 | .09 | .09 | 1.09 | 1.96 |
| 69 | .495 | .030 | 3.25 | .09 | .09 | .09 | 1.57 | 2.38 |
| 70 | .505 | .010 | 1.95 | .09 | .09 | .09 | 1.40 | 1.48 |
| 71 | .360 | .010 | 2.55 | .09 | .09 | .09 | 1.54 | . |
| 72 | .605 | .010 | 2.35 | .09 | .09 | .09 | 1.19 | 1.40 |
| 73 | .495 | .020 | 2.95 | .09 | .09 | .09 | 1.47 | 1.70 |
| 74 | .481 | .014 | 2.50 | .09 | .09 | .09 | 1.77 | . |
| 75 | .550 | .040 | 2.25 | .09 | .09 | .09 | 1.03 | 1.47 |
| 76 | .450 | .580 | 4.00 | .09 | .09 | .09 | .86 | 2.88 |
| 77 | .415 | .020 | 2.65 | .09 | .09 | .09 | 1.28 | 2.00 |
| 78 | .435 | .050 | 1.95 | .09 | .09 | .09 | 1.23 | 1.10 |
| 79 | .510 | .021 | 2.20 | .09 | .09 | .09 | 1.47 | 1.62 |
| 80 | .525 | .025 | 3.15 | .09 | .09 | .09 | 1.44 | 1.54 |
| 81 | .550 | .020 | 2.25 | .09 | .09 | .09 | 1.36 | 1.58 |
| 82 | .485 | .060 | 2.90 | .10 | .09 | .09 | 1.38 | 2.04 |
| 83 | .481 | .095 | 1.32 | .10 | .09 | .09 | 1.37 | 1.80 |
| 84 | .545 | .010 | 2.84 | .10 | .09 | .09 | 1.10 | 2.76 |
| 85 | .465 | .120 | 1.78 | .10 | .09 | .09 | 1.43 | 1.52 |
| 86 | .430 | .025 | 2.56 | .10 | .09 | .09 | 1.04 | 1.40 |
| 87 | .450 | .050 | 3.85 | .10 | .09 | .09 | 1.25 | 2.64 |
| 88 | .415 | .100 | 2.60 | .10 | .09 | .09 | .62 | 1.60 |
| 89 | .460 | .030 | 2.11 | .10 | .09 | .09 | 1.20 | 1.96 |
| 90 | .440 | .020 | 2.95 | .10 | .09 | .09 | 1.27 | 2.00 |
| 91 | .435 | .050 | 1.80 | .10 | .09 | .09 | .57 | 1.52 |
| 92 | .430 | .019 | 2.14 | .10 | .09 | .09 | 1.13 | 1.76 |
| 93 | .465 | .040 | 3.49 | .10 | .09 | .09 | 1.32 | 2.48 |
| 94 | .481 | .070 | 3.18 | .10 | .09 | .09 | 1.73 | 2.60 |
| 95 | .423 | .023 | 1.98 | .10 | .09 | .09 | 1.33 | 1.80 |
| 96 | .440 | .450 | 4.95 | .10 | .09 | .09 | 1.49 | 3.90 |

| | actpo | sustpo | sustbr | divyld | divtobk | dcfcost | ratiofc | futm1yrt |
|---|---|---|---|---|---|---|---|---|
| 65 | .800 | .696 | .0441 | .0717 | .1009 | .1158 | 1.25 | .0549 |
| 66 | .646 | .489 | .0639 | .0600 | .0611 | .1239 | 1.01 | .0349 |
| 67 | .663 | .683 | .0428 | .0642 | .0922 | .1071 | 1.26 | .0449 |
| 68 | .956 | .830 | .0230 | .1032 | .1120 | .1262 | 1.07 | .0449 |
| 69 | .732 | .754 | .0369 | .0721 | .1131 | .1091 | 1.38 | .0599 |
| 70 | .759 | .751 | .0362 | .0779 | .1088 | .1141 | 1.27 | .0549 |
| 71 | . | . | . | . | . | . | . | .0899 |
| 72 | .596 | .641 | .0467 | .0700 | .0833 | .1167 | 1.11 | .0398 |
| 73 | .576 | .637 | .0508 | .0607 | .0892 | .1115 | 1.26 | .0499 |
| 74 | . | . | . | . | . | . | . | .0699 |
| 75 | .652 | .605 | .0493 | .0734 | .0757 | .1227 | 1.02 | .0349 |
| 76 | .720 | .636 | .0492 | .0993 | .0858 | .1485 | .91 | .0449 |
| 77 | .755 | .792 | .0280 | .0833 | .1070 | .1114 | 1.21 | .0449 |
| 78 | .564 | .507 | .0690 | .0579 | .0710 | .1269 | 1.10 | .0499 |
| 79 | .736 | .767 | .0315 | .0704 | .1035 | .1019 | 1.32 | .0449 |
| 80 | .489 | .607 | .0531 | .0570 | .0819 | .1101 | 1.23 | .0449 |
| 81 | .702 | .722 | .0375 | .0718 | .0975 | .1093 | 1.24 | .0449 |
| 82 | .703 | .670 | .0462 | .0680 | .0938 | .1142 | 1.23 | .0443 |
| 83 | 1.364 | .824 | .0229 | .0783 | .1071 | .1012 | 1.28 | .0343 |
| 84 | .972 | .864 | .0136 | .0789 | .0864 | .0925 | 1.08 | .0043 |
| 85 | .854 | .838 | .0210 | .0760 | .1090 | .0970 | 1.34 | .0343 |
| 86 | .547 | .601 | .0538 | .0778 | .0812 | .1316 | 1.03 | .0393 |
| 87 | .686 | .719 | .0379 | .0776 | .0971 | .1156 | 1.17 | .0393 |
| 88 | .615 | .566 | .0477 | .1000 | .0623 | .1477 | .74 | .0143 |
| 89 | .929 | .821 | .0224 | .0852 | .1026 | .1076 | 1.16 | .0293 |
| 90 | .678 | .863 | .0192 | .0952 | .1208 | .1144 | 1.22 | .0443 |
| 91 | .844 | .578 | .0485 | .1169 | .0665 | .1654 | .70 | .0193 |
| 92 | .822 | 1.001 | -.0001 | .0978 | .1101 | .0976 | 1.13 | .0143 |
| 93 | .711 | .730 | .0377 | .0775 | .1023 | .1152 | 1.21 | .0443 |
| 94 | .818 | .815 | .0268 | .0684 | .1182 | .0952 | 1.52 | .0493 |
| 95 | .909 | .865 | .0163 | .0783 | .1037 | .0945 | 1.27 | .0243 |
| 96 | .788 | .807 | .0289 | .0813 | .1211 | .1101 | 1.36 | .0543 |

| | futm5yrt | futm30yt | premcor | precor5y | yldcrv | ln30yrt | beta | sv |
|---|---|---|---|---|---|---|---|---|
| 65 | .0535 | .0563 | -.031 | .041 | .97 | -2.42 | .70 | .0029 |
| 66 | .0335 | .0363 | -.031 | .041 | .97 | -2.42 | .80 | .0000 |
| 67 | .0435 | .0463 | -.031 | .041 | .97 | -2.42 | .70 | .0000 |
| 68 | .0435 | .0463 | -.031 | .041 | .97 | -2.42 | .75 | .0000 |
| 69 | .0585 | .0613 | -.031 | .041 | .97 | -2.42 | .65 | -.0055 |
| 70 | .0535 | .0563 | -.031 | .041 | .97 | -2.42 | .65 | -.0032 |
| 71 | .0885 | .0913 | -.031 | .041 | .97 | -2.42 | .85 | .0004 |
| 72 | .0385 | .0413 | -.031 | .041 | .97 | -2.42 | .60 | -.0027 |
| 73 | .0485 | .0513 | -.031 | .041 | .97 | -2.42 | .60 | .0022 |
| 74 | .0685 | .0713 | -.031 | .041 | .97 | -2.42 | .70 | .0022 |
| 75 | .0335 | .0363 | -.031 | .041 | .97 | -2.42 | .60 | .0011 |
| 76 | .0435 | .0463 | -.031 | .041 | .97 | -2.42 | .70 | -.0037 |
| 77 | .0435 | .0463 | -.031 | .041 | .97 | -2.42 | .75 | .0000 |
| 78 | .0485 | .0513 | -.031 | .041 | .97 | -2.42 | .70 | .0019 |
| 79 | .0435 | .0463 | -.031 | .041 | .97 | -2.42 | .60 | .0063 |
| 80 | .0435 | .0463 | -.031 | .041 | .97 | -2.42 | .65 | .0000 |
| 81 | .0435 | .0463 | -.031 | .041 | .97 | -2.42 | .60 | .0000 |
| 82 | .0453 | .0489 | -.029 | .045 | .96 | -2.40 | .65 | .0070 |
| 83 | .0353 | .0389 | -.029 | .045 | .96 | -2.40 | .65 | .0000 |
| 84 | .0053 | .0089 | -.029 | .045 | .96 | -2.40 | .60 | .0011 |
| 85 | .0353 | .0389 | -.029 | .045 | .96 | -2.40 | .60 | .0013 |
| 86 | .0403 | .0439 | -.029 | .045 | .96 | -2.40 | .75 | .0010 |
| 87 | .0403 | .0439 | -.029 | .045 | .96 | -2.40 | .70 | .0271 |
| 88 | .0153 | .0189 | -.029 | .045 | .96 | -2.40 | .75 | -.0009 |
| 89 | .0303 | .0339 | -.029 | .045 | .96 | -2.40 | .65 | .0002 |
| 90 | .0453 | .0489 | -.029 | .045 | .96 | -2.40 | .70 | .0003 |
| 91 | .0203 | .0239 | -.029 | .045 | .96 | -2.40 | .65 | -.0016 |
| 92 | .0153 | .0189 | -.029 | .045 | .96 | -2.40 | .75 | .0027 |
| 93 | .0453 | .0489 | -.029 | .045 | .96 | -2.40 | .75 | .0007 |
| 94 | .0503 | .0539 | -.029 | .045 | .96 | -2.40 | .70 | .0003 |
| 95 | .0253 | .0289 | -.029 | .045 | .96 | -2.40 | .65 | .0059 |
| 96 | .0553 | .0589 | -.029 | .045 | .96 | -2.40 | .60 | .0045 |

| | dcfsv | dcfvle | dcfvld | dcfvlb | dcfvla3 | dcfcst80 |
|---|---|---|---|---|---|---|
| 65 | .1186 | .092 | .117 | .107 | .105 | .1158 |
| 66 | .1239 | .220 | .060 | .090 | .123 | .1239 |
| 67 | .1071 | .099 | .119 | .109 | .109 | .1071 |
| 68 | .1262 | .103 | .118 | .113 | .111 | . |
| 69 | .1035 | .127 | .117 | .102 | .115 | .1091 |
| 70 | .1109 | .118 | .118 | .103 | .113 | .1141 |
| 71 | . | . | . | . | . | . |
| 72 | .1140 | .120 | .130 | .130 | .127 | .1167 |
| 73 | .1137 | .101 | .121 | .106 | .109 | .1115 |
| 74 | . | . | . | . | . | . |
| 75 | .1238 | .113 | .123 | .128 | .122 | .1227 |
| 76 | .1447 | .089 | .129 | .089 | .103 | . |
| 77 | .1114 | .088 | .108 | .108 | .102 | .1114 |
| 78 | .1289 | .128 | .163 | .128 | .140 | . |
| 79 | .1082 | .085 | .110 | .100 | .099 | .1019 |
| 80 | .1101 | .112 | .122 | .132 | .122 | .1101 |
| 81 | .1093 | .102 | .107 | .112 | .107 | .1093 |
| 82 | .1212 | .128 | .128 | .123 | .126 | .1142 |
| 83 | .1012 | .173 | .098 | .098 | .123 | .1012 |
| 84 | .0935 | .129 | .119 | .089 | .112 | . |
| 85 | .0983 | .116 | .111 | .126 | .118 | . |
| 86 | .1326 | .078 | .073 | .083 | .078 | . |
| 87 | .1427 | .118 | .113 | .128 | .119 | .1156 |
| 88 | .1469 | .090 | .045 | .115 | .083 | . |
| 89 | .1078 | .115 | .100 | .095 | .104 | .1076 |
| 90 | .1147 | .135 | .105 | .125 | .122 | .1144 |
| 91 | .1638 | .112 | -.043 | .107 | .059 | . |
| 92 | .1004 | .098 | .098 | .123 | .106 | . |
| 93 | .1159 | .113 | .118 | .123 | .118 | .1152 |
| 94 | .0955 | .083 | .108 | .088 | .093 | . |
| 95 | .1004 | .118 | .103 | .108 | .110 | . |
| 96 | .1147 | .121 | .126 | .131 | .126 | .1101 |

| | name | recordno | date | book | price | qdiv | futroe |
|---|---|---|---|---|---|---|---|
| 97 | Washington Wtr. | 97.00 | 03/03/89 | 20.980 | 27.00 | .620 | .145 |
| 98 | Allegheny Power | 98.00 | 03/23/90 | 30.000 | 40.00 | .790 | .135 |
| 99 | Amer. Elec. Pwr | 99.00 | 03/23/90 | 22.750 | 31.00 | .600 | .135 |
| 100 | Atlantic Energy | 100.00 | 03/23/90 | 28.450 | 37.00 | .720 | .120 |
| 101 | Boltimore G.&E. | 101.00 | 03/23/90 | 24.910 | 30.00 | .525 | .135 |
| 102 | Boston Edison | 102.00 | 03/23/90 | 16.700 | 19.00 | .380 | .120 |
| 103 | Carolina Power | 103.00 | 03/23/90 | 27.750 | 44.00 | .730 | .140 |
| 104 | Central Hudson | 104.00 | 03/23/90 | 21.760 | 23.00 | .440 | .115 |
| 105 | Central Maine | 105.00 | 03/23/90 | 16.040 | 19.00 | .390 | .120 |
| 106 | Cent. Vermont P | 106.00 | 03/23/90 | 20.000 | 28.00 | .510 | .135 |
| 107 | Com'w'th Energy | 107.00 | 03/23/90 | 32.000 | 37.00 | .700 | .130 |
| 108 | Con. Edison | 108.00 | 03/23/90 | 19.200 | 26.00 | .455 | .135 |
| 109 | Dqe,Inc. | 109.00 | 03/23/90 | 19.850 | 21.00 | .340 | .110 |
| 110 | Delmarva Power | 110.00 | 03/23/90 | 13.680 | 20.00 | .385 | .130 |
| 111 | Dominion Res. | 111.00 | 03/23/90 | 34.000 | 45.00 | .830 | .125 |
| 112 | Duke Power | 112.00 | 03/23/90 | 36.100 | 55.00 | .780 | .130 |
| 113 | Eastern Utils. | 113.00 | 03/23/90 | 25.600 | 35.00 | .625 | .150 |
| 114 | Fpl Group, Inc. | 114.00 | 03/23/90 | 25.900 | 33.00 | .570 | .130 |
| 115 | Florida Progres | 115.00 | 03/23/90 | 26.790 | 38.00 | .660 | .145 |
| 116 | Gen. Pub. Util. | 116.00 | 03/23/90 | 37.260 | 45.00 | .550 | .135 |
| 117 | Green Mountain | 117.00 | 03/23/90 | 18.850 | 26.00 | .495 | .130 |
| 118 | L.I. Lighting | 118.00 | 03/23/90 | 17.450 | 19.00 | .250 | .130 |
| 119 | New England EL. | 119.00 | 03/23/90 | 19.050 | 27.00 | .510 | .125 |
| 120 | N.Y. State E. & | 120.00 | 03/23/90 | 21.300 | 25.00 | .510 | .120 |
| 121 | Niagara Mohawk | 121.00 | 03/23/90 | 14.070 | 13.00 | .000 | .130 |
| 122 | N.E. Utilities | 122.00 | 03/23/90 | 16.150 | 21.00 | .440 | .130 |
| 123 | Orange & R'KL'D | 123.00 | 03/23/90 | 24.170 | 30.00 | .575 | .130 |
| 124 | Penna. P. & L. | 124.00 | 03/23/90 | 28.360 | 42.00 | .715 | .140 |
| 125 | Phila. Electric | 125.00 | 03/23/90 | 17.510 | 18.00 | .550 | .115 |
| 126 | Potomac El. Pwr | 126.00 | 03/23/90 | 14.230 | 22.00 | .380 | .180 |
| 127 | P.s. Enterporic | 127.00 | 03/23/90 | 19.850 | 26.00 | .520 | .140 |
| 128 | Pub. Serv. N.H. | 128.00 | 03/23/90 | . | 3.50 | .000 | . |

| | comeq | afcpft | acteps | tres1yr | tres5yr | tres30yr | pricebk | anndiv |
|---|---|---|---|---|---|---|---|---|
| 97 | .398 | .020 | 2.54 | .10 | .09 | .09 | 1.29 | 2.48 |
| 98 | .465 | .035 | 3.72 | .08 | .09 | .08 | 1.33 | 3.16 |
| 99 | .430 | .275 | 3.25 | .08 | .09 | .08 | 1.36 | 2.40 |
| 100 | .472 | .035 | 3.74 | .08 | .09 | .08 | 1.30 | 2.88 |
| 101 | .445 | .135 | 3.05 | .08 | .09 | .08 | 1.20 | 2.10 |
| 102 | .355 | .130 | 1.76 | .08 | .09 | .08 | 1.14 | 1.52 |
| 103 | .445 | .040 | 4.20 | .08 | .09 | .08 | 1.59 | 2.92 |
| 104 | .378 | .011 | 2.28 | .08 | .09 | .08 | 1.06 | 1.76 |
| 105 | .465 | .070 | 1.92 | .08 | .09 | .08 | 1.18 | 1.56 |
| 106 | .540 | .040 | 2.59 | .08 | .09 | .08 | 1.40 | 2.04 |
| 107 | .470 | .410 | 4.14 | .08 | .09 | .08 | 1.16 | 2.80 |
| 108 | .545 | .020 | 2.49 | .08 | .09 | .08 | 1.35 | 1.82 |
| 109 | .380 | .030 | 2.03 | .08 | .09 | .08 | 1.06 | 1.36 |
| 110 | .445 | .105 | 1.80 | .08 | .09 | .08 | 1.46 | 1.54 |
| 111 | .391 | .040 | 4.14 | .08 | .09 | .08 | 1.32 | 3.32 |
| 112 | .502 | .140 | 5.13 | .08 | .09 | .08 | 1.52 | 3.12 |
| 113 | .364 | 1.900 | 2.95 | .08 | .09 | .08 | 1.37 | 2.50 |
| 114 | .464 | .047 | 3.12 | .08 | .09 | .08 | 1.27 | 2.28 |
| 115 | .501 | .026 | 3.58 | .08 | .09 | .08 | 1.42 | 2.64 |
| 116 | .476 | .063 | 5.01 | .08 | .09 | .08 | 1.21 | 2.20 |
| 117 | .535 | .045 | 2.36 | .08 | .09 | .08 | 1.38 | 1.98 |
| 118 | .271 | .344 | 1.86 | .08 | .09 | .08 | 1.09 | 1.00 |
| 119 | .385 | .270 | 2.20 | .08 | .09 | .08 | 1.42 | 2.04 |
| 120 | .385 | .036 | 2.53 | .08 | .09 | .08 | 1.17 | 2.04 |
| 121 | .335 | .129 | .78 | .08 | .09 | .08 | .92 | . |
| 122 | .360 | .293 | 1.87 | .08 | .09 | .08 | 1.30 | 1.76 |
| 123 | .474 | .037 | 3.14 | .08 | .09 | .08 | 1.24 | 2.30 |
| 124 | .378 | .039 | 4.05 | .08 | .09 | .08 | 1.48 | 2.86 |
| 125 | .356 | .569 | 2.49 | .08 | .09 | .08 | 1.03 | 2.20 |
| 126 | .506 | .072 | 2.16 | .08 | .09 | .08 | 1.55 | 1.52 |
| 127 | .470 | .060 | 2.62 | .08 | .09 | .08 | 1.31 | 2.08 |
| 128 | . | . | . | .08 | .09 | .08 | . | . |

| | actpo | sustpo | sustbr | divyld | divtobk | dcfcost | ratiofc | futm1yrt |
|---|---|---|---|---|---|---|---|---|
| 97 | .976 | .815 | .0268 | .0919 | .1182 | .1186 | 1.22 | .0493 |
| 98 | .849 | .780 | .0297 | .0790 | .1053 | .1087 | 1.24 | .0508 |
| 99 | .738 | .781 | .0295 | .0774 | .1055 | .1069 | 1.26 | .0508 |
| 100 | .770 | .844 | .0188 | .0778 | .1012 | .0966 | 1.24 | .0357 |
| 101 | .689 | .624 | .0507 | .0700 | .0843 | .1207 | 1.12 | .0508 |
| 102 | .864 | .758 | .0290 | .0800 | .0910 | .1090 | 1.10 | .0357 |
| 103 | .695 | .752 | .0348 | .0664 | .1052 | .1011 | 1.38 | .0558 |
| 104 | .772 | .703 | .0341 | .0765 | .0809 | .1106 | 1.04 | .0308 |
| 105 | .813 | .810 | .0227 | .0821 | .0973 | .1048 | 1.14 | .0357 |
| 106 | .788 | .756 | .0330 | .0729 | .1020 | .1059 | 1.28 | .0508 |
| 107 | .676 | .673 | .0425 | .0757 | .0875 | .1182 | 1.10 | .0458 |
| 108 | .731 | .702 | .0402 | .0700 | .0948 | .1102 | 1.22 | .0508 |
| 109 | .670 | .623 | .0415 | .0648 | .0685 | .1062 | 1.04 | .0258 |
| 110 | .856 | .866 | .0174 | .0770 | .1126 | .0944 | 1.38 | .0458 |
| 111 | .802 | .781 | .0274 | .0738 | .0976 | .1011 | 1.24 | .0408 |
| 112 | .608 | .665 | .0436 | .0567 | .0864 | .1003 | 1.30 | .0458 |
| 113 | .847 | .651 | .0523 | .0714 | .0977 | .1238 | 1.21 | .0658 |
| 114 | .731 | .677 | .0420 | .0691 | .0880 | .1111 | 1.17 | .0458 |
| 115 | .737 | .680 | .0465 | .0695 | .0985 | .1159 | 1.25 | .0608 |
| 116 | .439 | .437 | .0760 | .0489 | .0590 | .1248 | 1.08 | .0508 |
| 117 | .839 | .808 | .0250 | .0762 | .1050 | .1011 | 1.29 | .0458 |
| 118 | .538 | .441 | .0727 | .0526 | .0573 | .1253 | 1.04 | .0458 |
| 119 | .927 | .857 | .0179 | .0756 | .1071 | .0935 | 1.34 | .0408 |
| 120 | .806 | .798 | .0242 | .0816 | .0958 | .1058 | 1.13 | .0357 |
| 121 | . | . | . | . | . | . | . | .0458 |
| 122 | .941 | .838 | .0210 | .0838 | .1090 | .1048 | 1.24 | .0458 |
| 123 | .732 | .732 | .0348 | .0767 | .0952 | .1115 | 1.17 | .0458 |
| 124 | .706 | .720 | .0392 | .0681 | .1008 | .1072 | 1.31 | .0558 |
| 125 | .884 | 1.093 | -.0106 | .1222 | .1256 | .1116 | 1.03 | .0308 |
| 126 | .704 | .593 | .0732 | .0691 | .1068 | .1423 | 1.27 | .0958 |
| 127 | .794 | .748 | .0352 | .0800 | .1048 | .1152 | 1.22 | .0558 |
| 128 | . | . | . | . | . | . | . | . |

| | futm5yrt | futm30yt | premcor | precor5y | yldcrv | ln30yrt | beta | sv |
|---|---|---|---|---|---|---|---|---|
| 97 | .0503 | .0539 | -.029 | .045 | .96 | -2.40 | .65 | .0005 |
| 98 | .0491 | .0503 | -.035 | .036 | .99 | -2.47 | .70 | .0031 |
| 99 | .0491 | .0503 | -.035 | .036 | .99 | -2.47 | .75 | .0000 |
| 100 | .0341 | .0353 | -.035 | .036 | .99 | -2.47 | .65 | .0037 |
| 101 | .0491 | .0503 | -.035 | .036 | .99 | -2.47 | .75 | .0001 |
| 102 | .0341 | .0353 | -.035 | .036 | .99 | -2.47 | .70 | .0017 |
| 103 | .0541 | .0553 | -.035 | .036 | .99 | -2.47 | .70 | -.0093 |
| 104 | .0291 | .0303 | -.035 | .036 | .99 | -2.47 | .55 | .0008 |
| 105 | .0341 | .0353 | -.035 | .036 | .99 | -2.47 | .70 | .0004 |
| 106 | .0491 | .0503 | -.035 | .036 | .99 | -2.47 | .60 | .0000 |
| 107 | .0441 | .0453 | -.035 | .036 | .99 | -2.47 | .75 | .0026 |
| 108 | .0491 | .0503 | -.035 | .036 | .99 | -2.47 | .75 | .0000 |
| 109 | .0241 | .0253 | -.035 | .036 | .99 | -2.47 | .70 | .0005 |
| 110 | .0441 | .0453 | -.035 | .036 | .99 | -2.47 | .65 | .0043 |
| 111 | .0391 | .0403 | -.035 | .036 | .99 | -2.47 | .70 | .0060 |
| 112 | .0441 | .0453 | -.035 | .036 | .99 | -2.47 | .75 | .0000 |
| 113 | .0641 | .0653 | -.035 | .036 | .99 | -2.47 | .75 | .0026 |
| 114 | .0441 | .0453 | -.035 | .036 | .99 | -2.47 | .75 | .0027 |
| 115 | .0591 | .0603 | -.035 | .036 | .99 | -2.47 | .70 | .0007 |
| 116 | .0491 | .0503 | -.035 | .036 | .99 | -2.47 | .75 | -.0028 |
| 117 | .0441 | .0453 | -.035 | .036 | .99 | -2.47 | .55 | .0049 |
| 118 | .0441 | .0453 | -.035 | .036 | .99 | -2.47 | .85 | .0020 |
| 119 | .0391 | .0403 | -.035 | .036 | .99 | -2.47 | .70 | .0076 |
| 120 | .0341 | .0353 | -.035 | .036 | .99 | -2.47 | .75 | .0020 |
| 121 | .0441 | .0453 | -.035 | .036 | .99 | -2.47 | .85 | -.0006 |
| 122 | .0441 | .0453 | -.035 | .036 | .99 | -2.47 | .75 | .0002 |
| 123 | .0441 | .0453 | -.035 | .036 | .99 | -2.47 | .70 | .0015 |
| 124 | .0541 | .0553 | -.035 | .036 | .99 | -2.47 | .70 | .0011 |
| 125 | .0291 | .0303 | -.035 | .036 | .99 | -2.47 | .75 | .0004 |
| 126 | .0941 | .0953 | -.035 | .036 | .99 | -2.47 | .65 | .0045 |
| 127 | .0541 | .0553 | -.035 | .036 | .99 | -2.47 | .80 | .0031 |
| 128 | . | . | -.035 | .036 | .99 | -2.47 | .85 | . |

| | dcfsv | dcfvle | dcfvld | dcfvlb | dcfvla3 | dcfcst80 |
|---|---|---|---|---|---|---|
| 97 | .1191 | .137 | .102 | .097 | .112 | .1186 |
| 98 | .1117 | .109 | .114 | .119 | .114 | .1087 |
| 99 | .1069 | .102 | .107 | .107 | .106 | .1069 |
| 100 | .1003 | .078 | .098 | .108 | .095 | .0966 |
| 101 | .1208 | .105 | .130 | .115 | .117 | .1207 |
| 102 | .1107 | .090 | .105 | .075 | .090 | .1090 |
| 103 | .0919 | .096 | .096 | .111 | .101 | .1011 |
| 104 | .1114 | .097 | .097 | .112 | .102 | .1106 |
| 105 | .1052 | .102 | .112 | .117 | .110 | .1048 |
| 106 | .1059 | .048 | .103 | .078 | .076 | .1059 |
| 107 | .1208 | .126 | .101 | .111 | .112 | .1182 |
| 108 | .1102 | .110 | .130 | .100 | .113 | .1102 |
| 109 | .1068 | .110 | .110 | .110 | .110 | .1062 |
| 110 | .0988 | .112 | .107 | .102 | .107 | .0944 |
| 111 | .1071 | .099 | .114 | .114 | .109 | .1011 |
| 112 | .1003 | .107 | .112 | .112 | .110 | .1003 |
| 113 | .1264 | .141 | .121 | .126 | .130 | . |
| 114 | .1137 | .124 | .119 | .114 | .119 | .1111 |
| 115 | .1167 | .109 | .104 | .114 | .109 | .1159 |
| 116 | .1221 | .119 | .049 | .119 | .096 | . |
| 117 | .1060 | .096 | .106 | .111 | .104 | .1011 |
| 118 | .1274 | .168 | .053 | .063 | .094 | . |
| 119 | .1011 | .086 | .101 | .106 | .097 | .0935 |
| 120 | .1079 | .062 | .102 | .097 | .087 | .1058 |
| 121 | . | .140 | .010 | .055 | .068 | . |
| 122 | .1050 | .114 | .119 | .109 | .114 | .1048 |
| 123 | .1130 | .122 | .112 | .122 | .118 | .1115 |
| 124 | .1083 | .118 | .108 | .108 | .111 | .1072 |
| 125 | .1120 | .102 | .037 | .127 | .089 | .1116 |
| 126 | .1467 | .144 | .139 | .124 | .136 | . |
| 127 | .1183 | .110 | .110 | .110 | .110 | .1152 |
| 128 | . | . | . | . | . | . |

| | name | recordno | date | book | price | qdiv | futroe |
|---|---|---|---|---|---|---|---|
| 129 | Rocheser G . & | 129.00 | 03/23/90 | 18.580 | 21.00 | .390 | .125 |
| 130 | Scana Corp | 130.00 | 03/23/90 | 22.850 | 33.00 | .615 | .135 |
| 131 | Southern Co. | 131.00 | 03/23/90 | 21.750 | 26.00 | .535 | .125 |
| 132 | Teco Energy, In | 132.00 | 03/23/90 | 15.450 | 29.00 | .380 | .145 |
| 133 | United Illum. | 133.00 | 03/23/90 | 27.000 | 31.00 | .580 | .140 |
| 134 | Cms Energy Corp | 134.00 | 01/19/90 | 24.450 | 37.00 | .100 | .100 |
| 135 | Centerior Energ | 135.00 | 01/19/90 | 20.050 | 20.00 | .400 | .110 |
| 136 | Central & S.W | 136.00 | 01/19/90 | 28.250 | 39.00 | .650 | .135 |
| 137 | Cent. Ill. P.S. | 137.00 | 01/19/90 | 17.900 | 23.00 | .450 | .130 |
| 138 | Central LA. El | 138.00 | 01/19/90 | 27.450 | 35.00 | .610 | .125 |
| 139 | Cilcorp, Inc. | 139.00 | 01/19/90 | 26.200 | 36.00 | .615 | .125 |
| 140 | Cicinnati Gas | 140.00 | 01/19/90 | 24.550 | 31.00 | .580 | .120 |
| 141 | Commonw. Ed. | 141.00 | 01/19/90 | 30.050 | 37.00 | .750 | .135 |
| 142 | Dpl Inc. | 142.00 | 01/19/90 | 22.100 | 30.00 | .585 | .145 |
| 143 | Detroit Edison | 143.00 | 01/19/90 | 16.150 | 25.00 | .420 | .160 |
| 144 | El Paso Elec. | 144.00 | 01/19/90 | 14.900 | 8.90 | .000 | .135 |
| 145 | Empire District | 145.00 | 01/19/90 | 22.050 | 31.00 | .580 | .135 |
| 146 | Entergy Corp. | 146.00 | 01/19/90 | 21.050 | 22.00 | .250 | .120 |
| 147 | Gulf St. Utils | 147.00 | 01/19/90 | 18.750 | 11.00 | .000 | .085 |
| 148 | Houston Inds. | 148.00 | 01/19/90 | 28.450 | 35.00 | .740 | .135 |
| 149 | Ie Industries | 149.00 | 01/19/90 | 19.650 | 27.00 | .515 | .140 |
| 150 | Illinois Power | 150.00 | 01/19/90 | 20.650 | 19.00 | .000 | .075 |
| 151 | Interstate Pwr. | 151.00 | 01/19/90 | 19.400 | 25.00 | .500 | .130 |
| 152 | Iowa-Illinous G | 152.00 | 01/19/90 | 32.250 | 44.00 | .815 | .125 |
| 153 | Iowa Resources | 153.00 | 01/19/90 | 16.000 | 21.00 | .425 | .125 |
| 154 | Iowa Southern | 154.00 | 01/19/90 | 22.700 | 33.00 | .540 | .135 |
| 155 | Ipalco Enterpri | 155.00 | 01/19/90 | 18.900 | 26.00 | .430 | .125 |
| 156 | Kansas City Pwr | 156.00 | 01/19/90 | 26.950 | 34.00 | .640 | .135 |
| 157 | Kansas G. & E. | 157.00 | 01/19/90 | 20.050 | 22.00 | .430 | .100 |
| 158 | Kansas P. & L. | 158.00 | 01/19/90 | 17.700 | 24.00 | .440 | .135 |
| 159 | Kentucky Utils. | 159.00 | 01/19/90 | 13.700 | 20.00 | .350 | .140 |
| 160 | Louisville G. & | 160.00 | 01/19/90 | 28.600 | 40.00 | .695 | .120 |

| | comeq | afcpft | acteps | tres1yr | tres5yr | tres30yr | pricebk | anndiv |
|---|---|---|---|---|---|---|---|---|
| 129 | .399 | .060 | 2.10 | .08 | .09 | .08 | 1.15 | 1.56 |
| 130 | .475 | .050 | 3.04 | .08 | .09 | .08 | 1.44 | 2.46 |
| 131 | .405 | .188 | 2.68 | .08 | .09 | .08 | 1.20 | 2.14 |
| 132 | .544 | .017 | 2.36 | .08 | .09 | .08 | 1.88 | 1.52 |
| 133 | .290 | .740 | 5.31 | .08 | .09 | .08 | 1.15 | 2.32 |
| 134 | .380 | .500 | 4.20 | .08 | .08 | .08 | 1.51 | .40 |
| 135 | .395 | .950 | 1.95 | .08 | .08 | .08 | 1.00 | 1.60 |
| 136 | .480 | .125 | 3.40 | .08 | .08 | .08 | 1.38 | 2.60 |
| 137 | .510 | .025 | 2.30 | .08 | .08 | .08 | 1.28 | 1.80 |
| 138 | .490 | .050 | 3.60 | .08 | .08 | .08 | 1.28 | 2.44 |
| 139 | .475 | .000 | 3.65 | .08 | .08 | .08 | 1.37 | 2.46 |
| 140 | .430 | .540 | 4.00 | .08 | .08 | .08 | 1.26 | 2.32 |
| 141 | .460 | .045 | 2.70 | .08 | .08 | .08 | 1.23 | 3.00 |
| 142 | .470 | .550 | 3.30 | .08 | .08 | .08 | 1.36 | 2.34 |
| 143 | .320 | .340 | 2.65 | .08 | .08 | .08 | 1.55 | 1.68 |
| 144 | .410 | .730 | .80 | .08 | .08 | .08 | .60 | . |
| 145 | .485 | .050 | 2.75 | .08 | .08 | .08 | 1.41 | 2.32 |
| 146 | .360 | .465 | 2.10 | .08 | .08 | .08 | 1.05 | 1.00 |
| 147 | .390 | 2.200 | .50 | .08 | .08 | .08 | .59 | . |
| 148 | .405 | 1.000 | 2.60 | .08 | .08 | .08 | 1.23 | 2.96 |
| 149 | .425 | .060 | 2.55 | .08 | .08 | .08 | 1.37 | 2.06 |
| 150 | .340 | .270 | .35 | .08 | .08 | .08 | .92 | . |
| 151 | .440 | .015 | 2.70 | .08 | .08 | .08 | 1.29 | 2.00 |
| 152 | .475 | .050 | 4.15 | .08 | .08 | .08 | 1.36 | 3.26 |
| 153 | .465 | .090 | 1.90 | .08 | .08 | .08 | 1.31 | 1.70 |
| 154 | .555 | .014 | 3.10 | .08 | .08 | .08 | 1.45 | 2.16 |
| 155 | .530 | .020 | 2.55 | .08 | .08 | .08 | 1.38 | 1.72 |
| 156 | .445 | .015 | 3.25 | .08 | .08 | .08 | 1.26 | 2.56 |
| 157 | .455 | .000 | 1.90 | .08 | .08 | .08 | 1.10 | 1.72 |
| 158 | .520 | .010 | 2.00 | .08 | .08 | .08 | 1.36 | 1.76 |
| 159 | .525 | .000 | 2.02 | .08 | .08 | .08 | 1.46 | 1.40 |
| 160 | .450 | .000 | 3.20 | .08 | .08 | .08 | 1.40 | 2.78 |

| | actpo | sustpo | sustbr | divyld | divtobk | dcfcost | ratiofc | futm1yrt |
|---|---|---|---|---|---|---|---|---|
| 129 | .743 | .683 | .0397 | .0743 | .0840 | .1139 | 1.10 | .0408 |
| 130 | .809 | .797 | .0273 | .0745 | .1077 | .1019 | 1.33 | .0508 |
| 131 | .799 | .787 | .0266 | .0823 | .0984 | .1089 | 1.15 | .0408 |
| 132 | .644 | .678 | .0466 | .0524 | .0984 | .0990 | 1.46 | .0608 |
| 133 | .437 | .614 | .0541 | .0748 | .0859 | .1289 | 1.09 | .0558 |
| 134 | .095 | .164 | .0836 | .0108 | .0164 | .0945 | 1.06 | .0193 |
| 135 | .821 | .725 | .0302 | .0800 | .0798 | .1102 | 1.00 | .0293 |
| 136 | .765 | .682 | .0430 | .0667 | .0920 | .1096 | 1.23 | .0543 |
| 137 | .783 | .774 | .0294 | .0783 | .1006 | .1077 | 1.21 | .0493 |
| 138 | .678 | .711 | .0361 | .0697 | .0889 | .1058 | 1.18 | .0443 |
| 139 | .674 | .751 | .0311 | .0683 | .0939 | .0994 | 1.26 | .0443 |
| 140 | .580 | .788 | .0255 | .0748 | .0945 | .1003 | 1.20 | .0393 |
| 141 | 1.111 | .740 | .0352 | .0811 | .0998 | .1162 | 1.16 | .0543 |
| 142 | .709 | .730 | .0391 | .0780 | .1059 | .1171 | 1.24 | .0643 |
| 143 | .634 | .650 | .0560 | .0672 | .1040 | .1232 | 1.30 | .0793 |
| 144 | . | . | . | . | . | . | . | .0543 |
| 145 | .844 | .779 | .0298 | .0748 | .1052 | .1046 | 1.29 | .0543 |
| 146 | .476 | .396 | .0725 | .0455 | .0475 | .1179 | 1.02 | .0393 |
| 147 | . | . | . | . | . | . | . | .0043 |
| 148 | 1.138 | .771 | .0310 | .0846 | .1040 | .1155 | 1.17 | .0543 |
| 149 | .808 | .749 | .0352 | .0763 | .1048 | .1115 | 1.26 | .0593 |
| 150 | . | . | . | . | . | . | . | . |
| 151 | .741 | .793 | .0269 | .0800 | .1031 | .1069 | 1.22 | .0493 |
| 152 | .786 | .809 | .0239 | .0741 | .1011 | .0980 | 1.28 | .0443 |
| 153 | .895 | .850 | .0188 | .0810 | .1063 | .0997 | 1.25 | .0443 |
| 154 | .697 | .705 | .0398 | .0655 | .0952 | .1053 | 1.28 | .0543 |
| 155 | .675 | .728 | .0340 | .0662 | .0910 | .1001 | 1.25 | .0443 |
| 156 | .788 | .704 | .0400 | .0753 | .0950 | .1153 | 1.17 | .0543 |
| 157 | .905 | .858 | .0142 | .0782 | .0858 | .0924 | 1.08 | .0193 |
| 158 | .880 | .737 | .0356 | .0733 | .0994 | .1089 | 1.24 | .0543 |
| 159 | .693 | .730 | .0378 | .0700 | .1022 | .1078 | 1.30 | .0593 |
| 160 | .869 | .810 | .0228 | .0695 | .0972 | .0923 | 1.30 | .0393 |

| | futm5yrt | futm30yt | premcor | precor5y | yldcrv | ln30yrt | beta | sv |
|---|---|---|---|---|---|---|---|---|
| 129 | .0391 | .0403 | -.035 | .036 | .99 | -2.47 | .75 | .0018 |
| 130 | .0491 | .0503 | -.035 | .036 | .99 | -2.47 | .70 | .0000 |
| 131 | .0391 | .0403 | -.035 | .036 | .99 | -2.47 | .75 | .0004 |
| 132 | .0591 | .0603 | -.035 | .036 | .99 | -2.47 | .60 | .0014 |
| 133 | .0541 | .0553 | -.035 | .036 | .99 | -2.47 | .75 | .0016 |
| 134 | .0177 | .0173 | -.037 | .032 | 1.00 | -2.49 | 1.00 | -.0027 |
| 135 | .0277 | .0273 | -.037 | .032 | 1.00 | -2.49 | .70 | .0000 |
| 136 | .0527 | .0523 | -.037 | .032 | 1.00 | -2.49 | .75 | .0008 |
| 137 | .0477 | .0473 | -.037 | .032 | 1.00 | -2.49 | .70 | .0000 |
| 138 | .0427 | .0423 | -.037 | .032 | 1.00 | -2.49 | .60 | .0010 |
| 139 | .0427 | .0423 | -.037 | .032 | 1.00 | -2.49 | .65 | .0000 |
| 140 | .0377 | .0373 | -.037 | .032 | 1.00 | -2.49 | .75 | .0030 |
| 141 | .0527 | .0523 | -.037 | .032 | 1.00 | -2.49 | .75 | -.0004 |
| 142 | .0627 | .0623 | -.037 | .032 | 1.00 | -2.49 | .70 | .0034 |
| 143 | .0777 | .0773 | -.037 | .032 | 1.00 | -2.49 | .70 | .0001 |
| 144 | .0527 | .0523 | -.037 | .032 | 1.00 | -2.49 | .65 | -.0018 |
| 145 | .0527 | .0523 | -.037 | .032 | 1.00 | -2.49 | .50 | .0067 |
| 146 | .0377 | .0373 | -.037 | .032 | 1.00 | -2.49 | .85 | -.0011 |
| 147 | .0027 | .0023 | -.037 | .032 | 1.00 | -2.49 | .85 | .0000 |
| 148 | .0527 | .0523 | -.037 | .032 | 1.00 | -2.49 | .80 | .0013 |
| 149 | .0577 | .0573 | -.037 | .032 | 1.00 | -2.49 | .70 | .0073 |
| 150 | . | . | -.037 | .032 | 1.00 | -2.49 | .60 | .0000 |
| 151 | .0477 | .0473 | -.037 | .032 | 1.00 | -2.49 | .70 | .0000 |
| 152 | .0427 | .0423 | -.037 | .032 | 1.00 | -2.49 | .60 | .0002 |
| 153 | .0427 | .0423 | -.037 | .032 | 1.00 | -2.49 | .70 | .0036 |
| 154 | .0527 | .0523 | -.037 | .032 | 1.00 | -2.49 | .60 | .0003 |
| 155 | .0427 | .0423 | -.037 | .032 | 1.00 | -2.49 | .70 | .0000 |
| 156 | .0527 | .0523 | -.037 | .032 | 1.00 | -2.49 | .65 | .0000 |
| 157 | .0177 | .0173 | -.037 | .032 | 1.00 | -2.49 | .75 | -.0018 |
| 158 | .0527 | .0523 | -.037 | .032 | 1.00 | -2.49 | .70 | .0000 |
| 159 | .0577 | .0573 | -.037 | .032 | 1.00 | -2.49 | .60 | .0000 |
| 160 | .0377 | .0373 | -.037 | .032 | 1.00 | -2.49 | .65 | .0075 |

| | dcfsv | dcfvle | dcfvld | dcfvlb | dcfvla3 | dcfcst80 |
|---|---|---|---|---|---|---|
| 129 | .1158 | .094 | .104 | .104 | .101 | .1139 |
| 130 | .1019 | .110 | .095 | .115 | .106 | .1019 |
| 131 | .1093 | .097 | .097 | .112 | .102 | .1089 |
| 132 | .1004 | .107 | .112 | .107 | .109 | .0990 |
| 133 | .1306 | .030 | .100 | .060 | .063 | . |
| 134 | .0918 | .106 | .011 | .101 | .072 | .0945 |
| 135 | .1102 | .080 | .040 | .085 | .068 | .1102 |
| 136 | .1104 | .117 | .127 | .117 | .120 | .1096 |
| 137 | .1077 | .118 | .103 | .108 | .110 | .1077 |
| 138 | .1068 | .085 | .115 | .110 | .103 | .1058 |
| 139 | .0994 | .108 | .093 | .103 | .102 | .0994 |
| 140 | .1033 | .060 | .100 | .135 | .098 | .1003 |
| 141 | .1158 | .091 | .121 | .086 | .099 | .1162 |
| 142 | .1205 | .108 | .118 | .128 | .118 | .1171 |
| 143 | .1233 | .097 | .107 | .092 | .099 | . |
| 144 | . | . | . | . | . | . |
| 145 | .1113 | .105 | .120 | .115 | .113 | .1046 |
| 146 | .1169 | .100 | .045 | .070 | .072 | .1179 |
| 147 | . | . | . | . | . | . |
| 148 | .1169 | .095 | .095 | .095 | .095 | .1155 |
| 149 | .1188 | .141 | .096 | .111 | .116 | .1115 |
| 150 | . | . | . | . | . | . |
| 151 | .1069 | .135 | .095 | .100 | .110 | .1069 |
| 152 | .0982 | .089 | .099 | .104 | .097 | .0980 |
| 153 | .1033 | .121 | .096 | .101 | .106 | .0997 |
| 154 | .1056 | .120 | .110 | .110 | .114 | .1053 |
| 155 | .1001 | .096 | .101 | .106 | .101 | .1001 |
| 156 | .1153 | .135 | .125 | .095 | .119 | .1153 |
| 157 | .0906 | .113 | .143 | .103 | .120 | .0924 |
| 158 | .1089 | .113 | .098 | .118 | .110 | .1089 |
| 159 | .1078 | .115 | .105 | .120 | .113 | .1078 |
| 160 | .0998 | .095 | .090 | .105 | .096 | .0923 |

| | name | recordno | date | book | price | qdiv | futroe |
|---|---|---|---|---|---|---|---|
| 161 | Mdu Resources | 161.00 | 01/19/90 | 15.200 | 22.00 | .405 | .145 |
| 162 | Midwest Energy | 162.00 | 01/19/90 | 13.100 | 21.00 | .400 | .145 |
| 163 | Minniesota Pwr. | 163.00 | 01/19/90 | 18.150 | 26.00 | .445 | .140 |
| 164 | Nipsco Industri | 164.00 | 01/19/90 | 14.050 | 19.00 | .260 | .145 |
| 165 | North. States P | 165.00 | 01/19/90 | 23.800 | 38.00 | .555 | .135 |
| 166 | Northwestern P. | 166.00 | 01/19/90 | 12.700 | 20.00 | .365 | .140 |
| 167 | Ohio Edison | 167.00 | 01/19/90 | 16.900 | 23.00 | .490 | .135 |
| 168 | Oklahoma G. & E | 168.00 | 01/19/90 | 21.100 | 37.00 | .620 | .150 |
| 169 | Otter Tail Pwr. | 169.00 | 01/19/90 | 13.900 | 24.00 | .380 | .145 |
| 170 | Psi Holdings In | 170.00 | 01/19/90 | 10.200 | 18.00 | .200 | .140 |
| 171 | St. Joe L. & P | 171.00 | 01/19/90 | 17.250 | 24.00 | .380 | .160 |
| 172 | So. Ind. G. & E | 172.00 | 01/19/90 | 20.250 | 30.00 | .450 | .140 |
| 173 | S.W. Pub. Serv. | 173.00 | 01/19/90 | 15.510 | 30.00 | .550 | .150 |
| 174 | Tnp Enterprises | 174.00 | 01/19/90 | 20.600 | 21.00 | .387 | .120 |
| 175 | texas Utilities | 175.00 | 01/19/90 | 33.750 | 35.00 | .730 | .130 |
| 176 | Union Electric | 176.00 | 01/19/90 | 19.100 | 28.00 | .520 | .130 |
| 177 | Utilicorp Utd. | 177.00 | 01/19/90 | 15.650 | 22.00 | .360 | .145 |
| 178 | Wpl Holdings | 178.00 | 01/19/90 | 15.800 | 24.00 | .420 | .135 |
| 179 | Wisconsin Energ | 179.00 | 01/19/90 | 19.600 | 30.00 | .415 | .135 |
| 180 | Wisconsin P. S. | 180.00 | 01/19/90 | 16.250 | 23.00 | .405 | .135 |
| 181 | Hawaiian Elec. | 181.00 | 03/02/90 | 22.900 | 36.00 | .540 | .130 |
| 182 | Idaho Power | 182.00 | 03/02/90 | 17.350 | 28.00 | .465 | .130 |
| 183 | Montana Power | 183.00 | 03/02/90 | 15.850 | 21.00 | .355 | .110 |
| 184 | Nevada Power | 184.00 | 03/02/90 | 14.200 | 23.00 | .390 | .130 |
| 185 | Pacific G. & E. | 185.00 | 03/02/90 | 17.350 | 22.00 | .380 | .135 |
| 186 | Pacificorp | 186.00 | 03/02/90 | 12.450 | 23.00 | .345 | .140 |
| 187 | Pinnacle West | 187.00 | 03/02/90 | 15.900 | 12.00 | .000 | .110 |
| 188 | Portland Genera | 188.00 | 03/02/90 | 16.400 | 17.00 | .300 | .110 |
| 189 | P.S. Of Colorad | 189.00 | 03/02/90 | 16.850 | 25.00 | .500 | .135 |
| 190 | P.s. N. Mexico | 190.00 | 03/02/90 | 19.400 | 15.00 | .000 | .115 |
| 191 | Puget Sound P & | 191.00 | 03/02/90 | 16.110 | 21.00 | .440 | .120 |
| 192 | SceCorp | 192.00 | 03/02/90 | 24.200 | 38.00 | .640 | .140 |

| | comeq | afcpft | acteps | tres1yr | tres5yr | tres30yr | pricebk | anndiv |
|---|---|---|---|---|---|---|---|---|
| 161 | .515 | .000 | 1.95 | .08 | .08 | .08 | 1.45 | 1.62 |
| 162 | .400 | .010 | 1.90 | .08 | .08 | .08 | 1.60 | 1.60 |
| 163 | .480 | .000 | 2.20 | .08 | .08 | .08 | 1.43 | 1.78 |
| 164 | .410 | .010 | 1.10 | .08 | .08 | .08 | 1.35 | 1.04 |
| 165 | .480 | .040 | 3.20 | .08 | .08 | .08 | 1.60 | 2.22 |
| 166 | .535 | .000 | 1.75 | .08 | .08 | .08 | 1.57 | 1.46 |
| 167 | .415 | .069 | 2.25 | .08 | .08 | .08 | 1.36 | 1.96 |
| 168 | .490 | .030 | 2.95 | .08 | .08 | .08 | 1.75 | 2.48 |
| 169 | .520 | .010 | 2.00 | .08 | .08 | .08 | 1.73 | 1.52 |
| 170 | .410 | .020 | 2.25 | .08 | .08 | .08 | 1.76 | .80 |
| 171 | .625 | .015 | 2.45 | .08 | .08 | .08 | 1.39 | 1.52 |
| 172 | .505 | .020 | 2.80 | .08 | .08 | .08 | 1.48 | 1.80 |
| 173 | .488 | .010 | 2.45 | .08 | .08 | .08 | 1.93 | 2.20 |
| 174 | .535 | .040 | 2.05 | .08 | .08 | .08 | 1.02 | 1.55 |
| 175 | .420 | .550 | 4.35 | .08 | .08 | .08 | 1.04 | 2.92 |
| 176 | .450 | .010 | 2.55 | .08 | .08 | .08 | 1.47 | 2.08 |
| 177 | .440 | .020 | 2.05 | .08 | .08 | .08 | 1.41 | 1.44 |
| 178 | .535 | .033 | 1.80 | .08 | .08 | .08 | 1.52 | 1.68 |
| 179 | .540 | .040 | 2.90 | .08 | .08 | .08 | 1.53 | 1.66 |
| 180 | .550 | .020 | 2.00 | .08 | .08 | .08 | 1.42 | 1.62 |
| 181 | .455 | .070 | 3.06 | .08 | .09 | .09 | 1.57 | 2.16 |
| 182 | .465 | .040 | 2.37 | .08 | .09 | .09 | 1.61 | 1.86 |
| 183 | .555 | .010 | 1.45 | .08 | .09 | .09 | 1.32 | 1.42 |
| 184 | .425 | .180 | 1.81 | .08 | .09 | .09 | 1.62 | 1.56 |
| 185 | .450 | .070 | 1.90 | .08 | .09 | .09 | 1.27 | 1.52 |
| 186 | .450 | .020 | 1.81 | .08 | .09 | .09 | 1.85 | 1.38 |
| 187 | .335 | .130 | 1.44 | .08 | .09 | .09 | .75 | . |
| 188 | .430 | .030 | 1.60 | .08 | .09 | .09 | 1.04 | 1.20 |
| 189 | .440 | .020 | 2.27 | .08 | .09 | .09 | 1.48 | 2.00 |
| 190 | .435 | .040 | 1.73 | .08 | .09 | .09 | .77 | . |
| 191 | .437 | .030 | 2.13 | .08 | .09 | .09 | 1.30 | 1.76 |
| 192 | .460 | .020 | 3.56 | .08 | .09 | .09 | 1.57 | 2.56 |

| | actpo | sustpo | sustbr | divyld | divtobk | dcfcost | ratiofc | futm1yrt |
|---|---|---|---|---|---|---|---|---|
| 161 | .831 | .735 | .0384 | .0736 | .1066 | .1121 | 1.29 | .0643 |
| 162 | .842 | .842 | .0229 | .0762 | .1221 | .0991 | 1.46 | .0643 |
| 163 | .809 | .701 | .0419 | .0685 | .0981 | .1104 | 1.27 | .0593 |
| 164 | .945 | .510 | .0710 | .0547 | .0740 | .1257 | 1.15 | .0643 |
| 165 | .694 | .691 | .0417 | .0584 | .0933 | .1001 | 1.35 | .0543 |
| 166 | .834 | .821 | .0250 | .0730 | .1150 | .0980 | 1.43 | .0593 |
| 167 | .871 | .859 | .0190 | .0852 | .1160 | .1042 | 1.30 | .0543 |
| 168 | .841 | .784 | .0325 | .0670 | .1175 | .0995 | 1.51 | .0693 |
| 169 | .760 | .754 | .0356 | .0633 | .1094 | .0990 | 1.46 | .0643 |
| 170 | .356 | .560 | .0616 | .0444 | .0784 | .1060 | 1.32 | .0593 |
| 171 | .620 | .551 | .0719 | .0633 | .0881 | .1352 | 1.18 | .0793 |
| 172 | .643 | .635 | .0511 | .0600 | .0889 | .1111 | 1.26 | .0593 |
| 173 | .898 | .946 | .0082 | .0733 | .1418 | .0815 | 1.84 | .0693 |
| 174 | .755 | .626 | .0449 | .0737 | .0751 | .1186 | 1.01 | .0393 |
| 175 | .671 | .666 | .0435 | .0834 | .0865 | .1269 | 1.02 | .0493 |
| 176 | .816 | .838 | .0211 | .0743 | .1089 | .0954 | 1.36 | .0493 |
| 177 | .702 | .635 | .0530 | .0655 | .0920 | .1184 | 1.22 | .0643 |
| 178 | .933 | .788 | .0287 | .0700 | .1063 | .0987 | 1.37 | .0543 |
| 179 | .572 | .627 | .0503 | .0553 | .0847 | .1056 | 1.28 | .0543 |
| 180 | .810 | .738 | .0353 | .0704 | .0997 | .1057 | 1.28 | .0543 |
| 181 | .706 | .726 | .0357 | .0600 | .0943 | .0957 | 1.36 | .0473 |
| 182 | .785 | .825 | .0228 | .0664 | .1072 | .0892 | 1.46 | .0473 |
| 183 | .979 | .814 | .0204 | .0676 | .0896 | .0880 | 1.25 | .0273 |
| 184 | .862 | .845 | .0201 | .0678 | .1099 | .0880 | 1.48 | .0473 |
| 185 | .800 | .649 | .0474 | .0691 | .0876 | .1165 | 1.16 | .0523 |
| 186 | .762 | .792 | .0292 | .0600 | .1108 | .0892 | 1.57 | .0573 |
| 187 | . | . | . | . | . | . | . | .0273 |
| 188 | .750 | .665 | .0368 | .0706 | .0732 | .1074 | 1.02 | .0273 |
| 189 | .881 | .879 | .0163 | .0800 | .1187 | .0963 | 1.40 | .0523 |
| 190 | . | . | . | . | . | . | . | .0323 |
| 191 | .826 | .910 | .0108 | .0838 | .1092 | .0946 | 1.27 | .0373 |
| 192 | .719 | .756 | .0342 | .0674 | .1058 | .1016 | 1.38 | .0573 |

| | futm5yrt | futm30yt | premcor | precor5y | yldcrv | ln30yrt | beta | sv |
|---|---|---|---|---|---|---|---|---|
| 161 | .0627 | .0623 | -.037 | .032 | 1.00 | -2.49 | .70 | .0000 |
| 162 | .0627 | .0623 | -.037 | .032 | 1.00 | -2.49 | .60 | .0001 |
| 163 | .0577 | .0573 | -.037 | .032 | 1.00 | -2.49 | .70 | .0054 |
| 164 | .0627 | .0623 | -.037 | .032 | 1.00 | -2.49 | .80 | -.0035 |
| 165 | .0527 | .0523 | -.037 | .032 | 1.00 | -2.49 | .75 | -.0024 |
| 166 | .0577 | .0573 | -.037 | .032 | 1.00 | -2.49 | .70 | .0000 |
| 167 | .0527 | .0523 | -.037 | .032 | 1.00 | -2.49 | .75 | .0000 |
| 168 | .0677 | .0673 | -.037 | .032 | 1.00 | -2.49 | .65 | -.0029 |
| 169 | .0627 | .0623 | -.037 | .032 | 1.00 | -2.49 | .65 | -.0077 |
| 170 | .0577 | .0573 | -.037 | .032 | 1.00 | -2.49 | .85 | .0154 |
| 171 | .0777 | .0773 | -.037 | .032 | 1.00 | -2.49 | .60 | -.0057 |
| 172 | .0577 | .0573 | -.037 | .032 | 1.00 | -2.49 | .55 | .0008 |
| 173 | .0677 | .0673 | -.037 | .032 | 1.00 | -2.49 | .75 | .0049 |
| 174 | .0377 | .0373 | -.037 | .032 | 1.00 | -2.49 | .60 | .0025 |
| 175 | .0477 | .0473 | -.037 | .032 | 1.00 | -2.49 | .75 | .0006 |
| 176 | .0477 | .0473 | -.037 | .032 | 1.00 | -2.49 | .80 | .0000 |
| 177 | .0627 | .0623 | -.037 | .032 | 1.00 | -2.49 | .70 | .0094 |
| 178 | .0527 | .0523 | -.037 | .032 | 1.00 | -2.49 | .60 | .0023 |
| 179 | .0527 | .0523 | -.037 | .032 | 1.00 | -2.49 | .65 | .0001 |
| 180 | .0527 | .0523 | -.037 | .032 | 1.00 | -2.49 | .60 | -.0007 |
| 181 | .0440 | .0445 | -.034 | .036 | .99 | -2.46 | .65 | .0113 |
| 182 | .0440 | .0445 | -.034 | .036 | .99 | -2.46 | .65 | .0000 |
| 183 | .0240 | .0245 | -.034 | .036 | .99 | -2.46 | .65 | .0069 |
| 184 | .0440 | .0445 | -.034 | .036 | .99 | -2.46 | .60 | .0238 |
| 185 | .0490 | .0495 | -.034 | .036 | .99 | -2.46 | .75 | .0027 |
| 186 | .0540 | .0545 | -.034 | .036 | .99 | -2.46 | .70 | .0046 |
| 187 | .0240 | .0245 | -.034 | .036 | .99 | -2.46 | .75 | -.0034 |
| 188 | .0240 | .0245 | -.034 | .036 | .99 | -2.46 | .65 | .0000 |
| 189 | .0490 | .0495 | -.034 | .036 | .99 | -2.46 | .70 | .0013 |
| 190 | .0290 | .0295 | -.034 | .036 | .99 | -2.46 | .65 | -.0007 |
| 191 | .0340 | .0345 | -.034 | .036 | .99 | -2.46 | .75 | .0026 |
| 192 | .0540 | .0545 | -.034 | .036 | .99 | -2.46 | .75 | .0000 |

| | dcfsv | dcfvle | dcfvld | dcfvlb | dcfvla3 | dcfcst80 |
|---|---|---|---|---|---|---|
| 161 | .1121 | .129 | .109 | .114 | .117 | .1121 |
| 162 | .0992 | .126 | .101 | .111 | .113 | .0991 |
| 163 | .1158 | .083 | .113 | .098 | .098 | .1104 |
| 164 | .1222 | .235 | .055 | .090 | .126 | . |
| 165 | .0977 | .093 | .108 | .098 | .100 | .1001 |
| 166 | .0980 | .098 | .118 | .108 | .108 | .0980 |
| 167 | .1042 | .120 | .100 | .095 | .105 | .1042 |
| 168 | .0966 | .102 | .112 | .092 | .102 | .0995 |
| 169 | .0913 | .098 | .088 | .088 | .092 | .0990 |
| 170 | .1214 | .069 | .044 | .239 | .118 | .1060 |
| 171 | .1295 | .113 | .123 | .103 | .113 | . |
| 172 | .1119 | .095 | .115 | .105 | .105 | .1111 |
| 173 | .0863 | .103 | .098 | .113 | .105 | . |
| 174 | .1210 | .119 | .124 | .119 | .120 | .1186 |
| 175 | .1275 | .083 | .103 | .083 | .090 | . |
| 176 | .0954 | .109 | .109 | .134 | .118 | .0954 |
| 177 | .1278 | .135 | .185 | .115 | .145 | .1184 |
| 178 | .1010 | .090 | .110 | .100 | .100 | .0987 |
| 179 | .1057 | .095 | .125 | .120 | .114 | .1056 |
| 180 | .1050 | .100 | .105 | .110 | .105 | .1057 |
| 181 | .1070 | .100 | .115 | .105 | .107 | .0957 |
| 182 | .0892 | .146 | .091 | .081 | .106 | . |
| 183 | .0950 | .118 | .103 | .073 | .098 | . |
| 184 | .1118 | .108 | .103 | .108 | .106 | . |
| 185 | .1192 | .119 | .064 | .094 | .092 | .1165 |
| 186 | .0938 | .105 | .095 | .105 | .102 | . |
| 187 | . | . | . | . | . | . |
| 188 | .1074 | .076 | .016 | .071 | .054 | .1074 |
| 189 | .0976 | .100 | .100 | .140 | .113 | .0963 |
| 190 | . | . | . | . | . | . |
| 191 | .0972 | .094 | .089 | .104 | .095 | .0946 |
| 192 | .1016 | .102 | .107 | .112 | .107 | .1016 |

| | name | recordno | date | book | price | qdiv | futroe |
|---|---|---|---|---|---|---|---|
| 193 | San Diego G. & | 193.00 | 03/02/90 | 22.460 | 42.00 | .675 | .145 |
| 194 | Sierra Pacific | 194.00 | 03/02/90 | 17.830 | 23.00 | .460 | .110 |
| 195 | Tucson Elec. Pw | 195.00 | 03/02/90 | 26.700 | 14.00 | .400 | .100 |
| 196 | Washington Wtr. | 196.00 | 03/02/90 | 21.220 | 29.00 | .620 | .130 |
| 197 | Allegheny Power | 197.00 | 03/22/91 | 30.500 | 37.00 | .790 | .125 |
| 198 | Amer. Elec. Pwr | 198.00 | 03/22/91 | 22.750 | 28.00 | .600 | .135 |
| 199 | Atlantic Energy | 199.00 | 03/22/91 | 29.350 | 35.00 | .740 | .125 |
| 200 | Boltimore G.&E. | 200.00 | 03/22/91 | 24.870 | 28.00 | .525 | .135 |
| 201 | Boston Edison | 201.00 | 03/22/91 | 17.200 | 20.00 | .395 | .120 |
| 202 | Carolina Power | 202.00 | 03/22/91 | 30.600 | 47.00 | .760 | .130 |
| 203 | Central Hudson | 203.00 | 03/22/91 | 22.310 | 24.00 | .460 | .115 |
| 204 | Central Maine | 204.00 | 03/22/91 | 16.000 | 18.00 | .390 | .120 |
| 205 | Cent. Vermont P | 205.00 | 03/22/91 | 21.000 | 26.00 | .520 | .115 |
| 206 | Com'w'th Energy | 206.00 | 03/22/91 | 31.000 | 31.00 | .730 | .120 |
| 207 | Con. Edison | 207.00 | 03/22/91 | 19.700 | 24.00 | .465 | .130 |
| 208 | Dqe | 208.00 | 03/22/91 | 20.070 | 25.00 | .360 | .120 |
| 209 | Delmarva Power | 209.00 | 03/22/91 | 12.840 | 18.00 | .385 | .130 |
| 210 | Dominion Res. | 210.00 | 03/22/91 | 35.120 | 45.00 | .860 | .125 |
| 211 | Duke Power | 211.00 | 03/22/91 | 18.840 | 28.00 | .410 | .130 |
| 212 | Eastern Utils. | 212.00 | 03/22/91 | 23.980 | 21.00 | .650 | .135 |
| 213 | Fpl Group, Inc. | 213.00 | 03/22/91 | 19.630 | 30.00 | .590 | .135 |
| 214 | Florida Progres | 214.00 | 03/22/91 | 27.550 | 39.00 | .685 | .125 |
| 215 | Gen. Pub. Util. | 215.00 | 03/22/91 | 39.670 | 46.00 | .650 | .120 |
| 216 | Green Mountain | 216.00 | 03/22/91 | 18.900 | 25.00 | .505 | .125 |
| 217 | L.I. Lighting | 217.00 | 03/22/91 | 18.570 | 23.00 | .375 | .135 |
| 218 | New England EL. | 218.00 | 03/22/91 | 21.430 | 27.00 | .510 | .125 |
| 219 | N.Y. State E. & | 219.00 | 03/22/91 | 21.850 | 26.00 | .520 | .120 |
| 220 | Niagara Mohawk | 220.00 | 03/22/91 | 14.370 | 14.00 | .000 | .125 |
| 221 | N.E. Utilities | 221.00 | 03/22/91 | 16.340 | 20.00 | .440 | .125 |
| 222 | Orange & R'KL'D | 222.00 | 03/22/91 | 25.460 | 32.00 | .585 | .120 |
| 223 | Penna. P. & L. | 223.00 | 03/22/91 | 29.370 | 43.00 | .775 | .130 |
| 224 | Phila. Electric | 224.00 | 03/22/91 | 16.710 | 20.00 | .300 | .120 |

| | comeq | afcpft | acteps | tres1yr | tres5yr | tres30yr | pricebk | anndiv |
|---|---|---|---|---|---|---|---|---|
| 193 | .491 | .051 | 3.43 | .08 | .09 | .09 | 1.87 | 2.70 |
| 194 | .435 | .022 | 2.05 | .08 | .09 | .09 | 1.29 | 1.84 |
| 195 | .345 | .050 | 1.45 | .08 | .09 | .09 | .52 | 1.60 |
| 196 | .412 | .010 | 2.70 | .08 | .09 | .09 | 1.37 | 2.48 |
| 197 | .460 | .035 | 3.61 | .06 | .08 | .08 | 1.21 | 3.16 |
| 198 | .460 | .155 | 2.76 | .06 | .08 | .08 | 1.23 | 2.40 |
| 199 | .460 | .080 | 3.02 | .06 | .08 | .08 | 1.19 | 2.96 |
| 200 | .434 | .250 | 2.10 | .06 | .08 | .08 | 1.13 | 2.10 |
| 201 | .341 | .130 | 1.60 | .06 | .08 | .08 | 1.16 | 1.58 |
| 202 | .455 | .030 | 4.41 | .06 | .08 | .08 | 1.54 | 3.04 |
| 203 | .406 | .041 | 2.38 | .06 | .08 | .08 | 1.08 | 1.84 |
| 204 | .460 | .135 | 1.68 | .06 | .08 | .08 | 1.13 | 1.56 |
| 205 | .490 | .040 | 2.43 | .06 | .08 | .08 | 1.24 | 2.08 |
| 206 | .415 | .130 | 2.16 | .06 | .08 | .08 | 1.00 | 2.92 |
| 207 | .535 | .030 | 2.34 | .06 | .08 | .08 | 1.22 | 1.86 |
| 208 | .375 | .022 | 2.24 | .06 | .08 | .08 | 1.25 | 1.44 |
| 209 | .412 | .073 | 1.49 | .06 | .08 | .08 | 1.40 | 1.54 |
| 210 | .413 | .029 | 4.13 | .06 | .08 | .08 | 1.28 | 3.44 |
| 211 | .498 | .203 | 2.40 | .06 | .08 | .08 | 1.49 | 1.64 |
| 212 | .330 | 2.621 | 1.07 | .06 | .08 | .08 | .88 | 2.60 |
| 213 | .419 | .063 | 2.65 | .06 | .08 | .08 | 1.53 | 2.36 |
| 214 | .477 | .021 | 3.50 | .06 | .08 | .08 | 1.42 | 2.74 |
| 215 | .474 | .061 | 5.02 | .06 | .08 | .08 | 1.16 | 2.60 |
| 216 | .485 | .045 | 2.29 | .06 | .08 | .08 | 1.32 | 2.02 |
| 217 | .284 | .024 | 2.25 | .06 | .08 | .08 | 1.24 | 1.50 |
| 218 | .428 | .198 | 2.36 | .06 | .08 | .08 | 1.26 | 2.04 |
| 219 | .414 | .033 | 2.48 | .06 | .08 | .08 | 1.19 | 2.08 |
| 220 | .337 | .157 | .98 | .06 | .08 | .08 | .97 | . |
| 221 | .369 | .275 | 1.94 | .06 | .08 | .08 | 1.22 | 1.76 |
| 222 | .441 | .039 | 2.99 | .06 | .08 | .08 | 1.26 | 2.34 |
| 223 | .405 | .036 | 3.95 | .06 | .08 | .08 | 1.46 | 3.10 |
| 224 | .349 | .100 | 2.16 | .06 | .08 | .08 | 1.20 | 1.20 |

| | actpo | sustpo | sustbr | divyld | divtobk | dcfcost | ratiofc | futm1yrt |
|---|---|---|---|---|---|---|---|---|
| 193 | .787 | .829 | .0248 | .0643 | .1202 | .0891 | 1.63 | .0623 |
| 194 | .898 | .938 | .0068 | .0800 | .1032 | .0868 | 1.27 | .0273 |
| 195 | 1.103 | .599 | .0401 | .1143 | .0599 | .1544 | .65 | .0173 |
| 196 | .919 | .899 | .0131 | .0855 | .1169 | .0986 | 1.32 | .0473 |
| 197 | .875 | .829 | .0214 | .0854 | .1036 | .1068 | 1.17 | .0601 |
| 198 | .870 | .781 | .0295 | .0857 | .1055 | .1152 | 1.17 | .0701 |
| 199 | .980 | .807 | .0241 | .0846 | .1009 | .1087 | 1.15 | .0601 |
| 200 | 1.000 | .625 | .0506 | .0750 | .0844 | .1256 | 1.08 | .0701 |
| 201 | .988 | .766 | .0281 | .0790 | .0919 | .1071 | 1.12 | .0551 |
| 202 | .689 | .764 | .0307 | .0647 | .0993 | .0953 | 1.36 | .0651 |
| 203 | .773 | .717 | .0325 | .0767 | .0825 | .1092 | 1.05 | .0501 |
| 204 | .929 | .813 | .0225 | .0867 | .0975 | .1092 | 1.10 | .0551 |
| 205 | .856 | .861 | .0160 | .0800 | .0990 | .0960 | 1.20 | .0501 |
| 206 | 1.352 | .785 | .0258 | .0942 | .0942 | .1200 | 1.00 | .0551 |
| 207 | .795 | .726 | .0356 | .0775 | .0944 | .1131 | 1.15 | .0651 |
| 208 | .643 | .598 | .0483 | .0576 | .0717 | .1059 | 1.13 | .0551 |
| 209 | 1.034 | .923 | .0101 | .0856 | .1199 | .0956 | 1.36 | .0651 |
| 210 | .833 | .784 | .0271 | .0764 | .0979 | .1035 | 1.21 | .0601 |
| 211 | .683 | .670 | .0430 | .0586 | .0870 | .1015 | 1.28 | .0651 |
| 212 | 2.430 | .803 | .0266 | .1238 | .1084 | .1504 | .90 | .0701 |
| 213 | .891 | .891 | .0148 | .0787 | .1202 | .0934 | 1.44 | .0701 |
| 214 | .783 | .796 | .0255 | .0703 | .0995 | .0958 | 1.30 | .0601 |
| 215 | .518 | .546 | .0545 | .0565 | .0655 | .1110 | 1.08 | .0551 |
| 216 | .882 | .855 | .0181 | .0808 | .1069 | .0989 | 1.26 | .0601 |
| 217 | .667 | .598 | .0542 | .0652 | .0808 | .1194 | 1.13 | .0701 |
| 218 | .864 | .762 | .0298 | .0756 | .0952 | .1054 | 1.19 | .0601 |
| 219 | .839 | .793 | .0248 | .0800 | .0952 | .1048 | 1.14 | .0551 |
| 220 | . | . | . | . | . | . | . | .0601 |
| 221 | .907 | .862 | .0173 | .0880 | .1077 | .1053 | 1.19 | .0601 |
| 222 | .783 | .766 | .0281 | .0731 | .0919 | .1012 | 1.19 | .0551 |
| 223 | .785 | .812 | .0245 | .0721 | .1055 | .0965 | 1.35 | .0651 |
| 224 | .556 | .598 | .0482 | .0600 | .0718 | .1082 | 1.11 | .0551 |

| | futm5yrt | futm30yt | premcor | precor5y | yldcrv | ln30yrt | beta | sv |
|---|---|---|---|---|---|---|---|---|
| 193 | .0590 | .0595 | -.034 | .036 | .99 | -2.46 | .70 | .0002 |
| 194 | .0240 | .0245 | -.034 | .036 | .99 | -2.46 | .65 | .0074 |
| 195 | .0140 | .0145 | -.034 | .036 | .99 | -2.46 | .60 | -.0026 |
| 196 | .0440 | .0445 | -.034 | .036 | .99 | -2.46 | .65 | .0006 |
| 197 | .0466 | .0418 | -.037 | .028 | 1.06 | -2.49 | .65 | .0025 |
| 198 | .0566 | .0518 | -.037 | .028 | 1.06 | -2.49 | .70 | .0000 |
| 199 | .0466 | .0418 | -.037 | .028 | 1.06 | -2.49 | .65 | .0068 |
| 200 | .0566 | .0518 | -.037 | .028 | 1.06 | -2.49 | .70 | .0023 |
| 201 | .0415 | .0368 | -.037 | .028 | 1.06 | -2.49 | .70 | .0056 |
| 202 | .0516 | .0468 | -.037 | .028 | 1.06 | -2.49 | .65 | .0000 |
| 203 | .0366 | .0318 | -.037 | .028 | 1.06 | -2.49 | .55 | .0015 |
| 204 | .0415 | .0368 | -.037 | .028 | 1.06 | -2.49 | .65 | .0030 |
| 205 | .0366 | .0318 | -.037 | .028 | 1.06 | -2.49 | .60 | .0073 |
| 206 | .0415 | .0368 | -.037 | .028 | 1.06 | -2.49 | .70 | .0000 |
| 207 | .0516 | .0468 | -.037 | .028 | 1.06 | -2.49 | .70 | .0001 |
| 208 | .0415 | .0368 | -.037 | .028 | 1.06 | -2.49 | .65 | .0039 |
| 209 | .0516 | .0468 | -.037 | .028 | 1.06 | -2.49 | .60 | .0081 |
| 210 | .0466 | .0418 | -.037 | .028 | 1.06 | -2.49 | .65 | .0066 |
| 211 | .0516 | .0468 | -.037 | .028 | 1.06 | -2.49 | .70 | .0071 |
| 212 | .0566 | .0518 | -.037 | .028 | 1.06 | -2.49 | .70 | -.0028 |
| 213 | .0566 | .0518 | -.037 | .028 | 1.06 | -2.49 | .70 | .0087 |
| 214 | .0466 | .0418 | -.037 | .028 | 1.06 | -2.49 | .65 | .0050 |
| 215 | .0415 | .0368 | -.037 | .028 | 1.06 | -2.49 | .70 | .0041 |
| 216 | .0466 | .0418 | -.037 | .028 | 1.06 | -2.49 | .55 | .0171 |
| 217 | .0566 | .0518 | -.037 | .028 | 1.06 | -2.49 | .90 | .0003 |
| 218 | .0466 | .0418 | -.037 | .028 | 1.06 | -2.49 | .70 | .0058 |
| 219 | .0415 | .0368 | -.037 | .028 | 1.06 | -2.49 | .70 | .0027 |
| 220 | .0466 | .0418 | -.037 | .028 | 1.06 | -2.49 | .80 | -.0003 |
| 221 | .0466 | .0418 | -.037 | .028 | 1.06 | -2.49 | .70 | .0020 |
| 222 | .0415 | .0368 | -.037 | .028 | 1.06 | -2.49 | .65 | .0024 |
| 223 | .0516 | .0468 | -.037 | .028 | 1.06 | -2.49 | .65 | .0016 |
| 224 | .0415 | .0368 | -.037 | .028 | 1.06 | -2.49 | .75 | .0027 |

| | dcfsv | dcfvle | dcfvld | dcfvlb | dcfvla3 | dcfcst80 |
|---|---|---|---|---|---|---|
| 193 | .0893 | .079 | .089 | .084 | .084 | . |
| 194 | .0942 | .100 | .095 | .110 | .102 | . |
| 195 | .1518 | .059 | .034 | .134 | .076 | . |
| 196 | .0992 | .131 | .091 | .101 | .107 | .0986 |
| 197 | .1093 | .100 | .110 | .110 | .107 | .1068 |
| 198 | .1152 | .101 | .101 | .111 | .104 | .1152 |
| 199 | .1155 | .105 | .110 | .120 | .111 | .1087 |
| 200 | .1279 | .130 | .110 | .115 | .118 | . |
| 201 | .1128 | .119 | .114 | .094 | .109 | .1071 |
| 202 | .0954 | .095 | .095 | .105 | .098 | .0953 |
| 203 | .1107 | .112 | .107 | .107 | .108 | .1092 |
| 204 | .1122 | .112 | .112 | .112 | .112 | .1092 |
| 205 | .1033 | .090 | .100 | .105 | .098 | .0960 |
| 206 | .1200 | .104 | .114 | .104 | .108 | .1200 |
| 207 | .1132 | .108 | .113 | .108 | .109 | .1131 |
| 208 | .1097 | .103 | .113 | .078 | .098 | .1059 |
| 209 | .1037 | .131 | .116 | .116 | .121 | .0956 |
| 210 | .1101 | .101 | .111 | .106 | .106 | .1035 |
| 211 | .1086 | .114 | .109 | .119 | .114 | .1015 |
| 212 | .1475 | .169 | .129 | .119 | .139 | . |
| 213 | .1021 | .094 | .109 | .079 | .094 | .0934 |
| 214 | .1008 | .100 | .100 | .105 | .102 | .0958 |
| 215 | .1151 | .097 | .197 | .112 | .135 | .1110 |
| 216 | .1160 | .096 | .101 | .106 | .101 | .0989 |
| 217 | .1197 | .145 | .065 | .110 | .107 | .1194 |
| 218 | .1111 | .126 | .101 | .106 | .111 | .1054 |
| 219 | .1075 | .105 | .100 | .100 | .102 | .1048 |
| 220 | . | . | . | . | . | . |
| 221 | .1073 | .098 | .093 | .103 | .098 | .1053 |
| 222 | .1036 | .103 | .098 | .118 | .106 | .1012 |
| 223 | .0982 | .102 | .112 | .107 | .107 | .0965 |
| 224 | .1108 | .070 | .030 | .090 | .063 | .1082 |

| | name | recordno | date | book | price | qdiv | futroe |
|---|---|---|---|---|---|---|---|
| 225 | Potomac EL. Pwr | 225.00 | 03/22/91 | 14.390 | 21.00 | .390 | .140 |
| 226 | P.S. Enterprise | 226.00 | 03/22/91 | 20.440 | 27.00 | .530 | .130 |
| 227 | Pub. Serv. N.H. | 227.00 | 03/22/91 | . | 3.40 | . | . |
| 228 | Rocheser G . & | 228.00 | 03/22/91 | 18.420 | 19.00 | .405 | .120 |
| 229 | Scana Corp | 229.00 | 03/22/91 | 23.450 | 36.00 | .630 | .140 |
| 230 | Southern Co. | 230.00 | 03/22/91 | 21.490 | 28.00 | .535 | .125 |
| 231 | Teco Energy, In | 231.00 | 03/22/91 | 14.610 | 32.00 | .405 | .165 |
| 232 | United Illum. | 232.00 | 03/22/91 | 27.350 | 33.00 | .610 | .130 |
| 233 | Cipsco, Inc. | 233.00 | 01/18/91 | 17.650 | 22.00 | .460 | .135 |
| 234 | Cms Energy Corp | 234.00 | 01/18/91 | 26.500 | 27.00 | .120 | .105 |
| 235 | Centerior Energ | 235.00 | 01/18/91 | 20.100 | 18.00 | .400 | .105 |
| 236 | Central & S.W | 236.00 | 01/18/91 | 29.150 | 43.00 | .690 | .135 |
| 237 | Central LA. El | 237.00 | 01/18/91 | 28.550 | 36.00 | .640 | .120 |
| 238 | Cilcorp, Inc. | 238.00 | 01/18/91 | 26.000 | 32.00 | .615 | .125 |
| 239 | Cicinnati G&E | 239.00 | 01/18/91 | 26.250 | 29.00 | .600 | .165 |
| 240 | Commonw. Ed. | 240.00 | 01/18/91 | 31.850 | 35.00 | .750 | .135 |
| 241 | Dpl Inc. | 241.00 | 01/18/91 | 15.450 | 19.00 | .390 | .140 |
| 242 | Detroit Edison | 242.00 | 01/18/91 | 17.600 | 28.00 | .445 | .155 |
| 243 | El Paso Elec. | 243.00 | 01/18/91 | 10.950 | 3.80 | .000 | .130 |
| 244 | Empire District | 244.00 | 01/18/91 | 23.300 | 30.00 | .605 | .130 |
| 245 | Entergy Corp. | 245.00 | 01/18/91 | 22.450 | 22.00 | .300 | .120 |
| 246 | Gulf St. Utils. | 246.00 | 01/18/91 | 18.150 | 11.00 | .000 | .080 |
| 247 | Houston Inds. | 247.00 | 01/18/91 | 28.950 | 36.00 | .740 | .135 |
| 248 | Ie Industries | 248.00 | 01/18/91 | 21.850 | 27.00 | .525 | .130 |
| 249 | Illinois Power | 249.00 | 01/18/91 | 20.950 | 16.00 | .000 | .100 |
| 250 | Interstate Pwr. | 250.00 | 01/18/91 | 19.950 | 26.00 | .500 | .135 |
| 251 | Iowa-Ill G. & E | 251.00 | 01/18/91 | 16.350 | 21.00 | .418 | .125 |
| 252 | Iowa Southern | 252.00 | 01/18/91 | 24.200 | 33.00 | .570 | .130 |
| 253 | Ipalco Enterpri | 253.00 | 01/18/91 | 19.600 | 26.00 | .450 | .130 |
| 254 | Kansas City Pwr | 254.00 | 01/18/91 | 27.350 | 35.00 | .670 | .140 |
| 255 | Kansas G. & E. | 255.00 | 01/18/91 | 19.700 | 27.00 | .430 | .125 |
| 256 | Kansas P. & L. | 256.00 | 01/18/91 | 18.250 | 21.00 | .450 | .125 |

| | comeq | afcpft | acteps | tres1yr | tres5yr | tres30yr | pricebk | anndiv |
|---|---|---|---|---|---|---|---|---|
| 225 | .466 | .160 | 1.62 | .06 | .08 | .08 | 1.46 | 1.56 |
| 226 | .464 | .087 | 2.56 | .06 | .08 | .08 | 1.32 | 2.12 |
| 227 | . | . | . | .06 | .08 | .08 | . | . |
| 228 | .414 | .090 | 1.72 | .06 | .08 | .08 | 1.03 | 1.62 |
| 229 | .455 | .050 | 3.31 | .06 | .08 | .08 | 1.54 | 2.52 |
| 230 | .409 | .160 | 2.60 | .06 | .08 | .08 | 1.30 | 2.14 |
| 231 | .504 | .005 | 2.45 | .06 | .08 | .08 | 2.19 | 1.62 |
| 232 | .262 | .064 | 3.55 | .06 | .08 | .08 | 1.21 | 2.44 |
| 233 | .505 | .015 | 2.00 | .07 | .08 | .08 | 1.25 | 1.84 |
| 234 | .380 | .120 | 3.80 | .07 | .08 | .08 | 1.02 | .48 |
| 235 | .385 | .690 | 1.70 | .07 | .08 | .08 | .90 | 1.60 |
| 236 | .480 | .015 | 3.75 | .07 | .08 | .08 | 1.48 | 2.76 |
| 237 | .495 | .020 | 3.60 | .07 | .08 | .08 | 1.26 | 2.56 |
| 238 | .455 | .008 | 2.85 | .07 | .08 | .08 | 1.23 | 2.46 |
| 239 | .435 | .560 | 4.10 | .07 | .08 | .08 | 1.10 | 2.40 |
| 240 | .470 | .075 | 2.40 | .07 | .08 | .08 | 1.10 | 3.00 |
| 241 | .485 | .600 | 2.20 | .07 | .08 | .08 | 1.23 | 1.56 |
| 242 | .320 | .210 | 3.25 | .07 | .08 | .08 | 1.59 | 1.78 |
| 243 | .290 | .000 | -.50 | .07 | .08 | .08 | .35 | . |
| 244 | .495 | .090 | 2.65 | .07 | .08 | .08 | 1.29 | 2.42 |
| 245 | .375 | .280 | 2.30 | .07 | .08 | .08 | .98 | 1.20 |
| 246 | .400 | .500 | .65 | .07 | .08 | .08 | .61 | . |
| 247 | .410 | .125 | 2.80 | .07 | .08 | .08 | 1.24 | 2.96 |
| 248 | .435 | .105 | 1.75 | .07 | .08 | .08 | 1.24 | 2.10 |
| 249 | .380 | .040 | .50 | .07 | .08 | .08 | .76 | . |
| 250 | .450 | .050 | 2.50 | .07 | .08 | .08 | 1.30 | 2.00 |
| 251 | .455 | .050 | 1.85 | .07 | .08 | .08 | 1.28 | 1.67 |
| 252 | .570 | .030 | 3.35 | .07 | .08 | .08 | 1.36 | 2.28 |
| 253 | .555 | .020 | 2.55 | .07 | .08 | .08 | 1.33 | 1.80 |
| 254 | .465 | .025 | 2.95 | .07 | .08 | .08 | 1.28 | 2.68 |
| 255 | .460 | .000 | 2.05 | .07 | .08 | .08 | 1.37 | 1.72 |
| 256 | .495 | .015 | 2.25 | .07 | .08 | .08 | 1.15 | 1.80 |

| | actpo | sustpo | sustbr | divyld | divtobk | dcfcost | ratiofc | futm1yrt |
|---|---|---|---|---|---|---|---|---|
| 225 | .963 | .774 | .0316 | .0743 | .1084 | .1059 | 1.32 | .0751 |
| 226 | .828 | .798 | .0263 | .0785 | .1037 | .1048 | 1.24 | .0651 |
| 227 | . | . | . | . | . | . | . | . |
| 228 | .942 | .733 | .0321 | .0853 | .0879 | .1173 | 1.02 | .0551 |
| 229 | .761 | .768 | .0325 | .0700 | .1075 | .1025 | 1.37 | .0751 |
| 230 | .823 | .797 | .0254 | .0764 | .0996 | .1018 | 1.23 | .0601 |
| 231 | .661 | .672 | .0541 | .0506 | .1109 | .1047 | 1.58 | .1001 |
| 232 | .687 | .686 | .0408 | .0739 | .0892 | .1147 | 1.13 | .0651 |
| 233 | .920 | .772 | .0308 | .0836 | .1042 | .1144 | 1.18 | .0620 |
| 234 | .126 | .173 | .0869 | .0178 | .0181 | .1047 | 1.00 | .0320 |
| 235 | .941 | .758 | .0254 | .0889 | .0796 | .1143 | .92 | .0320 |
| 236 | .736 | .701 | .0403 | .0642 | .0947 | .1045 | 1.29 | .0620 |
| 237 | .711 | .747 | .0303 | .0711 | .0897 | .1014 | 1.18 | .0470 |
| 238 | .863 | .757 | .0304 | .0769 | .0946 | .1073 | 1.17 | .0520 |
| 239 | .585 | .554 | .0736 | .0828 | .0914 | .1563 | 1.06 | .0920 |
| 240 | 1.250 | .698 | .0408 | .0857 | .0942 | .1265 | 1.07 | .0620 |
| 241 | .709 | .721 | .0390 | .0821 | .1010 | .1211 | 1.16 | .0670 |
| 242 | .548 | .652 | .0539 | .0636 | .1011 | .1174 | 1.32 | .0820 |
| 243 | . | . | . | . | . | . | . | .0570 |
| 244 | .913 | .799 | .0261 | .0807 | .1039 | .1068 | 1.22 | .0570 |
| 245 | .522 | .445 | .0665 | .0545 | .0535 | .1211 | .99 | .0470 |
| 246 | . | . | . | . | . | . | . | .0070 |
| 247 | 1.057 | .757 | .0328 | .0822 | .1022 | .1150 | 1.17 | .0620 |
| 248 | 1.200 | .739 | .0339 | .0778 | .0961 | .1117 | 1.16 | .0570 |
| 249 | . | . | . | . | . | . | . | .0270 |
| 250 | .800 | .743 | .0347 | .0769 | .1003 | .1117 | 1.21 | .0620 |
| 251 | .904 | .818 | .0227 | .0796 | .1023 | .1024 | 1.22 | .0520 |
| 252 | .681 | .725 | .0358 | .0691 | .0942 | .1049 | 1.24 | .0570 |
| 253 | .706 | .706 | .0382 | .0692 | .0918 | .1074 | 1.21 | .0570 |
| 254 | .908 | .700 | .0420 | .0766 | .0980 | .1186 | 1.18 | .0670 |
| 255 | .839 | .698 | .0377 | .0637 | .0873 | .1014 | 1.23 | .0520 |
| 256 | .800 | .789 | .0264 | .0857 | .0986 | .1121 | 1.12 | .0520 |

| | futm5yrt | futm30yt | premcor | precor5y | yldcrv | ln30yrt | beta | sv |
|---|---|---|---|---|---|---|---|---|
| 225 | .0616 | .0568 | -.037 | .028 | 1.06 | -2.49 | .65 | .0047 |
| 226 | .0516 | .0468 | -.037 | .028 | 1.06 | -2.49 | .75 | .0024 |
| 227 | . | . | -.037 | .028 | 1.06 | -2.49 | .75 | . |
| 228 | .0415 | .0368 | -.037 | .028 | 1.06 | -2.49 | .70 | .0006 |
| 229 | .0616 | .0568 | -.037 | .028 | 1.06 | -2.49 | .65 | .0000 |
| 230 | .0466 | .0418 | -.037 | .028 | 1.06 | -2.49 | .70 | .0000 |
| 231 | .0866 | .0818 | -.037 | .028 | 1.06 | -2.49 | .60 | .0017 |
| 232 | .0516 | .0468 | -.037 | .028 | 1.06 | -2.49 | .70 | .0037 |
| 233 | .0579 | .0534 | -.038 | .027 | 1.06 | -2.51 | .65 | .0000 |
| 234 | .0279 | .0234 | -.038 | .027 | 1.06 | -2.51 | .95 | -.0002 |
| 235 | .0279 | .0234 | -.038 | .027 | 1.06 | -2.51 | .70 | .0000 |
| 236 | .0579 | .0534 | -.038 | .027 | 1.06 | -2.51 | .70 | .0009 |
| 237 | .0429 | .0384 | -.038 | .027 | 1.06 | -2.51 | .60 | .0002 |
| 238 | .0479 | .0434 | -.038 | .027 | 1.06 | -2.51 | .65 | .0011 |
| 239 | .0879 | .0834 | -.038 | .027 | 1.06 | -2.51 | .70 | .0015 |
| 240 | .0579 | .0534 | -.038 | .027 | 1.06 | -2.51 | .80 | .0002 |
| 241 | .0629 | .0584 | -.038 | .027 | 1.06 | -2.51 | .65 | .0021 |
| 242 | .0779 | .0734 | -.038 | .027 | 1.06 | -2.51 | .70 | .0001 |
| 243 | .0529 | .0484 | -.038 | .027 | 1.06 | -2.51 | .65 | -.0029 |
| 244 | .0529 | .0484 | -.038 | .027 | 1.06 | -2.51 | .45 | .0039 |
| 245 | .0429 | .0384 | -.038 | .027 | 1.06 | -2.51 | .80 | .0002 |
| 246 | .0029 | -.0016 | -.038 | .027 | 1.06 | -2.51 | .80 | .0000 |
| 247 | .0579 | .0534 | -.038 | .027 | 1.06 | -2.51 | .75 | .0015 |
| 248 | .0529 | .0484 | -.038 | .027 | 1.06 | -2.51 | .65 | .0045 |
| 249 | .0229 | .0184 | -.038 | .027 | 1.06 | -2.51 | .60 | .0000 |
| 250 | .0579 | .0534 | -.038 | .027 | 1.06 | -2.51 | .65 | .0000 |
| 251 | .0479 | .0434 | -.038 | .027 | 1.06 | -2.51 | .60 | .0000 |
| 252 | .0529 | .0484 | -.038 | .027 | 1.06 | -2.51 | .60 | .0004 |
| 253 | .0529 | .0484 | -.038 | .027 | 1.06 | -2.51 | .70 | .0000 |
| 254 | .0629 | .0584 | -.038 | .027 | 1.06 | -2.51 | .60 | .0000 |
| 255 | .0479 | .0434 | -.038 | .027 | 1.06 | -2.51 | .65 | .0000 |
| 256 | .0479 | .0434 | -.038 | .027 | 1.06 | -2.51 | .70 | .0017 |

| | name | recordno | date | book | price | qdiv | futroe |
|---|---|---|---|---|---|---|---|
| 257 | Kentucky Utils. | 257.00 | 01/18/91 | 14.500 | 21.00 | .365 | .140 |
| 258 | Lg&e Energy Cor | 258.00 | 01/18/91 | 30.050 | 39.00 | .710 | .115 |
| 259 | Mdu Resources | 259.00 | 01/18/91 | 15.500 | 20.00 | .355 | .135 |
| 260 | Midwest Energy | 260.00 | 01/18/91 | 12.600 | 18.00 | .390 | .145 |
| 261 | Minnesota Pwr. | 261.00 | 01/18/91 | 16.500 | 26.00 | .465 | .150 |
| 262 | Nipsco Industri | 262.00 | 01/18/91 | 14.600 | 19.00 | .290 | .135 |
| 263 | Nothern States | 263.00 | 01/18/91 | 24.300 | 33.00 | .580 | .125 |
| 264 | Northwestern P. | 264.00 | 01/18/91 | 13.400 | 20.00 | .380 | .140 |
| 265 | Ohio Edison | 265.00 | 01/18/91 | 16.800 | 17.00 | .375 | .105 |
| 266 | Oklahoma G. & E | 266.00 | 01/18/91 | 21.900 | 37.00 | .645 | .150 |
| 267 | Otter Tail Pwr. | 267.00 | 01/18/91 | 13.900 | 25.00 | .390 | .145 |
| 268 | Psi Resources I | 268.00 | 01/18/91 | 11.600 | 16.00 | .220 | .155 |
| 269 | St. Joe L. & P. | 269.00 | 01/18/91 | 17.250 | 28.00 | .400 | .155 |
| 270 | So. Ind. G. & E | 270.00 | 01/18/91 | 21.000 | 32.00 | .475 | .135 |
| 271 | S.W. Pub. Serv. | 271.00 | 01/18/91 | 16.040 | 28.00 | .550 | .160 |
| 272 | Tnp Enterprises | 272.00 | 01/18/91 | 20.100 | 20.00 | .407 | .125 |
| 273 | Texas Utilities | 273.00 | 01/18/91 | 36.300 | 36.00 | .740 | .125 |
| 274 | Union Electric | 274.00 | 01/18/91 | 19.850 | 29.00 | .540 | .140 |
| 275 | Utilicorp Utd | 275.00 | 01/18/91 | 17.250 | 20.00 | .380 | .120 |
| 276 | Wpl Holdings | 276.00 | 01/18/91 | 16.400 | 24.00 | .435 | .135 |
| 277 | Wisconsin Energ | 277.00 | 01/18/91 | 20.500 | 31.00 | .440 | .135 |
| 278 | Wisconsin P.S. | 278.00 | 01/18/91 | 16.650 | 23.00 | .415 | .135 |
| 279 | Hawaiian Elec. | 279.00 | 03/01/91 | 22.750 | 33.00 | .550 | .120 |
| 280 | Idaho Power | 280.00 | 03/01/91 | 17.400 | 26.00 | .465 | .130 |
| 281 | Montana Power | 281.00 | 03/01/91 | 16.600 | 21.00 | .370 | .120 |
| 282 | Nevada Power | 282.00 | 03/01/91 | 14.200 | 22.00 | .400 | .130 |
| 283 | Pacific G. & E. | 283.00 | 03/01/91 | 18.000 | 25.00 | .410 | .125 |
| 284 | Pacificorp | 284.00 | 03/01/91 | 12.750 | 22.00 | .360 | .135 |
| 285 | Pinnacle West | 285.00 | 03/01/91 | 17.400 | 12.00 | .000 | .110 |
| 286 | Portland Genera | 286.00 | 03/01/91 | 17.500 | 18.00 | .300 | .110 |
| 287 | P.S. Of Colorad | 287.00 | 03/01/91 | 17.700 | 22.00 | .500 | .135 |
| 288 | P.s. N. Mexico | 288.00 | 03/01/91 | 17.800 | 9.30 | .000 | .120 |

| | comeq | afcpft | acteps | tres1yr | tres5yr | tres30yr | pricebk | anndiv |
|---|---|---|---|---|---|---|---|---|
| 257 | .540 | .000 | 2.00 | .07 | .08 | .08 | 1.45 | 1.46 |
| 258 | .445 | .000 | 3.35 | .07 | .08 | .08 | 1.30 | 2.84 |
| 259 | .550 | .000 | 1.75 | .07 | .08 | .08 | 1.29 | 1.42 |
| 260 | .435 | .070 | 1.40 | .07 | .08 | .08 | 1.43 | 1.56 |
| 261 | .490 | .010 | 2.10 | .07 | .08 | .08 | 1.58 | 1.86 |
| 262 | .420 | .010 | 1.80 | .07 | .08 | .08 | 1.30 | 1.16 |
| 263 | .490 | .030 | 2.85 | .07 | .08 | .08 | 1.36 | 2.32 |
| 264 | .550 | .000 | 1.70 | .07 | .08 | .08 | 1.49 | 1.52 |
| 265 | .425 | .030 | 1.70 | .07 | .08 | .08 | 1.01 | 1.50 |
| 266 | .495 | .030 | 3.40 | .07 | .08 | .08 | 1.69 | 2.58 |
| 267 | .465 | .015 | 2.00 | .07 | .08 | .08 | 1.80 | 1.56 |
| 268 | .440 | .030 | 2.15 | .07 | .08 | .08 | 1.38 | .88 |
| 269 | .620 | .035 | 2.45 | .07 | .08 | .08 | 1.62 | 1.60 |
| 270 | .510 | .060 | 3.05 | .07 | .08 | .08 | 1.52 | 1.90 |
| 271 | .514 | .014 | 2.38 | .07 | .08 | .08 | 1.75 | 2.20 |
| 272 | .580 | .600 | 1.90 | .07 | .08 | .08 | 1.00 | 1.63 |
| 273 | .465 | .530 | 4.65 | .07 | .08 | .08 | .99 | 2.96 |
| 274 | .475 | .010 | 2.80 | .07 | .08 | .08 | 1.46 | 2.16 |
| 275 | .385 | .039 | 1.70 | .07 | .08 | .08 | 1.16 | 1.52 |
| 276 | .510 | .025 | 2.25 | .07 | .08 | .08 | 1.46 | 1.74 |
| 277 | .560 | .060 | 2.75 | .07 | .08 | .08 | 1.51 | 1.76 |
| 278 | .565 | .020 | 2.00 | .07 | .08 | .08 | 1.38 | 1.66 |
| 279 | .485 | .130 | 2.02 | .07 | .08 | .08 | 1.45 | 2.20 |
| 280 | .490 | .030 | 1.91 | .07 | .08 | .08 | 1.49 | 1.86 |
| 281 | .560 | .020 | 1.84 | .07 | .08 | .08 | 1.27 | 1.48 |
| 282 | .430 | .190 | 1.60 | .07 | .08 | .08 | 1.55 | 1.60 |
| 283 | .455 | .050 | 2.25 | .07 | .08 | .08 | 1.39 | 1.64 |
| 284 | .445 | .080 | 1.85 | .07 | .08 | .08 | 1.73 | 1.44 |
| 285 | .285 | .160 | .81 | .07 | .08 | .08 | .69 | . |
| 286 | .455 | .020 | 1.82 | .07 | .08 | .08 | 1.03 | 1.20 |
| 287 | .460 | .040 | 2.49 | .07 | .08 | .08 | 1.24 | 2.00 |
| 288 | .460 | .170 | .32 | .07 | .08 | .08 | .52 | . |

| | actpo | sustpo | sustbr | divyld | divtobk | dcfcost | ratiofc | futm1yrt |
|---|---|---|---|---|---|---|---|---|
| 257 | .730 | .719 | .0393 | .0695 | .1007 | .1088 | 1.29 | .0670 |
| 258 | .848 | .822 | .0205 | .0728 | .0945 | .0933 | 1.23 | .0420 |
| 259 | .811 | .679 | .0434 | .0710 | .0916 | .1144 | 1.18 | .0620 |
| 260 | 1.114 | .854 | .0212 | .0867 | .1238 | .1079 | 1.34 | .0720 |
| 261 | .886 | .752 | .0373 | .0715 | .1127 | .1088 | 1.38 | .0770 |
| 262 | .644 | .589 | .0555 | .0611 | .0795 | .1166 | 1.16 | .0620 |
| 263 | .814 | .764 | .0295 | .0703 | .0955 | .0998 | 1.25 | .0520 |
| 264 | .894 | .810 | .0266 | .0760 | .1134 | .1026 | 1.36 | .0670 |
| 265 | .882 | .850 | .0157 | .0882 | .0893 | .1040 | 1.01 | .0320 |
| 266 | .759 | .785 | .0322 | .0697 | .1178 | .1019 | 1.47 | .0770 |
| 267 | .780 | .774 | .0328 | .0624 | .1122 | .0952 | 1.52 | .0720 |
| 268 | .409 | .489 | .0791 | .0550 | .0759 | .1341 | 1.16 | .0820 |
| 269 | .653 | .598 | .0622 | .0571 | .0928 | .1194 | 1.30 | .0820 |
| 270 | .623 | .670 | .0445 | .0594 | .0905 | .1039 | 1.30 | .0620 |
| 271 | .924 | .857 | .0228 | .0786 | .1372 | .1014 | 1.58 | .0870 |
| 272 | .857 | .648 | .0440 | .0814 | .0810 | .1254 | 1.00 | .0520 |
| 273 | .637 | .652 | .0435 | .0822 | .0815 | .1257 | .99 | .0520 |
| 274 | .771 | .777 | .0312 | .0745 | .1088 | .1057 | 1.32 | .0670 |
| 275 | .894 | .734 | .0319 | .0760 | .0881 | .1079 | 1.11 | .0470 |
| 276 | .773 | .786 | .0289 | .0725 | .1061 | .1014 | 1.33 | .0620 |
| 277 | .640 | .636 | .0491 | .0568 | .0859 | .1059 | 1.27 | .0620 |
| 278 | .830 | .739 | .0353 | .0722 | .0997 | .1075 | 1.26 | .0620 |
| 279 | 1.089 | .806 | .0233 | .0667 | .0967 | .0900 | 1.33 | .0531 |
| 280 | .974 | .822 | .0231 | .0715 | .1069 | .0946 | 1.37 | .0631 |
| 281 | .804 | .743 | .0308 | .0705 | .0892 | .1013 | 1.18 | .0531 |
| 282 | 1.000 | .867 | .0173 | .0727 | .1127 | .0901 | 1.44 | .0631 |
| 283 | .729 | .729 | .0339 | .0656 | .0911 | .0995 | 1.26 | .0581 |
| 284 | .778 | .837 | .0221 | .0655 | .1129 | .0875 | 1.54 | .0681 |
| 285 | . | . | . | . | . | . | . | .0431 |
| 286 | .659 | .623 | .0414 | .0667 | .0686 | .1081 | 1.02 | .0431 |
| 287 | .803 | .837 | .0220 | .0909 | .1130 | .1129 | 1.20 | .0681 |
| 288 | . | . | . | . | . | . | . | .0531 |

| | futm5yrt | futm30yt | premcor | precor5y | yldcrv | ln30yrt | beta | sv |
|---|---|---|---|---|---|---|---|---|
| 257 | .0629 | .0584 | -.038 | .027 | 1.06 | -2.51 | .60 | .0000 |
| 258 | .0379 | .0334 | -.038 | .027 | 1.06 | -2.51 | .65 | .0001 |
| 259 | .0579 | .0534 | -.038 | .027 | 1.06 | -2.51 | .70 | .0000 |
| 260 | .0679 | .0634 | -.038 | .027 | 1.06 | -2.51 | . | .0000 |
| 261 | .0729 | .0684 | -.038 | .027 | 1.06 | -2.51 | .70 | -.0014 |
| 262 | .0579 | .0534 | -.038 | .027 | 1.06 | -2.51 | .80 | -.0022 |
| 263 | .0479 | .0434 | -.038 | .027 | 1.06 | -2.51 | .75 | -.0015 |
| 264 | .0629 | .0584 | -.038 | .027 | 1.06 | -2.51 | .70 | .0000 |
| 265 | .0279 | .0234 | -.038 | .027 | 1.06 | -2.51 | .80 | .0000 |
| 266 | .0729 | .0684 | -.038 | .027 | 1.06 | -2.51 | .65 | .0000 |
| 267 | .0679 | .0634 | -.038 | .027 | 1.06 | -2.51 | .65 | -.0014 |
| 268 | .0779 | .0734 | -.038 | .027 | 1.06 | -2.51 | .85 | .0223 |
| 269 | .0779 | .0734 | -.038 | .027 | 1.06 | -2.51 | .55 | -.0133 |
| 270 | .0579 | .0534 | -.038 | .027 | 1.06 | -2.51 | .55 | .0018 |
| 271 | .0829 | .0784 | -.038 | .027 | 1.06 | -2.51 | .70 | .0010 |
| 272 | .0479 | .0434 | -.038 | .027 | 1.06 | -2.51 | .60 | -.0005 |
| 273 | .0479 | .0434 | -.038 | .027 | 1.06 | -2.51 | .70 | -.0001 |
| 274 | .0629 | .0584 | -.038 | .027 | 1.06 | -2.51 | .75 | .0000 |
| 275 | .0429 | .0384 | -.038 | .027 | 1.06 | -2.51 | .70 | .0062 |
| 276 | .0579 | .0534 | -.038 | .027 | 1.06 | -2.51 | .60 | .0012 |
| 277 | .0579 | .0534 | -.038 | .027 | 1.06 | -2.51 | .65 | .0000 |
| 278 | .0579 | .0534 | -.038 | .027 | 1.06 | -2.51 | .60 | .0066 |
| 279 | .0419 | .0372 | -.037 | .028 | 1.06 | -2.49 | .65 | .0194 |
| 280 | .0519 | .0472 | -.037 | .028 | 1.06 | -2.49 | .65 | .0000 |
| 281 | .0419 | .0372 | -.037 | .028 | 1.06 | -2.49 | .65 | .0036 |
| 282 | .0519 | .0472 | -.037 | .028 | 1.06 | -2.49 | .60 | .0420 |
| 283 | .0469 | .0422 | -.037 | .028 | 1.06 | -2.49 | .70 | .0040 |
| 284 | .0569 | .0522 | -.037 | .028 | 1.06 | -2.49 | .70 | .0084 |
| 285 | .0319 | .0272 | -.037 | .028 | 1.06 | -2.49 | .85 | -.0035 |
| 286 | .0319 | .0272 | -.037 | .028 | 1.06 | -2.49 | .70 | .0000 |
| 287 | .0569 | .0522 | -.037 | .028 | 1.06 | -2.49 | .65 | .0037 |
| 288 | .0419 | .0372 | -.037 | .028 | 1.06 | -2.49 | .70 | -.0018 |

| | dcfsv | dcfvle | dcfvld | dcfvlb | dcfvla3 | dcfcat80 |
|---|---|---|---|---|---|---|
| 257 | .1088 | .110 | .105 | .115 | .110 | .1088 |
| 258 | .0935 | .088 | .093 | .098 | .093 | .0933 |
| 259 | .1144 | .131 | .111 | .101 | .114 | .1144 |
| 260 | .1079 | .087 | .087 | .087 | .087 | .1079 |
| 261 | .1074 | .117 | .112 | .092 | .107 | .1088 |
| 262 | .1144 | .061 | .061 | .106 | .076 | .1166 |
| 263 | .0983 | .090 | .105 | .105 | .100 | .0998 |
| 264 | .1026 | .101 | .111 | .111 | .108 | .1026 |
| 265 | .1040 | .083 | .053 | .098 | .078 | .1040 |
| 266 | .1019 | .110 | .110 | .100 | .106 | .1019 |
| 267 | .0937 | .102 | .087 | .092 | .094 | .0952 |
| 268 | .1564 | .070 | .055 | .165 | .097 | . |
| 269 | .1061 | .117 | .112 | .107 | .112 | . |
| 270 | .1057 | .094 | .109 | .109 | .104 | .1039 |
| 271 | .1024 | .104 | .099 | .099 | .100 | .1014 |
| 272 | .1249 | .121 | .121 | .101 | .115 | . |
| 273 | .1256 | .092 | .102 | .092 | .096 | . |
| 274 | .1057 | .104 | .109 | .114 | .109 | .1057 |
| 275 | .1141 | .156 | .156 | .151 | .154 | .1079 |
| 276 | .1026 | .108 | .108 | .098 | .104 | .1014 |
| 277 | .1059 | .092 | .122 | .117 | .110 | .1059 |
| 278 | .1141 | .107 | .102 | .102 | .104 | .1075 |
| 279 | .1094 | .097 | .107 | .112 | .105 | . |
| 280 | .0946 | .137 | .097 | .087 | .107 | .0946 |
| 281 | .1050 | .135 | .100 | .075 | .104 | .1013 |
| 282 | .1320 | .123 | .098 | .123 | .114 | . |
| 283 | .1035 | .116 | .111 | .091 | .106 | .0995 |
| 284 | .0959 | .110 | .105 | .115 | .110 | . |
| 285 | . | . | . | . | . | . |
| 286 | .1081 | .102 | .022 | .082 | .068 | .1081 |
| 287 | .1166 | .106 | .111 | .141 | .119 | .1129 |
| 288 | . | . | . | . | . | . |

| | name | recordno | date | book | price | qdiv | futroe |
|---|---|---|---|---|---|---|---|
| 289 | Puget Sound P & | 289.00 | 03/01/91 | 16.520 | 22.00 | .440 | .130 |
| 290 | SceCorp | 290.00 | 03/01/91 | 25.200 | 39.00 | .660 | .140 |
| 291 | San Diego G. & | 291.00 | 03/01/91 | 23.290 | 44.00 | .675 | .140 |
| 292 | Sierra Pacific | 292.00 | 03/01/91 | 16.440 | 22.00 | .460 | .115 |
| 293 | Tucson Elec. Pw | 293.00 | 03/01/91 | 22.000 | 7.00 | .000 | .000 |
| 294 | Washington Wtr. | 294.00 | 03/01/91 | 21.680 | 30.00 | .620 | .130 |
| 295 | Allegheny Power | 295.00 | 03/20/92 | 31.200 | 42.00 | .800 | .110 |
| 296 | Amer. Elec. Pwr | 296.00 | 03/20/92 | 22.800 | 31.00 | .600 | .150 |
| 297 | Atlantic Energy | 297.00 | 03/20/92 | 29.250 | 41.00 | .750 | .125 |
| 298 | Boltimore G.&E. | 298.00 | 03/20/92 | 17.000 | 21.00 | .350 | .125 |
| 299 | Boston Edison | 299.00 | 03/20/92 | 17.920 | 23.00 | .410 | .120 |
| 300 | Carolina Power | 300.00 | 03/20/92 | 29.750 | 52.00 | .790 | .140 |
| 301 | Central Hudson | 301.00 | 03/20/92 | 22.840 | 27.00 | .480 | .115 |
| 302 | Central Maine | 302.00 | 03/20/92 | 16.250 | 21.00 | .390 | .130 |
| 303 | Cent. Vermont P | 303.00 | 03/20/92 | 21.100 | 31.00 | .520 | .125 |
| 304 | Com'w'th Energy | 304.00 | 03/20/92 | 30.000 | 39.00 | .730 | .115 |
| 305 | Con. Edison | 305.00 | 03/20/92 | 20.200 | 27.00 | .475 | .130 |
| 306 | Dqe | 306.00 | 03/20/92 | 21.000 | 29.00 | .380 | .115 |
| 307 | Delmarva Power | 307.00 | 03/20/92 | 13.150 | 21.00 | .385 | .125 |
| 308 | Dominion Res. | 308.00 | 03/20/92 | 24.410 | 35.00 | .595 | .125 |
| 309 | Duke Power | 309.00 | 03/20/92 | 19.860 | 32.00 | .430 | .130 |
| 310 | Eastern Utils. | 310.00 | 03/20/92 | 14.770 | 21.00 | .340 | .135 |
| 311 | Fpl Group, Inc. | 311.00 | 03/20/92 | 19.640 | 33.00 | .600 | .130 |
| 312 | Florida Progres | 312.00 | 03/20/92 | 28.720 | 43.00 | .710 | .140 |
| 313 | Gen. Pub. Util. | 313.00 | 03/20/92 | 20.850 | 26.00 | .375 | .130 |
| 314 | Green Mtn. Powe | 314.00 | 03/20/92 | 20.350 | 30.00 | .515 | .120 |
| 315 | L.I. Lighting | 315.00 | 03/20/92 | 19.130 | 23.00 | .425 | .120 |
| 316 | New England EL. | 316.00 | 03/20/92 | 22.200 | 30.00 | .520 | .125 |
| 317 | N.Y. State E. & | 317.00 | 03/20/92 | 22.150 | 27.00 | .530 | .115 |
| 318 | Niagara Mohawk | 318.00 | 03/20/92 | 15.540 | 18.00 | .160 | .120 |
| 319 | N.E. Utilities | 319.00 | 03/20/92 | 15.730 | 23.00 | .440 | .135 |
| 320 | Orange & R'KL'D | 320.00 | 03/20/92 | 26.330 | 35.00 | .600 | .120 |

| | comeq | afcpft | acteps | tres1yr | tres5yr | tres30yr | pricebk | anndiv |
|---|---|---|---|---|---|---|---|---|
| 289 | .440 | .040 | 2.16 | .07 | .08 | .08 | 1.33 | 1.76 |
| 290 | .470 | .030 | 3.60 | .07 | .08 | .08 | 1.55 | 2.64 |
| 291 | .495 | .060 | 3.37 | .07 | .08 | .08 | 1.89 | 2.70 |
| 292 | .408 | .024 | 1.93 | .07 | .08 | .08 | 1.34 | 1.84 |
| 293 | .290 | . | -2.70 | .07 | .08 | .08 | .32 | . |
| 294 | .423 | .010 | 2.79 | .07 | .08 | .08 | 1.38 | 2.48 |
| 295 | .455 | .037 | 3.61 | .05 | .07 | .08 | 1.35 | 3.20 |
| 296 | .430 | .090 | 2.70 | .05 | .07 | .08 | 1.36 | 2.40 |
| 297 | .465 | .055 | 3.49 | .05 | .07 | .08 | 1.40 | 3.00 |
| 298 | .421 | .160 | 1.52 | .05 | .07 | .08 | 1.24 | 1.40 |
| 299 | .357 | .095 | 1.96 | .05 | .07 | .08 | 1.28 | 1.64 |
| 300 | .443 | .023 | 4.53 | .05 | .07 | .08 | 1.75 | 3.16 |
| 301 | .420 | .051 | 2.40 | .05 | .07 | .08 | 1.18 | 1.92 |
| 302 | .435 | .040 | 1.82 | .05 | .07 | .08 | 1.29 | 1.56 |
| 303 | .469 | .065 | 2.48 | .05 | .07 | .08 | 1.47 | 2.08 |
| 304 | .380 | .040 | 3.30 | .05 | .07 | .08 | 1.30 | 2.92 |
| 305 | .530 | .040 | 2.32 | .05 | .07 | .08 | 1.34 | 1.90 |
| 306 | .403 | .030 | 2.50 | .05 | .07 | .08 | 1.38 | 1.52 |
| 307 | .425 | .100 | 1.44 | .05 | .07 | .08 | 1.60 | 1.54 |
| 308 | .431 | .031 | 2.94 | .05 | .07 | .08 | 1.43 | 2.38 |
| 309 | .510 | .120 | 2.60 | .05 | .07 | .08 | 1.61 | 1.72 |
| 310 | .316 | .079 | 1.58 | .05 | .07 | .08 | 1.42 | 1.36 |
| 311 | .446 | .100 | 2.65 | .05 | .07 | .08 | 1.68 | 2.40 |
| 312 | .467 | .049 | 3.24 | .05 | .07 | .08 | 1.50 | 2.84 |
| 313 | .475 | .055 | 2.52 | .05 | .07 | .08 | 1.25 | 1.50 |
| 314 | .520 | .030 | 2.45 | .05 | .07 | .08 | 1.47 | 2.06 |
| 315 | .273 | .019 | 2.15 | .05 | .07 | .08 | 1.20 | 1.70 |
| 316 | .440 | .020 | 2.77 | .05 | .07 | .08 | 1.35 | 2.08 |
| 317 | .406 | .041 | 2.36 | .05 | .07 | .08 | 1.22 | 2.12 |
| 318 | .356 | .078 | 1.49 | .05 | .07 | .08 | 1.16 | .64 |
| 319 | .356 | .241 | 2.12 | .05 | .07 | .08 | 1.46 | 1.76 |
| 320 | .450 | .033 | 3.12 | .05 | .07 | .08 | 1.33 | 2.40 |

| | actpo | sustpo | sustbr | divyld | divtobk | dcfcost | ratiofc | futm1yrt |
|---|---|---|---|---|---|---|---|---|
| 289 | .815 | .820 | .0235 | .0800 | .1065 | .1035 | 1.26 | .0631 |
| 290 | .733 | .748 | .0352 | .0677 | .1048 | .1029 | 1.36 | .0731 |
| 291 | .801 | .828 | .0241 | .0614 | .1159 | .0854 | 1.64 | .0731 |
| 292 | .953 | .973 | .0031 | .0836 | .1119 | .0867 | 1.33 | .0481 |
| 293 | . | . | . | . | . | . | . | . |
| 294 | .889 | .880 | .0156 | .0827 | .1144 | .0983 | 1.32 | .0631 |
| 295 | .886 | .932 | .0074 | .0762 | .1026 | .0836 | 1.32 | .0614 |
| 296 | .889 | .702 | .0447 | .0774 | .1053 | .1222 | 1.23 | .1014 |
| 297 | .860 | .821 | .0224 | .0732 | .1026 | .0956 | 1.31 | .0764 |
| 298 | .921 | .659 | .0426 | .0667 | .0824 | .1093 | 1.14 | .0764 |
| 299 | .837 | .763 | .0285 | .0713 | .0915 | .0998 | 1.20 | .0714 |
| 300 | .698 | .759 | .0338 | .0608 | .1062 | .0946 | 1.48 | .0914 |
| 301 | .800 | .731 | .0309 | .0711 | .0841 | .1020 | 1.13 | .0664 |
| 302 | .857 | .738 | .0340 | .0743 | .0960 | .1083 | 1.20 | .0814 |
| 303 | .839 | .789 | .0264 | .0671 | .0986 | .0935 | 1.34 | .0764 |
| 304 | .885 | .846 | .0177 | .0749 | .0973 | .0925 | 1.24 | .0664 |
| 305 | .819 | .724 | .0359 | .0704 | .0941 | .1063 | 1.22 | .0814 |
| 306 | .608 | .629 | .0426 | .0524 | .0724 | .0950 | 1.21 | .0664 |
| 307 | 1.069 | .937 | .0079 | .0733 | .1171 | .0812 | 1.54 | .0764 |
| 308 | .810 | .780 | .0275 | .0680 | .0975 | .0955 | 1.31 | .0764 |
| 309 | .662 | .666 | .0434 | .0538 | .0866 | .0971 | 1.34 | .0814 |
| 310 | .861 | .682 | .0429 | .0648 | .0921 | .1077 | 1.25 | .0864 |
| 311 | .906 | .940 | .0078 | .0727 | .1222 | .0805 | 1.61 | .0814 |
| 312 | .877 | .706 | .0411 | .0660 | .0989 | .1072 | 1.31 | .0914 |
| 313 | .595 | .553 | .0581 | .0577 | .0719 | .1158 | 1.12 | .0814 |
| 314 | .841 | .844 | .0188 | .0687 | .1012 | .0874 | 1.37 | .0714 |
| 315 | .791 | .741 | .0311 | .0739 | .0889 | .1050 | 1.14 | .0714 |
| 316 | .751 | .750 | .0313 | .0693 | .0937 | .1006 | 1.24 | .0764 |
| 317 | .898 | .832 | .0193 | .0785 | .0957 | .0978 | 1.18 | .0664 |
| 318 | .430 | .343 | .0788 | .0356 | .0412 | .1144 | 1.05 | .0714 |
| 319 | .830 | .829 | .0231 | .0765 | .1119 | .0996 | 1.35 | .0864 |
| 320 | .769 | .760 | .0288 | .0686 | .0912 | .0974 | 1.23 | .0714 |

| | futm5yrt | futm30yt | premcor | precor5y | yldcrv | ln30yrt | beta | sv |
|---|---|---|---|---|---|---|---|---|
| 289 | .0519 | .0472 | -.037 | .028 | 1.06 | -2.49 | .75 | .0000 |
| 290 | .0619 | .0572 | -.037 | .028 | 1.06 | -2.49 | .75 | .0000 |
| 291 | .0619 | .0572 | -.037 | .028 | 1.06 | -2.49 | .70 | .0000 |
| 292 | .0369 | .0322 | -.037 | .028 | 1.06 | -2.49 | .65 | .0110 |
| 293 | . | . | -.037 | .028 | 1.06 | -2.49 | .65 | -.0026 |
| 294 | .0519 | .0472 | -.037 | .028 | 1.06 | -2.49 | .65 | .0049 |
| 295 | .0386 | .0296 | -.040 | .021 | 1.13 | -2.52 | .60 | .0149 |
| 296 | .0787 | .0696 | -.040 | .021 | 1.13 | -2.52 | .70 | .0001 |
| 297 | .0537 | .0446 | -.040 | .021 | 1.13 | -2.52 | .60 | .0078 |
| 298 | .0537 | .0446 | -.040 | .021 | 1.13 | -2.52 | .65 | .0036 |
| 299 | .0487 | .0396 | -.040 | .021 | 1.13 | -2.52 | .70 | .0062 |
| 300 | .0687 | .0596 | -.040 | .021 | 1.13 | -2.52 | .65 | .0001 |
| 301 | .0437 | .0346 | -.040 | .021 | 1.13 | -2.52 | .55 | .0038 |
| 302 | .0587 | .0496 | -.040 | .021 | 1.13 | -2.52 | .60 | .0034 |
| 303 | .0537 | .0446 | -.040 | .021 | 1.13 | -2.52 | .60 | .0063 |
| 304 | .0437 | .0346 | -.040 | .021 | 1.13 | -2.52 | .65 | .0051 |
| 305 | .0587 | .0496 | -.040 | .021 | 1.13 | -2.52 | .70 | .0004 |
| 306 | .0437 | .0346 | -.040 | .021 | 1.13 | -2.52 | .65 | -.0028 |
| 307 | .0537 | .0446 | -.040 | .021 | 1.13 | -2.52 | .60 | .0038 |
| 308 | .0537 | .0446 | -.040 | .021 | 1.13 | -2.52 | .60 | .0107 |
| 309 | .0587 | .0496 | -.040 | .021 | 1.13 | -2.52 | .65 | .0087 |
| 310 | .0637 | .0546 | -.040 | .021 | 1.13 | -2.52 | .65 | .0122 |
| 311 | .0587 | .0496 | -.040 | .021 | 1.13 | -2.52 | .65 | .0306 |
| 312 | .0687 | .0596 | -.040 | .021 | 1.13 | -2.52 | .65 | .0021 |
| 313 | .0587 | .0496 | -.040 | .021 | 1.13 | -2.52 | .70 | .0058 |
| 314 | .0487 | .0396 | -.040 | .021 | 1.13 | -2.52 | .55 | .0064 |
| 315 | .0487 | .0396 | -.040 | .021 | 1.13 | -2.52 | .85 | .0016 |
| 316 | .0537 | .0446 | -.040 | .021 | 1.13 | -2.52 | .65 | .0069 |
| 317 | .0437 | .0346 | -.040 | .021 | 1.13 | -2.52 | .70 | .0061 |
| 318 | .0487 | .0396 | -.040 | .021 | 1.13 | -2.52 | .75 | .0041 |
| 319 | .0637 | .0546 | -.040 | .021 | 1.13 | -2.52 | .65 | .0060 |
| 320 | .0487 | .0396 | -.040 | .021 | 1.13 | -2.52 | .60 | .0030 |

| | dcfsv | dcfvle | dcfvld | dcfvlb | dcfvla3 | dcfcst80 |
|---|---|---|---|---|---|---|
| 289 | .1035 | .105 | .090 | .105 | .100 | .1035 |
| 290 | .1029 | .103 | .103 | .113 | .106 | .1029 |
| 291 | .0854 | .071 | .081 | .086 | .080 | . |
| 292 | .0977 | .109 | .094 | .094 | .099 | . |
| 293 | . | . | . | . | . | . |
| 294 | .1032 | .113 | .083 | .103 | .099 | .0983 |
| 295 | .0985 | .086 | .086 | .106 | .093 | . |
| 296 | .1223 | .112 | .097 | .102 | .104 | . |
| 297 | .1034 | .098 | .093 | .098 | .097 | .0956 |
| 298 | .1129 | .137 | .112 | .102 | .117 | .1093 |
| 299 | .1060 | .121 | .101 | .096 | .106 | .0998 |
| 300 | .0946 | .091 | .091 | .101 | .094 | .0946 |
| 301 | .1058 | .111 | .101 | .101 | .104 | .1020 |
| 302 | .1117 | .114 | .099 | .099 | .104 | .1083 |
| 303 | .0998 | .087 | .087 | .092 | .089 | .0935 |
| 304 | .0977 | .095 | .095 | .085 | .092 | .0925 |
| 305 | .1067 | .100 | .100 | .095 | .099 | .1063 |
| 306 | .0922 | .102 | .102 | .097 | .101 | .0950 |
| 307 | .0850 | .108 | .098 | .098 | .102 | . |
| 308 | .1062 | .088 | .103 | .088 | .093 | .0955 |
| 309 | .1059 | .104 | .114 | .109 | .109 | .0971 |
| 310 | .1199 | .085 | -.005 | .055 | .045 | .1077 |
| 311 | .1112 | .073 | .093 | .068 | .078 | . |
| 312 | .1093 | .121 | .101 | .101 | .108 | .1072 |
| 313 | .1215 | .103 | .198 | .103 | .134 | .1158 |
| 314 | .0938 | .094 | .089 | .104 | .095 | . |
| 315 | .1067 | .124 | .074 | .109 | .102 | .1050 |
| 316 | .1075 | .114 | .084 | .099 | .099 | .1006 |
| 317 | .1039 | .099 | .099 | .099 | .099 | .0978 |
| 318 | .1184 | .161 | .036 | .071 | .089 | .1144 |
| 319 | .1056 | .127 | .087 | .102 | .105 | .0996 |
| 320 | .1004 | .109 | .099 | .104 | .104 | .0974 |

| | name | recordno | date | book | price | qdiv | futroe |
|---|---|---|---|---|---|---|---|
| 321 | Penna. P. & L. | 321.00 | 03/20/92 | 15.150 | 25.00 | .400 | .125 |
| 322 | Phila. Electric | 322.00 | 03/20/92 | 17.690 | 24.00 | .325 | .125 |
| 323 | Potomac EL. Pwr | 323.00 | 03/20/92 | 15.440 | 23.00 | .400 | .140 |
| 324 | P.S. Enterprise | 324.00 | 03/20/92 | 21.010 | 27.00 | .540 | .130 |
| 325 | Pub. Serv. N.H. | 325.00 | 03/20/92 | 18.500 | 20.00 | .000 | .125 |
| 326 | Rocheser G . & | 326.00 | 03/20/92 | 18.410 | 23.00 | .420 | .115 |
| 327 | Scana Corp | 327.00 | 03/20/92 | 25.300 | 40.00 | .670 | .130 |
| 328 | Southern Co. | 328.00 | 03/20/92 | 21.900 | 31.00 | .550 | .125 |
| 329 | Teco Energy, In | 329.00 | 03/20/92 | 15.610 | 38.00 | .430 | .160 |
| 330 | United Illum. | 330.00 | 03/20/92 | 28.840 | 35.00 | .640 | .130 |
| 331 | Cipsco, Inc. | 331.00 | 01/17/92 | 17.900 | 28.00 | .470 | .140 |
| 332 | Cms Energy Corp | 332.00 | 01/17/92 | 15.550 | 19.00 | .120 | .130 |
| 333 | Centerior Energ | 333.00 | 01/17/92 | 20.400 | 20.00 | .400 | .100 |
| 334 | Central & S.W | 334.00 | 01/17/92 | 30.300 | 54.00 | .730 | .135 |
| 335 | Central LA. El | 335.00 | 01/17/92 | 29.700 | 49.00 | .670 | .125 |
| 336 | Cilcorp, Inc. | 336.00 | 01/17/92 | 26.100 | 37.00 | .615 | .130 |
| 337 | Cicinnati G&E | 337.00 | 01/17/92 | 27.600 | 39.00 | .620 | .135 |
| 338 | Commonw. Ed. | 338.00 | 01/17/92 | 29.850 | 39.00 | .750 | .155 |
| 339 | Dpl Inc. | 339.00 | 01/17/92 | 15.650 | 25.00 | .405 | .135 |
| 340 | Detroit Edison | 340.00 | 01/17/92 | 19.250 | 35.00 | .470 | .145 |
| 341 | El Paso Elec. | 341.00 | 01/17/92 | 9.600 | 3.40 | .000 | . |
| 342 | Empire District | 342.00 | 01/17/92 | 12.400 | 24.00 | .303 | .125 |
| 343 | Entergy Corp. | 343.00 | 01/17/92 | 23.650 | 29.00 | .350 | .115 |
| 344 | Gulf St. Utils. | 344.00 | 01/17/92 | 17.500 | 10.00 | .000 | .085 |
| 345 | Houston Inds. | 345.00 | 01/17/92 | 29.200 | 43.00 | .740 | .135 |
| 346 | Ies Industries | 346.00 | 01/17/92 | 19.200 | 28.00 | .525 | .125 |
| 347 | Illinois Power | 347.00 | 01/17/92 | 19.300 | 23.00 | .200 | .120 |
| 348 | Interstate Pwr. | 348.00 | 01/17/92 | 21.550 | 34.00 | .510 | .130 |
| 349 | Iowa-Illinois G | 349.00 | 01/17/92 | 16.700 | 26.00 | .427 | .120 |
| 350 | Ipalco Enterpri | 350.00 | 01/17/92 | 20.450 | 33.00 | .470 | .130 |
| 351 | Ku Energy Corp. | 351.00 | 01/17/92 | 15.200 | 27.00 | .375 | .145 |
| 352 | Kansas City Pwr | 352.00 | 01/17/92 | 28.700 | 46.00 | .700 | .140 |

| | comeq | afcpft | acteps | tres1yr | tres5yr | tres30yr | pricebk | anndiv |
|---|---|---|---|---|---|---|---|---|
| 321 | .406 | .034 | 2.01 | .05 | .07 | .08 | 1.65 | 1.60 |
| 322 | .381 | .043 | 2.15 | .05 | .07 | .08 | 1.36 | 1.30 |
| 323 | .490 | .156 | 1.87 | .05 | .07 | .08 | 1.49 | 1.60 |
| 324 | .459 | .079 | 2.43 | .05 | .07 | .08 | 1.29 | 2.16 |
| 325 | .295 | .000 | .52 | .05 | .07 | .08 | 1.08 | . |
| 326 | .425 | .055 | 1.81 | .05 | .07 | .08 | 1.25 | 1.68 |
| 327 | .470 | .055 | 3.37 | .05 | .07 | .08 | 1.58 | 2.68 |
| 328 | .415 | .155 | 2.47 | .05 | .07 | .08 | 1.42 | 2.20 |
| 329 | .481 | .007 | 2.55 | .05 | .07 | .08 | 2.43 | 1.72 |
| 330 | .273 | .105 | 3.22 | .05 | .07 | .08 | 1.21 | 2.56 |
| 331 | .510 | .034 | 2.15 | .04 | .06 | .08 | 1.56 | 1.88 |
| 332 | .290 | .055 | 2.10 | .04 | .06 | .08 | 1.22 | .48 |
| 333 | .385 | .390 | 1.70 | .04 | .06 | .08 | .98 | 1.60 |
| 334 | .495 | .015 | 4.05 | .04 | .06 | .08 | 1.78 | 2.92 |
| 335 | .450 | .020 | 3.85 | .04 | .06 | .08 | 1.65 | 2.68 |
| 336 | .460 | .012 | 2.75 | .04 | .06 | .08 | 1.42 | 2.46 |
| 337 | .445 | .330 | 3.75 | .04 | .06 | .08 | 1.41 | 2.48 |
| 338 | .465 | .060 | 3.00 | .04 | .06 | .08 | 1.31 | 3.00 |
| 339 | .490 | .160 | 1.80 | .04 | .06 | .08 | 1.60 | 1.62 |
| 340 | .365 | .150 | 3.55 | .04 | .06 | .08 | 1.82 | 1.88 |
| 341 | .310 | . | -.85 | .04 | .06 | .08 | .35 | . |
| 342 | .515 | .015 | 1.50 | .04 | .06 | .08 | 1.94 | . |
| 343 | .395 | .025 | 2.55 | .04 | .06 | .08 | 1.23 | 1.40 |
| 344 | .400 | .270 | .80 | .04 | .06 | .08 | .57 | .00 |
| 345 | .410 | .040 | 3.25 | .04 | .06 | .08 | 1.47 | 2.96 |
| 346 | .490 | .045 | 1.70 | .04 | .06 | .08 | 1.46 | 2.10 |
| 347 | .365 | .040 | 1.00 | .04 | .06 | .08 | 1.19 | .80 |
| 348 | .480 | .090 | 3.00 | .04 | .06 | .08 | 1.58 | 2.04 |
| 349 | .420 | .050 | 1.95 | .04 | .06 | .08 | 1.56 | 1.71 |
| 350 | .565 | .020 | 2.65 | .04 | .06 | .08 | 1.61 | 1.88 |
| 351 | .570 | .005 | 2.25 | .04 | .06 | .08 | 1.78 | 1.50 |
| 352 | .510 | .030 | 3.20 | .04 | .06 | .08 | 1.60 | 2.80 |

| | actpo | sustpo | sustbr | divyld | divtobk | dcfcost | ratiofc | futm1yrt |
|---|---|---|---|---|---|---|---|---|
| 321 | .796 | .845 | .0194 | .0640 | .1056 | .0834 | 1.50 | .0764 |
| 322 | .605 | .588 | .0515 | .0542 | .0735 | .1057 | 1.18 | .0764 |
| 323 | .856 | .740 | .0364 | .0696 | .1036 | .1059 | 1.32 | .0914 |
| 324 | .889 | .791 | .0272 | .0800 | .1028 | .1072 | 1.21 | .0814 |
| 325 | . | . | . | . | . | . | . | .0764 |
| 326 | .928 | .794 | .0237 | .0730 | .0913 | .0968 | 1.19 | .0664 |
| 327 | .795 | .815 | .0241 | .0670 | .1059 | .0911 | 1.43 | .0814 |
| 328 | .891 | .804 | .0245 | .0710 | .1005 | .0955 | 1.31 | .0764 |
| 329 | .675 | .689 | .0498 | .0453 | .1102 | .0951 | 1.68 | .1114 |
| 330 | .795 | .683 | .0412 | .0731 | .0888 | .1144 | 1.14 | .0814 |
| 331 | .874 | .750 | .0350 | .0671 | .1050 | .1021 | 1.37 | .0976 |
| 332 | .229 | .237 | .0991 | .0253 | .0309 | .1244 | 1.05 | .0876 |
| 333 | .941 | .784 | .0216 | .0800 | .0784 | .1016 | .98 | .0576 |
| 334 | .721 | .714 | .0386 | .0541 | .0964 | .0927 | 1.46 | .0925 |
| 335 | .696 | .722 | .0348 | .0547 | .0902 | .0895 | 1.40 | .0826 |
| 336 | .895 | .725 | .0357 | .0665 | .0943 | .1022 | 1.27 | .0876 |
| 337 | .661 | .666 | .0451 | .0636 | .0899 | .1087 | 1.24 | .0925 |
| 338 | 1.000 | .648 | .0545 | .0769 | .1005 | .1314 | 1.18 | .1126 |
| 339 | .900 | .767 | .0315 | .0648 | .1035 | .0963 | 1.40 | .0925 |
| 340 | .530 | .674 | .0473 | .0537 | .0977 | .1011 | 1.43 | .1026 |
| 341 | . | . | . | . | . | . | . | . |
| 342 | . | . | . | . | . | . | . | .0826 |
| 343 | .549 | .515 | .0558 | .0483 | .0592 | .1041 | 1.10 | .0726 |
| 344 | .000 | .000 | .0850 | .0000 | .0000 | .0850 | 1.00 | .0426 |
| 345 | .911 | .751 | .0336 | .0688 | .1014 | .1025 | 1.32 | .0925 |
| 346 | 1.235 | .875 | .0156 | .0750 | .1094 | .0906 | 1.38 | .0826 |
| 347 | .800 | .345 | .0785 | .0348 | .0415 | .1133 | 1.06 | .0775 |
| 348 | .680 | .728 | .0353 | .0600 | .0947 | .0953 | 1.36 | .0876 |
| 349 | .876 | .852 | .0177 | .0657 | .1023 | .0834 | 1.44 | .0775 |
| 350 | .709 | .707 | .0381 | .0570 | .0919 | .0950 | 1.37 | .0876 |
| 351 | .667 | .681 | .0463 | .0556 | .0987 | .1019 | 1.42 | .1026 |
| 352 | .875 | .697 | .0424 | .0609 | .0976 | .1033 | 1.36 | .0976 |

| | futm5yrt | futm30yt | premcor | precor5y | yldcrv | ln30yrt | beta | sv |
|---|---|---|---|---|---|---|---|---|
| 321 | .0537 | .0446 | -.040 | .021 | 1.13 | -2.52 | .60 | .0020 |
| 322 | .0537 | .0446 | -.040 | .021 | 1.13 | -2.52 | .75 | .0076 |
| 323 | .0687 | .0596 | -.040 | .021 | 1.13 | -2.52 | .60 | .0032 |
| 324 | .0587 | .0496 | -.040 | .021 | 1.13 | -2.52 | .70 | .0042 |
| 325 | .0537 | .0446 | -.040 | .021 | 1.13 | -2.52 | . | .0075 |
| 326 | .0437 | .0346 | -.040 | .021 | 1.13 | -2.52 | .65 | .0070 |
| 327 | .0587 | .0496 | -.040 | .021 | 1.13 | -2.52 | .65 | .0125 |
| 328 | .0537 | .0446 | -.040 | .021 | 1.13 | -2.52 | .65 | .0011 |
| 329 | .0887 | .0796 | -.040 | .021 | 1.13 | -2.52 | .60 | .0069 |
| 330 | .0587 | .0496 | -.040 | .021 | 1.13 | -2.52 | .60 | .0026 |
| 331 | .0755 | .0640 | -.044 | .014 | 1.18 | -2.58 | .65 | .0000 |
| 332 | .0655 | .0540 | -.044 | .014 | 1.18 | -2.58 | .95 | -.0016 |
| 333 | .0355 | .0240 | -.044 | .014 | 1.18 | -2.58 | .65 | -.0003 |
| 334 | .0705 | .0590 | -.044 | .014 | 1.18 | -2.58 | .65 | .0000 |
| 335 | .0605 | .0490 | -.044 | .014 | 1.18 | -2.58 | .60 | -.0073 |
| 336 | .0655 | .0540 | -.044 | .014 | 1.18 | -2.58 | .65 | .0010 |
| 337 | .0705 | .0590 | -.044 | .014 | 1.18 | -2.58 | .70 | .0069 |
| 338 | .0905 | .0790 | -.044 | .014 | 1.18 | -2.58 | .75 | .0009 |
| 339 | .0705 | .0590 | -.044 | .014 | 1.18 | -2.58 | .65 | .0015 |
| 340 | .0805 | .0690 | -.044 | .014 | 1.18 | -2.58 | .65 | .0000 |
| 341 | . | . | -.044 | .014 | 1.18 | -2.58 | .75 | .0000 |
| 342 | .0605 | .0490 | -.044 | .014 | 1.18 | -2.58 | .40 | .0165 |
| 343 | .0505 | .0390 | -.044 | .014 | 1.18 | -2.58 | .75 | -.0005 |
| 344 | .0205 | .0090 | -.044 | .014 | 1.18 | -2.58 | .85 | .0000 |
| 345 | .0705 | .0590 | -.044 | .014 | 1.18 | -2.58 | .70 | .0034 |
| 346 | .0605 | .0490 | -.044 | .014 | 1.18 | -2.58 | .60 | .0054 |
| 347 | .0555 | .0440 | -.044 | .014 | 1.18 | -2.58 | .55 | .0000 |
| 348 | .0655 | .0540 | -.044 | .014 | 1.18 | -2.58 | .65 | .0000 |
| 349 | .0555 | .0440 | -.044 | .014 | 1.18 | -2.58 | .60 | .0000 |
| 350 | .0655 | .0540 | -.044 | .014 | 1.18 | -2.58 | .65 | .0000 |
| 351 | .0805 | .0690 | -.044 | .014 | 1.18 | -2.58 | .60 | .0000 |
| 352 | .0755 | .0640 | -.044 | .014 | 1.18 | -2.58 | .60 | .0000 |

| | dcfsv | dcfvle | dcfvld | dcfvlb | dcfvla3 | dcfcst80 |
|---|---|---|---|---|---|---|
| 321 | .0854 | .079 | .089 | .094 | .087 | . |
| 322 | .1133 | .089 | .079 | .094 | .088 | .1057 |
| 323 | .1092 | .120 | .110 | .105 | .111 | .1059 |
| 324 | .1114 | .110 | .100 | .095 | .102 | .1072 |
| 325 | . | .000 | .000 | .000 | .000 | . |
| 326 | .1038 | .118 | .103 | .098 | .106 | .0968 |
| 327 | .1036 | .102 | .102 | .097 | .100 | .0911 |
| 328 | .0966 | .101 | .086 | .096 | .094 | .0955 |
| 329 | .1020 | .095 | .105 | .100 | .100 | .0951 |
| 330 | .1170 | .093 | .118 | .118 | .110 | .1144 |
| 331 | .1021 | .122 | .087 | .097 | .102 | .1021 |
| 332 | .1228 | .020 | .335 | .065 | .140 | . |
| 333 | .1012 | .110 | .075 | .095 | .093 | .1016 |
| 334 | .0927 | .104 | .104 | .089 | .099 | .0927 |
| 335 | .0822 | .080 | .100 | .090 | .090 | .0895 |
| 336 | .1032 | .121 | .091 | .101 | .105 | .1022 |
| 337 | .1157 | .079 | .109 | .114 | .100 | .1087 |
| 338 | .1323 | .242 | .117 | .082 | .147 | . |
| 339 | .0978 | .100 | .100 | .110 | .103 | .0963 |
| 340 | .1011 | .109 | .104 | .129 | .114 | .1011 |
| 341 | . | . | . | . | . | . |
| 342 | . | . | . | . | . | . |
| 343 | .1036 | .128 | .223 | .088 | .147 | .1041 |
| 344 | .0850 | .270 | .000 | .035 | .102 | .0850 |
| 345 | .1059 | .139 | .089 | .089 | .106 | .1025 |
| 346 | .0960 | .075 | .075 | .075 | .075 | .0906 |
| 347 | .1133 | .035 | .035 | .055 | .041 | .1133 |
| 348 | .0953 | .115 | .075 | .110 | .100 | .0953 |
| 349 | .0834 | .076 | .081 | .086 | .081 | . |
| 350 | .0950 | .092 | .097 | .097 | .095 | .0950 |
| 351 | .1019 | .111 | .086 | .111 | .102 | .1019 |
| 352 | .1033 | .116 | .101 | .096 | .104 | .1033 |

| | name | recordno | date | book | price | qdiv | futroe |
|---|---|---|---|---|---|---|---|
| 353 | Kansas G. & E. | 353.00 | 01/17/92 | 20.650 | 34.00 | .430 | .120 |
| 354 | Kansas P. & L. | 354.00 | 01/17/92 | 18.850 | 28.00 | .465 | .135 |
| 355 | Lg&e Energy Cor | 355.00 | 01/17/92 | 31.300 | 47.00 | .730 | .120 |
| 356 | Mdu Resources | 356.00 | 01/17/92 | 15.600 | 25.00 | .360 | .130 |
| 357 | Midwest Energy | 357.00 | 01/17/92 | 12.800 | 20.00 | .390 | .125 |
| 358 | Minnesota Pwr. | 358.00 | 01/17/92 | 16.100 | 32.00 | .475 | .165 |
| 359 | Nipsco Industri | 359.00 | 01/17/92 | 15.250 | 25.00 | .310 | .135 |
| 360 | Nothern States | 360.00 | 01/17/92 | 25.250 | 42.00 | .605 | .115 |
| 361 | Northwestern P. | 361.00 | 01/17/92 | 14.050 | 26.00 | .380 | .140 |
| 362 | Ohio Edison | 362.00 | 01/17/92 | 16.800 | 21.00 | .375 | .110 |
| 363 | Oklahoma G. & E | 363.00 | 01/17/92 | 22.650 | 43.00 | .665 | .135 |
| 364 | Otter Tail Pwr. | 364.00 | 01/17/92 | 14.200 | 31.00 | .400 | .160 |
| 365 | Psi Resources I | 365.00 | 01/17/92 | 12.750 | 17.00 | .250 | .140 |
| 366 | St. Joe L. & P. | 366.00 | 01/17/92 | 18.450 | 34.00 | .415 | .135 |
| 367 | So. Ind. G. & E | 367.00 | 01/17/92 | 21.950 | 44.00 | .500 | .135 |
| 368 | S.W. Pub. Serv. | 368.00 | 01/17/92 | 16.470 | 34.00 | .550 | .150 |
| 369 | Tnp Enterprises | 369.00 | 01/17/92 | 21.450 | 20.00 | .407 | .115 |
| 370 | Texas Utilities | 370.00 | 01/17/92 | 29.550 | 41.00 | .750 | .130 |
| 371 | Union Electric | 371.00 | 01/17/92 | 20.650 | 37.00 | .560 | .145 |
| 372 | Utilicorp Utd | 372.00 | 01/17/92 | 19.200 | 28.00 | .400 | .120 |
| 373 | Wpl Holdings | 373.00 | 01/17/92 | 16.850 | 32.00 | .450 | .130 |
| 374 | Wisconsin Energ | 374.00 | 01/17/92 | 21.500 | 39.00 | .465 | .135 |
| 375 | Wisconsin P.S. | 375.00 | 01/17/92 | 16.750 | 29.00 | .425 | .130 |
| 376 | Hawaiian Electr | 376.00 | 02/28/92 | 24.200 | 36.00 | .560 | .120 |
| 377 | Idaho Power | 377.00 | 02/28/92 | 17.100 | 26.00 | .465 | .125 |
| 378 | Montana Power | 378.00 | 02/28/92 | 16.350 | 26.00 | .385 | .120 |
| 379 | Nevada Power | 379.00 | 02/28/92 | 14.550 | 19.00 | .400 | .120 |
| 380 | Pacific G. & E. | 380.00 | 02/28/92 | 18.450 | 31.00 | .440 | .125 |
| 381 | Pacificorp | 381.00 | 02/28/92 | 13.450 | 22.00 | .375 | .135 |
| 382 | Pinnacle West | 382.00 | 02/28/92 | 15.250 | 18.00 | .000 | .115 |
| 383 | Portland Genera | 383.00 | 02/28/92 | 15.240 | 16.00 | .300 | .125 |
| 384 | P.S. Of Colorad | 384.00 | 02/28/92 | 18.550 | 26.00 | .500 | .135 |

| | comeq | afcpft | acteps | tres1yr | tres5yr | tres30yr | pricebk | anndiv |
|---|---|---|---|---|---|---|---|---|
| 353 | .430 | .045 | 2.10 | .04 | .06 | .08 | 1.65 | 1.72 |
| 354 | .485 | .010 | 2.50 | .04 | .06 | .08 | 1.49 | 1.86 |
| 355 | .455 | .000 | 3.85 | .04 | .06 | .08 | 1.50 | 2.92 |
| 356 | .560 | .000 | 1.90 | .04 | .06 | .08 | 1.60 | 1.44 |
| 357 | .425 | .040 | 1.45 | .04 | .06 | .08 | 1.56 | 1.56 |
| 358 | .460 | .020 | 2.00 | .04 | .06 | .08 | 1.99 | 1.90 |
| 359 | .445 | .010 | 2.00 | .04 | .06 | .08 | 1.64 | 1.24 |
| 360 | .490 | .060 | 3.00 | .04 | .06 | .08 | 1.66 | 2.42 |
| 361 | .525 | .010 | 1.95 | .04 | .06 | .08 | 1.85 | 1.52 |
| 362 | .410 | .075 | 1.60 | .04 | .06 | .08 | 1.25 | 1.50 |
| 363 | .505 | .030 | 3.35 | .04 | .06 | .08 | 1.90 | 2.66 |
| 364 | .480 | .030 | 2.15 | .04 | .06 | .08 | 2.18 | 1.60 |
| 365 | .450 | .030 | 1.95 | .04 | .06 | .08 | 1.33 | 1.00 |
| 366 | .580 | .015 | 2.45 | .04 | .06 | .08 | 1.84 | 1.66 |
| 367 | .495 | .040 | 3.15 | .04 | .06 | .08 | 2.00 | 2.00 |
| 368 | .521 | .033 | 2.63 | .04 | .06 | .08 | 2.06 | 2.20 |
| 369 | .335 | .500 | 2.20 | .04 | .06 | .08 | .93 | 1.63 |
| 370 | .400 | .480 | 3.10 | .04 | .06 | .08 | 1.39 | 3.00 |
| 371 | .500 | .020 | 3.05 | .04 | .06 | .08 | 1.79 | 2.24 |
| 372 | .395 | .033 | 2.10 | .04 | .06 | .08 | 1.46 | 1.60 |
| 373 | .525 | .010 | 2.35 | .04 | .06 | .08 | 1.90 | 1.80 |
| 374 | .570 | .070 | 2.80 | .04 | .06 | .08 | 1.81 | 1.86 |
| 375 | .500 | .010 | 2.15 | .04 | .06 | .08 | 1.73 | 1.70 |
| 376 | .505 | .090 | 2.40 | .04 | .07 | .08 | 1.49 | 2.24 |
| 377 | .480 | .080 | 1.56 | .04 | .07 | .08 | 1.52 | 1.86 |
| 378 | .555 | .020 | 2.03 | .04 | .07 | .08 | 1.59 | 1.54 |
| 379 | .460 | .380 | 1.01 | .04 | .07 | .08 | 1.31 | 1.60 |
| 380 | .460 | .070 | 2.30 | .04 | .07 | .08 | 1.68 | 1.76 |
| 381 | .415 | .060 | 1.86 | .04 | .07 | .08 | 1.64 | 1.50 |
| 382 | .265 | .110 | 1.00 | .04 | .07 | .08 | 1.18 | . |
| 383 | .415 | . | -.43 | .04 | .07 | .08 | 1.05 | 1.20 |
| 384 | .465 | .070 | 2.73 | .04 | .07 | .08 | 1.40 | 2.00 |

| | actpo | sustpo | sustbr | divyld | divtobk | dcfcost | ratiofc | futm1yrt |
|---|---|---|---|---|---|---|---|---|
| 353 | .819 | .694 | .0367 | .0506 | .0833 | .0873 | 1.37 | .0775 |
| 354 | .744 | .731 | .0363 | .0664 | .0987 | .1028 | 1.31 | .0925 |
| 355 | .758 | .777 | .0267 | .0621 | .0933 | .0888 | 1.35 | .0775 |
| 356 | .758 | .710 | .0377 | .0576 | .0923 | .0953 | 1.36 | .0876 |
| 357 | 1.076 | .975 | .0031 | .0780 | .1219 | .0811 | 1.54 | .0826 |
| 358 | .950 | .715 | .0470 | .0594 | .1180 | .1064 | 1.55 | .1226 |
| 359 | .620 | .602 | .0537 | .0496 | .0813 | .1033 | 1.31 | .0925 |
| 360 | .807 | .833 | .0192 | .0576 | .0958 | .0768 | 1.50 | .0726 |
| 361 | .779 | .773 | .0318 | .0585 | .1082 | .0903 | 1.55 | .0976 |
| 362 | .938 | .812 | .0207 | .0714 | .0893 | .0921 | 1.19 | .0676 |
| 363 | .794 | .870 | .0176 | .0619 | .1174 | .0794 | 1.70 | .0925 |
| 364 | .744 | .704 | .0473 | .0516 | .1127 | .0989 | 1.62 | .1176 |
| 365 | .513 | .560 | .0616 | .0588 | .0784 | .1204 | 1.16 | .0976 |
| 366 | .678 | .666 | .0450 | .0488 | .0900 | .0939 | 1.44 | .0925 |
| 367 | .635 | .675 | .0439 | .0455 | .0911 | .0893 | 1.51 | .0925 |
| 368 | .837 | .891 | .0164 | .0647 | .1336 | .0811 | 1.85 | .1076 |
| 369 | .740 | .660 | .0391 | .0814 | .0759 | .1205 | .95 | .0726 |
| 370 | .968 | .781 | .0285 | .0732 | .1015 | .1016 | 1.28 | .0876 |
| 371 | .734 | .748 | .0365 | .0605 | .1085 | .0971 | 1.49 | .1026 |
| 372 | .762 | .694 | .0367 | .0571 | .0833 | .0938 | 1.28 | .0775 |
| 373 | .766 | .822 | .0232 | .0563 | .1068 | .0794 | 1.64 | .0876 |
| 374 | .664 | .641 | .0485 | .0477 | .0865 | .0962 | 1.40 | .0925 |
| 375 | .791 | .781 | .0285 | .0586 | .1015 | .0871 | 1.49 | .0876 |
| 376 | .933 | .771 | .0274 | .0622 | .0926 | .0897 | 1.34 | .0760 |
| 377 | 1.192 | .870 | .0162 | .0715 | .1088 | .0878 | 1.42 | .0810 |
| 378 | .759 | .785 | .0258 | .0592 | .0942 | .0850 | 1.41 | .0760 |
| 379 | 1.584 | .916 | .0100 | .0842 | .1100 | .0942 | 1.27 | .0760 |
| 380 | .765 | .763 | .0296 | .0568 | .0954 | .0864 | 1.45 | .0810 |
| 381 | .806 | .826 | .0235 | .0682 | .1115 | .0917 | 1.47 | .0910 |
| 382 | . | . | . | . | . | . | . | .0710 |
| 383 | -2.791 | .630 | .0463 | .0750 | .0787 | .1213 | 1.03 | .0810 |
| 384 | .733 | .799 | .0272 | .0769 | .1078 | .1041 | 1.30 | .0910 |

| | futm5yrt | futm30yt | premcor | precor5y | yldcrv | ln30yrt | beta | sv |
|---|---|---|---|---|---|---|---|---|
| 353 | .0555 | .0440 | -.044 | .014 | 1.18 | -2.58 | .65 | .0000 |
| 354 | .0705 | .0590 | -.044 | .014 | 1.18 | -2.58 | .70 | .0054 |
| 355 | .0555 | .0440 | -.044 | .014 | 1.18 | -2.58 | .60 | .0006 |
| 356 | .0655 | .0540 | -.044 | .014 | 1.18 | -2.58 | .65 | .0000 |
| 357 | .0605 | .0490 | -.044 | .014 | 1.18 | -2.58 | . | .0133 |
| 358 | .1005 | .0890 | -.044 | .014 | 1.18 | -2.58 | .65 | .0183 |
| 359 | .0705 | .0590 | -.044 | .014 | 1.18 | -2.58 | .80 | -.0033 |
| 360 | .0505 | .0390 | -.044 | .014 | 1.18 | -2.58 | .70 | .0137 |
| 361 | .0755 | .0640 | -.044 | .014 | 1.18 | -2.58 | .70 | .0000 |
| 362 | .0455 | .0340 | -.044 | .014 | 1.18 | -2.58 | .80 | .0000 |
| 363 | .0705 | .0590 | -.044 | .014 | 1.18 | -2.58 | .60 | .0000 |
| 364 | .0955 | .0840 | -.044 | .014 | 1.18 | -2.58 | .65 | -.0142 |
| 365 | .0755 | .0640 | -.044 | .014 | 1.18 | -2.58 | .85 | .0245 |
| 366 | .0705 | .0590 | -.044 | .014 | 1.18 | -2.58 | .55 | .0000 |
| 367 | .0705 | .0590 | -.044 | .014 | 1.18 | -2.58 | .55 | .0000 |
| 368 | .0855 | .0740 | -.044 | .014 | 1.18 | -2.58 | .70 | .0015 |
| 369 | .0505 | .0390 | -.044 | .014 | 1.18 | -2.58 | .55 | -.0079 |
| 370 | .0655 | .0540 | -.044 | .014 | 1.18 | -2.58 | .70 | .0104 |
| 371 | .0805 | .0690 | -.044 | .014 | 1.18 | -2.58 | .70 | .0000 |
| 372 | .0555 | .0440 | -.044 | .014 | 1.18 | -2.58 | .65 | .0107 |
| 373 | .0655 | .0540 | -.044 | .014 | 1.18 | -2.58 | .60 | .0235 |
| 374 | .0705 | .0590 | -.044 | .014 | 1.18 | -2.58 | .65 | .0001 |
| 375 | .0655 | .0540 | -.044 | .014 | 1.18 | -2.58 | .60 | .0144 |
| 376 | .0543 | .0420 | -.042 | .016 | 1.19 | -2.55 | .65 | .0149 |
| 377 | .0593 | .0470 | -.042 | .016 | 1.19 | -2.55 | .65 | .0098 |
| 378 | .0543 | .0420 | -.042 | .016 | 1.19 | -2.55 | .65 | .0039 |
| 379 | .0543 | .0420 | -.042 | .016 | 1.19 | -2.55 | .60 | .0228 |
| 380 | .0593 | .0470 | -.042 | .016 | 1.19 | -2.55 | .70 | .0088 |
| 381 | .0693 | .0570 | -.042 | .016 | 1.19 | -2.55 | .65 | .0106 |
| 382 | .0493 | .0370 | -.042 | .016 | 1.19 | -2.55 | .80 | .0024 |
| 383 | .0593 | .0470 | -.042 | .016 | 1.19 | -2.55 | .65 | .0005 |
| 384 | .0693 | .0570 | -.042 | .016 | 1.19 | -2.55 | .65 | .0114 |

| | dcfsv | dcfvle | dcfvld | dcfvlb | dcfvla3 | dcfcst80 |
|---|---|---|---|---|---|---|
| 353 | .0873 | .111 | .096 | .076 | .094 | .0873 |
| 354 | .1082 | .106 | .091 | .091 | .096 | .1028 |
| 355 | .0894 | .092 | .082 | .092 | .089 | .0888 |
| 356 | .0953 | .103 | .088 | .088 | .093 | .0953 |
| 357 | .0944 | .078 | .078 | .078 | .078 | . |
| 358 | .1246 | .104 | .084 | .064 | .084 | .1064 |
| 359 | .1000 | .150 | .145 | .100 | .131 | .1033 |
| 360 | .0904 | .078 | .093 | .093 | .088 | . |
| 361 | .0903 | .088 | .088 | .093 | .090 | .0903 |
| 362 | .0921 | .091 | .046 | .076 | .071 | .0921 |
| 363 | .0794 | .072 | .082 | .087 | .080 | . |
| 364 | .0847 | .092 | .077 | .087 | .085 | .0989 |
| 365 | .1449 | .064 | .194 | .129 | .129 | . |
| 366 | .0939 | .089 | .099 | .094 | .094 | .0939 |
| 367 | .0893 | .080 | .095 | .100 | .092 | .0893 |
| 368 | .0826 | .095 | .080 | .100 | .091 | . |
| 369 | .1126 | .111 | .096 | .086 | .098 | . |
| 370 | .1121 | .088 | .093 | .083 | .088 | .1016 |
| 371 | .0971 | .096 | .096 | .096 | .096 | .0971 |
| 372 | .1046 | .132 | .132 | .117 | .127 | .0938 |
| 373 | .1030 | .101 | .091 | .096 | .096 | . |
| 374 | .0963 | .088 | .103 | .103 | .098 | .0962 |
| 375 | .1016 | .089 | .089 | .089 | .089 | .0871 |
| 376 | .1046 | .102 | .097 | .102 | .101 | .0897 |
| 377 | .0976 | .117 | .087 | .092 | .098 | .0878 |
| 378 | .0889 | .124 | .094 | .094 | .104 | . |
| 379 | .1170 | .099 | .084 | .069 | .084 | .0942 |
| 380 | .0951 | .127 | .117 | .097 | .113 | .0864 |
| 381 | .1022 | .108 | .103 | .118 | .110 | .0917 |
| 382 | . | . | . | . | . | . |
| 383 | .1218 | .100 | .055 | .080 | .078 | . |
| 384 | .1155 | .097 | .092 | .117 | .102 | .1041 |

| | name | recordno | date | book | price | qdiv | futroe |
|---|---|---|---|---|---|---|---|
| 385 | P.s. N. Mexico | 385.00 | 02/28/92 | 17.700 | 11.00 | .000 | .080 |
| 386 | Puget Sound P & | 386.00 | 02/28/92 | 16.960 | 26.00 | .440 | .130 |
| 387 | SceCorp | 387.00 | 02/28/92 | 25.750 | 41.00 | .680 | .135 |
| 388 | San Diego G. & | 388.00 | 02/28/92 | 24.140 | 44.00 | .700 | .140 |
| 389 | Sierra Pacific | 389.00 | 02/28/92 | 16.880 | 23.00 | .460 | .115 |
| 390 | Tucson Elec. Pw | 390.00 | 02/28/92 | -9.500 | 6.30 | .000 | . |
| 391 | Washington Wtr. | 391.00 | 02/28/92 | 21.850 | 33.00 | .620 | .125 |
| 392 | Allegheny Pwr. | 392.00 | 03/19/93 | 32.090 | 50.00 | .810 | .115 |
| 393 | Amer. Elec. Pwr | 393.00 | 03/19/93 | 23.000 | 36.00 | .600 | .135 |
| 394 | Boston Edison | 394.00 | 03/19/93 | 18.770 | 30.00 | .425 | .120 |
| 395 | Carolina Power | 395.00 | 03/19/93 | 15.770 | 33.00 | .410 | .130 |
| 396 | Central Hudson | 396.00 | 03/19/93 | 23.590 | 34.00 | .500 | .115 |
| 397 | Central Maine | 397.00 | 03/19/93 | 16.500 | 24.00 | .390 | .120 |
| 398 | Cent. Vermont P | 398.00 | 03/19/93 | 14.210 | 25.00 | .355 | .120 |
| 399 | Com'w'th Energy | 399.00 | 03/19/93 | 30.900 | 47.00 | .730 | .115 |
| 400 | Con. Edison | 400.00 | 03/19/93 | 22.000 | 36.00 | .485 | .110 |
| 401 | Dqe | 401.00 | 03/19/93 | 22.150 | 35.00 | .400 | .105 |
| 402 | Delmarva Power | 402.00 | 03/19/93 | 13.770 | 24.00 | .385 | .125 |
| 403 | Dominion Res. | 403.00 | 03/19/93 | 25.220 | 43.00 | .615 | .115 |
| 404 | Duke Power | 404.00 | 03/19/93 | 20.250 | 39.00 | .450 | .125 |
| 405 | Eastern Utils. | 405.00 | 03/19/93 | 15.480 | 27.00 | .340 | .130 |
| 406 | Fpl Group, Inc. | 406.00 | 03/19/93 | 20.990 | 39.00 | .610 | .125 |
| 407 | Florida Progres | 407.00 | 03/19/93 | 19.790 | 35.00 | .485 | .120 |
| 408 | Gen. Pub. Util. | 408.00 | 03/19/93 | 21.500 | 29.00 | .400 | .110 |
| 409 | Green Mtn. Powe | 409.00 | 03/19/93 | 20.900 | 36.00 | .525 | .125 |
| 410 | L.I. Lighting | 410.00 | 03/19/93 | 19.550 | 27.00 | .435 | .110 |
| 411 | New England EL. | 411.00 | 03/19/93 | 22.880 | 41.00 | .540 | .115 |
| 412 | N.Y. State E. & | 412.00 | 03/19/93 | 22.850 | 35.00 | .540 | .115 |
| 413 | Niagara Mohawk | 413.00 | 03/19/93 | 16.330 | 22.00 | .200 | .110 |
| 414 | N.E. Utilities | 414.00 | 03/19/93 | 16.650 | 28.00 | .440 | .135 |
| 415 | Orange & R'KL'D | 415.00 | 03/19/93 | 27.220 | 46.00 | .615 | .120 |
| 416 | Penna. P. & L. | 416.00 | 03/19/93 | 15.580 | 30.00 | .400 | .130 |

| | comeq | afcpft | acteps | tres1yr | tres5yr | tres30yr | pricebk | anndiv |
|---|---|---|---|---|---|---|---|---|
| 385 | .455 | .120 | .36 | .04 | .07 | .08 | .62 | . |
| 386 | .437 | .034 | 2.21 | .04 | .07 | .08 | 1.53 | 1.76 |
| 387 | .485 | .040 | 3.64 | .04 | .07 | .08 | 1.59 | 2.72 |
| 388 | .490 | .040 | 3.53 | .04 | .07 | .08 | 1.82 | 2.80 |
| 389 | .432 | .015 | 1.75 | .04 | .07 | .08 | 1.36 | 1.84 |
| 390 | -.535 | . | -5.61 | .04 | .07 | .08 | -.66 | . |
| 391 | .410 | .020 | 2.61 | .04 | .07 | .08 | 1.51 | 2.48 |
| 392 | .450 | .079 | 3.66 | .03 | .05 | .07 | 1.56 | 3.24 |
| 393 | .419 | .020 | 2.54 | .03 | .05 | .07 | 1.57 | 2.40 |
| 394 | .390 | .073 | 2.10 | .03 | .05 | .07 | 1.60 | 1.70 |
| 395 | .473 | .028 | 2.36 | .03 | .05 | .07 | 2.09 | 1.64 |
| 396 | .420 | .034 | 2.55 | .03 | .05 | .07 | 1.44 | 2.00 |
| 397 | .444 | .030 | 1.85 | .03 | .05 | .07 | 1.45 | 1.56 |
| 398 | .525 | .020 | 1.71 | .03 | .05 | .07 | 1.76 | 1.42 |
| 399 | .440 | .020 | 3.83 | .03 | .05 | .07 | 1.52 | 2.92 |
| 400 | .545 | .020 | 2.46 | .03 | .05 | .07 | 1.64 | 1.94 |
| 401 | .415 | .030 | 2.67 | .03 | .05 | .07 | 1.58 | 1.60 |
| 402 | .437 | .111 | 1.48 | .03 | .05 | .07 | 1.74 | 1.54 |
| 403 | .441 | .010 | 2.66 | .03 | .05 | .07 | 1.70 | 2.46 |
| 404 | .510 | .042 | 2.18 | .03 | .05 | .07 | 1.93 | 1.80 |
| 405 | .345 | .052 | 2.00 | .03 | .05 | .07 | 1.74 | 1.36 |
| 406 | .446 | .113 | 2.65 | .03 | .05 | .07 | 1.86 | 2.44 |
| 407 | .481 | .097 | 2.06 | .03 | .05 | .07 | 1.77 | 1.94 |
| 408 | .470 | .050 | 2.27 | .03 | .05 | .07 | 1.35 | 1.60 |
| 409 | .505 | .013 | 2.54 | .03 | .05 | .07 | 1.72 | 2.10 |
| 410 | .265 | .020 | 2.14 | .03 | .05 | .07 | 1.38 | 1.74 |
| 411 | .467 | .025 | 2.85 | .03 | .05 | .07 | 1.79 | 2.16 |
| 412 | .437 | .019 | 2.40 | .03 | .05 | .07 | 1.53 | 2.16 |
| 413 | .362 | .076 | 1.79 | .03 | .05 | .07 | 1.35 | .80 |
| 414 | .296 | .275 | 1.96 | .03 | .05 | .07 | 1.68 | 1.76 |
| 415 | .461 | .009 | 3.15 | .03 | .05 | .07 | 1.69 | 2.46 |
| 416 | .415 | .043 | 2.02 | .03 | .05 | .07 | 1.93 | 1.60 |

| | actpo | sustpo | sustbr | divyld | divtobk | dcfcost | ratiofc | futm1yrt |
|---|---|---|---|---|---|---|---|---|
| 385 | . | . | . | . | . | . | . | .0360 |
| 386 | .796 | .798 | .0262 | .0677 | .1038 | .0939 | 1.38 | .0860 |
| 387 | .747 | .782 | .0294 | .0663 | .1056 | .0957 | 1.41 | .0910 |
| 388 | .793 | .829 | .0240 | .0636 | .1160 | .0876 | 1.60 | .0960 |
| 389 | 1.051 | .948 | .0060 | .0800 | .1090 | .0860 | 1.34 | .0710 |
| 390 | . | . | . | . | . | . | . | . |
| 391 | .950 | .908 | .0115 | .0752 | .1135 | .0867 | 1.44 | .0810 |
| 392 | .885 | .878 | .0140 | .0648 | .1010 | .0788 | 1.46 | .0816 |
| 393 | .945 | .773 | .0307 | .0667 | .1043 | .0973 | 1.39 | .1016 |
| 394 | .810 | .755 | .0294 | .0567 | .0906 | .0861 | 1.39 | .0866 |
| 395 | .695 | .800 | .0260 | .0497 | .1040 | .0757 | 1.72 | .0966 |
| 396 | .784 | .737 | .0302 | .0588 | .0848 | .0890 | 1.29 | .0816 |
| 397 | .843 | .788 | .0255 | .0650 | .0945 | .0905 | 1.33 | .0866 |
| 398 | .830 | .833 | .0201 | .0568 | .0985 | .0769 | 1.56 | .0866 |
| 399 | .762 | .822 | .0205 | .0621 | .0945 | .0826 | 1.39 | .0816 |
| 400 | .789 | .802 | .0218 | .0539 | .0882 | .0757 | 1.45 | .0766 |
| 401 | .599 | .688 | .0328 | .0457 | .0722 | .0785 | 1.34 | .0716 |
| 402 | 1.041 | .895 | .0132 | .0642 | .1118 | .0773 | 1.62 | .0916 |
| 403 | .925 | .848 | .0175 | .0572 | .0975 | .0747 | 1.54 | .0816 |
| 404 | .826 | .711 | .0361 | .0462 | .0889 | .0823 | 1.52 | .0916 |
| 405 | .680 | .676 | .0421 | .0504 | .0879 | .0925 | 1.41 | .0966 |
| 406 | .921 | .930 | .0088 | .0626 | .1162 | .0713 | 1.75 | .0916 |
| 407 | .942 | .817 | .0220 | .0554 | .0980 | .0774 | 1.55 | .0866 |
| 408 | .705 | .677 | .0356 | .0552 | .0744 | .0908 | 1.21 | .0766 |
| 409 | .827 | .804 | .0245 | .0583 | .1005 | .0829 | 1.51 | .0916 |
| 410 | .813 | .809 | .0210 | .0644 | .0890 | .0854 | 1.29 | .0766 |
| 411 | .758 | .821 | .0206 | .0527 | .0944 | .0733 | 1.57 | .0816 |
| 412 | .900 | .822 | .0205 | .0617 | .0945 | .0822 | 1.40 | .0816 |
| 413 | .447 | .445 | .0610 | .0364 | .0490 | .0974 | 1.13 | .0766 |
| 414 | .898 | .783 | .0293 | .0629 | .1057 | .0922 | 1.46 | .1016 |
| 415 | .781 | .753 | .0296 | .0535 | .0904 | .0831 | 1.44 | .0866 |
| 416 | .792 | .790 | .0273 | .0533 | .1027 | .0806 | 1.61 | .0966 |

| | futm5yrt | futm30yt | premcor | precor5y | yldcrv | ln30yrt | beta | sv |
|---|---|---|---|---|---|---|---|---|
| 385 | .0143 | .0020 | -.042 | .016 | 1.19 | -2.55 | .65 | -.0007 |
| 386 | .0643 | .0520 | -.042 | .016 | 1.19 | -2.55 | .65 | .0000 |
| 387 | .0693 | .0570 | -.042 | .016 | 1.19 | -2.55 | .70 | .0030 |
| 388 | .0743 | .0620 | -.042 | .016 | 1.19 | -2.55 | .65 | .0106 |
| 389 | .0493 | .0370 | -.042 | .016 | 1.19 | -2.55 | .60 | .0142 |
| 390 | . | . | -.042 | .016 | 1.19 | -2.55 | .60 | -.3553 |
| 391 | .0593 | .0470 | -.042 | .016 | 1.19 | -2.55 | .60 | .0106 |
| 392 | .0631 | .0470 | -.052 | .002 | 1.31 | -2.69 | .60 | .0120 |
| 393 | .0831 | .0670 | -.052 | .002 | 1.31 | -2.69 | .75 | .0000 |
| 394 | .0681 | .0520 | -.052 | .002 | 1.31 | -2.69 | .70 | .0107 |
| 395 | .0781 | .0620 | -.052 | .002 | 1.31 | -2.69 | .75 | .0001 |
| 396 | .0631 | .0470 | -.052 | .002 | 1.31 | -2.69 | .65 | .0125 |
| 397 | .0681 | .0520 | -.052 | .002 | 1.31 | -2.69 | .65 | .0014 |
| 398 | .0681 | .0520 | -.052 | .002 | 1.31 | -2.69 | .65 | .0135 |
| 399 | .0631 | .0470 | -.052 | .002 | 1.31 | -2.69 | .65 | .0078 |
| 400 | .0581 | .0420 | -.052 | .002 | 1.31 | -2.69 | .75 | .0005 |
| 401 | .0531 | .0370 | -.052 | .002 | 1.31 | -2.69 | .60 | .0002 |
| 402 | .0731 | .0570 | -.052 | .002 | 1.31 | -2.69 | .60 | .0222 |
| 403 | .0631 | .0470 | -.052 | .002 | 1.31 | -2.69 | .65 | .0147 |
| 404 | .0731 | .0570 | -.052 | .002 | 1.31 | -2.69 | .70 | .0001 |
| 405 | .0781 | .0620 | -.052 | .002 | 1.31 | -2.69 | .55 | .0218 |
| 406 | .0731 | .0570 | -.052 | .002 | 1.31 | -2.69 | .65 | .0274 |
| 407 | .0681 | .0520 | -.052 | .002 | 1.31 | -2.69 | .65 | .0005 |
| 408 | .0581 | .0420 | -.052 | .002 | 1.31 | -2.69 | .65 | .0001 |
| 409 | .0731 | .0570 | -.052 | .002 | 1.31 | -2.69 | .55 | .0064 |
| 410 | .0581 | .0420 | -.052 | .002 | 1.31 | -2.69 | .70 | .0054 |
| 411 | .0631 | .0470 | -.052 | .002 | 1.31 | -2.69 | .65 | .0039 |
| 412 | .0631 | .0470 | -.052 | .002 | 1.31 | -2.69 | .70 | .0081 |
| 413 | .0581 | .0420 | -.052 | .002 | 1.31 | -2.69 | .75 | .0105 |
| 414 | .0831 | .0670 | -.052 | .002 | 1.31 | -2.69 | .65 | .0056 |
| 415 | .0681 | .0520 | -.052 | .002 | 1.31 | -2.69 | .50 | .0002 |
| 416 | .0781 | .0620 | -.052 | .002 | 1.31 | -2.69 | .65 | .0037 |

| | dcfsv | dcfvle | dcfvld | dcfvlb | dcfvla3 | dcfcst80 |
|---|---|---|---|---|---|---|
| 385 | . | . | . | . | . | . |
| 386 | .0939 | .088 | .078 | .093 | .086 | .0939 |
| 387 | .0987 | .096 | .096 | .106 | .100 | .0957 |
| 388 | .0982 | .099 | .089 | .104 | .097 | .0876 |
| 389 | .1002 | .100 | .085 | .090 | .092 | .0860 |
| 390 | . | . | . | . | . | . |
| 391 | .0972 | .105 | .075 | .095 | .092 | .0867 |
| 392 | .0909 | .090 | .075 | .095 | .086 | .0788 |
| 393 | .0973 | .092 | .082 | .087 | .087 | .0973 |
| 394 | .0968 | .117 | .092 | .097 | .102 | .0861 |
| 395 | .0758 | .070 | .080 | .100 | .083 | . |
| 396 | .1015 | .094 | .099 | .079 | .090 | .0890 |
| 397 | .0919 | .095 | .080 | .090 | .088 | .0905 |
| 398 | .0904 | .097 | .077 | .092 | .088 | .0769 |
| 399 | .0904 | .092 | .077 | .082 | .084 | .0826 |
| 400 | .0762 | .079 | .074 | .089 | .081 | . |
| 401 | .0787 | .081 | .091 | .091 | .087 | .0785 |
| 402 | .0995 | .109 | .084 | .089 | .094 | .0773 |
| 403 | .0893 | .092 | .087 | .087 | .089 | . |
| 404 | .0824 | .081 | .091 | .086 | .086 | .0823 |
| 405 | .1143 | .145 | .075 | .105 | .109 | .0925 |
| 406 | .0987 | .073 | .083 | .073 | .076 | . |
| 407 | .0779 | .090 | .075 | .080 | .082 | .0774 |
| 408 | .0908 | .070 | .125 | .090 | .095 | .0908 |
| 409 | .0893 | .088 | .078 | .083 | .083 | .0829 |
| 410 | .0909 | .099 | .149 | .104 | .118 | .0854 |
| 411 | .0772 | .083 | .083 | .088 | .084 | . |
| 412 | .0903 | .092 | .082 | .082 | .085 | .0822 |
| 413 | .1079 | .121 | .036 | .086 | .081 | .0974 |
| 414 | .0978 | .063 | .063 | .063 | .063 | .0922 |
| 415 | .0833 | .088 | .078 | .083 | .083 | .0831 |
| 416 | .0844 | .078 | .078 | .078 | .078 | .0806 |

| | name | recordno | date | book | price | qdiv | futroe |
|---|---|---|---|---|---|---|---|
| 417 | Phila. Electric | 417.00 | 03/19/93 | 18.500 | 30.00 | .350 | .130 |
| 418 | Potomac EL. Pwr | 418.00 | 03/19/93 | 15.950 | 26.00 | .410 | .135 |
| 419 | P.S. Enterprise | 419.00 | 03/19/93 | 20.320 | 33.00 | .540 | .120 |
| 420 | Rocheser G . & | 420.00 | 03/19/93 | 18.930 | 27.00 | .430 | .100 |
| 421 | Scana Corp | 421.00 | 03/19/93 | 26.100 | 46.00 | .685 | .120 |
| 422 | Southern Co. | 422.00 | 03/19/93 | 22.800 | 41.00 | .570 | .130 |
| 423 | Teco Energy, In | 423.00 | 03/19/93 | 16.630 | 45.00 | .455 | .145 |
| 424 | United Illum. | 424.00 | 03/19/93 | 30.500 | 43.00 | .665 | .110 |
| 425 | Cipsco, Inc. | 425.00 | 01/15/93 | 18.050 | 30.00 | .480 | .135 |
| 426 | Cms Energy Corp | 426.00 | 01/15/93 | 13.250 | 19.00 | .120 | .110 |
| 427 | Centerior Energ | 427.00 | 01/15/93 | 20.350 | 20.00 | .400 | .080 |
| 428 | Central & S.W | 428.00 | 01/15/93 | 15.450 | 29.00 | .385 | .135 |
| 429 | Central LA. El | 429.00 | 01/15/93 | 15.400 | 24.00 | .345 | .125 |
| 430 | Cilcorp, Inc. | 430.00 | 01/15/93 | 26.100 | 39.00 | .615 | .140 |
| 431 | Cicinnati G&E | 431.00 | 01/15/93 | 18.800 | 24.00 | .413 | .120 |
| 432 | Commonw. Ed. | 432.00 | 01/15/93 | 26.950 | 24.00 | .400 | .105 |
| 433 | Dpl Inc. | 433.00 | 01/15/93 | 10.700 | 19.00 | .270 | .135 |
| 434 | Detroit Edison | 434.00 | 01/15/93 | 21.100 | 33.00 | .495 | .135 |
| 435 | El Paso Elec. | 435.00 | 01/15/93 | . | 2.60 | .000 | . |
| 436 | Empire District | 436.00 | 01/15/93 | 12.350 | 21.00 | .320 | .125 |
| 437 | Entergy Corp. | 437.00 | 01/15/93 | 25.150 | 33.00 | .400 | .110 |
| 438 | Gulf St. Utils. | 438.00 | 01/15/93 | 18.500 | 16.00 | .000 | .095 |
| 439 | Houston Inds. | 439.00 | 01/15/93 | 26.350 | 46.00 | .750 | .140 |
| 440 | Ies Industries | 440.00 | 01/15/93 | 18.750 | 29.00 | .525 | .120 |
| 441 | Illinois Power | 441.00 | 01/15/93 | 19.800 | 22.00 | .200 | .100 |
| 442 | Interstate Pwr. | 442.00 | 01/15/93 | 20.450 | 31.00 | .520 | .135 |
| 443 | Iowa-Illinois G | 443.00 | 01/15/93 | 16.850 | 22.00 | .432 | .110 |
| 444 | Ipalco Enterpri | 444.00 | 01/15/93 | 20.900 | 35.00 | .490 | .120 |
| 445 | Ku Energy Corp. | 445.00 | 01/15/93 | 15.550 | 28.00 | .390 | .135 |
| 446 | Kansas City Pwr | 446.00 | 01/15/93 | 13.800 | 23.00 | .360 | .135 |
| 447 | Lg&e Energy Cor | 447.00 | 01/15/93 | 21.150 | 34.00 | .502 | .130 |
| 448 | Mdu Resources | 448.00 | 01/15/93 | 15.900 | 27.00 | .370 | .130 |

| | comeq | afcpft | acteps | tres1yr | tres5yr | tres30yr | pricebk | anndiv |
|---|---|---|---|---|---|---|---|---|
| 417 | .405 | .038 | 2.17 | .03 | .05 | .07 | 1.62 | 1.40 |
| 418 | .496 | .148 | 1.66 | .03 | .05 | .07 | 1.63 | 1.64 |
| 419 | .463 | .063 | 1.97 | .03 | .05 | .07 | 1.62 | 2.16 |
| 420 | .458 | .033 | 1.83 | .03 | .05 | .07 | 1.43 | 1.72 |
| 421 | .490 | .090 | 3.11 | .03 | .05 | .07 | 1.76 | 2.74 |
| 422 | .435 | .040 | 2.98 | .03 | .05 | .07 | 1.80 | 2.28 |
| 423 | .464 | .007 | 2.60 | .03 | .05 | .07 | 2.71 | 1.82 |
| 424 | .290 | .060 | 3.17 | .03 | .05 | .07 | 1.41 | 2.66 |
| 425 | .520 | .055 | 2.10 | .03 | .06 | .07 | 1.66 | 1.92 |
| 426 | .305 | .032 | 1.05 | .03 | .06 | .07 | 1.43 | .48 |
| 427 | .400 | .430 | 1.60 | .03 | .06 | .07 | .98 | 1.60 |
| 428 | .495 | .020 | 2.00 | .03 | .06 | .07 | 1.88 | 1.54 |
| 429 | .520 | .040 | 1.95 | .03 | .06 | .07 | 1.56 | 1.38 |
| 430 | .480 | .025 | 2.75 | .03 | .06 | .07 | 1.49 | 2.46 |
| 431 | .400 | .055 | 2.05 | .03 | .06 | .07 | 1.28 | 1.65 |
| 432 | .405 | .050 | 2.25 | .03 | .06 | .07 | .89 | 1.60 |
| 433 | .500 | .010 | 1.40 | .03 | .06 | .07 | 1.78 | 1.08 |
| 434 | .415 | .040 | 3.70 | .03 | .06 | .07 | 1.56 | 1.98 |
| 435 | . | . | . | .03 | .06 | .07 | . | . |
| 436 | .520 | .016 | 1.35 | .03 | .06 | .07 | 1.70 | 1.28 |
| 437 | .425 | .027 | 2.55 | .03 | .06 | .07 | 1.31 | 1.60 |
| 438 | .420 | .030 | .75 | .03 | .06 | .07 | .86 | . |
| 439 | .400 | .033 | 3.15 | .03 | .06 | .07 | 1.75 | 3.00 |
| 440 | .470 | .085 | 1.90 | .03 | .06 | .07 | 1.55 | 2.10 |
| 441 | .390 | .040 | 1.35 | .03 | .06 | .07 | 1.11 | .80 |
| 442 | .455 | .025 | 1.85 | .03 | .06 | .07 | 1.52 | 2.08 |
| 443 | .450 | .020 | 1.45 | .03 | .06 | .07 | 1.31 | 1.73 |
| 444 | .565 | .060 | 2.35 | .03 | .06 | .07 | 1.67 | 1.96 |
| 445 | .550 | .005 | 2.00 | .03 | .06 | .07 | 1.80 | 1.56 |
| 446 | .490 | .030 | 1.35 | .03 | .06 | .07 | 1.67 | 1.44 |
| 447 | .460 | .000 | 2.20 | .03 | .06 | .07 | 1.61 | 2.01 |
| 448 | .550 | .000 | 1.75 | .03 | .06 | .07 | 1.70 | 1.48 |

| | actpo | sustpo | sustbr | divyld | divtobk | dcfcost | ratiofc | futm1yrt |
|---|---|---|---|---|---|---|---|---|
| 417 | .645 | .582 | .0543 | .0467 | .0757 | .1010 | 1.29 | .0966 |
| 418 | .988 | .762 | .0322 | .0631 | .1028 | .0953 | 1.42 | .1016 |
| 419 | 1.096 | .886 | .0137 | .0655 | .1063 | .0792 | 1.52 | .0866 |
| 420 | .940 | .909 | .0091 | .0637 | .0909 | .0728 | 1.37 | .0666 |
| 421 | .881 | .875 | .0150 | .0596 | .1050 | .0746 | 1.61 | .0866 |
| 422 | .765 | .769 | .0300 | .0556 | .1000 | .0856 | 1.52 | .0966 |
| 423 | .700 | .755 | .0356 | .0404 | .1094 | .0760 | 1.91 | .1116 |
| 424 | .839 | .793 | .0228 | .0619 | .0872 | .0846 | 1.30 | .0766 |
| 425 | .914 | .788 | .0286 | .0640 | .1064 | .0926 | 1.46 | .1005 |
| 426 | .457 | .329 | .0738 | .0253 | .0362 | .0990 | 1.11 | .0755 |
| 427 | 1.000 | .983 | .0014 | .0800 | .0786 | .0814 | .98 | .0455 |
| 428 | .770 | .738 | .0353 | .0531 | .0997 | .0884 | 1.53 | .1005 |
| 429 | .708 | .717 | .0354 | .0575 | .0896 | .0929 | 1.35 | .0905 |
| 430 | .895 | .673 | .0457 | .0631 | .0943 | .1088 | 1.29 | .1055 |
| 431 | .806 | .732 | .0321 | .0688 | .0879 | .1010 | 1.19 | .0855 |
| 432 | .711 | .565 | .0456 | .0667 | .0594 | .1123 | .94 | .0705 |
| 433 | .771 | .748 | .0341 | .0568 | .1009 | .0909 | 1.49 | .1005 |
| 434 | .535 | .695 | .0412 | .0600 | .0938 | .1012 | 1.33 | .1005 |
| 435 | . | . | . | . | . | . | . | . |
| 436 | .948 | .829 | .0214 | .0610 | .1036 | .0823 | 1.52 | .0905 |
| 437 | .627 | .578 | .0464 | .0485 | .0636 | .0949 | 1.16 | .0755 |
| 438 | . | . | . | . | . | . | . | .0605 |
| 439 | .952 | .813 | .0261 | .0652 | .1139 | .0914 | 1.53 | .1055 |
| 440 | 1.105 | .933 | .0080 | .0724 | .1120 | .0804 | 1.49 | .0855 |
| 441 | .593 | .404 | .0596 | .0364 | .0404 | .0960 | 1.04 | .0654 |
| 442 | 1.124 | .753 | .0333 | .0671 | .1017 | .1004 | 1.34 | .1005 |
| 443 | 1.192 | .932 | .0074 | .0785 | .1026 | .0860 | 1.28 | .0755 |
| 444 | .834 | .781 | .0262 | .0560 | .0938 | .0822 | 1.46 | .0855 |
| 445 | .780 | .743 | .0347 | .0557 | .1003 | .0904 | 1.49 | .1005 |
| 446 | 1.067 | .773 | .0307 | .0626 | .1043 | .0933 | 1.45 | .1005 |
| 447 | .913 | .730 | .0351 | .0591 | .0949 | .0941 | 1.38 | .0954 |
| 448 | .846 | .716 | .0369 | .0548 | .0931 | .0917 | 1.42 | .0954 |

| | futm5yrt | futm30yt | premcor | precor5y | yldcrv | ln30yrt | beta | sv |
|---|---|---|---|---|---|---|---|---|
| 417 | .0781 | .0620 | -.052 | .002 | 1.31 | -2.69 | .75 | .0014 |
| 418 | .0831 | .0670 | -.052 | .002 | 1.31 | -2.69 | .65 | .0029 |
| 419 | .0681 | .0520 | -.052 | .002 | 1.31 | -2.69 | .70 | .0105 |
| 420 | .0481 | .0320 | -.052 | .002 | 1.31 | -2.69 | .65 | .0074 |
| 421 | .0681 | .0520 | -.052 | .002 | 1.31 | -2.69 | .60 | .0209 |
| 422 | .0781 | .0620 | -.052 | .002 | 1.31 | -2.69 | .70 | .0018 |
| 423 | .0931 | .0770 | -.052 | .002 | 1.31 | -2.69 | .65 | .0283 |
| 424 | .0581 | .0420 | -.052 | .002 | 1.31 | -2.69 | .55 | .0000 |
| 425 | .0769 | .0616 | -.047 | .008 | 1.26 | -2.61 | .60 | .0000 |
| 426 | .0519 | .0366 | -.047 | .008 | 1.26 | -2.61 | .95 | .0032 |
| 427 | .0219 | .0066 | -.047 | .008 | 1.26 | -2.61 | .65 | -.0002 |
| 428 | .0769 | .0616 | -.047 | .008 | 1.26 | -2.61 | .70 | .0000 |
| 429 | .0669 | .0516 | -.047 | .008 | 1.26 | -2.61 | .50 | -.0042 |
| 430 | .0819 | .0666 | -.047 | .008 | 1.26 | -2.61 | .65 | .0006 |
| 431 | .0619 | .0466 | -.047 | .008 | 1.26 | -2.61 | .65 | .0037 |
| 432 | .0469 | .0316 | -.047 | .008 | 1.26 | -2.61 | .75 | -.0002 |
| 433 | .0769 | .0616 | -.047 | .008 | 1.26 | -2.61 | .55 | .0012 |
| 434 | .0769 | .0616 | -.047 | .008 | 1.26 | -2.61 | .70 | .0001 |
| 435 | . | . | -.047 | .008 | 1.26 | -2.61 | .80 | . |
| 436 | .0669 | .0516 | -.047 | .008 | 1.26 | -2.61 | .45 | .0057 |
| 437 | .0519 | .0366 | -.047 | .008 | 1.26 | -2.61 | .70 | .0000 |
| 438 | .0369 | .0216 | -.047 | .008 | 1.26 | -2.61 | .70 | .0000 |
| 439 | .0819 | .0666 | -.047 | .008 | 1.26 | -2.61 | .65 | .0006 |
| 440 | .0619 | .0466 | -.047 | .008 | 1.26 | -2.61 | .55 | .0155 |
| 441 | .0419 | .0266 | -.047 | .008 | 1.26 | -2.61 | .70 | .0000 |
| 442 | .0769 | .0616 | -.047 | .008 | 1.26 | -2.61 | .60 | .0000 |
| 443 | .0519 | .0366 | -.047 | .008 | 1.26 | -2.61 | .55 | .0000 |
| 444 | .0619 | .0466 | -.047 | .008 | 1.26 | -2.61 | .65 | .0192 |
| 445 | .0769 | .0616 | -.047 | .008 | 1.26 | -2.61 | .65 | .0000 |
| 446 | .0769 | .0616 | -.047 | .008 | 1.26 | -2.61 | .60 | .0000 |
| 447 | .0719 | .0566 | -.047 | .008 | 1.26 | -2.61 | .60 | .0006 |
| 448 | .0719 | .0566 | -.047 | .008 | 1.26 | -2.61 | .55 | .0000 |

| | dcfsv | dcfvle | dcfvld | dcfvlb | dcfvla3 | dcfcst80 |
|---|---|---|---|---|---|---|
| 417 | .1024 | .082 | .082 | .082 | .082 | .1010 |
| 418 | .0982 | .118 | .098 | .093 | .103 | .0953 |
| 419 | .0896 | .095 | .080 | .085 | .087 | .0792 |
| 420 | .0803 | .119 | .089 | .114 | .107 | . |
| 421 | .0955 | .085 | .085 | .100 | .090 | . |
| 422 | .0874 | .101 | .086 | .086 | .091 | .0856 |
| 423 | .1043 | .080 | .095 | .100 | .092 | .0760 |
| 424 | .0846 | .052 | .097 | .092 | .080 | .0846 |
| 425 | .0926 | .109 | .089 | .079 | .092 | .0926 |
| 426 | .1022 | -.045 | .185 | .020 | .054 | .0990 |
| 427 | .0812 | .070 | .080 | .090 | .080 | .0814 |
| 428 | .0884 | .098 | .098 | .088 | .095 | .0884 |
| 429 | .0887 | .093 | .093 | .088 | .091 | .0929 |
| 430 | .1094 | .133 | .098 | .088 | .106 | .1088 |
| 431 | .1047 | .064 | .094 | .099 | .086 | .1010 |
| 432 | .1121 | .087 | -.003 | .062 | .048 | . |
| 433 | .0921 | .097 | .087 | .092 | .092 | .0909 |
| 434 | .1013 | .075 | .110 | .125 | .103 | .1012 |
| 435 | . | . | . | . | . | . |
| 436 | .0880 | .106 | .091 | .096 | .098 | .0823 |
| 437 | .0949 | .108 | .178 | .093 | .127 | .0949 |
| 438 | . | . | . | . | . | . |
| 439 | .0919 | .130 | .075 | .070 | .092 | .0914 |
| 440 | .0959 | .072 | .072 | .072 | .072 | . |
| 441 | .0960 | .036 | .036 | .071 | .048 | .0960 |
| 442 | .1004 | .077 | .082 | .082 | .080 | .1004 |
| 443 | .0860 | .079 | .084 | .089 | .084 | .0860 |
| 444 | .1015 | .081 | .096 | .096 | .091 | .0822 |
| 445 | .0904 | .096 | .086 | .096 | .092 | .0904 |
| 446 | .0933 | .098 | .098 | .078 | .091 | .0933 |
| 447 | .0948 | .114 | .084 | .094 | .097 | .0941 |
| 448 | .0917 | .090 | .090 | .085 | .088 | .0917 |

| | name | recordno | date | book | price | qdiv | futroe |
|---|---|---|---|---|---|---|---|
| 449 | Midwest Energy | 449.00 | 01/15/93 | 12.350 | 16.00 | .290 | .125 |
| 450 | Minnesota Pwr. | 450.00 | 01/15/93 | 16.250 | 34.00 | .485 | .155 |
| 451 | Nipsco Industri | 451.00 | 01/15/93 | 15.900 | 27.00 | .330 | .140 |
| 452 | Nothern States | 452.00 | 01/15/93 | 25.800 | 43.00 | .630 | .130 |
| 453 | Northwestern P. | 453.00 | 01/15/93 | 13.900 | 26.00 | .405 | .140 |
| 454 | Ohio Edison | 454.00 | 01/15/93 | 15.750 | 23.00 | .375 | .130 |
| 455 | Oklahoma G. & E | 455.00 | 01/15/93 | 22.350 | 34.00 | .665 | .115 |
| 456 | Otter Tail Pwr. | 456.00 | 01/15/93 | 14.750 | 33.00 | .410 | .165 |
| 457 | Psi Resources I | 457.00 | 01/15/93 | 11.850 | 20.00 | .280 | .130 |
| 458 | St. Joe L. & P. | 458.00 | 01/15/93 | 18.900 | 33.00 | .430 | .145 |
| 459 | So. Ind. G. & E | 459.00 | 01/15/93 | 17.050 | 33.00 | .390 | .120 |
| 460 | S.W. Pub. Serv. | 460.00 | 01/15/93 | 16.610 | 32.00 | .550 | .155 |
| 461 | Tnp Enterprises | 461.00 | 01/15/93 | 21.500 | 18.00 | .407 | .095 |
| 462 | Texas Utilities | 462.00 | 01/15/93 | 30.000 | 43.00 | .760 | .135 |
| 463 | Union Electric | 463.00 | 01/15/93 | 21.050 | 37.00 | .580 | .140 |
| 464 | Utilicorp Utd | 464.00 | 01/15/93 | 19.100 | 28.00 | .400 | .105 |
| 465 | Wpl Holdings | 465.00 | 01/15/93 | 17.450 | 34.00 | .465 | .125 |
| 466 | Western Resourc | 466.00 | 01/15/93 | 21.600 | 31.00 | .475 | .120 |
| 467 | Wisconsin Energ | 467.00 | 01/15/93 | 14.850 | 26.00 | .325 | .110 |
| 468 | Wisconsin P.S. | 468.00 | 01/15/93 | 17.000 | 31.00 | .435 | .115 |
| 469 | Hawaiian Electr | 469.00 | 02/26/93 | 22.100 | 36.00 | .570 | .120 |
| 470 | Idaho Power | 470.00 | 02/26/93 | 17.400 | 29.00 | .465 | .125 |
| 471 | Montana Power | 471.00 | 02/26/93 | 17.000 | 27.00 | .395 | .120 |
| 472 | Nevada Power | 472.00 | 02/26/93 | 14.750 | 24.00 | .400 | .110 |
| 473 | Pacific G. & E. | 473.00 | 02/26/93 | 19.550 | 33.00 | .470 | .130 |
| 474 | Pacificorp | 474.00 | 02/26/93 | 12.200 | 19.00 | .270 | .115 |
| 475 | Pinnacle West | 475.00 | 02/26/93 | 17.600 | 21.00 | .000 | .095 |
| 476 | Portland Genera | 476.00 | 02/26/93 | 15.400 | 18.00 | .300 | .125 |
| 477 | P.S. Of Colorad | 477.00 | 02/26/93 | 19.250 | 28.00 | .500 | .130 |
| 478 | P.s. N. Mexico | 478.00 | 02/26/93 | 15.000 | 10.00 | .000 | .080 |
| 479 | Puget Sound P & | 479.00 | 02/26/93 | 17.650 | 27.00 | .450 | .120 |
| 480 | SceCorp | 480.00 | 02/26/93 | 26.850 | 47.00 | .700 | .125 |

| | comeq | afcpft | acteps | tres1yr | tres5yr | tres30yr | pricebk | anndiv |
|---|---|---|---|---|---|---|---|---|
| 449 | .440 | .100 | .85 | .03 | .06 | .07 | 1.30 | 1.16 |
| 450 | .435 | .055 | 2.05 | .03 | .06 | .07 | 2.09 | 1.94 |
| 451 | .475 | .010 | 2.00 | .03 | .06 | .07 | 1.70 | 1.32 |
| 452 | .505 | .110 | 2.35 | .03 | .06 | .07 | 1.67 | 2.52 |
| 453 | .500 | .010 | 1.70 | .03 | .06 | .07 | 1.87 | 1.62 |
| 454 | .405 | .070 | 1.70 | .03 | .06 | .07 | 1.46 | 1.50 |
| 455 | .505 | .010 | 2.40 | .03 | .06 | .07 | 1.52 | 2.66 |
| 456 | .480 | .010 | 2.15 | .03 | .06 | .07 | 2.24 | 1.64 |
| 457 | .410 | .130 | 1.60 | .03 | .06 | .07 | 1.69 | 1.12 |
| 458 | .595 | .085 | 2.10 | .03 | .06 | .07 | 1.75 | 1.72 |
| 459 | .510 | .020 | 2.20 | .03 | .06 | .07 | 1.94 | 1.56 |
| 460 | .526 | .043 | 2.34 | .03 | .06 | .07 | 1.93 | 2.20 |
| 461 | .220 | .020 | 1.60 | .03 | .06 | .07 | .84 | 1.63 |
| 462 | .410 | .400 | 3.00 | .03 | .06 | .07 | 1.43 | 3.04 |
| 463 | .530 | .020 | 2.70 | .03 | .06 | .07 | 1.76 | 2.32 |
| 464 | .400 | .000 | 1.30 | .03 | .06 | .07 | 1.47 | 1.60 |
| 465 | .495 | .050 | 2.05 | .03 | .06 | .07 | 1.95 | 1.86 |
| 466 | .375 | .030 | 2.15 | .03 | .06 | .07 | 1.44 | 1.90 |
| 467 | .550 | .085 | 1.70 | .03 | .06 | .07 | 1.75 | 1.30 |
| 468 | .515 | .030 | 2.20 | .03 | .06 | .07 | 1.82 | 1.74 |
| 469 | .455 | .130 | 2.54 | .03 | .05 | .07 | 1.63 | 2.28 |
| 470 | .445 | .090 | 1.55 | .03 | .05 | .07 | 1.67 | 1.86 |
| 471 | .555 | .030 | 2.02 | .03 | .05 | .07 | 1.59 | 1.58 |
| 472 | .445 | .280 | 1.44 | .03 | .05 | .07 | 1.63 | 1.60 |
| 473 | .465 | .090 | 2.58 | .03 | .05 | .07 | 1.69 | 1.88 |
| 474 | .385 | .030 | .98 | .03 | .05 | .07 | 1.56 | 1.08 |
| 475 | .320 | .050 | 1.73 | .03 | .05 | .07 | 1.19 | . |
| 476 | .415 | .020 | 2.00 | .03 | .05 | .07 | 1.17 | 1.20 |
| 477 | .455 | .070 | 2.60 | .03 | .05 | .07 | 1.45 | 2.00 |
| 478 | .420 | .080 | .75 | .03 | .05 | .07 | .67 | . |
| 479 | .440 | .030 | 2.16 | .03 | .05 | .07 | 1.53 | 1.80 |
| 480 | .485 | .040 | 3.49 | .03 | .05 | .07 | 1.75 | 2.80 |

| | actpo | sustpo | sustbr | divyld | divtobk | dcfcost | ratiofc | futm1yrt |
|---|---|---|---|---|---|---|---|---|
| 449 | 1.365 | .751 | .0311 | .0725 | .0939 | .1036 | 1.21 | .0905 |
| 450 | .946 | .770 | .0356 | .0571 | .1194 | .0927 | 1.67 | .1205 |
| 451 | .660 | .593 | .0570 | .0489 | .0830 | .1059 | 1.32 | .1055 |
| 452 | 1.072 | .751 | .0323 | .0586 | .0977 | .0909 | 1.43 | .0954 |
| 453 | .953 | .832 | .0235 | .0623 | .1165 | .0858 | 1.63 | .1055 |
| 454 | .882 | .733 | .0348 | .0652 | .0952 | .1000 | 1.30 | .0954 |
| 455 | 1.108 | 1.035 | -.0040 | .0782 | .1190 | .0742 | 1.55 | .0804 |
| 456 | .763 | .674 | .0538 | .0497 | .1112 | .1035 | 1.59 | .1305 |
| 457 | .700 | .727 | .0355 | .0560 | .0945 | .0915 | 1.42 | .0954 |
| 458 | .819 | .628 | .0540 | .0521 | .0910 | .1061 | 1.37 | .1105 |
| 459 | .709 | .762 | .0285 | .0473 | .0915 | .0758 | 1.58 | .0855 |
| 460 | .940 | .855 | .0226 | .0688 | .1325 | .0913 | 1.70 | .1205 |
| 461 | 1.018 | .797 | .0193 | .0904 | .0757 | .1097 | .87 | .0605 |
| 462 | 1.013 | .751 | .0337 | .0707 | .1013 | .1044 | 1.29 | .1005 |
| 463 | .859 | .787 | .0298 | .0627 | .1102 | .0925 | 1.51 | .1055 |
| 464 | 1.231 | .798 | .0212 | .0571 | .0838 | .0784 | 1.34 | .0705 |
| 465 | .907 | .853 | .0184 | .0547 | .1066 | .0731 | 1.71 | .0905 |
| 466 | .884 | .733 | .0320 | .0613 | .0880 | .0933 | 1.29 | .0855 |
| 467 | .765 | .796 | .0225 | .0500 | .0875 | .0725 | 1.52 | .0755 |
| 468 | .791 | .890 | .0126 | .0561 | .1024 | .0688 | 1.67 | .0804 |
| 469 | .898 | .860 | .0168 | .0633 | .1032 | .0802 | 1.50 | .0871 |
| 470 | 1.200 | .855 | .0181 | .0641 | .1069 | .0822 | 1.52 | .0921 |
| 471 | .782 | .775 | .0271 | .0585 | .0929 | .0856 | 1.40 | .0871 |
| 472 | 1.111 | .986 | .0015 | .0667 | .1085 | .0682 | 1.61 | .0770 |
| 473 | .729 | .740 | .0338 | .0570 | .0962 | .0908 | 1.43 | .0971 |
| 474 | 1.102 | .770 | .0265 | .0568 | .0885 | .0833 | 1.38 | .0821 |
| 475 | . | . | . | . | . | . | . | .0621 |
| 476 | .600 | .623 | .0471 | .0667 | .0779 | .1137 | 1.10 | .0921 |
| 477 | .769 | .799 | .0261 | .0714 | .1039 | .0975 | 1.33 | .0971 |
| 478 | . | . | . | . | . | . | . | . |
| 479 | .833 | .850 | .0180 | .0667 | .1020 | .0847 | 1.42 | .0871 |
| 480 | .802 | .834 | .0207 | .0596 | .1043 | .0803 | 1.56 | .0921 |

| | futm5yrt | futm30yt | premcor | precor5y | yldcrv | ln30yrt | beta | sv |
|---|---|---|---|---|---|---|---|---|
| 449 | .0669 | .0516 | -.047 | .008 | 1.26 | -2.61 | . | .0029 |
| 450 | .0969 | .0816 | -.047 | .008 | 1.26 | -2.61 | .65 | .0037 |
| 451 | .0819 | .0666 | -.047 | .008 | 1.26 | -2.61 | .65 | -.0032 |
| 452 | .0719 | .0566 | -.047 | .008 | 1.26 | -2.61 | .75 | .0090 |
| 453 | .0819 | .0666 | -.047 | .008 | 1.26 | -2.61 | .60 | .0000 |
| 454 | .0719 | .0566 | -.047 | .008 | 1.26 | -2.61 | .80 | .0000 |
| 455 | .0569 | .0416 | -.047 | .008 | 1.26 | -2.61 | .65 | .0000 |
| 456 | .1069 | .0916 | -.047 | .008 | 1.26 | -2.61 | .60 | -.0114 |
| 457 | .0719 | .0566 | -.047 | .008 | 1.26 | -2.61 | .75 | .0284 |
| 458 | .0869 | .0716 | -.047 | .008 | 1.26 | -2.61 | .45 | .0000 |
| 459 | .0619 | .0466 | -.047 | .008 | 1.26 | -2.61 | .60 | .0000 |
| 460 | .0969 | .0816 | -.047 | .008 | 1.26 | -2.61 | .70 | -.0001 |
| 461 | .0369 | .0216 | -.047 | .008 | 1.26 | -2.61 | .55 | -.0144 |
| 462 | .0769 | .0616 | -.047 | .008 | 1.26 | -2.61 | .65 | .0105 |
| 463 | .0819 | .0666 | -.047 | .008 | 1.26 | -2.61 | .65 | .0000 |
| 464 | .0469 | .0316 | -.047 | .008 | 1.26 | -2.61 | .60 | .0205 |
| 465 | .0669 | .0516 | -.047 | .008 | 1.26 | -2.61 | .65 | .0184 |
| 466 | .0619 | .0466 | -.047 | .008 | 1.26 | -2.61 | . | .0000 |
| 467 | .0519 | .0366 | -.047 | .008 | 1.26 | -2.61 | .65 | .0111 |
| 468 | .0569 | .0416 | -.047 | .008 | 1.26 | -2.61 | .65 | .0186 |
| 469 | .0679 | .0511 | -.051 | .002 | 1.32 | -2.68 | .70 | .0156 |
| 470 | .0729 | .0561 | -.051 | .002 | 1.32 | -2.68 | .60 | .0098 |
| 471 | .0679 | .0511 | -.051 | .002 | 1.32 | -2.68 | .70 | .0106 |
| 472 | .0579 | .0411 | -.051 | .002 | 1.32 | -2.68 | .65 | .0248 |
| 473 | .0779 | .0611 | -.051 | .002 | 1.32 | -2.68 | .70 | .0053 |
| 474 | .0629 | .0461 | -.051 | .002 | 1.32 | -2.68 | .70 | .0079 |
| 475 | .0429 | .0261 | -.051 | .002 | 1.32 | -2.68 | .85 | .0003 |
| 476 | .0729 | .0561 | -.051 | .002 | 1.32 | -2.68 | .70 | .0015 |
| 477 | .0779 | .0611 | -.051 | .002 | 1.32 | -2.68 | .65 | .0106 |
| 478 | . | . | -.051 | .002 | 1.32 | -2.68 | .75 | -.0006 |
| 479 | .0679 | .0511 | -.051 | .002 | 1.32 | -2.68 | .60 | .0079 |
| 480 | .0729 | .0561 | -.051 | .002 | 1.32 | -2.68 | .70 | .0084 |

| | dcfsv | dcfvle | dcfvld | dcfvlb | dcfvla3 | dcfcst80 |
|---|---|---|---|---|---|---|
| 225 | .1106 | .129 | .129 | .139 | .133 | .1059 |
| 226 | .1072 | .109 | .109 | .114 | .110 | .1048 |
| 227 | . | . | . | . | . | . |
| 228 | .1179 | .120 | .120 | .110 | .117 | .1173 |
| 229 | .1025 | .095 | .100 | .105 | .100 | .1025 |
| 230 | .1018 | .091 | .081 | .101 | .091 | .1018 |
| 231 | .1064 | .111 | .111 | .101 | .107 | .1047 |
| 232 | .1184 | .059 | .114 | .119 | .097 | .1147 |
| 233 | .1144 | .124 | .109 | .099 | .110 | .1144 |
| 234 | .1044 | .083 | .018 | .128 | .076 | .1047 |
| 235 | .1143 | .094 | .074 | .099 | .089 | .1143 |
| 236 | .1054 | .109 | .119 | .109 | .113 | .1045 |
| 237 | .1017 | .091 | .116 | .106 | .104 | .1014 |
| 238 | .1083 | .137 | .097 | .132 | .122 | .1073 |
| 239 | .1579 | .093 | .113 | .133 | .113 | . |
| 240 | .1268 | .126 | .116 | .086 | .109 | . |
| 241 | .1232 | .117 | .122 | .137 | .125 | . |
| 242 | .1175 | .114 | .114 | .119 | .115 | .1174 |
| 243 | . | . | . | . | . | . |
| 244 | .1107 | .106 | .121 | .116 | .114 | .1068 |
| 245 | .1213 | .140 | .055 | .080 | .091 | . |
| 246 | . | . | . | . | . | . |
| 247 | .1165 | .132 | .092 | .097 | .107 | .1150 |
| 248 | .1162 | .133 | .098 | .118 | .116 | .1117 |
| 249 | . | . | . | . | . | . |
| 250 | .1117 | .137 | .092 | .112 | .114 | .1117 |
| 251 | .1024 | .090 | .095 | .100 | .095 | .1024 |
| 252 | .1053 | .109 | .104 | .109 | .107 | .1049 |
| 253 | .1074 | .099 | .104 | .109 | .104 | .1074 |
| 254 | .1186 | .132 | .122 | .102 | .118 | .1186 |
| 255 | .1014 | .124 | .119 | .084 | .109 | .1014 |
| 256 | .1138 | .116 | .111 | .111 | .112 | .1121 |

| | dcfsv | dcfvle | dcfvld | dcfvlb | dcfvla3 | dcfcst80 |
|---|---|---|---|---|---|---|
| 449 | .1065 | .073 | .073 | .073 | .073 | .1036 |
| 450 | .0963 | .107 | .082 | .072 | .087 | .0927 |
| 451 | .1027 | .144 | .129 | .104 | .126 | .1059 |
| 452 | .0999 | .094 | .094 | .094 | .094 | .0909 |
| 453 | .0858 | .092 | .092 | .082 | .089 | .0858 |
| 454 | .1000 | .110 | .100 | .080 | .097 | .1000 |
| 455 | .0742 | .068 | .048 | .103 | .073 | . |
| 456 | .0922 | .100 | .090 | .080 | .090 | .1035 |
| 457 | .1199 | .051 | .161 | .111 | .108 | .0915 |
| 458 | .1061 | .097 | .107 | .092 | .099 | .1061 |
| 459 | .0758 | .072 | .087 | .102 | .087 | . |
| 460 | .0912 | .089 | .079 | .084 | .084 | .0913 |
| 461 | .0953 | .100 | .100 | .095 | .099 | .1097 |
| 462 | .1148 | .086 | .081 | .081 | .082 | .1044 |
| 463 | .0925 | .083 | .098 | .088 | .089 | .0925 |
| 464 | .0988 | .082 | .097 | .117 | .099 | . |
| 465 | .0915 | .075 | .085 | .100 | .086 | . |
| 466 | .0933 | .101 | .076 | .081 | .086 | .0933 |
| 467 | .0836 | .060 | .100 | .090 | .083 | . |
| 468 | .0874 | .086 | .081 | .096 | .088 | . |
| 469 | .0957 | .108 | .088 | .083 | .093 | .0802 |
| 470 | .0921 | .094 | .074 | .074 | .081 | .0822 |
| 471 | .0962 | .104 | .089 | .084 | .092 | .0856 |
| 472 | .0930 | .107 | .072 | .097 | .092 | . |
| 473 | .0961 | .117 | .117 | .097 | .110 | .0908 |
| 474 | .0912 | .037 | .022 | .077 | .045 | .0833 |
| 475 | . | .144 | . | . | . | . |
| 476 | .1152 | .094 | .062 | .092 | .073 | . |
| 477 | .1082 | .092 | .091 | .111 | .100 | .0975 |
| 478 | . | .110 | . | . | . | . |
| 479 | .0925 | .068 | .082 | .097 | .090 | .0847 |
| 480 | .0887 | .100 | .085 | .095 | .086 | .0803 |

| | name | recordno | date | book | price | qdiv | futroe |
|---|---|---|---|---|---|---|---|
| 481 | San Diego G. & | 481.00 | 02/26/93 | 12.550 | 25.00 | .360 | .145 |
| 482 | Sierra Pacific | 482.00 | 02/26/93 | 15.900 | 21.00 | .280 | .105 |
| 483 | Tucson Elec. Pw | 483.00 | 02/26/93 | -1.150 | 3.00 | .000 | . |
| 484 | Washington Wtr. | 484.00 | 02/26/93 | 23.150 | 37.00 | .620 | .125 |
| 485 | | . | . | . | . | . | . |
| 486 | | . | . | . | . | . | . |
| 487 | | . | . | . | . | . | . |
| 488 | | . | . | . | . | . | . |
| 489 | | . | . | . | . | . | . |
| 490 | | . | . | . | . | . | . |
| 491 | | . | . | . | . | . | . |
| 492 | | . | . | . | . | . | . |
| 493 | | . | . | . | . | . | . |
| 494 | | . | . | . | . | . | . |
| 495 | | . | . | . | . | . | . |
| 496 | | . | . | . | . | . | . |
| 497 | | . | . | . | . | . | . |
| 498 | | . | . | . | . | . | . |
| 499 | | . | . | . | . | . | . |
| 500 | | . | . | . | . | . | . |
| 501 | | . | . | . | . | . | . |
| 502 | | . | . | . | . | . | . |
| 503 | | . | . | . | . | . | . |
| 504 | | . | . | . | . | . | . |
| 505 | | . | . | . | . | . | . |
| 506 | | . | . | . | . | . | . |
| 507 | | . | . | . | . | . | . |
| 508 | | . | . | . | . | . | . |

c:\studies\regress\sdat.sav

| | comeq | afcpft | acteps | tres1yr | tres5yr | tres30yr | pricebk | anndiv |
|---|---|---|---|---|---|---|---|---|
| 481 | .525 | .050 | 1.77 | .03 | .05 | .07 | 1.99 | 1.44 |
| 482 | .382 | .044 | 1.09 | .03 | .05 | .07 | 1.32 | 1.12 |
| 483 | -.150 | . | -2.48 | .03 | .05 | .07 | . | . |
| 484 | .425 | .030 | 2.64 | .03 | .05 | .07 | 1.60 | 2.48 |
| 485 | . | . | . | . | . | . | . | . |
| 486 | . | . | . | . | . | . | . | . |
| 487 | . | . | . | . | . | . | . | . |
| 488 | . | . | . | . | . | . | . | . |
| 489 | . | . | . | . | . | . | . | . |
| 490 | . | . | . | . | . | . | . | . |
| 491 | . | . | . | . | . | . | . | . |
| 492 | . | . | . | . | . | . | . | . |
| 493 | . | . | . | . | . | . | . | . |
| 494 | . | . | . | . | . | . | . | . |
| 495 | . | . | . | . | . | . | . | . |
| 496 | . | . | . | . | . | . | . | . |
| 497 | . | . | . | . | . | . | . | . |
| 498 | . | . | . | . | . | . | . | . |
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| 506 | . | . | . | . | . | . | . | . |
| 507 | . | . | . | . | . | . | . | . |
| 508 | . | . | . | . | . | . | . | . |

| | actpo | sustpo | sustbr | divyld | divtobk | dcfcost | ratiofc | futm1yrt |
|---|---|---|---|---|---|---|---|---|
| 481 | .814 | .791 | .0303 | .0576 | .1147 | .0879 | 1.65 | .1121 |
| 482 | 1.028 | .671 | .0346 | .0533 | .0704 | .0879 | 1.19 | .0721 |
| 483 | . | . | . | . | . | . | . | . |
| 484 | .939 | .857 | .0179 | .0670 | .1071 | .0849 | 1.47 | .0921 |
| 485 | . | . | . | . | . | . | . | . |
| 486 | . | . | . | . | . | . | . | . |
| 487 | . | . | . | . | . | . | . | . |
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| 505 | . | . | . | . | . | . | . | . |
| 506 | . | . | . | . | . | . | . | . |
| 507 | . | . | . | . | . | . | . | . |
| 508 | . | . | . | . | . | . | . | . |

| | futm5yrt | futm30yt | premcor | precor5y | yldcrv | ln30yrt | beta | sv |
|---|---|---|---|---|---|---|---|---|
| 481 | .0929 | .0761 | -.051 | .002 | 1.32 | -2.68 | .60 | .0133 |
| 482 | .0529 | .0361 | -.051 | .002 | 1.32 | -2.68 | .55 | .0092 |
| 483 | . | . | -.051 | .002 | 1.32 | -2.68 | .65 | . |
| 484 | .0729 | .0561 | -.051 | .002 | 1.32 | -2.68 | .55 | .0073 |
| 485 | . | . | . | . | . | . | . | . |
| 486 | . | . | . | . | . | . | . | . |
| 487 | . | . | . | . | . | . | . | . |
| 488 | . | . | . | . | . | . | . | . |
| 489 | . | . | . | . | . | . | . | . |
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| 507 | . | . | . | . | . | . | . | . |
| 508 | . | . | . | . | . | . | . | . |

| | dcfsv | dcfvle | dcfvld | dcfvlb | dcfvla3 | dcfcst80 |
|---|---|---|---|---|---|---|
| 481 | .1012 | .051 | .083 | .103 | .096 | .0879 |
| 482 | .0971 | .097 | .003 | .073 | .047 | .0879 |
| 483 | . | .072 | . | . | . | . |
| 484 | .0922 | .089 | .067 | .097 | .087 | .0849 |
| 485 | . | .100 | .100 | .095 | .099 | . |
| 486 | . | .086 | .081 | .081 | .082 | . |
| 487 | . | .083 | .098 | .088 | .089 | . |
| 488 | . | .082 | .097 | .117 | .099 | . |
| 489 | . | .075 | .085 | .100 | .086 | . |
| 490 | . | .101 | .076 | .081 | .086 | . |
| 491 | . | .060 | .100 | .090 | .083 | . |
| 492 | . | .086 | .081 | .096 | .088 | . |
| 493 | . | .108 | .088 | .083 | .093 | . |
| 494 | . | .094 | .074 | .074 | .081 | . |
| 495 | . | .104 | .089 | .084 | .092 | . |
| 496 | . | .107 | .072 | .097 | .092 | . |
| 497 | . | .117 | .117 | .097 | .110 | . |
| 498 | . | .037 | .022 | .077 | .045 | . |
| 499 | . | . | . | . | . | . |
| 500 | . | .067 | .062 | .092 | .073 | . |
| 501 | . | .096 | .091 | .111 | .100 | . |
| 502 | . | . | . | . | . | . |
| 503 | . | .092 | .082 | .097 | .090 | . |
| 504 | . | .080 | .085 | .095 | .086 | . |
| 505 | . | .103 | .083 | .103 | .096 | . |
| 506 | . | .063 | .003 | .073 | .047 | . |
| 507 | . | . | . | . | . | . |
| 508 | . | .097 | .067 | .097 | .087 | . |

NGRID 1-13 Referring to the Rothschild Direct Testimony at Schedule JAR 3. Please state the date of the issue of Value Line publication that was used for this schedule.

RESPONSE: June 13, 2008.

NGRID 1-14 Referring to the Rothschild Direct Testimony at Schedule JAR 4 at page 1. Please provide a hard copy of Yahoo Finance, as of February 15, 2007 showing the prices referenced in footnote [B].

RESPONSE: Please see attached.

## AGL Resources Inc. (ATG)

At 2:47PM ET: 36.05 0.16 (0.45%)



### Historical Prices

Get Historical Prices for: GO



SET DATE RANGE

Start Date: Jun 1 2007 Eg. Jan 1, 2003

End Date: May 31 2008

Daily
Weekly
Monthly
Dividends Only

Get Prices

First | Prev | Next | Last

PRICES

| Date | Open | High | Low | Close | Avg Vol | Adj Close* |
|---|---|---|---|---|---|---|
| 14-May-08 | $ 0.42 Dividend | | | | | |
| May-08 | 34.23 | 36.50 | 34.06 | 35.70 | 575,200 | 35.70 |
| Apr-08 | 34.66 | 36.05 | 33.73 | 34.00 | 393,300 | 33.61 |
| Mar-08 | 34.75 | 35.62 | 33.45 | 34.32 | 457,100 | 33.92 |
| 13-Feb-08 | $ 0.42 Dividend | | | | | |
| Feb-08 | 37.85 | 39.13 | 34.63 | 34.68 | 506,600 | 34.28 |
| Jan-08 | 37.46 | 38.69 | 35.49 | 37.85 | 754,500 | 36.99 |
| Dec-07 | 37.09 | 38.65 | 35.42 | 37.64 | 650,400 | 36.78 |
| 14-Nov-07 | $ 0.41 Dividend | | | | | |
| Nov-07 | 38.53 | 39.21 | 35.85 | 37.08 | 728,300 | 36.24 |
| Oct-07 | 39.73 | 41.16 | 36.65 | 39.53 | 499,900 | 38.21 |
| Sep-07 | 39.67 | 40.35 | 38.53 | 39.62 | 446,400 | 38.30 |
| 15-Aug-07 | $ 0.41 Dividend | | | | | |
| Aug-07 | 37.70 | 40.25 | 35.24 | 39.71 | 729,500 | 38.39 |
| Jul-07 | 40.69 | 41.51 | 37.66 | 37.70 | 405,200 | 36.04 |
| Jun-07 | 42.78 | 42.80 | 39.52 | 40.48 | 596,800 | 38.70 |

* Close price adjusted for dividends and splits.

First | Prev | Next | Last

## Atmos Energy Corp. (ATO)

At 2:47PM ET: 27.19 0.13 (0.48%)



## Historical Prices

Get Historical Prices for: GO



SET DATE RANGE

Start Date: Jun 1 2007 Eg. Jan 1, 2003

End Date: May 31 2008

Daily
Weekly
Monthly
Dividends Only

Get Prices

First | Prev | Next | Last

PRICES

| Date | Open | High | Low | Close | Avg Vol | Adj Close* |
|---|---|---|---|---|---|---|
| 22-May-08 | | | $ 0.325 Dividend | | | |
| May-08 | 27.80 | 28.64 | 27.14 | 27.39 | 440,900 | 27.39 |
| Apr-08 | 25.75 | 28.27 | 25.55 | 27.68 | 425,800 | 27.36 |
| Mar-08 | 26.08 | 26.52 | 25.00 | 25.50 | 611,400 | 25.20 |
| 21-Feb-08 | | | $ 0.325 Dividend | | | |
| Feb-08 | 28.71 | 29.29 | 25.84 | 26.00 | 585,100 | 25.70 |
| Jan-08 | 28.04 | 28.85 | 26.00 | 28.74 | 767,800 | 28.07 |
| Dec-07 | 26.30 | 28.83 | 26.10 | 28.04 | 494,500 | 27.39 |
| 21-Nov-07 | | | $ 0.325 Dividend | | | |
| Nov-07 | 27.95 | 28.18 | 26.01 | 26.19 | 615,400 | 25.58 |
| Oct-07 | 28.48 | 29.63 | 27.54 | 28.05 | 367,300 | 27.07 |
| Sep-07 | 28.29 | 28.73 | 27.28 | 28.32 | 440,800 | 27.33 |
| 23-Aug-07 | | | $ 0.32 Dividend | | | |
| Aug-07 | 28.07 | 28.90 | 23.87 | 28.11 | 809,200 | 27.13 |
| Jul-07 | 30.10 | 30.84 | 28.01 | 28.07 | 483,900 | 26.77 |
| Jun-07 | 32.36 | 32.60 | 29.11 | 30.06 | 422,600 | 28.67 |

* Close price adjusted for dividends and splits.

First | Prev | Next | Last

## Equitable Resources Inc. (EQT)

At 2:48PM ET: **72.84** 0.91 (1.27%)



### Historical Prices

Get Historical Prices for: GO



SET DATE RANGE

Start Date: Jun 1 2007 Eg. Jan 1, 2003

End Date: May 31 2008

Daily
Weekly
Monthly
Dividends Only

Get Prices

First | Prev | Next | Last

PRICES

| Date | Open | High | Low | Close | Avg Vol | Adj Close* |
|---|---|---|---|---|---|---|
| 7-May-08 | | | $ 0.22 Dividend | | | |
| May-08 | 66.10 | 76.14 | 63.04 | 70.23 | 1,485,400 | 70.23 |
| Apr-08 | 59.78 | 69.54 | 58.94 | 66.37 | 961,500 | 66.16 |
| Mar-08 | 61.82 | 65.05 | 55.65 | 58.90 | 1,403,500 | 58.71 |
| 13-Feb-08 | | | $ 0.22 Dividend | | | |
| Feb-08 | 56.06 | 63.77 | 55.08 | 61.62 | 1,075,600 | 61.42 |
| Jan-08 | 53.01 | 57.62 | 47.16 | 55.75 | 1,361,000 | 55.36 |
| Dec-07 | 53.02 | 55.58 | 51.55 | 53.28 | 725,000 | 52.91 |
| 7-Nov-07 | | | $ 0.22 Dividend | | | |
| Nov-07 | 55.82 | 56.75 | 51.54 | 52.86 | 1,035,400 | 52.49 |
| Oct-07 | 52.13 | 56.71 | 52.12 | 56.32 | 916,200 | 55.71 |
| Sep-07 | 49.42 | 52.46 | 48.42 | 51.87 | 722,900 | 51.31 |
| 8-Aug-07 | | | $ 0.22 Dividend | | | |
| Aug-07 | 47.25 | 54.42 | 44.57 | 49.19 | 1,327,900 | 48.66 |
| Jul-07 | 50.19 | 53.37 | 46.31 | 47.11 | 910,600 | 46.40 |
| Jun-07 | 52.57 | 53.70 | 48.11 | 49.56 | 719,100 | 48.81 |

* Close price adjusted for dividends and splits.

First | Prev | Next | Last

## Laclede Group Inc. (LG)

At 2:48PM ET: **40.45** 0.86 (2.17%)



## Historical Prices

Get Historical Prices for: GO



SET DATE RANGE

Start Date: Jun 1 2007 Eg. Jan 1, 2003

End Date: May 31 2008

Daily
Weekly
Monthly
Dividends Only

Get Prices

First | Prev | Next | Last

PRICES

| Date | Open | High | Low | Close | Avg Vol | Adj Close* |
|---|---|---|---|---|---|---|
| May-08 | 37.53 | 41.57 | 37.48 | 40.00 | 165,200 | 40.00 |
| Apr-08 | 35.93 | 38.28 | 35.36 | 37.82 | 214,300 | 37.82 |
| 7-Mar-08 | | | $ 0.375 Dividend | | | |
| Mar-08 | 34.10 | 36.45 | 33.42 | 35.63 | 180,000 | 35.63 |
| Feb-08 | 33.68 | 35.46 | 32.76 | 34.15 | 156,500 | 33.78 |
| Jan-08 | 34.37 | 35.34 | 31.86 | 33.77 | 147,000 | 33.40 |
| 7-Dec-07 | | | $ 0.375 Dividend | | | |
| Dec-07 | 34.36 | 35.72 | 33.31 | 34.24 | 105,200 | 33.86 |
| Nov-07 | 34.30 | 35.09 | 32.15 | 34.41 | 98,200 | 33.67 |
| Oct-07 | 32.33 | 34.99 | 31.48 | 34.79 | 85,100 | 34.04 |
| 7-Sep-07 | | | $ 0.365 Dividend | | | |
| Sep-07 | 32.43 | 34.17 | 30.60 | 32.28 | 91,600 | 31.59 |
| Aug-07 | 29.95 | 34.05 | 28.84 | 32.64 | 130,500 | 31.57 |
| Jul-07 | 32.03 | 33.14 | 29.00 | 29.55 | 115,900 | 28.58 |
| 7-Jun-07 | | | $ 0.365 Dividend | | | |
| Jun-07 | 31.93 | 32.84 | 30.40 | 31.88 | 156,800 | 30.84 |

* Close price adjusted for dividends and splits.

First | Prev | Next | Last

## Nicor Inc. (GAS)

At 2:49PM ET: **42.48** 0.71 (1.70%)



### Historical Prices

Get Historical Prices for: GO



SET DATE RANGE

Start Date: Jun 1 2007 Eg. Jan 1, 2003

End Date: May 31 2008

Daily
Weekly
Monthly
Dividends Only

Get Prices

First | Prev | Next | Last

PRICES

| Date | Open | High | Low | Close | Avg Vol | Adj Close* |
|---|---|---|---|---|---|---|
| May-08 | 36.99 | 41.60 | 36.08 | 40.83 | 716,100 | 40.83 |
| 3-Apr-08 | | | $ 0.465 Dividend | | | |
| Apr-08 | 33.95 | 36.00 | 33.33 | 35.12 | 593,900 | 35.12 |
| Mar-08 | 34.10 | 34.29 | 32.35 | 33.51 | 977,600 | 33.07 |
| Feb-08 | 41.09 | 42.62 | 33.99 | 34.10 | 941,400 | 33.65 |
| Jan-08 | 42.70 | 42.70 | 37.40 | 40.94 | 909,500 | 40.40 |
| 27-Dec-07 | | | $ 0.465 Dividend | | | |
| Dec-07 | 42.14 | 45.14 | 42.00 | 42.35 | 739,400 | 41.79 |
| Nov-07 | 42.21 | 42.78 | 39.18 | 42.14 | 1,046,300 | 41.15 |
| Oct-07 | 43.00 | 45.16 | 41.31 | 43.27 | 546,200 | 42.25 |
| 26-Sep-07 | | | $ 0.465 Dividend | | | |
| Sep-07 | 41.67 | 43.86 | 40.51 | 42.90 | 549,600 | 41.89 |
| Aug-07 | 40.98 | 48.20 | 37.80 | 41.56 | 950,200 | 40.14 |
| Jul-07 | 43.01 | 44.10 | 39.28 | 39.41 | 839,200 | 38.06 |
| 27-Jun-07 | | | $ 0.465 Dividend | | | |
| Jun-07 | 47.27 | 47.47 | 42.17 | 42.92 | 703,900 | 41.45 |

* Close price adjusted for dividends and splits.

First | Prev | Next | Last

## Northwest Natural Gas Co. (NWN)

At 2:47PM ET: 46.02 0.18 (0.39%)



## Historical Prices

Get Historical Prices for: GO

SET DATE RANGE

Start Date: Jun 1 2007 Eg. Jan 1, 2003

End Date: May 31 2008

Daily
Weekly
Monthly
Dividends Only

Get Prices



First | Prev | Next | Last

PRICES

| Date | Open | High | Low | Close | Avg Vol | Adj Close* |
|---|---|---|---|---|---|---|
| May-08 | 44.77 | 46.50 | 43.46 | 45.59 | 197,200 | 45.59 |
| 28-Apr-08 | | | $ 0.375 Dividend | | | |
| Apr-08 | 43.76 | 45.74 | 43.08 | 44.87 | 174,000 | 44.87 |
| Mar-08 | 41.86 | 43.92 | 41.07 | 43.44 | 275,700 | 43.07 |
| Feb-08 | 47.34 | 48.81 | 41.88 | 42.04 | 315,400 | 41.68 |
| 29-Jan-08 | | | $ 0.375 Dividend | | | |
| Jan-08 | 48.67 | 50.74 | 45.87 | 47.34 | 273,800 | 46.94 |
| Dec-07 | 48.18 | 50.58 | 46.35 | 48.66 | 150,400 | 47.87 |
| Nov-07 | 47.34 | 50.89 | 44.62 | 47.97 | 246,000 | 47.19 |
| 29-Oct-07 | | | $ 0.375 Dividend | | | |
| Oct-07 | 45.60 | 48.45 | 44.28 | 48.17 | 119,500 | 47.39 |
| Sep-07 | 46.06 | 48.49 | 43.45 | 45.70 | 124,900 | 44.60 |
| Aug-07 | 41.54 | 49.37 | 40.98 | 46.46 | 265,600 | 45.34 |
| 27-Jul-07 | | | $ 0.355 Dividend | | | |
| Jul-07 | 46.41 | 46.83 | 41.23 | 41.67 | 185,600 | 40.66 |
| Jun-07 | 50.07 | 50.49 | 44.35 | 46.19 | 220,700 | 44.70 |

* Close price adjusted for dividends and splits.

First | Prev | Next | Last

## Piedmont Natural Gas Co. Inc. (PNY)

At 3:37PM ET: 26.18 1.27 (4.63%)



### Historical Prices

Get Historical Prices for: GO



SET DATE RANGE

Start Date: Jun 1 2007 Eg. Jan 1, 2003

End Date: May 31 2008

Daily
Weekly
Monthly
Dividends Only

Get Prices

First | Prev | Next | Last

PRICES

| Date | Open | High | Low | Close | Avg Vol | Adj Close* |
|---|---|---|---|---|---|---|
| May-08 | 26.34 | 27.42 | 25.70 | 27.03 | 302,300 | 27.03 |
| Apr-08 | 26.20 | 27.68 | 26.03 | 26.29 | 316,200 | 26.29 |
| 20-Mar-08 | $ 0.26 Dividend | | | | | |
| Mar-08 | 24.57 | 27.32 | 24.05 | 26.26 | 573,500 | 26.26 |
| Feb-08 | 25.22 | 25.95 | 24.28 | 24.60 | 388,800 | 24.36 |
| Jan-08 | 26.17 | 26.96 | 24.01 | 25.07 | 535,300 | 24.82 |
| 20-Dec-07 | $ 0.25 Dividend | | | | | |
| Dec-07 | 26.42 | 27.98 | 25.74 | 26.16 | 320,000 | 25.90 |
| Nov-07 | 25.16 | 26.56 | 24.37 | 26.04 | 364,000 | 25.54 |
| Oct-07 | 25.05 | 26.72 | 24.03 | 25.53 | 295,100 | 25.04 |
| 20-Sep-07 | $ 0.25 Dividend | | | | | |
| Sep-07 | 26.27 | 26.79 | 24.48 | 25.09 | 311,400 | 24.61 |
| Aug-07 | 23.17 | 27.50 | 23.09 | 26.40 | 508,900 | 25.65 |
| Jul-07 | 24.81 | 25.77 | 22.00 | 23.19 | 478,900 | 22.53 |
| 20-Jun-07 | $ 0.25 Dividend | | | | | |
| Jun-07 | 26.67 | 27.47 | 24.37 | 24.65 | 460,400 | 23.95 |

* Close price adjusted for dividends and splits.

First | Prev | Next | Last

## South Jersey Industries Inc. (SJI)

At 3:09PM ET: **38.33** ↑ 0.16 (0.42%)



### Historical Prices

Get Historical Prices for: GO



SET DATE RANGE

Start Date: Jun 1 2007 Eg. Jan 1, 2003

End Date: May 31 2008

Daily
Weekly
Monthly
Dividends Only

Get Prices

First | Prev | Next | Last

PRICES

| Date | Open | High | Low | Close | Avg Vol | Adj Close* |
|---|---|---|---|---|---|---|
| May-08 | 36.56 | 39.25 | 36.36 | 38.25 | 167,100 | 37.99 |
| Apr-08 | 35.42 | 37.54 | 35.31 | 36.51 | 154,900 | 36.26 |
| 6-Mar-08 | | | $ 0.27 Dividend | | | |
| Mar-08 | 34.25 | 35.71 | 31.90 | 35.11 | 229,200 | 34.87 |
| Feb-08 | 35.16 | 36.88 | 34.05 | 34.17 | 171,300 | 33.66 |
| Jan-08 | 35.92 | 38.41 | 33.82 | 35.03 | 211,400 | 34.51 |
| 6-Dec-07 | | | $ 0.27 Dividend | | | |
| Dec-07 | 37.09 | 38.03 | 34.73 | 36.09 | 141,100 | 35.56 |
| Nov-07 | 37.00 | 38.50 | 35.32 | 36.90 | 182,900 | 36.09 |
| Oct-07 | 34.92 | 37.78 | 33.80 | 37.56 | 155,700 | 36.73 |
| 6-Sep-07 | | | $ 0.245 Dividend | | | |
| Sep-07 | 33.83 | 36.41 | 31.83 | 34.80 | 134,100 | 34.03 |
| Aug-07 | 32.72 | 35.98 | 31.20 | 33.91 | 197,600 | 32.92 |
| Jul-07 | 35.61 | 36.48 | 32.37 | 32.77 | 183,500 | 31.81 |
| 7-Jun-07 | | | $ 0.245 Dividend | | | |
| Jun-07 | 39.00 | 39.28 | 34.53 | 35.38 | 283,100 | 34.35 |

* Close price adjusted for dividends and splits.

First | Prev | Next | Last

## Southwest Gas Corp. (SWX)

At 3:12PM ET: 30.20 0.02 (0.07%)



### Historical Prices

Get Historical Prices for: GO



SET DATE RANGE

Start Date: Jun 1 2007 Eg. Jan 1, 2003

End Date: May 31 2008

Daily
Weekly
Monthly
Dividends Only

Get Prices

First | Prev | Next | Last

PRICES

| Date | Open | High | Low | Close | Avg Vol | Adj Close* |
|---|---|---|---|---|---|---|
| 13-May-08 | | | $ 0.225 Dividend | | | |
| May-08 | 28.91 | 31.74 | 28.90 | 31.18 | 266,800 | 31.18 |
| Apr-08 | 28.18 | 30.05 | 27.90 | 28.87 | 196,900 | 28.65 |
| Mar-08 | 25.65 | 28.35 | 25.14 | 27.96 | 418,400 | 27.75 |
| 13-Feb-08 | | | $ 0.215 Dividend | | | |
| Feb-08 | 28.61 | 29.96 | 25.48 | 25.59 | 273,500 | 25.40 |
| Jan-08 | 29.60 | 30.48 | 26.30 | 28.55 | 309,000 | 28.12 |
| Dec-07 | 29.02 | 30.97 | 28.62 | 29.77 | 195,900 | 29.33 |
| 13-Nov-07 | | | $ 0.215 Dividend | | | |
| Nov-07 | 29.40 | 29.52 | 26.61 | 28.92 | 286,100 | 28.49 |
| Oct-07 | 28.39 | 29.98 | 27.29 | 29.76 | 268 900 | 29.09 |
| Sep-07 | 28.94 | 30.50 | 28.01 | 28.29 | 359,800 | 27.66 |
| 13-Aug-07 | | | $ 0.215 Dividend | | | |
| Aug-07 | 30.99 | 31.89 | 26.45 | 29.01 | 456,700 | 28.36 |
| Jul-07 | 33.97 | 34.22 | 28.99 | 31.08 | 289,900 | 30.17 |
| Jun-07 | 38.15 | 38.52 | 33.10 | 33.81 | 299,400 | 32.82 |

* Close price adjusted for dividends and splits.

First | Prev | Next | Last

# WGL Holdings Inc. (WGL)

At 3:12PM ET: **35.20** 0.09 (0.26%)



## Historical Prices

Get Historical Prices for: GO



SET DATE RANGE

Start Date: Jun 1 2007 Eg. Jan 1, 2003
End Date: May 31 2008

Daily
Weekly
Monthly
Dividends Only

Get Prices

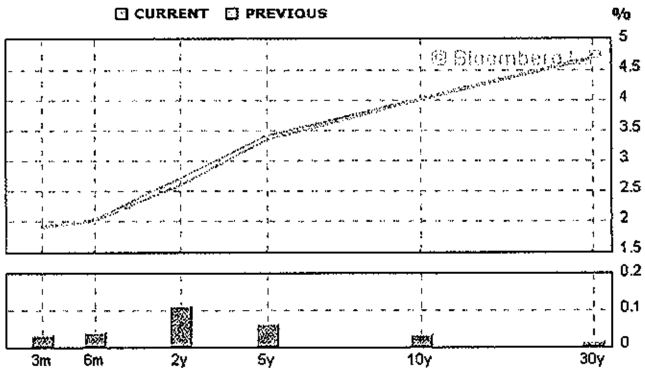
First | Prev | Next | Last

PRICES

| Date | Open | High | Low | Close | Avg Vol | Adj Close* |
|---|---|---|---|---|---|---|
| May-08 | 34.65 | 35.69 | 33.51 | 34.89 | 497,600 | 34.89 |
| 8-Apr-08 | | | $ 0.355 Dividend | | | |
| Apr-08 | 32.25 | 33.94 | 31.84 | 32.80 | 376,900 | 32.80 |
| Mar-08 | 31.19 | 33.49 | 30.26 | 32.06 | 762,300 | 31.71 |
| Feb-08 | 32.25 | 33.38 | 31.11 | 31.19 | 692,100 | 30.85 |
| 8-Jan-08 | | | $ 0.343 Dividend | | | |
| Jan-08 | 32.60 | 34.62 | 31.31 | 32.24 | 828,400 | 31.89 |
| Dec-07 | 32.95 | 34.50 | 31.82 | 32.76 | 440,400 | 32.06 |
| Nov-07 | 33.83 | 34.39 | 32.02 | 33.04 | 592,200 | 32.34 |
| 5-Oct-07 | | | $ 0.343 Dividend | | | |
| Oct-07 | 34.18 | 35.08 | 32.17 | 33.92 | 391,600 | 33.20 |
| Sep-07 | 32.77 | 34.60 | 31.55 | 33.89 | 388,900 | 32.84 |
| Aug-07 | 30.16 | 35.01 | 29.79 | 32.89 | 657,200 | 31.87 |
| 6-Jul-07 | | | $ 0.343 Dividend | | | |
| Jul-07 | 32.82 | 33.44 | 29.79 | 29.94 | 484,800 | 29.01 |
| Jun-07 | 35.46 | 35.91 | 31.82 | 32.64 | 474,100 | 31.30 |

* Close price adjusted for dividends and splits

First | Prev | Next | Last




Inflation Indexed Treasury

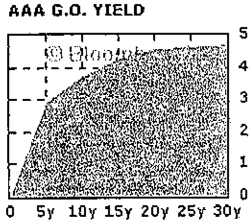
| | COUPON | MATURITY DATE | CURRENT PRICE/YIELD | PRICE/YIELD CHANGE | TIME |
|---|---|---|---|---|---|
| 5-Year | 0.625 | 04/15/2013 | 98-09 / .98 | -0-06 / .040 | 08:38 |
| 10-Year | 1.625 | 01/15/2018 | 100-23 / 1.54 | -0-05 / .019 | 08:38 |
| 20-Year | 1.750 | 01/15/2028 | 94-17 / 2.09 | -0-04 / .009 | 08:38 |
| 30-Year | 3.375 | 04/15/2032 | 125-00 / 2.05 | -0-07 / .010 | 08:38 |

Municipal Bonds

National Municipal Bond Yields:
Triple-A Rated, Tax-Exempt Insured Revenue Bonds

| | CURRENT YIELD | PREVIOUS YIELD | CHANGE IN YIELD | 28% EQ YIELD | 1 WEEK PRIOR YIELD | 1 MONTH PRIOR YIELD | 6 MONTH PRIOR YIELD |
|---|---|---|---|---|---|---|---|
| 2-Year | 2.40% | 2.38% | 0.02% | 3.33% | 2.40% | 2.37% | 3.39% |
| 5-Year | 3.13% | 3.13% | 0.00% | 4.35% | 3.14% | 3.15% | 3.53% |
| 7-Year | 3.36% | 3.35% | 0.01% | 4.67% | 3.36% | 3.43% | 3.70% |
| 10-Year | 3.86% | 3.86% | 0.00% | 5.36% | 3.86% | 3.95% | 3.98% |
| 15-Year | 4.51% | 4.49% | 0.02% | 6.26% | 4.52% | 4.66% | 4.41% |
| 20-Year | 4.68% | 4.67% | 0.01% | 6.50% | 4.71% | 4.80% | 4.61% |
| 30-Year | 4.71% | 4.68% | 0.03% | 6.54% | 4.72% | 4.90% | 4.65% |

AAA G.O. YIELD

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Muni Material Events

Related News

- Treasuries Decline Before GDP Report, $19 Billion Five-Year Note Auction
- Climate-Bonds Plan by UN Official Aims to Increase Clean-Energy Investment
- Apollo's Momentive Chooses to Repay Bond Interest With Additional Debt

Unless indicated otherwise: intraday data is at least 15 minutes delayed; mutual fund NAVs are updated at the close of every market day; all prices are in the local currency; Time is ET.

NGRID 1-15 Referring to the Rothschild Direct Testimony at Schedule JAR 4 at page 3. Please provide a hard copy of the source documents Zacks.com, May 29, 2008 for each of the companies listed on this schedule.

RESPONSE: Please see attached.

ZACKS INVESTMENT RESEARCH
*Proven Ratings. Research & Recommendations*

## Zacks.com Quotes and Research



### AGL RES INC (NYSE)

| | | | | |
|---|---|---|---|---|
| ATG | 35.66 | 0.00 | (0.00%) | Vol. 0 |

0.00 CST

| | | | |
|---|---|---|---|
| Current Quarter Estimate | .34 | Next Report Date | Aug 07, 2008 |
| Next Quarter Estimate | .29 | EPS last quarter | 1.33 |
| Current Year Estimate | 2.76 | Last Quarter EPS Surprise | 3.61% |
| Next Year Estimate | 2.81 | Last Year's Earnings | 2.72 |
| Expected Earnings Growth | 4.75% | Forward Projected PE | 12.74 |
| Expected Sales Growth | 25.34% | ABR | 2 |

Learn More About Estimate Research
See Brokerage Recommendations

### Zacks Premium Research

Zacks Rank
Zacks Recommendation
Zacks Target Price
Zacks Industry Rank
Rank in Industry
Zacks Equity Research Report

### Earnings Growth Estimates

| | ATG | IND | S&P |
|---|---|---|---|
| Current Qtr (06/2008) | -14.0 | N/A | N/A |
| Next Qtr (09/2008) | 69.6 | N/A | N/A |
| Current Year (05/2007) | 1.4 | 5.7 | 0.0 |
| Next Year (05/2008) | 1.9 | 6.9 | 6.3 |
| Past 5 Years | 8.7 | 10.0 | 0.0 |
| Next 5 Years | 4.8 | 8.1 | 0.0 |
| PE | 13.7 | 30.6 | 14.7 |
| PEG Ratio | 2.7 | 2.6 | 0.0 |

### Detailed Earnings Estimates

| | Current Quarter (06/2008) | Next Quarter (09/2008) | Current Year (12/2008) | Next Year (12/2009) |
|---|---|---|---|---|
| Zacks Consensus Estimate | 0.34 | 0.29 | 2.76 | 2.81 |
| # of Estimates | 5 | 6 | 7 | 7 |
| Most Recent Consensus | 0.00 | 0.00 | 0.00 | 0.00 |
| High Estimate | 0.36 | 0.35 | 2.81 | 2.90 |
| Low Estimate | 0.31 | 0.19 | 2.65 | 2.68 |
| Year ago EPS | 0.40 | 0.17 | 2.72 | 2.76 |
| Year over Year Growth Est. | -14.00% | 69.61% | 1.42% | 1.86% |

### Agreement - Estimate Revisions

| | Current Qtr (06/2008) | Next Qtr (09/2008) | Current Year (12/2008) | Next Year (12/2009) |
|---|---|---|---|---|
| Up Last 7 Days | 0 | 0 | 0 | 0 |
| Up Last 30 Days | 1 | 2 | 0 | 1 |
| Down Last 7 Days | 0 | 0 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| Down Last 30 Days | 1 | 1 | 4 | 2 |

**Magnitude - Consensus Estimate Trend**

| | Current Quarter (06/2008) | Next Quarter (09/2008) | Current Year (12/2008) | Next Year (12/2009) |
|---|---|---|---|---|
| Current | 0.34 | 0.29 | 2.76 | 2.81 |
| 7 Days Ago | 0.34 | 0.29 | 2.76 | 2.81 |
| 30 Days Ago | 0.35 | 0.28 | 2.79 | 2.84 |
| 60 Days Ago | 0.34 | 0.31 | 2.82 | 2.85 |
| 90 Days Ago | 0.35 | 0.31 | 2.82 | 2.88 |

**Upside - Most Accurate Estimate versus Zacks Consensus**

| | Current Quarter (06/2008) | Next Quarter (09/2008) | Current Year (12/2008) | Next Year (12/2009) |
|---|---|---|---|---|
| Most Accurate Estimate | 0.35 | 0.31 | 2.74 | 2.75 |
| Zacks Consensus Estimate | 0.34 | 0.29 | 2.76 | 2.81 |
| Upside Potential | 2.94% | 6.90% | -0.73% | -2.14% |

**Surprise - Reported Earnings History**

| | 03/2008 | 12/2007 | 09/2007 | 06/2007 | Average Surprise |
|---|---|---|---|---|---|
| Reported | 1.16 | 0.86 | 0.17 | 0.40 | |
| Estimate | 1.33 | 0.83 | 0.16 | 0.38 | |
| Difference | -0.17 | 0.03 | 0.01 | 0.02 | -0.03 |
| Surprise | -12.78% | 3.61% | 6.25% | 5.26% | 0.59% |

Surprise Trader: Zacks Best Kept Secret

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**Annual Estimates by Analyst**

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**Zacks.com Quotes and Research**



## ATMOS ENERGY CORP (NYSE)

| | | | |
|---|---|---|---|
| ATO 27.56 | 0.00 (0.00%) | Vol. 0 | 0.00 CST |
| Current Quarter Estimate | -.06 | Next Report Date | Aug 05, 2008 |
| Next Quarter Estimate | -.08 | EPS last quarter | 1.33 |
| Current Year Estimate | 1.97 | Last Quarter EPS Surprise | 2.5% |
| Next Year Estimate | 2.07 | Last Year's Earnings | 1.91 |
| Expected Earnings Growth | 5.29% | Forward Projected PE | 13.54 |
| Expected Sales Growth | 32.66% | ABR | 2.2 |

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See Brokerage Recommendations

### Zacks Premium Research

Zacks Rank
Zacks Recommendation
Zacks Target Price
Zacks Industry Rank
Rank in Industry
Zacks Equity Research Report

### Earnings Growth Estimates

| | ATO | IND | S&P |
|---|---|---|---|
| Current Qtr (06/2008) | 61.7 | N/A | N/A |
| Next Qtr (09/2008) | -89.3 | N/A | N/A |
| Current Year (05/2007) | 0.2 | 5.7 | 0.0 |
| Next Year (05/2008) | 4.6 | 6.9 | 6.3 |
| Past 5 Years | 5.0 | 10.0 | 0.0 |
| Next 5 Years | 5.3 | 8.1 | 0.0 |
| PE | 14.7 | 30.6 | 14.7 |
| PEG Ratio | 2.6 | 2.6 | 0.0 |

### Detailed Earnings Estimates

| | Current Quarter (06/2008) | Next Quarter (09/2008) | Current Year (09/2008) | Next Year (09/2009) |
|---|---|---|---|---|
| Zacks Consensus Estimate | -0.06 | -0.08 | 1.97 | 2.07 |
| # of Estimates | 8 | 7 | 10 | 8 |
| Most Recent Consensus | 0.00 | 0.00 | 0.00 | 0.00 |
| High Estimate | 0.00 | 0.03 | 2.02 | 2.20 |
| Low Estimate | -0.12 | -0.19 | 1.91 | 1.89 |
| Year ago EPS | -0.15 | -0.04 | 1.97 | 1.97 |
| Year over Year Growth Est. | 61.67% | -89.29% | 0.20% | 4.61% |

### Agreement - Estimate Revisions

| | Current Qtr (06/2008) | Next Qtr (09/2008) | Current Year (09/2008) | Next Year (09/2009) |
|---|---|---|---|---|
| Up Last 7 Days | 0 | 0 | 0 | 0 |
| Up Last 30 Days | 3 | 3 | 0 | 0 |
| Down Last 7 Days | 0 | 0 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| Down Last 30 Days | 0 | 0 | 2 | 1 |

**Magnitude - Consensus Estimate Trend**

| | Current Quarter (06/2008) | Next Quarter (09/2008) | Current Year (09/2008) | Next Year (09/2009) |
|---|---|---|---|---|
| Current | -0.06 | -0.08 | 1.97 | 2.07 |
| 7 Days Ago | -0.06 | -0.08 | 1.97 | 2.07 |
| 30 Days Ago | -0.07 | -0.09 | 1.98 | 2.07 |
| 60 Days Ago | -0.07 | -0.09 | 1.98 | 2.07 |
| 90 Days Ago | -0.06 | -0.09 | 1.99 | 2.10 |

**Upside - Most Accurate Estimate versus Zacks Consensus**

| | Current Quarter (06/2008) | Next Quarter (09/2008) | Current Year (09/2008) | Next Year (09/2009) |
|---|---|---|---|---|
| Most Accurate Estimate | -0.06 | -0.03 | 1.96 | 2.09 |
| Zacks Consensus Estimate | -0.06 | -0.08 | 1.97 | 2.07 |
| Upside Potential | 0.00% | 62.50% | -0.51% | 0.97% |

**Surprise - Reported Earnings History**

| | 03/2008 | 12/2007 | 09/2007 | 06/2007 | Average Surprise |
|---|---|---|---|---|---|
| Reported | 1.24 | 0.82 | -0.04 | -0.15 | |
| Estimate | 1.33 | 0.80 | -0.08 | -0.06 | |
| Difference | -0.09 | 0.02 | 0.04 | -0.09 | -0.03 |
| Surprise | -6.77% | 2.50% | 50.00% | -150.00% | -26.07% |

Surprise Trader: Zacks Best Kept Secret

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## EQUITABLE RES INC (NYSE)



| EQT | 70.94 | 0.00 | (0.00%) | Vol. 0 | 0.00 CST |
|---|---|---|---|---|---|

| | | | |
|---|---|---|---|
| Current Quarter Estimate | .41 | Next Report Date | Jul 24, 2008 |
| Next Quarter Estimate | .36 | EPS last quarter | .71 |
| Current Year Estimate | 2.05 | Last Quarter EPS Surprise | -15.52% |
| Next Year Estimate | 2.61 | Last Year's Earnings | 1.66 |
| Expected Earnings Growth | 9.75% | Forward Projected PE | 31.20 |
| Expected Sales Growth | .09% | ABR | 1.71 |

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See Brokerage Recommendations

### Zacks Premium Research

Zacks Rank ⑦
Zacks Recommendation ⑦
Zacks Target Price ⑦
Zacks Industry Rank ⑦
Rank in Industry ⑦
Zacks Equity Research Report ⑦

### Earnings Growth Estimates

| | EQT | IND | S&P |
|---|---|---|---|
| Current Qtr (06/2008) | 72.4 | N/A | N/A |
| Next Qtr (09/2008) | 32.9 | N/A | N/A |
| Current Year (05/2007) | -2.3 | 5.7 | 0.0 |
| Next Year (05/2008) | 27.3 | 6.9 | 6.3 |
| Past 5 Years | 11.1 | 10.0 | 0.0 |
| Next 5 Years | 9.8 | 8.1 | 0.0 |
| PE | 45.3 | 30.6 | 14.7 |
| PEG Ratio | 3.6 | 2.6 | 0.0 |

### Detailed Earnings Estimates

| | Current Quarter (06/2008) | Next Quarter (09/2008) | Current Year (12/2008) | Next Year (12/2009) |
|---|---|---|---|---|
| Zacks Consensus Estimate | 0.41 | 0.36 | 2.05 | 2.61 |
| # of Estimates | 8 | 8 | 10 | 7 |
| Most Recent Consensus | 0.00 | 0.00 | 0.00 | 0.00 |
| High Estimate | 0.48 | 0.41 | 2.26 | 3.01 |
| Low Estimate | 0.35 | 0.25 | 1.68 | 2.12 |
| Year ago EPS | 0.24 | 0.27 | 2.10 | 2.05 |
| Year over Year Growth Est. | 72.40% | 32.87% | -2.33% | 27.32% |

### Agreement - Estimate Revisions

| | Current Qtr (06/2008) | Next Qtr (09/2008) | Current Year (12/2008) | Next Year (12/2009) |
|---|---|---|---|---|
| Up Last 7 Days | 0 | 0 | 0 | 0 |
| Up Last 30 Days | 3 | 3 | 3 | 2 |
| Down Last 7 Days | 0 | 0 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| Down Last 30 Days | 1 | 0 | 3 | 1 |

**Magnitude - Consensus Estimate Trend**

| | Current Quarter (06/2008) | Next Quarter (09/2008) | Current Year (12/2008) | Next Year (12/2009) |
|---|---|---|---|---|
| Current | 0.41 | 0.36 | 2.05 | 2.61 |
| 7 Days Ago | 0.41 | 0.36 | 2.05 | 2.61 |
| 30 Days Ago | 0.41 | 0.35 | 2.04 | 2.56 |
| 60 Days Ago | 0.38 | 0.33 | 2.02 | 2.57 |
| 90 Days Ago | 0.38 | 0.34 | 2.03 | 2.56 |

**Upside - Most Accurate Estimate versus Zacks Consensus**

| | Current Quarter (06/2008) | Next Quarter (09/2008) | Current Year (12/2008) | Next Year (12/2009) |
|---|---|---|---|---|
| Most Accurate Estimate | 0.41 | 0.35 | 1.99 | 2.55 |
| Zacks Consensus Estimate | 0.41 | 0.36 | 2.05 | 2.61 |
| Upside Potential | 0.00% | -2.78% | -2.93% | -2.30% |

**Surprise - Reported Earnings History**

| | 03/2008 | 12/2007 | 09/2007 | 06/2007 | Average Surprise |
|---|---|---|---|---|---|
| Reported | 0.57 | 0.49 | 0.27 | 0.24 | |
| Estimate | 0.71 | 0.58 | 0.31 | 0.39 | |
| Difference | -0.14 | -0.09 | -0.04 | -0.15 | -0.11 |
| Surprise | -19.72% | -15.52% | -12.90% | -38.46% | -21.65% |



**Quarterly Estimates by Analyst**



**Annual Estimates by Analyst**

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*Proven Ratings, Research & Recommendations*

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## LACLEDE GROUP INC (NYSE)



| | | | | | |
|---|---|---|---|---|---|
| LG | 40.52 | 0.00 | (0.00%) | Vol. 0 | 0.00 CST |

| | | | |
|---|---|---|---|
| Current Quarter Estimate | .16 | Next Report Date | Jul 25, 2008 |
| Next Quarter Estimate | -.09 | EPS last quarter | .94 |
| Current Year Estimate | 2.26 | Last Quarter EPS Surprise | 12.79% |
| Next Year Estimate | 2.3 | Last Year's Earnings | 2.09 |
| Expected Earnings Growth | 10% | Forward Projected PE | 17.84 |
| Expected Sales Growth | 17.62% | ABR | 3 |

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### Zacks Premium Research

Zacks Rank ?
Zacks Recommendation ?
Zacks Target Price ?
Zacks Industry Rank ?
Rank in Industry ?
Zacks Equity Research Report ?

### Earnings Growth Estimates

| | LG | IND | S&P |
|---|---|---|---|
| Current Qtr (06/2008) | -62.8 | N/A | N/A |
| Next Qtr (09/2008) | -400.0 | N/A | N/A |
| Current Year (05/2007) | -2.2 | 5.7 | 0.0 |
| Next Year (05/2008) | 1.8 | 6.9 | 6.3 |
| Past 5 Years | 0.0 | 10.0 | 0.0 |
| Next 5 Years | 10.0 | 8.1 | 0.0 |
| PE | 14.5 | 30.6 | 14.7 |
| PEG Ratio | 1.8 | 2.6 | 0.0 |

### Detailed Earnings Estimates

| | Current Quarter (06/2008) | Next Quarter (09/2008) | Current Year (09/2008) | Next Year (09/2009) |
|---|---|---|---|---|
| Zacks Consensus Estimate | 0.16 | -0.09 | 2.26 | 2.30 |
| # of Estimates | 1 | 1 | 3 | 2 |
| Most Recent Consensus | 0.00 | 0.00 | 0.00 | 0.00 |
| High Estimate | 0.16 | -0.09 | 2.43 | 2.40 |
| Low Estimate | 0.16 | -0.09 | 2.15 | 2.20 |
| Year ago EPS | 0.43 | 0.03 | 2.31 | 2.26 |
| Year over Year Growth Est. | -62.79% | -400.00% | -2.16% | 1.77% |

### Agreement - Estimate Revisions

| | Current Qtr (06/2008) | Next Qtr (09/2008) | Current Year (09/2008) | Next Year (09/2009) |
|---|---|---|---|---|
| Up Last 7 Days | 0 | 0 | 0 | 0 |
| Up Last 30 Days | 0 | 0 | 0 | 0 |
| Down Last 7 Days | 0 | 0 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| Down Last 30 Days | 0 | 0 | 0 | 0 |

**Magnitude - Consensus Estimate Trend**

| | Current Quarter (06/2008) | Next Quarter (09/2008) | Current Year (09/2008) | Next Year (09/2009) |
|---|---|---|---|---|
| Current | 0.16 | -0.09 | 2.26 | 2.30 |
| 7 Days Ago | 0.16 | -0.09 | 2.26 | 2.30 |
| 30 Days Ago | 0.16 | -0.09 | 2.29 | 2.30 |
| 60 Days Ago | 0.33 | 0.04 | 2.22 | 2.29 |
| 90 Days Ago | 0.33 | 0.04 | 2.14 | 2.38 |

**Upside - Most Accurate Estimate versus Zacks Consensus**

| | Current Quarter (06/2008) | Next Quarter (09/2008) | Current Year (09/2008) | Next Year (09/2009) |
|---|---|---|---|---|
| Most Accurate Estimate | 0.16 | -0.09 | 2.32 | 2.40 |
| Zacks Consensus Estimate | 0.16 | -0.09 | 2.26 | 2.30 |
| Upside Potential | 0.00% | 0.00% | 2.66% | 4.35% |

**Surprise - Reported Earnings History**

| | 03/2008 | 12/2007 | 09/2007 | 06/2007 | Average Surprise |
|---|---|---|---|---|---|
| Reported | 1.39 | 0.97 | 0.03 | 0.43 | |
| Estimate | 0.94 | 0.86 | -0.12 | 0.15 | |
| Difference | 0.45 | 0.11 | 0.15 | 0.28 | 0.25 |
| Surprise | 47.87% | 12.79% | 125.00% | 186.67% | 93.08% |

Surprise Trader: Zacks Best Kept Secret

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NICOR INC (NYSE)

| | | | | | |
|---|---|---|---|---|---|
| GAS | 40.38 | -0.18 | (-0.44%) | Vol. 570,656 | 16.00 CST |
| Current Quarter Estimate | | | .3 | Next Report Date | Aug 05, 2008 |
| Next Quarter Estimate | | | .21 | EPS last quarter | .3 |
| Current Year Estimate | | | 2.32 | Last Quarter EPS Surprise | 9.91% |
| Next Year Estimate | | | 2.44 | Last Year's Earnings | 2.75 |
| Expected Earnings Growth | | | 5.2% | Forward Projected PE | 16.95 |
| Expected Sales Growth | | | 6% | ABR | 3.33 |

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| Zacks Premium Research | |
|---|---|
| Zacks Rank | |
| Zacks Recommendation | |
| Zacks Target Price | |
| Zacks Industry Rank | |
| Rank in Industry | |
| Zacks Equity Research Report | |

**Earnings Growth Estimates**

| | GAS | IND | S&P |
|---|---|---|---|
| Current Qtr (06/2008) | -25.6 | N/A | N/A |
| Next Qtr (09/2008) | -34.4 | N/A | N/A |
| Current Year (07/2007) | -19.4 | 5.9 | 0.0 |
| Next Year (07/2008) | 5.1 | 8.9 | 5.9 |
| Past 5 Years | 1.9 | 10.0 | 0.0 |
| Next 5 Years | 5.2 | 8.2 | 0.0 |
| PE | 14.2 | 16.8 | 13.3 |
| PEG Ratio | 3.4 | 2.5 | 0.0 |

**Detailed Earnings Estimates**

| | Current Quarter (06/2008) | Next Quarter (09/2008) | Current Year (12/2008) | Next Year (12/2009) |
|---|---|---|---|---|
| Zacks Consensus Estimate | 0.30 | 0.21 | 2.32 | 2.44 |
| # of Estimates | 4 | 3 | 4 | 4 |
| Most Recent Consensus | 0.00 | 0.00 | 0.00 | 0.00 |
| High Estimate | 0.35 | 0.22 | 2.35 | 2.60 |
| Low Estimate | 0.25 | 0.20 | 2.30 | 2.30 |
| Year ago EPS | 0.40 | 0.32 | 2.88 | 2.32 |
| Year over Year Growth Est. | -25.62% | -34.38% | -19.44% | 5.06% |

**Agreement - Estimate Revisions**

| | Current Qtr (06/2008) | Next Qtr (09/2008) | Current Year (12/2008) | Next Year (12/2009) |
|---|---|---|---|---|
| Up Last 7 Days | 0 | 0 | 0 | 0 |
| Up Last 30 Days | 0 | 0 | 0 | 0 |
| Down Last 7 Days | 0 | 0 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| Down Last 30 Days | 0 | 0 | 0 | 1 |

**Magnitude - Consensus Estimate Trend**

| | Current Quarter (06/2008) | Next Quarter (09/2008) | Current Year (12/2008) | Next Year (12/2009) |
|---|---|---|---|---|
| Current | 0.30 | 0.21 | 2.32 | 2.44 |
| 7 Days Ago | 0.31 | 0.21 | 2.31 | 2.45 |
| 30 Days Ago | 0.29 | 0.20 | 2.32 | 2.58 |
| 60 Days Ago | 0.29 | 0.20 | 2.31 | 2.54 |
| 90 Days Ago | 0.34 | 0.23 | 2.39 | 2.54 |

**Upside - Most Accurate Estimate versus Zacks Consensus**

| | Current Quarter (06/2008) | Next Quarter (09/2008) | Current Year (12/2008) | Next Year (12/2009) |
|---|---|---|---|---|
| Most Accurate Estimate | 0.31 | 0.22 | 2.32 | 2.43 |
| Zacks Consensus Estimate | 0.30 | 0.21 | 2.32 | 2.44 |
| Upside Potential | 3.33% ▲ | 4.76% ▲ | 0.00% | -0.41% ▼ |

**Surprise - Reported Earnings History**

| | 03/2008 | 12/2007 | 09/2007 | 06/2007 | Average Surprise |
|---|---|---|---|---|---|
| Reported | 0.91 | 1.22 | 0.32 | 0.40 | |
| Estimate | 0.73 | 1.11 | 0.33 | 0.38 | |
| Difference | 0.18 | 0.11 | -0.01 | 0.02 | 0.08 |
| Surprise | 24.66%▲ | 9.91%▲ | -3.03%▼ | 5.26%▲ | 9.20%▲ |

Surprise Trader: Zacks Best Kept Secret

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*Proven Ratings, Research & Recommendations*

## Zacks.com Quotes and Research

### NORTHWEST NAT GAS CO (NYSE)



| | | | | |
|---|---|---|---|---|
| NWN | 45.49 | 0.00 | (0.00%) | Vol. 0 | 0.00 CST |

| | | | |
|---|---|---|---|
| Current Quarter Estimate | .11 | Next Report Date | Aug 11, 2008 |
| Next Quarter Estimate | -.28 | EPS last quarter | 1.67 |
| Current Year Estimate | 2.58 | Last Quarter EPS Surprise | -.88% |
| Next Year Estimate | 2.72 | Last Year's Earnings | 2.75 |
| Expected Earnings Growth | 6.2% | Forward Projected PE | 17.37 |
| Expected Sales Growth | 13.72% | ABR | 2.14 |

Learn More About Estimate Research
See Brokerage Recommendations

### Zacks Premium Research

Zacks Rank ?
Zacks Recommendation ?
Zacks Target Price ?
Zacks Industry Rank ?
Rank in Industry ?
Zacks Equity Research Report ?

### Earnings Growth Estimates

| | NWN | IND | S&P |
|---|---|---|---|
| Current Qtr (06/2008) | 12.5 | N/A | N/A |
| Next Qtr (09/2008) | -25.0 | N/A | N/A |
| Current Year (05/2007) | -6.4 | 5.7 | 0.0 |
| Next Year (05/2008) | 5.4 | 6.9 | 6.3 |
| Past 5 Years | 8.2 | 10.0 | 0.0 |
| Next 5 Years | 6.2 | 8.1 | 0.0 |
| PE | 17.4 | 30.6 | 14.7 |
| PEG Ratio | 2.9 | 2.6 | 0.0 |

### Detailed Earnings Estimates

| | Current Quarter (06/2008) | Next Quarter (09/2008) | Current Year (12/2008) | Next Year (12/2009) |
|---|---|---|---|---|
| Zacks Consensus Estimate | 0.11 | -0.28 | 2.58 | 2.72 |
| # of Estimates | 4 | 4 | 5 | 6 |
| Most Recent Consensus | 0.00 | 0.00 | 0.00 | 0.00 |
| High Estimate | 0.13 | -0.24 | 2.63 | 2.82 |
| Low Estimate | 0.10 | -0.30 | 2.48 | 2.51 |
| Year ago EPS | 0.10 | -0.22 | 2.76 | 2.58 |
| Year over Year Growth Est. | 12.50% | -25.00% | -6.45% | 5.41% |

### Agreement - Estimate Revisions

| | Current Qtr (06/2008) | Next Qtr (09/2008) | Current Year (12/2008) | Next Year (12/2009) |
|---|---|---|---|---|
| Up Last 7 Days | 0 | 0 | 0 | 0 |
| Up Last 30 Days | 0 | 1 | 1 | 0 |
| Down Last 7 Days | 0 | 0 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| Down Last 30 Days | 0 | 0 | 1 | 1 |

**Magnitude - Consensus Estimate Trend**

| | Current Quarter (06/2008) | Next Quarter (09/2008) | Current Year (12/2008) | Next Year (12/2009) |
|---|---|---|---|---|
| Current | 0.11 | -0.28 | 2.58 | 2.72 |
| 7 Days Ago | 0.11 | -0.28 | 2.58 | 2.73 |
| 30 Days Ago | 0.11 | -0.28 | 2.61 | 2.74 |
| 60 Days Ago | 0.11 | -0.28 | 2.61 | 2.74 |
| 90 Days Ago | 0.11 | -0.28 | 2.60 | 2.74 |

**Upside - Most Accurate Estimate versus Zacks Consensus**

| | Current Quarter (06/2008) | Next Quarter (09/2008) | Current Year (12/2008) | Next Year (12/2009) |
|---|---|---|---|---|
| Most Accurate Estimate | 0.00 | -0.24 | 2.56 | 2.61 |
| Zacks Consensus Estimate | 0.11 | -0.28 | 2.58 | 2.72 |
| Upside Potential | 0.00% | 14.29% | -0.78% | -4.04% |

**Surprise - Reported Earnings History**

| | 03/2008 | 12/2007 | 09/2007 | 06/2007 | Average Surprise |
|---|---|---|---|---|---|
| Reported | 1.63 | 1.12 | -0.22 | 0.10 | |
| Estimate | 1.67 | 1.13 | -0.30 | 0.08 | |
| Difference | -0.04 | -0.01 | 0.08 | 0.02 | 0.01 |
| Surprise | -2.40% | -0.88% | 26.67% | 25.00% | 12.10% |



**Quarterly Estimates by Analyst**



**Annual Estimates by Analyst**

Zacks.com Quotes and Research

PIEDMONT NAT GAS INC (NYSE)



| | | | | | |
|---|---|---|---|---|---|
| PNY | 27.10 | 0.00 | (0.00%) | Vol. 0 | 0.00 CST |
| Current Quarter Estimate | .71 | | Next Report Date | | Jun 04, 2008 |
| Next Quarter Estimate | -.16 | | EPS last quarter | | .71 |
| Current Year Estimate | 1.52 | | Last Quarter EPS Surprise | | -120% |
| Next Year Estimate | 1.58 | | Last Year's Earnings | | 1.45 |
| Expected Earnings Growth | 6% | | Forward Projected PE | | 17.43 |
| Expected Sales Growth | 9.9% | | ABR | | 2.57 |

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See Brokerage Recommendations

**Zacks Premium Research**

Zacks Rank ⑦
Zacks Recommendation ⑦
Zacks Target Price ⑦
Zacks Industry Rank ⑦
Rank in Industry ⑦
Zacks Equity Research Report ⑦

**Earnings Growth Estimates**

| | PNY | IND | S&P |
|---|---|---|---|
| Current Qtr (04/2008) | 3.3 | N/A | N/A |
| Next Qtr (07/2008) | -36.1 | N/A | N/A |
| Current Year (05/2007) | 8.5 | 5.7 | 0.0 |
| Next Year (05/2008) | 4.3 | 6.9 | 6.3 |
| Past 5 Years | 6.5 | 10.0 | 0.0 |
| Next 5 Years | 6.0 | 8.1 | 0.0 |
| PE | 17.2 | 30.6 | 14.7 |
| PEG Ratio | 3.0 | 2.6 | 0.0 |

**Detailed Earnings Estimates**

| | Current Quarter (04/2008) | Next Quarter (07/2008) | Current Year (10/2008) | Next Year (10/2009) |
|---|---|---|---|---|
| Zacks Consensus Estimate | 0.71 | -0.16 | 1.52 | 1.58 |
| # of Estimates | 4 | 3 | 7 | 6 |
| Most Recent Consensus | 0.00 | 0.00 | 0.00 | 0.00 |
| High Estimate | 0.74 | -0.14 | 1.60 | 1.61 |
| Low Estimate | 0.68 | -0.19 | 1.50 | 1.55 |
| Year ago EPS | 0.69 | -0.12 | 1.40 | 1.52 |
| Year over Year Growth Est. | 3.26% | -36.11% | 8.47% | 4.26% |

**Agreement - Estimate Revisions**

| | Current Qtr (04/2008) | Next Qtr (07/2008) | Current Year (10/2008) | Next Year (10/2009) |
|---|---|---|---|---|
| Up Last 7 Days | 0 | 0 | 0 | 0 |
| Up Last 30 Days | 0 | 0 | 0 | 0 |
| Down Last 7 Days | 0 | 0 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| Down Last 30 Days | 1 | 0 | 1 | 1 |

**Magnitude - Consensus Estimate Trend**

| | Current Quarter (04/2008) | Next Quarter (07/2008) | Current Year (10/2008) | Next Year (10/2009) |
|---|---|---|---|---|
| Current | 0.71 | -0.16 | 1.52 | 1.58 |
| 7 Days Ago | 0.71 | -0.16 | 1.52 | 1.58 |
| 30 Days Ago | 0.72 | -0.16 | 1.52 | 1.59 |
| 60 Days Ago | 0.72 | -0.14 | 1.52 | 1.60 |
| 90 Days Ago | 0.72 | -0.13 | 1.50 | 1.58 |

**Upside - Most Accurate Estimate versus Zacks Consensus**

| | Current Quarter (04/2008) | Next Quarter (07/2008) | Current Year (10/2008) | Next Year (10/2009) |
|---|---|---|---|---|
| Most Accurate Estimate | 0.68 | 0.00 | 1.52 | 1.61 |
| Zacks Consensus Estimate | 0.71 | -0.16 | 1.52 | 1.58 |
| Upside Potential | -4.23% | 0.00% | 0.00% | 1.90% |

**Surprise - Reported Earnings History**

| | 01/2008 | 10/2007 | 07/2007 | 04/2007 | Average Surprise |
|---|---|---|---|---|---|
| Reported | 1.12 | -0.11 | -0.12 | 0.69 | |
| Estimate | 0.97 | -0.05 | -0.12 | 0.62 | |
| Difference | 0.15 | -0.06 | 0.00 | 0.07 | 0.05 |
| Surprise | 15.46% | -120.00% | 0.00% | 11.29% | -31.08% |

Surprise Trader: Zacks Best Kept Secret

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**Zacks.com Quotes and Research**

**SOUTH JERSEY INDS INC** (NYSE)



| SJI | 38.79 | 0.00 | (0.00%) | Vol. 0 | 0.00 CST |
|---|---|---|---|---|---|

| | | | |
|---|---|---|---|
| Current Quarter Estimate | .28 | Next Report Date | Aug 06, 2008 |
| Next Quarter Estimate | .09 | EPS last quarter | 1.12 |
| Current Year Estimate | 2.25 | Last Quarter EPS Surprise | 3.28% |
| Next Year Estimate | 2.27 | Last Year's Earnings | 2.06 |
| Expected Earnings Growth | 7.88% | Forward Projected PE | 17.04 |
| Expected Sales Growth | 8.52% | ABR | 1.71 |

Learn More About Estimate Research
See Brokerage Recommendations

**Zacks Premium Research**

Zacks Rank ?
Zacks Recommendation ?
Zacks Target Price ?
Zacks Industry Rank ?
Rank in Industry ?
Zacks Equity Research Report ?

**Earnings Growth Estimates**

| | SJI | IND | S&P |
|---|---|---|---|
| Current Qtr (06/2008) | 34.1 | N/A | N/A |
| Next Qtr (09/2008) | 270.0 | N/A | N/A |
| Current Year (05/2007) | 7.8 | 5.7 | 0.0 |
| Next Year (05/2008) | 0.7 | 6.9 | 6.3 |
| Past 5 Years | 10.9 | 10.0 | 0.0 |
| Next 5 Years | 7.9 | 8.1 | 0.0 |
| PE | 18.4 | 30.6 | 14.7 |
| PEG Ratio | 2.2 | 2.6 | 0.0 |

**Detailed Earnings Estimates**

| | Current Quarter (06/2008) | Next Quarter (09/2008) | Current Year (12/2008) | Next Year (12/2009) |
|---|---|---|---|---|
| Zacks Consensus Estimate | 0.28 | 0.09 | 2.25 | 2.27 |
| # of Estimates | 6 | 6 | 4 | 5 |
| Most Recent Consensus | 0.00 | 0.00 | 0.00 | 0.00 |
| High Estimate | 0.36 | 0.14 | 2.31 | 2.32 |
| Low Estimate | 0.23 | 0.02 | 2.15 | 2.19 |
| Year ago EPS | 0.21 | -0.05 | 2.09 | 2.25 |
| Year over Year Growth Est. | 34.13% | 270.00% | 7.78% | 0.69% |

**Agreement - Estimate Revisions**

| | Current Qtr (06/2008) | Next Qtr (09/2008) | Current Year (12/2008) | Next Year (12/2009) |
|---|---|---|---|---|
| Up Last 7 Days | 0 | 0 | 0 | 0 |
| Up Last 30 Days | 1 | 0 | 3 | 1 |
| Down Last 7 Days | 0 | 0 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| Down Last 30 Days | 2 | 3 | 0 | 0 |

**Magnitude - Consensus Estimate Trend**

| | Current Quarter (06/2008) | Next Quarter (09/2008) | Current Year (12/2008) | Next Year (12/2009) |
|---|---|---|---|---|
| Current | 0.28 | 0.09 | 2.25 | 2.27 |
| 7 Days Ago | 0.28 | 0.09 | 2.25 | 2.27 |
| 30 Days Ago | 0.29 | 0.12 | 2.16 | 2.26 |
| 60 Days Ago | 0.29 | 0.12 | 2.17 | 2.26 |
| 90 Days Ago | 0.30 | 0.13 | 2.16 | 2.21 |

**Upside - Most Accurate Estimate versus Zacks Consensus**

| | Current Quarter (06/2008) | Next Quarter (09/2008) | Current Year (12/2008) | Next Year (12/2009) |
|---|---|---|---|---|
| Most Accurate Estimate | 0.27 | 0.06 | 2.29 | 2.30 |
| Zacks Consensus Estimate | 0.28 | 0.09 | 2.25 | 2.27 |
| Upside Potential | -3.57% | -33.33% | 1.78% | 1.32% |

**Surprise - Reported Earnings History**

| | 03/2008 | 12/2007 | 09/2007 | 06/2007 | Average Surprise |
|---|---|---|---|---|---|
| Reported | 1.32 | 0.63 | -0.05 | 0.21 | |
| Estimate | 1.12 | 0.61 | 0.04 | 0.23 | |
| Difference | 0.20 | 0.02 | -0.09 | -0.02 | 0.03 |
| Surprise | 17.86% | 3.28% | -225.00% | -8.70% | -53.14% |

Surprise Trader: Zacks Best Kept Secret

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**Zacks.com Quotes and Research**

**SOUTHWEST GAS CORP** (NYSE)



| | | | | |
|---|---|---|---|---|
| SWX | 31.08 | 0.00 | (0.00%) | Vol. 0 | 0.00 CST |

| | | | |
|---|---|---|---|
| Current Quarter Estimate | -.03 | Next Report Date | Aug 11, 2008 |
| Next Quarter Estimate | -.21 | EPS last quarter | 1.19 |
| Current Year Estimate | 2.08 | Last Quarter EPS Surprise | -6.54% |
| Next Year Estimate | 2.28 | Last Year's Earnings | 2.03 |
| Expected Earnings Growth | 8% | Forward Projected PE | 14.45 |
| Expected Sales Growth | 15.46% | ABR | 2.25 |

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See Brokerage Recommendations

**Zacks Premium Research**

Zacks Rank ?
Zacks Recommendation ?
Zacks Target Price ?
Zacks Industry Rank ?
Rank in Industry ?
Zacks Equity Research Report ?

**Earnings Growth Estimates**

| | SWX | IND | S&P |
|---|---|---|---|
| Current Qtr (06/2008) | -166.7 | N/A | N/A |
| Next Qtr (09/2008) | 4.6 | N/A | N/A |
| Current Year (05/2007) | 6.8 | 5.7 | 0.0 |
| Next Year (05/2008) | 9.6 | 6.9 | 6.3 |
| Past 5 Years | 10.9 | 10.0 | 0.0 |
| Next 5 Years | 8.0 | 8.1 | 0.0 |
| PE | 16.4 | 30.6 | 14.7 |
| PEG Ratio | 1.9 | 2.6 | 0.0 |

**Detailed Earnings Estimates**

| | Current Quarter (06/2008) | Next Quarter (09/2008) | Current Year (12/2008) | Next Year (12/2009) |
|---|---|---|---|---|
| Zacks Consensus Estimate | -0.03 | -0.21 | 2.08 | 2.28 |
| # of Estimates | 3 | 2 | 5 | 4 |
| Most Recent Consensus | 0.00 | 0.00 | 0.00 | 0.00 |
| High Estimate | -0.01 | -0.19 | 2.17 | 2.39 |
| Low Estimate | -0.06 | -0.23 | 1.92 | 2.24 |
| Year ago EPS | -0.01 | -0.22 | 1.95 | 2.08 |
| Year over Year Growth Est. | -166.67% | 4.55% | 6.77% | 9.63% |

**Agreement - Estimate Revisions**

| | Current Qtr (06/2008) | Next Qtr (09/2008) | Current Year (12/2008) | Next Year (12/2009) |
|---|---|---|---|---|
| Up Last 7 Days | 0 | 0 | 0 | 0 |
| Up Last 30 Days | 0 | 0 | 0 | 0 |
| Down Last 7 Days | 0 | 0 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| Down Last 30 Days | 0 | 0 | 2 | 0 |

**Magnitude - Consensus Estimate Trend**

| | Current Quarter (06/2008) | Next Quarter (09/2008) | Current Year (12/2008) | Next Year (12/2009) |
|---|---|---|---|---|
| Current | -0.03 | -0.21 | 2.08 | 2.28 |
| 7 Days Ago | -0.03 | -0.21 | 2.08 | 2.28 |
| 30 Days Ago | -0.01 | -0.21 | 2.10 | 2.28 |
| 60 Days Ago | -0.01 | -0.21 | 2.10 | 2.28 |
| 90 Days Ago | 0.00 | 0.00 | 2.06 | 2.19 |

**Upside - Most Accurate Estimate versus Zacks Consensus**

| | Current Quarter (06/2008) | Next Quarter (09/2008) | Current Year (12/2008) | Next Year (12/2009) |
|---|---|---|---|---|
| Most Accurate Estimate | -0.06 | 0.00 | 2.01 | 0.00 |
| Zacks Consensus Estimate | -0.03 | -0.21 | 2.08 | 2.28 |
| Upside Potential | -100.00% ▾ | 0.00% | -3.37% ▾ | 0.00% |

**Surprise - Reported Earnings History**

| | 03/2008 | 12/2007 | 09/2007 | 06/2007 | Average Surprise |
|---|---|---|---|---|---|
| Reported | 1.14 | 1.00 | -0.22 | -0.01 | |
| Estimate | 1.19 | 1.07 | -0.20 | 0.10 | |
| Difference | -0.05 | -0.07 | -0.02 | -0.11 | -0.06 |
| Surprise | -4.20% ▾ | -6.54% ▾ | -10.00% ▾ | -110.00% ▾ | -32.69% ▾ |

<u>**Surprise Trader: Zacks Best Kept Secret**</u>

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**WGL HLDGS INC** (NYSE)



| | | | | | |
|---|---|---|---|---|---|
| WGL | 35.48 | 0.00 | (0.00%) | Vol. 0 | 0.00 CST |
| Current Quarter Estimate | | .13 | Next Report Date | | Aug 06, 2008 |
| Next Quarter Estimate | | -.32 | EPS last quarter | | 1.4 |
| Current Year Estimate | | 2.42 | Last Quarter EPS Surprise | | -5.88% |
| Next Year Estimate | | 2.37 | Last Year's Earnings | | 2.22 |
| Expected Earnings Growth | | 7.33% | Forward Projected PE | | 14.89 |
| Expected Sales Growth | | 7.53% | ABR | | 2 |

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See Brokerage Recommendations

**Zacks Premium Research**

Zacks Rank ?
Zacks Recommendation ?
Zacks Target Price ?
Zacks Industry Rank ?
Rank in Industry ?
Zacks Equity Research Report ?

**Earnings Growth Estimates**

| | WGL | IND | S&P |
|---|---|---|---|
| Current Qtr (06/2008) | -42.4 | N/A | N/A |
| Next Qtr (09/2008) | -4.3 | N/A | N/A |
| Current Year (05/2007) | 10.5 | 5.7 | 0.0 |
| Next Year (05/2008) | -2.3 | 6.9 | 6.3 |
| Past 5 Years | 5.8 | 10.0 | 0.0 |
| Next 5 Years | 7.3 | 8.1 | 0.0 |
| PE | 14.0 | 30.6 | 14.7 |
| PEG Ratio | 2.0 | 2.6 | 0.0 |

**Detailed Earnings Estimates**

| | Current Quarter (06/2008) | Next Quarter (09/2008) | Current Year (09/2008) | Next Year (09/2009) |
|---|---|---|---|---|
| Zacks Consensus Estimate | 0.13 | -0.32 | 2.42 | 2.37 |
| # of Estimates | 3 | 3 | 4 | 6 |
| Most Recent Consensus | 0.00 | 0.00 | 0.00 | 0.00 |
| High Estimate | 0.16 | -0.28 | 2.45 | 2.50 |
| Low Estimate | 0.11 | -0.36 | 2.40 | 2.20 |
| Year ago EPS | 0.22 | -0.31 | 2.19 | 2.42 |
| Year over Year Growth Est. | -42.42% | -4.30% | 10.50% | -2.27% |

**Agreement - Estimate Revisions**

| | Current Qtr (06/2008) | Next Qtr (09/2008) | Current Year (09/2008) | Next Year (09/2009) |
|---|---|---|---|---|
| Up Last 7 Days | 0 | 0 | 0 | 0 |
| Up Last 30 Days | 0 | 0 | 3 | 3 |
| Down Last 7 Days | 0 | 0 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| Down Last 30 Days | 3 | 3 | 0 | 0 |

**Magnitude - Consensus Estimate Trend**

| | Current Quarter (06/2008) | Next Quarter (09/2008) | Current Year (09/2008) | Next Year (09/2009) |
|---|---|---|---|---|
| Current | 0.13 | -0.32 | 2.42 | 2.37 |
| 7 Days Ago | 0.13 | -0.32 | 2.42 | 2.37 |
| 30 Days Ago | 0.22 | -0.23 | 2.35 | 2.32 |
| 60 Days Ago | 0.20 | -0.24 | 2.35 | 2.33 |
| 90 Days Ago | 0.20 | -0.23 | 2.34 | 2.35 |

**Upside - Most Accurate Estimate versus Zacks Consensus**

| | Current Quarter (06/2008) | Next Quarter (09/2008) | Current Year (09/2008) | Next Year (09/2009) |
|---|---|---|---|---|
| Most Accurate Estimate | 0.13 | -0.32 | 2.42 | 2.45 |
| Zacks Consensus Estimate | 0.13 | -0.32 | 2.42 | 2.37 |
| Upside Potential | 0.00% | 0.00% | 0.00% | 3.38% |

**Surprise - Reported Earnings History**

| | 03/2008 | 12/2007 | 09/2007 | 06/2007 | Average Surprise |
|---|---|---|---|---|---|
| Reported | 1.66 | 0.96 | -0.31 | 0.22 | |
| Estimate | 1.40 | 1.02 | -0.35 | 0.01 | |
| Difference | 0.26 | -0.06 | 0.04 | 0.21 | 0.11 |
| Surprise | 18.57% | -5.88% | 11.43% | 2,100.00% | 531.03% |

Surprise Trader: Zacks Best Kept Secret

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NGRID 1-16 Referring to the Rothschild Direct Testimony at Schedule JAR 4 at page 3. Unless otherwise provided, please provide the workpapers electronically with all formulas intact and hard copy form for the "Return on Equity to achieve Analysts' Growth."

RESPONSE: Please see response to NGRID 1-11.

NGRID 1-17 Referring to the Rothschild Direct Testimony at Schedule JAR 6 at page 1. Please provide a copy of the source documents referenced in footnote [C].

RESPONSE: Please see response to NGRID 1-5.

NGRID 1-18 Referring to the Rothschild Direct Testimony at Schedule JAR 6 at page 2. Please provide an electronic copy (i.e., Microsoft Excel spreadsheet with all formulas intact).

RESPONSE: Please see response to NGRID 1-11.

NGRID 1-19 Referring to the Rothschild Direct Testimony at Schedule JAR 6 at page 3. Please provide an electronic copy (i.e., Microsoft Excel spreadsheet with all formulas intact) of this schedule.

RESPONSE: Please see response to NGRID 1-11.

NGRID 1-20 Referring to the Rothschild Direct Testimony at Schedule JAR 6 at page 4. Please provide an electronic copy (i.e., Microsoft Excel spreadsheet with all formulas intact) of this schedule.

RESPONSE: Please see response to NGRID 1-11.

NGRID 1-21 Referring to the Rothschild Direct Testimony at Schedule JAR 7. Please provide an electronic copy (i.e., Microsoft Excel spreadsheet with all formulas intact) of this schedule.

RESPONSE: Please see response to NGRID 1-11.

NGRID 1-22 Referring to the Rothschild Direct Testimony at Schedule JAR 7. Please provide the workpapers for the development of the short-term debt amounts shown on this schedule. Also, please provide the source documents and workpapers in electronic spreadsheet format with all formulas intact.

RESPONSE: Please see response to NGRID 1-11.

NGRID 1-23 Referring to the Rothschild Direct Testimony at Appendix C. Please provide a copy of the three most recent testimonies on the subject of cost of capital/rate of return. If these cases did not involve natural gas distribution companies, please provide the three most recent cases for natural gas distribution companies.

RESPONSE: Please see attached.

295

**BEFORE THE STATE OF NEW JERSEY**
**BOARD OF PUBLIC UTILITIES**
**OFFICE OF ADMINISTRATIVE LAW**

| | |
|---|---|
| **IN THE MATTER OF THE PETITION OF)** | |
| **SOUTH JERSEY GAS COMPANY FOR )** | **BPU DOCKET NO. GR03080683** |
| **APPROVAL OF INCREASED BASE )** | **OAL DOCKET NO. PUCRL 06695-2003S** |
| **TARIFF RATES AND CHARGES FOR )** | |
| **GAS SERVICE AND OTHER TARIFF )** | |
| **REVISIONS )** | |

| | |
|---|---|
| **IN THE MATTER OF THE PETITION OF)** | |
| **SOUTH JERSEY GAS COMPANY TO )** | **BPU DOCKET NO. GR00050295** |
| **IMPLEMENT CERTAIN PROVISIONS )** | **OAL DOCKET NO. PUCRL 08532-2003S** |
| **OF ITS RATE UNBUNDLING )** | |
| **STIPULATION )** | |

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**DIRECT TESTIMONY AND EXHIBITS OF JAMES A. ROTHSCHILD**
**ON BEHALF OF THE**
**NEW JERSEY DIVISION OF THE RATEPAYER ADVOCATE**

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DAR 8

## I. STATEMENT OF QUALIFICATIONS OF JAMES A. ROTHSCHILD

**Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

A. My name is James A. Rothschild and my address is 115 Scarlet Oak Drive, Wilton, Connecticut 06897.

**Q. WHAT IS YOUR OCCUPATION?**

A. I am a financial consultant specializing in utility regulation. I have experience in the regulation of electric, gas, telephone, sewer, and gas utilities throughout the United States.

**Q. PLEASE SUMMARIZE YOUR UTILITY REGULATORY EXPERIENCE.**

A. I am President of Rothschild Financial Consulting and have been a consultant since 1972. From 1979 through January 1985, I was President of Georgetown Consulting Group, Inc. From 1976 to 1979, I was the President of J. Rothschild Associates. Both of these firms specialized in utility regulation. From 1972 through 1976, Touche Ross & Co., a major international accounting firm, employed me as a management consultant. Touche Ross & Co. later merged to form Deloitte Touche. Much of my consulting at Touche Ross was in the area of utility regulation. While associated with the above firms, I have worked for various state utility commissions, attorneys general, and public advocates on regulatory matters relating to regulatory and financial issues. These have included rate of return, financial issues, and accounting issues. (See Appendix B.)

**Q. WHAT IS YOUR EDUCATIONAL BACKGROUND?**

A. I received an MBA in Banking and Finance from Case Western University (1971) and a BS in Chemical Engineering from the University of Pittsburgh (1967).

## II. PURPOSE

**Q. WHAT IS THE PURPOSE OF THIS TESTIMONY?**

A. The purpose of this testimony is to determine the cost of capital that is appropriate to apply to South Jersey Gas Company ("South Jersey Gas," "SJG" or the "Company"). Additionally, this testimony will provide an evaluation of the testimony of SJG's cost of capital witness, Paul R. Moul.

## III. SUMMARY OF CONCLUSIONS

**Q. PLEASE BRIEFLY SUMMARIZE YOUR FINDINGS.**

A. In consideration of the recent tax law change and other changes in the capital markets, I recommend that SJG be allowed an overall cost of capital of 7.22%. This is based upon a cost of equity of 9.50%. and a capital structure containing 39.69% common equity, 47.30% long-term debt, 12.74% short-term debt, and 0.27% preferred stock. My overall cost of capital recommendation also includes short-term debt in the capital structure at the current actual cost rate of 1.695%.

Because of recent changes in the federal income tax law and the current financial environment, the cost of equity to SJG should be lower than has been allowed by the New Jersey Board of Public Utilities ("Board" or "BPU") in cases that were decided based upon records developed prior to the mid-2003 passage of the tax law.

My cost of equity recommendation is based upon an analysis using both the Discounted Cash Flow ("DCF") method and the Risk Premium/Capital Asset Pricing Model ("CAPM") method. The cost of equity was determined by examining the financial data for a group of gas distribution companies consisting of all of the gas distribution companies covered by Value Line, as well as financial data for the same group of companies utilized by Company witness Mr. Moul.

As explained in detail later in this testimony, my capital structure recommendation is based upon the actual capital structure of SJG, modified to exclude the impact of the artificial reduction and elimination of the common dividend paid by SJG to its parent, South Jersey Industries ("SJI").

**Q. WHAT HAS SJG REQUESTED?**

A. SJG has requested an allowed a cost of equity of 12.0%, based upon a capital structure containing 50.10% common equity, 0.28% preferred equity, 43.06% long-term debt, and 6.56% short-term debt, for an overall cost of capital of 9.14%.

The 12.0% cost of equity requested by the Company is considerably more than the 9.50% to 9.75% cost of equity the BPU has allowed in recent electric base rate cases and the 9.50% I recommend in this case. Unlike the cost of equity recommended by Mr. Moul, my cost of equity recommendation can be reconciled to the cost of cost of equity allowed in these recent New Jersey electric rate cases. An important reconciling factor is the tax law change. The new federal income tax law that was passed in late May, 2003, in and of itself, justifies a lowering of the cost of equity.

The 6.56% short-term debt used by the Company in its recommended capital structure is considerably less than the 12.74% short-term debt that I used. As explained below in my testimony, the level of short-term debt that I recommend is based upon the actual average level of common equity used by SJG for the year, adjusted to account for the impact of the artificial reduction and elimination of the common dividend paid by SJG. See Schedule JAR-11, p. 1.

**Q. PLEASE SUMMARIZE THE PROBLEMS WITH THE COST OF EQUITY RECOMMENDATION MADE BY MR. MOUL.**

A. In his analysis, Mr. Moul applied a DCF method, a risk premium method, a CAPM method, and a comparable earnings method. As explained in detail later in my testimony, Mr. Moul has mis-applied all of these methods. Mr. Moul's DCF method is deficient primarily because he used a higher growth rate in his DCF model than can be justified by the historical data he claims to use. He presents a wide array of short-term non-constant growth rates, that cannot be expected to continue for the long term, even though the form of the DCF model he selected requires constant growth rates, that remain constant over the long term. These non-constant growth rates take the form of historical growth rates and short-term growth rates when applying his DCF method. He then arbitrarily selected a growth rate towards the upper end of the growth rates he computed. The net result of Mr. Moul's mis-application of a DCF method is a cost of equity recommendation that is too high.

In addition, as explained below in my testimony, Mr. Moul relied upon a flawed Risk Premium and CAPM analysis. When applying the Risk Premium and CAPM methods, Mr. Moul erroneously used the arithmetic mean instead of the geometric mean. He also improperly measures the historical actual risk premium by using median values, instead of mean values. Mr. Moul compounded this error by ignoring the substantial downward trend that has occurred in risk premiums over the last several decades. As if these errors are not enough, Mr. Moul incorrectly makes an upward adjustment to the beta's of the companies in his CAPM computation based upon the market-to-book ratio of the companies he analyzes, which has the effect of providing shareholders with a return on their investment which exceeds the required return on the equity component of the company's rate base. As will be explained in detail later in my testimony, all of these mistakes contribute to a cost of equity that is higher than what can be justified.

## IV. CAPITAL STRUCTURE AND EMBEDDED COST RATES

### A. Introduction.

**Q. WHAT IS CAPITAL STRUCTURE?**

A. The capital structure of a company is the percentages of different funding sources obtained by the company from investors. These funds are used by the company to acquire assets. One major source of funding is debt (bonds) and the other major source of funding is common equity. For example, if a company has total capital of $15 million that was obtained by selling $10 million of debt and $5 million of equity, the capital structure of this company would be 67% debt and 33% common equity.

**Q. WHY DOES CAPITAL STRUCTURE MATTER?**

A. It is important for a company to have the right capital structure because if the company has too much equity it will be paying more to raise funds than it has to – the cost of equity is more than the cost of debt. However, if a company has too much debt in its capital structure then that company risks not being able to meet its interest payments and potentially going bankrupt.

**B. Summary of Conclusions on Capital Structure.**

**Q. WHAT CAPITAL STRUCTURE SHOULD BE USED FOR SJG TO DETERMINE ITS OVERALL COST OF CAPITAL?**

A. I recommend that the appropriate capital structure to use to determine the overall cost of capital for SJG is one that contains 39.69% common equity, 47.30% long-term debt, 12.74% short-term debt, and 0.27% preferred stock. See Schedule JAR-11, p. 1. This capital structure is based upon the average capital structure for the year ending February 2004 for SJG. In my analysis, I used the actual capital structure of SJG, adjusted to impute the continued booking of regular SJG dividend payments to its parent, South Jersey Industries ("SJI"). This is the appropriate way to view the actual capital structure of SJG because the actual dividends paid by its parent, SJI, to outside investors was not cut. In fact, the dividend was increased. By properly recognizing the continuation of the dividend on the books of SJG as well as SJI, my computation of the capital structure of South Jersey Gas continues to make sense in the context of SJI's consolidated actual capital structure. Furthermore, my recommendation of a capital structure containing 39.69% common equity is consistent with the actual capital structure of the gas distribution companies covered by Value Line. As shown on Schedule JAR-7, p. 1, the average common equity in the capital structure of the gas distribution companies covered by Value Line is 39.27%, or virtually identical to the capital structure I have recommended for SJG.

**Q. WHAT CAPITAL STRUCTURE DID COMPANY WITNESS MR. MOUL RECOMMEND FOR THIS RATE CASE?**

A. Mr. Moul recommended a capital structure of 50.10% equity, 49.62% debt and 0.28% preferred stock.

**Q. HOW DID THE COMPANY OBTAIN ITS RECOMMENDED CAPITAL STRUCTURE?**

A. Mr. Moul recommended a capital structure based upon the reported common equity of SJG without considering that the higher common equity ratio of SJG was "artificially" created simply by cutting or suspending the common dividend payments from SJG to SJI. Mr. Moul's downward adjustment to long-term debt reflected his exclusion of reacquisition costs in long-term debt. Making this downward adjustment to the level of long-term debt has the effect of increasing the common equity ratio to a higher level than is being used by the Company to finance its assets. Mr. Moul also made a downward adjustment to short-term debt to exclude the financing associated with an array of short-term projects. In so doing, Mr. Moul ignored any consideration of a normal level of temporary short-term projects. As a result, Mr. Moul is recommending a capital structure with more common equity and less debt than is appropriate. If Mr. Moul's capital structure recommendation were to be used to set rates, ratepayers would be asked to pay more than what is appropriate for financing.

**Q. WHAT DID YOU USE FOR THE EMBEDDED COST OF LONG-TERM DEBT, PREFERRED STOCK, AND SHORT-TERM DEBT?**

A. I have adopted the cost rates proposed by the Company for long-term debt and for preferred stock. However, I used the actual cost of short-term debt of 1.695% rather than the 2.90% short-term debt cost rate requested by the Company.

## C. Impact of Dividend Policy.

**Q. IF A COMPANY WANTS TO INCREASE ITS COMMON EQUITY RATIO, HOW CAN THIS BE ACCOMPLISHED?**

A. A company can increase its common equity ratio by selling new common stock or by cutting its dividend rate.

**Q. CAN SJG SELL COMMON STOCK DIRECTLY TO THE PUBLIC?**

A. No. Since SJG is wholly owned by SJI, if it wants to raise new common equity through the sale of common equity, it must sell the common equity to SJI. SJI must then, in turn, sell new common stock to the public.

**Q. WHEN SJG PAYS A DIVIDEND, WHO RECEIVES THE DIVIDEND?**

A. SJG pays its dividend to SJI. SJI then pays its dividend to outside investors.

**Q. WHAT EVIDENCE LED YOU TO THE CONCLUSION THAT THE SOUTH JERSEY GAS CAPITAL STRUCTURE SHOULD VIEWED IN THE CONTEXT**

**OF REFLECTING THE CONTINUED BOOKING OF DIVIDENDS FROM SJG TO SJI?**

A. I started by examining the response to RAR-ROR-55. This response shows that SJG cut the rate of dividends it was paying to its parent, SJI, by more than 50% starting in the 2nd quarter of 2002 and then chose to totally eliminate the common dividend from SJG to SJI in 2003. The elimination of the payment of common dividends from SJG to SJI had the effect of increasing the level of common equity on the books of SJG. However, unless there was a corresponding cut in the dividends paid by SJI to its stockholders, there would be no corresponding increase in the common equity ratio of SJI. Under such circumstances, the only economic benefit of the dividend cut by SJG is to create the illusion of a higher common equity ratio on the books of SJG than actually exists from the perspective of outside bond and stock investors.

**Q. SINCE THE DIVIDENDS BEING PAID BY SJG TO SJI WERE SO SEVERELY REDUCED, DID SJI RESPOND BY CUTTING THE DIVIDENDS IT PAID TO ITS STOCKHOLDERS?**

A. No. As shown on Schedule JAR-11, p. 2, before this sudden and radical change in the dividend rate being paid by SJG to SJI, the total dividend paid by SJG to SJI was $17,500,400 in 2001. This was virtually identical to the total of $17,493,500 paid by SJI to its stockholders in 2001. Moreover, in subsequent years, the dividends paid by SJI to its stockholders continued to increase even though, during that time, the dividend paid by SJG to SJI was first cut dramatically and then was totally eliminated.

**Q. WHAT WAS THE IMPACT OF THE DIVIDEND CUT ON THE REPORTED CAPITAL STRUCTURE OF SJG?**

A. The Company's Exhibit PRM-1 Schedule 2 (page 1), shows that the capital structure of SJG contained 34.9% common equity in 2002, averaged 34.0% from 1998-2002, and varied between 32.5% and 34.9% from 1998 through 2002. As I discussed earlier, I found that SJG cut the rate of dividends it was paying to its parent, SJI, by more than 50% starting in the $2^{nd}$ quarter of 2002 and then chose to totally eliminate the common dividend from SJG to SJI in 2003. SJG's more recent capital structure reflects the change in dividend policy. Company Exhibit PRM-1, Schedule 5, shows the capital structure of SJG to contain 50.10% common equity by February 28, 2003, up from 43.26% as of February 28, 2003.

**Q. DOES THE EXTREMELY LARGE INCREASE IN THE PERCENTAGE OF COMMON EQUITY IN THE CAPITAL STRUCTURE REQUESTED BY SJG RESULT FROM A PLANNED NEW COMMON EQUITY ISSUANCE BY SJI?**

A. No. SJG has not stated that SJI plans to cut its common dividend or to issue any new common stock other than through the continuation of its ongoing dividend reinvestment plan. See the response to RAR-ROR-53 part c.

**Q. IF SJG CUTS OR ELIMINATES ITS DIVIDEND TO SJI BUT SJI DOES NOT CUT ITS DIVIDEND, HOW IS SJI ABLE TO MAKE ITS DIVIDEND PAYMENT?**

A. If SJG does not make its dividend payment to SJI, then SJI must rely upon other sources of funds, such as additional debt financing, to make its payment to stockholders. In this way, a cut in SJG's dividend rate without a corresponding cut in SJI's dividend rate is merely internal transactions that result in no substantive increase in the common equity ratio of SJG.

**D. Other Factors Impacting Capital Structure.**

**Q. IS THE FAILURE OF SJG TO PAY DIVIDENDS TO SJI THE ONLY REASON THE CAPITAL STRUCURE SHOWN IN THE COMPANY'S EXHIBIT RPM-1, SCHEDULE 6, OVERSTATES THE COMMON EQUITY RATIO?**

A. No. SJG sells most of its gas in the winter heating season. As a result, SJG also earns most of its money and retains most of its earnings during the heating season. Mr. Moul bases his recommendation for the capital structure as of the date of February 28. February 28 is a time in which the common equity ratio is at or near its seasonal high. Rates should be set based upon normal conditions, not conditions that are temporarily distorted by a seasonal factor. As shown on Schedule JAR-11, p. 1, even before correcting SJG's common equity balance to more fairly reflect the dividends paid by SJI - the level of common equity in the capital structure of SJG reaches a seasonal high in February and March.

**Q. ARE THERE ANY OTHER REASONS WHY THE 50.10% COMMON EQUITY IN THE CAPITAL STRUCTURE REQUESTED BY THE COMPANY IS TOO HIGH?**

A. Yes. Exhibit PRM-1, Schedule 6 (page 2) shows that Mr. Moul made a downward adjustment to the amount of debt outstanding to reflect the call premium on bonds re-acquired by the Company. Mr. Moul's adjustment assumes without justification that the call premiums paid by the Company were financed by extra debt that the Company would not have otherwise issued. By subtracting the call premium from the amount of debt outstanding, the percentage of debt in the capital structure is reduced. This reduction to the amount of debt outstanding has the effect of understating the amount of debt actually carried by SJG.

Mr. Moul's decision to reject using the actual capital structure because of debt re-acquisition is inappropriate because funds are fungible. Just because the Company might have issued more capital because it had to pay a re-acquisition premium does not mean the Company's appropriate capital structure changed. There is no way of telling if the extra capital to pay the call premium was actually financed with debt, with equity, or some combination of both. Good management manages the entire capital to optimize the cost of capital. Therefore, even if one debt issuance might be a little on the high side the impact of this is appropriately offset through actions such as changing the amount of earning retained or the size and timing of the next equity issuance. Hence, the balance of long-term debt used to compute the capital structure of the company should remain as reported.

## E. SJG and SJI Capital Structure.

**Q. IS IT PROPER TO CONSIDER THE CAPITAL STRUCTURE OF SJG WITHOUT CONSIDERING THE CAPITAL STRUCTURE OF SJI?**

A. No. SJG is a wholly owned subsidiary of SJI. Therefore, a correct analysis of the capitalization of SJG includes the impact of SJI.

In light of the importance that SJI's capital structure and business activities have on all its subsidiaries, including South Jersey Gas, it would be improper to automatically adopt SJG's "actual" capital structure for ratemaking purposes. In my analysis, I used a capital structure that was SJG's "actual" capital structure, adjusted to impute the continued booking of regular SJG dividend payments to SJI. My recommended common equity ratio for SJG of 39.69% is consistent with consolidated capital structure, which has 37.10% common equity as of September 30, 2003. See JAR-11, p. 3. In the future, South Jersey Gas's capital structure could be inappropriate especially if the financial characteristics of the South Jersey Gas stand-alone capital structure exceed those of its bond rating.

The Standard & Poor's ("S&P") report provided by the Company in response to RAR-ROR-28 confirms this. The S&P report begins its bond rating rationale section by stating the following in the very first two sentences under the section entitled "Rationale":

> The ratings of South Jersey Gas Co. reflect the qualitative and quantitative attributes of the consolidated entity, which includes its parent South Jersey Industries and its nonregulated subsidiaries. South Jersey Gas represents about 90% of the consolidated assets of South Jersey

Industries, whose other investments include South Jersey Energy Co. and Marina Energy LLC[1].

The section of the S&P report on SJG entitled "Weaknesses" further shows the tie-in between SJG and SJI by identifying one of the two weaknesses as: "Future increases in riskier nonregulated activities could produce an adverse change in credit quality." [2]

The undeniable tie-in between SJG and SJI is further clarified in the "Liquidity" section of the S&P report provided by the Company in response to RAR-ROR-28. This "Liquidity" section starts out with the following:

> South Jersey Gas' liquidity is adequate to meet its anticipated needs. The company's and its affiliates' lines of credit total $182 million ($125 million was used as of June 30,2003), of which $157 million is an exclusive line for South Jersey Gas. The parent has registered a new $150 million medium-term note program with the SEC, of which $64.5 million was available as of June 30, 2003. Furthermore, debt maturities for the next five years are a manageable $49.4 million[3].

The above-cites from the S&P report are consistent with the stated policy of S&P. Page 43 of S&P's "Corporate Ratings Criteria" which is publicly available on the S&P website, contains the following:

> Utilities are often owned by companies that own other, riskier businesses or that are saddled with an additional layer of debt at the parent level. **Corporate rating criteria would rarely view the default risk of an unregulated subsidiary as being substantially different from the**

[1] "Research: South Jersey Gas Company", *STANDARD & POOR'S RATINGSDIRECT* (Publication date: 25-Sep-2003), pages 1 & 2.
[2] "Research: South Jersey Gas Company," page 1.
[3] "Research: South Jersey Gas Company," pages 2 & 3.

> **credit quality of the consolidated economic entity** (which would fully take into account parent-company obligations). Regulated subsidiaries can be treated as exceptions to this rule –if the specific regulators involved are expected to create barriers that insulate a subsidiary from its parent. [Bold emphasis added.]

**Q. DOES SJG HAVE LESS BUSINESS RISK THAN ITS PARENT, SJI?**

A. Yes. As noted in the S&P report provided by the company in response to RAR-ROR-28, besides SJG, SJI owns unregulated businesses that have higher business risk than SJG.

**Q. IS IT A GENERALLY RECOGNIZED PRINCIPLE OF FINANCE THAT THE LOWER A COMPANY'S BUSINESS RISK, THE LOWER ITS PERCENTAGE OF EQUITY CAN APPROPRIATELY BE?**

A. Yes.

**Q. IS IT YOUR OPINION THAT IT WOULD BE APPROPRIATE FOR SJG TO HAVE LESS EQUITY IN ITS CAPITAL STRUCTURE THAN ITS PARENT SJI?**

A. Yes. For ratemaking purposes SJG should not be allocated a higher common equity ratio than its parent SJI, as the Company witness has requested. This is an indication that the Company's proposed capital structure, with 50% equity, is not an appropriate capital structure for SJG.

**Q. DOES SJI HAVE AN INCENTIVE TO LOWER THE OVERALL COST OF CAPITAL OF ITS SJG SUBSIDIARY?**

A. No, on the contrary. While there is substantial incentive for the competitive SJI to lower its overall cost of capital on a consolidated basis, it does not follow that a regulated subsidiary has such an incentive. As long as the Company believes the SJG capital structure might be used for regulatory purposes, it has an incentive to keep the common equity ratio of the regulated subsidiary as high as it dares. Since a regulated subsidiary such as SJG can and does provide cash flow to service more debt than it currently has outstanding, that cash flow could be used either to increase borrowing at the SJG subsidiary level or at the consolidated level. The important difference, however, is that unless regulatory procedures are implemented to protect against this, if SJG's extra cash flow is used to finance a higher proportion of debt at the parent level rather than at the SJG level, the percentage of equity in SJG's capital structure is increased to high levels even though the overall debt/equity ratio of the consolidated company may be maintained at more cost effective levels.

**Q. WAS SJG ABLE TO PROVIDE ANY COST JUSTIFICATION FOR ITS EXTREMELY LARGE PROPOSED INCREASE IN THE COMMON EQUITY RATIO?**

A. No. In its response to RAR-ROR-44, the Company claimed that the pro-forma common equity ratio was justified because it is "... within the range of ratios that investors expect for a gas distribution company." An examination of my Schedule JAR-7, p. 1 shows what is "...within the range..." is extremely wide. A common equity ratio as low as 20.0% and as high as 54.7% would be "within the range."

The additional part of the answer given by the company to cost justify its capital structure is a stated goal of an "A" bond rating. There are two problems with using this "A" bond rating as a cost justification. First, while other things being equal, A rated debt does have a slightly lower cost rate than the "BBB+" "Corporate Credit Rating" for SJG provided in response to RAR-ROR-28. Lowering the cost of debt does not provide cost justification unless the savings in interest cost is enough to at least offset the increase in the cost associated with the higher common equity component in the capital structure. Furthermore, for reasons explained above, even the decrease in the debt cost should not be expected unless the increase in the common equity ratio forecast for SJG were to also occur at the SJI level.

## V. COST OF COMMON EQUITY

### A. Introduction

**Q. WHAT IS THE COST OF EQUITY?**

A. The cost of equity is the rate of return that must be offered to a common equity investor in order for that investor to be willing to buy the common stock. The rate of return is earned in two different ways. One part of the return is from a dividend. The other part of the return is through the change in the stock price. Investors buy stock to benefit from the total return. Total return is the sum of the dividend income and the profit (or loss) obtained from the change in the stock price. While dividends are common in the utility industry, many companies do not pay a dividend. Yet, investors are willing to buy the stock if they feel that the likely capital appreciation will offset the lack of any dividend income. Common equity investors do not know with certainty what the stock price will be in the future. Also, investors are not certain at what rate future dividends might be increased or decreased. They also recognize that the possibility exists that dividends could be totally eliminated. Therefore, common equity investment always entails risk, but the risk can vary greatly from company to company.

The return an investor cares about is best measured as the return on market price. An investor who buys a common stock at $10.00 per share and sells it a year later for $10.90 will have received a 9% return (plus dividends, if any) irrespective of whether or not the company earned any money, and irrespective of the return on book value. However, utility commissions have the responsibility of balancing the interests of investors and ratepayers. Therefore, if it can be determined that investors are willing to buy stock with the expectation of being able to earn an annual return of 9%, then a commission should set rates so that the return on used and useful rate base is at the level where the future return on book value is expected to be 9%. If the market price should happen to be below book value, this would not be justification for providing a lower return than the cost of equity demanded by investors. If the market price should happen to be above book value, this would not be justification for providing a higher return than the cost of equity demanded by investors. As the U. S. Supreme Court found in its decision in Federal Power Commission v. Hope Natural Gas (320 *U.S.* 591), p. 602, the stock price is "... the end product of the process of rate-making not the starting point..." and that "... the fact that the value is reduced does not mean that the regulation is invalid." Therefore, in rate cases it is important to set rates based on a return on book value.

**Q. HOW MANY BASIC METHODS ARE USED TO CALCULATE THE COST OF EQUITY?**

A. There are two basic methods to determine the cost of equity: the Discounted Cash Flow ("DCF") method and the risk premium/Capital Asset Pricing Model ("CAPM") method. A detailed discussion of the implementation of each method is found in my testimony in Appendix A.

**Q. COULD YOU PLEASE EXPLAIN BRIEFLY HOW THE DCF METHOD WORKS?**

A. Yes. The DCF method starts with the current dividend yield, and adds to that dividend yield an estimate of growth to arrive at the estimated cost of capital. This growth is really the estimate of the future capital appreciation that investors are expecting. Dividend growth, book value growth, and earnings growth, to the extent they may be used, are only relevant to the degree they can help estimate stock price appreciation.

Q. **COULD YOU PLEASE EXPLAIN BRIEFLY WHY THE DCF METHOD IS USED?**

A. Yes. Perhaps a major part of the reason that the DCF method has been so commonly used over the years is because, more than any other method, it directly examines these factors that provide the incentive for investors to buy common stock in the first place.

Q. **COULD YOU PLEASE EXPLAIN BRIEFLY HOW THE RISK PREMIUM/CAPM METHOD WORKS?**

A. Yes. The risk premium method in a generic sense includes the CAPM method, is also commonly used by witnesses in rate proceedings. The risk premium/CAPM method is really measuring the very same thing as the DCF method --- the total return expected by a common stock investor. However, rather than determining this total return by directly estimating future dividends and capital appreciation, the method is looking either to interest rates or the inflation rate to help estimate what total return common stock investors want.

**B. Summary of Conclusions on Cost of Equity.**

Q. **HOW DID YOU DETERMINE THE COST OF EQUITY AND WHAT WERE YOUR FINDINGS?**

A. As explained in detail in this section, I determined the cost of equity to SJG by applying two different versions of the DCF method and two different versions of the Risk Premium/CAPM method. Based upon the analyses I conducted, I find that the cost of equity to SJG and applicable to a capital structure containing 39.69% common equity is 9.50%. See Schedule JAR-2. In contrast, Mr. Moul recommended a cost of equity of "at least" 12.0%,[4] with a capital structure containing 50.10% common equity.

**Q. HOW DID YOU ARRIVE AT YOUR RECOMMENDED COST OF EQUITY?**

A. I reviewed the results of my analyses using the DCF method and the risk premium/CAPM methods, as shown on Schedule JAR-2.[5] As explained in detail in my Appendix A, the results shown on Schedule JAR-2 were developed from my application of both the constant growth version of the DCF method and the complex DCF method.

Based on my analysis, the DCF-derived cost of equity for comparative gas companies is indicated to be 9.13% to 9.97% depending upon whether average or spot stock prices are used, the group of companies used, or whether the single-stage or multi-stage approach to the DCF method is applied.

As also shown on the bottom of Schedule JAR-2, my analysis using the risk premium/CAPM method indicates a cost of equity of 8.08% (based upon historical

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[4] Page 1, lines 19-20 of Mr. Moul's direct testimony.

[5] A detailed description of the DCF method and the Risk Premium/CAPM method is found in Appendix A.

returns and applicable to the gas utility risk category) to 10.00% (based upon a study of inflation premiums and applicable to an equity investment of average risk).

**Q. IS YOUR RECOMMENDATION CONSERVATIVELY HIGH?**

A. Yes. I did not adjust my cost of equity down even though I recognized that in the current marketplace the DCF method generally overstates the cost of equity. This is because there is a general tendency for analysts' forecasts that some rate of return witnesses mistakenly use in their application of the DCF method to be overly optimistic about future earnings prospects.

Recognizing that analysts' habitual optimism causes the DCF method to overstate the cost of equity, I noted that the constant growth version of the DCF method as applied to the comparative group of gas utilities is 9.13% to 9.67%. See Schedule JAR-2. I also found that the cost of equity indicated by the multi-stage version of the DCF method applied to the same group of gas utilities varied between 9.94% and 9.97% depending upon the company group used and the stock price time period (spot price or average for the year). The cost of equity indicated by the risk premium/CAPM method as applicable to gas utility companies varies from 8.08% to 10.00%. See Schedule JAR-2.

By being conservative and giving more weight to the DCF result even though the DCF result is currently overstating the cost of equity, I find that the proper cost of equity to allow to a gas utility of average risk is 9.50%.

**Q. HOW DOES YOUR IMPLEMENTATION OF THE DCF MODEL VARY FROM THE IMPLEMEMTATION USED BY THE COMPANY?**

A. Unlike Mr. Moul, when I applied the constant-growth version of the DCF model, I quantified growth by using a method that computes constant growth that is sustainable over the long term. In contrast, Mr. Moul calculates his growth rate by arbitrarily picking a growth rate that is higher than historical or projected growth rates indicate is maintainable in the future. When I examined non-constant growth rates, I used a version of the DCF model that is based upon mathematics that can properly quantify the impact of non-constant growth. These differences are explained in detail later in this testimony.

**Q. HOW DOES YOUR IMPLEMENTATION OF THE RISK PREMIUM/CAPM MODEL VARY FROM THE RISK PREMIUM AND CAPM MODELS PRESENTED BY MR. MOUL?**

A. As will be explained in detail later in this testimony, Mr. Moul again resorted to deficient mathematics when applying his risk premium and CAPM models by improperly using an arithmetic averaging method. I show later in this testimony that the arithmetic average used by Mr. Moul substantially overstates growth rates that have occurred. Furthermore, the geometric mean method is the method that is consistent with the return rate that should be allowed on rate base. The arithmetic average differential should not form the basis for the allowed return on rate base because arithmetic returns will occur in any event from the normal ongoing stock price fluctuations that will occur irrespective of the return rate that is allowed on rate base. In contrast to Mr. Moul, I use the geometric mean in my analysis.

## C. Cost of Equity Impact Caused by New Federal Income Tax Law Change

**Q. HAVE THE RECENTLY ENACTED FEDERAL TAX LAW CHANGES IMPACTED THE COST OF EQUITY FOR SOUTH JERSEY GAS COMPANY?**

A. Yes. The new U.S. tax cut law results in a large tax savings to equity investors, especially equity investors who own dividend paying utility stocks. Under the old law, dividends were taxed at rates that typically were 30% or more[6]; now dividends are taxed at no more than 15%. Under the old law, long-term capital gains were taxed at 20% and now they also will be taxed at no more than 15%.[7] The result of this tax cut is that investors keep a greater percentage of dividends and capital gains. Because income taxes are lower, the cost of equity allowed by the BPU in the past, assuming all else is equal, needs to be reduced by about 0.50%, or 50 basis points. Reducing the allowed return by 0.50% will result in the investor receiving the same after-tax return that he or she achieved under the old tax law.

Schedule JAR-12, p. 2, shows that under the old tax law, a cost of equity of 9.11% provided a typical investor with an after tax return of 7.61%. As also shown on Schedule JAR-12, p. 3, under the new tax law a cost of equity of 9.11% provides investors with an after-tax return of 8.32%, which is 0.71% more than under the old tax law.

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[6] Prior to the tax law change, federal income tax rates were 10%, 15%, 27%, 30%, 35%,or 38.6% depending upon the relevant income bracket. Under the newly passed law, the 27% drops to 25%, the 30% to 28%, the 35% to 33% and the 38.6% to 35%. Since the old 27% tax bracket applied to married couples with a combined income of no more than $47,450, it is reasonable to say that the dollar weighted dividends paid to most individual investors were in brackets of between 27% and 38.6%.

**Q. IS THE CURRENT TAX LAW PERMANENT?**

A. The current tax law technically expires after 2008. However, the May 31st 2003 issue of the *Economist* says, "...the chances of politicians letting the taxes reappear are slim."[8] Nevertheless, since the new tax law could expire at the end of 2008, I used a DCF analysis to calculate the tax effect assuming tax rates return to 20% for long-term capital gains and 30% for dividends in 2009. In the unlikely case that the new tax law should only be temporary, investors who hold the stock for 40 years would still receive a 0.12% greater after tax return on equity compared to the return under the old tax law. Investors with a time horizon shorter than 40 years would receive greater than a 0.12% benefit from the new tax law even under the unlikely assumption that the tax reduction is temporary. See Schedule JAR-12, p.1. Furthermore, whether or not the tax law change is permanent, investors will enjoy the benefits of the new tax law change during the years it is in effect. This is a cost reduction benefit that should be passed on to ratepayers for as many years as the new tax law does remain in effect.

**Q. WHY DOES A REDUCTION IN THE INCOME TAX RATE PAID BY COMMON STOCK INVESTORS LOWER THE COST OF EQUITY THAT THE BOARD SHOULD ALLOW TO SJG?**

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[7] Merrill Lynch "President Bush Signs Tax Bill Into Law" May 29, 2003.

[8] The *Economist*, "Disingenuous and Risky" May 31, 2003, page 13.

A. Investors care about maximizing the return on investment that they keep rather than simply maximizing the before-tax return an investment may return. This is why tax-free bonds pay a lower interest rate than taxable bonds. The cost of equity the Board allows is the return a company is allowed to earn after paying income taxes. However, the cost of equity allowed by the BPU is the rate earned by the investor before the investor pays income taxes on dividends or capital gains. When there is a change to the tax rate the investor pays on interest and on capital gains, there is a corresponding change in the return the Board must allow to give the investor the same return.

In the past, when there has been a tax law change in the income tax rate paid by SJG on its income, the income tax expense included an operating expense charge. For that very same reason it is appropriate to alter the tax allowance when the corporate tax rate changes and it is equally important to change the cost of equity allowance when the individual income tax rate changes.

**Q. EARLIER IN YOUR TESTIMONY, YOU SAID THAT THE BOARD SHOULD CONSIDER THE IMPACT OF THE NEWLY PASSED TAX LAW WHEN COMPARING THE ALLOWED RETURN IN RECENT GAS CASES AND WHAT IT SHOULD NOW ALLOW. PLEASE EXPLAIN HOW YOU QUANTIFIED THE IMPACT.**

A. The cost of equity impact was quantified by separately examining the following:

1) A present value analysis of cash flows assuming:

A) 40-year holding period with no tax law change;

B) 40-year holding period assuming the old tax law returns after 7 years;

C) A one-year holding period.

2) An examination of AAA corporate bonds versus the AAA tax-free municipal bonds.

I used a 40-year holding period in my DCF analysis because a long-term perspective is appropriate to fairly evaluate the impact on investors. Almost no investors will hold a stock for 40 years but they eventually will sell to another investor who also will be affected by the new tax environment.

**Q. IF YOU SHORTEN THE HOLDING PERIOD DOES IT REDUCE THE SAVINGS AVAILABLE FROM THE NEW TAX LAW?**

A. No. If it is assumed that an investor sells the stock after only one year, the after-tax return on equity increases to 0. 86% or a slightly greater savings than the 0. 71% savings shown in the assumed 40-year holding period case. See Schedule JAR-12, pp.1, 5.

**Q. ARE THERE ANY EXISTING INVESTMENT PRODUCTS THAT CAN BE USED FOR COMPARISON PURPOSES TO EVALUATE THE IMPACT OF THE NEW TAX BILL?**

A. Yes. The AAA 20-year tax-free municipal bond can be used for comparison and it provides a return of 4.26%.[9] Unlike the Municipal bonds, interest income from corporate bonds is taxed. AAA Corporate bonds offer a return of 5.52%.[10] The interest rate paid on AAA tax-free municipal bonds is 22.83% less than on AAA taxable corporate bonds.

[9] Yahoo Finance, January 6, 2004

[10] Yahoo Finance, January 6, 2004

A 22.83% reduction in the 9.11% DCF-derived cost of equity is a reduction of 2.08%. Since the new tax law approximately cuts the income tax rate in half, not totally eliminating the tax paid by an equity investor, the interest rate differential between taxable and tax-free bonds indicate that the cost of equity will drop by 1.04% (2.08% / 2) as a result of the new tax law. See Schedule JAR-12, p. 6. To be conservative, I interpret the results to mean that as a result of the new income tax law, the cost of equity has declined by at least 0.50%.

## VI. EVALUATION OF THE TESTIMONY OF MR. MOUL.

### A. Summary

**Q. PLEASE SUMMARIZE THE TESTIMONY OF MR. MOUL.**

A. Mr. Moul has recommended that SJG be allowed a return on equity of "at least" 12.0%.[11] Based upon this 12.0% return on equity, he calculated an overall cost of capital of 9.14%. He arrived at this recommendation based upon what he calls "... four, well recognized measures of the cost of equity....": DCF, risk premium analysis, CAPM, and comparable earnings. Please see page 3 of his direct testimony.

**Q. PLEASE SUMMARIZE THE FLAWS IN MR. MOUL'S ANALYSIS.**

A. An analysis of his testimony shows that each of the approaches he has relied upon to determine the cost of equity contain significant errors that have caused him to overstate the cost of equity. Following is a brief summary of the problems with Mr. Moul's testimony that are explained in detail later in this section of my testimony.

DCF Method:

- Failure to use sustainable growth in constant growth form of DCF method.
- Arbitrary selection of growth rates from wide array of improper growth rate results.
- Overstating dividend yield by making an improper downward adjustment to stock price when computing dividend yield.

Risk Premium and CAPM Methods:

[11] Page 1, lines 19-20 of Mr. Moul's direct testimony.

- Overstating historic actual performance by giving weight to arithmetic average and arithmetic median rather than giving exclusive weight to the geometric averaging method.

- Failure to consider the decline in the risk premium that has occurred in the last several decades.

- Further exaggerating the results of the Risk Premium and CAPM models by making an upward adjustment to the already inflated result.

Comparable Earnings Method:

- Not an equity costing method. All it does is assume that whatever is the future expected return on book equity is automatically the cost of equity.

As a result of the flaws in Mr. Moul's analysis, Mr. Moul has recommended a cost of equity and overall cost of capital that are higher than can be justified.

**B. DCF Method**

**Q. IS THERE MORE THAN ONE APPROACH TO THE DCF METHOD?**

A. Yes. There are two different DCF approaches that are used for ratemaking purposes. One is a simplified or constant growth DCF method, requiring a constant growth rate assumption that is sustainable in perpetuity. The other is a complex or non-constant growth method that allows for the correct mathematical interpretation of results even if growth is not expected to be constant in the future.

**Q. DO YOU USE BOTH DCF METHODS IN YOUR ANALYSIS OF SJG'S COST OF EQUITY?**

A. YES.

**Q. DOES MR. MOUL USE BOTH DCF METHODS IN HIS ANALSYIS OF SJG'S COST OF EQUITY?**

A. No. Mr. Moul uses only a constant growth rate form of the model, but applies the constant growth rate form by using non-constant growth rate inputs.

**Q. DID MR. MOUL PROPERLY APPLY THE SIMPLIFIED OR CONSTANT DCF METHOD?**

A. No. Strictly speaking, Mr. Moul has not really applied the DCF method at all. Just because he adds a number to a dividend yield does not make it a DCF method. It is only a DCF method if the dividend yield is computed properly, and the growth rate used is derived from a careful study of what future sustainable growth in cash flow is anticipated by investors.

**Q. HAS MR. MOUL USED AN APPROPRIATE METHODOLOGY TO DETERMINE THE GROWTH RATE THAT SHOULD BE USED IN THE DCF MODEL?**

A. No. Instead of determining a realistic growth rate number, Mr. Moul presented a wide array of growth computations, irrespective of whether or not what he was measuring for growth has anything to do with indicating investors' expectations for future sustainable long-term growth in cash flow. The results he presents in his Schedule 9, page 1, and Schedule 10, page 1, are so wide and imprecise that he could just as well have selected a growth rate that was considerably different from the one he chose.

His method is arbitrary, and results in a substantial overstatement of the growth rate actually expected by investors. Mr. Moul used a 5.75% expected growth rate for his comparative group of gas companies. Please see page 32, line 15, of Mr. Moul's direct testimony. He claims to have based these conclusions on observations of historic and projected growth rates in earnings per share and dividends per share, as summarized on his Schedules 9 and 10. However, a review of the historic growth rate inputs he examined that appears on his Schedule 9, page 1, shows that his historic inputs vary from 2.90% to 5.50%, and average 4.20%. Similarly, an examination of the five-year projected growth rate inputs examined by Mr. Moul on his Schedule 10, page 1, show that these growth rate inputs examined by Mr. Moul vary from a low of 2.31% to a high of 7.28%, and average 5.49%. In contrast to Mr. Moul's projected growth rate of 5.75%, I found that the average of the historic and five-year projected growth rates that he claimed to use is 4.85%.

**Q. IS THE DCF METHOD AS IMPRECISE AS MR. MOUL MAKES IT SEEM?**

A. No. The DCF method properly implemented is capable of a far greater accuracy than the range defined by Mr. Moul.

**Q. BESIDES GROWTH RATE, ARE THERE ANY OTHER DCF ANALYSIS INPUTS THAT MR. MOUL HAS ESTIMATED INCORRECTLY?**

A. Yes. As discussed below, Mr. Moul made inappropriate upward adjustments to the dividend yield.

**Q. WHAT COST OF EQUITY WOULD BE INDICATED BY MR. MOUL'S DCF METHOD IF HE USED HIS DIVIDEND YIELD, AND USED THE GROWTH RATE INDICATED BY THE AVERAGE OF ALL OF THE GROWTH RATE METHODS HE SELECTED?**

A. If he had simply averaged his own data - rather than arbitrarily selecting any growth rate at all from his wide array of growth rates - he would have started with his dividend yield of 4.96%, as shown on his page 32, line 15. To this, he would have added the average of all growth rate methods, 4.85%, instead of the arbitrary 5.75% growth rate that he chose to add to his 4.96% dividend yield. If he did this, his DCF method would have been indicating a cost of equity of 9.81%, instead of 10.71%.[12] If the actual dividend yield, instead of the invalid adjustments to dividend yield, is used then Mr. Moul's DCF result becomes 4.77% dividend yield,[13] plus 4.85% growth, for a DCF indicated cost of equity of 9.62%. There are still many conceptual flaws associated with all of the growth rate indicators selected by Mr. Moul. However, the 4.85% average growth rate derived from these indicators is within the range of the 4.85% to 5.16% growth rate I found proper on my Schedule JAR-4, pp. 1, 2.

**Q. YOU SAID THAT MR. MOUL MADE INAPPROPRIATE UPWARD ADJUSTMENTS TO HIS DIVIDEND YIELD COMPUTATION. PLEASE EXPLAIN.**

[12] Page 35, Line 15, of Mr. Moul's direct testimony.

[13] Response to RAR-ROR-45.

A. Mr. Moul explains on pages 25-26 of his direct testimony that he increased his dividend yield computation by making an upward adjustment for dividend accruals. The upward adjustment for accrued dividends is inappropriate because it is incomplete. The return on equity that is allowed to utility companies is an annual rate of return. Actually, since companies bill customers monthly rather than annually, the return rate being earned is a compound monthly return although the cost of equity is an annual return number. Any timing adjustments such as the accrued dividend factor proposed by Mr. Moul is an incomplete adjustment unless the monthly compounding of earnings is also considered. Considering the monthly compounding of earnings would more than offset Mr. Moul's proposed accrued dividend adjustment. For example, if the cost of equity were determined to be 8%, rates would be set to give a utility company a reasonable opportunity to earn 8% on its equity. However, the implementation of the 8% would allow the company to collect 1/12 of that 8% every month. As the company earns that money every month, it keeps a portion of it for re-investment in the business. The rest is paid out as dividends to investors. Investors are then free to take the dividends and re-invest them as they see fit throughout the year. If these funds are re-invested either by the company or by investors at 8%, they will compound. 1/12 of 8% is 0.67%. A monthly return of 0.67% produces an annual return of 8.34%, not 8%. (1.0067^12-1=8.34%)[14]. Therefore, if the BPU were to adopt Mr. Moul's philosophy of adjusting for the timing effect of dividends during the year, to be consistent it would be necessary to also make a

[14] ^ means raise to the power of.

downward adjustment of about 0.34% to the allowed return on equity to account for the monthly compounding of earnings available to the company.

**Q. IF MR. MOUL'S ADJUSTMENTS TO DIVIDEND YIELD ARE ADOPTED ARE THERE ANY ADJUSTMENTS THAT YOU WOULD PROPOSE?**

A. Yes. A downward adjustment to the return on equity must be made to account for the compounding of earnings if Mr. Moul's adjustments to the dividend yield are adopted. My DCF analysis did not require such an adjustment.

**Q. IN ADDITION TO THE FAILURE OF MR. MOUL TO ACTUALLY USE THE GROWTH RATES HE PRESENTED FOR THE DCF MODEL, AND HIS ERRONEOUS UPWARD ADJUSTMENT TO THE DIVIDEND YIELD, PLEASE EXPLAIN WHAT CONCEPTUAL FLAWS ARE INHERENT IN THE GROWTH RATES HE SELECTED.**

A. The first problem is that of the growth rate methods presented by Mr. Moul only the "b x r" approach is actually used by analysts in a DCF formula and only this "b x r" method is taught in textbooks. The second problem is that even the "b x r" approach Mr. Moul used to arrive at his "b x r" answer has been improperly implemented. The "b x r" method is explained in my Appendix A.

**Q. MR. MOUL HAS PRESENTED A "B X R" GROWTH RATE METHOD. PLEASE COMMENT ON HIS APPROACH TO THE METHOD.**

A. I have used a "b x r" approach to the DCF method as the method for computing growth in the constant growth version of the DCF model I have presented[15]. However, Mr. Moul failed to make the retention rate he used for computing growth consistent with the retention rate he used to compute the dividend yield. His analysis built-in a serious mis-match. Mr. Moul computed the dividend yield based upon dividends from 2003, but computed growth based upon a forecasted retention rate for 2006-2008. Such a mismatch introduces a potentially major error in his b x r approach.

**Q. WHAT CHARACTERISTICS MUST A GROWTH RATE HAVE IN ORDER FOR IT TO BE A VALID INDICATOR OF THE GROWTH RATE TO USE IN THE CONSTANT GROWTH DCF FORMULA?**

A. **The only proper growth rate to use in the simplified version of the DCF model is a growth rate that investors expect is sustainable for many years into the future.** A long-term sustainable growth rate in cash flow is a very special type of growth rate. Short-term, five-year earnings per share growth rates, such as those reported by ThomsonFN/First Call, are frequently substantially different from future sustainable growth rates.

**Q. CAN YOU PLEASE SUMMARIZE WHY A FUTURE ORIENTED "B X R" METHOD IS SUPERIOR TO A FIVE-YEAR EARNINGS PER SHARE**

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[15] This method is often referred to in a generic sense as the "b x r" method. However, its full implementation requires that not only b x r, or "br" growth (which is the growth caused by the retention of earnings) but also sv growth (which is the growth caused by sales of new stock at other than book value) be considered as well.

**GROWTH RATE FORECAST IN PROVIDING A LONG-TERM SUSTAINABLE GROWTH RATE?**

A. Yes. The primary cause of sustainable earnings growth is the retention of earnings. A company is able to create higher future earnings by retaining a portion of the prior year's earnings in the business and purchasing new business assets with those retained earnings. There are many factors that can cause short-term swings in earnings growth rates, but the long-term sustainable growth is caused by retaining earnings and reinvesting those earnings.

Factors that cause short-term swings include anything that causes a company to earn a return on book equity at a rate different from the long-term sustainable rate. Assume, for example, that a particular utility company is regulated so that it is provided with a reasonable opportunity to earn 10.0% on its equity. If the company should experience an event such as the loss of several key customers, or unfavorable weather conditions which cause it to earn only 6.0% on equity in a given year, the drop from a 10% earned return on equity to a 6% earned return on equity would be concurrent with a very large drop in earnings per share. In fact, if a company did not issue any new shares of stock during the year, a drop from a 10% earned return on book equity to a 6% earned return on book equity would result in a 40% decline in earnings per share over the period.[16] However, such a drop in earnings would not be any indication of what is a long-term sustainable earnings per share growth rate. If the drop were caused by weather

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16 By definition, earned return on equity is earnings divided by book value. Therefore, whatever level of earnings is required to produce earnings of 6% of book would have to be 40% lower than the level of earnings required to produce a return on book equity of 10%.

conditions, the drop in earnings would be immediately offset once normal weather conditions return. If the drop is from the loss of some key customers, the company would replace the lost earnings by filing for a rate increase to bring revenues up to the level required for the company to be given a reasonable opportunity to recover its cost of equity.

For the above reasons, changes in earnings per share growth rates that are caused by non-recurring changes in the earned return on book equity are inconsistent with long-term sustainable growth, but changes in earnings per share because of the reinvestment of additional assets is a cause of sustainable earnings growth. The "b x r" term in the DCF equation computes sustainable growth because it measures only the growth which a company can expect to achieve when its earned return on book equity "r" remains in equilibrium. If analysts have sufficient data to be able to forecast varying values of "r" in future years, then a complex, or multi-stage DCF method must be used to accurately quantify the effect. Averaging growth rates over sub-periods, such as averaging growth over the first five years with a growth rate expected over the subsequent period will not provide an appropriate representation of the cash flows expected by investors in the future and, therefore, will not provide an acceptable method of quantifying the cost of equity using the DCF method. The choices are either a constant growth DCF, in which one "b x r" derived growth rate should be used, or a complex DCF method in which the cash flow anticipated in each future year is separately estimated.

**Q. WHY ARE ANALYSTS FIVE-YEAR CONSENSUS GROWTH RATES NOT INDICATIVE OF LONG-TERM SUSTAINABLE GROWTH RATES?**

A. Analysts' five–year earnings per share growth rates are earnings per share growth rates that measure earnings growth from the most currently completed fiscal year to projected earnings five years into the future. These growth rates are not indicative of future sustainable growth rates in part because the sources of cash flow to an investor are dividends and stock price appreciation. While both stock price and dividends are impacted in the long-run by the level of earnings a company is capable of achieving, earnings growth over a period as short as five years is rarely in synchronization with the cash flow growth from increases in dividends and stock price. For example, if a company experiences a year in which earnings are temporarily below investor expectations, stock prices generally do not decline at the same percentage that earnings decline, and dividends are usually not cut just because of a temporary decline in a company's earnings. Unless both the stock price and dividends mirror every down swing in earnings, they cannot be expected to recover at the same growth rate that earnings recover. Therefore, growth rates such as five-year projected growth in earnings per share are not indicative of long-term sustainable growth rates in cash flow. As a result, they are inapplicable for direct use in the simplified DCF method.

**Q. IS THERE A WAY FOR AN ANALYST TO KNOW WHETHER OR NOT THE EARNINGS FOR ANY PERIOD ARE REFLECTIVE OF NORMAL EARNINGS?**

A. Yes. **In order for earnings to be reflective of normal conditions, the company has to earn a return on book equity in that year at a level that is equal to the long-term sustainable return on book equity.**

**Q. PLEASE ELABORATE ON WHY THE USE OF FIVE-YEAR EARNINGS PER SHARE GROWTH RATES IN THE DCF MODEL IS IMPROPER?**

A. A raw, unadjusted, five-year earnings per share growth rate is usually a very poor proxy for either short-term or long-term cash flow growth that an investor expects to receive. When implementing the DCF method, the time value of money is considered by equating the current stock price of a company to the present value of the future cash flows that an investor expects to receive over the entire time that he or she owns the stock. The discount rate required to make the future cash flow stream, on a net present value basis, equal to the current stock price is the cost of equity. The only two sources of cash flow to an investor are dividends and the net proceeds from the sale of stock at whatever time in the future the investor finally sells. Therefore, the DCF method is discounting future cash flows that investors expect to receive from dividends and from the eventual sale of the stock.

Five-year earnings growth rate forecasts are especially poor indicators of cash flow growth even over the five years being measured by the five-year earnings growth rate number. This is because, for different reasons, the five-year earnings per share growth rate is not indicative of growth in either of the two cash flow sources to an investor.

**Q. WHY IS A FIVE-YEAR EARNINGS PER SHARE GROWTH RATE A POOR INDICATOR OF THE FIVE-YEAR CASH FLOW EXPECTATION FROM DIVIDENDS?**

A. The board of directors changes dividend rates based upon long-term earnings expectations combined with the capital needs of a company. Most companies do not cut the dividend simply because a company has a year in which earnings were below sustainable trends, and similarly they do not increase dividends simply because earnings for one year happened to be above long-term sustainable trends. Therefore, over any given five-year period, earnings growth is frequently very different from dividend growth. In order for earnings growth to equal dividend growth, at a minimum, earnings per share in the first year of the five-year earnings growth rate period would have to be exactly on whatever long-term earnings trend line is expected by investors. Since earnings in most years are either above or below the trend line, the earnings per share growth rate over most five-year periods is different than what is expected for earnings growth.

**Q. WHY IS A FIVE-YEAR EARNINGS PER SHARE GROWTH RATE A POOR INDICATOR OF FUTURE STOCK PRICE GROWTH?**

A. If a company happens to experience a year in which earnings decline below what investors believe are consistent with the long-term trend, then the stock price does not drop anywhere near as much as earnings drop. Similarly, if a company happens to experience a year in which earnings are higher than the investor-perceived long-term sustainable trend, then the stock price will not increase as much as earnings. In other words, the P/E (price/earnings) ratio of a company will increase after a year in which investors believe earnings are below sustainable levels, and the P/E ratio will decline in a year in which investors believe earnings are higher than expected. Since it is stock price that is one of the important cash flow sources to an investor, a five-year earnings growth rate is a poor indicator of cash flow both because it is a poor indicator of stock price growth over the five years being examined and is equally a poor predictor of dividend growth over the period.

**Q. ARE YOU SAYING THAT ANALYSTS' CONSENSUS EARNINGS PER SHARE GROWTH RATES ARE USELESS AS AN AID TO PROJECTING THE FUTURE?**

A. No. **Analysts' EPS growth rate are, however, very dangerous if used in a simplified DCF without proper interpretation**. While they are not useful if used in their "raw" form, they can be useful in computing estimates of what earned return on equity investors expect will be sustained in the future, and as such, are useful in developing long-term sustainable growth rates. But, the growth rate from an arbitrary starting year is, in and of itself, as useless as attempting to measure the average slope of a mountain based upon the slope encountered over the last five minutes of hiking on a jagged trail up the mountain. In my implementation of the simplified DCF method, I use the Zacks five-year earnings per share growth only to help determine what earned return on book equity investors anticipate will be achieved in five years. Then, I consider the resultant earned return on book equity as one of the inputs to determine the value of "r" that I use in the "b x r" growth rate computation. In this way, I give consideration to analysts' consensus growth rate, but do so in a way that results in a long-term sustainable cash flow growth rate rather than making the erroneous assumption that a five-year earnings per share growth rate is somehow an indicator of cash flow growth remember, cash flow received by an investor is in the form of either dividends or stock price appreciation.

**Q. DO ARTICLES IN BUSINESS LITERATURE DEFINITIVELY SHOW THAT INVESTORS ARE AWARE OF THE SERIOUS BIASES CONTAINED IN THE RECOMMENDATIONS OF MANY ANALYSTS' REPORTS?**

A. Yes. There have been countless articles that appeared in both business publications and the popular press throughout the last year that show these biases. *Business Week*, a widely read and important business publication, contained numerous articles that reported on the problems with securities analysts. These include:

1. A cover story entitled "How Corrupt is Wall Street" appeared in the May 13, 2002 issue of *Business Week.*
   a) The article mentions that Merrill Lynch, Solomon Smith Barney, Morgan Stanley Dean Witter along with 10 other firms are being investigated by the US Securities and Exchange Commission for unethical practices.[17]
   b) According to the article, New York State Attorney General Eliot Spitzer made public e-mail exchanges at Merrill where, e-mail messages uncovered by Dr. Spitzer showed that "...analysts disparage stocks as 'crap' and 'junk' that they were pushing at the time. The e-mails are so incendiary that they threaten to thrust Wall Street into the sort of public-relations nightmare that Philip Morris, Ford, Firestone, and Arthur Andersen have endured in recent years."[18]
   c) The article features the following quote from David Komansky, the CEO of Merrill Lynch, by placing it in bold letters and large print:

> We have failed to live up to the high standards that are our tradition, and I want to take this opportunity

[17] May 13, 2002 *Business Week*, page 37.
[18] *Business Week*, May 13, 2002 page 39.

> to publicly apologize to our clients, our shareholders, and our employees.[19]

In the above quote, Dr. Komansky was responding to what *Business Week* describes as "...the analyst debacle..."[20]

2. The cover of the July 29, 2002 issue of *Business Week* features the article entitled "THE ANGRY MARKET." The Cover summarizes the article by saying "THE BLUNT MESSAGE: Investors are re-pricing stocks to reflect a more honest picture of earnings, options, and the future." In a discussion about the inaccurate and misleading earnings reporting done by many companies, *Business Week* says:

> Brokerage-house analysts aren't much help either. They tend to do what companies want. For example, only six of the 21 analysts that have given First Call their estimates for AOL Time Warner Inc.'s 2003 earnings actually provided GAAP figures.

3. A cover article in the August 5, 2002 issue of *Business Week* is entitled " INSIDE THE TELECOM GAME. How a small group of insiders made billions as the industry collapsed." The article discusses the buy recommendations consistently made by Dr. Grubman on these companies, and says on page 34:

> Now, investors are questioning whether Grubman was motivated by his true opinions – or by the millions of dollars he received from supporting his telecom clique.

4. "HOW TO FIX CORPORATE GOVERNANCE" is the cover article in the in the May 6, 2002 issue of *Business Week*. Page 76 of this article says:

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[19] *Business Week* "How Corrupt is Wall Street" May 13, 2002, page 42.
[20] *Ibid*, page 42.

> If investors have learned anything from this crisis, it's that Wall Street's analysts are often loath to put a bad spin on a stock. Historically, "sell" ratings have constituted fewer than 1% of analysts' recommendations, according to Thompson Financial/First Call...It's more a case of an inherently conflicted system, that is now the focus of a Justice Department investigation.
>
> "'Investors need to realize that the free research they're getting is often just a marketing tool', says Kent Womack, a professor at Dartmouth College's Amos Tuck school of business."

5. A June 10, 2002 issue of *Fortune* had an article entitled "In Search of the Last Honest Analyst". The *Fortune* article noted:

> In fact, stock research sank so low during the bubble that it actually became a contrary indicator of a stock's performance. Researchers at the University of California and Stanford reviewed almost 40,000 stock recommendations from 213 brokerages during the year 2000. The most highly rated stocks had a –31% return for the year, according to the study. Meanwhile, the stocks least favorably recommended (that is, the sells) soared an annualized 49% -- a differential of 80 percentage points.[21]

6. A September 24th, 2002 *Wall Street Journal* article entitled "Will Grubman Case Tone Down the Exaggeration by Analysts?" states the following:

> During the 1980s and 1990s, analysts often served as quasiadvocates for companies that hired their firms for investment-banking work, accompanying them on road shows to sell their stock, setting up

[21] Fortune.com, "In Search of the Last Honest Analyst" June 2002, page 1 of 2.

> one-on-one meetings between management and institutional investors, and proffering their access to management to give an unofficial version of the companies' view of business developments.[22]

7. On October 22, 2002, a *Wall Street Journal* article entitled "Massachusetts Claims CSFB Stock Reports Led Investors Astray" appeared on pages C-1 and C-10. Following are some highlights from this article:

> The complaint [by the Secretary of the Commonwealth of Massachusetts] alleges CSFB misled investors by allowing its investment-banking division – in particular, star Frank Quattrone – to exert undue influence on the firm's research department.
>
> The complaint which echoes one filed earlier this year by Elliott Spitzer against Merrill Lynch & Co. will no doubt add to investor concern that Wall Street peddled research it didn't believe only to get its hands on the much more lucrative investment-banking fees.
>
> 'The presumption that every firm engaged in this behavior is fair,' says Roy Smith, a professor of finance at New York University and a former partner at Goldman Sachs Group, Inc. 'It reminds me of how we used to talk in the locker room after a football game. That talk happens all the time, but it would sure be embarrassing if anyone ever recorded it.'[23]

**Q. HAS ALL THE UNFAVORABLE PRESS REGARDING EQUITY ANALYSTS RESULTED IN ANY POSITIVE REFORM IN THE INDUSTRY?**

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[22] Wall Street Journal "Will Grubman Case Tone Down The Exaggeration by Analysts?" September 24, 2002, starting on pages C-1 and C-3.

[23] Wall Street Journal, October 22, 2002, page C-1 and C-10.

A. No. A *Business Week* editorial published on September 8, 2003 called "The Myth of Independence" states that the new independent research firms also have conflicts of interest to deal with and "Many hire analysts with little or no track record, raising questions about the quality of their research."

**Q. ONE OF THE GROWTH RATES THAT MR. MOUL RELIES UPON IS VALUE LINE FORECASTED EARNINGS PER SHARE GROWTH RATES. IS THE VALUE LINE EARNINGS PER SHARE GROWTH RATE SUFFICIENTLY NORMALIZED TO MAKE IT AN ACCURATE INDICATOR OF LONG-TERM SUSTAINABLE GROWTH RATES?**

A. No, because Value Line's method results in only a very incomplete normalization of the base period earnings it uses in its earnings per share five-year forecast. The Value Line earnings per share forecast of the type presented by Mr. Moul is defined by Value Line as the earnings per share growth from "Est'd '00-'02 to "06-'08". The procedure used by Value Line is to average the earnings per share from the 2000-02 base period and relate that three-year average to the earnings per share it expects will be achieved, on average, over the future 2006-2008 time period. The method used by Value Line does not assure the appropriate normalization of earnings per share in the base period, because there is not even an attempt by Value Line to make the average earned return on book equity in the base period reflective of the normal expected return on book equity. In fact, in the case of all the gas companies covered by Value Line, the average earned return on book equity from 2000-2002 is lower than Value Line expects in the 2006-2008 period.

## C. Risk Premium Method

**Q. PLEASE BRIEFLY DESCRIBE THE RISK PREMIUM METHOD.**

A. The risk premium method estimates the cost of equity by analyzing the historic difference between the cost of equity and a related factor such as the rate of inflation or the cost of debt. This method is explained in detail in my Appendix A.

**Q. PLEASE COMMENT ON THE RISK PREMIUM METHODS AS PRESENTED BY MR. MOUL.**

A. Mr. Moul applies the risk premium method by computing the difference in the returns earned by common stocks as compared to the return earned on bonds from 1928 through 2001. See Mr. Moul's Schedule 13, page 1. He measures the historic risk premium three different ways. One way he used was the geometric mean, another was the arithmetic mean, and the third way he used was the geometric median. He combines the results of the three methods by first determining the mid-point between the median return and the geometric mean. Then, he averages the results of the mid-point between the geometric mean and the median with the arithmetic mean. See Mr. Moul's Schedule 13, page 2. While giving some weight to the arithmetic mean is a mistake that I have seen other company cost of capital witnesses make, the use of the median for establishing historic returns is, to my knowledge, unique to Mr. Moul.

There are two very serious problems with Mr. Moul's risk premium method. One is a problem with his financial theory, and the other is a mathematical mistake. The problem with his financial theory is that he incorrectly assumes that the risk premium between debt and equity are constant, when they are not. As I have shown earlier in this testimony, empirical evidence, financial theory, and financial articles all show that the risk premium as measured against interest rates has been anything but constant. It is risk premiums measured against the inflation rate, not interest rates, which have shown to be reasonably constant.

I will discuss Mr. Moul's mathematical mistakes below.

**Q. PLEASE EXPLAIN THE MATHEMATICAL MISTAKES MADE BY MR. MOUL.**

A. Mr. Moul made mathematical errors when he quantified the historic earned returns actually achieved by both common stocks and by bonds. As will be explained in detail later in this testimony, textbooks, the U.S. Securities and Exchange Commission ("SEC"), and Value Line have all recognized that the only proper way to measure long-term historic actual earned returns is to use the geometric mean. In contrast, Mr. Moul used the arithmetic mean. The arithmetic mean is specifically identified by several sources as a method that will specifically result in an answer that is upwardly biased.

In addition to using the "known-to-be-biased" arithmetic mean, Mr. Moul also presented a risk premium study based upon a comparison of median returns. I have never seen anyone attempt to measure the historic actual risk premium by using median values other than Mr. Moul. The use of the median overstates the risk premium merely because there is a different distribution of the returns on bonds than the returns on stocks. The distribution happens to vary such that there is a larger difference between the median and the geometric mean return on bonds than there is on common stocks. The actual return achieved by real investors is not based upon a median return, but is based upon the actual aggregate return. Therefore, Mr. Moul is wrong to have even considered using the median analysis in a risk premium context.

**Q. IS THERE A MATHEMATICAL RELATIONSHIP BETWEEN THE GEOMETRIC AVERAGE AND THE ARITHMETIC AVERAGE?**

A. Yes. Page 24 of the third edition of *Stocks for the Long Run* by Professor Jeremy J. Siegel © 2002 contains the following:

> The geometric return is approximately equal to the arithmetic return minus one-half of the variance $\sigma^2$ of yearly returns $r_G = r_A - 1/2\ \sigma^2$ .
>
> Investors can be expected to realize geometric returns only over long periods of time. The average geometric return is always less than the average arithmetic return except when all yearly returns are exactly equal. This difference is related to the volatility of yearly returns.

As correctly explained above, the only reason the arithmetic average is higher than the geometric average is because of the volatility of yearly returns. Therefore, from the perspective of the cost of equity to allow a regulated utility, the correct return is the geometric return. The geometric return, if allowed, will be the return the utility company is given a reasonable opportunity to earn. If there is a difference between the geometric return and the arithmetic return, for a regulated utility this difference will occur simply because a utility company's stock price will fluctuate up and down even though the allowed return on equity remains fixed at least until the next rate case.

**Q. HAVE YOU SEEN WITNESSES CLAIM THAT THE GEOMETRIC AVERAGE IS THE CORRECT AVERAGE TO USE WHEN MEASURING HISTORIC RETURNS, BUT THE ARITHMETIC AVERAGE IS SOMEHOW CORRECT FOR FORECASTING FUTURE RETURNS?**

A. Yes, I have seen this argument. But, given that the difference between the geometric return and the arithmetic return is due to volatility and not the true return actually being achieved, such an argument that claims a different measurement technique applies to historic data than to forecasted data is incorrect. Consider the following example. Assume that the U.S. Government issued a 30-year treasury bond 15 years ago that pays an annual interest rate of 5.0% on the face amount of the bond. Further assume that although interest rates fluctuated over the last 15 years, the current interest rate demanded by investors happens to be 5% today. Under these assumptions, over the last 15 years, the price of the bond has gone up in some years and gone down in other years. But, if the current interest rate demanded by investors on this bond is still the same 5% as was demanded by investors at the time of the original issuance, the bond will be selling for the same price as it did when originally issued 15 years ago. Because of this fluctuation, if the total return (price appreciation or price depreciation plus the 5% interest income) is measured using the arithmetic average, then the measured return will include the 5% real return actually obtained by investors plus an additional illusory return cause by volatility rather than an actual return received by the investor. From the perspective of the investor who is forecasting the return on this 5% government bond with 15 years remaining, we know with certainty that the accurate forecasted future return will be 5% per year. We also can be confident that interest rates will fluctuate over the next 15 years. Therefore, this fluctuation will cause the arithmetic return measurement to be higher than the 5% annual return even though the 5% return is the only possible return an investor who holds this bond to maturity could get.

**Q. IS IT THE 5% RETURN ON THE TREASURY BOND OR IS IT THE ARITHMETIC AVERAGE RETURN THAT IS ANALAGOUS TO THE ALLOWED RETURN ON EQUITY TO A REGULATED UTILITY COMPANY?**

A. The 5% coupon return is the return that is analogous to the allowed return. Therefore, even if we were to attempt to satisfy the investor who was incorrectly led to believe that he or she would achieve the arithmetic average and not the geometric average, the return based upon the geometric average should form the return allowed. Then, an investor who wishes to be fooled into achieving a higher return than is achieved by the geometric average will continue to be under the misconception that he or he is earning more than the geometric average. This can happen because the stock price fluctuation will still produce annual returns that, under the arithmetic average method, will appear to be higher than the allowed geometric return.

Consider the problem that would develop if allowed returns were errantly set based upon the arithmetic average rather than the geometric average. If a utility company is allowed to earn a return on rate base equal to the arithmetic average, then the normal stock price fluctuations would cause the new arithmetic average measured result to continue to exceed the old allowed arithmetic average. A repetition of the error caused by using the arithmetic average, if repeated in the next rate case, would cause yet a further ratcheting up of the allowed return in each future rate case where this mistake to use the arithmetic average is repeated.

**Q. CAN YOU PROVIDE A MATHEMATICAL EXAMPLE THAT SHOWS WHY RISK PREMIUM BASED UPON HISTORIC ARITHMETIC RETURNS ARE IMPROPER?**

A. Yes. As previously stated, arithmetic average returns overstate the actual returns received by investors because arithmetic returns measure volatility, not actual returns earned by investors. The more variable historic growth rates have been, the more his method exaggerates actual growth rates. Arithmetic average returns ignore the impact of compound interest. For example, if a company were to have a stock price of $10.00 in the beginning of the first year of the measurement period and a $5.00 stock price at the end of the first year, an arithmetic average approach would conclude that the return earned by the investor would be a loss of 50% [($5-$10)/($10)]. If, in the second year, the stock price returned to $10.00, then the arithmetic average would compute a gain of 100% in the second year [($10-$5)/($5)]. The arithmetic average approach would naively average the 50% loss in the first year with the 100% gain in the second year to arrive at the conclusion that the total return received by the investor over this two year period would be 25% per year [(-50% +100%)/2 years]. In other words, the arithmetic average approach is so inaccurate that it would conclude the average annual return over this two year period was 25% per year even though the stock price started at $10.00 and ended at $10.00. The geometric average would not make such an error. It would only consider the compound annual return from the beginning $10.00 to the ending $10.00, and correctly determine that the annual average of the total returns was not 25%, but was zero.

In order to protect investors from misleading data, the SEC requires mutual funds to report historic returns by using the geometric average only. The arithmetic average is not permitted. The geometric average, or SEC method, has the compelling advantage of providing a true representation of the performance that would have actually been achieved by an investor who made an investment at the beginning of a period and re-invested dividends at market prices prevailing at the time the dividends were paid.

**Q. DOES THE FINANCIAL COMMUNITY COMPUTE HISTORIC ACTUAL ACHIEVED RETURNS BASED UPON ARITHMETIC MEANS OR GEOMETRIC MEANS?**

A. As shown earlier in this testimony, the financial community (as represented by articles from *The Wall Street Journal* and from *Business Week*) refers to geometric averages when evaluating historic returns. Additionally, an article on page 92 of the August 16, 1999 issue of *Fortune* magazine refers to the return that is equal to the geometric mean from Ibbotsion Associates as "...the oft-quoted calculation..." of historic actual returns on common stocks. The article does not even mention the number that is equal to the historic arithmetic return.

**Q. DO FINANCIAL TEXTBOOKS SUPPORT THE USE OF THE GEOMETRIC AVERAGE FOR COMPUTING HISTORIC ACTUAL RETURNS?**

A. Yes. For example, the textbook *Valuation. Measuring and Managing the Value of Companies*, by Copeland, Koller, and Murrin of McKinsey & Co. , John Wiley & Sons, 1994, in a description of how to use the Ibbotson Associates data states the following on pages 261-262:

> We use a geometric average of rates of return because arithmetic averages are biased by the measurement period. An arithmetic average estimates the rates of return by taking a simple average of the single period rates of return. Suppose you buy a share of a nondividend-paying stock for $50. After one year the stock is worth $100. After two years the stock falls to $50 once again. The first period return is 100 percent; the second period return is -50 percent. The arithmetic average return is 25 percent [(100 percent - 50 percent)/2]. The geometric average is zero. (The geometric average is the compound rate of return that equates the beginning and ending value.) **We believe that the geometric average represents a better estimate of investors' expected returns over long periods of time.** [Emphasis added]

Similarly, in another textbook discussion that specifically addresses the use of the Ibbotson data, *Financial Market Rates & Flows*, by James C. Van Horne, Prentice Hall, 1990, states the following on page 80:

> The geometric mean is a geometric average of annual returns, whereas the arithmetic mean is an arithmetic average. For cumulative wealth changes over long sweeps of time, the geometric mean is the appropriate measure.

The textbook *Investments* by Nancy L. Jacob and R. Richardson Pettit, Irwin, 1988, puts it well when it says:

> The existence of uncertainty as reflected in a distribution of possible values makes the **expected value**, or arithmetic average rate of return, a misleading and biased representation of the wealth increments which will be generated from multiperiod investment opportunities.

> The average *annual* rate of wealth accumulation over the investment period, termed the **average annual geometric rate of return**, correctly measures the average annual accumulation to wealth when multiple periods are involved.
> [Emphasis is contained in the original]

**Q. HAS VALUE LINE SAID ANYTHING REGARDING THE USE OF AN ARITHMETIC AVERAGE OR A GEOMETRIC AVERAGE?**

A. Yes. On May 9, 1997, Value Line issued a report entitled "The Differences in Averaging". This report was contained on pages 6844-6845 of the "Value Line Selection & Opinion" portion of its weekly mailings to subscribers. This report says that:

> (t)he arithmetic average has an upward bias, though it is the simplest to calculate. The geometric average does not have any bias, and thus is the best to use when compounding (over a number of years) is involved.

The Value Line report then goes on to provide examples that show why the arithmetic average overstates the achieved returns while the geometric average produces the correct result.

Ibbotson Associates has also said that it is the geometric average that is "... the correct average to compare with a bond yield..."[24]

Therefore, when Mr. Moul chose to give weight to the arithmetic average, he chose a method that both a financial textbook and Value Line have specifically noted to

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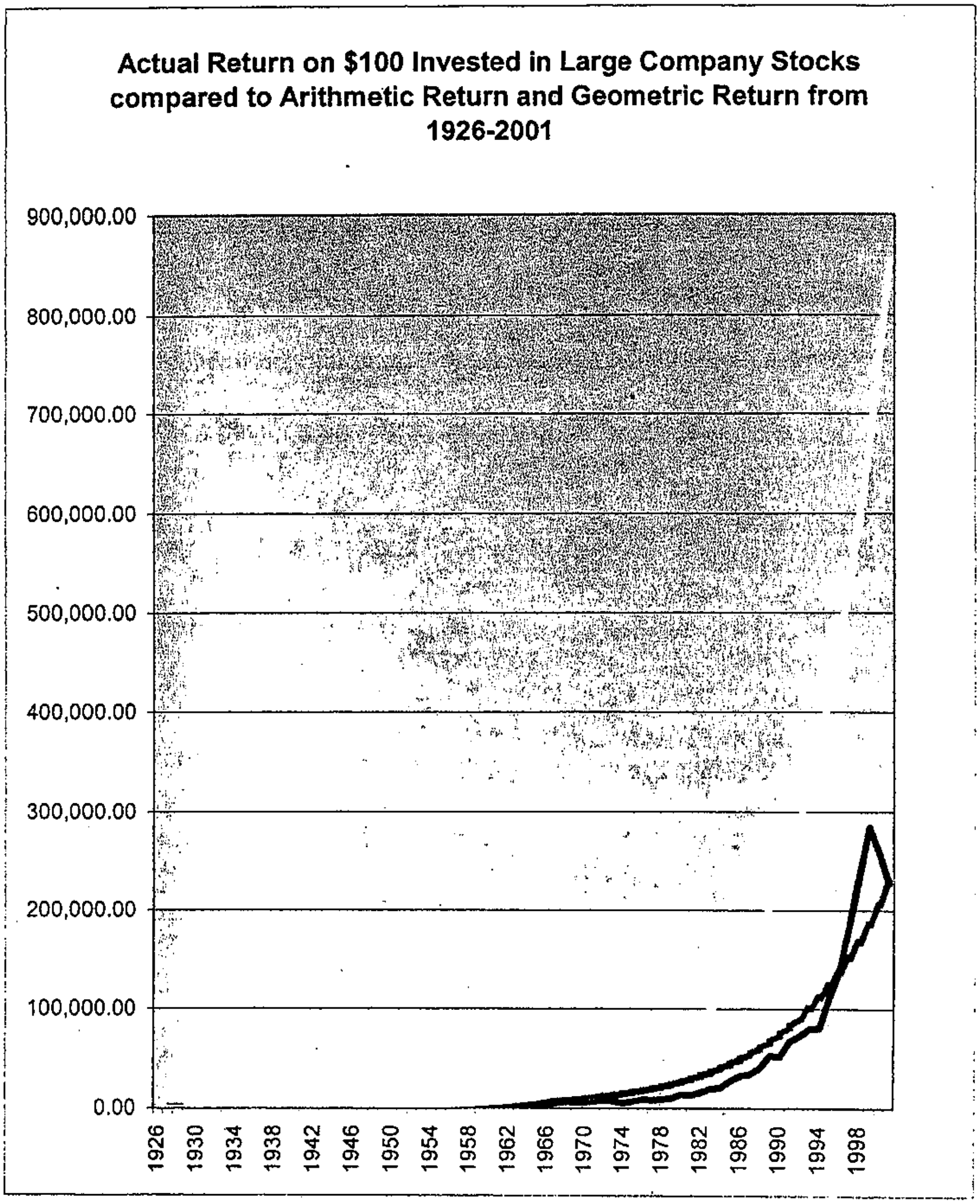
[24] Page 75 of Stocks, Bonds, Bills, and Inflation 1986 Yearbook.

be biased. The more weight that is given to the arithmetic average result, the larger the upward bias in the risk premium method.

**Q. HAVE YOU COMPARED GRAPHICALLY THE CAPITAL APPRECIATION GROWTH RATE USING THE ARITHMETIC AVERAGE METHOD WITH THE CAPITAL APPRECIATION GROWTH RATE THAT IS OBTAINED USING THE SEC METHOD?**

A. Yes. In the following graph I show the actual movement of the S&P Utility index from 1928 through 2001. I also show how the index would have behaved on a year-by-year basis using the average growth obtained from the SEC method and using the arithmetic average historic growth rate methodology. The graph illustrates that the arithmetic average calculation of historic actual returns deviates at an ever-increasing rate over time from the actual S&P Utility Index, overstating the total return from 1928-2001 by about 400%. By contrast, the historic actual returns computed using the SEC method is a dramatically more reasonable track of the growth of the S&P utility over time and thus is a better measure of historic actual return rates realized by investors.

1


Actual Return on $100 Invested in Large Company Stocks compared to Arithmetic Return and Geometric Return from 1926-2001
900,000.00
800,000.00
700,000.00
600,000.00
500,000.00
400,000.00
300,000.00
200,000.00
100,000.00
0.00
1926
1930
1934
1938
1942
1946
1950
1954
1958
1962
1966
1970
1974
1978
1982
1986
1990
1994
1998

In the above chart, the top line shows that if $100 had been invested in public utility common stocks in 1928 through 2001 and had earned the arithmetic return, the $100 would have grown to about $850,000. The line that starts as the lowest and spikes around 2000 shows what actually would have happened to a real $100 investment if it had been invested in public utility common stocks. As shown on the graph, the $100 investment would have actually grown to about $230,000. While the increase from $100 to $230,000 is a very sizeable return, it is far less than the $855,000 return that would have been achieved if the arithmetic return methodology had been achieved. The smooth line that ends at the same place as the actual return line is the ongoing value of $100 invested in 1928 that grew at the geometric return rate. Note that the $100 invested at the geometric return rate is, by 2001, exactly equal to the actual return. Therefore, the geometric return accurately measures the actual return that was achieved from 1928 through 2001, but the arithmetic average return exaggerates the actual return by over three times.

**Q. HOW MUCH HIGHER IS THE RISK PREMIUM DIFFERENCE BASED UPON AN ARITHMETIC AVERAGE THAN IT IS BASED UPON A GEOMETRIC AVERAGE?**

A. From 1928 to 2001, the arithmetic average method (to which Mr. Moul gives weight) produced an indicated risk premium that was about 1.90% higher for public utility stocks versus public utility bonds than the risk premium indicated by using the SEC, or geometric average method. The arithmetic median method produced a 1.87% higher risk premium than is indicated by using the SEC, or geometric average method.

**Q. HOW MUCH DOES THE USE OF THE ARITHMETIC AVERAGE INCREASE MR. MOUL'S RISK PREMIUM COST OF EQUITY CALCULATION?**

A. Mr. Moul recommends a common equity risk premium of 5.00%.[25] Mr. Moul calculated the geometric average of the S&P Public Utilities to be 3.28%.[26] Therefore, if Mr. Moul used the geometric average of 3.28% to calculate the risk premium instead of the 5.00% he recommends his cost of equity calculation using the risk premium method would decrease by 1.72% (5.00% - 3.28%).

**Q. HAVE RISK PREMIUMS BEEN STABLE OVER THE YEARS?**

A. No. This is yet another important problem with Mr. Moul's approach to the risk premium method. As I have previously stated, Federal Reserve Chairman Alan Greenspan has noted that risk premiums have declined over the last ten years. Mr. Moul has ignored this clear down trend in risk premiums and as a result he over estimates the cost of equity for SJG.

**D. CAPM Method.**

**Q. PLEASE BRIEFLY DESCRIBE THE CAPM METHOD.**

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[25] Page 39, lines 20-21 of Mr. Moul's direct testimony.

[26] Page 5, Appendix H of Mr. Moul's direct testimony.

A. As explained in greater detail in Appendix A, the risk premium/CAPM method estimates the cost of equity by analyzing the historic difference between the cost of equity and a related factor such as the rate of inflation or the cost of debt.

**Q. WHAT ARE THE PROBLEMS WITH MR. MOUL'S CAPM METHOD?**

A. Mr. Moul's implementation of the CAPM method in this case is similar to his risk premium method, except that he has added even more financial mistakes to his analysis. Much like his application of the risk premium method, Mr. Moul has erroneously used the arithmetic average and he has ignored the downtrend in risk premiums that I mentioned earlier in testimony. He further inflates the already over-stated risk premium he used in his "Risk Premium" method from 6.4% up to 9.67% by relying on Value Line's short-term forecast of stock price movement. Finally, Mr. Moul super-imposes yet one more serious error within his CAPM method by making an improper upward adjustment to the actual betas.

Mr. Moul recognizes that whatever risk premium is appropriate for industrials should be reduced because of the lower risk of gas utilities. He recognizes that the risk premium is proportionate to the risk difference between the group of industrial companies he examined and gas utilities. However, he understates the adjustment that should be made because he incorrectly defined the risk free investment to be a long-term treasury bond. Long-term treasury bonds are not risk free investments. Long-term treasury bonds can, and do, fluctuate substantially in price as long-term interest rates change. Therefore, long-term treasury bonds do not have the zero beta that would be consistent with a true risk free investment. The beta on 30-day treasury bills, however, is almost zero. In normal capital markets, the interest rate on 30-day treasury bills is considerably lower than the interest rate on intermediate term treasury bonds. However, an additional complication in trying to apply the CAPM method in the current environment exists because this is not a normal capital market. Short-term interest rates are high in relation to longer term bonds. In other words, the yield curve is more flat than usual. The spread between the return expected on a risk-free investment and on a common stock investment in the S&P industrials has a material impact on the cost of equity indicated from the CAPM model because this spread is used to quantify the cost of equity impact of the lower cost of equity for a gas distribution utility as compared to the average industrial company.

**Q. PLEASE EXPLAIN THE ERROR MR. MOUL MADE IN THE DETERMINATION OF THE BETA HE USED IN HIS CAPM METHOD.**

A. Beta is used in the CAPM method as the technique to compare the risk of a company or group of companies to the risk of a broad market-based group of companies such as the S&P 500 or the New York Stock Exchange index. The periodic stock price movements of the market index are correlated to the stock price movements of the individual company. The resulting correlation coefficient is called beta. A company whose stock price tends to move at the same rate as the overall market has a beta of 1.0. A company whose stock price moves less than the overall market has a beta of less than 1.0, and a company whose stock price moves more than the overall market has a beta greater than 1.0.

Rather than basing the risk adjustment portion of his CAPM computation on the actual computed beta's, Mr. Moul made an upward adjustment to the beta he has determined based upon the market-to-book ratio of a company. Since market-to-book ratios are above 1.0, the effect of this adjustment is to inflate the risk measurement. Since investors supply funds and buy and sell the stock at market value, not book value, this is an improper computation that does nothing but add yet another upward bias to the cost of equity computation presented by Mr. Moul.

**Q. HAVE YOU EVER SEEN ANY WITNESS PROPOSE AN UPWARD ADJUSTMENT TO THE BETA TO ALLOW FOR THE MARKET-TO-BOOK RATIO OF A COMPANY?**

A. No. While I have seen Mr. Moul propose this in the past, I have never seen any other witness propose this before. Furthermore, I am not aware of any financial textbook that proposes such an adjustment to beta.

**E. Comparable Earnings Method**

**Q. PLEASE BRIEFLY DESCRIBE THE COMPARABLE EARINGS METHOD.**

A. A method in which a group of companies are chosen that are allegedly in the same risk category as the subject company. The future expected return on book equity is estimated. This future expected return on equity is equated the cost of equity without any mechanism to determine weather or not this future expected return on equity is more than is needed to attract capital on reasonable terms.

**Q. PLEASE EXPLAIN THE COMPARABLE EARNINGS METHOD PRESENTED BY MR. MOUL.**

A. Mr. Moul selected a group of non-utility companies that he believes to be of comparable risk to SJG. After selecting the companies, he presents the historic and Value Line expected return on book equity. See Schedule 15, page 2 of Mr. Moul's testimony. The final column of numbers on this table is the "Projected 2006-08." However, what he labels as the projected 2006-08 return is actually the return on book equity that Value Line forecasts, not the return that Value Line projects investors will receive on their investment as a result of purchasing the common stock at current prices. According to Mr. Moul's schedule the total return expected by Value Line on the book equity of these industrial companies is between a negative return and a high of 58.0%, for an average of 15.6%, and a median of 13.5%.

**Q. IS THIS METHOD VALID?**

A. No. Mr. Moul has attempted to determine the cost of equity that would be demanded by investors on the market price of a company comparable to SJG by comparing it to the historic and projected returns on book equity of a selection of industrial companies. Leaving aside the problems with actually being able to select companies that are comparable, the overriding problem with Mr. Moul's comparable earnings analysis is that it did not address the cost of equity at all. It simply considered the returns on book equity that were achieved, and are expected to be achieved by Value Line in the next 3 to 5 years. **The earned return on book equity is an entirely different concept from the**

**cost of equity.** For example, one of the companies selected by Mr. Moul is WD-40 Company. According to the most recent Value Line report (October 10, 2003). WD-40 earned 27.8% on its common equity in its F/T 2003 and is expected to earn 23.0% on its book common equity in 2006-2008. However, the actual projected 3-5 year total return that Value Line forecasts for WD-40 is between 5% and 14%[27], for a mid-point expected total return of 9.5%. This is less than half of the 23% forecasted return on book equity that Mr. Moul confuses with a cost of equity.

**Q. HOW CAN VALUE LINE EXPECT AN ANNUAL RETURN ON INVESTMENT OF BETWEEN 5% AND 14% FOR WD-40 AT THE SAME TIME IT EXPECTS WD-40 TO EARN 23.0% ON ITS BOOK INVESTMENT?**

A. To see why there is such a large difference between the earned return on book and the return on the investment achievable by investors, it is first essential to recognize that investors who want to own a share of WD-40 must purchase the common stock of WD-40 at the market price, not at book value. In the October 10, 2003 issue of Value Line, Value Line shows that the market price of WD-40 was $32.06, but the book value was only $6.34. In other words, investors were so desirous of obtaining a piece of these extremely high earnings that the stock price was bid up to the point where it is trading in excess of 500% of book.

[27] Value Line Investment Survey, October 10, 2003, p. 958.

## F. Miscellaneous Inaccurate Statements in Mr. Moul's Direct Testimony

**Q. ON PAGE 16 OF HIS TESTIMONY, MR. MOUL DISCUSSES THE VARIABILITY OF EARNINGS AS MEASURED BY THE COEFFICIENT OF VARIATION. HE USES THIS AS AN INDICATOR OF RISK FOR SJG. PLEASE COMMENT.**

A. The coefficient of variation of earnings measures the individual volatility of a company, but does not measure risk as it impacts the cost of equity. The fact that the coefficient of variation is not an indicator of the risk that impacts the cost of equity is explained in a textbook chapter that has been relied upon by Mr. Moul in past cases. That textbook response (*Fundamentals of Financial Management*, by Eugene F. Brigham, Fifth Edition, 1989) states:

> Diversifiable risk is not important to rational, informed investors, because they will eliminate its effects by diversifying it away. The really meaningful risk is nondiversifiable risk – this risk is bad in the sense that it cannot be eliminated … (p. 104).

This textbook then goes on to show that overall risk (diversifiable and nondiversifiable risk) can be computed by using the coefficient of variation. But, when it comes time to determine the cost of equity, then the diversifiable risk needs to be eliminated. On page 125, the textbook states:

> Thus, since a stock's beta measures its contribution to the riskiness of a portfolio, beta is a theoretically correct measure of a stock's riskiness.

Furthermore, Mr. Moul does not properly compare the coefficient of variation of SJG to the coefficients of variation in his barometer group. The very nature of diversification means that as more companies are added to a portfolio, diversification effects are felt. The diversification has the effect of driving down the riskiness of the overall portfolio. Because of diversification effects, an investment in Mr. Moul's comparative group is less risky than a single investment in any one of the companies in his group. Instead, he compared the coefficient of variation of SJG to the aggregate data of his comparative group. It is likely that the coefficient of variation for most if not all of the individual companies in the barometer group is larger than the coefficient of variation for the entire group.

## G. Conclusion

**Q. PLEASE SUMMARIZE YOUR ANALYSIS OF MR. MOUL'S TESTIMONY.**

A. Mr. Moul recommends that the Company be allowed a return on equity of 12.0%. This is his recommendation even though the numbers behind his DCF analysis support a cost of equity 10.0%. To exaggerate his DCF indicated cost rate, Mr. Moul had to overstate the dividend yield by making inappropriate adjustments to the actual returns and by arbitrarily selecting a growth rate substantially higher than the one indicated by his own data. His Risk Premium method was developed based upon an improper mathematical approach to quantifying historic actual returns, an invalid assumption that what investors expect will be the earned return in the future is equal to the returns realized in the past. Mr. Moul did not consider basic changes in either federal income tax laws or federal reserve policies. His CAPM method is premised on an erroneous assumption that long term treasury bond investments are risk free and that Value Line's expectations for each stock is exactly consistent with what are expected in aggregate by investors. His Comparable Earnings method is not really an equity costing method at all as no consideration was given to investor's reactions to the earned returns on book equity.

## VII. CONCLUSION

**Q. PLEASE SUMMARIZE YOUR RECOMMENDATIONS IN THIS CASE.**

A. The overall cost of capital that should be allowed to SJG in this proceeding is 7.22%. This 7.22% overall cost of capital is based upon a cost of equity of 9.50% and a capital structure based upon the average capital structure for SJG for the year ending 2004. In computing this overall cost of capital, I used the company requested cost of debt of 6.78% for long-term debt, and the company requested cost of preferred stock of 8.03%. However, I recommend using the actual cost for short-term debt of 1.695% instead of the Company's requested cost rate of 2.90%. The 1.695% I chose is similar to what is generally being incurred as a cost for short-term debt in the current financial marketplace

I also conclude that Mr. Moul's cost of equity recommendation should be rejected. His DCF method is unreliable because the growth rate he used was subjectively selected from a wide array of largely irrelevant growth rate indicators and because he made improper upward adjustments to the dividend yield. His risk premium method overstates the cost of equity because he gave weight to the arithmetic average of historic returns and because he ignored the pronounced, widely recognized, downtrend in risk premiums that has occurred in recent decades. His CAPM approach not only repeats the errors Mr. Moul made in his risk premium method, but introduces an additional error by using a Value Line short-term forecast for stock price appreciation as an indicator of the "risk premium". Mr. Moul's "comparable earnings" method is not an equity costing method at all. It merely examines expected returns on book equity without any consideration of whether or not the expected returns are consistent with the return rate required by equity investors to be willing to buy common stock.

**Q. DOES THIS CONCLUDE YOUR TESTIMONY?**

A. Yes.

## APPENDIX A - IMPLEMENTATION OF BOTH THE DCF METHOD AND THE RISK PREMIUM/CAPM METHOD

### I. DCF METHOD

**Q. HOW IS THE DCF METHOD USUALLY IMPLEMENTED?**

A. The DCF method is usually implemented in utility rate proceedings using the constant growth version. It is applied by implementing the following formula:

cost of equity = dividend yield + future expected growth

Where growth refers to the future sustainable growth rate in dividends, earnings, book value and stock price.

**Q. IS THE DCF MODEL WIDELY USED IN UTILITY RATE PROCEEDINGS?**

A. Yes. The DCF model has been widely used for many years. From my experience, the constant growth form of the DCF model is more widely used than any other approach to determining the cost of equity.

**Q. IS THE DCF MODEL COMMONLY IMPLEMENTED IN A CONSISTENT MANNER?**

A. No. The DCF model is widely used and widely abused. Most implementations of the DCF model in utility rate proceedings start out with the same D/P +g, or dividend yield plus growth formula. Also, most generally agree that the growth rate "g" must be representative of the constant future growth rate anticipated by investors for dividends, earnings, book value, and stock price. However, all too often, this important principle is forgotten when it comes time to implement the constant growth DCF formula. Such carelessness causes substantial, unnecessary error when implementing the constant growth version of the DCF model.

**Q. WHY IS IT SO IMPORTANT FOR THE GROWTH RATE USED IN THE CONSTANT GROWTH VERSION OF THE DCF MODEL TO BE REPRESENTATIVE OF THE CONSTANT GROWTH RATE FOR DIVIDENDS, EARNINGS, BOOK VALUE AND STOCK PRICE?**

A. The derivation of the constant growth formula is based upon the principle that investors buy stock solely for the right to future cash flows obtained as a result of that ownership. The cash flows are obtained through dividend payments and/or stock price appreciation. The constant growth version of the DCF formula will accurately quantify investors' expectations only if investors expect the dividend yield (defined as dividend payment divided by stock price) and the growth in dividends to best be estimated at one constant growth rate for many years into the future. The dividend yield and growth rate that are used in the constant growth formula must be selected carefully. Consider what happens if the expected growth rates are not all equal:

1. DIFFERENT GROWTH RATE FOR EARNINGS AND FOR DIVIDENDS. Both dividends and the ability for a company to grow dividends in the future are directly derived from earnings. The dividend yield, or D/P, portion of the constant growth DCF formula quantifies the investor-derived value from the portion of earnings paid out as a dividend and the "g" portion of the constant growth DCF formula quantifies the value of the portion of earnings retained in the business. If dividends are quantified using the current dividend rate, but an earnings forecast is used to quantify "g" that is based upon a future environment in which earnings are expected to grow more rapidly than dividends, an ever-increasing portion of the total return expected by investors will be attributable to growth and a smaller portion will be attributable to dividends. Under these conditions, other things

being equal, the constant growth version of the DCF model would overstate the cost of equity because the decrease in the payout ratio that results from a more rapid earnings growth rate than dividend growth rate would shift a greater portion of the earnings from dividends to earnings growth. The result of this is that the higher future earnings growth rate would cause the portion of earnings available for dividends to be lower, and therefore the dividend yield would be lower. Conversely, if future earnings growth were expected to be less than dividend growth, the constant growth form of the DCF model would understate the cost of equity. Every time a dividend payment is scheduled, the board of directors of a company decides what portion of earnings to pay out as a dividend and what portion of earnings to re-invest, or "retain" in the business. It is this re-investment of earnings that causes sustainable growth. Both dividends and growth therefore compete for the same dollars of earnings. The higher the portion of earnings allocated to the payment of dividends, the smaller the amount of earnings left over for re-investment and therefore the lower the future growth rate. The relationship between the portion of earnings paid out as a dividend and the portion re-invested in the business is commonly referred to as either the dividend "payout" ratio (which is computed by dividing dividends by earnings), or the "retention rate" (which is computed by dividing the portion of earnings re-invested in the business by earnings). The sum of the payout ratio and the retention rate is 1.0, or 100% because 100% of earnings are either paid out as a dividend or retained in the business. The constant growth version of the DCF formula uses a specific dividend rate to compute the "D/P" term of its formula. This specific dividend rate has a specific earnings "retention rate" associated with it. This specific "retention rate" provides for one and only one percentage of earnings that remains to cause the growth that is quantified in the second term of the equation. This is because the portion of earnings paid out as a dividend and the portion not paid out as a dividend must remain equal to total earnings. Consider what happens if the dividend "payout ratio" or the earnings "retention" ratio are not constant. If they are not constant, the portion of earnings available for growth and the portion available for dividends will continue to shift over time, but under such conditions the constant growth formula produces an erroneous result because it is incapable of properly accounting for this change.

2. EARNINGS PER SHARE GROWTH RATE DIFFERENT FROM STOCK PRICE GROWTH RATE.

When earnings per share growth rates are measured over a relatively short time period such as the five-year consensus growth rates compiled by services such as Zacks and I/B/E/S, it is likely that investors expect materially different growth rates in earnings per share and stock price. This is because the earnings per share growth rate as reported in such services is simply the compound annual growth rate in the earnings per share from the most recently completed fiscal year to the earnings per share forecast for five years into the future. Presumably, an earnings per share forecast for five years into the future is sufficiently far off that analysts' forecasts for that time period must be based upon an expectation of normal conditions. Five years into the future is too far off to forecast abnormal economic conditions, abnormal weather conditions, or any abnormal operating problems that could impact earnings. However, the base year from which earnings are forecast is likely to contain some abnormalities that have an impact on earnings. To the extent this abnormality exists, the forecast of earnings per share growth from the base year to a period five years in the future will be equal to the sustainable growth rate plus or minus the impact of any abnormalities. Growth that is required to bring earnings up to or down to normally expected conditions is not sustainable growth and therefore it is not the kind of growth that would be mirrored in the stock price growth rate.

3. DIFFERENT GROWTH RATE FOR EARNINGS AND FOR BOOK VALUE. The return on book equity is computed by dividing earnings by book value. This is an important number for several reasons: a) for a regulated utility company, the allowed cost of equity is the return on book equity that a utility commission intends for a company to earn on the regulated portion of its business, and b) unregulated companies attempt to earn the highest risk adjusted returns on equity that are possible. If earnings per share grow more rapidly than book value per share, the return on equity increases. Conversely, if earnings per share grow more slowly than book value per share, the return on equity decreases. While increases and/or decreases in the earned return on equity can and do occur, it is not credible to forecast a sustained change in the return on equity for the many years into the future that are required in the constant-growth DCF model. A forecasted continuation of a decrease in the earned return on equity would eventually drive the earned return on equity to near zero – a condition that is not credible for a regulated business providing a needed service. Similarly, a forecasted continuation of an increase in the earned return on equity would eventually drive the earned return on equity to an extremely high number – a condition that would not form the basis for a credible growth rate forecast for a regulated business because of the regulatory constraints on the authorized return. Similarly, an earnings per share growth rate higher than the book value per share growth rate is not credible for a competitive business because, as returns would go higher and higher, more and more competitors would be attracted. If a growth rate based upon an earning per share forecast higher than the forecast book value per share growth rate were used in a constant-growth form of the DCF model, then the constant-growth version of the DCF model would contain an upward bias. Conversely, if an earnings per share forecast that is lower than the book value per

share growth rate, then the constant-growth form of the DCF model would contain a downward bias.

**Q. ARE FIVE-YEAR EARNINGS PER SHARE FORECASTS OF THE TYPE AVAILABLE FROM SOURCES SUCH AS ZACKS, I/B/E/S, AND VALUE LINE SUITABLE AS A PROXY FOR LONG-TERM SUSTAINABLE GROWTH IN THE CONSTANT-GROWTH FORM OF THE DCF MODEL?**

A. No. For the above reasons, it is improper to directly use a five-year earnings per share forecast as a proxy for long-term sustainable growth in the constant-growth DCF model. No attempt is made for these earnings per share forecasts to be representative of the anticipated growth rate in dividends per share, book value per share, or stock price. Therefore, these sources can be used to develop a sustainable growth rate in the context of a constant-growth DCF model, but if used directly as a proxy for long-term growth they are no more accurate than it would be to forecast the height of a human at age 60 based upon a reasonable forecast of annual growth for the five years starting at age 12. These earnings per share forecasts are generally different from the anticipated growth in dividends, book value, and stock price because they include the often substantial impact of bringing earnings up or down to a normal earned return on equity from whatever return on equity was achieved in the most recently completed fiscal year. Additionally, such analysts' growth rates tend to be overstated because of the well-documented propensity for analysts to be optimistic.[28] The combined effect of the habitual optimism and the

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[28] While there are many sources that have shown this optimism to exist, one noteworthy source is a statement by Arthur Levitt, former chairman of the U.S. Securities and Exchange Commission. The following appeared on page 4 of the 5/31/99 issue of Barrons:
ARTHUR LEVITT MAY BE THE best chairman of the SEC since Joe Kennedy. And no accident, really: Like Kennedy, Levitt spent enough time in the Street to develop a fine nose for good stocks and bad people.
Back in April, Levitt delivered some cogent remarks on analysts (in the sacred order of being, they're somewhat lower than angels) and their innate bullishness (solely the product of their sunny natures).
As he observed, sell recommendations make up 1.4% of all analysts' recommendations, while buys represent 68%.

required movement over a relatively short five-year time period to bring earnings per share up to the optimistic levels causes five-year analysts' growth rates to commonly overstate the future sustainable growth rate. As noted earlier, an October 4, 2001 report issued by Credit Suisse First Boston noted that analysts' estimates "... have on average been 6% too optimistic 12 months prior to a reporting date."[29] As a result, DCF approaches that rely upon the direct use of analysts' five-year growth rates repeatedly overstate the cost of equity.

**Q. HOW IS IT POSSIBLE TO ENSURE THAT THE GROWTH RATE USED IN THE CONSTANT-GROWTH VERSION OF THE DCF MODEL WILL RESULT IN A CONSTANT GROWTH RATE INDICATOR FOR DIVIDENDS, EARNINGS, BOOK VALUE, AND STOCK PRICE?**

A. The most straight-forward and most accurate way to make this computation is to use the formula "b x r + sv" formula, where b= the earnings retention rate, r=the future expected return on book equity, and sv is a factor that accounts for sustainable growth caused by the sale of new shares of common stock. The mathematics in support of the derivation of the DCF model show that the "b x r + sv" formula should be used to quantify sustainable growth. Common mistakes with this formula include using historic values of "b x r" and/or of "sv" rather than future expected values, and most importantly by failing to realize that in order for the formula to be applied properly, the retention rate value, "b" must be determined in a manner that is consistent with the other values input into the DCF model. This is a critical step necessary to ensure that the portion of the future

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By way of explanation for this strange imbalance, he offers the possibility of a "direct correlation between the content of an analyst's recommendation and the amount of business his firm does with the issuer."
Analysts, he grouses are too eager to see every frog of a stock as a prince. What the world needs, he laments, are analysts who call a frog a frog.

29 *Weekly Insights*, "Global Strategy Perspectives", October 4, 2001, page 58.

expected earnings that has been allocated to dividends is consistent with the future expected earnings level that is used to compute growth. This is the way to be sure that the retention rate used to compute the dividend yield portion of the constant-growth portion of the DCF model is the same as the retention rate used to compute growth. If the two are not equal, then the total amount of future expected earnings allocated in aggregate to dividends and to growth will be something other than 100% of earnings. An approach that accounts for something other than 100% of earnings in the cost of equity computation will result in an invalid result.

The way to ensure the consistency necessary for a valid result from the implementation of the constant-growth form of the DCF model is to compute the retention rate "b" based upon the inputs used for the dividend rate "D" and the future expected return on equity, "r". This computation is straight-forward. By definition the retention rate "b" is equal to the portion of dividends not paid out as a dividend divided by earnings. The earnings consistent with the value used for "D" is computed by multiplying book value as of the time of the determination of "D" by the value of "r". The result is the future expected rate of earnings that is consistent with the value used for "D". By subtracting "D" from the future expected earnings consistent with the value used for "r" and dividing that amount by the earnings consistent with the value chosen for "r" results in a retention rate that contains the necessary consistency. If any other value for "b" is used, such as a forecasted value for "b" in some future time period, then the result from the constant-growth DCF computation would be invalid.

**Q. HOW DID YOU APPLY THE DCF MODEL IN THIS CASE?**

A. I applied the DCF method two different ways. One way is a single-stage, or constant growth DCF model in which I added a growth rate that was carefully constructed to meet the rigorous requirements of the constant growth formula. The second DCF analysis is a multi-stage method. Both approaches to the DCF method are dependent upon an estimate of what common equity investors expect for future cash flow. Any company creates a future cash flow for its equity investors by investing funds in assets that are needed by its business. The future cash flow rate is therefore dependent upon the rate at which the funds invested by the equity investors is able to earn. The rate at which they are able to earn is referred to as the return on book equity.

**Q. HOW DID YOU DETERMINE THE FUTURE RETURN ON BOOK EQUITY ANTICIPATED BY INVESTORS?**

A. I examined both the historic actual returns earned on average by the comparative groups of electric companies, the future return on equity forecast by Value Line, and the return on equity required to achieve the consensus growth rate compiled by Zacks.

**Q. YOU SAID THAT ANALYSTS' ESTIMATES ARE WELL KNOWN TO HAVE A TENDENCY TO BE HIGH. PLEASE PROVIDE YOUR BASIS FOR THAT CONCLUSION.**

A. In addition to the statements from former Securities Exchange Commission chairman Arthur Levitt, and the statements in a recent report from Credit Suisse First Boston that I have referenced earlier in this testimony, other noteworthy sources include an article that appeared on the first page of the September 3, 2001 issue of the *Financial Times*. The following article, entitled "HSBC shakes up research" begins by saying:

> HSBC is radically restructuring its investment research in a sign that banks are responding to criticism of the quality of equity analysis.
>
> The bank's analysts will be required to publish as many "sell" recommendations on stocks as "buys" and HSBC will invest its own money in its best research ideas. The move is in response to criticism that investment banks' analysts are too positive about companies in the hope of generating lucrative corporate finance work.

> Criticism has been particularly strong in the US, where many banks continued to talk up technology shares at the peak of the market. The banks are facing a wave of litigation from investors who lost money by following analysts' recommendations. Merrill Lynch recently paid $400,000 to a client to drop an action against Henry Blodget, its star internet analyst.
>
> Banks have also been attacked by US regulators and politicians.

An article appeared in the November 18, 2001 edition of the *New York Times*, on the first page of the Sunday business section 3. This article, entitled "Telecom's Pied Piper: Whose Side Was He On?" is an article about Salomon Smith Barney telecommunications analyst Jack Benjamin Grubman, "... one of Wall Street's highest-paid analysts...". The article then says:

> Anyone can make mistakes, but Dr. Grubman's cheerleading epitomizes the conflict-of-interest questions that have dogged Wall Street for two years: Even as he rallied clients of Salomon Smith Barney, a unit of **Citigroup**, to buy shares of untested telecommunications companies and to hold on to the shares as they lost almost all of their value, he was aggressively helping his firm win lucrative stock and bond deals from these same companies.
>
> Since 1997, Salomon has taken in more investment banking fees from telecom companies than any other firm on the Street. Because of Dr. Grubman's power and prominence, and because his compensation is based in part on fees the company generated with his help, a part of those fees went to him.

The demise of Enron has served to substantially reinforce investors' mistrust of analysts. Consider the impact on investors when they read the article entitled "The Analyst Who Warned About Enron" that appeared on pages C1 and C17 of the 1/29/02 edition of the *Wall Street Journal*. The article explains that "Financial Analysts who tracked Enron Corp. have taken a pounding for being company 'shills' and for failing to concede they didn't fully understand the Houston energy-trading concern's complex finances." Then, the article explains one exception was bond analyst Daniel Scotto who told clients back in August that Enron securities "should be sold at all costs and sold now" Instead of his accurate recommendation resulting in him getting a promotion, it resulted in his being fired. As the article explains:

> Dr. Scotto's experience highlights one of the oldest pressure points on Wall Street involving financial analysts, who traditionally act as a filter between investors and the financial markets. During the past decade, Wall Street securities firms increasingly have pushed their research analysts to actively trumpet stocks and bonds, not impartially analyze them.
>
> The side benefits to the securities firms can be enormous: If an analyst touts a company's securities, the securities firm stands a greater chance at becoming an adviser to that company, and garnering the fees that will follow. Nowadays, analysts can be stars, receiving bonuses of several hundred thousand dollars for helping their firm to win big underwriting deals. Bash the securities of a corporate client, though, and the securities firm could be shut out of lucrative deals. Enron issued billions of dollars worth of securities in recent years, generating huge fees for its financial advisers and bankers.

Because of articles like these, others that have appeared over the years, and knowledge gained from personal experience, knowledgeable investors know that analysts' forecasts have a strong tendency to be overly optimistic.

## A. Implementation of Single-stage DCF

**Q. HOW DID YOU IMPLEMENT THE SINGLE-STAGE OR CONSTANT GROWTH DCF IN THIS CASE?**

A. I started by taking the current quarterly dividend rate for each company examined[30] and multiplying it by 4 to arrive at the current annual rate. This number was then converted to a dividend yield by dividing it by the stock price of each company. The stock price used was determined two different ways. One way was to take the actual stock price as of December 31, 2003. The second way was to take the average of the high and low stock price for the year ended December 31, 2003. Then, the dividend yield was increased by adding one-half the future expected growth rate. This upward adjustment to the dividend yield is necessary because the DCF formula specifies that the dividend yield to be used is equal to the dividends expected to be paid over the next year divided by the market price. After this adjustment to increase the dividend yield, the yield is equal to an estimate of dividends over the next year. To each dividend yield result, I added one-half the future expected growth rate. After the adjustment, the yield is equal to an estimate of dividends over the next year.[31]

**Q. HOW DID YOU OBTAIN THE GROWTH RATES YOU USED IN THE CONSTANT GROWTH, OR k= D/P + G, VERSION OF THE DCF METHOD?**

A. I derived the growth rates from the internal, or retention growth rate, or "b x r" method where "b" represents the future expected retention rate and "r" represents the future expected earned return on book equity. In addition to the "b x r" growth caused by the retention of earnings, I added an amount to recognize that growth is also caused by the sale of new common stock in excess of book value. *A critical requirement in the implementation of the simplified version of the DCF model is that the estimate of the future expected growth rate be a growth rate that is expected to be sustained, on average,*

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[30] The group of companies were selected by the company witness.

[31] The complex version does not directly use dividend yields. Instead, it determines the present value of each dividend payment as a discounted cash flow.

*for many years into the future.* Stock analysts and textbooks recognize that generally the most accurate way to estimate the sustainable growth rate in a constant growth DCF method is to use what is usually referred to as the retention growth, or "b x r" method. In this approach, the future expected retention rate "b" is multiplied by the future expected return on book equity "r" in order to obtain a sustainable growth rate. Other methods to estimate future sustainable growth are sometimes used. However, those methods are generally more subjective, and even if used with extreme care, do not have the same potential for accuracy that a properly applied "b x r" estimate has. The reason for this is, in order to produce a meaningful result, those methods must be adjusted to eliminate factors which would otherwise cause them to include non-recurring influences on growth and/or growth rates that are not equally representative of the future average expected growth in earnings, dividends, book value, and stock price.

The "b x r" method is best implemented by multiplying the *future expected* return on book equity by the retention rate that is consistent with both the future expected return on book equity and the dividend rate used to compute the dividend yield. Also, future sustainable growth should include an increment of growth to allow for the impact of sales of new common stock above book value.

The "b x r" growth rate computation, unless adjusted, does not account for sustainable growth that is caused by the purchase or sale of common stock above book value. Therefore, I modified the "b x r" growth rate to account for this additional growth factor. This additional growth factor, which is a standard part of the DCF computation, is sometimes referred to as the "SV" growth.

An accurate estimate for the future sustainable value of "r" (return on equity) when multiplied by a value for "b" (retention rate) that is consistent with the selection of the dividend rate and the expected return on book equity, produces a growth rate that is constant and sustainable.

**Q. DO STOCK ANALYSTS USE THE "b x r" METHOD?**

A. Yes. In the textbook, Investments, by Bodie, Kane and Marcus (Irwin, 1989) at page 478, expected growth rate of dividends is described as follows:

> How do stock analysts derive forecasts of *g*, the expected growth rate of dividends? Usually, they first assume a constant dividend payout ratio (that is, ratio of dividends to earnings), which implies that dividends will grow at the same rate as earnings. Then they try to relate the expected growth rate of earnings to the expected profitability of the firm's *future* investment opportunities.
>
> The exact relationship is
>
> $$g = b \times ROE$$
>
> where *b* is the proportion of the firm's earnings that is reinvested in the business, called the **plowback ratio** or the **earnings retention ratio,** and ROE is the rate of return (return on equity) on new investments. If all of the variables are specified correctly, [the] equation . . . is true by definition, . . .

**Q. HOW DID YOU COMPUTE "g"?**

A. As previously stated, I used the "b x ROE" method specified in the above textbook quote, although I refer to it in this testimony as the "b x r" method. In the above equation, ROE has the same meaning as "r". I recognized that investors have both historical and forecasted information available to determine the future return on book equity expected by investors. Forecasted data includes not only specific data for a company being evaluated, but also includes overall industry forecasted data. In addition to "b x r" growth, I included a factor to allow for growth caused by the sale of new common stock at a price other than book value.

I have reflected the impact on growth caused by the sale or repurchase of common stock in my recommended growth rate.

**Q. THERE ARE COST OF CAPITAL WITNESSES WHO CLAIM THAT THE "b x r" METHOD IS SOMEHOW CIRCULAR. THIS IS BECAUSE THE FUTURE EARNED RETURN ON BOOK EQUITY THAT YOU USE TO QUANTIFY GROWTH IS USED TO DETERMINE THE COST OF EQUITY, AND THE COST OF EQUITY IS THEN USED TO DETERMINE THE FUTURE RETURN ON EQUITY THAT WILL BE EARNED. IS THIS CIRCULAR?**

A. No. Those who erroneously claim that the method is circular confuse the definition of "r" and the definition of "k". While "r" is defined as the future return on **book** equity anticipated by investors, "k" is the cost of equity, or the return investors expect on the **market price** investment. Since the market price is determined based upon what investors are willing to pay for a stock, and the book value is based upon the net stockholders' investment in the company, "r" usually has a different value than "k". In fact, the proper application of the DCF method relates a specific stock market price to a specific expectation of future cash flows that is created by future earned return ("r") levels. For example, assume investors are willing to pay $10 a share for a company when the expectations are that the company will be able to earn 12% on its book equity in the future. If events would cause investors to re-evaluate the 12% return expectation, the stock price should be expected to change. If investors' expectations of the future return on book equity change from 12% to 10%, and there is no corresponding change in the cost of equity, the stock price would decline. The cost of equity, however, would not decline simply because an event might occur that would cause investors to lower their estimate for "r". The cost of equity is equal to the sum of both the dividend yield and growth. Investors' estimate of "r" influences the investors' estimate for growth. Changes in growth expectations cause investors to change the price they are willing to pay for stock. A change in the stock price can cause a change in the dividend yield that offsets the change in expected growth. In this way, a higher dividend yield would offset by the lower expected growth rate and leave the cost of equity, "k", unchanged.

**B. Determination of the Future Return on Equity "r"**

**Q. HOW DID YOU DETERMINE THE VALUE OF "r" THAT YOU USED IN YOUR RETAINED EARNINGS GROWTH COMPUTATIONS?**

A. My estimate for "r" for the comparative group of gas companies covered by value line is 11.00%. The value of "r" used for companies chosen by the company witness was also 11.00%. The value of "r" that is required in the DCF formula is the one that is sustainable into the future for much longer than 5 years.

**C. Determination of Retention Rate, "b"**

**Q. HOW HAVE YOU DETERMINED THE VALUE OF THE FUTURE EXPECTED RETENTION RATE "b" THAT YOU USED IN YOUR SIMPLIFIED DCF ANALYSIS?**

A. I have recognized that the retention rate, "b", is merely the residual of the dividend rate, "D", and the future expected return on book equity, "r." Since, by definition, "b" is the fraction of earnings not paid out as a dividend, the only correct value to use for "b" is the one that is consistent with the quantification of the other variables when implementing the DCF method. The formula to determine "b" is:

b= 1- (D/E), where

b = retention rate

D = Dividend rate

E = Earnings rate

However, "E" is equal to "r" times the book value per share. Book value per share is a known amount, as is "E", consistent with the future expected value for "r", and the "D" used to compute dividend yield. Therefore, to maximize the accuracy of the DCF method, quantification of the value of "b" should be done in a manner that recognizes the interdependency between the value of "b" and the values for "r" and "D". I directly computed the value of "b" based upon the values of "D", and "r".

**Q. WHAT RETENTION RATES DID YOU USE IN THE SINGLE-STAGE DCF METHOD?**

A. Based upon the above formula, I used a retention rate of 36.26% to 38.81% based on the companies covered by Value Line and 35.36% to 37.63% based on the companies chosen by Mr. Moul. See JAR-4, pp.1, 2.

## D. Implementation of Multi-stage DCF

**Q. HOW DID YOU IMPLEMENT THE MULTI-STAGE DCF METHOD?**

A. The first stage of the model is based upon Value Line's estimates of dividends per share and earnings per share for 2003 through 2007[32] for the companies examined. Value Line does not show a specific earnings and dividend projection for every year from 2003 to

[32] The estimate for 2007 is shown by Value Line as its estimate from 2006-2008.

2007. Projections for years skipped by Value Line were made by extrapolation from the available data. When implementing this method, I mechanically used Value Line's projections for the period in which the projections were available.

I determined future earnings in the second stage of the non-constant DCF model by multiplying the future book value per share by the future expected earned return on book equity. For the purposes of this case, I used two future return on book equity estimates; a high end of range and a low end of range. Projected book value equals the beginning book value plus the current year's earnings minus the current year's dividends. Book value growth projections also include the effect of sales of new common stock. The projections in the second stage of the DCF model were made for 40 years into the future. Events longer than 40 years into the future have a minimal present value.[33] My projections have relied on a constant dividend payout ratio for the second stage[34].

I derived the estimated future stock price from the projected book value using the same market-to-book ratio at the time of sale as exists today. The only cash outflow is the price paid for the stock. The non-constant version of the model uses both the spot stock price and the average stock price over one year to be representative of the price paid.

The retention rate used in the second-stage was computed by projecting the continuation of dividend growth at the same percentage change as occurred between the next-to-the last and the last year of the first stage into the first year of the second stage.

[33] For example, a change in an assumption that the selling market-to-book would be 0.1 lower or higher than as of the time of purchase would introduce a potential inaccuracy in the indicated cost of equity of plus or minus about 25 basis points in a 30-year analysis, but a similar change in the market-to-book ratio expectation would introduce only plus or minus about 15 basis points in a 40 year analysis. If longer than 40 years were used, the result would be even less sensitive to the future market-to-book ratio expectation.

[34] As in the case of the future expected earned return on equity assumption, if there were evidence to support the use of varying payout ratios instead of a constant payout ratio, the same model could still be used to accurately quantify the cost of equity. Unlike the simplified DCF model, this model specifically accounts for the fact that a change in the payout ratio has an impact on the book value, and therefore has an impact on the earnings rate achieved in the future.

The resulting retention rate for this first year of the second stage was then determined by relating the resultant dividend rate to the earnings per share projected for the first year of the second stage. For years subsequent to the first year of the second stage, the retention rate was held constant at the second stage first-year amount.

The results for the complex, or multi-stage DCF are shown on JAR-5, pp. 1, 2.

**Q. WHAT COST OF EQUITY IS INDICATED BY THE IMPLEMENTATION OF THE DCF METHOD IN THIS CASE?**

A. As shown on Schedule JAR-2, the cost of equity indicated by the DCF method was estimated to be between 9.13% and 9.97%, depending upon the group of companies and the time period examined.

## II. RISK PREMIUM/CAPM METHOD

**Q. PLEASE EXPLAIN THE RISK PREMIUM/CAPM METHOD.**

A. As explained earlier in my testimony, the risk premium/CAPM method estimates the cost of equity by analyzing the historic difference between the cost of equity and a related factor such as the rate of inflation or the cost of debt.

One critically important fact to understand when implementing the risk premium method is that risk premiums have declined in recent years. As mentioned earlier in this testimony, Federal Reserve Chairman Alan Greenspan made a speech on October 14, 1999 entitled "Measuring Financial Risk in the Twenty-first Century". The text of the speech is available at http://www.bog.frb.fed.us/boarddocs/speeches/1999/19991014.htm. In the speech, Chairman Greenspan says:

> That equity risk premiums have generally declined during the past decade is not in dispute. What is at issue is how much of the decline reflects new, irreversible technologies, and what part is a consequence of a prolonged business expansion without a significant period of adjustment. The business expansion is, of course, reversible, whereas technological advancements presumably are not.

**Q. IS CHAIRMAN GREENSPAN'S VIEW OF THE REDUCTION IN RISK PREMIUMS CONSISTENT WITH WHAT INVESTORS NOW GENERALLY EXPECT?**

A. Yes. One good source to confirm that the financial community shares Chairman Greenspan's conclusion is an article that appeared in the April 5, 1999 issue of *Business Week*:

> The risk premium is the difference between the risk-free interest rate, usually the return on U.S. Treasury bills, and the return on a diversified stock portfolio. Over more than

> 70 years, the return to stocks averaged 11.2%, and T-bills, just 3.8%. The difference between the two returns, 7.4%, is the risk premium. Economists explain this extra return as an investors' reward for taking on the greater risk of owning stocks. **Most market watchers believe that in recent years, the premium has fallen to somewhere between 3% and 4% because of lower inflation and a long business upswing that makes corporate earnings less variable.**
> [Emphasis added.]

On October 4, 2001, the previously referenced report from Credit Suisse First Boston concluded that the equity risk premium over treasury bonds is 3.7%, and the equity risk premium over Baa rated corporate bonds is now 1.9%.[35]

**A. Inflation Risk Premium Method.**

**Q. HOW HAVE YOU APPLIED THE INFLATION PREMIUM METHOD?**

A. I implemented the inflation premium method by adding investors' current expectation for inflation to the long-term rate earned by common stocks net of inflation. This result was modified, based upon beta, to obtain a result that was compatible with the risk of the average electric distribution utility.

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[35] Weekly Insights, "Global Strategy Perspectives", October 4, 2001, Credit Suisse First Boston, pages 55 and 61.

**Q. WHAT IS THE BASIS FOR THE INFLATION PREMIUM METHOD?**

A. A book entitled *Stocks for the Long Run*[36] examined the real returns achieved by common stocks from 1802 through 1997. The conclusion in the book is that equity returns in excess of the inflation rate have been very similar in all major sub-periods between 1802 and 1997, while the risk premium in between bonds and common stocks has been erratic. Page 11 of this book says:

> Despite extraordinary changes in the economic, social, and political environment over the past two centuries, stocks have yielded between 6.6 and 7.2 percent per year after inflation in all major subperiods.

The book then says on page 12:

> Note the extraordinary stability of the real return on stocks over all major subperiods: 7.0 percent per year from 1802-1870, 6.6 percent from 1871 through 1925, and 7.2 percent per year since 1926. Ever since World War II, during which all the inflation in the U.S. has experienced over the past two hundred years has occurred, the average real rate of return on stocks has been 7.5 percent per year. This is virtually identical to the previous 125 years, which saw no overall inflation. This remarkable stability of long-term real returns is a characteristic of mean reversion, a property of a variable to offset its short-term fluctuations so as to produce far more stable long-term returns.

Continuing on page 14, *Stocks for the Long Run* says:

> As stable as the long-term real returns have been for equities, the same cannot be said of fixed-income assets. Table 1-2 reports the nominal and real returns on both short-term and long-term bonds over the same time periods as in Table 1-1. The real returns on bills has dropped

36 *Stocks for the Long Run* by Jeremy J. Siegel, Professor at Wharton. McGraw Hill, 1998. According to the book cover, Professor Siegel was "… hailed by *Business Week* as the top business school professor in the country…"

> precipitously from 5.1 percent in the early part of the nineteenth century to a bare 0.6 percent since 1926, a return only slightly above inflation.
>
> The real return on long-term bonds has shown a similar pattern. Bond returns fell from a generous 4.8 percent in the first subperiod to 3.7 percent in the second, and then to only 2.0 percent in the third.

The book explains some of the reasons why bond returns have been especially unstable.

Page 16 says:

> The stock collapse of the early 1930's caused a whole generation of investors to shun equities and invest in government bonds and newly-insured bank deposits, driving their return downward. Furthermore, the increase in the financial assets of the middle class, whose behavior towards risk was far more conservative than that of the wealthy of the nineteenth century, likely played a role in depressing bond and bill returns.
>
> Moreover, during World War II and the early postwar years, interest rates were kept low by the stated bond support policy of the Federal Reserve. Bondholders had bought these bonds because of the widespread predictions of depression after the war. This support policy was abandoned in 1951 because low interest rates fostered inflation. But interest rate controls, particularly on deposits, lasted much longer.

The book then provides a conclusion on page 16 that:

> Whatever the reason for the decline in the return on fixed-income assets over the past century, it is almost certain that the real returns on bonds will be higher in the future than they have been over the last 70 years. As a result of the inflation shock of the 1970's, bondholders have incorporated a significant inflation premium in the coupon on long-term bonds.

**Q. IS IT POSSIBLE TO ACCURATELY QUANTIFY INVESTORS' CURRENT EXPECTATIONS FOR INFLATION?**

A. Yes. It has recently become possible to analytically determine investor's expectations for inflation. The U.S. government has issued inflation-indexed treasury bonds. The total return received by investors in these bonds is a fixed interest rate plus an increment to the principal based upon the actual rate of inflation that occurs over the life of the bond. These bonds pay a lower interest rate simply because investors know that in addition to the interest payments, they will receive the allowance for inflation as part of the increment to the principal. This is in contrast to conventional U.S. treasury bonds. The principal amount of a conventional bond does not change over the life of the bond. Therefore, whatever allowance for inflation investors believe they need can only be obtained through the interest payment. By comparing the interest rate on conventional U.S. treasury bonds with the interest rate on inflation-indexed U.S. treasury bonds, the future inflation rate anticipated by investors can be quantified.

**Q. WHAT IS THE CURRENT INFLATION EXPECTATION OF INVESTORS?**

A. As of November, 2003, the inflation expectation of investors was estimated to be about 3.00%. See JAR-9. This was obtained by observing that long-term inflation-indexed treasury securities were yielding 2.24%, while long-term non inflation-indexed treasury securities were yielding 5.07%. The difference between 5.07% and 2.24% is 2.83%. Adding this 3.00% inflation expectation to the 6.6% to 7.0% range produces an inflation risk premium indicated cost of equity of 9.60% to 10.00% for an equity investment of average risk.

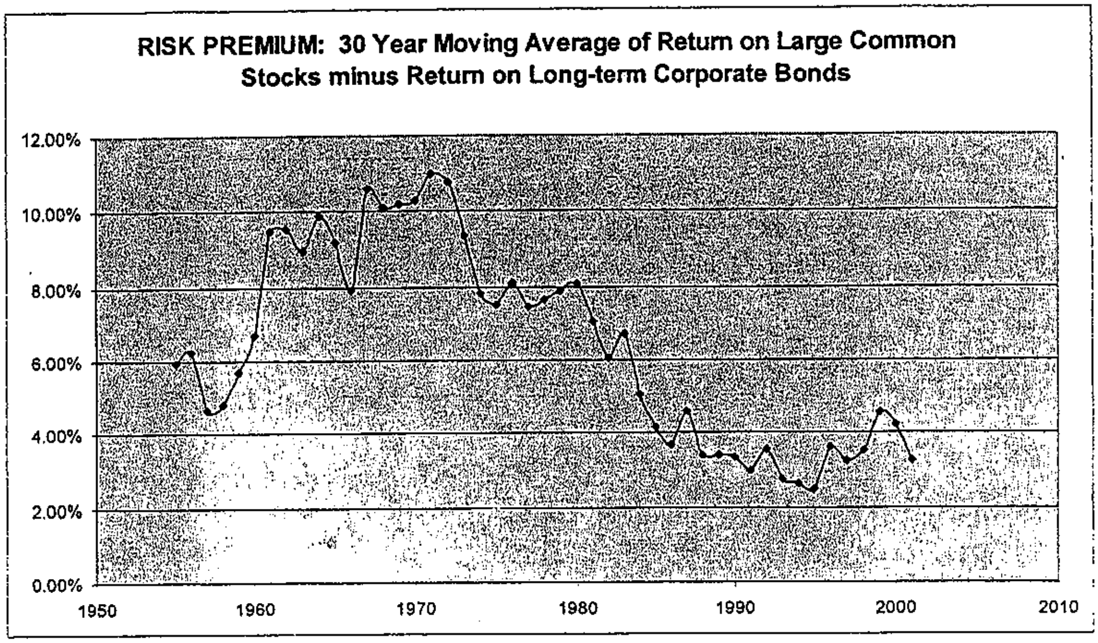
## B. Debt Risk Premium Method

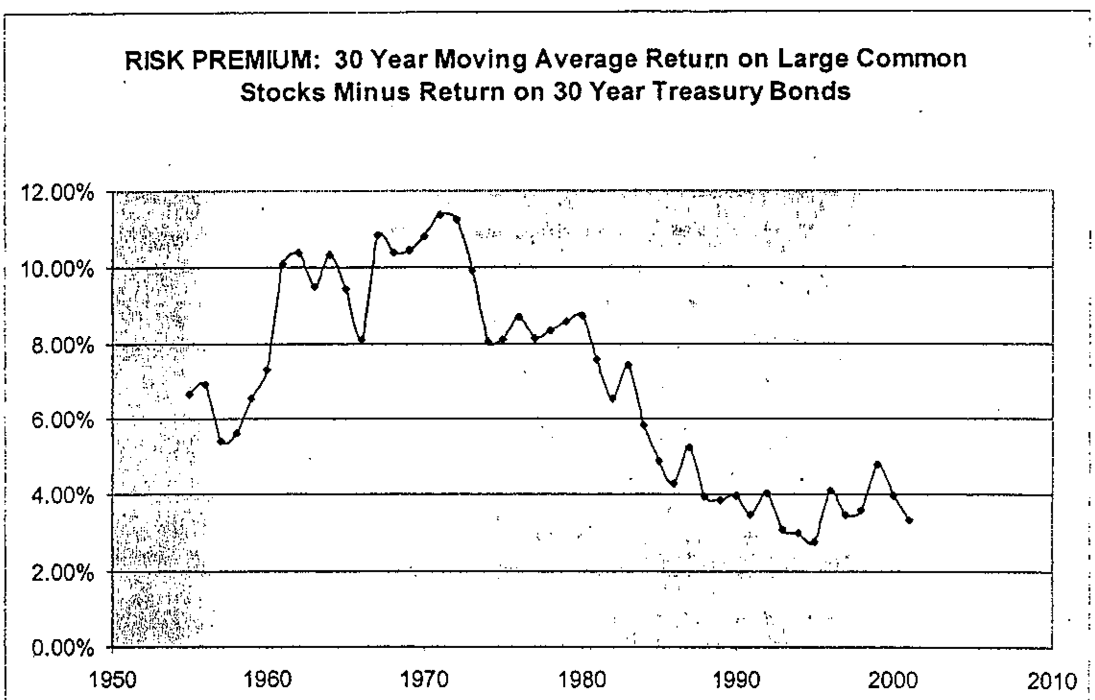
**Q. HOW DID YOU DETERMINE THE COST OF EQUITY USING THE DEBT RISK PREMIUM METHOD?**

A. As shown on JAR-10, pp. 1,2, I separately determined the proper risk premium applicable to long-term treasury bonds, long-term corporate bonds, intermediate-term treasury bonds and short-term treasury bills. In this way, the debt risk premium method I present considers a wide array of data points across the yield curve. In this way, the results are less impacted by a temporary imbalance that may exist in the debt maturity "yield curve".

**Q. EARLIER IN THIS SECTION OF YOUR TESTIMONY, YOU SHOWED THAT FEDERAL RESERVE CHAIRMAN GREENSPAN NOTED THAT THE FACT THAT EQUITY RISK PREMIUMS HAVE DECLINED "... IS NOT IN DISPUTE." YOU ALSO PROVIDED SOURCES FROM FINANCIAL LITERATURE CONCLUDING THAT THE RISK PREMIUM IS NOW LESS THAN 4%. DO YOU HAVE ANALYTICAL SUPPORT TO SHOW THAT THE STATEMENTS BY CHAIRMAN GREENSPAN AND FROM THE OTHER SOURCES YOU HAVE QUOTED ARE CORRECT?**

A. I examined the historic actual earned returns on common stocks and bonds from 1926 through 2000. But, rather than merely making one simplistic computation that examined the entire time period with only one return number over the entire period, I examined a 30-year moving average of the earned returns. 30 years is long enough to see if indeed there is a trend to the earned returns, but not so short as to be overly influenced by the natural volatility in earned returns that generally occurs over just a year or a few years. As shown in the following graphs, the decline in the risk premiums is persistent and undeniable.



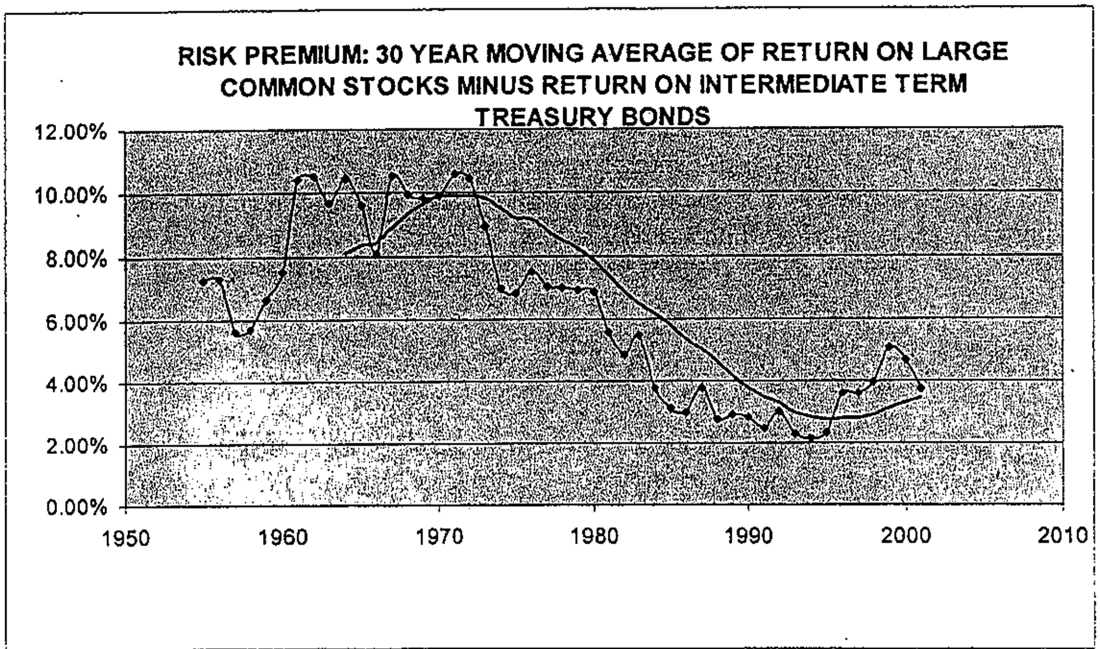




An examination of the above graphs confirms that a risk premium over 30 year treasuries in the 3 to 4% range is appropriate. For my equity cost computations, I used the conservatively high estimate of 4.0% as the risk premium appropriate to add to U.S.

treasuries when determining the cost of equity for an industrial company of average risk. For applying the appropriate risk premium to interest rates other than U.S. treasuries, I determined the average historic risk spread between long-term treasuries and the other interest rate categories I examined. See Schedule JAR-10, p. 2. This 4% risk premium was increased or decreased as warranted by the historic data when applied to each of the separate interest rate categories to which I applied the risk premium method.

**Q. WHY HAVE YOU CHOSEN 30 YEARS TO SHOW THE DOWNTREND IN THE RISK PREMIUM RATHER THAN A SHORTER TIME PERIOD SUCH AS 10 YEARS?**

A. Ten years is far too short a time period to be able to observe the actual risk premium based upon realized historic returns. The reason that realized returns over a short time are not helpful at quantifying the risk premium is as follows. If the equity risk premium declines, this means by definition that equity investors are willing to settle for a lower risk premium component of the total return they are demanding. If they are willing to settle for a lower return and if other things remain equal, this means that investors are willing to pay a higher stock price for the same future expected cash flow. What this means is that the initial reaction to a lowering of the equity risk premium is for the stock price to rise. A rise in the stock price results in a higher historic earned return at the same time the higher stock price means the investor would expect a lower future return. Unless enough years are used in the historic analysis to diminish the misleading impact of the initial response to a reduction in the risk premium, the historic earned returns will not be helpful. I am especially encouraged by the relative consistency of the trend in the lowering of the risk premium as shown in the 30-year data. This reinforces the likelihood that the risk premium has declined as Federal Reserve Chairman Greenspan and many others have observed.




**Q. ARE THERE REASONS WHY THE RISK PREMIUM HAS BEEN ON A MULTI-DECADE DECLINE?**

A. Yes. One important reason is a lowering of the U.S. capital gains income tax rate. Investors are concerned about the total after-tax return earned. The majority of the return earned by an investor on a long-term bond (and in many cases all of the return earned by a long-term bond investor) is the interest income. Interest income is fully taxed at regular income tax rates. This is in contrast to an investor in common stocks. An investor in the average large common stock has received the majority of their total return in the form of stock price, or capital appreciation. Capital appreciation is not taxed at all until the stock is sold. Then, it is taxed at the long-term capital gains rate if the stock has been owned long enough to be eligible for such treatment. Currently, long-term capital gains are subject to a federal income tax of no more than 20%. This is a considerably lower rate on long-term capital gains than prevailed in prior decades.

Another important reason why the risk premium demanded by common stock investors versus bond investors has declined is because enough years have now passed since the Great Depression that a greater proportion of investors are more comfortable owning common stocks than was the case when the memory of the Great Depression was forefront in the minds of most investors.

Yet another factor is the proliferation of mutual funds. While it is debatable whether the popularity of mutual funds is proof that the risk premium has declined (because more investors are comfortable investing in common stock) or is the reason that the risk premium declined (because mutual fund marketing has increased the availability of investment funds for equity), it is nevertheless a relevant factor.

**Q. WHAT COST OF EQUITY IS INDICATED BY THE IMPLEMENTATION OF THE RISK PREMIUM/CAPM METHOD IN THIS CASE?**

A. As shown on JAR-2, the cost of equity indicated by the risk premium/CAPM method is 9.23 %.

**Q. DOES THIS CONCLUDE YOUR TESTIMONY?**

Yes.

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# APPENDIX B - TESTIFYING EXPERIENCE OF JAMES A. ROTHSCHILD

## Testifying Experience of James A. Rothschild

**TESTIFYING EXPERIENCE OF JAMES A. ROTHSCHILD**
**THROUGH DECEMBER 1, 2003**

### ALABAMA

Continental Telephone of the South; Docket No. 17968, Rate of Return, January, 1981

### ARIZONA

Southwest Gas Corporation; Rate of Return, Docket No. U-1551-92-253, March, 1993
Sun City West Utilities; Accounting, January, 1985

### CONNECTICUT

Connecticut American Water Company; Docket No. 800614, Rate of Return, September, 1980
Connecticut American Water Company, Docket No. 95-12-15, Rate of Return, February, 1996
Connecticut Light & Power Company; Docket No. 85-10-22, Accounting and Rate of Return, February, 1986
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Connecticut Light & Power Company, Docket No. 97-05-12, Rate of Return, September, 1997
Connecticut Light & Power Company, Docket No. 98-01-02, Rate of Return, July, 1998
Connecticut Light & Power Company, Docket No. 99-02-05, Rate of Return, April, 1999
Connecticut Light & Power Company, Docket No. 99-03-36, Rate of Return, July, 1999
Connecticut Light & Power Company, Docket No. 98-10-08 RE 4, Financial Issues, September 2000
Connecticut Light & Power Company, Docket No. 00-05-01, Financial Issues, September, 2000
Connecticut Light & Power Company, Docket No. 01-07-02, Capital Structure, August, 2001
Connecticut Light & Power Company, Docket No. 03-07-02 , Rate of Return, October, 2003
Connecticut Natural Gas; Docket No. 780812, Accounting and Rate of Return, March, 1979
Connecticut Natural Gas; Docket No. 830101, Rate of Return, March, 1983
Connecticut Natural Gas; Docket No. 87-01-03, Rate of Return, March, 1987
Connecticut Natural Gas, Docket No. 95-02-07, Rate of Return, June, 1995
Connecticut Natural Gas, Docket No. 99-09-03, Rate of Return, January, 2000
Southern Connecticut Gas, Docket No. 97-12-21, Rate of Return, May, 1998
Southern Connecticut Gas, Docket No. 99-04-18, Rate of Return, September, 1999
United Illuminating Company; Docket No. 89-08-11:ES:BBM, Financial Integrity and Financial Projections, November, 1989.
United Illuminating Company; Docket No. 99-02-04, Rate of Return, April, 1999
United Illuminating Company, Docket No. 99-03-35, Rate of Return, July, 1999
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Artesian Water Company, Inc.; Rate of Return, December, 1986
Artesian Water Company, Inc.; Docket No. 87-3, Rate of Return, August, 1987
Diamond State Telephone Company; Docket No. 82-32, Rate of Return, November, 1982
Diamond State Telephone Company; Docket No. 83-12, Rate of Return, October, 1983
Wilmington Suburban Water Company; Rate of Return Report, September, 1986
Wilmington Suburban Water Company; Docket No. 86-25, Rate of Return, February, 1987

## FEDERAL ENERGY REGULATORY COMMISSION (FERC)

Koch Gateway Pipeline Company, Docket No. RP97-373-000 Cost of Capital, December, 1997
Maine Yankee Atomic Power Company, Docket No. EL93-22-000, Cost of Capital, July, 1993
New England Power Company; CWIP, February, 1984. Rate of return.

New England Power Company; Docket No.ER88-630-000 & Docket No. ER88-631-000, Rate of Return, April, 1989
New England Power Company; Docket Nos. ER89-582-000 and ER89-596-000, Rate of Return, January, 1990
New England Power Company: Docket Nos. ER91-565-000, ER91-566-000 , FASB 106, March, 1992. Rate of Return.
Philadelphia Electric Company - Conowingo; Docket No. EL-80-557/588, July, 1983. Rate of Return.
Ocean State Power Company, Ocean States II Power Company, Docket No. ER94-998-000 and ER94-999-000, Rate of Return, July, 1994.
Ocean State Power Company, Ocean States II Power Company, Docket No ER 95-533-001 and Docket No. ER-530-001, Rate of Return, June, 1995 and again in October, 1995.
Ocean State Power Company, Ocean State II Power Company, Docket No. ER96-1211-000 and ER96-1212-000, Rate of Return, March, 1996.
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Transco, Docket No. RP95-197-000, Phase I, August, 1995. Rate of Return.

Transco, Docket Nos. RP-97-71-000 and RP97-312-000, June, 1997, Rate of Return.

## FLORIDA

Alltel of Florida; Docket No. 850064-TL, Accounting, September, 1985
Florida Power & Light Company; Docket No. 810002-EU, Rate of Return, July, 1981
Florida Power & Light Company; Docket No. 82007-EU, Rate of Return, June, 1982
Florida Power & Light Company; Docket No. 830465-EI, Rate of Return and CWIP, March, 1984
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Florida Power Corporation; Docket No. 830470-EI, Rate Phase-In, June, 1984
Florida Power Corp.; Rate of Return, August, 1986
Florida Power Corp.; Docket No. 870220-EI, Rate of Return, October, 1987
Florida Power Corp; Docket No. 000824-EI, Rate of Return, January, 2002
GTE Florida, Inc.; Docket No. 890216-TL, Rate of Return, July, 1989

Gulf Power Company; Docket No. 810136-EU, Rate of Return, October, 1981
Gulf Power Company; Docket No. 840086-EI, Rate of Return, August, 1984
Gulf Power Company; Docket No. 881167-EI, Rate of Return, 1989
Gulf Power Company; Docket No. 891345-EI, Rate of Return, 1990
Gulf Power Company; Docket No.010949-EI, Rate of Return, December 2001
Rolling Oaks Utilities, Inc.; Docket No. 850941-WS, Accounting, October, 1986
Southern Bell Telephone Company; Docket No. 880069-TL, Rate of Return, January, 1992
Southern Bell Telephone Company, Docket No. 920260-TL, Rate of Return, November, 1992
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Southern States Utilities, Docket No. 950495-WS, Rate of Return, April, 1996
Tampa Electric Company; Docket No. 820007-EU, Rate of Return, June, 1982
Tampa Electric Company; Docket No. 830012-EU, Rate of Return, June, 1983
United Telephone of Florida; Docket No. 891239-TL, Rate of Return, November, 1989
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Water and Sewer Utilities, Docket No 880006-WS, Rate of Return, February, 1988.

**GEORGIA**

Georgia Power Company; Docket No. 3397-U, Accounting, July, 1983

**ILLINOIS**

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Central Illinois Public Service Company; ICC Docket No. 86-0256, Financial and Rate of Return, October, 1986.
Central Telephone Company of Illinois, ICC Docket No. 93-0252, Rate of Return, October, 1993.
Commonwealth Edison Company; Docket No. 85CH10970, Financial Testimony, May, 1986.
Commonwealth Edison Company; Docket No. 86-0249, Financial Testimony, October, 1986.
Commonwealth Edison Company; ICC Docket No. 87-0057, Rate of Return and Income Taxes, April 3, 1987.
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Commonwealth Edison Company; ICC Docket Nos. 91-747 and 91-748; Financial Affidavit, March, 1991.
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GTE North, ICC Docket 93-0301/94-0041, Cost of Capital, April, 1994
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**KENTUCKY**

Kentucky- American Water Company, Case No. 97-034, Rate of Return, June, 1997.
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**MAINE**

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**MARYLAND**

C & P Telephone Company; Case No. 7591, Fair Value, December, 1981

**MASSACHUSETTS**

Boston Edison Company; Docket No. DPU 906, Rate of Return, December, 1981
Fitchburg Gas & Electric; Accounting and Finance, October, 1984
Southbridge Water Company; M.D.P.U., Rate of Return, September, 1982

**MINNESOTA**

Minnesota Power & Light Company; Docket No. EO15/GR-80-76, Rate of Return, July, 1980

**NEW JERSEY**

Atlantic City Sewage; Docket No. 774-315, Rate of Return, May, 1977
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Elizabethtown Water Company, BPU Docket No. WR 95110557, OAL Docket No. PUC 12247-95, Rate of Return, March, 1996.
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Elizabethtown Water Company, BPU Docket No. WR060307511, Cost of Capital, December 2003.
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Hackensack Water Company; Docket No. 776-455, October, 1977 and Accounting, February, 1979
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National Association of Water Companies; Tariff Design, 1977
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Nuclear Performance Standards; BPU Docket No. EX89080719, Nuclear Performance Standards policy testimony
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**NEW HAMPSHIRE**

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**NEW YORK**

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Long Island Lighting Company; Case No. 27774, Rate of Return, November, 1980
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Newport Electric Corporation; Docket No. 1410, Accounting, July, 1979
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# SCHEDULES

**South Jersey Gas Company**
**Overall Cost of Capital**

| Recommended Capital Structure<br>Based on South Jersey Gas Company's Average Capital Structure for Year Ending February 2004<br>Type of Capital | Ratios<br>[A] | Cost Rate | Weighted<br>Cost Rate<br>[F] | Pre-tax<br>Cost Rate |
|---|---|---|---|---|
| Long-Term Debt | 47.300% | 6.780% [B] | 3.21% | 3.21% |
| Short-Term Debt | 12.740% | 1.695% [C] | 0.22% | 0.22% |
| Preferred Stock | 0.270% | 8.030% [D] | 0.02% | 0.04% [G] |
| Common Equity | 39.690% | 9.50% [E] | 3.77% | 6.43% [G] |
| | 100.00% | | 7.22% | 9.89% |

Source:

[A] JAR 11, P.1
[B] State of New Jersey. Direct Testimony of Paul R. Moul. Schedule 6 (2 of 3).
Long-Term Debt Weigthed Cost Rate
[C] From RAR-ROR-43, Page 2 and 28. Applicable LIBOR margin of 0.475% + Libor Rate of 1.22%
Libor Rate from Bankrate.com, 1/2/04
[D] State of New Jersey. Direct Testimony of Paul R. Moul
Preferred Stock
[E] JAR 2
[F] Capital Ratios times Cost Rate
[G] Calculated Pre-Tax Cost Rate by Multiplying Weighted Cost Rate by 1.706 per exhibit DPY-2 schedule A, P.1.

## South Jersey Gas Company
### COST OF EQUITY SUMMARY

| | | Based Upon Average for Year Ended12/31/03 Stock Prices | | Based Upon Stock Prices on 12/31/2003 | |
|---|---|---|---|---|---|
| **DCF** | | | | | |
| SIMPLIFIED, OR CONSTANT GROWTH DCF (D/P +g) RESULTS: | | | | | |
| COMPANY WITNESS GROUP | | 9.67% | [A] | 9.64% | [A] |
| ALL VALUE LINE GAS UTILITY INDUSTRY | | 9.13% | [B] | 9.23% | [B] |
| | | 9.40% | | 9.44% | |
| COMPLEX, OR MULTI-STAGE DCF RESULT FOR VALUE LINE GROUP: | Midpoint | 9.97% | [D] | 9.94% | [C] |
| **Risk Premluim/CAPM** | | Low end of Range | | High end of Range | |
| Based upon Average Return over inflation In all major sub-periods from 1802 through 2001 (Major sub-periods are 1802-1870, 1871-1925, and 1926-2001) For Stock of Average Risk | | 9.60% | | 10.00% | |
| Based upon analysis of historic returns from 1926-2001: | | | 8.08% | [E] | |
| | Midpoint | | 9.23% | [F] | |

| | |
|---|---|
| Recommended Equity Cost Rate For Average Capital Structure | 9.50% |
| Adjustment Applicable to Recommended Capital Structure | 0.00% |
| Recommended Cost of Equity Applied to Recommended Capital Structure | 9.50% |

Source:

[A] JAR 4, P.1
[B] JAR 4, P.2
[C] JAR 5, P.1
[D] JAR 5, P.2
[E] JAR 10, P.1
Result based upon risk premium over corporate bonds only, as results from risk premium analyses from treasury bonds are too low due to flight to quality and efforts to stimulate the U.S. economy.
[F] Average of three figures above, low end of range for return over inflation, high end of range for return over inflation and analysis of historic re

**COMPARATIVE COMPANIES**
**SELECTED FINANCIAL DATA**



| | VL Issue | [1] Book Per Sh. Dec. 00 [A] | [2] Book Per Sh. Dec. 01 [A] | [3] Book Per Sh. Dec. 2002 [A] | [4] Book Per Sh. Dec. 2003 [A] | [5] Market Price At 12/31/03 [B] | [6] Market Price High for Year [B] | [7] Market Price Low for Year [B] | [8] Market to Book At 12/31/03 [C] | [9] Market to Book Avg. for Year [C] | [10] Div. Rate [A] | [11] Dividend Yield At 12/31/2003 [D] | [12] Dividend Yield Avg. for Year [D] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COMPANY WITNESS GROUP** | | | | | | | | | | | | | |
| AGL RESOURCES | 3 | $11.50 | $12.19 | $12.52 | $14.35 E | $29.10 | $29.35 | $21.90 | 2.03 | 1.91 | $1.12 | 3.85% | 4.37% |
| ATMOS ENERGY CORP. | 3 | $12.28 | $14.31 | $13.75 | $16.70 E | $24.30 | $25.50 | $20.85 | 1.46 | 1.52 | $1.22 | 5.02% | 5.26% |
| ENERGEN CORP. | 3 | $13.31 | $15.54 | $16.77 | $19.05 E | $41.03 | $42.00 | $28.08 | 2.15 | 1.96 | $0.74 | 1.80% | 2.11% |
| KEYSPAN CORP. | 3 | $20.65 | $20.73 | $20.67 | $22.30 E | $36.80 | $38.14 | $31.02 | 1.65 | 1.61 | $1.78 | 4.84% | 5.15% |
| NEW JERSEY RES. | 3 | $12.43 | $13.20 | $13.06 | $15.75 E | $38.51 | $39.54 | $30.01 | 2.45 | 2.41 | $1.30 | 3.38% | 3.74% |
| NICOR, INC. | 3 | $15.56 | $16.39 | $16.55 | $16.85 E | $34.04 | $39.30 | $23.70 | 2.02 | 1.89 | $1.86 | 5.46% | 5.90% |
| PEOPLES ENERGY | 3 | $22.02 | $22.76 | $22.74 | $23.05 E | $42.04 | $45.25 | $34.93 | 1.82 | 1.75 | $2.12 | 5.04% | 5.29% |
| PIEDMONT NAT'L | 3 | $16.52 | $17.26 | $17.82 | $19.85 E | $43.46 | $43.95 | $33.22 | 2.19 | 2.05 | $1.66 | 3.82% | 4.30% |
| SOUTH JERSEY INDS. | 3 | $14.50 | $15.62 | $19.34 | $20.20 E | $40.50 | $40.70 | $30.55 | 2.00 | 1.80 | $1.54 | 3.80% | 4.32% |
| WGL | 3 | $15.31 | $16.24 | $15.78 | $16.25 E | $27.79 | $28.79 | $23.15 | 1.71 | 1.62 | $1.28 | 4.61% | 4.93% |
| AVERAGE | | $15.41 | $16.42 | $16.90 | $18.44 | $35.76 | $37.25 | $27.74 | 1.95 | 1.85 | $1.46 | 4.16% | 4.54% |
| MEDIAN | | | | | | | | | 2.02 | 1.89 | | 4.84% | 5.15% |
| **ALL VALUE LINE GAS UTILITY INDUSTRY** | | | | | | | | | | | | | |
| AGL RESOURCES | 3 | $11.50 | $12.19 | $12.52 | $14.35 E | $29.10 | $29.35 | $21.90 | 2.03 | 1.91 | $1.12 | 3.85% | 4.37% |
| ATMOS ENERGY CORP. | 3 | $12.28 | $14.31 | $13.75 | $16.70 E | $24.30 | $25.50 | $20.85 | 1.46 | 1.52 | $1.22 | 5.02% | 5.26% |
| CASCADE NAT'L GAS | 3 | $10.79 | $11.01 | $10.34 | $11.15 E | $21.09 | $21.99 | $18.00 | 1.89 | 1.86 | $0.96 | 4.55% | 4.80% |
| ENERGEN CORP. | 3 | $13.31 | $15.54 | $16.77 | $19.05 E | $41.03 | $42.00 | $28.08 | 2.15 | 1.96 | $0.74 | 1.80% | 2.11% |
| KEYSPAN CORP. | 3 | $20.65 | $20.73 | $20.67 | $22.30 E | $36.80 | $38.14 | $31.02 | 1.65 | 1.61 | $1.78 | 4.84% | 5.15% |
| LACLEDE GROUP | 3 | $14.99 | $15.26 | $15.07 | $15.65 E | $28.55 | $30.00 | $21.85 | 1.82 | 1.69 | $1.34 | 4.69% | 5.17% |
| NUI CORP. | 3 | $19.79 | $21.29 | $18.03 | $15.65 E | $16.12 | $17.40 | $13.13 | 1.03 | 0.91 | $0.52 | 3.23% | 3.41% |
| NEW JERSEY RES. | 3 | $12.43 | $13.20 | $13.06 | $15.75 E | $38.51 | $39.54 | $30.01 | 2.45 | 2.41 | $1.30 | 3.38% | 3.74% |
| NICOR, INC. | 3 | $15.56 | $16.39 | $16.55 | $16.85 E | $34.04 | $39.30 | $23.70 | 2.02 | 1.89 | $1.86 | 5.46% | 5.90% |
| N.W. NAT'L GAS | 3 | $17.93 | $18.56 | $18.88 | $19.40 E | $30.75 | $31.30 | $24.05 | 1.59 | 1.45 | $1.30 | 4.23% | 4.70% |
| PEOPLES ENERGY | 3 | $22.02 | $22.76 | $22.74 | $23.05 E | $42.04 | $45.25 | $34.93 | 1.82 | 1.75 | $2.12 | 5.04% | 5.29% |
| PIEDMONT NAT'L | 3 | $16.52 | $17.26 | $17.82 | $19.85 E | $43.46 | $43.95 | $33.22 | 2.19 | 2.05 | $1.66 | 3.82% | 4.30% |
| SEMCO ENERGY | 3 | $7.50 | $6.20 | $5.84 | $7.40 E | $4.90 | $8.80 | $3.15 | 0.66 | 0.90 | $0.30 | 6.12% | 5.02% |
| SOUTH JERSEY INDS. | 3 | $14.50 | $15.62 | $19.34 | $20.20 E | $40.50 | $40.70 | $30.55 | 2.00 | 1.80 | $1.54 | 3.80% | 4.32% |
| SOUTHERN UNION | 3 | $15.49 | $12.26 | $11.89 | $12.60 E | $18.40 | $18.71 | $12.08 | 1.46 | 1.26 | $0.00 | 0.00% | 0.00% |
| SOUTHWEST GAS | 3 | $16.82 | $17.27 | $17.91 | $18.65 E | $22.45 | $23.64 | $19.30 | 1.20 | 1.17 | $0.82 | 3.65% | 3.82% |
| UGI CORP. | 3 | $6.11 | $6.24 | $7.64 | $12.25 E | $33.90 | $46.18 | $28.85 | 2.77 | 3.77 | $1.14 | 3.36% | 3.04% |
| WGL | 3 | $15.31 | $16.24 | $15.78 | $16.25 E | $27.79 | $28.79 | $23.15 | 1.71 | 1.62 | $1.28 | 4.61% | 4.93% |
| AVERAGE | | $14.64 | $15.13 | $15.26 | $16.51 | $29.65 | $31.70 | $23.21 | 1.77 | 1.75 | $1.17 | 3.97% | 4.19% |
| MEDIAN | | | | | | | | | 1.82 | 1.69 | | 4.23% | 4.70% |

Sources: [A] Most current Value Line at time of prep
[B] Yahoo Finance, as of January,2 2004
[C] Market price divided by book value
[D] Dividend rate divided by market price

**COMPARATIVE COMPANIES**
**EARNINGS PER SHARE AND RETURN ON EQUITY**

| | [1] EPS 2001 | [2] EPS 2002 | [3] EPS 2003 | | [4] Return on Eq. 2003 | [5] Return on Eq. 2002 | [6] Value Line Future Exp. Return on Eq. | [7] Return on Equity 2001 |
|---|---|---|---|---|---|---|---|---|
| | [A] | [A] | [A] | | | [B] | [A] | |
| **COMPANY WITNESS GROUP** | | | | | | | | |
| AGL RESOURCES | $1.50 | $1.82 | $2.00 | E | 14.89% | 14.73% | 11.50% | 12.66% |
| ATMOS ENERGY CORP. | $1.47 | $1.45 | $1.71 | | 11.23% | 10.33% | 12.50% | 11.06% |
| ENERGEN CORP. | $2.23 | $1.99 | $3.10 | E | 17.31% | 12.32% | 17.00% | 15.46% |
| KEYSPAN CORP. | $1.72 | $2.75 | $2.40 | E | 11.17% | 13.29% | 12.00% | 8.31% |
| NEW JERSEY RES. | $1.95 | $2.09 | $2.38 | | 16.52% | 15.92% | 12.50% | 15.22% |
| NICOR, INC. | $3.01 | $2.88 | $2.10 | E | 12.57% | 17.49% | 16.50% | 18.84% |
| PEOPLES ENERGY | $3.16 | $2.80 | $2.87 | | 12.54% | 12.31% | 12.00% | 14.11% |
| PIEDMONT NAT'L | $2.02 | $1.89 | $2.15 | E | 11.41% | 10.78% | 11.50% | 11.96% |
| SOUTH JERSEY INDS. | $2.29 | $2.43 | $2.65 | E | 13.40% | 13.90% | 11.50% | 15.21% |
| WGL | $1.88 | $1.14 | $2.30 | | 14.36% | 7.12% | 11.00% | 11.92% |
| AVERAGE | $2.12 | $2.12 | $2.37 | | 13.54% | 12.82% | 12.80% | 13.47% |
| | | Median | | | 12.57% | 13.29% | 12.50% | 14.11% |
| **ALL VALUE LINE GAS UTILITY INDUSTRY** | | | | | | | | |
| AGL RESOURCES | $1.50 | $1.82 | $2.00 | E | 14.89% | 13.55% | 11.50% | 12.14% |
| ATMOS ENERGY CORP. | $1.47 | $1.45 | $1.71 | | 11.23% | 9.52% | 12.50% | 10.48% |
| CASCADE NAT'L GAS | $1.47 | $1.13 | $0.87 | | 8.10% | 10.52% | 11.50% | 13.77% |
| ENERGEN CORP. | $2.23 | $1.99 | $3.10 | E | 17.31% | 11.11% | 17.00% | 13.80% |
| KEYSPAN CORP. | $1.72 | $2.75 | $2.40 | E | 11.17% | 12.80% | 12.00% | 8.31% |
| LACLEDE GROUP | $1.61 | $1.18 | $1.82 | | 11.85% | 7.68% | 10.50% | 10.62% |
| NUI CORP. | $1.70 | $1.08 | $0.92 | | 5.46% | 6.41% | 10.00% | 8.65% |
| NEW JERSEY RES. | $1.95 | $2.09 | $2.38 | | 16.52% | 14.51% | 12.50% | 14.85% |
| NICOR, INC. | $3.01 | $2.88 | $2.10 | E | 12.57% | 17.25% | 16.50% | 18.28% |
| N.W. NAT'L GAS | $1.88 | $1.62 | $1.75 | E | 9.14% | 8.46% | 10.00% | 10.04% |
| PEOPLES ENERGY | $3.16 | $2.80 | $2.87 | | 12.54% | 12.23% | 12.00% | 13.89% |
| PIEDMONT NAT'L | $2.02 | $1.89 | $2.15 | E | 11.41% | 10.03% | 11.50% | 11.52% |
| SEMCO ENERGY | $0.01 | $0.48 | $0.20 | E | 3.02% | 7.25% | 7.00% | 0.17% |
| SOUTH JERSEY INDS. | $2.29 | $2.43 | $2.65 | E | 13.40% | 12.29% | 11.50% | 13.10% |
| SOUTHERN UNION | $0.21 | $0.61 | $0.74 | E | 6.04% | 4.98% | 9.00% | 1.74% |
| SOUTHWEST GAS | $1.15 | $1.16 | $1.20 | E | 6.56% | 6.35% | 10.00% | 6.54% |
| UGI CORP. | $1.40 | $1.80 | $2.29 | E | 23.03% | 18.10% | 18.50% | 20.17% |
| WGL | $1.88 | $1.14 | $2.30 | | 14.36% | 7.12% | 11.00% | 11.74% |
| AVERAGE | $1.70 | $1.68 | $1.86 | | 11.59% | 10.56% | 11.92% | 11.10% |
| | | Median | | | 11.63% | 10.28% | 11.50% | 11.63% |

Source: [A] Most Current Value Line at Time of Prep
[B] Earnings Per Share divded by average book value. Book value shown on JAR 3, P.1

## RETURN ON EQUITY IMPLIED IN ZACK'S CONSENSUS GROWTH RATES

| | | Y/E Book 2003 [3] [A] | Earnings 2003 [A] | Dividends [A] | Zack's Consensus 5 Year Growth Rate 12/28/2003 [B] | Y/E Book in 2007 at Zack's Growth [C] | Y/E Book in 2008 at Zack's Growth [C] | Earnings 2008 at Zack's Growth [C] | Return on Equity to achieve Zack's Growth [C] | | VALUE LINE BETA [A] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| COMPANY WITNESS GROUP | | | | | | | | | | | |
| AGL RESOURCES | | $14.35 | $2.00 | $1.12 | 5.30% | $18.36 | $19.50 | $2.59 | 13.68% | ATG | 0.75 |
| ATMOS ENERGY CORP. | | $16.70 | $1.71 | $1.22 | 6.00% | $18.97 | $19.63 | $2.29 | 11.86% | ATO | 0.65 |
| ENERGEN CORP. | | $19.05 | $3.10 | $0.74 | 8.30% | $30.62 | $34.13 | $4.62 | 14.27% | EGN | 0.70 |
| KEYSPAN CORP. | | $22.30 | $2.40 | $1.78 | 5.60% | $25.15 | $25.96 | $3.15 | 12.33% | KSE | 0.75 |
| NEW JERSEY RES. | | $15.75 | $2.38 | $1.30 | 6.30% | $20.79 | $22.26 | $3.23 | 15.01% | NJR | 0.70 |
| NICOR, INC. | | $16.85 | $2.10 | $1.86 | 4.30% | $17.92 | $18.21 | $2.59 | 14.35% | GAS | 1.00 |
| PEOPLES ENERGY | | $23.05 | $2.87 | $2.12 | 4.00% | $26.36 | $27.27 | $3.49 | 13.02% | PGL | 0.75 |
| PIEDMONT NAT'L | | $19.85 | $2.15 | $1.66 | 5.20% | $22.08 | $22.71 | $2.77 | 12.37% | PNY | 0.70 |
| SOUTH JERSEY INDS. | | $20.20 | $2.65 | $1.54 | 4.00% | $25.10 | $26.45 | $3.22 | 12.51% | SJI | 0.55 |
| WGL | | $16.25 | $2.30 | $1.28 | 3.90% | $20.74 | $21.98 | $2.78 | 13.04% | WGL | 0.70 |
| AVERAGE | Average | $18.44 | $2.37 | $1.46 | 5.29% | $22.61 | $23.81 | $3.07 | 13.24% | | 0.73 |
| | Median | | | | 5.60% | | | | 13.68% | | 0.75 |
| ALL VALUE LINE GAS UTILITY INDUSTRY | | | | | | | | | | | |
| AGL RESOURCES | | $14.35 | $2.00 | $1.12 | 5.30% | $18.36 | $19.50 | $2.59 | 13.68% | ATG | 0.75 |
| ATMOS ENERGY CORP. | | $16.70 | $1.71 | $1.22 | 6.00% | $18.97 | $19.63 | $2.29 | 11.86% | ATO | 0.65 |
| CASCADE NAT'L GAS | | $11.15 | $0.87 | $0.96 | n/a | | | | | CGC | 0.70 |
| ENERGEN CORP. | | $19.05 | $3.10 | $0.74 | 8.30% | $30.62 | $34.13 | $4.62 | 14.27% | EGN | 0.70 |
| KEYSPAN CORP. | | $22.30 | $2.40 | $1.78 | 5.60% | $25.15 | $25.96 | $3.15 | 12.33% | KSE | 0.75 |
| LACLEDE GROUP | | $15.65 | $1.82 | $1.34 | 3.00% | $17.72 | $18.27 | $2.11 | 11.72% | LG | 0.70 |
| NUI CORP. | | $15.65 | $0.92 | $0.52 | n/a | | | | | NUI | 0.70 |
| NEW JERSEY RES. | | $15.75 | $2.38 | $1.30 | 6.30% | $20.79 | $22.26 | $3.23 | 15.01% | NJR | 0.70 |
| NICOR, INC. | | $16.85 | $2.10 | $1.86 | 4.30% | $17.92 | $18.21 | $2.59 | 14.35% | GAS | 1.00 |
| N.W. NAT'L GAS | | $19.40 | $1.75 | $1.30 | 4.20% | $21.40 | $21.95 | $2.15 | 9.92% | NWN | 0.60 |
| PEOPLES ENERGY | | $23.05 | $2.87 | $2.12 | 4.00% | $26.36 | $27.27 | $3.49 | 13.02% | PGL | 0.75 |
| PIEDMONT NAT'L | | $19.85 | $2.15 | $1.66 | 5.20% | $22.08 | $22.71 | $2.77 | 12.37% | PNY | 0.70 |
| SEMCO ENERGY | | $7.40 | $0.20 | $0.30 | n/a | | | | | SEN | 0.65 |
| SOUTH JERSEY INDS. | | $20.20 | $2.65 | $1.54 | 4.00% | $25.10 | $26.45 | $3.22 | 12.51% | SJI | 0.55 |
| SOUTHERN UNION | | $12.60 | $0.74 | $0.00 | n/a | | | | | SUG | 0.90 |
| SOUTHWEST GAS | | $18.65 | $1.20 | $0.82 | 5.50% | $20.39 | $20.89 | $1.57 | 7.60% | SWX | 0.75 |
| UGI CORP. | | $12.25 | $2.29 | $1.14 | 6.30% | $17.62 | $19.18 | $3.11 | 16.89% | UGI | 0.75 |
| WGL | | $16.25 | $2.30 | $1.28 | 3.90% | $20.74 | $21.98 | $2.78 | 13.04% | WGL | 0.70 |
| AVERAGE | Average | $16.51 | $1.86 | $1.17 | 5.14% | $21.66 | $22.74 | $2.83 | 12.75% | | 0.72 |
| | Median | | | | 5.25% | | | | 12.76% | | 0.70 |

[A] Most Current Value Line at Time of Preparation
[B] Harrisdirect Web Site: Zacks Company Report, Printed 1/2/04
[C] Projected return on equity is obtained by escalating both dividends and earnings per share by the stated growth rate, and adding earnings and subtracting dividends in each year to determine the book value.

**COMPARATIVE GAS COMPANIES SELECTED BY COMPANY**
**DISCOUNTED CASH FLOW (DCF) INDICATED COST OF EQUITY**

| | | BASED ON AVERAGE MARKET PRICE FOR AVERAGE OF Year Ending 12/31/03 | BASED UPON MARKET PRICE AS OF 12/31/2003 |
|---|---|---|---|
| 1 Dividend Yield On Market Price | [B] | **4.54%** | **4.16%** |
| 2 Retention Ratio: | | | |
| a) Market-to-book | [B] | 1.85 | 1.95 |
| b) Div. Yld on Book | [C] | 8.40% | 8.11% |
| c) Return on Equity | [A] | 13.00% | 13.00% |
| d) Retention Rate | [D] | **35.36%** | **37.63%** |
| 3 Reinvestment Growth | [E] | 4.60% | 4.89% |
| 4 New Financing Growth (sv) | [F] | 0.43% | 0.47% |
| 5 Total Estimate of Investor Anticipated Growth | [G] | 5.02% | 5.37% |
| 6 Increment to Dividend Yield for Growth to Next Year | [H] | 0.11% | 0.11% |
| **7 Indicated Cost of Equity** | [I] | **9.67%** | **9.64%** |

**Some of the Considerations for determining Future Expected Return on Equity:**

| | | | Median | Mean | Source: |
|---|---|---|---|---|---|
| [A] | Value Line Expectation | | 12.50% | 12.80% | JAR 3, P.2 |
| | Expectation Derived from Zack's Consensus Growth Rate | | 13.68% | 13.24% | JAR 3, P.3 |
| | Earned Return on Equity in | **2003** | 13.54% | 12.57% | JAR 3, P.2 |
| | Earned Return on Equity in | **2002** | 13.29% | 12.82% | JAR 3, P.2 |
| | Earned Return on Equity in | **2001** | 14.11% | 13.47% | JAR 3, P.2 |

For recommended expectation, see text.

[B] JAR 3, P.1
[C] Line 1 x Line 2a
[D] 1- Line 2b/Line 2c
[E] Line 2c x Line 2d
[F] The amount of new shares issued as a percentage of shares outstanding (S) was multiplied by "V", which is the M/B ratio -1.

Ext. Fin. Rate (S) used = **0.50%** [J]

[G] Line 3 + Line 4
[H] Line 1 x one-half of line 5
[I] Line 1 + Line 5 + Line 6
[J] JAR 8

**ALL VALUE LINE GAS UTILITY INDUSTRY**
**DISCOUNTED CASH FLOW (DCF) INDICATED COST OF EQUITY**

| | | BASED ON AVERAGE MARKET PRICE FOR AVERAGE OF Year Ending 12/31/03 | BASED UPON MARKET PRICE AS OF 12/31/2003 |
|---|---|---|---|
| 1 Dividend Yield On Market Price | [B] | 4.19% | 3.97% |
| 2 Retention Ratio: | | | |
| a) Market-to-book | [B] | 1.75 | 1.77 |
| b) Div. Yld on Book | [C] | 7.33% | 7.04% |
| c) Return on Equity | [A] | 11.50% | 11.50% |
| d) Retention Rate | [D] | 36.26% | 38.81% |
| 3 Reinvestment Growth | [E] | 4.17% | 4.46% |
| 4 New Financing Growth (sv) | [F] | 0.68% | 0.70% |
| 5 Total Estimate of Investor Anticipated Growth | [G] | 4.85% | 5.16% |
| 6 Increment to Dividend Yield for Growth to Next Year | [H] | 0.10% | 0.10% |
| **7 Indicated Cost of Equity** | [I] | 9.13% | 9.23% |

**Some of the Considerations for determining Future Expected Return on Equity:**

| | | | Median | Mean | Source: |
|---|---|---|---|---|---|
| [A] | Value Line Expectation | | 11.50% | 11.92% | JAR 3, P.2 |
| | Expectation Derived from Zack's Consensus Growth Rate | | 12.76% | 12.75% | JAR 3, P.3 |
| | Earned Return on Equity in | 2003 | 11.59% | 11.63% | JAR 3, P.2 |
| | Earned Return on Equity in | 2002 | 10.28% | 10.56% | JAR 3, P.2 |
| | Earned Return on Equity in | 2001 | 11.63% | 11.10% | JAR 3, P.2 |

For recommended expectation, see text.

[B] JAR 3, P.1
[C] Line 1 x Line 2a
[D] 1- Line 2b/Line 2c
[E] Line 2c x Line 2d
[F] The amount of new shares issued as a percentage of shares outstanding (S) was multiplied by "V", which is the M/B ratio -1.

Ext. Fin. Rate (S) used = 0.90% [J]

[G] Line 3 + Line 4
[H] Line 1 x one-half of line 5
[I] Line 1 + Line 5 + Line 6
[J] JAR 8

## ALL VALUE LINE GAS UTILITY INDUSTRY
COMPLEX DCF METHOD
Based on Market Price on 12/31/2003

| Stage | [1] Year | Year End Book | [2] Retention Rate | [3] Dividend | [4] Earnings Per Share | [5] Retained Earnings Per Share | [6] External Financing Rate | [7] Incremer to book from Ext. Fin. | [8] Total Increment to Book | [9] Market Price | [10] Mkt to Book | [11] Expect. Ret. on Equity | [12] Cash Fl. from Stock Trans. | [13] Cash Fl. from Div. | [14] Total Cash Flow | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | [A] | [B] | [C] | [D] | [E] | [F] | [G] | [H] | [I] M/B Change | [J] | [K] | [L] | [M] | [N] | |
| | 2002 | $15.26 | 25.67% | $1.25 | $1.68 | $0.43 | | | $0.43 | $27.04 | 1.77 | | ($27.04) | | ($27.04) | |
| | 2003 | $16.51 | 32.17% | $1.26 | $1.86 | $0.60 | | | $0.60 | $29.26 | 1.77 | 11.70% | | $1.26 | $1.26 | |
| First | 2004 | $17.61 | 36.14% | $1.25 | $1.96 | $0.71 | | | $0.71 | $31.21 | 1.77 | 11.47% | | $1.25 | $1.25 | First |
| Stage | 2005 | $19.20 | 44.98% | $1.23 | $2.23 | $1.00 | | | $1.00 | $34.03 | 1.77 | 12.10% | | $1.23 | $1.23 | Stage |
| | 2006 | $20.79 | 46.13% | $1.35 | $2.50 | $1.15 | | | $1.15 | $36.86 | 1.77 | 12.49% | | $1.35 | $1.35 | |
| | 2007 | $21.92 | 39.85% | $1.48 | $2.46 | $0.98 | 0.90% | $0.15 | $1.13 | $38.86 | 1.77 | 11.50% | | $1.48 | $1.48 | |
| | 2008 | $23.11 | 39.85% | $1.56 | $2.59 | $1.03 | 0.90% | $0.16 | $1.19 | $40.96 | 1.77 | 11.50% | | $1.56 | $1.56 | |
| | 2009 | $24.36 | 39.85% | $1.64 | $2.73 | $1.09 | 0.90% | $0.17 | $1.25 | $43.18 | 1.77 | 11.50% | | $1.64 | $1.64 | |
| | 2010 | $25.68 | 39.85% | $1.73 | $2.88 | $1.15 | 0.90% | $0.17 | $1.32 | $45.52 | 1.77 | 11.50% | | $1.73 | $1.73 | |
| | 2011 | $27.06 | 39.85% | $1.82 | $3.03 | $1.21 | 0.90% | $0.18 | $1.39 | $47.99 | 1.77 | 11.50% | | $1.82 | $1.82 | |
| | 2012 | $28.54 | 39.85% | $1.92 | $3.20 | $1.27 | 0.90% | $0.19 | $1.47 | $50.59 | 1.77 | 11.50% | | $1.92 | $1.92 | |
| | 2013 | $30.09 | 39.85% | $2.03 | $3.37 | $1.34 | 0.90% | $0.20 | $1.55 | $53.34 | 1.77 | 11.50% | | $2.03 | $2.03 | |
| | 2014 | $31.72 | 39.85% | $2.14 | $3.55 | $1.42 | 0.90% | $0.21 | $1.63 | $56.23 | 1.77 | 11.50% | | $2.14 | $2 14 | |
| | 2015 | $33.44 | 39.85% | $2.25 | $3.75 | $1.49 | 0.90% | $0.23 | $1.72 | $59.28 | 1.77 | 11.50% | | $2.25 | $2.25 | |
| | 2016 | $35.25 | 39.85% | $2.38 | $3.95 | $1.57 | 0.90% | $0.24 | $1.81 | $62.49 | 1.77 | 11.50% | | $2.38 | $2 38 | |
| | 2017 | $37.17 | 39.85% | $2.50 | $4.16 | $1.66 | 0.90% | $0.25 | $1.91 | $65.88 | 1.77 | 11.50% | | $2.50 | $2.50 | |
| | 2018 | $39.18 | 39.85% | $2.64 | $4.39 | $1.75 | 0.90% | $0.27 | $2.01 | $69.45 | 1.77 | 11.50% | | $2.64 | $2 64 | |
| | 2019 | $41.30 | 39.85% | $2.78 | $4.63 | $1.84 | 0.90% | $0.28 | $2.12 | $73.21 | 1.77 | 11.50% | | $2.78 | $2.78 | |
| | 2020 | $43.54 | 39.85% | $2.93 | $4.88 | $1.94 | 0.90% | $0.29 | $2.24 | $77.18 | 1.77 | 11.50% | | $2.93 | $2 93 | |
| | 2021 | $45.90 | 39.85% | $3.09 | $5.14 | $2.05 | 0.90% | $0.31 | $2.36 | $81.37 | 1.77 | 11.50% | | $3.09 | $3 09 | |
| | 2022 | $48.39 | 39.85% | $3.26 | $5.42 | $2.16 | 0.90% | $0.33 | $2.49 | $85.78 | 1.77 | 11.50% | | $3.26 | $3 26 | |
| | 2023 | $51.02 | 39.85% | $3.44 | $5.72 | $2.28 | 0.90% | $0.35 | $2.62 | $90.43 | 1.77 | 11.50% | | $3.44 | $3 44 | |
| | 2024 | $53.78 | 39.85% | $3.62 | $6.03 | $2.40 | 0.90% | $0.36 | $2.77 | $95.33 | 1.77 | 11.50% | | $3.62 | $3 62 | |
| | 2025 | $56.70 | 39.85% | $3.82 | $6.35 | $2.53 | 0.90% | $0.38 | $2.92 | $100.50 | 1.77 | 11.50% | | $3.82 | $3 82 | |
| | 2026 | $59.77 | 39.85% | $4.03 | $6.70 | $2.67 | 0.90% | $0.40 | $3.07 | $105.94 | 1.77 | 11.50% | | $4.03 | $4 03 | |
| | 2027 | $63.01 | 39.85% | $4.25 | $7.06 | $2.81 | 0.90% | $0.43 | $3.24 | $111.69 | 1.77 | 11.50% | | $4.25 | $4 25 | |
| | 2028 | $66.43 | 39.85% | $4.48 | $7.44 | $2.97 | 0.90% | $0.45 | $3.42 | $117.74 | 1.77 | 11.50% | | $4.48 | $4 48 | |
| | 2029 | $70.03 | 39.85% | $4.72 | $7.85 | $3.13 | 0.90% | $0.47 | $3.60 | $124.13 | 1.77 | 11.50% | | $4.72 | $4 72 | |
| | 2030 | $73.82 | 39.85% | $4.98 | $8.27 | $3.30 | 0.90% | $0.50 | $3.80 | $130.85 | 1.77 | 11.50% | | $4.98 | $4 98 | |
| | 2031 | $77.83 | 39.85% | $5.25 | $8.72 | $3.47 | 0.90% | $0.53 | $4.00 | $137.95 | 1.77 | 11.50% | | $5.25 | $5 25 | |
| | 2032 | $82.05 | 39.85% | $5.53 | $9.19 | $3.66 | 0.90% | $0.56 | $4.22 | $145.43 | 1.77 | 11.50% | | $5.53 | $5 53 | |
| | 2033 | $86.49 | 39.85% | $5.83 | $9.69 | $3.86 | 0.90% | $0.59 | $4.45 | $153.31 | 1.77 | 11.50% | | $5.83 | $5 83 | |
| | 2034 | $91.18 | 39.85% | $6.15 | $10.22 | $4.07 | 0.90% | $0.62 | $4.69 | $161.62 | 1.77 | 11.50% | | $6.15 | $6 15 | |
| | 2035 | $96.13 | 39.85% | $6.48 | $10.77 | $4.29 | 0.90% | $0.65 | $4.94 | $170.38 | 1.77 | 11.50% | | $6 48 | $6 48 | Second |
| | 2036 | $101.34 | 39.85% | $6.83 | $11.35 | $4.52 | 0.90% | $0.69 | $5.21 | $179.62 | 1.77 | 11.50% | | $6.83 | $6 83 | Stage |
| Second | 2037 | $106.83 | 39.85% | $7.20 | $11.97 | $4.77 | 0.90% | $0.72 | $5.49 | $189.36 | 1.77 | 11.50% | | $7.20 | $7.20 | |
| Stage | 2038 | $112.62 | 39.85% | $7.59 | $12.62 | $5.03 | 0.90% | $0.76 | $5.79 | $199.62 | 1.77 | 11.50% | | $7.59 | $7 59 | |
| | 2039 | $118.73 | 39.85% | $8.00 | $13.30 | $5.30 | 0.90% | $0.80 | $6.11 | $210.44 | 1.77 | 11.50% | | $8 00 | $8 00 | |
| | 2040 | $125.16 | 39.85% | $8.44 | $14.02 | $5.59 | 0.90% | $0.85 | $6.44 | $221.85 | 1.77 | 11.50% | | $8.44 | $8.44 | |
| | 2041 | $131.95 | 39.85% | $8.89 | $14.78 | $5.89 | 0.90% | $0.89 | $6.79 | $233.88 | 1.77 | 11.50% | | $8.89 | $8.89 | |
| | 2042 | $139.10 | 39.85% | $9.37 | $15.59 | $6.21 | 0.90% | $0.94 | $7.15 | $246.56 | 1.77 | 11.50% | $246.56 | $9.37 | $255 93 | |
| | | | | | | | | | | | | Internal Rate of Return | | | 9 94% | |

Source:

[A] First Stage is average from Value Line. Second stage is prior years' book plus value from Col.[8]
[B] First Stage is 1 - ((Col. [4]-Col.[5])/Col.[4]). Second stage is equal to (Col [4] - Col [3])/Col [4]
[C] First Stage is from Value Line. Second stage starts with growth rate equal to the growth between 2005 and 2006 and then is equal to Col. [4] x (1-Col. [2])
[D] First Stage is from Value line. Second stage is average of current and prior year's value from Col. [1] x Col. [11]
[E] Col. [4] - Col. [3]
[F] JAR 8
[G] (Col.10-1)*Col.[6]*(Avg. of Col.[1] for current year and Col.[1] for prior year)
[H] Col. [5] + Col. [7]
[I] Col. [1] x Col. [10]
[J] JAR 3, P.1
[K] First stage is Col. [4]/Avg. of Current and prior year's Col. [1]. Second stage is from eval. Of JAR 4, P.1
[L] - Col. [9] for year of purchase, + Col. [9] for year of sale.
[M] Col. [3]
[N] Col. [12] + Col. [13]

ALL VALUE LINE GAS UTILITY INDUSTRY
COMPLEX DCF METHOD
Based on Market Price for Year Ended 12/31/2003

| Year | [1] Year End Book | [2] Retentio Rate | [3] Dividend | [4] Earnings Per Share | [5] Retained Earnings Per Shar | [6] External Financing Rate | [7] Incremer to book from Ext. Fin. | [8] Total Incremer to Book | [9] Market Price | [10] Mkt to Book | [11] Expect. Ret. on Equity | [12] Cash Fl. from Stock Trans. | [13] Cash Fl. from Div. | [14] Total Cash Flow |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | $0.00 | | | | | | | | | | | |
| | [A] | [B] | [C] | [D] | [E] | [F] | [G] | [H] | [I] M/B Change | [J] | [K] | [L] | [M] | [N] |
| 2002 | $15.26 | 25.67% | $1.25 | $1.68 | $0.43 | | | | $26.72 | 1.75 | | ($26.72) | | ($26.72) |
| 2003 | $16.51 | 32.17% | $1.26 | $1.86 | $0.60 | | | $0.60 | $26.91 | 1.75 | 11.70% | | $1.26 | $1.26 |
| 2004 | $17.61 | 36.14% | $1.25 | $1.96 | $0.71 | | | $0.71 | $30.84 | 1.75 | 11.47% | | $1.25 | $1.25 |
| 2005 | $19.20 | 44.96% | $1.23 | $2.23 | $1.00 | | | $1.00 | $33.63 | 1.75 | 12.10% | | $1.23 | $1.23 |
| 2006 | $20.79 | 46.13% | $1.35 | $2.50 | $1.15 | | | $1.15 | $36.42 | 1.75 | 12.49% | | $1.35 | $1.35 |
| 2007 | $21.92 | 39.85% | $1.48 | $2.46 | $0.98 | 0.90% | $0.14 | $1.12 | $38.39 | 1.75 | 11.50% | | $1.48 | $1.48 |
| 2008 | $23.10 | 39.85% | $1.56 | $2.59 | $1.03 | 0.90% | $0.15 | $1.18 | $40.46 | 1.75 | 11.50% | | $1.56 | $1.56 |
| 2009 | $24.35 | 39.85% | $1.64 | $2.73 | $1.09 | 0.90% | $0.16 | $1.25 | $42.65 | 1.75 | 11.50% | | $1.64 | $1.64 |
| 2010 | $25.66 | 39.85% | $1.73 | $2.88 | $1.15 | 0.90% | $0.17 | $1.32 | $44.95 | 1.75 | 11.50% | | $1.73 | $1.73 |
| 2011 | $27.05 | 39.85% | $1.82 | $3.03 | $1.21 | 0.90% | $0.18 | $1.39 | $47.38 | 1.75 | 11.50% | | $1.82 | $1.82 |
| 2012 | $28.51 | 39.85% | $1.92 | $3.19 | $1.27 | 0.90% | $0.19 | $1.46 | $49.94 | 1.75 | 11.50% | | $1.92 | $1.92 |
| 2013 | $30.05 | 39.85% | $2.03 | $3.37 | $1.34 | 0.90% | $0.20 | $1.54 | $52.63 | 1.75 | 11.50% | | $2.03 | $2.03 |
| 2014 | $31.67 | 39.85% | $2.13 | $3.55 | $1.41 | 0.90% | $0.21 | $1.62 | $55.48 | 1.75 | 11.50% | | $2.13 | $2.13 |
| 2015 | $33.39 | 39.85% | $2.25 | $3.74 | $1.49 | 0.90% | $0.22 | $1.71 | $58.47 | 1.75 | 11.50% | | $2.25 | $2.25 |
| 2016 | $35.19 | 39.85% | $2.37 | $3.94 | $1.57 | 0.90% | $0.23 | $1.80 | $61.63 | 1.75 | 11.50% | | $2.37 | $2.37 |
| 2017 | $37.09 | 39.85% | $2.50 | $4.16 | $1.66 | 0.90% | $0.24 | $1.90 | $64.96 | 1.75 | 11.50% | | $2.50 | $2.50 |
| 2018 | $39.09 | 39.85% | $2.63 | $4.38 | $1.75 | 0.90% | $0.26 | $2.00 | $68.47 | 1.75 | 11.50% | | $2.63 | $2.63 |
| 2019 | $41.20 | 39.85% | $2.78 | $4.62 | $1.84 | 0.90% | $0.27 | $2.11 | $72.17 | 1.75 | 11.50% | | $2.78 | $2.78 |
| 2020 | $43.43 | 39.85% | $2.93 | $4.87 | $1.94 | 0.90% | $0.29 | $2.23 | $76.06 | 1.75 | 11.50% | | $2.93 | $2.93 |
| 2021 | $45.77 | 39.85% | $3.09 | $5.13 | $2.04 | 0.90% | $0.30 | $2.35 | $80.17 | 1.75 | 11.50% | | $3.09 | $3.09 |
| 2022 | $48.25 | 39.85% | $3.25 | $5.41 | $2.15 | 0.90% | $0.32 | $2.47 | $84.50 | 1.75 | 11.50% | | $3.25 | $3.25 |
| 2023 | $50.85 | 39.85% | $3.43 | $5.70 | $2.27 | 0.90% | $0.34 | $2.61 | $89.07 | 1.75 | 11.50% | | $3.43 | $3.43 |
| 2024 | $53.60 | 39.85% | $3.61 | $6.01 | $2.39 | 0.90% | $0.35 | $2.75 | $93.88 | 1.75 | 11.50% | | $3.61 | $3.61 |
| 2025 | $56.49 | 39.85% | $3.81 | $6.33 | $2.52 | 0.90% | $0.37 | $2.89 | $98.95 | 1.75 | 11.50% | | $3.81 | $3.81 |
| 2026 | $59.55 | 39.85% | $4.01 | $6.67 | $2.66 | 0.90% | $0.39 | $3.05 | $104.29 | 1.75 | 11.50% | | $4.01 | $4.01 |
| 2027 | $62.76 | 39.85% | $4.23 | $7.03 | $2.80 | 0.90% | $0.41 | $3.22 | $109.93 | 1.75 | 11.50% | | $4.23 | $4.23 |
| 2028 | $66.15 | 39.85% | $4.46 | $7.41 | $2.95 | 0.90% | $0.44 | $3.39 | $115.86 | 1.75 | 11.50% | | $4.46 | $4.46 |
| 2029 | $69.72 | 39.85% | $4.70 | $7.81 | $3.11 | 0.90% | $0.46 | $3.57 | $122.12 | 1.75 | 11.50% | | $4.70 | $4.70 |
| 2030 | $73.49 | 39.85% | $4.95 | $8.23 | $3.28 | 0.90% | $0.48 | $3.77 | $128.72 | 1.75 | 11.50% | | $4.95 | $4.95 |
| 2031 | $77.46 | 39.85% | $5.22 | $8.68 | $3.46 | 0.90% | $0.51 | $3.97 | $135.67 | 1.75 | 11.50% | | $5.22 | $5.22 |
| 2032 | $81.64 | 39.85% | $5.50 | $9.15 | $3.65 | 0.90% | $0.54 | $4.18 | $143.00 | 1.75 | 11.50% | | $5.50 | $5.50 |
| 2033 | $86.05 | 39.85% | $5.80 | $9.64 | $3.84 | 0.90% | $0.57 | $4.41 | $150.72 | 1.75 | 11.50% | | $5.80 | $5.80 |
| 2034 | $90.70 | 39.85% | $6.11 | $10.16 | $4.05 | 0.90% | $0.60 | $4.65 | $158.86 | 1.75 | 11.50% | | $6.11 | $6.11 |
| 2035 | $95.60 | 39.85% | $6.44 | $10.71 | $4.27 | 0.90% | $0.63 | $4.90 | $167.44 | 1.75 | 11.50% | | $6.44 | $6.44 |
| 2036 | $100.76 | 39.85% | $6.79 | $11.29 | $4.50 | 0.90% | $0.66 | $5.16 | $176.48 | 1.75 | 11.50% | | $6.79 | $6.79 |
| 2037 | $106.20 | 39.85% | $7.16 | $11.90 | $4.74 | 0.90% | $0.70 | $5.44 | $186.01 | 1.75 | 11.50% | | $7.16 | $7.16 |
| 2038 | $111.94 | 39.85% | $7.54 | $12.54 | $5.00 | 0.90% | $0.74 | $5.74 | $196.06 | 1.75 | 11.50% | | $7.54 | $7.54 |
| 2039 | $117.99 | 39.85% | $7.95 | $13.22 | $5.27 | 0.90% | $0.78 | $6.05 | $206.65 | 1.75 | 11.50% | | $7.95 | $7.95 |
| 2040 | $124.36 | 39.85% | $8.38 | $13.93 | $5.55 | 0.90% | $0.82 | $6.37 | $217.81 | 1.75 | 11.50% | | $8.38 | $8.38 |
| 2041 | $131.08 | 39.85% | $8.83 | $14.69 | $5.85 | 0.90% | $0.86 | $6.72 | $229.58 | 1.75 | 11.50% | | $8.83 | $8.83 |
| 2042 | $138.15 | 39.85% | $9.31 | $15.48 | $6.17 | 0.90% | $0.91 | $7.08 | $241.98 | 1.75 | 11.50% | $241.98 | $9.31 | $251.29 |
| | | | | | | | | | | | Internal Rate of Return | | | 9.97% |

Source:

[A] First Stage is average from Value Line Second stage is prior years' book plus value from Col.[8]
[B] First Stage is 1 - ((Col. [4]-Col.[5])/Col [4]). Second stage is equal to (Col [4] - Col [3])/Col [4]
[C] First Stage is from Value Line. Second stage starts with growth rate equal to the growth between 2005 and 2006 and then is equal to Col [4] x (1-Col. [2])
[D] First Stage is from Value line. Second stage is average of current and prior year's value from Col. [1] x Col. [11]
[E] Col. [4] - Col. [3]
[F] JAR 6
[G] (Col.10-1)*Col.[6]*(Avg. of Col.[1] for current year and Col.[1] for prior year)
[H] Col. [5] + Col. [7]
[I] Col. [1] x Col. [10]
[J] JAR 3, P.1
[K] First stage is Col. [4]/Avg of Current and prior year's Col. [1]. Second stage is from eval. Of JAR 4, P.1
[L] - Col. [9] for year of purchase, + Col. [9] for year of sale.
[M] Col. [3]
[N] Col. [12] + Col. [13]

ALL VALUE LINE GAS UTILITY INDUSTRY
VALUE LINE'S EARNINGS PROJECTIONS

Earnings Per Share Forecast by Value Line

| | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|
| AGL RESOURCES | $1.82 | $2.00 | $2.10 | $2.18 | $2.25 |
| ATMOS ENERGY CORP. | $1.45 | $1.71 | $1.60 | $1.80 | $2.00 |
| CASCADE NAT'L GAS | $1.13 | $0.87 | $1.35 | $1.55 | $1.75 |
| ENERGEN CORP. | $1.99 | $3.10 | $2.90 | $3.38 | $3.85 |
| KEYSPAN CORP. | $2.75 | $2.40 | $2.65 | $2.98 | $3.30 |
| LACLEDE GROUP | $1.18 | $1.82 | $1.80 | $1.88 | $1.95 |
| NUI CORP. | $1.08 | $0.92 | $1.05 | $1.45 | $1.85 |
| NEW JERSEY RES. | $2.09 | $2.38 | $2.45 | $2.78 | $3.10 |
| NICOR, INC. | $2.88 | $2.10 | $2.20 | $2.63 | $3.05 |
| N.W. NAT'L GAS | $1.62 | $1.75 | $1.95 | $2.15 | $2.35 |
| PEOPLES ENERGY | $2.80 | $2.87 | $2.80 | $3.25 | $3.70 |
| PIEDMONT NAT'L | $1.89 | $2.15 | $2.30 | $2.68 | $3.05 |
| SEMCO ENERGY | $0.48 | $0.20 | $0.30 | $0.43 | $0.55 |
| SOUTH JERSEY INDS. | $2.43 | $2.65 | $2.80 | $3.05 | $3.30 |
| SOUTHERN UNION | $0.61 | $0.74 | $1.35 | $1.60 | $1.85 |
| SOUTHWEST GAS | $1.16 | $1.20 | $1.55 | $1.85 | $2.15 |
| UGI CORP. | $1.80 | $2.29 | $2.35 | $2.60 | $2.85 |
| WGL | $1.14 | $2.30 | $1.70 | $1.88 | $2.05 |
| AVERAGE | $1.68 | $1.86 | $1.96 | $2.23 | $2.50 |

Source: Most current Value Line at time of Prep

ALL VALUE LINE GAS UTILITY INDUSTRY
VALUE LINE'S BOOK VALUE PROJECTIONS

Book Value Per Share Forecast by Value Line

| | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|
| AGL RESOURCES | $12.52 | $14.35 | $15.65 | $17.58 | $19.50 |
| ATMOS ENERGY CORP. | $13.75 | $16.70 | $16.30 | $16.08 | $15.85 |
| CASCADE NAT'L GAS | $10.34 | $11.15 | $12.75 | $13.70 | $14.65 |
| ENERGEN CORP. | $16.77 | $19.05 | $19.75 | $21.08 | $22.40 |
| KEYSPAN CORP. | $20.67 | $22.30 | $23.30 | $25.65 | $28.00 |
| LACLEDE GROUP | $15.07 | $15.65 | $16.70 | $17.70 | $18.70 |
| NUI CORP. | $18.03 | $15.65 | $16.15 | $17.75 | $19.35 |
| NEW JERSEY RES. | $13.06 | $15.75 | $17.55 | $20.98 | $24.40 |
| NICOR, INC. | $16.55 | $16.85 | $17.45 | $18.03 | $18.60 |
| N.W. NAT'L GAS | $18.88 | $19.40 | $20.20 | $21.70 | $23.20 |
| PEOPLES ENERGY | $22.74 | $23.05 | $25.15 | $28.53 | $31.90 |
| PIEDMONT NAT'L | $17.82 | $19.85 | $21.30 | $21.85 | $22.40 |
| SEMCO ENERGY | $5.84 | $7.40 | $7.55 | $7.53 | $7.50 |
| SOUTH JERSEY INDS. | $19.34 | $20.20 | $22.40 | $25.88 | $29.35 |
| SOUTHERN UNION | $11.89 | $12.60 | $15.20 | $18.00 | $20.80 |
| SOUTHWEST GAS | $17.91 | $18.65 | $19.55 | $20.83 | $22.10 |
| UGI CORP. | $7.64 | $12.25 | $13.30 | $15.25 | $17.20 |
| WGL | $15.78 | $16.25 | $16.65 | $17.53 | $18.40 |
| AVERAGE | $15.26 | $16.51 | $17.61 | $19.20 | $20.79 |

Source: Most current Value Line at time of Prep

**ALL VALUE LINE GAS UTILITY INDUSTRY** **JAR 6**

**Value Line's Projection of Dividends Per Share**

| AMOUNT: | 2001 | 2002 | 2003 Value Line Estimate | 2004 | 2005 | 2006 | Compound Annual Growth from 2001 to 2006 |
|---|---|---|---|---|---|---|---|
| AGL RESOURCES | $1.08 | $1.08 | $1.11 | $1.12 | $1.12 | $1.12 | |
| ATMOS ENERGY CORP. | $1.16 | $1.18 | $1.20 | $1.22 | $1.27 | $1.32 | 2.62% |
| CASCADE NAT'L GAS | $0.96 | $0.96 | $0.96 | $0.96 | $0.97 | $0.98 | 0.41% |
| ENERGEN CORP. | $0.69 | $0.71 | $0.73 | $0.75 | $0.78 | $0.81 | 3.26% |
| KEYSPAN CORP. | $1.78 | $1.78 | $1.78 | $1.78 | $1.84 | $1.90 | 1.31% |
| LACLEDE GROUP | $1.34 | $1.34 | $1.34 | $1.34 | $1.36 | $1.37 | 0.44% |
| NUI CORP. | $0.98 | $0.98 | $0.98 | $0.52 | $0.52 | $0.52 | -11.90% |
| NEW JERSEY RES. | $1.17 | $1.20 | $1.23 | $1.30 | $1.35 | $1.40 | 3.65% |
| NICOR, INC. | $1.76 | $1.84 | $1.86 | $1.86 | $1.98 | $2.10 | 3.60% |
| N.W. NAT'L GAS | $1.25 | $1.26 | $1.27 | $1.30 | $1.34 | $1.37 | 1.85% |
| PEOPLES ENERGY | $2.03 | $2.07 | $2.12 | $2.16 | $2.20 | $2.24 | 1.99% |
| PIEDMONT NAT'L | $1.52 | $1.60 | $1.66 | $1.72 | $1.81 | $1.90 | 4.56% |
| SEMCO ENERGY | $0.84 | $0.59 | $0.40 | $0.25 | $0.38 | $0.50 | -9.86% |
| SOUTH JERSEY INDS. | $1.48 | $1.51 | $1.56 | $1.62 | $1.70 | $1.77 | 3.64% |
| SOUTHERN UNION | | | | | $0.00 | | |
| SOUTHWEST GAS | $0.82 | $0.82 | $0.82 | $0.86 | $0.88 | $0.90 | 1.88% |
| UGI CORP. | $1.05 | $1.08 | $1.13 | $1.18 | $1.26 | $1.34 | 5.54% |
| WGL | $1.26 | $1.27 | $1.28 | $1.29 | $1.31 | $1.33 | 1.16% |
| Average | $1.25 | $1.25 | $1.26 | $1.25 | $1.23 | $1.35 | 0.89% |
| Median | $1.17 | $1.20 | $1.23 | $1.29 | $1.29 | $1.34 | 1.93% |
| Percent Change from Prior Yr. | | 0.47% | 0.75% | -0.93% | -1.91% | 9.82% | |

| PERCENT CHANGE FROM PRIOR YEAR: | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|
| AGL RESOURCES | 0.00% | 2.78% | 0.90% | 0.00% | 0.00% |
| ATMOS ENERGY CORP. | 1.72% | 1.69% | 1.67% | 4.10% | 3.94% |
| CASCADE NAT'L GAS | 0.00% | 0.00% | 0.00% | 1.04% | 1.03% |
| ENERGEN CORP | 2.90% | 2.82% | 2.74% | 4.00% | 3.85% |
| KEYSPAN CORP. | 0.00% | 0.00% | 0.00% | 3.37% | 3.26% |
| LACLEDE GROUP | 0.00% | 0.00% | 0.00% | 1.12% | 1.11% |
| NUI CORP. | 0.00% | 0.00% | -46.94% | 0.00% | 0.00% |
| NEW JERSEY RES. | 2.56% | 2.50% | 5.69% | 3.85% | 3.70% |
| NICOR, INC. | 4.55% | 1.09% | 0.00% | 6.45% | 6.06% |
| N.W. NAT'L GAS | 0.80% | 0.79% | 2.36% | 2.69% | 2.62% |
| PEOPLES ENERGY | 1.97% | 2.42% | 1.89% | 1.85% | 1.82% |
| PIEDMONT NAT'L | 5.26% | 3.75% | 3.61% | 5.23% | 4.97% |
| SEMCO ENERGY | -29.76% | -32.20% | -37.50% | 50.00% | 33.33% |
| SOUTH JERSEY INDS. | 2.03% | 3.31% | 3.85% | 4.63% | 4.42% |
| SOUTHERN UNION | | | | | |
| SOUTHWEST GAS | 0.00% | 0.00% | 4.88% | 2.33% | 2.27% |
| UGI CORP. | 2.86% | 4.63% | 4.42% | 6.78% | 6.35% |
| WGL | 0.79% | 0.78% | 0.78% | 1.55% | 1.53% |
| Average | -0.25% | -0.33% | -3.04% | 5.82% | 4.72% |
| Median | 0.80% | 1.09% | 1.67% | 3.37% | 3.26% |
| Percent Change from Prior Yr | 0.47% | 0.75% | -0.93% | -1.91% | 9.82% |

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Source: Most Current Value Line At Time of Prep

**ALL VALUE LINE GAS UTILITY INDUSTRY** **JAR 6**

**Value Line's Projection of Dividends Per Share**

| AMOUNT: | 2001 | 2002 | 2003 Value Line Estimate | 2004 | 2005 | 2006 | Compound Annual Growth from 2001 to 2006 |
|---|---|---|---|---|---|---|---|
| AGL RESOURCES | $1.08 | $1.08 | $1.11 | $1.12 | $1.12 | $1.12 | |
| ATMOS ENERGY CORP. | $1.16 | $1.16 | $1.20 | $1.22 | $1.27 | $1.32 | 2.62% |
| CASCADE NAT'L GAS | $0.96 | $0.96 | $0.96 | $0.96 | $0.97 | $0.98 | 0.41% |
| ENERGEN CORP. | $0.69 | $0.71 | $0.73 | $0.75 | $0.78 | $0.81 | 3.26% |
| KEYSPAN CORP. | $1.78 | $1.78 | $1.78 | $1.78 | $1.84 | $1.90 | 1.31% |
| LACLEDE GROUP | $1.34 | $1.34 | $1.34 | $1.34 | $1.36 | $1.37 | 0.44% |
| NUI CORP. | $0.98 | $0.98 | $0.98 | $0.52 | $0.52 | $0.52 | -11.90% |
| NEW JERSEY RES. | $1.17 | $1.20 | $1.23 | $1.30 | $1.35 | $1.40 | 3.65% |
| NICOR, INC. | $1.76 | $1.84 | $1.86 | $1.86 | $1.98 | $2.10 | 3.60% |
| N.W. NAT'L GAS | $1.25 | $1.26 | $1.27 | $1.30 | $1.34 | $1.37 | 1.85% |
| PEOPLES ENERGY | $2.03 | $2.07 | $2.12 | $2.16 | $2.20 | $2.24 | 1.99% |
| PIEDMONT NAT'L | $1.52 | $1.60 | $1.66 | $1.72 | $1.81 | $1.90 | 4.56% |
| SEMCO ENERGY | $0.84 | $0.59 | $0.40 | $0.25 | $0.38 | $0.50 | -9.86% |
| SOUTH JERSEY INDS. | $1.48 | $1.51 | $1.56 | $1.62 | $1.70 | $1.77 | 3.64% |
| SOUTHERN UNION | | | | | $0.00 | | |
| SOUTHWEST GAS | $0.82 | $0.82 | $0.82 | $0.86 | $0.88 | $0.90 | 1.88% |
| UGI CORP. | $1.05 | $1.08 | $1.13 | $1.18 | $1.26 | $1.34 | 5.54% |
| WGL | $1.26 | $1.27 | $1.28 | $1.29 | $1.31 | $1.33 | 1.16% |
| Average | $1.25 | $1.25 | $1.26 | $1.25 | $1.23 | $1.35 | 0.89% |
| Median | $1.17 | $1.20 | $1.23 | $1.29 | $1.29 | $1.34 | 1.93% |
| | | | | | | | |
| Percent Change from Prior Yr. | | 0.47% | 0.75% | -0.93% | -1.91% | 9.82% | |

| | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|
| **PERCENT CHANGE FROM PRIOR YEAR:** | | | | | |
| AGL RESOURCES | 0.00% | 2.78% | 0.90% | 0.00% | 0.00% |
| ATMOS ENERGY CORP. | 1.72% | 1.69% | 1.67% | 4.10% | 3.94% |
| CASCADE NAT'L GAS | 0.00% | 0.00% | 0.00% | 1.04% | 1.03% |
| ENERGEN CORP. | 2.90% | 2.82% | 2.74% | 4.00% | 3.85% |
| KEYSPAN CORP. | 0.00% | 0.00% | 0.00% | 3.37% | 3.26% |
| LACLEDE GROUP | 0.00% | 0.00% | 0.00% | 1.12% | 1.11% |
| NUI CORP. | 0.00% | 0.00% | -46.94% | 0.00% | 0.00% |
| NEW JERSEY RES. | 2.56% | 2.50% | 5.69% | 3.85% | 3.70% |
| NICOR, INC. | 4.55% | 1.09% | 0.00% | 6.45% | 6.06% |
| N.W. NAT'L GAS | 0.80% | 0.79% | 2.36% | 2.69% | 2.62% |
| PEOPLES ENERGY | 1.97% | 2.42% | 1.89% | 1.85% | 1.82% |
| PIEDMONT NAT'L | 5.26% | 3.75% | 3.61% | 5.23% | 4.97% |
| SEMCO ENERGY | -29.76% | -32.20% | -37.50% | 50.00% | 33.33% |
| SOUTH JERSEY INDS. | 2.03% | 3.31% | 3.85% | 4.63% | 4.42% |
| SOUTHERN UNION | | | | | |
| SOUTHWEST GAS | 0.00% | 0.00% | 4.88% | 2.33% | 2.27% |
| UGI CORP. | 2.86% | 4.63% | 4.42% | 6.78% | 6.35% |
| WGL | 0.79% | 0.78% | 0.78% | 1.55% | 1.53% |
| Average | -0.25% | -0.33% | -3.04% | 5.82% | 4.72% |
| Median | 0.80% | 1.09% | 1.67% | 3.37% | 3.26% |
| | | | | | |
| Percent Change from Prior Yr. | 0.47% | 0.75% | -0.93% | -1.91% | 9.82% |
| 0 | | | | | |

Source: Most Current Value Line At Time of Prep

All Gas Utilities Covered By Value Line

| | ($000,000s) Total Debt | Quantity: LT Debt [A] | Quantity: ST Debt [B] | Quantity: Pfd Stock [A] | Quantity: Equity [C] | Quantity: Total Capital [D] | Percentage: LT Debt [E] | Percentage: ST Debt [E] | Percentage: Pfd Stock [E] | Percentage: Equity Ratio With ST Debt [E] |
|---|---|---|---|---|---|---|---|---|---|---|
| AGL RESOURCES | $ 1,257 | $ 1,130 | $ 127 | $ - | $ 808 | $ 2,066 | 54.7% | 6.2% | 0.0% | 39.1% |
| ATMOS ENERGY CORP. | 874.7 | 864.3 | 10.4 | - | 739.2 | 1,613.9 | 53.6% | 0.6% | 0.0% | 45.8% |
| CASCADE NAT'L GAS | 164.9 | 164.9 | - | - | 114.1 | 279.0 | 59.1% | 0.0% | 0.0% | 40.9% |
| ENERGEN CORP. | 562.0 | 503.0 | 59.0 | - | 571.8 | 1,133.8 | 44.4% | 5.2% | 0.0% | 50.4% |
| KEYSPAN CORP. | 5,600.0 | 4,900.0 | 700.0 | 83.7 | 2,767.0 | 8,450.7 | 58.0% | 8.3% | 1.0% | 32.7% |
| LACLEDE GROUP | 522.8 | 304.6 | 218.2 | 1.3 | 335.4 | 859.5 | 35.4% | 25.4% | 0.2% | 39.0% |
| NUI CORP. | 474.1 | 319.3 | 154.8 | - | 287.7 | 761.8 | 41.9% | 20.3% | 0.0% | 37.8% |
| NEW JERSEY RES. | 380.7 | 273.7 | 107.0 | - | 267.2 | 647.9 | 42.2% | 16.5% | 0.0% | 41.2% |
| NICOR, INC. | 1,086.7 | 396.7 | 690.0 | 1.7 | 723.9 | 1,812.3 | 21.9% | 38.1% | 0.1% | 39.9% |
| N.W. NAT'L GAS | 543.7 | 450.8 | 92.9 | - | 478.7 | 1,022.4 | 44.1% | 9.1% | 0.0% | 46.8% |
| PEOPLES ENERGY | 896.3 | 744.3 | 152.0 | - | 1,084.4 | 1,980.7 | 37.6% | 7.7% | 0.0% | 54.7% |
| PIEDMONT NAT'L | 507.0 | 460.0 | 47.0 | - | 587.8 | 1,094.8 | 42.0% | 4.3% | 0.0% | 53.7% |
| SEMCO ENERGY | 579.3 | 475.5 | 103.8 | - | 103.7 | 683.0 | 69.6% | 15.2% | 0.0% | 15.2% |
| SOUTH JERSEY INDS. | 433.5 | 328.7 | 104.8 | 1.7 | 282.6 | 717.8 | 45.8% | 14.6% | 0.2% | 39.4% |
| SOUTHERN UNION | 2,731.7 | 2,041.5 | 690.2 | - | 1,183.6 | 3,915.3 | 52.1% | 17.6% | 0.0% | 30.2% |
| SOUTHWEST GAS | 1,111.2 | 1,104.1 | 7.1 | - | 571.3 | 1,682.5 | 65.6% | 0.4% | 0.0% | 34.0% |
| UGI CORP. | 1,260.5 | 1,135.9 | 124.6 | - | 314.8 | 1,575.3 | 72.1% | 7.9% | 0.0% | 20.0% |
| WGL | 815.5 | 620.7 | 194.8 | 28.2 | 714.3 | 1,558.0 | 39.8% | 12.5% | 1.8% | 45.8% |
| | $ 1,100 | $ 901 | $ 199 | $ 6 | $ 663 | $ 1,770 | 46.89% | 11.66% | 0.18% | 39.27% |
| | | | | | | Median | 45.08% | 8.68% | 0.00% | 39.66% |

[A] Source: Most Current Value Line at Time of Preparation

[B] Total Debt Minus Long-Term Debt

[C] The amount of equity was calculated by using the following information provided by Value Line:

%E: % of equity in the capital structure without short-term debt

LT: Amount of Long-Term Debt in the Capital Structure

PS: Amount of Preferred Stock in the Capital Structure

We know the % of equity provided by Value Line can be expressed algebraically:

*Note: E is defined as the amount of equity in the Capital Structure*

Step 1: E = (%E) X (E + LT + PS)

Step 2: E = %E X E + %E X LT + %E X PS

Step 3: E - %E X E = %E X LT + %E X PS

Step 4: E - %E X E = %E X ( LT + PS)

Step 5: E X (1 - %E) = %E X ( LT + PS)

**Step 6: E = %E X ( LT + PS) / (1 - %E)**

Therefore we are able to solve for the amount of equity in the capital structure with the information provided by Value Line. As the formula in Step 6 shows, the amount of equity is equal to the % of equity in the capital structure without short-term debt times the sum of Long-term debt and Preferred Stock all divided by 1 minus the % of equity in the capital structure.

[D] Sum of Long-Term Debt, Short-Term Debt, Preferred Stock and Equity

[E] Quantities in columns L through O Divided by Total Capital in Column P. Use avrg. of 2002 and 2003 equity ratios

**All Gas Utilities Covered By Value Line**

| | % Common Equity | | | | | |
|---|---|---|---|---|---|---|
| | 1999 | 2000 | 2001 | 2002 | 2003 | Average Without Short Term Debt |
| AGL RESOURCES | 49.20% | 48.30% | 38.70% | 41.70% | 47.00% | 44.98% |
| ATMOS ENERGY CORP. | 50.00% | 51.90% | 45.70% | 46.10% | 50.00% | 48.74% |
| CASCADE NAT'L GAS | 46.60% | 48.80% | 49.30% | 40.90% | 42.00% | 45.52% |
| ENERGEN CORP. | 49.30% | 53.10% | 46.90% | 53.20% | 58.00% | 52.10% |
| KEYSPAN CORP. | 60.60% | 39.20% | 37.70% | 35.70% | 41.00% | 42.84% |
| LACLEDE GROUP | 57.80% | 54.50% | 50.20% | 52.30% | 49.40% | 52.84% |
| NUI CORP. | 46.60% | 48.50% | 48.10% | 47.40% | 44.00% | 46.92% |
| NEW JERSEY RES. | 51.20% | 52.90% | 49.90% | 49.40% | 61.00% | 52.88% |
| NICOR, INC. | 64.00% | 66.70% | 61.70% | 64.50% | 65.50% | 64.48% |
| N.W. NAT'L GAS | 49.90% | 50.90% | 53.20% | 51.50% | 52.50% | 51.60% |
| PEOPLES ENERGY | 59.60% | 64.90% | 55.60% | 59.30% | 53.50% | 58.58% |
| PIEDMONT NAT'L | 53.80% | 53.90% | 52.40% | 56.10% | 59.00% | 55.04% |
| SEMCO ENERGY | 45.60% | 23.20% | 19.20% | 17.90% | 32.00% | 27.58% |
| SOUTH JERSEY INDS. | 37.00% | 37.60% | 35.90% | 46.10% | 48.00% | 40.92% |
| SOUTHERN UNION | 38.00% | 46.90% | 33.60% | 36.70% | 35.00% | 38.04% |
| SOUTHWEST GAS | 35.50% | 35.80% | 39.60% | 34.10% | 36.50% | 36.30% |
| UGI CORP. | 19.80% | 19.10% | 17.40% | 21.70% | 29.00% | 21.40% |
| WGL | 56.10% | 54.80% | 56.30% | 52.40% | 55.80% | 55.08% |
| | 48.4% | 47.3% | 44.0% | 44.8% | 47.7% | 46.4% |

Source: Most Current Value Line at Time of Preparation

Note: Long Term Debt is reported in Value Line to be higher than Total Debt. Therefore, estimated short term debt is zero.

**COMPARATIVE COMPANIES**
**EXTERNAL FINANCING RATE**
(Millions of Shares)

| COMPANY WITNESS GROUP | Common Stock Outstanding 2003 | 2006-08 | Compound Annual Growth |
|---|---|---|---|
| AGL RESOURCES | 64.50 E | 65.00 E | 0.19% |
| ATMOS ENERGY CORP. | 51.50 E | 65.00 E | 5.99% |
| ENERGEN CORP. | 36.50 E | 42.00 E | 3.57% |
| KEYSPAN CORP. | 159.10 E | 164.00 E | 0.76% |
| NEW JERSEY RES. | 27.30 E | 25.00 E | -2.18% |
| NICOR, INC. | 44.10 E | 43.00 E | -0.63% |
| PEOPLES ENERGY | 36.75 E | 32.00 E | -3.40% |
| PIEDMONT NAT'L | 33.50 E | 40.00 E | 4.53% |
| SOUTH JERSEY INDS. | 13.00 E | 13.50 E | 0.95% |
| WGL | 48.60 E | 48.60 E | 0.00% |
| | 51.49 | 53.81 | |
| | | Average | 0.98% |
| | | Median | 0.48% |
| | | Round to | 0.50% |

Gas

| ALL EASTERN ~~ELECTRIC~~ COMPANIES COVERED BY VALUE LINE | Common Stock Outstanding 2003 | 2006-08 | Compound Annual Growth |
|---|---|---|---|
| AGL RESOURCES | 64.50 E | 65.00 E | 0.19% |
| ATMOS ENERGY CORP. | 51.50 E | 65.00 E | 5.99% |
| CASCADE NAT'L GAS | 11.13 E | 12.00 E | 1.90% |
| ENERGEN CORP. | 36.50 E | 42.00 E | 3.57% |
| KEYSPAN CORP. | 159.10 E | 164.00 E | 0.76% |
| LACLEDE GROUP | 19.11 E | 19.00 E | -0.14% |
| NUI CORP. | 16.50 E | 19.00 E | 3.59% |
| NEW JERSEY RES. | 27.30 E | 25.00 E | -2.18% |
| NICOR, INC. | 44.10 E | 43.00 E | -0.63% |
| N.W. NAT'L GAS | 25.90 E | 28.00 E | 1.97% |
| PEOPLES ENERGY | 36.75 E | 32.00 E | -3.40% |
| PIEDMONT NAT'L | 33.50 E | 40.00 E | 4.53% |
| SEMCO ENERGY | 28.00 E | 30.00 E | 1.74% |
| SOUTH JERSEY INDS. | 13.00 E | 13.50 E | 0.95% |
| SOUTHERN UNION | 73.07 E | 74.00 E | 0.32% |
| SOUTHWEST GAS | 33.75 E | 37.00 E | 2.33% |
| UGI CORP. | 42.69 E | 42.00 E | -0.41% |
| WGL | 48.60 E | 48.60 E | 0.00% |
| | 42.50 | 44.39 | |
| | | Average | 1.17% |
| | | Median | 0.85% |
| | | Round to | 0.90% |

Source: Most Current Value Line at Time of Preperation

**RISK PREMIUM/CAPM METHOD**
**COST OF EQUITY FOR COMMON STOCK :**

| | Average Risk | Risk Premium Adjustment | Applicable to Gas Utility Based upon a beta of | 0.72 [G] |
|---|---|---|---|---|
| *Based on Long-term Treasury Bonds* | | | | |
| Interest rate on 20 year treasury bonds | 5.11% [A] | | 5.11% | |
| Applicable Risk Premium | 4.00% [B] | -1.11% [F] | 2.89% | |
| | 9.11% | | 8.00% | |
| *Based on Corporate Bonds* | | | | |
| Interest on corporate bonds | 5.55% [C] | | 5.55% | |
| Applicable Risk Premium | 3.51% [B] | -0.97% [F] | 2.53% | |
| | 9.06% | | 8.08% | |
| *Based on Intermediate Term U.S Treasury Bonds* | | | | |
| Intereset on 10 year U.S. Treasury Bonds | 3.38% [D] | | 3.38% | |
| Applicable Risk Premium | 3.90% [B] | -1.08% [F] | 2.82% | |
| | 7.28% | | 6.20% | |
| *Based on U.S. Treasury Bills* | | | | |
| Interest on 90 day U.S. Treasury Bills | 0.85% [E] | | 0.85% | |
| Applicable Risk Premium | 5.33% [B] | -1.48% [F] | 3.85% | |
| | 6.18% | | 4.70% | |

SUMMARY OF INDICATED RISK PREMIUM FOR EQUITY WITH AVERAGE RISK

| | | |
|---|---|---|
| Lowest | 6.18% | 4.70% |
| Highest | 9.11% | 8.08% |
| Average | 7.91% | 6.75% |

Sources:

[A] Wall Street Journal, 1/2/04. Used Maturity Date Of November 2024
[B] JAR 10, P.2
[C] Federal Reserve Statistical Release, 1/2/04 AAA Rated. Week Ending December 26th rate.
[D] Wall Street Journal, 1/2/04. Used Maturity Date of August 2014
[E] Wall Street Journal, 1/2/4. Used Maturity Date of March 2004
[F] Amount in last column determined by multiplying the amount in the first column by the beta.
The amount in the middle column is the difference between the amount in the first column and the amount i the last column. Used AAA Corporate bonds.
[G] JAR 3, P3. Average Beta of All Gas Companies

**RISK PREMIUM BASED UPON ANALYSIS OF HISTORIC RETURNS**



Compound annual returns from 1926 through 1999:

| | |
|---|---|
| Large Common Stocks | 11.35% [A] |
| Corporate Bonds | 5.61% [A] |
| Long-term U.S. Treasury Bonds | 5.12% [A] |
| Intermediate Term U.S. Treasury Bonds | 5.22% [A] |
| U.S. Treasury Bills | 3.79% [A] |
| Inflation | 3.07% [A] |

Average diference from Long-term U.S. Treasury Bonds:

| | |
|---|---|
| Large Common Stocks | 6.23% |
| Corporate Bonds | 0.49% |
| Long-term U.S. Treasury Bonds | 0.00% |
| Intermediate Term U.S. Treasury Bonds | 0.10% |
| U.S. Treasury Bills | -1.33% |
| Inflation | -2.05% |

Common Stock Risk Premium Consistent With Current Market Environment:

| | | |
|---|---|---|
| Long-term U.S. Treasury Bonds | 4.00% or less. | See graphs on Schedule JAR 10, P. 6 |
| Corporate Bonds | 3.51% or less. | Risk premium on large common stocks minus average differnce from corporate bonds per above table. |
| Intermediate Term U.S. Treasury Bonds | 3.90% or less. | Risk premium on large common stocks minus average differnce from corporate bonds per above table |
| U.S. Treasury Bills | 5.33% or less. | Risk premium on large common stocks minus average differnce from corporate bonds per above table |
| Inflation | 6.05% or less. | Risk premium on large common stocks minus average differnce from corporate bonds per above table |

The numbers that are developed start with the 4.00% risk premium differential between long-term U.S. treasury bonds and common stocks.
Then, this 4.00% is adjusted based upon the average difference between the return on long-term government bonds and the other factors indicated.

Sources:
[A] JAR 10, P.4

**COMPARATIVE GAS COMPANIES**
**Percentage of Common Equity in the Capital Structure**
**Excluding Short-term Debt**

**Company Witness Comparison Group**

| | % Common Equity | | | | | |
|---|---|---|---|---|---|---|
| | 1999 | 2000 | 2001 | 2002 | 2003 | Average |
| AGL RESOURCES | 49.20% | 48.30% | 38.70% | 41.70% | 47.00% | 44.98% |
| ATMOS ENERGY CORP. | 50.00% | 51.90% | 45.70% | 46.10% | 50.00% | 48.74% |
| ENERGEN CORP. | 49.30% | 53.10% | 46.90% | 53.20% | 58.00% | 52.10% |
| KEYSPAN CORP. | 60.60% | 39.20% | 37.70% | 35.70% | 41.00% | 42.84% |
| NEW JERSEY RES. | 51.20% | 52.90% | 49.90% | 49.40% | 61.00%. | 52.88% |
| NICOR, INC. | 64.00% | 66.70% | 61.70% | 64.50% | 65.50% | 64.48% |
| PEOPLES ENERGY | 59.60% | 64.90% | 55.60% | 59.30% | 53.50% | 58.58% |
| PIEDMONT NAT'L | 53.80% | 53.90% | 52.40% | 56.10% | 59.00% | 55.04% |
| SOUTH JERSEY INDS. | 37.00% | 37.60% | 35.90% | 46.10% | 48.00% | 40.92% |
| WGL | 56.10% | 54.80% | 56.30% | 52.40% | 55.80% | 55.08% |
| **Average** | **53.08%** | **52.33%** | **48.08%** | **50.45%** | **53.88%** | **51.56%** |
| **Median** | **52.50%** | **53.00%** | **48.40%** | **50.90%** | **54.65%** | **52.49%** |

Source: Most Current Value Line at Time of Preparation

**ALL VALUE LINE GAS UTILITY INDUSTRY**

| | % Common Equity | | | | | |
|---|---|---|---|---|---|---|
| | 1999 | 2000 | 2001 | 2002 | 2003 | Average |
| AGL RESOURCES | 49.20% | 48.30% | 38.70% | 41.70% | 47.00% | 44.98% |
| ATMOS ENERGY CORP. | 50.00% | 51.90% | 45.70% | 46.10% | 50.00% | 48.74% |
| CASCADE NAT'L GAS | 46.60% | 48.80% | 49.30% | 40.90% | 42.00% | 45.52% |
| ENERGEN CORP. | 49.30% | 53.10% | 46.90% | 53.20% | 58.00% | 52.10% |
| KEYSPAN CORP. | 60.60% | 39.20% | 37.70% | 35.70% | 41.00% | 42.84% |
| LACLEDE GROUP | 57.80% | 54.50% | 50.20% | 52.30% | 49.40% | 52.84% |
| NUI CORP. | 46.60% | 48.50% | 48.10% | 47.40% | 44.00% | 46.92% |
| NEW JERSEY RES. | 51.20% | 52.90% | 49.90% | 49.40% | 61.00% | 52.88% |
| NICOR, INC. | 64.00% | 66.70% | 61.70% | 64.50% | 65.50% | 64.48% |
| N.W. NAT'L GAS | 49.90% | 50.90% | 53.20% | 51.50% | 52.50% | 51.60% |
| PEOPLES ENERGY | 59.60%. | 64.90% | 55.60% | 59.30% | 53.50% | 58.58% |
| PIEDMONT NAT'L | 53.80% | 53.90% | 52.40% | 56.10% | 59.00% | 55.04% |
| SEMCO ENERGY | 45.60% | 23.20% | 19.20% | 17.90% | 32.00% | 27.58% |
| SOUTH JERSEY INDS. | 37.00% | 37.60% | 35.90% | 46.10% | 48.00% | 40.92% |
| SOUTHERN UNION | 38.00% | 46.90% | 33.60% | 36.70% | 35.00% | 38.04% |
| SOUTHWEST GAS | 35.50% | 35.80% | 39.60% | 34.10% | 36.50% | 36.30% |
| UGI CORP. | 19.80% | 19.10% | 17.40% | 21.70% | 29.00% | 21.40% |
| WGL | 56.10% | 54.80% | 56.30% | 52.40% | 55.80% | 55.08% |
| **Average** | **48.4%** | **47.3%** | **44.0%** | **44.8%** | **47.7%** | **46.4%** |
| **Median** | **49.6%** | **49.9%** | **47.5%** | **46.8%** | **48.7%** | **47.8%** |

Source: Most Current Value Line at Time of Preparation

*Value of $100 invested at end of of 1925*

| | Large Company Stocks | Long-Term Corporate Bonds | Long-term Government Bonds | Intermediate Term Government Bonds | U.S. Treasury Bills | Inflation | *Large Company Stocks* | *Long-Term Corporate Bonds* | *Long-term Government Bonds* | *Intermediate Term Government Bonds* | *U.S. Treasury Bills* | *Inflation* | $100 Investment Esc. at Pub. Ut. Geom. Averag | $100 Investment Esc at Pub. Ut. Arithmetic Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1925 | | | | | | | 100 | 100 | 100 | 100 | 100 | 100 | | |
| 1926 | 11.62% | 7.37% | 7.77% | 5.38% | 3.27% | -1.49% | 111.62 | 107.37 | 107.77 | 105.38 | 103.27 | 98.51 | 111.35 | 112.65 |
| 1927 | 37.49% | 7.44% | 8.93% | 4.52% | 3.12% | -2.08% | 153.47 | 115.38 | 117.39 | 110.14 | 106.49 | 96.48 | 123.98 | 126.91 |
| 1928 | 43.61% | 2.84% | 0.10% | 0.92% | 3.56% | -0.97% | 220.39 | 118.63 | 117.51 | 111.16 | 110.28 | 95.53 | 138.05 | 142.97 |
| 1929 | -8.42% | 3.27% | 3.42% | 6.01% | 4.75% | 0.20% | 201.84 | 122.51 | 121.53 | 117.84 | 115.52 | 95.72 | 153.71 | 161.05 |
| 1930 | -24.90% | 7.98% | 4.66% | 6.72% | 2.41% | -6.03% | 151.58 | 132.29 | 127.19 | 125.76 | 118.31 | 89.94 | 171.16 | 181.43 |
| 1931 | -43.34% | -1.85% | -5.31% | -2.32% | 1.07% | -9.52% | 85.88 | 129.84 | 120.44 | 122.84 | 119.57 | 81.36 | 190.58 | 204.39 |
| 1932 | -8.19% | 10.82% | 16.84% | 8.81% | 0.96% | -10.30% | 78.85 | 143.89 | 140.72 | 133.66 | 120.72 | 73.00 | 212.20 | 230.25 |
| 1933 | 53.99% | 10.38% | -0.07% | 1.83% | 0.30% | 0.51% | 121.42 | 158.83 | 140.62 | 136.11 | 121.08 | 73.37 | 236.28 | 259.39 |
| 1934 | -1.44% | 13.84% | 10.03% | 9.00% | 0.16% | 2.03% | 119.67 | 180.81 | 154.73 | 148.36 | 121.28 | 74.86 | 263.09 | 292.21 |
| 1935 | 47.67% | 9.61% | 4.98% | 7.01% | 0.17% | 2.99% | 176.72 | 198.19 | 162.43 | 158.76 | 121.48 | 77.10 | 292.94 | 329.18 |
| 1936 | 33.92% | 6.74% | 7.52% | 3.06% | 0.18% | 1.21% | 236.67 | 211.54 | 174.65 | 163.61 | 121.70 | 78.03 | 326.18 | 370.83 |
| 1937 | -35.03% | 2.76% | 0.23% | 1.56% | 0.31% | 3.10% | 153.76 | 217.36 | 175.05 | 166.17 | 122.08 | 80.45 | 363.19 | 417.75 |
| 1938 | 31.12% | 6.13% | 5.53% | 6.23% | -0.02% | -2.78% | 201.61 | 230.69 | 184.73 | 176.52 | 122.05 | 78.22 | 404.41 | 470.61 |
| 1939 | -0.41% | 3.97% | 5.94% | 4.52% | 0.02% | -0.48% | 200.79 | 239.84 | 195.70 | 184.50 | 122.08 | 77.84 | 450.29 | 530.16 |
| 1940 | -9.78% | 3.39% | 6.09% | 2.96% | 0.00% | 0.96% | 181.15 | 247.97 | 207.62 | 189.96 | 122.08 | 78.59 | 501.39 | 597.24 |
| 1941 | -11.59% | 2.73% | 0.93% | 0.50% | 0.06% | 9.72% | 160.15 | 254.74 | 209.55 | 190.91 | 122.15 | 86.23 | 558.28 | 672.61 |
| 1942 | 20.34% | 2.60% | 3.22% | 1.94% | 0.27% | 9.29% | 192.73 | 261.37 | 216.30 | 194.61 | 122.48 | 94.24 | 621.63 | 757.94 |
| 1943 | 25.90% | 2.83% | 2.08% | 2.81% | 0.35% | 3.16% | 242.65 | 268.76 | 220.80 | 200.08 | 122.91 | 97.21 | 692.16 | 853.85 |
| 1944 | 19.75% | 4.73% | 2.81% | 1.80% | 0.33% | 2.11% | 290.57 | 281.46 | 227.00 | 203.68 | 123.31 | 99.26 | 770.70 | 961.89 |
| 1945 | 36.44% | 4.08% | 10.73% | 2.22% | 0.33% | 2.25% | 396.45 | 292.96 | 251.36 | 208.20 | 123.72 | 101.50 | 858.15 | 1,083.60 |
| 1946 | -8.07% | 1.72% | -0.10% | 1.00% | 0.35% | 18.16% | 364.46 | 298.00 | 251.11 | 210.28 | 124.15 | 119.93 | 955.53 | 1,220.71 |
| 1947 | 5.71% | -2.34% | -2.62% | 0.91% | 0.50% | 9.01% | 385.27 | 291.03 | 244.53 | 212.20 | 124.78 | 130.74 | 1,063.95 | 1,375.16 |
| 1948 | 5.50% | 4.14% | 3.40% | 1.85% | 0.81% | 2.71% | 406.46 | 303.07 | 252.84 | 216.12 | 125.79 | 134.28 | 1,184.67 | 1,549.16 |
| 1949 | 18.79% | 3.31% | 6.45% | 2.32% | 1.10% | -1.80% | 482.83 | 313.11 | 269.15 | 221.14 | 127.17 | 131.86 | 1,319.10 | 1,745.16 |
| 1950 | 31.71% | 2.12% | 0.06% | 0.70% | 1.20% | 5.79% | 635.94 | 319.74 | 269.31 | 222.69 | 128.70 | 139.50 | 1,468.78 | 1,966.00 |
| 1951 | 24.02% | -2.69% | -3.93% | 0.36% | 1.49% | 5.87% | 788.69 | 311.14 | 258.73 | 223.49 | 130.61 | 147.69 | 1,635.44 | 2,214.76 |
| 1952 | 18.37% | 3.52% | 1.16% | 1.63% | 1.66% | 0.88% | 933.57 | 322.10 | 261.73 | 227.13 | 132.78 | 148.99 | 1,821.01 | 2,495.00 |
| 1953 | -0.99% | 3.41% | 3.64% | 3.23% | 1.82% | 0.62% | 924.33 | 333.08 | 271.26 | 234.47 | 135.20 | 149.91 | 2,027.64 | 2,810.70 |
| 1954 | 52.62% | 5.39% | 7.19% | 2.68% | 0.86% | -0.50% | 1,410.71 | 351.03 | 290.76 | 240.76 | 136.36 | 149.16 | 2,257.71 | 3,166.34 |
| 1955 | 31.56% | 0.48% | -1.29% | -0.65% | 1.57% | 0.37% | 1,855.94 | 352.72 | 287.01 | 239.19 | 138.50 | 149.71 | 2,513.89 | 3,566.98 |
| 1956 | 6.56% | -6.81% | -5.59% | -0.42% | 2.46% | 2.86% | 1,977.68 | 328.70 | 270.97 | 238.18 | 141.91 | 153.99 | 2,799.14 | 4,018.32 |
| 1957 | -10.78% | 8.71% | 7.46% | 7.84% | 3.14% | 3.02% | 1,764.49 | 357.33 | 291.16 | 256.85 | 146.36 | 158.64 | 3,116.76 | 4,526.76 |
| 1958 | 43.36% | -2.22% | -6.09% | -1.29% | 1.54% | 1.76% | 2,529.57 | 349.39 | 273.45 | 253.54 | 148.62 | 161.44 | 3,470.42 | 5,099.54 |
| 1959 | 11.96% | -0.97% | -2.26% | -0.39% | 2.95% | 1.50% | 2,832.11 | 346.00 | 267.27 | 252.55 | 153.00 | 163.86 | 3,864.20 | 5,744.80 |
| 1960 | 0.47% | 9.07% | 13.78% | 11.76% | 2.66% | 1.48% | 2,845.42 | 377.39 | 304.10 | 282.25 | 157.07 | 166.28 | 4,302.67 | 6,471.69 |
| 1961 | 26.89% | 4.82% | 0.97% | 1.85% | 2.13% | 0.67% | 3,610.55 | 395.58 | 307.05 | 287.47 | 160.42 | 167.40 | 4,790.89 | 7,290.57 |
| 1962 | -8.73% | 7.95% | 6.89% | 5.56% | 2.73% | 1.22% | 3,296.35 | 427.03 | 328.20 | 303.46 | 164.80 | 169.44 | 5,334.51 | 8,213.05 |
| 1963 | 22.80% | 2.19% | 1.21% | 1.64% | 3.12% | 1.65% | 4,046.69 | 436.38 | 332.17 | 308.43 | 169.94 | 172.23 | 5,939.81 | 9,252.27 |
| 1964 | 16.48% | 4.77% | 3.51% | 4.04% | 3.54% | 1.19% | 4,713.59 | 457.19 | 343.83 | 320.90 | 175.96 | 174.28 | 6,613.80 | 10,422.07 |
| 1965 | 12.45% | -0.46% | 0.71% | 1.02% | 3.93% | 1.92% | 5,300.43 | 455.09 | 346.27 | 324.17 | 182.87 | 177.63 | 7,364.26 | 11,741.80 |
| 1966 | -10.06% | 0.20% | 3.65% | 4.69% | 4.76% | 3.35% | 4,767.21 | 456.00 | 358.91 | 339.37 | 191.58 | 183.58 | 8,199.88 | 13,227.51 |
| 1967 | 23.98% | -4.95% | -9.18% | 1.01% | 4.21% | 3.04% | 5,910.38 | 433.43 | 325.97 | 342.80 | 199.64 | 189.16 | 9,130.31 | 14,901.21 |
| 1968 | 11.06% | 2.57% | -0.26% | 4.54% | 5.21% | 4.72% | 6,564.07 | 444.57 | 325.12 | 358.36 | 210.04 | 198.09 | 10,168.32 | 16,786.68 |
| 1969 | -8.50% | -8.09% | -5.07% | -0.74% | 6.58% | 6.11% | 6,006.13 | 408.60 | 308.63 | 355.71 | 223.86 | 210.19 | 11,319.88 | 18,910.73 |
| 1970 | 4.01% | 18.37% | 12.11% | 16.86% | 6.52% | 5.49% | 6,246.97 | 483.86 | 346.01 | 415.68 | 238.46 | 221.73 | 12,604.34 | 21,303.53 |
| 1971 | 14.31% | 11.01% | 13.23% | 8.72% | 4.39% | 3.36% | 7,140.91 | 536.91 | 391.79 | 451.93 | 248.93 | 229.18 | 14,034.55 | 23,999.10 |
| 1972 | 18.98% | 7.26% | 5.69% | 5.16% | 3.84% | 3.41% | 8,496.26 | 575.89 | 414.08 | 475.25 | 258.49 | 237.00 | 15,627.04 | 27,035.75 |
| 1973 | -14.66% | 1.14% | -1.11% | 4.61% | 6.93% | 8.80% | 7,250.71 | 582.46 | 409.48 | 497.16 | 276.40 | 257.85 | 17,400.22 | 30,456.63 |
| 1974 | -26.47% | -3.06% | 4.35% | 5.69% | 8.00% | 12.20% | 5,331.44 | 564.63 | 427.30 | 525.45 | 298.51 | 289.31 | 19,374.61 | 34,310.35 |
| 1975 | 37.20% | 14.64% | 9.20% | 7.83% | 5.80% | 7.01% | 7,314.74 | 647.30 | 466.61 | 566.59 | 315.82 | 309.59 | 21,573.04 | 38,651.69 |
| 1976 | 23.84% | 18.65% | 16.75% | 12.87% | 5.08% | 4.81% | 9,058.58 | 768.02 | 544.76 | 639.51 | 331.67 | 324.48 | 24,020.91 | 43,542.35 |
| 1977 | -7.18% | 1.71% | -0.69% | 1.41% | 5.12% | 6.77% | 8,408.17 | 781.15 | 541.01 | 648.53 | 348.66 | 346.45 | 26,746.55 | 49,051.84 |
| 1978 | 6.56% | -0.07% | -1.18% | 3.49% | 7.18% | 9.03% | 8,959.75 | 780.60 | 534.62 | 671.16 | 373.91 | 377.74 | 29,781.46 | 55,258.44 |
| 1979 | 18.44% | -4.18% | -1.23% | 4.09% | 10.38% | 13.31% | 10,611.92 | 747.97 | 528.05 | 698.61 | 412.72 | 428.01 | 33,160.74 | 62,250.36 |
| 1980 | 32.42% | -2.76% | -3.95% | 3.91% | 11.24% | 12.40% | 14,052.31 | 727.33 | 507.19 | 725.93 | 459.11 | 481.09 | 36,923.46 | 70,127.02 |
| 1981 | -4.91% | -1.24% | 1.86% | 9.45% | 14.71% | 8.94% | 13,362.34 | 718.31 | 516.62 | 794.63 | 526.64 | 524.10 | 41,113.14 | 79,000.30 |
| 1982 | 21.41% | 42.56% | 40.36% | 29.10% | 10.54% | 3.87% | 16,223.22 | 1,024.03 | 725.13 | 1,025.74 | 582.15 | 544.38 | 45,778.21 | 88,996.33 |
| 1983 | 22.51% | 6.26% | 0.65% | 7.41% | 8.80% | 3.80% | 19,875.06 | 1,088.13 | 729.84 | 1,101.74 | 633.38 | 565.07 | 50,972.63 | 100,257.18 |
| 1984 | 6.27% | 16.86% | 15.48% | 14.02% | 9.85% | 3.95% | 21,121.23 | 1,271.59 | 842.82 | 1,256.21 | 695.77 | 587.39 | 56,756.46 | 112,942.88 |
| 1985 | 32.16% | 30.09% | 30.97% | 20.33% | 7.72% | 3.77% | 27,913.82 | 1,654.21 | 1,103.85 | 1,511.59 | 749.48 | 609.53 | 63,196.57 | 127,233.72 |
| 1986 | 18.47% | 19.85% | 24.53% | 15.14% | 6.16% | 1.13% | 33,069.50 | 1,982.57 | 1,374.62 | 1,740.45 | 795.65 | 616.42 | 70,367.44 | 143,332.60 |
| 1987 | 5.23% | -0.27% | -2.71% | 2.90% | 5.47% | 4.41% | 34,799.04 | 1,977.22 | 1,337.37 | 1,790.92 | 839.17 | 643.60 | 78,351.98 | 161,468.93 |
| 1988 | 16.81% | 10.70% | 9.67% | 6.10% | 6.35% | 4.42% | 40,646.75 | 2,188.78 | 1,466.69 | 1,900.17 | 892.46 | 672.05 | 87,242.52 | 181,899.85 |
| 1989 | 31.49% | 16.23% | 18.11% | 13.29% | 8.37% | 4.65% | 53,449.05 | 2,544.02 | 1,732.31 | 2,152.70 | 967.16 | 703.30 | 97,141.66 | 204,915.92 |
| 1990 | -3.17% | 6.78% | 6.18% | 9.73% | 7.81% | 6.11% | 51,754.71 | 2,716.50 | 1,839.36 | 2,362.16 | 1,042.70 | 746.27 | 108,164.48 | 230,844.26 |
| 1991 | 30.55% | 19.89% | 19.30% | 15.46% | 5.60% | 3.06% | 67,565.78 | 3,256.61 | 2,194.36 | 2,727.35 | 1,101.09 | 769.11 | 120,437.82 | 260,053.35 |
| 1992 | 7.67% | 9.39% | 8.05% | 7.19% | 3.51% | 2.90% | 72,746.07 | 3,562.63 | 2,371.01 | 2,923.44 | 1,139.73 | 791.41 | 134,103.81 | 292,958.31 |
| 1993 | 9.99% | 13.19% | 18.24% | 11.24% | 2.90% | 2.75% | 80,015.61 | 4,032.54 | 2,803.46 | 3,252.04 | 1,172.79 | 813.17 | 149,320.46 | 330,028.76 |
| 1994 | 1.31% | -5.76% | -7.77% | -5.14% | 3.90% | 2.67% | 81,063.81 | 3,800.26 | 2,585.65 | 3,084.88 | 1,218.53 | 834.89 | 166,263.74 | 371,785.59 |
| 1995 | 37.43% | 27.20% | 31.67% | 16.80% | 5.60% | 2.54% | 111,405.99 | 4,833.94 | 3,404.52 | 3,603.14 | 1,286.76 | 856.09 | 185,129.56 | 418,828.21 |
| 1996 | 23.07% | 1.40% | -0.93% | 2.10% | 5.21% | 3.32% | 137,107.36 | 4,901.61 | 3,372.86 | 3,678.81 | 1,353.60 | 884.51 | 206,136.08 | 471,823.21 |
| 1997 | 33.36% | 12.95% | 15.85% | 8.38% | 5.26% | 1.70% | 182,846.37 | 5,536.37 | 3,907.46 | 3,987.10 | 1,425.01 | 899.55 | 229,526.18 | 531,523.74 |
| 1998 | 28.58% | 10.76% | 13.06% | 10.21% | 4.86% | 1.61% | 235,103.86 | 6,132.06 | 4,417.77 | 4,394.18 | 1,494.27 | 914.03 | 255,570.34 | 598,778.28 |
| 1999 | 21.04% | -7.45% | -8.96% | -1.77% | 4.68% | 2.68% | 284,569.72 | 5,675.24 | 4,021.94 | 4,316.40 | 1,564.20 | 938.53 | 284,569.72 | 674,542.64 |
| 2000 | -9.11% | 12.67% | 21.48% | 12.59% | 5.89% | 3.39% | 258,646.41 | 6,405.65 | 4,885.66 | 4,859.84 | 1,656.33 | 970.35 | 316,859.63 | 759,893.59 |
| 2001 | -11.88% | 10.65% | 3.70% | 7.62% | 3.83% | 1.55% | 227,916.34 | 7,087.85 | 5,088.63 | 5,230.16 | 1,719.77 | 985.39 | 352,813.45 | 856,044.12 |
| Arithmetic Mean | 12.65% | 6.09% | 5.69% | 5.49% | 3.88% | 3.15% | 11.35% Geometric Mean | 5.61% Geometric Mean | 5.12% Geometric Mean | 5.22% Geometric Mean | 3.79% Geometric Mean | 3.07% Geometric Mean | | |

Source of data:
Ibbotson Associates Stocks, Bonds, Bills, and Inflation 2002 Yearbook

30 Year Moving Average

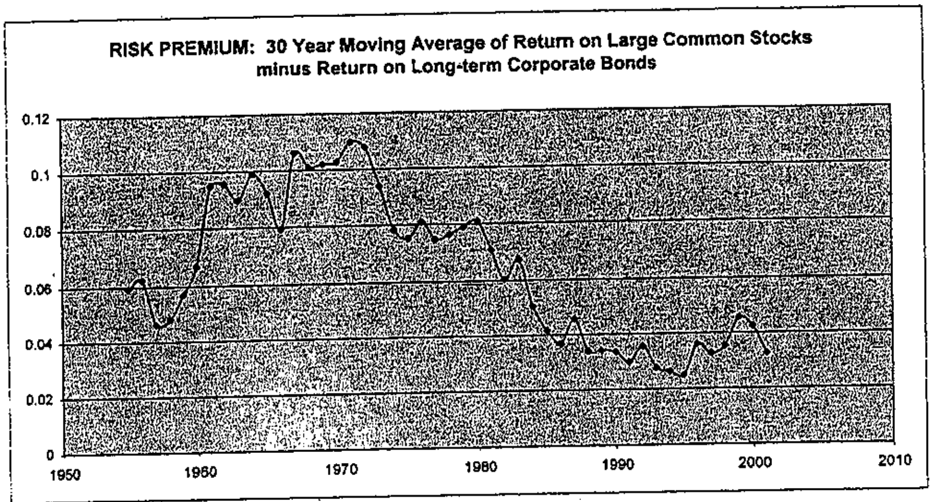
| Returns on Large Company Stocks Bonds | Returns on Long-Term Corporate Bonds Bonds | Returns on Long-term Government Bonds Government Bills | Returns on Intermediate Term Government Bills | Returns on U.S. Treasury |
|---|---|---|---|---|
| 10.23% | 4.29% | 3.58% | 2.95% | 1.09% |
| 10.06% | 3.80% | 3.12% | 2.76% | 1.07% |
| 8.48% | 3.84% | 3.07% | 2.86% | 1 07% |
| 8.47% | 3.67% | 2.88% | 2.79% | 1.00% |
| 9.20% | 3.52% | 2.66% | 2.57% | 0.94% |
| 10.27% | 3.56% | 2.95% | 2.73% | 0.95% |
| 13.27% | 3.76% | 3.17% | 2.87% | 0.98% |
| 13.26% | 3.89% | 2.86% | 2 77% | 1.04% |
| 12.40% | 3.43% | 2.91% | 2.76% | 1.14% |
| 13.03% | 3.14% | 2.70% | 2.61% | 1.25% |
| 12.00% | 2.81% | 2.56% | 2.41% | 1.37% |
| 10.53% | 2.59% | 2.43% | 2.46% | 1.52% |
| 12.93% | 2.33% | 2.09% | 2 44% | 1.65% |
| 12.31% | 2.21% | 1.90% | 2.39% | 1.83% |
| 11.99% | 1.79% | 1.53% | 2 21% | 2.04% |
| 12.53% | 2.25% | 1.72% | 2 64% | 2.26% |
| 13.49% | 2.52% | 2.11% | 2.91% | 2 40% |
| 13.45% | 2.67% | 2.19% | 3 02% | 2 52% |
| 11.99% | 2.81% | 2.08% | 3.08% | 2.74% |
| 10.16% | 2.35% | 2.13% | 3.21% | 2 99% |
| 10.20% | 2.66% | 2.08% | 3.39% | 3 17% |
| 11.30% | 3.21% | 2.62% | 3.78% | 3.33% |
| 10.62% | 3.35% | 2.68% | 3 79% | 3.49% |
| 10.86% | 3.20% | 2.53% | 3.85% | 3.70% |
| 10.85% | 2.95% | 2.27% | 3.91% | 4.00% |
| 10.87% | 2.78% | 2.13% | 4.02% | 4.33% |
| 9.69% | 2.83% | 2.33% | 4 32% | 4.76% |
| 9.98% | 3.93% | 3.46% | 5.15% | 5.05% |
| 10.77% | 4.03% | 3.35% | 5.29% | 5 28% |
| 9.44% | 4.38% | 3.61% | 5.66% | 5.58% |
| 9.46% | 5.29% | 4.59% | 6 34% | 5 79% |
| 9.84% | 6.17% | 5.56% | 6.85% | 5.91% |
| 10.45% | 6.87% | 5.21% | 6.69% | 5 99% |
| 9.70% | 6.31% | 5.76% | 6.94% | 6 16% |
| 10.29% | 6.88% | 6.43% | 7 40% | 6.34% |
| 10.15% | 6.80% | 6.18% | 7.34% | 6.51% |
| 10.26% | 7.28% | 6.78% | 7 79% | 6.63% |
| 10.87% | 7.33% | 6.81% | 7.64% | 6 66% |
| 10.48% | 7.69% | 7.37% | 8 17% | 6.65% |
| 9.95% | 7.31% | 6.96% | 7.64% | 6 66% |
| 10.68% | 8.19% | 7.92% | 8.36% | 6 72% |
| 11.85% | 8.24% | 7.75% | 8.27% | 6.74% |
| 12.12% | 8.86% | 8.63% | 8.52% | 6 77% |
| 12.67% | 9.14% | 9.09% | 8.71% | 6.76% |
| 13.72% | 9.17% | 8.93% | 8 68% | 6.89% |
| 13.21% | 8.99% | 9.23% | 8.54% | 6.87% |
| 12.24% | 8.98% | 8.91% | 8.50% | 6.85% |

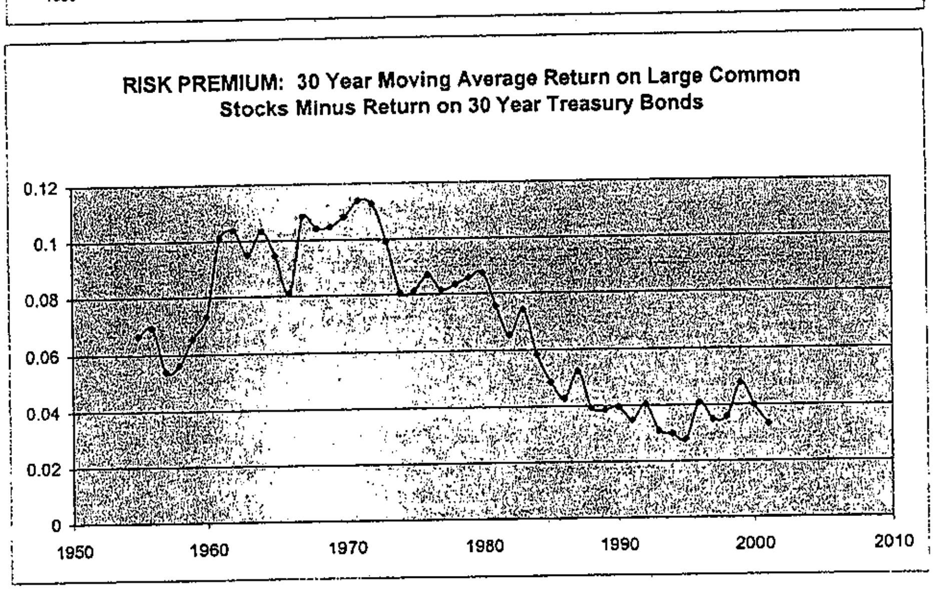
Source: Schedule JAR 10, P. 4

30 Year Moving Average

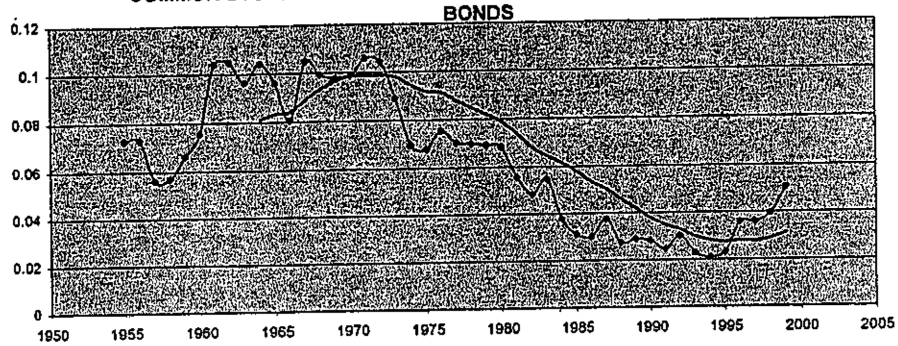
Risk Premium

| | Large Stocks vs. Long-Term Corporate Bonds | Large Stocks vs Long-term Government Bonds | Intermediate Term Government | U.S. Treasury Bills |
|---|---|---|---|---|
| 1955 | 5.94% | 6.65% | 7.28% | 9.13% |
| 1956 | 6.26% | 6.93% | 7.30% | 8.99% |
| 1957 | 4.64% | 5 41% | 5.62% | 7.42% |
| 1958 | 4.81% | 5.62% | 5.69% | 7.48% |
| 1959 | 5.66% | 6.54% | 6.63% | 8.26% |
| 1960 | 6.71% | 7.32% | 7.54% | 9.32% |
| 1961 | 9.49% | 10.10% | 10.40% | 12.29% |
| 1962 | 9.56% | 10.39% | 10.46% | 12.21% |
| 1963 | 8.97% | 9.49% | 9.63% | 11.26% |
| 1964 | 9.69% | 10.33% | 10.42% | 11.78% |
| 1965 | 9.19% | 9.45% | 9.60% | 10.63% |
| 1966 | 7.93% | 8.10% | 8.07% | 9.00% |
| 1967 | 10.61% | 10.84% | 10 49% | 11.28% |
| 1968 | 10.10% | 10.41% | 9.92% | 10.48% |
| 1969 | 10.20% | 10.46% | 9.76% | 9.95% |
| 1970 | 10.27% | 10.61% | 9.66% | 10.27% |
| 1971 | 10.98% | 11.39% | 10.56% | 11.09% |
| 1972 | 10.76% | 11.26% | 10.43% | 10.93% |
| 1973 | 9.38% | 9.91% | 8.91% | 9.25% |
| 1974 | 7.84% | 8.05% | 6.97% | 7.19% |
| 1975 | 7.53% | 8.12% | 6.81% | 7.03% |
| 1976 | 8.10% | 8.69% | 7.53% | 7.97% |
| 1977 | 7.46% | 8.14% | 7.03% | 7.34% |
| 1978 | 7.66% | 8.33% | 7.01% | 7.16% |
| 1979 | 7.90% | 8.58% | 6.94% | 6 85% |
| 1980 | 8.09% | 8.74% | 6.65% | 6.54% |
| 1981 | 7.06% | 7.58% | 5.57% | 5.13% |
| 1982 | 6.05% | 6.53% | 4.63% | 4.93% |
| 1983 | 6.74% | 7 41% | 5.48% | 5.49% |
| 1984 | 5.06% | 5.83% | 3 78% | 3.66% |
| 1985 | 4.17% | 4.86% | 3.12% | 3.67% |
| 1986 | 3.67% | 4.29% | 2.99% | 3.93% |
| 1987 | 4.58% | 5.24% | 3.76% | 4.48% |
| 1988 | 3.39% | 3.94% | 2.75% | 3.54% |
| 1989 | 3.41% | 3.86% | 2.66% | 3.95% |
| 1990 | 3.35% | 3.97% | 2.61% | 3.64% |
| 1991 | 2.98% | 3 48% | 2.47% | 3.63% |
| 1992 | 3.54% | 4 05% | 3.02% | 4.21% |
| 1993 | 2.77% | 3.09% | 2.29% | 3.81% |
| 1994 | 2.63% | 2.99% | 2.11% | 3.28% |
| 1995 | 2.49% | 2.77% | 2.33% | 3.96% |
| 1996 | 3.61% | 4.09% | 3.58% | 5.11% |
| 1997 | 3.26% | 3.49% | 3.60% | 5.35% |
| 1998 | 3.53% | 3.58% | 3.95% | 5.91% |
| 1999 | 4.56% | 4.79% | 5.05% | 7.03% |
| 2000 | 4.22% | 3.99% | 4.67% | 6.54% |
| 2001 | 3.25% | 3.33% | 3.73% | 5.56% |
| | 5.74% | 6.23% | 6.13% | 7.56% |

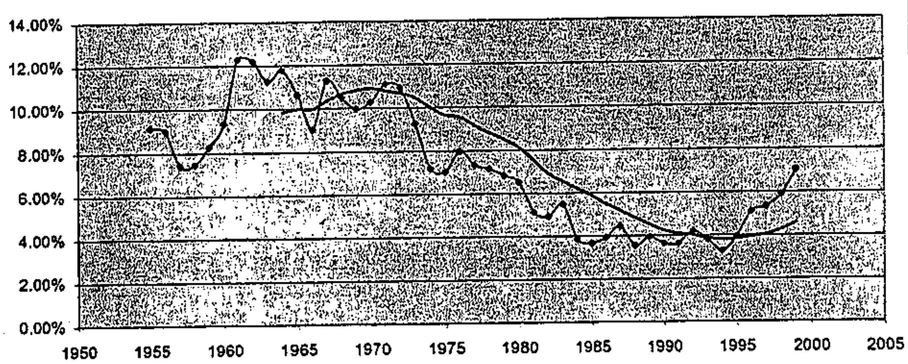

RISK PREMIUM: 30 Year Moving Average of Return on Large Common Stocks minus Return on Long-term Corporate Bonds
0.12
0.1
0.08
0.06
0.04
0.02
0
1950
1960
1970
1980
1990
2000
2010


RISK PREMIUM: 30 Year Moving Average Return on Large Common Stocks Minus Return on 30 Year Treasury Bonds
0.12
0.1
0.08
0.06
0.04
0.02
0
1950
1960
1970
1980
1990
2000
2010

RISK PREMIUM: 30 YEAR MOVING AVERAGE OF RETURN ON LARGE COMMON STOCKS MINUS RETURN ON INTERMEDIATE TERM TREASURY BONDS




RISK PREMIUM; 30-YEAR MOVING AVERAGE OF RETURN ON LARGE COMMON STOCKS VERSUS RETURN ON SHORT-TERM TREASURY BILLS



**South Jersey Gas Company**
**Average Capital Structure for Year Ending February 2004**

| Amounts (000 Omitted) | Long-term Debt | Short-term Debt | Preferred Stock | Common Equity | TOTAL CAPITAL | SJG Percent Common Before Dividend Correction | SJI Percent Common |
|---|---|---|---|---|---|---|---|
| 2002 | | | | | | | |
| 2003 March | $ 203,712 | $ 5,600 | $ 36,690 | $ 242,347 | $ 488,349 | 49.6% | |
| 2003 April | $ 201,439 | $ 98,500 | $ 36,690 | $ 244,282 | $ 580,911 | 42.1% | |
| 2003 May | $ 194,054 | $ 118,500 | $ 36,690 | $ 243,850 | $ 593,094 | 41.1% | |
| 2003 June | $ 194,054 | $ 112,212 | $ 36,690 | $ 242,775 | $ 585,731 | 41.4% | |
| 2003 July | $ 276,404 | $ 48,941 | $ 36,690 | $ 241,453 | $ 603,488 | 40.0% | |
| 2003 August | $ 276,404 | $ 61,363 | $ 36,690 | $ 240,262 | $ 614,719 | 39.1% | |
| 2003 September | $ 269,054 | $ 77,866 | $ 36,690 | $ 239,442 | $ 623,052 | 38.4% | 37.1% |
| 2003 October | $ 269,054 | $ 81,586 | $ 36,690 | $ 247,621 | $ 634,951 | 39.0% | |
| 2003 November | $ 269,054 | $ 91,882 | $ 36,690 | $ 251,058 | $ 648,684 | 38.7% | |
| 2003 December | $ 269,054 | $ 92,745 | $ 36,690 | $ 256,853 | $ 655,342 | 39.2% | |
| 2004 January | $ 269,054 | $ 86,204 | $ 1,690 | $ 277,063 | $ 634,011 | 43.7% | |
| 2004 February | $ 264,554 | $ 85,825 | $ 1,690 | $ 282,366 | $ 634,435 | 44.5% | |
| AVERAGE | $ 246,324 | $ 80,102 | $ 30,857 | $ 250,781 | $ 608,064 | | |
| YEAR END BALANCE | $ 264,554 | $ 85,825 | $ 1,690 | $ 282,366 | | | |
| Proper Dividend Allocation | $ 32,839 | | | $ (32,839) | | | |
| Adjustment to Average ST Debt | | $ (5,723) | | | | | |
| Adjustment to Average Comm. Equity | | | | | | | |
| | $ 297,393 | $ 80,102 | $ 1,690 | $ 249,527 | $ 628,712 | | |
| Capital Stucture Percent | 47.30% | 12.74% | 0.27% | 39.69% | | | |

Source of Proper Dividend Allocation Schedule JAR 11, P. 2

**SJG AND SJI**
**DIVIDEND HISTORY**
**AND COMPUTATION OF APPROPRIATE ADJUSTMENT**

(Dollars in Thousands)

| | | SJI | | | SJG | Dividend Mis-Allocation |
|---|---|---|---|---|---|---|
| | | Common Dividends Per Share [A] | Shares Outstanding (Millions) [A] | [B] | [C] | |
| | 2001 | $ 1.475 | 11.86 | $17,493.50 | $ 17,500.4 | |
| | 2002 | $ 1.495 | 12.21 | $18,253.95 | $ 10,700.1 | $ 7,553.85 |
| | 2003 | $ 1.540 | 13.00 | $20,020.00 | $ - | $ 20,020.00 |
| First quarte | 2004 | 0.405 | 13.00 | $5,265.00 | | $ 5,265.00 |
| | | | | | | $ 32,838.85 |

Source:

[A] SJI Numbers Obtained from Value Line
Value Line indicates that regular 1 q 2004 dividend was declared in 2003. Above table reflects this 2003 4q dividend in the 2004 rather than in 2003.

[B] Common Dividends Per Share X Shares Outstanding

[C] SJG from 2001 through 2003 from RAR-ROR-55
2004 Estimated.

**South Jersey Industries**

**Capital Structure**
**(000 Omitted)**

| | Sept. 30 2003 | Sept. 30 2002 | 31-Dec 2002 |
|---|---|---|---|
| Notes Payable | 96,400 | 133,500 | 166,500 |
| | | | |
| Current Maturities LTD | 8,423 | 12,884 | 10,696 |
| LTD | 328,560 | 289,446 | 274,098 |
| Total LT Debt | 336,983 | 302,330 | 284,794 |
| | | | |
| Common Equity | | | |
| Common Stock | 15,885 | 15,135 | 15,258 |
| Premium on Common Stock | 167,221 | 147,513 | 150,434 |
| Accumulated Other Comprehensive Loss | (13,110) | (1,581) | (5,902) |
| Retained Earnings | 85,621 | 70,752 | 78,002 |
| | 255,617 | 231,819 | 237,792 |
| | | | |
| TOTAL CAPITAL | 689,000 | 667,649 | 689,086 |
| | | | |
| Percent Common | 37:10% | 34.72% | 34.51% |

Source: SEC 10 Q Report of SJI
Obtained from sec.gov website.

**Historic Capital Structure Information**
**South Jersey Industries and South Jersey Gas**

| | | 2002 | 2001 | 2000 | 1999 | 1998 | Source |
|---|---|---|---|---|---|---|---|
| **TOTAL CAPITAL ($Millions)** | | | | | | | |
| 1 SJI | | 689.7 | 678.3 | 576.6 | 534.7 | 507 | RAR-ROR-52 |
| 2 SJG | | 614.5 | 618.2 | 564.7 | 530.5 | 500.7 | Exhibit PRM-1, Schedule 2, Page 1 |
| 3 SJI Net of SJG | | 75.2 | 60.1 | 11.9 | 4.2 | 6.3 | Row 1 - Row 2 |
| **CAPITAL STRUCTURE RATIOS** | | | | | | | |
| 4 SJI | Total Debt | 65.30% | 67.30% | 64.70% | 65.00% | 66.20% | RAR-ROR-52 |
| 5 | Preferred Stock | 0.20% | 0.20% | 0.30% | 0.40% | 0.40% | RAR-ROR-52 |
| 6 | Common Equity | 34.50% | 32.50% | 35.00% | 34.60% | 33.40% | RAR-ROR-52 |
| 7 | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | |
| 8 SJG | Total Debt | 59.20% | 60.70% | 58.60% | 58.70% | 60.00% | Exhibit PRM-1, Schedule 2, Page 1 |
| 9 | Preferred Stock | 6.00% | 5.90% | 6.50% | 7.00% | 7.40% | Exhibit PRM-1, Schedule 2, Page 1 |
| 10 | Common Equity | 34.90% | 33.30% | 34.90% | 34.30% | 32.50% | Exhibit PRM-1, Schedule 2, Page 1 |
| 11 | | 100.10% | 99.90% | 100.00% | 100.00% | 99.90% | |
| 12 SJI Net of SJG | Total Debt | 183.21% | 203.99% | 701.83% | 5945.97% | 1319.62% | |
| 13 | Preferred Stock | -78.01% | -91.58% | -611.23% | -6107.73% | -1388.49% | |
| 14 | Common Equity | -5.20% | -12.42% | 9.40% | 261.76% | 168.87% | |
| 15 | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | |
| **CAPITAL STRUCTURE AMOUNTS** | | | | | | | |
| 12 SJI | Total Debt | 450.4 | 456.5 | 373.1 | 347.6 | 335.6 | Line 1 x Line 4 |
| 13 | Preferred Stock | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Line 1 x Line 5 |
| 14 | Common Equity | 212.0 | 200.9 | 197.6 | 183.6 | 167.2 | Line 1 x Line 6 |
| 15 | TOTAL CAPITAL | 662.4 | 657.4 | 570.7 | 531.1 | 502.9 | Sum of Lines 12-14 |
| 16 SJG | Total Debt | 363.8 | 375.2 | 330.9 | 311.4 | 300.4 | Line 2 x Line 8 |
| 17 | Preferred Stock | 36.9 | 36.5 | 36.7 | 37.1 | 37.1 | Line 2 x Line 9 |
| 18 | Common Equity | 214.5 | 205.9 | 197.1 | 182.0 | 162.7 | Line 2 x Line 10 |
| 19 | TOTAL CAPITAL | 615.1 | 617.6 | 564.7 | 530.5 | 500.2 | Sum of Lines 16-18 |
| SJI Net of SJG | Total Debt | 86.6 | 81.2 | 42.1 | 36.2 | 35.2 | |
| | Preferred Stock | -36.9 | -36.5 | -36.7 | -37.1 | -37.1 | |
| | Common Equity | -2.5 | -4.9 | 0.6 | 1.6 | 4.5 | |
| | TOTAL CAPITAL | 47.3 | 39.8 | 6.0 | 0.6 | 2.7 | |

SJG Equity as % of SJI Equity

## Cost of Equity Impact of Federal Income Tax Reduction
### Summary

| Schedule JAR 11, P. 1 | After Tax Return New Tax Law | After Tax Return Old Tax Law | Cost of Equity Reduction |
|---|---|---|---|
| 1. Assuming Tax Law Temporary | 7.73% [A] | 7.61% [B] | 0.12% |
| 2. Assume Tax Law Permanent | 8.32% [C] | 7.61% [B] | 0.71% |
| 3. Assume 1-Year Holding Period | | | 0.86% [D] |
| 4. Tax Free Bond Analysis | | | 1.04% |
| | | Average | 0.95% |
| Recommended Cost of Equity Reduction | | | 0.50% |

[A] JAR 12, P.4
[B] JAR 12, P.2
[C] JAR 12, P.3
[D] JAR 12,P.5

**Cost of Equity Impact of Federal Income Tax Reduction**
**After Tax Cash Flow for Old Tax Law**

| | Source | Year 1 | Year 2 | Year 3 | Year 10 | Year 20 | Year 30 | Year 40 |
|---|---|---|---|---|---|---|---|---|
| **Before Tax Cash Flow to Investor** | | | | | | | | |
| Capital Gains (loss) | [A] | ($35.76) | | | | | | 241.72 |
| Dividends | [A] | | $1.46 | 1.54 | 2.16 | 3.53 | 5.77 | 9.41 |
| Before Tax Cash Flow to Investor | | $ (35.76) | $ 1.46 | $ 1.54 | $ 2.16 | $ 3.53 | $ 5.77 | $ 251.13 |
| *Before Tax Return (Old and New Tax Law)* | | 9.11% | | | | | | |
| Retention Rate | [B] | 35.36% | 35.36% | 35.36% | 35.36% | 35.36% | 35.36% | 35.36% |
| Future Expected Return on Book | [B] | 13.00% | 13.00% | 13.00% | 13.00% | 13.00% | 13.00% | 13.00% |
| Growth | [B] | 5.02% | 5.02% | 5.02% | 5.02% | 5.02% | 5.02% | 5.02% |
| Market to Book Ratio | [B] | 1.85 | 1.85 | 1.85 | 1.85 | 1.85 | 1.85 | 1.85 |
| Book Value | [C] | 19.31 | 20.28 | 21.30 | 30.01 | 48.99 | 79.96 | 130.53 |
| **Tax Rates -- Old** | | | | | | | | |
| Capital Gains | [D] | 20% | 20% | 20% | 20% | 20% | 20% | 20% |
| Dividends | [D] | 30% | 30% | 30% | 30% | 30% | 30% | 30% |
| **After Tax Cash Flow to Investor -- Old** | | | | | | | | |
| Capital Gains (loss) | | $ (35.76) | $ - | $ - | $ - | $ - | $ - | $ 200.53 |
| Dividends | | 0.00 | 1.02 | 1.07 | 1.51 | 2.47 | 4.04 | 6.59 |
| After Tax Cash Flow to Investor | | $ (35.76) | $ 1.02 | $ 1.07 | $ 1.51 | $ 2.47 | $ 4.04 | $ 207.12 |
| *After Tax Return Old Tax Law (Assume Permanent)* | | 7.61% | | | | | | |

Sources:

[A] OPC EX. (C)-3 P.1.
[B] OPC EX. (C)-4 P.3.
[C] Capital Gains (loss) / Market to Book Ratio
[D] 2003 U.S. Master Tax Guide

**Cost of Equity Impact of Federal Income Tax Reduction**
**After Tax Cash Flow for New Tax Law -- Assume Permanent**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Tax Rates -- New** | | | | | | | | |
| Capital Gains | [A] | 15% | 15% | 15% | 15% | 15% | 15% | 15% |
| Dividends | [A] | 15% | 15% | 15% | 15% | 15% | 15% | 15% |
| **After Tax Cash Flow to Investor -- New** | | | | | | | | |
| Capital Gains (loss) | | $ (35.76) | $ - | $ - | $ - | $ - | $ - | $ 210.83 |
| Dividends | | 0.00 | 1.24 | 1.31 | 1.84 | 3.00 | 4.90 | 8.00 |
| After Tax Cash Flow to Investor | | $ (35.76) | $ 1.24 | $ 1.31 | $ 1.84 | $ 3.00 | $ 4.90 | $ 218.83 |
| *After Tax Return New Tax Law* | | *8.32%* | | | | | | |

Sources:
[A] The Street.Com "Dear Dagen: Bush's Tax Cut and Your Porfolio" June 9, 2003

## Cost of Equity Impact of Federal Income Tax Reduction
## After Tax Cash Flow for New Tax Law -- Assume Temporary

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Tax Rates -- New & Change Back In 2009** | | | | | | | | |
| Capital Gains | [A] | 15% | 15% | 15% | 20% | 20% | 20% | 20% |
| Dividends | [A] | 15% | 15% | 15% | 30% | 30% | 30% | 30% |
| **After Tax Cash Flow to Investor -- New & Change Back In 2009** | | | | | | | | |
| Capital Gains (loss) | | $ (35.76) | $ - | $ - | $ - | $ - | $ - | $ 200.53 |
| Dividends | | 0.00 | 1.24 | 1.31 | 1.51 | 2.47 | 4.04 | 6.59 |
| After Tax Cash Flow to Investor | | $ (35.76) | $ 1.24 | $ 1.31 | $ 1.51 | $ 2.47 | $ 4.04 | $ 207.12 |
| *After Tax Return New Tax Law (Assume Temporary)* | | 7.73% | | | | | | |

Sources:
[A] The Street.Com "Dear Dagen: Bush's Tax Cut and Your Porfolio" June 9, 2003

**Cost of Equity Impact of Federal Income Tax Reduction**
**One Year Stock Return Analysis**

| | | | | |
|---|---|---|---|---|
| **Before Tax Cash Flow to Investor** | | | | |
| Capital Gains (loss) | [A] | $ (35.76) | 37.55 | |
| Dividends | [A] | 0.00 | 1.46 | 1.54 |
| Before Tax Cash Flow to Investor | | $ (35.76) | $ 39.01 | $ 1.54 |
| *Before Tax Return* | | 12.91% | | |
| **Tax Rates -- Old** | | | | |
| Capital Gains | [B] | 20% | 20% | 20% |
| Dividends | [B] | 30% | 30% | 30% |
| **After Tax Cash Flow to Investor -- Old** | | | | |
| Capital Gains (loss) | [A] | $ (35.76) | $ 37.19 | |
| Dividends | [A] | 0.00 | 1.02 | |
| After Tax Cash Flow to Investor | | $ (35.76) | $ 38.22 | $ - |
| *After Tax Return Old Tax Law* | | 6.88% | | |
| **Tax Rates -- New** | | | | |
| Capital Gains | [C] | 15% | 15% | 15% |
| Dividends | [C] | 15% | 15% | 15% |
| **After Tax Cash Flow to Investor -- New** | | | | |
| Capital Gains (loss) | [A] | $ (35.76) | $ 37.28 | |
| Dividends | [A] | 0.00 | 1.24 | |
| After Tax Cash Flow to Investor | | $ (35.76) | $ 38.53 | |
| *After Tax Return New Tax Law* | | 7.74% | | |
| **Difference** | | **0.86%** | | |

Sources:
[A] OPC EX. (C)-3 P.1.
[B] 2003 U.S. Master Tax Guide
[C] The Street.Com "Dear Dagen: Bush's Tax Cut and Your Porfolio" June 9, 2003

**Cost of Equity Impact of Federal Income Tax Reduction**
**One Year Stock Return Analysis**

| | |
|---|---|
| Interest Rate - AAA 20 Year Tax-Free Municipal Bond | 4.26% |
| Interest Rate - AAA 20 Year Corporate Bond | 5.52% |
| Spread | 1.26% |
| % Lower Interest Rate for Tax-Free Bond | 22.83% |
| *Before Tax Return (Old and New Tax Law)* | 9.11% |
| 14.34% Reduction of Before Tax Return | 2.08% |
| Approximate Percentage Tax Cut | *50.00%* |
| Cost of Equity Drop (50% X 1.38%) | *1.04%* |