Arnott, Robert, and Ronald Ryan. 2001. "The Death of the Risk Premium: Consequences of the 1990s." *Journal of Portfolio Management*, vol. 27, no. 3 (Spring):61–74.

Applying the dividend discount model to then-current (January 2000) valuations produces an equity risk premium of –0.9 percent, consisting of a real equity expected return of 3.2 percent minus a real Treasury Inflation-Protected Securities (TIPS) yield of 4.1 percent. A similar analysis of the equity risk premium at the end of 1925 shows that it was 2.7 percent. Pension funds, especially (because of their liability characteristics), should invest more in bonds given these estimates.

Avramov, Doron, and Tarun Chordia. 2006. "Predicting Stock Returns." *Journal of Financial Economics*, vol. 82, no. 2 (November):387–415. [added April 2008; abstract by Luis Garcia-Feijoo, CFA]

The authors construct optimal portfolios that allow for company-level equity expected returns, variances, and covariances to vary conditional on a set of macroeconomic variables. Predictability-based investments outperform static and dynamic investments in the market, the Fama–French plus momentum factors, and strategies that invest in stocks with similar size, book-to-market, and prior return characteristics. Returns on individual stocks are predictable out-of-sample because of alpha variation, not because of equity premium predictability.

Bansal, Ravi, and Amir Yaron. 2004. "Risk for the Long Run: A Potential Resolution of Asset Pricing Puzzles." *Journal of Finance*, vol. 59, no. 4 (August):1481–1509.

This article presents a model that can explain the equity risk premium. Dividend and, thus, consumption growth are assumed to consist of two components: a small persistent expected growth rate component and a time-varying economic uncertainty component. The authors show that the historical equity risk premium can be quantitatively justified by the model using a risk aversion parameter of 7.5 to 10.

Barberis, Nicholas, and Ming Huang. 2006. "The Loss Aversion/Narrow Framing Approach to the Equity Premium Puzzle." In *Handbook of Investments: Equity Risk Premium*. Edited by Rajnish Mehra. Amsterdam: North Holland.

The authors review the behavioral approach to understanding the ERP puzzle. The key elements of this approach are loss aversion and narrow framing, two well-known features of decision making under risk in experimental settings. By incorporating these features into traditional utility functions, Barberis and Huang show that a large equity premium and a low and stable risk-free rate can be generated simultaneously, even when consumption growth is smooth and only weakly correlated with the stock market.

Barberis, Nicholas, Ming Huang, and Tano Santos. 2001. "Prospect Theory and Asset Prices." *Quarterly Journal of Economics*, vol. 116, no. 1 (February):1–53.

This paper proposes a new approach for pricing assets by incorporating two psychological ideas into the traditional consumption-based model. Investors are assumed to be more sensitive to losses than to gains, and their risk aversion changes over time depending on their prior investment outcomes. The authors show that this framework can help explain the high historical equity risk premium.

Barro, Robert. 2006. "Rare Disasters and Asset Markets in the Twentieth Century." *Quarterly Journal of Economics*, vol. 121, no. 3 (August):823–866.

This paper extends the analysis of Rietz (1988) and argues that it does provide a plausible resolution of the ERP puzzle. The author suggests that the rare-disasters framework (i.e., the allowance for low-probability disasters proposed by Rietz) can explain the ERP puzzle while "maintaining the tractable framework of a representative agent, time-additive and iso-elastic preferences, and complete markets" (p. 823). These technical terms refer to assumptions that are embedded in Mehra and Prescott (1985) and that are considered standard in general equilibrium or macroeconomic models.

Benartzi, Shlomo, and Richard H. Thaler. 1995. "Myopic Loss Aversion and the Equity Premium Puzzle." *Quarterly Journal of Economics*, vol. 110, no. 1 (February):73–92.

This article proposes an explanation for the equity premium based on two concepts from the psychology of decision making. The first concept is called "loss aversion," meaning that investors are more sensitive to losses than to gains. The second concept is called "mental accounting," which points out that investors mentally separate their portfolios into subportfolios for which they have quite different utility functions or risk aversion parameters. For example, investors may have one set of portfolios that they never evaluate and another set that they evaluate every day. Benartzi and Thaler show that the size of the historical equity premium can be explained if investors evaluate their portfolio at least annually.

Bernstein, Peter L. 1997. "What Rate of Return Can You Reasonably Expect... or What Can the Long Run Tell Us about the Short Run?" *Financial Analysts Journal*, vol. 53, no. 2 (March/April):20–28.

By studying historical intervals when stock valuation (P/D or P/E) was the same at the end of the interval as at the beginning, one can avoid incorporating unexpected valuation changes into long-term rate of return studies. The analysis gives an equity risk premium of 3 percent, although the more interesting finding is that equity returns are mean-reverting whereas bond returns have no mean to which to regress. Thus, in the very long run and in real terms, stocks are safer than bonds.

Blanchard, Olivier J., Robert Shiller, and Jeremy J. Siegel. 1993. "Movements in the Equity Premium." *Brookings Papers on Economic Activity*, no. 2:75–138.

The authors show that the expected equity premium has gone steadily down since the 1950s from an unusually high level in the late 1930s and 1940s. Blanchard et al. show the positive relation between inflation and the equity premium, and they conclude that the equity premium is expected to stay at its current level of 2–3 percent if inflation remains low. Implications of this forecast for the macroeconomy are explored.

Brav, Alon, George M. Constantinides, and Christopher C. Geczy. 2002. "Asset Pricing with Heterogeneous Consumers and Limited Participation: Empirical Evidence." *Journal of Political Economy*, vol. 110, no. 4 (August):793–824.

This paper shows that the equity risk premium can be explained with a stochastic discount factor (SDF) calculated as the weighted average of the individual households' marginal rate of substitution. Important components of the SDF are cross-section variance and skewness of the households' consumption growth rates.

Brown, Stephen J., William N. Goetzmann, and Stephen A. Ross. 1995. "Survival." *Journal of Finance*, vol. 50, no. 3 (July):853–873.

This paper suggests that survival could induce a substantial spurious equity premium and at least partially explain the equity premium puzzle documented by Mehra and Prescott (1985). (That is, to explain it away, because the returns used to frame the "puzzle" were neither expected nor were they achieved by many investors.)

Campbell, John Y., Peter A. Diamond, and John B. Shoven. 2001. "Estimating the Real Rate of Return on Stocks over the Long Term." Social Security Advisory Board. (www.ssab.gov/Publications/Financing/estimated%20rate%20of%20return.pdf)

This collection of papers presented to the Social Security Advisory Board explores expected equity rates of return for the purpose of assessing proposals to invest Social Security assets in the stock market.

Under certain stringent conditions, the earnings-to-price ratio (E/P) is an unbiased estimator of the expected equity return. Noting that earnings are highly cyclical, Campbell, in "Forecasting U.S. Equity Returns in the 21st Century," produces a more stable numerator for E/P by taking the 10-year trailing

average of real earnings, E* (after Graham and Dodd;[10] see also Campbell and Shiller 1998, Shiller 2000, and Asness[11]). From this perspective, current data suggest that the structural equity risk premium is now close to zero or that prices will fall, causing the equity risk premium to rise to a positive number. A little of each is the most likely outcome. Departing from the steady-state assumptions used to equate E/P with the expected equity return and using a macroeconomic growth forecast and sensible assumptions about the division, by investors, of corporate risk between equities and bonds, a real interest rate of 3–3.5 percent is forecast, along with an equity risk premium of 1.5–2.5 percent geometric (3–4 percent arithmetic).

In "What Stock Market Returns to Expect for the Future?" Diamond explores the implications of an assumed 7 percent real rate of return on equities. Stocks cannot earn a real total return of 7 percent or else they will have a market capitalization of 39.5 times U.S. GDP by the year 2075 (assuming a 2 percent dividend-plus-share-buyback yield). In contrast, the current capitalization/GDP ratio is 1.5. Changing the GDP growth rate within realistic bounds does not change the answer much. To justify a real total return of 7 percent, stocks must fall by 53 percent in real terms over the next 10 years (assuming a 2 percent dividend yield). Increasing the dividend payout does reduce the projected capitalization/GDP ratio materially, but in no case does it reduce the ratio below 7.86 in 2075.

In "What Are Reasonable Long-Run Rates of Return to Expect on Equities?" Shoven examines what is likely to happen to rates of return over the next 75 years. Dividends are irrelevant, because of tax policy; what counts is total cash flow to the investor. In a steady state, the expected return on equities (per share) equals the dividend yield, plus the share buyback yield, plus the growth rate of macroeconomic aggregates. This analysis produces an expected real total return on equities of 6.125 percent (say, 6–6.5 percent). Because of high (3 percent) real rates as projected—not the very high, current TIPS yield—the equity risk premium is only 3–3.5 percent, but these projections require one to reduce the 7 percent real equity return projection used by the Social Security Advisory Board only a little. At a P/E of 15, the real equity return projection would be a little better than 7 percent.

Campbell, John Y., and Robert J. Shiller. 1998. "Valuation Ratios and the Long-Run Stock Market Outlook." *Journal of Portfolio Management*, vol. 28, no. 2 (Winter):11–26. (Updated in Cowles Foundation Discussion Paper #1295, Yale University, March 2001.)

The dividend-to-price ratio (D/P) can forecast either changes in dividend, which is what efficient market theory suggests, or changes in price, or both. Empirically, it forecasts only changes in price. At the current D/P, the forecast is extraordinarily bearish: The stock market will lose about two-thirds of its real value. The forecast becomes less drastically bearish (although still quite bearish) when one uses (dividend + share buybacks), earnings, the 10-year moving average of earnings in constant dollars, or other variables in the denominator. Real stock returns close to zero over the next 10 years are forecast. A number of statistical weaknesses in the analysis are acknowledged: The historical observations are not independent, and the analysis depends on valuation ratios regressing to their historical means, whereas the actual means are not known and could conceivably lie outside the historical range.

The 2001 update reaches the same conclusion and an even more bearish forecast.

[10] Benjamin Graham and David Dodd, *Security Analysis* (New York: McGraw-Hill, 1934).

[11] Clifford S. Asness, "Stocks versus Bonds: Explaining the Equity Risk Premium," *Financial Analysts Journal*, vol. 56, no. 2 (March/ April 2000):96–113.

Carhart, Mark M., and Kurt Winkelmann. 2003. "The Equity Risk Premium." In *Modern Investment Management*. Edited by William N. Goetzmann and Roger G. Ibbotson. Hoboken, NJ: John Wiley & Sons:44–54.

Historical perspective and an equilibrium estimate of the equity risk premium are discussed. The authors estimate that the U.S. corporate bond yield above Treasury bonds is 2.25 percent, and the expected U.S. corporate bond risk premium is thus 1.5 percent after subtracting an expected default loss of 0.75 percent. This amount (1.5 percent) is considered to be the lower bound of the current equity risk premium. Because equity volatility is two or three times higher than that of corporate bonds, the authors "cautiously" suggest an equity risk premium of 3 percent or higher.

Claus, James, and Jacob Thomas. 2001. "Equity Premia as Low as Three Percent? Evidence from Analysts' Earnings Forecasts for Domestic and International Stock Markets." *Journal of Finance*, vol. 56, no. 5 (October):1629–1666.

The Ibbotson or historical-extrapolation method gives ERP estimates that are much too high, relative to both purely utility-based estimates (Mehra and Prescott 1985) and estimates based on valuation (for example, Campbell and Shiller 1998). Estimates of the equity risk premium were calculated for each year since 1985 by subtracting the 10-year risk-free rate from the discount rate that equates U.S. stock market valuations with forecasted future flows, and results suggest that the equity risk premium is probably no more than 3 percent. International evidence from Canada, France, Germany, Japan, and the United Kingdom also support this claim. Known upward biases in analysts' earnings forecasts are corrected in making the estimates. Possible reasons why the historical method might have overstated the expected equity risk premium in recent years are discussed.

Cochrane, John H. 1997. "Where Is the Market Going? Uncertain Facts and Novel Theories." *Economic Perspectives*, Federal Reserve Bank of Chicago, vol. 21, no. 6 (November/December):3–37.

This paper summarizes the statistical evidence on average stock return and surveys economic theories that try to explain it. Standard models can only justify a low equity risk premium, whereas new models that can explain the 8 percent historical equity premium drastically modify the description of stock market risk. The author concludes that low forecast stock returns do not imply that the investor should change his portfolio unless he is different from the average investor in risk exposure, attitude, or information.

Constantinides, George M. 1990. "Habit Formation: A Resolution of the Equity Premium Puzzle." *Journal of Political Economy*, vol. 98, no. 3 (June):519–543.

Constantinides introduces habit persistence in an effort to explain the ERP puzzle. This model assumes that an investor's utility is affected by both current and past consumption and that a small drop in consumption can generate a large drop in consumption net of the subsistence level. The author shows that the historical equity premium can be explained if past consumption generates a subsistence level of consumption that is about 80 percent of the normal consumption rate.

———. 2002. "Rational Asset Prices." *Journal of Finance*, vol. 57, no. 4 (August):1567–1591.

This article examines the extent to which historical asset returns can be explained by relaxing the assumptions of the traditional asset pricing model. Constantinides reviews statistical evidence on historical equity returns and premiums and discusses the limitations of existing theories. The author suggests that it is promising to try to explain the equity risk premium by integrating the notions of incomplete market, life-cycle issues, borrowing constraints, and limited stock participation (i.e., stockholdings are concentrated in the hands of the wealthiest few), along with investors' deviation from rationality.

Constantinides, George M., John B. Donaldson, and Rajnish Mehra. 2002. "Junior Can't Borrow: A New Perspective on the Equity Premium Puzzle." *Quarterly Journal of Economics*, vol. 117, no. 1 (February):269–296.

As the correlation of equities with personal income changes over the life of the investor, so does the attractiveness of equities to that investor. The young, who should borrow to smooth consumption and

to invest in equities, can't do so. Therefore, equities are priced almost exclusively by middle-aged investors, who find equities to be unattractive. (Middle-aged investors have a shorter time horizon and also prefer bonds because they smooth consumption in retirement, as wages do when one is working.) The result is a decreased demand for equities and an increased demand for bonds relative to what it would be in a perfectly competitive market. Thus, equities are (on average, over time) underpriced and bonds are overpriced, producing a higher equity risk premium than predicted by Mehra and Prescott (1985).

Cornell, Bradford. 1999. *The Equity Risk Premium.* New York: Wiley.

The literature on the equity risk premium is extensively reviewed and somewhat popularized in this book. The conclusion is that the equity risk premium will be lower in the future than it was in the past. A premium of 3.5–5.5 percent over Treasury bonds and 5–7 percent over Treasury bills is projected.

Dichev, Ilia D. 2007. "What Are Stock Investors' Actual Historical Returns? Evidence from Dollar-Weighted Returns." *American Economic Review*, vol. 97, no. 1 (March):386–401. [added April 2008, abstract by Bruce D. Phelps, CFA]

For the NYSE and Amex, the author finds that dollar-weighted returns are 1.9 percent per year lower on average than value-weighted (or buy-and-hold) returns. For the NASDAQ, dollar-weighted returns are 5.3 percent lower. Similar results hold internationally. Because actual investor returns are lower than published returns, empirical measurements of the equity risk premium and companies' cost of equity are potentially overstated.

Diermeier, Jeffrey J., Roger G. Ibbotson, and Laurence B. Siegel. 1984. "The Supply of Capital Market Returns." *Financial Analysts Journal*, vol. 40, no. 2 (March/April):74–80.

Stock total returns must equal dividend yields plus the growth rate of dividends, which cannot, in the long run, exceed the growth rate of the economy. If infinite-run expected dividend growth exceeded infinite-run expected economic growth, then dividends would crowd out all other economic claims. Net new issues, representing new capital (transferred from the labor market) that is needed so the corporate sector can grow, may cause the dividend growth rate to be slower than the GDP growth rate. Thus, the equity risk premium equals the dividend yield (minus new issues net of share buybacks), plus the GDP growth rate, minus the riskless rate.

As far as we know, this is the first direct application of the dividend discount model of John Burr Williams (writing in the 1930s) and Myron Gordon and Eli Shapiro (in the 1950s) to the question of the equity risk premium for the whole equity market as opposed to an individual company. The "supply side" thread thus begins with this work.

Dimson, Elroy, Paul Marsh, and Mike Staunton. 2002. *Triumph of the Optimists: 101 Years of Global Investment Returns.* Princeton, NJ: Princeton University Press.

This book provides a comprehensive examination of returns on stocks, bonds, bills, inflation, and currencies for 16 countries over the period from 1900 to 2000. This evidence suggests that the high historical equity premium obtained for the United States is comparable with that of other countries. The point estimate of the historical equity premium for the United States and the United Kingdom is about 1.5 percent lower than reported in previous studies, and the authors attribute the difference to index construction bias (for the United Kingdom) and a longer time frame (for the United States). The prospective risk premium that investors can expect going forward is also discussed. The estimated geometric mean premium for the United States is 4.1 percent, 2.4 percent for the United Kingdom, and 3.0 percent for the 16-country world index. Implications for individual investors, investment institutions, and companies are carefully explored.

———. 2003. "Global Evidence on the Equity Risk Premium." *Journal of Applied Corporate Finance*, vol. 15, no. 4 (Summer):27–38.

This article examines the historical equity risk premium for 16 countries using data from 1900 to 2002. The geometric mean annualized equity risk premium for the United States was 5.3 percent, and the average risk premium across the 16 countries was 4.5 percent. The forward-looking risk premium for the world's major markets is likely to be around 3 percent on a geometric mean basis and about 5 percent on an arithmetic mean basis.

———. 2006. "The Worldwide Equity Premium: A Smaller Puzzle." Working paper.

This paper is an updated version of Dimson, Marsh, and Staunton (2003). Using 1900–2005 data for 17 countries, the authors show that the annualized equity premium for the rest of the world was 4.2 percent, not too much below the U.S. equity premium of 5.5 percent over the same period.

The historical equity premium is decomposed into dividend growth, multiple expansion, the dividend yield, and changes in the real exchange rate. Assuming zero change in the real exchange rate and no multiple expansion, and a dividend yield 0.5–1 percent lower than the historical mean (4.49 percent), the authors forecast a geometric equity premium on the world index around 3–3.5 percent and 4.5–5 percent on an arithmetic mean basis.

Elton, Edwin J. 1999. "Presidential Address: Expected Return, Realized Return and Asset Pricing Tests." *Journal of Finance*, vol. 54, no. 4 (August):1199–1220.

At one time, researchers felt they had to (weakly) defend the assumption that expected returns were equal to realized returns. Now, they just make the assumption without defending it. This practice embeds the assumption that information surprises cancel to zero; evidence, however, shows they do not. The implications of this critique are applied to asset-pricing tests, not to the equity risk premium.

Fama, Eugene F., and Kenneth R. French. 1999. "The Corporate Cost of Capital and the Return on Corporate Investment." *Journal of Finance*, vol. 54, no. 6 (December):1939–1967.

The authors use Compustat data to estimate the internal rate of return (IRR) of the capitalization-weighted corporate sector from 1950 to 1996. This IRR, 10.72 percent, is assumed to have been the nominal weighted average cost of capital (WACC). By observing the capital structure and assuming a corporate debt yield 150 bps above Treasuries, and making the usual tax adjustment to the cost of debt, a nominal expected equity total return of 12.8 percent is derived, which produces an equity risk premium of 6.5 percent. The cash flow from the "sale" of securities in 1996 is a large proportion of the total cash flow studied, so the sensitivity of the result to the 1996 valuation is analyzed. Because the period studied is long, the result is not particularly sensitive to the exit price.

———. 2002. "The Equity Premium." *Journal of Finance*, vol. 57, no. 2 (April):637–659.

This paper compares alternative estimates of the unconditional expected stock return between 1872 and 2000, and provides explanation to the low expected return estimates derived from fundamentals such as dividends and earnings for the 1951–2000 period. The authors conclude that the decline in discount rates largely causes the unexplained capital gain of the last half-century.

Faugère, Christophe, and Julian Van Erlach. 2006. "The Equity Premium: Consistent with GDP Growth and Portfolio." *Financial Review*, vol. 41, no. 4 (November):547–564. [added April 2008; abstract by Stephen Phillip Huffman, CFA]

Two macroeconomic equity premium models are derived and tested for consistency with historical data. The first model illustrates that the long-term equity premium is directly related to per capita growth in GDP. The second model, based on a portfolio insurance strategy of buying put options, illustrates that debtholders are paying stockholders an insurance premium, which is essentially the equity premium.

Fisher, Lawrence, and James H. Lorie. 1964. "Rates of Return on Investments in Common Stocks." *Journal of Business*, vol. 37, no. 1 (January):1–21.

This paper presents the first comprehensive data on rates of return on investments in common stocks listed on New York Stock Exchange over the period from 1926 to 1960. The authors show that the annually compounded stock return was 9 percent with reinvestment of dividend for tax-exempt institutions during this period.

Geweke, John. 2001. "A Note on Some Limitations of CRRA Utility." *Economic Letters*, vol. 71, no. 3 (June): 341–345.

This paper points out that the equity premium calculated from the standard growth model in Mehra and Prescott (1985) is quite sensitive to small changes in distribution assumptions. As such, it is questionable to use this kind of growth model to interpret observed economic behavior.

Goyal, Amit, and Ivo Welch. 2006. "A Comprehensive Look at the Empirical Performance of Equity Premium Prediction." Working paper.

This paper examines a wide range of variables that have been proposed by economists to predict the equity premium. The authors find that the prediction models have failed both in sample and out of sample using data from 1975 to 2004 and that out-of-sample predictions of the models are unexpectedly poor. They conclude that "the models would not have helped an investor with access only to the information available at the time to time the market" (p. 1).

Grinold, Richard, and Kenneth Kroner. 2002. "The Equity Risk Premium." *Investment Insights*, Barclays Global Investors, vol. 5, no. 3 (July):1–24.

The authors examine the four components of the expected equity risk premium separately (income return, expected real earnings growth, expected inflation, and expected repricing) and suggest a current risk premium of about 2.5 percent. The authors argue that neither the "rational exuberance" view (5.5 percent equity risk premium) and "risk premium is dead" (zero or negative premium) view can be justified without making extreme and/or irrational assumptions.

The authors also forcefully attack the "puzzle" literature by arguing that literature on the equity risk premium puzzle is too academic and is dependent on unrealistic asset-pricing models.

Ibbotson, Roger G., and Peng Chen. 2003. "Long-Run Stock Returns: Participating in the Real Economy." *Financial Analysts Journal*, vol. 59, no. 1 (January/February):88–98.

If one simply uses the dividend discount model to forecast stock returns, the forecast violates M&M dividend invariance because the current dividend yield is much lower than the average dividend yield over the period from which historical earnings growth rates were taken. Applying M&M intertemporally, lower dividend payouts should result in higher earnings growth rates. The solution is to add, to the straight dividend discount model estimate, an additional-growth term of 2.28 percent *as well as* using a current-dividend number of 2.05 percent, which is what the dividend yield would have been in 2000 if the dividend payout ratio had equaled the historical average of 59.2 percent. The equity risk premium thus estimated is about 4 percent (geometric) or 6 percent (arithmetic), about 1.25 percent lower than the straight historical estimate.

Ibbotson, Roger G., and Rex A. Sinquefield, 1976. "Stocks, Bonds, Bills and Inflation: Year-by-Year Historical Returns (1926–74)." *Journal of Business*, vol. 49, no. 1 (January):11–47. (Updated in *Stocks, Bonds, Bills and Inflation: 2006 Yearbook*; Chicago: Morningstar, 2006.)

Total equity returns consist of a stationary part (the equity risk premium) and a nonstationary part (the interest rate component, which consists of a real interest rate plus compensation for expected inflation). The estimator of the future arithmetic mean equity risk premium is the past arithmetic mean premium, which is currently about 7 percent. To this is added the current interest rate, 4.8 percent (on 20-year Treasury bonds). The sum of these, about 12 percent, is the arithmetic mean expected total return on equities. This method is justified by the assertion that in the long run, investors should and do conform their expectations to what is actually realizable. As a result, the historical equity risk premium reflects equilibrium at all times and forms the proper estimator of the future equity risk premium. (Note that the 2006 update discusses other methods rather than supporting a doctrinaire "future equals past" interpretation of historical data.)

Jagannathan, Ravi, Ellen R. McGrattan, and Anna Scherbina. 2000. "The Declining U.S. Equity Premium." *Quarterly Review*, Federal Reserve Bank of Minneapolis, vol. 24, no. 4 (Fall):3–19.

The IRR equating expected future dividends from a stock portfolio with the current price is the expected total return on equities; subtracting the bond yield, one arrives at the equity risk premium. This number is estimated at historical points in time and is shown to have declined over the sample period (1926–1999). The expected total return on equities is about the same in the 1990s as it was in the 1960s, but the equity risk premium is smaller because bond yields have increased. The equity risk premium in 1999 is –0.27 percent for the S&P 500, –0.05 percent for the "CRSP portfolio," and 2.71 percent for the "Board of Governors stock portfolio" (a broad-cap portfolio with many small stocks that pay high dividend yields). The analysis is shown to be reasonably robust when tested for sensitivity to the dividend yield being too low because of share repurchases and the bond yield being too high. If dividend growth is assumed equal to GNP growth, instead of being 1.53 percentage points lower as it was historically, then the equity risk premium based on the S&P 500 rises to 1.26 percent.

Jorion, Philippe, and William N. Goetzmann. 1999. "Global Stock Markets in the Twentieth Century." *Journal of Finance*, vol. 54, no. 3 (June):953–980.

The U.S. equity market experience in the 20th century is an unrepresentative sample of what can and does happen. The high equity risk premium observed globally is mostly a result of high equity returns in the United States (with a 4.3 percent real capital appreciation return), which had a large initial weight in the GDP-weighted world index. All other surviving countries had lower returns (with a median real capital appreciation return of 0.8 percent), and there were many nonsurviving countries. Although the large capitalization of the United States was in a sense the market's forecast of continued success, investors did not know in advance that they would be in the highest-returning country or even in a surviving one. Nonsurvival or survival with poor returns should be factored in when reconstructing the history of investor expectations (and should conceivably be factored into current expectations too). This finding contrasts with that of Dimson, Marsh, and Staunton (2002, 2003, 2006).

Kocherlakota, Narayana R. 1996. "The Equity Premium: It Is Still a Puzzle." *Journal of Economic Literature*, vol. 34, no. 1 (March):42–71.

After reviewing the literature on modifications of investor risk preference and on market friction, the author suggests that the ERP puzzle is still unsolved. Kocherlakota concludes that the equity risk premium puzzle should be solved by discovering the fundamental features of goods and asset markets rather than patching existing models.

Kritzman, Mark P. 2001. "The Equity Risk Premium Puzzle: Is It Misspecification of Risk?" *Economics and Portfolio Strategy* (15 March), Peter L. Bernstein, Inc.

Investors do not know when they are going to need their money back (for consumption), so the terminal-wealth criterion used by Mehra and Prescott (1985) to frame the ERP puzzle greatly understates the risk of equities (but not of bonds). In addition, some investors face risk from "breaching a threshold" that is not captured by classical utility theory. Thus, a much higher equity risk premium is justified by utility theory than is proposed by Mehra and Prescott.

Longstaff, Francis A., and Monika Piazzesi. 2004. "Corporate Earnings and the Equity Premium." *Journal of Financial Economics*, vol. 74, no. 3 (December):401–421.

Most studies assume that aggregate dividends equal aggregate consumption. This article argues that separating corporate cash flow from aggregate consumption is critical because "corporate cash flows have historically been far more volatile and sensitive to economic shocks than has aggregate consumption" (p. 402). The authors show that the equity premium consists of three components, identified by allowing aggregate dividends and consumption to follow distinct dynamic processes. The first component is called the consumer-risk premium, which is the Mehra and Prescott (1985) equity risk premium proportional to the variance of consumption growth. The second component is the event-risk premium, which compensates for downward jumps. And the third component is the corporate-risk premium, which is proportional to the covariance between the consumption growth rate and the "corporate fraction" (defined as the ratio of aggregate dividends to consumption). Using a risk aversion parameter of 5, the three components are 0.36 percent, 0.51 percent, and 1.39 percent, summing to a total equity premium of 2.26 percent. The authors admit that their model does not solve the ERP puzzle completely and suggest that the ultimate resolution may lie in the integration of their model with other elements, such as habit formation or investor heterogeneity in incomplete markets.

Lundblad, Christian. 2007. "The Risk Return Tradeoff in the Long Run: 1836–2003." *Journal of Financial Economics*, vol. 85, no. 1 (July):123–150. [added April 2008; abstract by Yazann S. Romahi, CFA]

Although the risk–return trade-off is fundamental to finance, the empirical literature has offered mixed results. The author extends the sample considerably and analyzes nearly two centuries of both U.S. and U.K. market returns and finds a positive and statistically significant risk–return trade-off in line with the postulated theory.

Mankiw, N. Gregory. 1986. "The Equity Premium and the Concentration of Aggregate Shocks." *Journal of Financial Economics*, vol. 17, no. 1 (September):211–219.

This article shows that one cannot judge the appropriateness of the equity premium from aggregate data alone, as Mehra and Prescott (1985) did. In an economy where aggregate shocks are not dispersed equally throughout the population, the equity premium depends on the concentrations of these aggregate shocks in particular investors and can be made arbitrarily large by making the shock more and more concentrated.

Mankiw, N. Gregory, and Stephen P. Zeldes. 1991. "The Consumption of Stockholders and Non-Stockholders." *Journal of Financial Economics*, vol. 29, no. 1 (March):97–112.

This article examines whether the consumption of stockholders differs from that of nonstockholders and whether this difference helps to explain the historical equity risk premium. It shows that aggregate consumption of stockholders is more highly correlated with the stock market and is more volatile than the consumption of nonstockholders. A risk aversion parameter of 6 (relative to the magnitude of 30–40 in Mehra and Prescott 1985) can explain the size of the equity premium based on consumption of stockholders alone.

McGrattan, Ellen R., and Edward C. Prescott. 2000. "Is the Stock Market Overvalued?" *Quarterly Review*, Federal Reserve Bank of Minneapolis (Fall):20–40.

Standard macroeconomic growth theory (Cobb–Douglas, etc.) is used to value the corporate sector in the United States. The current capitalization-to-GDP ratio of 1.8 is justified, so the market is not overvalued. "[T]heory . . . predicts that the real returns on debt and equity should both be near 4 percent" (p. 26). Thus, the predicted equity risk premium is small.

———. 2001. "Taxes, Regulations, and Asset Prices." NBER Working Paper #8623.

This paper shows that the large run-up in equity value relative to GDP between 1962 and 2000 is mainly caused by (1) large reductions in individual tax rates, (2) increased opportunities to hold equity in a nontaxed pension plan, and (3) increases in intangible and foreign capital. The authors argue that the high equity risk premium documented by Mehra and Prescott (1985) is not puzzling after these three factors are accounted for. However, in the future, one should expect no further gains from tax policy; the currently expected real return on equities is about 4 percent, down from 8 percent in the early postwar period.

———. 2003. "Average Debt and Equity Returns: Puzzling?" *American Economic Review*, vol. 93, no. 2 (May):392–397.

This article shows that the realized equity premium in the last century was less than 1 percent after accounting for taxes, regulations, and diversification costs. The authors also argue that Treasury bills "provide considerable liquidity services and are a negligible part of individuals' long-term debt holdings" (p. 393). Long-term savings instruments replace short-term government debt in their equity premium calculation.

Mehra, Rajnish. 2003. "The Equity Premium: Why Is It a Puzzle?" *Financial Analysts Journal*, vol. 59, no. 1 (January/February):54–69.

The ERP puzzle literature is easily misunderstood because of its difficulty. Here, the puzzle is stated in language that is accessible to most finance practitioners. First, empirical facts regarding the returns and risks of major asset classes are presented. Then, the theory responsible for the "puzzle" is summarized. Modern asset pricing theory assumes that economic agents pursue and, on average, get fair deals. When one follows this line of reasoning to its conclusion, using the tools of classic growth and real business cycle theory, an equity risk premium of at most 1 percent emerges. An extensive discussion reveals why this is the case and addresses various attempts made by other authors to resolve the puzzle.

Mehra, Rajnish, and Edward C. Prescott. 1985. "The Equity Premium: A Puzzle." *Journal of Monetary Economics*, vol. 15, no. 2 (March):145–161.

In this seminal work, Mehra and Prescott first document the "equity premium puzzle" using a consumption-based asset-pricing model in which the quantity of risk is defined as the covariance of excess stock return with consumption growth and the price of risk is the coefficient of relative risk aversion. Because of the low risk resulting from the smooth historical growth of consumption, the 6 percent equity risk premium in the 1889–1978 period can only be explained by a very high coefficient of risk aversion in the magnitude of 30 to 40. Risk aversion parameters observed in other aspects of financial behavior are around 1. Such a risk aversion parameter is consistent with at most a 1 percent equity risk premium, and possibly one as small as 0.25 percent.

Note that Mehra and Prescott assumed that consumption was equal to aggregate dividends. Because consumption is very smooth and dividends are not as smooth, this comparison may be troublesome.

Philips, Thomas K. 1999. "Why Do Valuation Ratios Forecast Long-Run Equity Returns?" *Journal of Portfolio Management*, vol. 25, no. 3 (Spring):39–44.

In this article, the Edwards–Bell–Ohlson equation,

$$P_0 = B_0 + \sum_{i=1}^{\infty} \left\{ \frac{E\left[\left(ROE_i - r\right) B_{i-1}\right]}{\left(1+r\right)} \right\},$$

where P is price, B is book value, ROE is return on book equity, r is the expected return on equity, and i is the time increment, is first used to derive closed-form expressions for the expected return on equities, stated in terms of both dividends and earnings. Then, the GDP growth rate is introduced as an indicator of earnings growth. Share repurchases are considered to be a part of dividends. This setup leads to the following conclusions: (1) The expected return increases monotonically with book-to-price ratio (B/P), E/P, and D/P; (2) if a corporation's return on equity equals its cost of capital (expected return), then its price-to-book ratio (P/B) should be 1 and its expected return should equal E/P. The analysis suggests that nominal total expected equity returns shrank from almost 14 percent in 1982 to 6.5 percent in 1999 (a larger decline than can be explained by decreases in unanticipated inflation). This decrease in expected return was accompanied by very high concurrent actual returns that were misread by investors as evidence of an *increase* in the expected return. Going forward, investors will not get an increased return.

Rietz, Thomas A. 1988. "The Equity Risk Premium: A Solution." *Journal of Monetary Economics*, vol. 22, no. 1 (July):117–131.

Rietz suggests that the ERP puzzle can be solved by incorporating a very small probability of a very large drop in consumption. In such a scenario, the risk-free rate is much lower than the equity return. In an article published in the same issue, Mehra and Prescott argued that Rietz's model requires a 1 in 100 chance of a 25 percent decline in consumption to reconcile the equity premium with a risk aversion parameter of 10. However, the author says, the largest consumption decline in the last 100 years was only 8.8 percent. Campbell, Lo, and MacKinlay (see Note 3) point out that "the difficulty with Rietz's argument is that it requires not only an economic catastrophe, but one which affects stock market investors more seriously than investors in the short-term debt instruments" (p. 311).

But during the Great Depression, the stock market fell by 86 percent from peak to trough and dividends fell by about half; consumption by stockholders over that period thus probably fell by much more than 8.8 percent. Aggregate consumption at that time included many lower-income people, especially farmers, whose consumption was not directly affected by falling stock prices.

Shiller, Robert J. 2000. *Irrational Exuberance*. Princeton, NJ: Princeton University Press.

This influential book provides a wealth of historical detail on the equity risk premium. Using 10 years of trailing real earnings (see, originally, Graham and Dodd) to estimate normalized P/Es, Shiller concludes that the market is not only overpriced but well outside the range established by previous periods of high stock prices.

Siegel, Jeremy J. 1999. "The Shrinking Equity Premium." *Journal of Portfolio Management*, vol. 26, no. 1 (Fall):10–19.

In contrast to Siegel (2002), analysis of dividend and earnings multiples suggests a real return (not an equity risk premium) of only 3.1–3.7 percent for stocks, lower than the then-current real TIPS yield. Although then-current high prices suggest higher-than-historical earnings growth, investors are likely to realize lower returns than in the past. (Incidentally, past achieved returns are lower than index returns because of transaction costs and lack of diversification.) On the positive side, the Jorion and Goetzmann (1999) finding that world markets returned a real capital gain of only 0.8 percent from 1921 to the present, compared with 4.3 percent in the United States, is misstated because the analysis is of the median portfolio, not the average. The GDP-weighted average is only 0.28 percent short of the U.S. return and is higher than the U.S. return if converted to dollars (although Jorion and Goetzmann point out that the large initial size of the United States causes the annualized world index return to lie within 1 percent of the U.S. return by construction).

———. 2002. *Stocks for the Long Run*. 3rd ed. New York: McGraw-Hill.

Siegel argues for a U.S. equity risk premium of 2–3 percent, about half of the historic equity risk premium. He expects a future real return on equity of about 6 percent, justified by several positive factors. Siegel considers an equity risk premium as low as 1 percent but clearly sees that stocks must yield more than inflation-indexed bond yields (3.5 percent at the time of the book). He turns to earnings yield arguments to answer the question of how much more. A Tobin's *q* greater than 1 in 2001 leads Siegel to see the earnings yield as understated. In addition, the overinvestment in many technology companies led to a drop in the cost of productivity-enhancing investments, which allows companies to buy back shares or raise dividends. In technology, an excess supply of capital, overbuilding, and a subsequent price collapse provide a technological base to benefit the economy and future shareholder returns. Also, the United States is still seen as an entrepreneurial nation to attract a growing flow of investment funds seeking a safe haven, leading to higher equity prices. Furthermore, short-run room for growth in corporate profits is another positive factor for future real return enhancement.

———. 2005. "Perspectives on the Equity Risk Premium." *Financial Analysts Journal*, vol. 61, no. 6 (November/December):61–73.

This article reviews and discusses the ERP literature as follows: (1) a summary of data used in equity premium calculation and their potential biases, (2) a discussion of academic attempts to find models to fit the data, (3) the practical applications of some proposed models, and (4) a discussion of the future equity risk premium.

Siegel, Jeremy J., and Richard H. Thaler. 1997. "Anomalies: The Equity Premium Puzzle." *Journal of Economic Perspectives*, vol. 11, no. 1 (Winter):191–200.

Proposed resolutions of the ERP puzzle fall into two categories: (1) observations that the stock market is riskier, or the equity risk premium is smaller, than generally thought, and (2) different theoretical frameworks that would make the observed risk aversion rational. Neither approach has been "completely successful" in explaining why, if stocks are so rewarding, investors don't hold more of them.

Weil, Philippe. 1989. "The Equity Premium Puzzle and the Risk-Free Rate Puzzle." *Journal of Monetary Economics*, vol. 24, no. 3 (November):401–421.

A critique of the power utility function used by Mehra and Prescott (1985) is the tight link between risk aversion and intertemporal substitution. This article shows that the ERP puzzle cannot be solved by simply separating risk aversion for intertemporal substitution.

Weitzman, Martin L. "Prior-Sensitive Expectations and Asset-Return Puzzles." Forthcoming. *American Economic Review*.

This article presents one unified Bayesian theory that explains the ERP puzzle, risk-free rate puzzle, and excess volatility puzzle. The author shows that Bayesian updating of unknown structural parameters introduces a permanent thick tail to posterior expectation that can account for, and even reverse, major asset-return puzzles.

Welch, Ivo. 2000. "Views of Financial Economists on the Equity Premium and Professional Controversies." *Journal of Business*, vol. 73, no. 4 (October):501–537.

This paper presents the results of a comprehensive survey of 226 financial economists. The main findings are: (1) the average arithmetic 30-year equity premium forecast is about 7 percent; (2) short-term forecasts are lower than the long-term forecast, in the range of 6–7 percent; (3) economists perceive that their consensus is about 0.5–1 percent higher than it actually is.

———. 2001. "The Equity Premium Consensus Forecast Revisited." Working paper, Yale University.
The equity premium forecast in this 2001 survey declined significantly compared with the 1998 survey. The one-year forecast is 3–3.5 percent, and the 30-year forecast stands at 5–5.5 percent.

I would like to thank Laurence Siegel, research director of the Research Foundation of CFA Institute, for his assistance and for providing much of the foundation for this project with his earlier work on the equity risk premium. I am also grateful to the Research Foundation for financial support.

This publication qualifies for 1 CE credit.

S&P Global
Ratings

Credit Research

U.S. And Canadian Utility Regulatory Updates And Insights: June 2020

June 8, 2020

Key Takeaways

- S&P Global Ratings periodically assesses each regulatory jurisdiction in the U.S. and Canada with a rated utility or where a rated entity operates.
- These assessments--with categories from "credit supportive" to "most credit supportive"--provide information for reference in determining the regulatory risk of a regulated utility or holding company with more than one utility. We made no changes since our last report, but examine developments in several jurisdictions.
- We base our analysis on quantitative and qualitative factors, focusing on regulatory stability, tariff-setting procedures and design, financial stability, and regulatory independence and insulation.
- The presence of utility regulation, no matter where in the spectrum of our assessments, strengthens the business risk profile and generally supports utility ratings.

S&P Global Ratings conducts periodic assessments of each regulatory jurisdiction in the U.S. and Canada where a rated utility operates as a reference when determining a utility's regulatory advantage or regulatory risk. Regulatory advantage is a heavily weighted factor in our analysis of a regulated utility's business risk profile.

Our analysis covers quantitative and qualitative factors, focusing on regulatory stability, tariff-setting procedures and design, financial stability, and regulatory independence and insulation. (See "Key Credit Factors For The Regulated Utilities Industry," published Nov. 19, 2013, for more details on each category.)

Sorting Through Regulatory Jurisdictions In The U.S. And Canada

We updated our assessments of regulatory jurisdictions since our commentary "U.S. And Canadian Regulatory Jurisdiction Updates And Insights: November 2019," published Nov. 4, 2019. Our assessments of U.S. jurisdictions' and Canadian provinces' approaches to regulation over the past several months are unchanged. Here, we provide our current snapshot of each regulatory jurisdiction (Table 1, Charts 1 and 2). We group the jurisdictions by the quantitative and qualitative

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factors and collective opinions expressed in the regulatory advantage determinations made in rating committees for the approximately 225 U.S. and 30 Canadian utilities we rate.

The categories indicate an important point regarding utility regulation and its effect on ratings: They are denoted credit supportive to one degree or another, as all utility regulation sustains credit quality when compared with corporate and infrastructure ratings. The presence of regulators, no matter where in the spectrum of our assessments, reduces business risk and generally supports utility ratings. We describe all these jurisdictions in a range from credit supportive to most credit supportive, and these vary only in degree rather than in kind.

Assessing U.S. And Canadian Regulatory Jurisdictions

Table 1

Regulatory Jurisdictions For Utilities Among U.S. States And Canadian Provinces

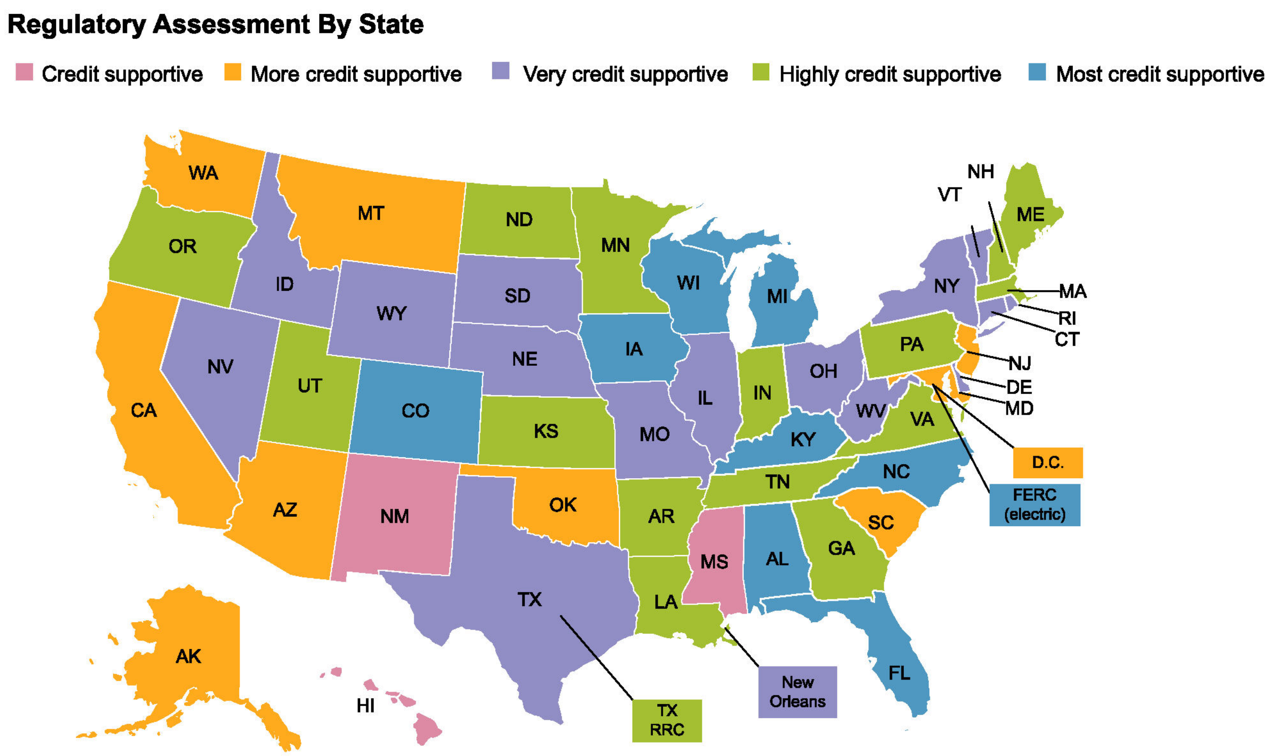
Credit supportive	More credit supportive	Very credit supportive	Highly credit supportive	Most credit supportive
Hawaii	Alaska	Connecticut	Arkansas	Alabama
Mississippi	Arizona	Delaware	Georgia	Alberta
New Mexico	California	Idaho	Indiana	British Columbia
Prince Edward Island	District of Columbia	Illinois	Kansas	Colorado
	Maryland	Missouri	Louisiana	FERC (electric)
	Montana	Nebraska	Maine	Florida
	New Jersey	Nevada	Massachusetts	Iowa
	Oklahoma	New Orleans	Minnesota	Kentucky
	South Carolina	New York	New Hampshire	Michigan
	Washington	Ohio	Newfoundland & Labrador	North Carolina
		Rhode Island	North Dakota	Nova Scotia
		South Dakota	Oregon	Ontario
		Texas	Pennsylvania	Quebec
		Vermont	Tennessee	Wisconsin
		West Virginia	Texas RRC	
		Wyoming	Utah	
			Virginia	

FERC--U.S. Federal Energy Regulatory Commission. RRC--Railroad Commission of Texas.

Mapping Regulatory Jurisdictions

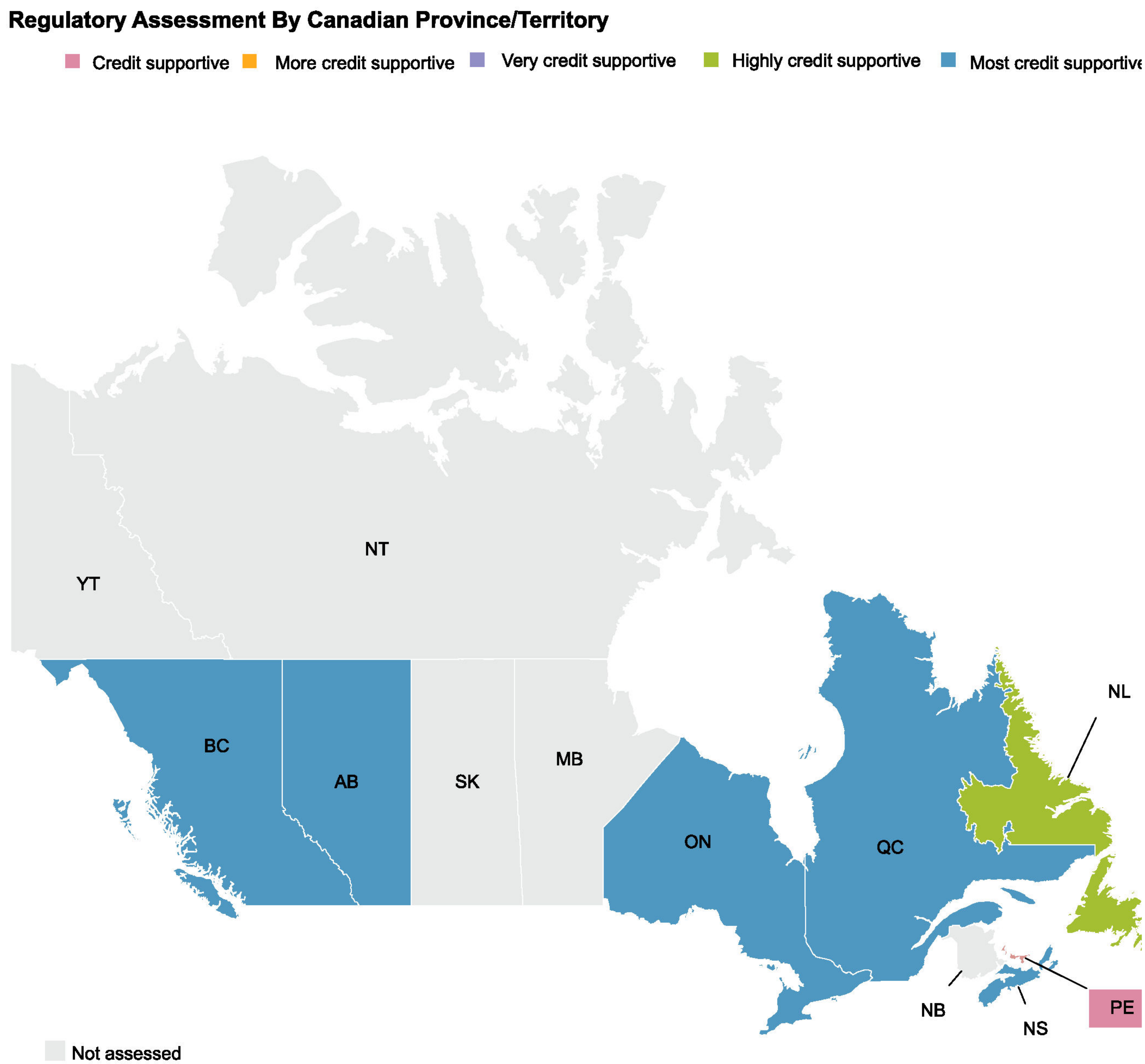
For jurisdictions assessed in these maps (Charts 1 and 2), colors delineate our assessments of credit supportiveness. (We do not have assessments on some Canadian provinces where we don't rate any utilities.) The assessments offer some scale and detail in our thinking regarding the rules and implementation of regulation. Often they simply designate a stable jurisdiction slightly better or worse than its closest peers in credit quality.

Chart 1



FERC—Federal Energy Regulatory Commission. RRC—Railroad Commission of Texas. Data as of June 2020.

Chart 2



Data as of June 2020. Copyright © 2020 by Standard & Poor's Financial Services LLC. All rights reserved.

Notable Topics Throughout North America

Although our biannual review found no material events that would change a jurisdictional assessment amid the COVID-19 pandemic, there have been an unprecedented number of regulatory actions with respect to cost recovery and bad debt collection moratoriums ("Regulatory Responses To COVID-19 Are Key To Utilities' Credit Prospects", published May 20, 2020). In addition, other notable developments have occurred in several jurisdictions.

Alberta

Compared to our assessment in November, the Alberta regulatory construct is weakening as regulatory lag has not improved. In addition, utilities are continually exposed to the risk of absorbing the undepreciated capital cost of stranded assets due to extraordinary retirement. Furthermore, the recent regulatory decision by the Alberta Utilities Commission regarding the Alberta Electric System Operator's customer contribution policy, under which requiring distribution operators to transfer transmission related investments to transmission operators at net book value, somewhat calls into question the regulatory framework's consistency.

FERC Electric

Recent U.S. Federal Energy Regulatory Commission (FERC) rulings on Midcontinent Independent System Operator (MISO) transmission owners' authorized return on equity (ROE) indicate inconsistency in how ROE decisions could be applied toward New England transmission owners' ROEs. Specifically, in late 2018, FERC proposed using a new ROE calculation method that focused on four factors. However, in late 2019, FERC did not use that methodology to establish the new ROE for MISO transmission owners, instead using a method that relied on two factors. Furthermore, FERC further revised the methodology in May 2020 by adding a third approach to calculate transmission owner ROEs. It was marginally favorable for MISO transmission owners compared to the two-factor approach, but resulted in a slight base ROE reduction.

Although there are inconsistencies regarding ROEs for electric transmission owners, we continue to consider FERC regulation toward electric transmission as one of the most credit supportive.

Hawaii

The state is undergoing regulatory reform, and the Hawaii Public Utilities Commission (HPUC) is proceeding with a performance-based regulation (PBR) framework. HPUC plans to finalize the implementation details by the end of 2020. The proposal includes a five-year rate plan with an indexed annual revenue adjustment mechanism, coupled with existing capital recovery mechanisms in between rate cases. We expect this will improve the timeliness of both capital and operating cost recovery for utilities that could lead to improved profitability.

In addition, an earnings-sharing mechanism (ESM) and various performance incentive mechanisms (PIMs) are included. The proposed ESM shares excess earnings with customers and protects the utilities from extreme financial shortfalls. PIMs may provide potential earnings to a utility should it meet certain performance targets. Overall, we expect the new PBR framework will lead to more regulatory predictability and cash flow stability for utilities in Hawaii, including Hawaiian Electric Industries Inc.

Massachusetts

Due to the state regulatory commission's recent rate decision for utility Massachusetts Electric Co. in late 2019, we believe the regulatory environment is gradually improving. The Mass Electric rate case decision was the second major case that included a PBR mechanism, the first being NSTAR Electric Co. Such mechanisms provide for a more predictable formulaic rate setting construct that accounts for utilities' capital and operational spending, inflation over a five-year period, and a decoupling mechanism that provides downside protection irrespective of sales volume declines.

NSTAR Gas Co. recently filed for a similar PBR mechanism in their gas distribution rate case, and we are monitoring this development. Overall, even with our view of gradual improvement, we believe there could be regulatory lag since the state uses historical test years when setting rates.

Mississippi

We continue to monitor the pending regulatory commission decision on Mississippi Power Co.'s (MPC) reserve margin plan (RMP), a request by the regulator to develop alternatives to lower its reserve margin. This plan could accelerate retirements for some of MPC's coal-fired power plants by 2022. We continue to monitor this proceeding to determine how the rate recovery of remaining book value of retired assets will be addressed.

Nevada

Following a legislative initiative in 2019, the Public Utilities Commission of Nevada (PUCN) initiated a proceeding and has conducted workshops regarding the options around alternative ratemaking plans that could include formula rates, decoupling, earnings sharing, and multiyear rate plans. In April 2020, PUCN released the first report that outlines efforts regarding potential alternative ratemaking mechanisms for Nevada's electric utilities. Ultimately a draft proposal may be issued in 2021 with regulations adopted after reviewing feedback from workshop participants. PUCN is evaluating whether alternative ratemaking would provide better incentives than traditional cost-of-service ratemaking for NV Energy Inc.'s regulated utilities, Nevada Power Co. and Sierra Pacific Power Co. This is to achieve state policy goals for lower carbon emissions, renewable energy, energy efficiency, and electric vehicle adoption while keeping costs down.

Also, the commission is examining whether alternative rates such as flexible pricing options for customer classes will capture utilities' cost of doing business and support financial stability while assuring the delivery of safe and reliable electricity at a reasonable cost. The final determination is expected in 2021, and we will continue to monitor developments.

New York

Political attention toward utilities in the state was somewhat heightened during the past year following a blackout in summer 2019 in Consolidated Edison Inc.'s (Con Ed) service territory. In addition, Con Ed's and National Grid North America's (NGNA) implementation of gas distribution moratoriums to manage gas supply issues in the region added to the regulatory uncertainty. The moratoriums led to a letter in late 2019 from Gov. Andrew Cuomo indicating the state would move to revoke NGNA's certificate to operate its downstate gas franchise in response to NGNA's management of the gas supply issues in its service territory.

NGNA subsequently agreed to pay $36 million to compensate customers affected by its moratorium and support other energy conservation measures and projects, all of which reduced regulatory uncertainty. However, regulatory risk is still likely to persist because gas supply constraints remain a key issue for gas utilities in the state.

Con Ed has faced political pushback for some of its actions, including on the gas supply moratorium and summer 2019 blackout, but has avoided formal reprimands. This somewhat limits its regulatory and political risks. Despite the negative political attention, Con Ed achieved a

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somewhat constructive rate case decision from the New York State Public Service Commission (NYSPSC), including on a multiyear rate plan for its electric and gas operations at Consolidated Edison Co. of New York Inc. for rate increases totaling nearly $1.2 billion over three years beginning in 2020. While the multiyear rate plan provides some cash flow predictability, under this plan the authorized return on equity is 8.8%, lower than what is typical for peers.

New Mexico

In 2019, the state passed the Energy Transition Act (ETA) to eliminate carbon emissions by 2045 from electric utilities with interim targets. We believe this provides credit support to the retirement of fossil-fuel generation in the state. PNM Resources Inc. subsequently sought approval to close units at the San Juan coal-fired plant and securitize the plant abandonment costs. In early 2020, a New Mexico Supreme Court ruling confirmed the applicability of the ETA to PNM's plan and replacement power project. The commission is reviewing different options of the proposed replacement project.

An initiative is expected to be included on the state's 2020 general election ballot that, if approved, would require Public Regulation Commission members to be appointed. The constitutional amendment would change the PRC from a five-person elected body to a three-person agency, with members chosen by the governor from a list of candidates compiled by a nominating committee, beginning in 2023.

North Carolina

While some developments suggest possible improvement to regulatory risks, other issues remain unresolved. Specifically, passage of Senate Bill 559, a storm securitization measure, permits recovery for certain storm recovery costs. Duke Energy Corp. utilities Duke Energy Carolinas LLC and Duke Energy Progress LLC can use a new financing measure to recover restoration costs incurred after several storms and hurricanes in 2018. We consider this favorable for credit quality. Separately, in 2019, Duke Energy settled with the North Carolina Department of Environmental Quality and certain community groups to excavate seven of the nine remaining coal ash basins in North Carolina and partly excavate the other two. Although this reduces legal uncertainty associated with the company's ash pond closure strategy, cost recovery for coal ash costs is still pending, which indicates some regulatory uncertainty.

Texas

We have not revised our regulatory jurisdiction assessment on the Public Utilities Commission of Texas (PUCT), which we consider to be very credit supportive. But we believe recent orders related to COVID-19 in addition to noteworthy trends stemming from recent rate proceedings require a comment.

In March 2020, PUCT issued orders related to COVID-19, suspending utility service disconnections for nonpayment and creating the COVID-19 Electricity Relief Program. We find this program to be constructive from a credit standpoint, specifically as it relates to the recoverability of unexpected costs arising from customer nonpayment due to the pandemic. We believe PUCT's action to be more proactive and demonstrates a commitment to credit quality compared to responses from other jurisdictions that relied only on deferrals of these costs as regulatory assets.

In multiple recent rate case decisions, PUCT approved more-leveraged hypothetical capital structures that reflect an equity ratio of 42.5%. This differs from previous trends when PUCT approved equity ratios of 45%. We believe these actions could weaken credit quality as utilities manage equity ratios down to this lower level, possibly weakening financial measures without offsetting adjustments.

Virginia

The Virginia Clean Economy Act passed in March 2020, which requires electric utilities to supply 100% of electricity from renewable sources by 2050. Intermediate targets are also set for utilities, including Virginia Electric & Power Co. and Appalachian Power Co., that require 30% of power to be supplied from renewables by 2030 and to close all carbon-emitting power plants by 2045 and 2050, respectively. The Grid Transformation and Security Act passed in 2018 allows utilities to rate-base large renewable projects. However, certain key risks remain, including concerns on the leveled cost of energy provided by new offshore wind projects, even though lawmakers have been historically supportive to the utilities' effort to expand wind capacity. The Clean Economy Act also grants the Virginia State Corporation Commission more oversight over major projects, including the 2.6-gigawatt offshore wind project with construction slated to start in 2024. Some risks may arise due to potential cost overruns or project delays, which could create pressure on the timely cost recovery and ratepayer affordability. We are closely monitoring the 12-megawatt pilot project, which may complete construction this summer.

Renewable Portfolio Standard And Clean Energy Standards

State-level clean and renewable energy standards greatly influence the overall strategic direction and growth investments of North American regulated utilities. Regulatory support through timely cost recovery helps support credit quality and facilitate the energy transition. A number of states are passing or proposing legislation that would require utilities to further scale back carbon emissions from power plants and utilize a greater percentage of renewable energy generation. Today, 31 states have a mandatory renewable portfolio standard (RPS), and seven have a voluntary renewable energy standard target.

The most recent state to adopt a mandatory RPS target is Virginia, which as of 2020 requires investor-owned utilities to achieve 100% renewable generation by either 2045 or 2050, depending on the entity, and a certain amount from solar and wind sources. Other states are revising their targets or passing additional legislation. Washington passed a bill to achieve net-zero carbon emissions by 2050. Maine requires state greenhouse gas emissions to be below 1990 levels by at least 45% by 2030 and at least 80% by 2050. Iowa, New Mexico, and Maryland have either passed or proposed legislation that would curb emissions and require more clean energy sources.

We will continue to monitor these developments for any impact.

Related Research

- Regulatory Responses To COVID-19 Are Key To Utilities' Credit Prospects, May 20, 2020
- U.S. And Canadian Regulatory Jurisdiction Updates And Insights: November 2019, Nov. 4, 2019
- Key Credit Factors For The Regulated Utilities Industry, Nov. 19, 2013

This report does not constitute a rating action.

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26 Western Water And Sewer Issuers Are Upgraded On Revised Criteria

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26 Western Water And Sewer Issuers Are Upgraded On Revised Criteria

Standard & Poor's Ratings Services has raised its ratings on 26 municipal waterworks, sanitary sewer, and/or drainage utility revenue bonds (see table 1). The upgrades are primarily based on our recent criteria revision (see the article, "Standard & Poor's Revises Criteria For Rating Water, Sewer, And Drainage Utility Revenue Bonds," dated Sept. 15, 2008, on RatingsDirect). In all cases, the rating outlook is stable.

In our opinion, western region utilities included in this review tend to demonstrate strong financial metrics and management practices that mitigate several regionally specific challenges. Western states face a diminishing water supply, coupled with a rising population. Drought in the Colorado River Basin and court-ordered restrictions on water deliveries from the Sacramento-San Joaquin River Delta in California to protect fish and wildlife have necessitated alternative water solutions; the construction of desalination and reclaimed water plants and water banking programs are a few of the alternatives that have gained popularity. For example, the California Department of Water Resources created a drought water bank for 2009 to facilitate the transfer of water from local water districts willing to sell excess supply to those with short supply. Despite these endeavors, we believe conservation efforts will persist and mandatory water restrictions might still be needed. We, however, believe that a well-planned rate structure can mitigate cyclical revenue trends resulting from reduced water usage. In addition, we believe that the funding of capital programs for aging infrastructures in mature areas and new infrastructure for young growing communities will require proactive long-term planning.

In our opinion, stalled housing construction has been both a blessing and a burden for some systems. Slowed new construction has provided some capital expenditure relief for growth-pressured systems. It has also resulted in declining impact fee revenues.

We believe the utilities included in this review, in general, have either sufficient operating revenues to generate adequate debt service coverage and had been using impact fees to fund capital projects that are now on hold because of reduced growth demand or responded with budget adjustments or increased user rates. Notwithstanding these challenges, these issuers, in our view, have exhibited stable credit profiles and, in general, demonstrate one or more of the following credit characteristics:

- Strong financial metrics, including debt service coverage and cash reserves;
- Good economic fundamentals, such that we expect their respective utility system(s) to be able to handle such pressures as housing market vulnerabilities, employment softness, or cost-of-service inflation; and
- Solid management, which includes a demonstrated willingness to adjust rates, long-term planning to fund key service components like water supply or regulatory-driven capital expenditures, and the ability to serve the needs of a growing community.

It should be noted that without exception, municipally owned water, sewer, and drainage systems in the United States are monopolistic service providers that enjoy local rate autonomy in the provision of a relatively price inelastic service. These are characteristics that we believe help support credit quality. Only a few states require local rate increases by a state regulator such as a public service commission.

Although we have historically incorporated factors such as the service area economy and financial performance as components of our analysis, we now believe the sector's demonstrated stability in operations and financial performance, as well as successful management of the requirements of the federal Safe Drinking Water Act of 1974 and Clean Water Act of 1972, and all of their respective amendments and state regulations, supports these rating actions.

Our criteria revision reflects our view that for general obligation ratings, a small and/or rural issuer does not necessarily have what we consider weaker credit quality than a larger or more-urban issuer. Although we assess these factors in our credit analysis for some revenue bond ratings, we believe many municipal systems still exhibit, in our view, strong and stable credit quality despite size or location constraints. While we believe that smaller or rural utility systems may not necessarily benefit from the economies of scale that can lead to more-efficient operations or lower costs, in our view, they can still have affordable rates, even in places with less-than-favorable household income and wealth levels.

As a result of our reexamination of these credit factors, we reviewed these issuers and raised our ratings. We expect to publish additional ratings adjustments on water and sewer ratings based on our criteria revisions. All of the systems in table 1 are water and sewer service providers unless noted otherwise.

Issuer Review

Table 1

Rating Changes

Issuer	New Rating	Previous Rating	Analyst	Comment
East Cherry Creek Vy Wtr & San Dist, CO	A+	A	Timothy Barrett	The district continues to demonstrate what we consider good financial performance, including strong coverage of debt service and strong liquidity. This is despite a slowdown in growth and related water tap fees, which accounted for roughly 15% of total water system revenues in fiscal 2007. Within the next year, we understand that the district will likely issue additional bonds for a water treatment plant that could bring coverage close to 1.25x debt service, but we expect liquidity to remain strong at more than a year's cash on hand.
Marin Municipal Water District, CA	AA+	AA	Timothy Barrett	The district provides water to residents of the southern and central portion of Marin County, located in the North San Francisco Bay Area. The district currently serves a population of approximately 183,000 through 61,054 service connections in the cities of Belvedere, Corte Madera, Fairfax, Larkspur, Mill Valley, Ross, Sausalito, San Anselmo, San Rafael, and Tiburon, as well as a large unincorporated area. We understand that the district is currently reviewing options to expand its water supply. This could be achieved through a new 5 mgd facility or through system enhancements. Despite the potential need for additional debt to fund increased water supply, we expect financial performance to remain strong, with management annually adjusting rates and targeting at least six months' operations in cash on hand.
Montrose, CO	A+	BBB+	Timothy Barrett	The utility system serves a population of 16,070 in western Colorado. Montrose provides water and sewer service to 7,109 and 7,198 customers, respectively. We understand that water and wastewater supply and capacity are sufficient for the near future, with the utility projecting supply to meet demand for a population of 40,000 and treatment capacity to be sufficient through 2020. Liquidity and coverage remain in our view very strong, despite the system's use of operations to fund capital needs. We understand that the city does not expect to issue additional debt.
Santa Ana Financing Authority, CA	AA	AA-	Timothy Barrett	Located about 33 miles southeast of Los Angeles, Santa Ana, with a population estimate of 364,000, is both Orange County's largest city and seat. The water system provides potable water to more than 49,000 customers. The customer base is very diverse and built out. We consider the system's financial performance to be very strong, with strong liquidity and coverage of debt service.
Helix Wtr Dist, CA	AA	A+	Ian Carroll	The water district serves eastern San Diego County with retail water services and benefits from a wealthy economic base. Financial performance has been in our view strong, with 3.25x coverage of debt service and 166 days' cash on hand. Operationally, the system relies on San Diego County Water Authority for about 80% of its water supply.

Table 1

Rating Changes (cont.)				
Hillsborough, CA	AAA	AA	Ian Carroll	Hillsborough's combined water and sewer utility maintained what we consider its strong financial performance in 2008 with 2.4x coverage and 678 days' cash on hand; the underlying economy is one of the wealthiest in the U.S., with incomes at 414% of the U.S. median. We understand that there is no plan to issue any additional debt.
Imperial Irrigation District, CA	AA-	A+	Ian Carroll	The district has maintained what we consider a good debt service coverage of more than 2x, in part due to rising sales of water to San Diego County Water Authority. In our view, cash was also strong at 395 days in 2007. The system's service area is in the imperial valley, an agricultural area east of San Diego and on the U.S.-Mexico border, but sales to the water authority mitigate the local economy's agricultural concentration.
Municipality of Anchorage (Sewer), AK	AA	A+	Ian Carroll	The city's wastewater enterprise had what we consider very strong coverage of annual debt service of more than 5x in 2007, based on audited financial statements and 215 days' cash on hand, following rate increases in the past few years. We expect finances to remain strong as long as the required treatment standard is not increased, which we believe would add considerable capital pressures.
Municipality of Anchorage (Water), AK	AA	AA-	Ian Carroll	We understand that the city's water utility has virtually unlimited supply by virtue of mountain snowfall. In our view, the enterprise's finances have been strong, with 1.8x coverage and 242 days' cash on hand. Capital needs, moreover, are what we consider minimal, which should allow for stable financial performance without the need for additional rate increases.
Orange County Water Dist, CA	AAA	AA+	Ian Carroll	The water district maintained what we consider very strong coverage, more than 2x in each of the past several years, as well as exceptional cash liquidity of 590 days, in 2007. The district's economy, moreover, does not present a challenge because the district participates in the Teeter plan. Income levels are 33% above the U.S. median. The district is responsible for the long-term viability of the groundwater basin and levies an assessment on its customers who pump from the ground.
Brea Public Finance Authority, CA	A+	A	Le T. Quach	The city of Brea's water rates are adjusted annually based on inflation, which has supported what we consider good coverage of annual debt service. The city projects coverage for fiscal 2008 to be a strong 1.6x. The city has historically funded its water capital improvements with cash, but expects to issue additional parity bonds this spring. Brea receives its water supply from Southern California Metropolitan Water District and California Domestic Water Co., a private company.
Oro Loma Sanitary District, CA	AA+	AA-	Le T. Quach	This wastewater treatment system benefits from what we consider a strong collections process, which allows it to collect a majority of its fees through annual property tax billings. In our view, the system has maintained very strong financial performance, with coverage of at least 5x annual debt service from fiscals 2005-2007. Based on audited results for fiscal 2008, this Bay Area district will end with a $28.6 million unreserved cash balance, equal to what we consider a strong 817 days' expenditures. The system projects that its capital needs will be funded by ongoing revenues.
Crescenta Vy Wtr Dist, CA	A+	A	Li Yang	Recent rate increases have contributed to what we consider the district's strong 4.3x coverage in fiscal 2008 for its outstanding water revenue debt. The first principal payments for the 2007 certificates of participation begin in fiscal 2009, and we expect coverage to be 1.5x excluding connection fees. The district currently maintains a five-year capital plan totaling roughly $9.9 million. We understand that the district is considering issuing additional debt.
East Vy Wtr Dist, CA	AA-	A	Li Yang	The district maintains what we consider a sizable capital plan, with the majority being used for constructing new treatment plants in order to meet federal water quality standards. The most recent rate increase of 12.5% became effective in fiscal 2009. We understand that future rate are increases possible, which would enable the district to maintain what we consider good debt service coverage levels.
Goleta Wtr Dist, CA	A+	A-	Li Yang	In our opinion, the district's financial performance has improved significantly in recent years due to increased water demand. In addition, water rates were raised in fiscal 2008, which has led to what we consider strong debt service coverage of 1.53x without connection fees. We expect coverage to remain at this level as the district does not plan to issue additional debt. Currently, the district maintains a five-year capital plan of approximately $5 million.
Lake Arrowhead Comnty Svcs Dist (water), CA	A+	A-	Matt Reining	In our opinion, the utility has shown good financial performance, while serving a mostly residential, resort community, with strong liquidity and good coverage. After a number of years of ongoing legal action regarding the district's use of water from Lake Arrowhead, the state issued a final order in 2006 allowing the district to use 1,566 acre feet per year, while also pointing to the need for outside sources given that the lake allowance supplies only 63% of recent average years' water usage. The district has met this need in the intermediate future with a 10-year contract with the Crestline-Lake Arrowhead Water Agency. Through rate increases, the district is generating revenue to cover the increase in water supply costs.

Table 1

Rating Changes (cont.)				
Los Angeles Cnty San Dist #14 (Lancaster), CA	A+	A-	Matt Reining	The district primarily serves the city of Lancaster, which has seen significant residential growth in recent years. Because of this growth, the district has a $295 million five-year capital improvement plan that includes more routine sewer and line improvements as well as a major plant expansion and treated water storage facility. The series 2005 bonds were issued to meet these capital financing needs; the district has used and we understand will use additional state loans. Based on audited 2007 results, the district had in our view a solid 1.2x debt service coverage with a strong 1.8x coverage including connection and developer fees. Although the district projects that connection fees will fall, given the local real estate slowdown, management believes that flexibility is built into its capital improvement plan and that it can adjust expenditures through modular plant expansion and section line construction.
Los Angeles Cnty San Dists Fincg Auth, CA	AA+	AA	Matt Reining	The sanitation districts serve a large and diverse customer base of approximately 5.2 million people, or roughly all of the non-City of Los Angeles portions of Los Angeles County. Organized as a partnership among 24 individual districts (each with individual debt and tax bases), the overall district functions as a single unified operating entity with a single management structure. The overall district provides main-line conveyance, treatment, and disposal of sewage, with local collections done by individual, local agencies. For residential usage, customers pay a fixed annual service charge as well as a modest portion of property tax. These service charges ranged from $78-$308 in fiscal 2008 and adopted service charge increases averaged 11% for fiscal 2009. Debt service coverage by each of the member districts allows for a 20% increase in revenues as needed for the step-up charges. Coverage by what we consider the stronger districts (taking into account the step-up) ranged from a good 1.4x to a very strong 8.7x in fiscal 2007, with strong cash levels ranging from 365 days to more than 4,000 days.
Arapahoe Cnty Water & Wastewater Authority, CA	AA-	A+	Misty Newland	The authority provides service to portions of Arapahoe and Douglas counties. In our view, proximity to Denver has driven expansion in these areas. Coverage and cash balances have been historically what we consider strong. Estimated coverage for fiscal 2008 is lower but still in our view strong at 3.4x due to a decline in tap fees and added debt service for series 2007 revenue bonds. We understand that future capital projects will include expansion of its water treatment plant and water acquisition, a portion of which would be funded with additional debt. The authority's additional bonds coverage test is 1.25x maximum annual debt service.
Olivenhain Mun Wtr Dist, CA	AA	AA-	Misty Newland	The district serves an affluent area in San Diego County, including part of the city of Encinitas. Financial management includes a 10-year operating and capital spending forecast. In addition, the district is proposing a rate structure that includes step-ups during drought conditions to offset revenue losses due to decreased consumption. The district has reserve targets for the operating, capital, and rate stabilization funds. The district is about 74% built-out and we expect will require additional capacity in the future, which we understand it plans to fund with system revenues and debt financing.
Manteca, CA	A+	A-	Shannon Groff	The city is located in the northern portion of the San Joaquin Valley between the cities of Stockton and Modesto and approximately 75 miles east of San Francisco. The city is located in the agriculturally rich San Joaquin Valley between Interstate 5 and State Highway 99. After determining that it was over-drafting its ground water resources, the city entered into an agreement with South San Joaquin Irrigation District for the provision of surface water. The city's current usage is 44% surface water and 56% ground water and future usage is projected at 53% surface water and 47% ground water. A recent rate study led the city to adopt rate increases of 5% each year from 2009-2013; the adopted plan will decrease fixed rates and increase water use charges.
Susanville, CA	A	BBB-	Lisa Schroeer	The moderately small system serves roughly 18,600 people in the seat of Lassen County. In our view, finances are good, and coverage has not fallen below the 1.25x target. We believe cash is very strong, with $2.2 million in fiscal 2007, and management has indicated that it intends to keep cash at this level. Finances should stay at what we consider good given the system's relatively small capital needs and recent rate increases. Management intends a recent rate increase to fund the system's capital needs, with an estimated revenue of $400,000 annually.
Los Angeles Cnty San Dist #20, CA	A	A-	Lisa Schroeer	The system serves the city of Palmdale and surrounding areas with roughly 110,000 people. In 2007, the district issued bonds to address environmental compliance issues. Management expects the project to be completed on time. Coverage was more than 2.0x with connection fee revenue and what we consider a still good 1.2x without it in 2007. Management indicated that approved rate increases are anticipated to be sufficient to cover any decline in connection fee revenue and expects 2008 coverage to be similarly strong. The district does have about $200 million in additional capital needs through 2014. Management anticipates using state loans in the upcoming year to address some of these needs and that it will meet all bond covenants. In our view, the district's strong cash position, with cash held in restricted funds but available for operations, mitigates some concerns over additional capital needs.

Table 1

Rating Changes (cont.)

Clovis, CA	A+	A-	Lisa Schroeer	The system serves a population of roughly 90,000 in the city of Clovis. Previously a rapidly growing area, the city has had to curb its expectation for one-time revenues, but lower construction costs have provided additional financial flexibility not previously anticipated. Coverage is more than 1x without growth-related revenues, and management expects cash to stay strong. The city's capital plans are, in our view, minimal, but management noted that the city may need to contribute to projects necessary for the Fresno system, which the city currently uses for its treatment. Management indicated a willingness to raise rates to ensure a target level of coverage of 1.2x. Additionally, the city has a rate stabilization fund that can stabilize revenues as growth-related revenues drop off. The new rating reflects our expectation that the city will take into account the decrease in growth-related revenues and adjust its finances.
Weber Basin Wtr Conservancy Dist, UT	AA	AA-	Lisa Schroeer	This wholesale and retail utility, covering Weber and Davis counties, has customer cities that, in our opinion, are of strong credit quality. In addition, the district benefits from property tax revenues and a strong water supply. The district provides water to what we consider a strong economic area that ties into the broader Salt Lake economy.
Valley Sanitary District, CA	A+	A-	Lisa Schroeer	The district serves the city of Indio and surrounding areas. Coverage is more than 4x, even when excluding one-time development-generated revenue. User rates are rising to address additional costs and should help as connection fee revenue decreases. In our view, the district holds strong cash that it may partially use to address some treatment plan needs, but it has a policy to maintain at least six months' operations in cash on hand, which it is well above. Additional capital projects are related to growth, and we understand that the district is evaluating whether or not it is a prudent time, financially, to move forward. These are not currently need-based projects, which gives the district flexibility.

mgd--Million gallons per day. MSA--Metropolitan statistical area. MHEBI--Median household effective buying income.

Table 2

Selected Credit Ratios

Issuer	DSC (x)	Days' Cash	MHEBI (% of U.S.)	Debt to Plant (%)
East Cherry Creek Valley Water and Sanitation District, CO	2.4	537	104	33
Marin Municipal Water District, CA	2.0	238	156	19
Montrose, CO	4.3	876	83	21
Santa Ana Financing Authority, CA	3.9	187	101	30
Helix Wtr Dist, CA	3.3	166	114	11
Hillsborough, CA	2.4	678	414	85
Imperial Irrigation District, CA	2.1	395	75	39
Municipality of Anchorage (Sewer), AK	5.4	215	132	24
Municipality of Anchorage (Water), AK	1.8	242	132	35
Orange County Water Dist, CA	2.3	590	130	73
Brea Public Finance Authority, CA	1.7	212	132	30
Oro Loma Sanitary District, CA	6.4	935	128	8
Crescenta Vy Wtr Dist, CA	4.3	312	133	23
East Vy Wtr Dist, CA	1.7	339	97	24
Goleta Wtr Dist, CA	2.0	112	139	53
Lake Arrowhead Comnty Svcs Dist (water), CA	1.8	397	146	28
Los Angeles Cnty San Dist #14 (Lancaster), CA	1.2	2,493	96	134
Los Angeles Cnty San Dists Fincg Auth, CA	1.4 to 8.7	365 to 4,000	101	38
Arapahoe Cnty Water & Wastewater Authority, CO	7.9	799	127	69
Olivenhain Mun Wtr Dist, CA	4.0	399	145	20
Manteca, CA	5.46	1,977	109	71
Susanville, CA	1.3	289	85	123

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Table 2

Selected Credit Ratios (cont.)				
Los Angeles Cnty San Dist #20, CA	1.2	833	101	303
Clovis, CA	2.2	1,000	100	154
Weber Basin Wtr Conservancy Dist, UT	3.2	696	122/104	31
Valley Sanitary District, CA	6.5	2,120	90	20

MHEBI--Median household effective buying income. DSC--Debt service coverage.

Table 3

Contact Information

Credit analyst	Location	Phone	E-mail
Tim Barrett	New York	212-438-6327	timothy_barrett@standardandpoors.com
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Lisa Schroeer	San Francisco	415-371-5006	lisa_schroeer@standardandpoors.com
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Forecast
Multi-Asset Solutions

Q3 2022

Long-Term Asset Class Forecasts

Our longer-term asset class forecasts are forward-looking estimates of total return and risk premia, generated through a combined assessment of current valuation measures, economic growth, inflation prospects, ESG considerations, yield conditions as well as historical price patterns. We also include shorter-term return forecasts that incorporate output from our multi-factor tactical asset allocation models. Outlined below is the process we use to arrive at our return forecasts for the major asset classes.

For a copy of the latest quarterly investment commentary from the Investment Solutions Group, please reach out to your State Street representative.

Inflation

The starting point for our nominal asset class return projections is an inflation forecast. We incorporate both estimates of long-term inflation and the inflation expectations implied in current bond yields. US Treasury Inflation-Protected Securities (TIPS) provide a market observation of the real yields that are available to investors. The difference between the nominal bond yield and the real bond yield at longer maturities furnishes a marketplace assessment of long-term inflation expectations.

Cash

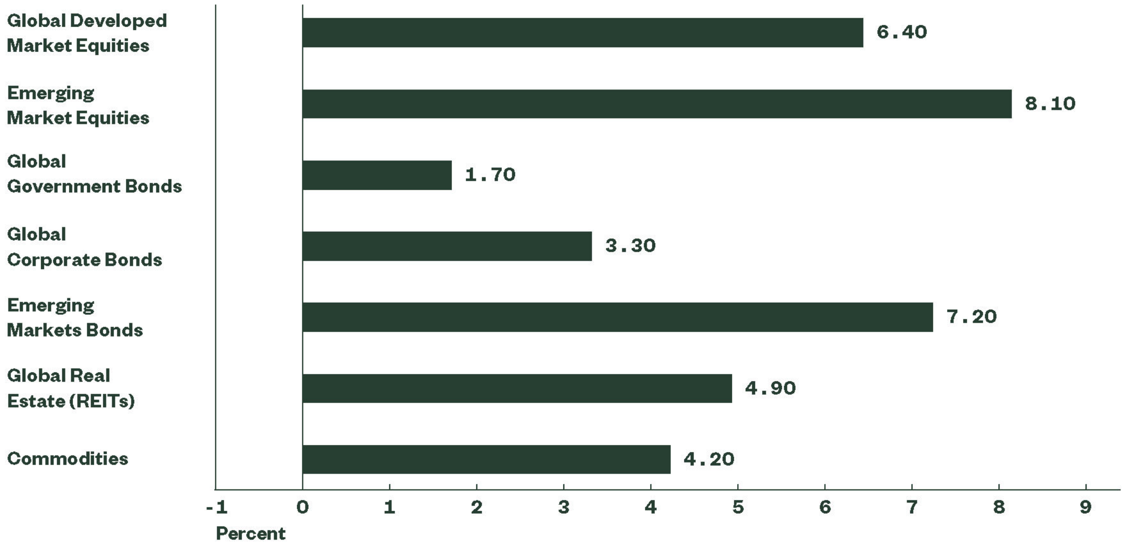
Our long-term forecasts for global cash returns incorporate what we view as the normal real return that investors can expect to earn over time. Historically, cash investors have earned a modest premium over inflation but we also take current and forward-looking global central bank policy rates into consideration in formulating our cash forecast.

Bonds

Our return forecasts for fixed income are derived from current yield conditions together with expectations as to how real and nominal yield curves will evolve relative to historical precedent. We then build our benchmark forecasts from discrete analysis of relevant maturities. For corporate bonds, we also analyse credit spreads and their term structures, with separate assessments of investment grade and high yield bonds. We also take into account the default probability for high yield bonds in the foreseeable future.

Figure 1
Forecasted Long-Term Annualised Return

Long-Term (10+ Years)



Source: State Street Global Advisors Investment Solutions Group as of 30/06/2022.
Forecasted returns are based upon estimates and reflect subjective judgements and assumptions. These results were achieved by means of a mathematical formula and do not reflect the effect of unforeseen economic and market factors on decision-making. The forecasted returns are not necessarily indicative of future performance, which could differ substantially.

Equities

Our long-term equity market return forecasts combine estimates of real return potential, derived from historical and current dividend yields, forecasted real earnings growth rates, expected share issuance or buyback yield, and potential for expansion or contraction of valuation multiples. Our way of estimating real earnings growth rates incorporates forecasts of GDP levels. Across both developed and emerging markets, variations in labour, capital and productivity levels result in region-specific differences in the GDP estimates, allowing for more region-appropriate forecasts for both developed and emerging market equities.

Another important feature of our equity forecasts is that they include elements of ESG through leveraging State Street Global Advisors' R-Factor scores. Improvements in a country's aggregated and normalised R-Factor scores are used to incrementally reduce its risk expectations within the forecast and the other way around.

Smart Beta

Smart Beta forecasts are developed using MSCI World index forecasts as a starting point and adding expected alpha and beta adjustments as appropriate.

Private Equity

Our long-term forecast for private equity is based upon past performance patterns of private equity funds relative to listed equity markets and our extrapolation of these performance patterns on a forward basis. According to several academic studies[1,2,3] the annual rate of return of private equity funds over the long term appears to be largely in line with that of listed equities after appropriate adjustments for leverage are made. Private equity funds seem to have been outperforming relative to listed equities before fees, but generally in line with them (on a leverage-adjusted basis) after fees.

REITs

Real Estate Investment Trusts (REITs) have historically earned returns between bonds and stocks due to their stable income streams and potential for capital appreciation. Hence, we model it as a blend of two approaches. The first approach is to apply the average historical spread of the yields over Treasuries to forecast the expected return. The second approach is to account for inflation and long-term capital appreciation with the current dividend yield.

Commodities

Our long-term commodity forecast is based on the level of world GDP, as a proxy for consumption demand, as well as on our inflation outlook. Additional factors affecting the returns to commodity investors include how commodities are held (e.g., physically, synthetically, or via futures) and the various construction methodologies of different commodity benchmarks. Futures-based investors have the potential to earn a premium by providing liquidity and capital to producers seeking to hedge market risk. This premium is greatest when the need for hedging is high, driving commodities to trade in backwardation, with future prices that are lower than spot prices. When spot prices are lower, however, the market is said to be in contango, and futures investors may realise a negative premium.

Long Horizon Risk

We believe that over the long term, prices are anchored to some sort of a slow-moving, fundamentals-anchored process, while in the short term, these same prices cycle quasi-randomly around such anchors. Thus, the returns on most financial assets can be effectively separated into a long-term component linked to economic fundamentals and a transient part linked to "excess volatility" or other noise. Such property of asset returns rhythms nicely with the investors' need to balance strategic portfolio optimality with the short-term risk control. With that in mind, we expanded our Long-Term Return Forecasts to include long-horizon risk estimates alongside ordinary, short-horizon ones.

Figure 2
SSGA Asset Class Return Forecasts
As of 30 June 2022

Asset Class	Benchmark	Short Term 1 Year (%)	Intermediate Term 3–5 Years (%)	Long Term 10+ Years (%)	Long-Horizon Risk (Std Dev) (%)	"Observed" Short-Horizon Risk (Std Dev) (%)
Global Equities (ACWI)	MSCI ACWI	7.4	7.4	6.6	4.7	14.7
Global Developed (World)	**MSCI World**	**7.2**	**7.2**	**6.4**	**4.7**	**14.8**
US Large Cap	S&P 500	7.1	7.3	6.6	4.7	15.4
US Mid Cap	S&P MidCap 400	7.7	7.6	6.9	4.8	17.8
US Small Cap	S&P Small Cap 600	8.0	7.8	7.1	5.3	19.7
Europe	MSCI Europe	8.2	7.2	6.2	5.1	15.9
Euro	MSCI Euro	7.7	6.7	5.6	6.4	19.6
Developed Pacific	MSCI Pacific	6.3	6.2	5.5	5.8	17.9
Australian Equities	MSCI Australia	8.6	9.1	8.5	4.0	15.0
New Zealand Equities	MSCI New Zealand	3.8	5.7	5.1	4.6	17.7
Global Value Tilted	MSCI World Value Weighted	7.0	6.9	6.2	4.8	15.3
Global Quality Tilted	MSCI World Quality	7.3	7.3	6.6	4.0	13.4
Global Momentum Tilted	MSCI World Momentum	8.4	8.4	7.6	5.2	15.7
Global Minimum Variance	MSCI World Minimum Vol	7.5	7.5	6.8	3.4	11.0
Emerging Markets (EM)	**MSCI EM**	—	**9.0**	**8.1**	**8.4**	**21.0**
EM Asia	MSCI EM Asia	—	8.5	7.7	7.3	22.0
EM EMEA	MSCI EM EMEA	—	8.7	8.1	6.3	20.1
EM Latin America	MSCI EM Latin America	—	16.4	14.2	12.3	27.8

Asset Class	Benchmark	Short Term 1 Year (%)	Intermediate Term 3–5 Years (%)	Long Term 10+ Years (%)	Long-Horizon Risk (Std Dev) (%)	"Observed" Short-Horizon Risk (Std Dev) (%)
Global Government Bonds	**BofA Global Government Bond Index**	**1.3**	**1.5**	**1.7**	**1.3**	**3.9**
Global Corporate	**Barclays Global Aggregate Corporate**	**1.9**	**2.7**	**3.3**	**2.3**	**8.0**
Non-US Government Bonds	Citi WGBI NonUSD	0.8	1.1	1.3	1.5	3.9
Non-US Corporate Bonds	BofA Merrill Lynch Global Large Cap Corporate Ex/ Barclays Global Agg x — Corporate	2.4	2.5	2.8	2.8	11.4
US Government Bond	Barclays US Aggregate Government	2.8	2.8	2.8	1.6	5.1
US Investment Grade Bond	Barclays US Agg Bond	2.2	3.0	3.2	1.5	4.5
US High Yield Bond	BofA US High Yield	5.6	6.9	6.6	3.2	8.9
Euro Government Bonds	BofA Euro Government	0.7	1.4	1.8	1.6	4.8
Euro Corporate Bonds	BofA Merrill Lynch Euro Corporate	1.8	2.0	2.6	1.6	4.5
Euro High Yield Bonds	BofA Euro High Yield	4.7	5.4	5.2	4.4	12.2
Australian Government Bonds	BofA Merrill Lynch Australia Government	2.8	3.5	3.5	1.6	5.1
Australian Corporate Bonds	BofA Merrill Lynch Australia Corporate	3.8	4.6	4.7	1.2	3.5
New Zealand Government Bonds	ICE BofA Merrill Lynch New Zealand Government	2.9	3.4	3.6	1.5	4.5
Japanese Government Bonds	Citi Japanese GBI JPY	0.1	-0.2	0.0	1.2	3.9
Japanese Corporate Bonds	BofA Japan Corporate	0.2	0.2	0.4	0.5	2.0
UK Government Bonds	Citi UK GBI GBP	2.3	1.8	1.9	2.1	7.5
UK Corporate Bonds	BofA UK Corporate	3.4	3.3	3.5	2.1	7.3
Emerging Markets Bonds	**JPM EMBI Plus**	**5.1**	**6.0**	**7.2**	**4.1**	**13.5**
Global Real Estate (REITs)	**FTSE EPRA/ NAREIT Developed**	**4.5**	**5.1**	**4.9**	**6.5**	**18.1**
Commodities	**Bloomberg Commodity**	**11.3**	**4.3**	**4.2**	**5.6**	**15.5**
Hedge Funds	HFRI Fund of Funds Composite Index	6.2	5.9	5.6	2.5	5.9
Private Equity	Burgiss Private Equity	9.0	9.5	8.6	7.9	11.6
Core Private Credit	Burgiss Private Senior Debt	—	—	8.8	5.3	9.1
Opportunistic Private Credit	Burgiss Private Distressed Debt	—	—	11.4	6.4	10.4
Direct Real Estate	Burgiss Real Estate	—	—	7.9	7.5	9.1
US Cash	BofA 3 Month T-Bill	1.6	2.2	2.1	0.7	1.0
Australian Cash	JP Morgan Cash Index Australia (3 Month)	1.3	2.2	2.2	0.8	1.1
New Zealand Cash	JP Morgan Cash Index New Zealand (3 Month)	1.9	2.4	2.3	0.9	1.1

Asset Class	Benchmark	Short Term 1 Year (%)	Intermediate Term 3–5 Years (%)	Long Term 10+ Years (%)	Long-Horizon Risk (Std Dev) (%)	"Observed" Short-Horizon Risk (Std Dev) (%)
US Inflation	—	—	2.9	2.3	—	—
Australian Inflation	—	—	2.5	2.4	—	—
New Zealand Inflation	—	—	2.3	2.1	—	—

Source: The forecasted returns are annual arithmetic averages based on State Street Global Advisors' Investment Solutions Group 30 June 2022 forecasted returns and long-term standard deviations. The forecasted performance data is reported on a gross of fees basis. Additional fees, such as the advisory fee, would reduce the return. For example, if an annualised gross return of 10% was achieved over a five-year period and a management fee of 1% per year was charged and deducted annually, then the resulting return would be reduced from 61% to 53%. The performance includes the reinvestment of dividends and other corporate earnings and is calculated in the local (or regional) currency presented. It does not take into consideration currency effects. The forecasted performance is not necessarily indicative of future performance, which could differ substantially.
Please reach out to your representative in case of any further questions on our forecasts or methodologies.
Note: Forecasts apply to the listed primary benchmarks and other asset class benchmarks as long as they are substantially similar.
Note: Private asset forecasted returns are Net of Fees, Public asset forecasted returns are Gross of Fees.

Endnotes

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About State Street Global Advisors

Our clients are the world's governments, institutions and financial advisors. To help them achieve their financial goals we live our guiding principles each and every day:

- Start with rigor
- Build from breadth
- Invest as stewards
- Invent the future

For four decades, these principles have helped us be the quiet power in a tumultuous investing world. Helping millions of people secure their financial futures. This takes each of our employees in 30 offices around the world, and a firm-wide conviction that we can always do it better. As a result, we are the world's fourth-largest asset manager* with US $3.48 trillion† under our care.

* Pensions & Investments Research Center, as of December 31, 2021.
† This figure is presented as June 30, 2022 and includes approximately $66.43 billion of assets with respect to SPDR products for which State Street Global Advisors Funds Distributors, LLC (SSGA FD) acts solely as the marketing agent. SSGA FD and State Street Global Advisors are affiliated.

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Information Classification: General

Glossary

Bloomberg Barclays U.S. Corporate High Yield Index A fixed-income benchmark of US dollar-denominated, high-yield and fixed-rate corporate bonds. Securities are classified as high yield if the middle rating of Moody's, Fitch and S&P is Ba1/BB+/BB+ or below. Bonds from issuers with an emerging markets country of risk, based on Barclays' emerging markets country definition, are excluded.

Commodities A generic, largely unprocessed, good that can be processed and resold. Commodities traded in the financial markets for immediate or future delivery include grains, metals, and minerals.

Credit Spreads The spread between Treasury securities and non-Treasury securities that are identical in all respects except for quality rating.

Dividend Equities and Dividend Yield Equity securities that pay dividends. A dividend is a distribution of a portion of a company's earnings, decided by the board of directors, to a class of its shareholders. Dividends can be issued as cash payments, as shares of stock, or other property. Equity, also known as stock, is a type of security that signifies ownership in a corporation and represents a claim on part of the corporation's assets and earnings. The dividend yield is the ratio of the dividend paid per share of issued equity over the share price.

Inflation An overall increase in the price of an economy's goods and services during a given period, translating to a loss in purchasing power per unit of currency. Inflation generally occurs when growth of the money supply outpaces growth of the economy. Central banks attempt to limit inflation, and avoid deflation, in order to keep the economy running smoothly.

MSCI World Index The MSCI World Index is a free-float weighted equity index. It includes about 1,600 stocks from developed world markets, and does not include emerging markets.

Nominal Bond Yield The annual income that an investor receives from a bond divided by the par value of the security. The result, stated as a percentage, is the same as the rate of interest the security pays.

Private Equity An umbrella term for large amounts of money raised directly from accredited individuals and institutions and pooled in a fund that invests in a range of business ventures.

Real Interest Rates, or Real Yields An interest rate that takes into consideration the actual or expected inflation rate, which is the actual amount of yield an investor receives. The real rate is the calculation of the "nominal" interest rate minus the inflation rate as follows: Real Interest Rate = Nominal Interest Rate – Inflation.

REITs (Real Estate Investment Trusts) Publicly traded companies that pool investors' capital to invest in a variety of real estate ventures, such as apartment and office buildings, shopping centers, medical facilities, industrial buildings, and hotels.

Tactical Asset Allocation Models Illustrate a dynamic approach to asset management that emphasises exposure to asset classes that are designed to enhance returns or control drawdowns.

Yield Curve (e.g., US Treasury Curve) A graph or line that plots the interest rates or yields of bonds with similar credit quality but different durations, typically from shortest to longest duration. When the yield curve is said to be "flat," it means the difference in yields between bonds with shorter and longer durations is relatively narrow. When the yield curve is said to be "steep," it means the difference in yields between bonds with shorter and longer durations is relatively wide.

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An Examination of Value Line's Long-term Projection

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An Examination of Value Line's Long Term Projections

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Abstract

Unlike previous papers, which have focused on the timeliness ranks, we examine Value Line's 3-5 year projections for stock returns, earnings, sales and related measures. We find that Value Line's stock return and earnings forecasts exhibit large positive bias, although their sales predictions do not. For stock returns, Value Line's projections lack predictive power; for other variables predictive power may exist to some degree. Our findings suggest the spectacular past performance of the timeliness indicator reflects either close alignment with other known anomalies or data mining, and that investors and researchers should use Value Line's long term projections with caution.

JEL Classification: G11; G12; G14
Keywords: Value Line; long-term projections; analyst forecasts; cost-of-capital

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An Examination of Value Line's Long Term Projections

The Value Line Investment Survey follows approximately 1600 stocks. It has been continuously published for many decades and is widely used by investors. Value Line publishes a timeliness rank that forecasts stock price performance over the following 6-12 months. The performance of this indicator has been the focus of dozens of published articles beginning with Shelton (1967). Other notable studies include Kaplan and Weil (1973), Holloway (1981), Stickel (1985), Huberman and Kandel (1987,1990), Affleck-Graves and Mendenhall (1992) and Choi (2000). The consensus of these and other studies is that after controlling for systematic risk factors, Value Line timeliness ranks have substantial predictive power for future short-term stock returns. Although it is true that much of the abnormal returns occur shortly after *changes* in the timeliness ranking, and it is not clear that one can "beat the market" once transactions costs are taken into account, Value Line's record is impressive. As Choi (2000) notes, it has captured the imagination of the finance community like few others.

In addition to its timeliness rank, Value Line publishes a large amount of information in its quarterly stock reports that may be useful to investors. In particular, once every quarter, for each stock, Value Line reports 3-5 year projections for annual total return, sales per share, earnings per share, dividends per share and historical data for these measures.[1] Unlike virtually all previous studies, which focus on the timeliness ranks, our study concentrates on Value Line's long-term projections. In the spirit of past studies using timeliness ranks, we examine whether Value Line's 3-5 year projections for common stock returns, earnings, sales, profit margins or earnings yields have *predictive power* with regard to realized values over that horizon, e.g. whether purchasing stocks with higher predicted returns would really enable investors to earn higher realized returns, or if firms with higher predicted growth in earnings per share actually do exhibit higher earnings growth ex-post than firms with lower predicted growth. Furthermore, because many previous studies of analyst forecasts have focused on forecast bias, we also

[1] Current Value Line reports for each of the 30 stocks comprising the Dow Jones Industrial Average can be freely accessed even by non-subscribers at http://www.valueline.com. A brief perusal reveals the enormous range of information these reports contain beyond the timeliness rank that has been the focus of most prior studies.

examine whether Value Line's 3-5 year projections exhibit significant bias, i.e. whether mean predicted values for stock returns, earnings, etc. differ from mean realized values.

Beyond the fact that Value Line's long-term projections have received little past scrutiny, our study is motivated by three broader considerations. First, while at least dozens of studies have examined various aspects of analysts' short-term (under one year horizon) earnings and stock price forecasts, surprisingly little research has been conducted concerning longer horizon projections. La Porta (1996) sorts stocks into portfolios based on analysts' five-year earnings projections. He finds that stocks with low expected earnings growth earn considerably higher returns, ex-post, than those with high expected growth, partly because analysts subsequently revise earnings forecasts upward for stocks with low expected earnings growth (and vice-versa). Dechow and Sloan (1997) find that analysts' five-year earnings projections are biased upward in general, and that stock prices appear to naively reflect these biased forecasts.[2] Our study, which uses a long sample period and examines the record of an independent advisory service, may shed further light on whether (and if so, why) analyst forecasts are biased.

The second motivation for our study arises from the extensive debate about *why* Value Line's record has been so impressive when compared with those of other security analysts. Several recent studies, notably Desai and Jain (1995), Barber, Lehavy, McNichols and Trueman (2001, 2003) have examined security analyst recommendations, and report some evidence that purchasing stocks with the most favorable consensus recommendations (and/or selling short stocks with the least favorable ratings) yield abnormal returns. However, these returns are generally not as large as has been documented for portfolios constructed from Value Line rankings, and the performance of the analysts varies greatly over time (for example, relative to the market as a whole, their buy recommendations performed extremely

[2] Among studies investigating short-term analyst forecasts, results regarding bias vary depending on the time period and variable examined; for example, Brown, Foster and Noreen (1985), along with O'Brien (1988) find no compelling evidence of bias in security analyst earnings forecasts over their 1976-1980 and 1975-1981 (respectively) sample periods, while Butler and Lang (1991) show analysts were sharply overoptimistic in predicting earnings between 1983 and 1986, and Easterwood and Nutt (1999) report similar evidence for the period 1982-1995. More recently, Agrawal and Chen (2005) find little evidence of systematic bias in earnings forecasts between 1994 and 2003, but Bradshaw and Brown (2005) document substantial overoptimism in 12-month horizon target stock price predictions over their 1997-2002 sample period, and Mikhail, Asquith and Au (2003) find that the probability of achieving a 12-month price target is inversely related to the favorability of an analyst's recommendation.

poorly in 2000 and 2001, while their sell recommendations handily outperformed the market). One possible reason Value Line's record stands out is that Value Line, being an independent subscription service, is not beholden to the firms whose stocks it covers. In contrast, most analysts are employed by investment banks that are dependent on client firms for business. These analysts are notoriously reluctant to issue sell recommendations, and their buy recommendations may depend more on self-interest than on objective analysis of a firm's prospects. Moreover, as Bradshaw, Richardson and Sloan (2006) show, analysts' over-optimism is systematically related to corporate financing activities: over-optimism is greatest for firms issuing securities and smallest for firms repurchasing securities. However, an alternative possible reason for Value Line's superior record that has been suggested by many (see, for example, Gregory 1983) is that this record is a product of luck. If a large number of independent advisory services exist and Value Line is the only one that has managed to outperform the market substantially ex-post, then this finding is unsurprising in a statistical sense and does not necessarily imply that markets are inefficient. Finally, some studies suggest that Value Line's timeliness rankings are highly correlated with other known anomalies such as post-earnings announcement drift (Affleck-Graves and Mendenhall, 1992) and that Value Line's record is an artifact of this alignment.[3] By examining Value Line's long-term return predictions, we believe we can contribute towards a resolution of this debate. If it turns out that Value Line's long term predictions perform as well as their short-term predictions, this would support the argument that Value Line's forecasts are inherently of high quality. Conversely, finding that Value Line's long-term prediction record is not good would suggest that the performance of its timeliness ranks might be a product of data mining or alignment with other anomalies.

The third important motivation for our study is that Value Line's 3-5 year return projections have been extensively used to estimate the cost of equity capital, and to test asset pricing models in ex-ante (rather than the traditional ex-post) form. The performance of these projections is therefore an

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[3] Some studies have claimed, however, that information contained in Value Line reports can move the market in ways that cannot be completely explained by post-earnings announcement drift. For example, Peterson (1987) documents that initial reviews of stocks in Value Line generate abnormal returns around a three-day window surrounding publication; Peterson (1995) shows that post-earnings announcement drift does not fully explain abnormal returns around publication of stock highlights in Value Line.

important issue in its own right. Botosan (1997), Botosan and Plumlee (2002, 2005) and Francis, LaFond, Olsson and Schipper (2004) have all used Value Line 3-5 year projected stock returns as proxies for the cost of equity capital. Ang and Peterson (1985) use ex-ante data from Value Line to investigate the relation between expected stock returns and dividend yield. Similarly, in an interesting recent paper, Brav, Lehavy and Michaely (2005) use Value Line 3-5 year predicted returns as a proxy for consensus expected returns. Unlike prior studies (e.g. Fama and French 1992) using realized returns, Brav, Lehavy and Michaely find a robust positive relation between Value Line's expected returns and market beta, a negative relation between expected return and firm size, and no significant relation between expected return and book-to-market. However, none of these studies explores the relation between Value Line's predictions and future realized returns. The sharp disparity in results obtained when the cost of capital is estimated using Value Line predicted returns vis-à-vis other approaches, and when asset-pricing models are tested with these predicted returns instead of realized returns, both underscore the need to examine how Value Line predicted returns and realized returns are related.

The balance of this paper is organized as follows. In Section I, we describe the two datasets we construct from the Value Line surveys and the Center for Research in Security Prices (CRSP) database in order to examine how well Value Line's 3-5 year forecasts predict subsequently realized values. Descriptions of our basic empirical tests and results are provided in Section II, while robustness tests are reported in Section III. Section IV concludes the paper.

I. Dataset Construction

The study uses data collected from the Value Line Investment Survey once every four years beginning in the third quarter of 1969 and ending with the third quarter of 1997. The publication dates of the Value Line surveys we sample are between July 1 and September 30 of 1969, 1973, 1977, 1981, 1985, 1989, 1993 and 1997. For each of these periods we collect data for the 65 Stocks included in the Dow Jones Indexes at that time (30 Industrials, 20 Transports and 15 Utilities), providing us (potentially) with 520 pairs of predicted and realized values for each of the variables we study. We thus focus on eight non-overlapping, approximately four-year periods for the following: common stock return (r48), percent change in split-adjusted earnings per share (PCEPS), percent change in split-adjusted sales per share (PCSPS), change in profit margin (DPM), and change in earnings yield (DEY).[4] In order to construct both predicted and realized values for these variables, and to provide us with necessary controls, for each firm-year we collect the following information from Value Line: current stock price and estimated book value per share, number of common shares outstanding, low and high 3-5 year predicted target prices, Value Line's estimated beta, (split-adjusted) sales, earnings and dividends per share for each firm for the eighth, fourth and first years prior to the publication year, and Value Line's sales, earnings and dividends per share forecasts for the publication year and for 3-5 years in the future.[5]

We interpret Value Line's 3-5 year horizon projections as 4-year predictions. This interpretation is merely an approximation. For example, a Value Line report dated August 15, 1997 will contain a high and low projected stock price for the 2000-2002 period. To estimate the "4-year horizon" predicted annual return, we first compute a dividend growth rate as $g = (DIV_{2000\text{-}2002} / DIV_{1997})^{.25} - 1$, where DIV is Value Line's predicted dividend per share. Next, we project yearly cash flows over a four year period by assuming the estimated publication year dividend grows at the rate of g each year, and by assuming the stock is sold at the average of the high and low target prices taken from Value Line.[6] Finally, we define the Value Line predicted annual return ($VLR48_t$) as the internal rate of return earned by buying the stock at the "recent stock price" recorded in the Value Line survey and by receiving the cash flows constructed in the previous step. The reason the presumed 4-year forecast horizon is only approximate is that the midpoint of the 2000-2002 range is June 30, 2001; if the report containing the projection is dated August

[4] Here and throughout the study a "pc" prefix in a variable name indicates a percentage change, and a"d" prefix a first difference.

[5] Value Line does not provide annual forecasts of sales, earnings and dividends per share; rather, a single point forecast is provided for 3-5 years in the future. For example, in a Value Line Investment Survey stock report from the third quarter of 1997, figures are provided for 1997, 1998 and 2000-2002. As explained below, we would interpret the 2000-2002 projection in this case as a 4-year horizon forecast.

[6] Our use of the average of the high and low prices as an implicit point forecast for the future stock price is consistent with Value Line's (2000, p.24) definition of the target price range. The guide explicitly states that "the midpoint of the range is our estimate of the average annual price three to five years from now."

15, 1997 then in this case the actual forecast horizon would be only 3 years and 10.5 months. This degree of shortfall would be fairly typical, given that the Value Line reports we sample are all dated between July 1 and September 30. Similar considerations prevail regarding the horizons of the sales, earnings, profit margin and earnings yield forecasts of companies that report results for calendar years. For financial statement-based variables, the horizon discrepancies may be greater in the case of a minority of firms whose fiscal years do not coincide with calendar years.[7]

From CRSP, we match monthly realized returns for up to 48 months prior, and 48 months subsequent to the last trading day of September for each firm and publication year in the study to the Value Line data. There were relatively few instances where we could not obtain at least a four-year returns history for the stocks in this dataset. More frequently, however, due to mergers and the occasional bankruptcy, we could not obtain post-forecast returns from CRSP for a full 4-year period. Because we wished to avoid selection bias, we retained such stocks in the study. The CRSP returns we used included partial month delisting returns; in subsequent months, when we could not obtain a return from CRSP, we substituted the CRSP value-weighted portfolio return for the missing return on the individual stock. For each stock, the actual realized return is defined as

$$R48_{it,t+48} = \left[\prod_{k=1}^{48} \left(1 + r_{it+k}\right) \right]^{.25} - 1 \quad , \tag{1}$$

where $R48_{it,t+48}$ is the annual average realized return on stock i from the end of publication month t to month t+48, and r_{it+k} is the actual return on stock i in month t+k.[8]

Financial statement data presents several distinct challenges not encountered with stock returns. Value Line reports historical and projected earnings per share before extraordinary items; nevertheless,

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[7] Stock return forecasts are not affected if fiscal and calendar years differ, because dividend and target stock price projections in Value Line are always for calendar years. In addition, as explained below, we obtain realized values for sales and earnings from future issues of Value Line, insuring that even when the true horizon differs from 4 years, the horizons are always the same for predicted and actual values.

[8] In constructing the realized return, the publication month is considered to be September even if the actual stock report from which we obtained data from Value Line was published in July or August.

earnings are sometimes negative, and a percent change can be calculated only if EPS is positive in the base year. We cannot use an annual growth rate in earnings because such a calculation would further require that EPS be positive at the horizon date (thus forcing us to drop observations where this criterion is not met). Furthermore, no proxy for actual earnings can be obtained for firms that do not survive four years after the forecast date (due to either merger or bankruptcy). Finally, unlike stock prices, earnings are available only with a considerable lag. Consequently, during the July-September period each year when EPS data is obtained from Value Line, only the previous year's actual earnings are known.

In light of these difficulties, we focus on the total percent change in earnings over an approximate 4-year horizon. Value Line's predicted percent change in earnings per share is defined as

$$VLPCEPS_{i,t+4} = \frac{(VLEPS_{i,t+4} - EPS_{i,t-1})}{EPS_{i,t-1}} , \qquad (2)$$

Where $VLEPS_{i,t+4}$ is Value Line's predicted EPS for 3-5 calendar years after the publication date for firm i, and $EPS_{i,t-1}$ is the EPS for firm i in year t-1 (the latest known annual EPS at the time the Value Line report is published). We construct a matching actual total percent change in earnings per share as

$$PCEPS_{it,t+4} = \left(\frac{EPS_{i,t+3} + EPS_{i,t+4} + EPS_{i,t+5}}{3} - EPS_{i,t-1} \right) \Big/ EPS_{i,t-1} \qquad (3)$$

Where $EPS_{i,t+n}$ is the split-adjusted EPS for firm i in year t+n, as reported in Value Line six years after the year in which the forecasted earnings were obtained. We use an average of earnings per share in years t+3 to t+5 to reduce cyclical fluctuations and to match Value Line's stated 3-5 year forecast horizon.[9]

The predicted and actual percent change in sales per share are calculated similarly to their earnings counterparts. We define profit margin (PM) as the (Value Line definitions of) earnings per share divided by sales per share. We then calculate the predicted and actual change in profit margin as

[9] Following some previous studies, we also calculate an alternative definition of earnings, DEPSP, defined as the split-adjusted change in EPS (average of years t+3 to t+5 minus year t-1) divided by the initial stock price at the time the EPS forecast is made. Results for this alternative definition are reported in a separate robustness section.

$$VLDPM_{it,t+4} = VLPM_{i,t+4} - PM_{i,t-1} \quad and \quad DPM_{it,t+4} = \left(\frac{PM_{i,t+3} + PM_{i,t+4} + PM_{i,t+5}}{3}\right) - PM_{i,t-1} \quad (4)$$

Where $VLPM_{it,t+4}$ is Value line's predicted profit margin for firm i 3-5 years after the publication year, and PM for years t+3 through t+5 are taken from future issues of Value Line. Predicted and actual changes in the earnings yield, respectively, are calculated as

$$VLDEY_{it,t+4} = VLEY_{i,t+4} - EY_{i,t} \quad and \quad DEY_{it,t+4} = \left(\frac{EY_{i,t+3} + EY_{i,t+4} + EY_{i,t+5}}{3}\right) - EY_{i,t} \quad (5)$$

Where $EY_{i,t}$ is the forecasted EPS for the publication year divided by the current stock price as reported in Value Line, $VLEY_{i,t+4}$ is the forecast EPS for 3-5 years after publication divided by the average of the high and low predicted 3-5 year horizon stock prices, and $EY_{i,t+n}$ is the actual EPS for firm i, year n as reported in future issues of Value Line divided by the average annual stock price as reported by CRSP.[10]

Although useful, the Dow dataset has one substantial limitation. Because all of the Dow stocks are large and actively traded, with extensive analyst following, investors would incur relatively lower transactions costs in trading them, and the pricing of these stocks may be more efficient than the typical stock that Value Line follows. To ensure that at least those findings in our study pertaining to stock returns are not primarily driven by the subset of stocks we analyze, we construct a second dataset. Each week, Value Line publishes a summary that contains a table of the top 100 stocks ranked by appreciation potential over a 3-5 year horizon. We sample this table every four years on the final week of September starting in 1969 and ending in 1997. From the table, we obtain the recent stock price, predicted total appreciation, and Value Line's timeliness and safety ranks, and we match return data from CRSP for up to 48 months prior, and 48 months subsequent to the last trading day of September.[11]

[10] For a small number of firms, we were able to obtain financial statement information for four (but not five) post-publication years. In these cases, rather than drop the observations from the sample, we used only the fourth post-publication year (rather than an average of years t+3 to t+5) in calculating actual earnings, sales, etc.
[11] As before, when we could not obtain post-publication returns for a stock from CRSP for a full 4-year period, we include partial month delisting returns. However, unlike in the case of the Dow dataset, because we perform only portfolio tests for these top 100 firms, we substitute the average of the remaining firms' returns for the missing firm's returns in subsequent months. Otherwise, we construct average annual realized returns in this dataset in exactly the same way as for the Dow stocks.

II. Tests for Unbiasedness and Predictive Power of Value Line Forecasts

Descriptive statistics for predicted and actual (realized) values for the Dow dataset are reported in Table 1, wherein we report the number of observations, means, standard deviations and various points along the distribution. In the table, we report similar statistics for control variables used in our study. For ease of exposition, we multiply most variables by 100, i.e. we report percentages as whole numbers. We were forced to drop one observation from the sample for predicted and realized stock returns (Penn Central in 1973, for which Value Line did not supply target stock prices), leaving us 519 matching paired observations for VLR48 and R48. For other variables, as explained previously, more observations had to be dropped (this was particularly true in the case of VLPCEPS and PCEPS, where EPS in year t-1 had to be positive for the figures to be meaningful); consequently, for financial statement-based variables, number of observations ranges from 434 for PCEPS to 453 for DEPSP. Apart from the large differences in means between many of the Value Line predictions and their matching realized values, examined in much greater depth in Table 2 below, the most striking aspects of the distributions in Table 1 are the extreme values observed for some variables. For example, while the mean for PCEPS (total percent change in earnings over an approximately 4-year horizon) is 31.46, the minimum is -545.07 and the maximum 3,122.22.[12] This aspect of the distributions cautions us to test whether our major findings still hold if extreme values are removed, which we do in a separate robustness section below.

< INSERT TABLE 1 HERE >

Formal tests of Value Line forecast bias are reported in Table 2. Mean predicted and subsequently realized four-year horizon stock returns, broken down by cohort year, are reported in Panel A. These results show that Value Line's analysts have been incredibly overoptimistic in predicting future returns for the Dow stocks in our sample period, insofar as the mean predicted annual return (20.255%) has been almost twice the mean realized return (10.173%), with a t-statistic for the difference in means of 12.966.

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[12] Because PCEPS measures the total percent change in EPS, and EPS can be negative, it is possible for PCEPS to be less than -100%. For example, if a firm has an EPS of $1 in year t-1, and average EPS for years t+3 to t+5 were -$2, then PCEPS would equal -300%.

Indeed, in six of the eight cohort years, the mean predicted return greatly exceeds the mean realized return, and t-tests reject the equality of the two measures at better than 1%.

< INSERT TABLE 2 HERE >

Evidence concerning the unbiasedness of Value Line's earnings, sales, profit margin and earnings yield forecasts is provided in Panels B through E of Table 2. The EPS and profit margin projections are strikingly overoptimistic on average. The null hypothesis that predicted and actual values overall are equal is rejected at any conventional level for these variables. Indeed, for both EPS in panel B and profit margin in Panel D, predicted values are larger than realized values *for every single cohort year,* and the forecast error is significantly positive in a large majority of cohort years. In sharp contrast, Value Line appears to be considerably less biased when predicting sales or earnings yields. For sales overall, we cannot reject the null that the predicted and actual values are equal. In the case of earnings yields, Value Line's analysts have actually been slightly too *pessimistic*, as the mean predicted decline in EY has been significantly smaller (at the 5% level) than the mean actual decline. As EY is simply the reciprocal of the P/E ratio, this indicates stock valuations have risen relative to earnings more than Value Line predicted.[13]

Taking a bottom-up view, the overall tenor of the results in Table 2 strongly indicates that the key variable is profit margin. Because Value Line's analysts consistently overpredict the profit margin, their earnings forecasts also tend to be too high despite the fact that their sales forecasts appear unbiased. The grossly inflated earnings forecasts, in turn, produce inflated stock return predictions despite the apparent pessimism with regard to valuations. If one takes a top-down view, however, Value Line's overoptimism

[13] Like their sales projections, Value Line's economic projections do not appear to have been systematically biased for the most part. Every issue of Value Line contains a statement of the hypothesized economic environment 3-5 years in the future, with detailed annual projections for nominal and real GDP, industrial production and a few other variables. We collected these "forecasts" (Value Line does not formally characterize them as such) every four years and compared them with actual realizations for the annual percent change in real GDP, industrial production and the GDP deflator. These results (not reported) showed that while Value Line's economic predictions are often wide of the mark, there generally is no strong bias in these predictions on average. The mean predicted annual growth in real GDP was 3.42%, which is only slightly above mean actual growth of 3.22%. Similarly, the mean predicted inflation rate (4.10%) was only slightly below the mean actual inflation rate (4.44%). The only economic variable for which Value Line appears to have been systematically overoptimistic is industrial production: here Value Line's mean annual growth prediction overall (4.26%) was well above actual growth (2.80%), and the predicted growth rate exceeded the actual for seven of the eight 4-year periods we examined.

with respect to future returns is difficult to understand, because the ex-post performance of the stock market as a whole over the period 1969 - 2001, and the performance of the Dow stocks, has not been out of line when compared with longer historical periods.[14] Finally, we note that mean VL predicted returns for the Dow stocks are very similar to mean VL predicted returns on a much broader cross-section of stocks, as can be seen by closely comparing our results in Table 2, by cohort year, to those in Francis et. al. (2004, Table 2). Thus, it is unlikely that Value Line's overoptimism is confined to the Dow stocks.

We next examine whether Value Line's long-term forecasts of stock returns, earnings, sales, profit margins and earnings yields have power to predict realized values of these variables in a cross-sectional sense, e.g. do firms for which Value Line predicts relatively greater stock returns actually perform better than firms for which Value Line predicts lower returns? To examine predictive power, we begin by modeling the simple relation between predicted and realized values in a regression framework. While our dataset is primarily cross-sectional, it does have a subtle time series component, and Value Line's long-term forecasts might therefore conceivably have power to predict realized values in two ways. First, as already shown in Table 2 Panel A, Value Line's aggregate predicted return for the "market" (as proxied by the Dow stocks) is time-varying. Similarly, predicted aggregate changes in earnings, profit margins and earnings yields vary substantially based on the cohort year, and might forecast subsequent aggregate realized values. Second, Value Line's analysts might have purely cross-sectional predictive power, i.e. they may successfully predict which stocks will outperform others over a given time period, or which firms will experience rapid earnings growth relative to other firms. Because time-varying market expected returns are generally considered consistent with efficiency, our primary interest lies in the second, purely cross-sectional component of Value Line's predictive power.

[14] Between September 1969 and September 2001, the geometric mean annual return on an equally weighted portfolio of the 65 Dow stocks was about 9.9% in nominal terms, or 5.3% in real terms using the GDP deflator to measure inflation. Over the same period, the CRSP value weighted NYSE/AMEX/NASDAQ portfolio returned 11.1% per annum in nominal terms and 6.4% in real terms. Both of these measures are roughly in accord with geometric average long-run returns for U.S. stocks reported in Siegel (1998), which are 8.4% per annum in nominal terms (7.0% in real terms) over the 1802-1997 period.

We examine the relations between predicted and realized values both with and without controlling for the time series component using the following regressions:

$$\text{Realized Value} = \alpha + \beta\,(\text{VL Prediction}) + e_{it}, \quad (6)$$

$$\text{Realized Value} = \alpha_1 D69 + \alpha_2 D73 + \alpha_3 D77 + \alpha_4 D81 + \alpha_5 D85 + \alpha_6 D89 + \alpha_7 D93 + \alpha_8 D97 + \beta\,(\text{VL Prediction}) + e_{it}, \quad (7)$$

Where D69…D97 are 0,1 dummy variables representing the cohort year of the Value Line forecast. Here and in other regression tests in the study, we use the White (1980) correction to ensure that our estimated coefficient standard errors are robust to heteroskedasticity in the residuals.[15] We interpret the slope coefficient from model (6) as a measure of the total predictive power of the Value Line forecasts, and the coefficient β from regression (7) as measuring only the cross-sectional component of Value Line's predictive ability. If these coefficients are significantly positive, then the Value Line forecasts can be interpreted as having predictive power.

< INSERT TABLE 3 HERE >

The results from estimating models (6) and (7) are provided in Table 3, panels A and B, respectively. As one might expect based on the efficient markets hypothesis, the results vary depending on the forecasted variable. For stock returns, there is no evidence that Value Line has any predictive power. The slope coefficient in Panel A, while positive, is very small and indistinguishable from zero; the slope coefficient in panel B is actually marginally significant and negative, indicating that stocks for which Value Line predicts relatively high appreciation in a given cohort year actually tend to do worse than stocks for which they predict lower appreciation. For earnings, sales, profit margins and earnings yields, our results are more favorable to Value Line. Regardless of whether we do (panel B) or do not (panel A) control for time-series components, the slope coefficients for all of these variables are positive and statistically significant at the 1% level, indicating that Value Line's analysts do have predictive power over an approximately 4-year horizon vis-à-vis these variables. In both panels of Table 3, we also test the hypothesis that the slope coefficients equal one. A slope that is positive but significantly below one would

[15] Our error terms are not serially correlated given the largely cross-sectional nature of the dataset, and the fact that we do not use overlapping data.

be in accordance with LaPorta's (1996) finding that analysts' growth expectations are too extreme. Clearly, our findings for earnings, sales and profit margins support this interpretation, as in both panels the slopes for these variables are significantly less than one. We do find, however, that Value Line's earnings yield forecasts are not extreme, because for this variable the slopes are very close to one.[16]

For stock prices (but not for other variables, for which only single point forecasts are provided), Value Line reports 3-5 year projected high and low prices. As explained earlier, we use the mean of these price projections (combined with forecasted dividends) to compute 4-year horizon projected stock returns. We now use these same high-low price projections to measure forecast uncertainty, and to determine whether the bias and predictive power of Value Line's stock return forecasts is related to this uncertainty. We define Value Line Forecast Uncertainty (VLFU) as $(P_{high} - P_{low}) / 0.5(P_{high} + P_{low})$, where P_{high} and P_{low} are, respectively, Value Line's 3-5 year projected high and low stock prices. We normalize the uncertainty variable by dividing each firm's result by the average calculated uncertainty of all Dow stocks in the same cohort year. Thus, firms with VLFU exceeding one have above average forecast uncertainty relative to all Dow stocks in a given year, and vice-versa. We then sort firms into quintiles based on VLFU, and examine whether stock return forecast bias and predictive power varies across these quintiles using the same procedures used previously.[17]

< INSERT TABLE 4 HERE >

The forecast uncertainty findings are reported in Table 4. It appears from the results in Panel A that Value Line's positive forecast bias increases with forecast uncertainty: the mean difference between predicted and actual annual stock return increases from 5.685% for firms in the lowest VLFU quintile to 16.09% for firms in the highest quintile. We note, however, that a significant positive forecast bias

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[16] The R^2 statistics reported in Table 3, Panel B for model (7) should be interpreted with caution. While they are uniformly higher than for model (6), R^2 in this context is an ex-post measure and does not indicate greater ex-ante predictability using model (7). We believe the slope coefficients in the two models are comparable, and these generally do not indicate greater predictability with model (7).

[17] We are unable to calculate VLFU for the 1969 cohort because Value Line provides only a single point forecast for the 3-5 year horizon stock price in its Investment Survey issues in that year. We thank an anynomous referee for suggesting that we examine if stock return forecast bias and predictive power are related to forecast uncertainty.

remains across all of the quintiles. The regression tests for predictive power, sorted by VLFU quintile, are reported in Panel B. While the slope coefficients do appear to vary across quintiles, and are significantly positive in three cases, the results fail to conclusively demonstrate that predictive power and VLFU are related, because the slope is actually highest for the fourth VLFU quintile.[18]

To gain further insight into how Value Line's predicted and realized values are related, as well as into how Value Line's predictions for different variables for the same firm are linked, we next examine how predicted and realized values differ across portfolios that are formed based on (ex-ante) Value Line predictions. These results are reported in Table 5, wherein we form portfolios based on quintiles of VLR48 (Value Line predicted stock returns) in Panel A, VLPCEPS (predicted % change in EPS) in Panel B and VLDPM (predicted change in profit margin) in Panel C. For each quintile resulting from each of these three sorts, we report the mean annual realized stock return over the subsequent 48 months (R48), the mean realized stock return orthogonal to market capitalization, book-to-market, past 4-year stock return, and beta (ORTHR48), the mean Value Line predicted stock return (VLR48), the realized % change in EPS (PCEPS), the predicted % change in EPS (VLPCEPS), the realized change in profit margin (DPM) and the predicted change in profit margin (VLDPM). By forming portfolios every four years and reporting average results across eight cohorts, we deliberately remove any impact of time series predictability in returns; thus, our portfolio tests should closely complement the regressions with dummy variables approach in Table 3 Panel B.

< INSERT TABLE 5 HERE >

If Value Line has predictive power with respect to stock returns, then we would expect that the portfolio composed of the top 20% of firms each cohort year ranked on the basis of VLR48 (p5 in Panel A) would have higher R48 than the portfolio composed of the bottom 20% of firms (p1). Consistent with the regression tests of predictive power in Table 3, however, we find that this is not the case: the mean p5 stock returns are actually lower than the mean p1 stock returns. If realized stock returns are adjusted to

[18] The regressions in Table 4, Panel B were also estimated using a variant of Model 7, in which the constant term is allowed to vary by cohort year. While some of the estimated slope coefficients were quite different, the evidence regarding a clear relation between the slope coefficients and VLFU remained inconclusive.

make them orthogonal to factors that prior research has shown to affect cross-sectional returns, then there is virtually no difference in the realized adjusted returns between p5 and p1. Two other results in Panel A are worth noting. First, Value Line overpredicts stock returns, on average, for all five quintiles, thus underscoring the pervasive optimistic bias of the Value Line stock return projections. Second, the results demonstrate internal consistency in the form of a positive relation, at the firm level, across the set of Value Line predictions: firms that are predicted to experience higher stock returns are also predicted to have higher earnings growth and larger profit margin increases. For example, mean VLPCEPS for p5 firms with high VLR48 is 189.37%, while mean VLPCEPS for p1 firms with low VLR48 is only 54.23%.

The results for portfolios sorted based on predicted earnings (Panel B) and predicted profit margin (Panel C) confirm earlier regression findings that Value Line does have some power to predict (approximately) 4-year horizon changes in these variables. For example, in Panel B, the realized % change in EPS for the lowest prediction quintile is -3.30%, vs. 90.65% for the highest quintile. Similarly, in Panel C, the realized change in profit margin for the lowest quintile is -2.75, vs. +1.01 for the highest quintile. We also confirm earlier findings that Value Line analysts are uniformly overoptimistic: for all quintiles the realized change in EPS or profit margin is lower than the predicted change. Finally, the results continue to show internal consistency, in that firms with higher VLPCEPS or VLDPM also tend to have higher predicted stock returns, albeit not by large margins.[19]

III. Robustness Tests

As an initial measure of the robustness of our basic findings regarding unbiasedness and predictive power, we test whether these findings are sensitive to outliers. These results are reported in Panel A of Table 6. Here we repeat some of the tests conducted in Tables 2 and 3, except that the extreme 5% of observations of the *realized values* (2.5% in each tail), along with firm-matched Value Line predicted values, are trimmed. As regards bias, for the stock returns, earnings and profit margins, the

[19] We also examined the internal consistency of Value Line's forecasts by running cross-sectional regressions of forecast errors for each variable on forecast errors for other variables. These results confirm the finding that forecast errors across firms for stock returns, earnings and profit margins are significantly positively related to each other.

overall trimmed results are very similar to the untrimmed and confirm that Value Line has grossly overpredicted these variables on average. For sales, the trimmed results show a slight tendency to overpredict (forecast error significantly positive at the 5% level), whereas the untrimmed results did not. Conversely, for earnings yields, the trimmed results show no significant difference between the means of the actual and predicted values, whereas the untrimmed results indicated that Value Line was slightly too conservative in predicting earnings yields.

< INSERT TABLE 6 HERE >

We also report simple tests for predictive power with the trimmed data in Table 6, Panel A. For brevity, we only report trimmed results without cohort year dummy variables, but the conclusions are unchanged when the latter are included. For stock returns, sales and profit margins, the regressions estimated with trimmed data yield very similar conclusions to those estimated with untrimmed data (as reported in Table 3, Panel A), although the slope coefficient in Table 6 is 0.0929 in the case of stock returns and is marginally significant. Some interesting differences do emerge, however, for the remaining variables. For earnings, using the trimmed data, the slope is very nearly zero and insignificant, indicating that in non-extreme cases Value Line has no predictive power with respect to earnings growth. Similarly, we find that Value Line's predictive power with respect to earnings yields is notably lower with the trimmed data than with the untrimmed, albeit in this case some degree of predictive power may remain.

We further examine the robustness of our findings by repeating our basic tests using alternative variable definitions, focusing on what we consider the two most important variables. We create an orthogonal stock return by taking the constant term plus the residual from a regression of (respectively) R48 and VLR48 on relative market capitalization, book-to-market, stock return over the prior 48 months, and beta as reported in Value Line, with all independent variables in deviation from the mean form. We use these variables because previous studies, e.g. DeBondt and Thaler (1985, 1987) and Fama and French (1992), suggest they are important determinants of the cross-section of stock returns, and we want to ascertain if Value Line's stock return predictions have any value beyond what can be explained by these measures. As shown in Panel B of Table 6, neither unbiasedness nor predictive power using orthogonal stock returns are markedly different than when unadjusted returns are used; the severe optimistic bias and lack of evidence of predictive power remain evident in the case of the orthogonal returns.

In many previous studies of analyst forecasts, earnings changes are normalized by dividing both predicted and realized earnings per share by the initial stock price. To see if our results are sensitive to this normalization, we reran our basic tests using this alternative measure of earnings, defined in footnote 9. We find (Table 6, Panel B) that Value Line's earnings forecasts remain grossly overoptimistic, as the forecast error (predicted - realized) is large and significantly positive at any conventional level.[20] However, unlike with the simpler definition of earnings change used in Table 3, we now find no evidence of predictive power: the slope coefficient in a regression of realized values on predicted values (albeit positive) is insignificantly different from zero. Clearly, therefore, one important conclusion that emerges from Table 6 is that Value Line's ability to predict earnings across this cross-section of firms depends crucially on how the earnings change variable is defined. Results are much less favorable to Value Line when outliers are trimmed or when earnings changes are normalized by the current stock price.[21]

Another issue which arises with respect to earnings is the treatment of extraordinary (non-recurring) gains and losses. Value Line excludes these items from its historical and forecast EPS tables, but provides the total amounts, by year, in footnotes to its stock reports. Because Value Line only provides forecasts for EPS excluding extraordinary items, we believed it best to exclude these items in all of the tests reported in this study. However, to ascertain if our results are sensitive to this treatment, we randomly selected 50 stock reports and repeated the tests reported in Table 2 and Table 3, Panel A for percent change in EPS, change in profit margin, and change in earnings yield, where the earnings were

[20] Note that DEPSP (change in earnings as a percent of stock price) and DEY (change in earnings yield) differ. When computing the earnings yield in year t+4, the average of realized earnings per share in years t+3 to t+5 is divided by the stock price in year t+4 rather than by the stock price in year t.

[21] We also examined Value Line forecast bias and predictive power broken down by type of firm (industrial, transport or utility). These results (available from the authors on request) showed that firm type did not matter in evaluating forecast bias: Value Line's stock return, earnings and profit margin forecasts were significantly optimistic for all classifications. However, for reasons we cannot fully explain, Value Line did appear to have significant predictive power vis-à-vis utility stock returns, even though their record in forecasting earnings and profit margins for utilities is no better than for other types of firms.

defined as alternately including and excluding extraordinary items. These results (not reported) show that the findings we report in this paper are not highly sensitive to this choice.[22]

All of the results we have presented thus far are for the Dow dataset. As discussed earlier, one potentially severe limitation is that the included stocks are not representative of the typical stock Value Line covers. To ascertain if our stock return prediction results for the Dow stocks are likely to hold for a broader cross-section, we conduct portfolio tests for the "top 100" database, described earlier. These test results are reported in Table 7. Specifically, we form portfolios every 4 years beginning September 30, 1969 based on Value Line's listing of the top 100 stocks by appreciation potential (these stocks have the greatest predicted total returns over a 3-5 year horizon). The "All Top 100 Stocks" column is for an equally weighted portfolio holding all stocks on the list. The safety rank = 1,2,3, safety rank=4, and safety rank=5 portfolios, respectively, contain stocks on the top 100 list with the indicated safety ranks, and the timeliness rank =1,2,3 portfolio contains stocks on the top 100 list with a timeliness rank of 3 or better.[23] Finally, the "top 33" portfolio is an equally weighted combination of the top one-third of stocks (ranked by predicted return) on the top 100 list. We estimate time series regressions of the portfolio excess returns against various combinations of factors shown in previous studies (e.g. Fama and French 1992, and Carhart 1997) to be strongly related to realized stock returns.[24]

< INSERT TABLE 7 HERE >

[22] If anything, the positive bias in predicted PCEPS and DPM is actually *larger* when extraordinary items are included in historical and realized EPS, probably because these items are more often negative than positive. As regards predictive power, our results for the randomly selected subsample indicate less ability by Value Line to predict changes in earnings and profit margins (compared to the full sample) regardless of whether extraordinary items are included in EPS; there is no marked difference in predictive power with respect to including or excluding these items, other things held constant.

[23] Value Line defines its safety rank as a measurement of potential risk associated with an individual stock. The Safety Rank is computed by averaging two other Value Line indexes—the Price Stability Index and the Financial Strength Rating. Safety Ranks range from 1 (Highest) to 5 (Lowest).

[24] The factors are ERM (market return less T-Bill return), SMB (excess return on small cap stocks relative to large cap), HML (excess return on high book-to-market relative to low book-to-market stocks) and UMD (excess return on stocks with high return momentum relative to those with low momentum). All of the factors, along with the monthly T-bill returns used to construct the excess portfolio returns, were downloaded from Kenneth French's website at Dartmouth College.

The results in Table 7 are very easy to summarize. Not one single portfolio we construct from stocks on the top 100 list significantly outperformed the market, regardless of the performance evaluation model used.[25] These results for the top 100 dataset are consistent with the earlier conclusion, based on the Dow data, that Value Line demonstrates no predictive power vis-à-vis long run stock returns.

IV. Conclusion

In sharp contrast to the previously well-documented ability of Value Line timeliness ranks to predict future short-run stock performance, we find that Value Line's long-term stock return projections are extremely overoptimistic and have no predictive power. Predicted returns for the Dow stocks have averaged 20.3% per annum; this figure is about twice the level of realized returns on these stocks over the 1969-2001 period, and considerably above the long term average stock market return in the U.S. When we regress future realized returns over a 4-year horizon on Value Line's predicted 3-5 year returns for our Dow dataset, we find that the predicted returns are not significantly related to the future realized returns. This finding holds regardless of whether we control for time series effects and/or for other factors that previous studies have shown to be related to realized returns.

We shed additional light on Value Line's poor performance in predicting long-horizon stock returns by also examining their forecasts of earnings, sales, profit margins and earnings yields. We note, first, that there is a strong degree of consistency across Value Line's forecasts of various measures: Table 5 shows that firms with higher predicted stock returns also tend to have higher predicted growth in earnings and profit margins. It is, therefore, perhaps unsurprising that Value Line's record forecasting earnings changes over 3-5 year horizons is (at best) only marginally better than their stock return prediction record. We do find a significant positive cross sectional relation between predicted and actual

[25] When using the Fama and French 3-factor model, we obtain negative alphas for all of the portfolios, and the alpha is significantly negative when we restrict it to hold stocks with a Value Line safety rank of 3 or better. The closest our results come to economic (if not statistical) significance are the 4-factor alphas for the "all top 100," "timeliness rank=1,2,3" and "top 33 stocks." These alphas are all in the range of 0.16-0.31% per month (about 2.0-3.8% annualized). However, when we segregate the top 100 stocks by Value Line safety rank, we find that only those with safety ranks below 3 appear to have positive 4-factor alphas, indicating that the positive alpha on the top 100 portfolio is most likely due to unobserved risk factors that are not captured by even the 4-factor model.

earnings changes; however, this relation essentially disappears if extreme observations are trimmed from the sample or if earnings changes are normalized based on initial stock prices. Moreover, Value Line's earnings projections are even more upwardly biased than their stock return predictions. In contrast to this poor performance in predicting earnings, we find little evidence of bias in forecasts of earnings yields, and there is even some robust evidence of predictive power with respect to this variable. Consequently, our results indicate that Value Line's overoptimism and poor predictive power vis-à-vis stock returns is driven primarily by similar problems predicting earnings growth at the firm level, rather than by systematic mistakes in forecasts of future valuations as reflected in earnings yields.

Because earnings can be further decomposed into sales and profit margins, our examination of these predictions yields further insights into why Value Line's earnings and stock return forecasts perform so poorly. Value Line's sales predictions exhibit, at most, only a slight degree of upward bias, and there is robust evidence that Value Line displays cross-sectional predictive power in forecasting sales. The profit margin predictions are strongly upwardly biased, but there is robust evidence that they have predictive power as well. Thus, we can conclude that the *bias* in earnings forecasts appears to be entirely due to the extreme upward bias in projected profit margins, but we cannot easily explain the lack of predictive power with respect to earnings revealed by the robust tests reported in Table 6.

The poor overall record Value Line exhibits in its long-term stock return and earnings forecasts supports the view that the spectacular past performance of Value Line's timeliness indicator likely reflects either its close alignment with other known anomalies such as momentum and/or post earnings announcement drift, data mining, or some combination of these factors. At a minimum, Value Line's long-term forecast record as documented herein should caution investors not to rely mechanically on these projections for either stock selection, valuation or planning purposes. Similarly, the extreme upward bias and lack of predictive power exhibited by Value Line's stock return projections calls into question the common practice of using these predictions as proxies for the cost of equity in cost-of-capital studies, and their use as proxies for aggregate ex-ante expected returns in tests of asset pricing models.

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Table 1
Descriptive Statistics

Variable	Number of Obs.	Mean	Standard Deviation	Minimum	P=.05	P=.25	Median	P=.75	P=.95	Maximum
Value Line Four-Year Horizon Predictions										
VLR48	519	20.26	10.95	-16.06	5.79	12.88	18.66	26.35	39.68	102.47
VLPCEPS	434	98.78	214.30	-25.93	15.71	35.26	59.66	92.07	214.50	2703.03
VLDEPSP	453	8.36	11.24	-5.00	1.58	3.43	5.27	8.34	30.69	118.65
VLPCSPS	451	45.27	34.97	-65.74	9.47	26.04	39.78	56.80	100.39	398.69
VLDPM	451	1.22	2.39	-6.81	-1.55	0.02	0.69	1.85	5.70	17.05
VLDEY	449	-1.54	7.95	-90.42	-9.18	-3.95	-1.28	1.06	5.95	61.17
Realized Values over Four-Year Horizons										
R48	519	10.17	14.29	-51.78	-13.41	2.15	10.55	18.70	32.94	57.57
PCEPS	434	31.46	197.39	-545.07	-145.07	-9.24	24.47	70.90	144.06	3122.22
DEPSP	453	1.50	16.54	-120.78	-16.98	-0.67	2.10	5.91	16.59	146.27
PCSPS	451	43.14	58.08	-63.71	-31.47	10.30	37.12	65.03	127.79	626.34
DPM	451	-0.83	4.07	-18.31	-7.57	-2.56	-0.58	1.06	5.22	24.56
DEY	449	-4.85	30.21	-415.65	-21.95	-4.03	-0.76	2.37	7.84	38.08
Risk Factors and other Control Variables										
RMC	519	1.00	1.69	0.01	0.04	0.20	0.38	0.88	4.12	12.37
BM	519	0.91	0.62	-2.77	0.20	0.52	0.78	1.14	2.15	3.80
PR48	511	10.41	12.94	-27.64	-9.22	1.87	10.06	18.10	32.31	57.57
BETA	514	1.00	0.27	0.32	0.63	0.80	1.00	1.15	1.44	2.46
VLFU	454	1.00	0.31	0.35	0.55	0.77	0.96	1.22	1.52	2.06

Variables are defined as follows (a "VL" prefix indicates an ex-ante 4-year horizon value line forecast): R48 = average annual realized stock return over subsequent 48 months, PCEPS = % change in EPS, DEPSP = change in EPS as a percent of the initial stock price, PCSPS = % change in sales per share, DPM = change in profit margin, DEY = change in earnings yield, RMC = relative market capitalization, BM = ratio of book value to market value of common stock, PR48 = average annual common stock return over prior 48 months, BETA = stock's beta as reported in Value Line, VLFU = Value Line forecast uncertainty as computed from width of high - low target stock price range.

Table 2
Tests for Value Line Forecast Bias

Panel A: Annualized Common Stock Return, Month (t) to Month (t+48)

Cohort Year	Number of Observations	Mean VLR48	Mean R48	Mean Pred. - Actual	t-Statistic	
1969	65	19.389	3.049	16.341	9.454	***
1973	64	24.730	6.184	18.545	10.776	***
1977	65	28.307	7.539	20.769	10.473	***
1981	65	32.141	19.232	12.909	5.072	***
1985	65	18.682	19.323	-0.641	-0.375	
1989	65	15.638	8.423	7.216	3.119	***
1993	65	13.526	17.829	-4.303	-2.643	**
1997	65	9.697	-0.257	9.955	5.644	***
overall	519	20.255	10.173	10.083	12.966	***

Panel B: Total Percent Change in Earnings per Share, Year (t-1) to Year (t+4)

Cohort Year	Number of Observations	Mean VLPCEPS	Mean PCEPS	Mean Pred. - Actual	t-Statistic	
1969	61	71.613	27.914	43.700	2.943	***
1973	62	114.106	82.063	32.043	2.167	**
1977	62	81.527	2.227	79.300	3.263	***
1981	53	147.851	20.587	127.264	3.095	***
1985	49	61.779	18.945	42.834	3.573	***
1989	57	72.215	-11.741	83.956	6.380	***
1993	41	158.072	155.085	2.986	0.117	
1997	49	100.261	-20.070	120.331	4.059	***
overall	434	98.781	31.461	67.320	8.025	***

Panel C: Total Percent Change in Sales per Share, Year (t-1) to Year (t+4)

Cohort Year	Number of Observations	Mean VLPCSPS	Mean PCSPS	Mean Pred. - Actual	t-Statistic	
1969	62	35.090	55.569	-20.478	-3.450	***
1973	63	47.159	85.427	-38.269	-3.301	***
1977	63	48.636	56.409	-7.773	-1.550	
1981	56	57.096	7.431	49.665	9.980	***
1985	52	42.168	35.015	7.152	0.952	
1989	57	47.991	25.292	22.700	4.935	***
1993	49	39.406	23.808	15.598	3.655	***
1997	49	43.855	45.510	-1.655	-0.169	
overall	451	45.269	43.140	2.129	0.753	

Panel D: Total Change in Profit Margin, Year (t-1) to Year (t+4)

Cohort Year	Number of Observations	Mean VLDPM	Mean DPM	Mean Pred. - Actual	t-Statistic	
1969	62	1.353	-1.782	3.135	7.066	***
1973	63	0.911	-1.285	2.195	6.265	***
1977	63	0.542	-1.802	2.344	4.380	***
1981	56	0.773	0.163	0.610	1.118	
1985	52	1.098	-0.298	1.395	2.597	**
1989	57	0.915	-1.524	2.439	5.604	***
1993	49	3.123	2.728	0.395	0.870	
1997	49	1.439	-2.277	3.716	6.484	***
overall	451	1.223	-0.834	2.057	11.595	***

Panel E: Total Change in Earnings Yield, Year (t-1) to Year (t+4)

Cohort Year	Number of Observations	Mean VLDEY	Mean DEY	Mean Pred. - Actual	t-Statistic	
1969	62	-1.047	-5.088	4.042	0.595	
1973	63	-3.952	2.276	-6.228	-7.880	***
1977	62	-5.886	-13.712	7.826	1.242	
1981	54	-5.636	-7.415	1.779	1.228	
1985	52	-0.068	-4.243	4.175	2.555	**
1989	57	0.870	-6.555	7.425	3.501	***
1993	50	3.711	1.515	2.196	5.405	***
1997	49	1.202	-4.787	5.988	2.221	**
overall	449	-1.543	-4.846	3.303	2.401	**

Notes: Within each panel, the mean Value Line prediction is provided in column 3, the mean of the subsequently realized values in column 4 and the mean difference between the predicted and realized values in column 5. The t-statistic in column 6 is for the two-tailed test that the mean of the predicted minus actual values equals zero. See Table 1 for further variable definitions. *, ** and ***, respectively, indicate significance at the 10%, 5% and 1% levels.

Table 3
Tests for Cross-Sectional Predictive Power

Panel A: Realized Value = $\alpha + \beta$ (VL Prediction) + e_{it},

Coefficient:	Stock Return		%CH in EPS		%CH in Sales per Share		Change in Profit Margin		Change in Earnings Yield	
	Model Estimated For:									
α	9.304		-26.986		24.697		-1.700		-3.305	
	(6.321)	***	(-1.546)		(5.365)	***	(-8.832)	***	(-2.516)	**
β	0.0429		0.5917		0.4074		0.7084		0.9984	
	(0.630)		(2.652)	***	(5.067)	***	(5.671)	***	(3.516)	***
Test: β = 1, Chi-Sq	197.78	***	3.35	*	54.31	***	5.45	**	0.00	
R-Squared	0.0011		0.4126		0.0602		0.1726		0.0691	
# of OBS	519		434		451		451		449	

Panel B: Realized Value = $\alpha_1 D69 + \alpha_2 D73 + \alpha_3 D77 + \alpha_4 D81 + \alpha_5 D85 + \alpha_6 D89 + \alpha_7 D93 + \alpha_8 D97 + \beta$ (VL Prediction) + e_{it},

Where D69 – D97 are dummy variables representing the year during which the Value Line prediction was obtained.

Coefficient:	Stock Return		%CH in EPS		%CH in Sales per Share		Change in Profit Margin		Change in Earnings Yield	
	Model Estimated For:									
α_1	6.099		-13.827		39.492		-2.638		-3.986	
	(3.055)	***	(-0.727)		(5.903)	***	(-6.472)	***	(-0.589)	
α_2	10.075		15.555		63.822		-1.860		6.437	
	(4.286)	***	(0.618)		(5.673)	***	(-5.899)	***	(4.717)	***
α_3	11.992		-45.292		34.127		-2.145		-7.515	
	(4.659)	***	(-1.802)	*	(4.790)	***	(-4.192)	***	(-1.379)	
α_4	24.289		-65.590		-18.727		-0.326		-1.482	
	(9.169)	***	(-2.049)	**	(-2.604)	***	(-0.625)		(-0.642)	
α_5	22.262		-17.063		15.697		-0.992		-4.171	
	(11.233)	***	(-1.002)		(1.909)	*	(-1.941)	*	(-2.546)	**
α_6	10.883		-53.833		3.305		-2.103		-7.471	
	(4.783)	***	(-2.733)	***	(0.510)		(-4.709)	***	(-3.590)	***
α_7	19.957		62.951		5.755		0.753		-2.391	
	(9.878)	***	(2.465)	**	(0.937)		(1.266)		(-2.168)	**
α_8	1.268		-78.508		25.418		-3.187		-6.052	
	(0.694)		(-2.632)	***	(2.374)	**	(-5.258)	***	(-2.249)	**
β	-0.1573		0.5828		0.4581		0.6322		1.0527	
	(-1.930)	*	(2.754)	***	(4.357)	***	(4.792)	***	(3.743)	***
Test: β = 1, Chi-Sq	201.51	***	3.88	**	26.55	***	7.777	***	0.04	
R-Squared	0.2601		0.4558		0.2350		0.2524		0.0902	
# of OBS	519		434		451		451		449	

Figures in parentheses below coefficient estimates are t-statistics. *, ** and ***, respectively, indicate significance at the 10%, 5% and 1% levels.

Table 4

Tests for Value Line Stock Return Forecast Bias and Predictive Power, by Degree of Forecast Uncertainty

Panel A: Tests for Forecast Bias

VL Forecast Uncertainty Quintile	Number Of Obs	Mean VL Forecast Uncertainty	Mean VL Predicted Annual Stock Return (%)	Mean Realized Annual Stock Return (%)	Mean Pred. - Actual Stock Return (%)	t-Statistic	
P1 (low)	90	0.5726	17.837	12.152	5.685	3.7828	***
P2	91	0.8164	19.816	14.048	5.769	3.9815	***
P3	88	0.9737	18.669	10.668	8.002	5.0519	***
P4	93	1.1831	20.209	9.997	10.212	5.8309	***
P5 (high)	92	1.4399	25.232	9.142	16.090	6.0239	***

Panel B: Tests for Predictive Power. Model: **Realized Annual Return = $\alpha + \beta$ (VL Predicted Annual Return) + e_{it},**

	Model Estimated For VL Forecast Uncertainty Quintile:									
Coefficient:	P1 (low)		P2		P3		P4		P5 (high)	
α	7.826		8.107		12.119		3.002		12.327	
	(2.995)	***	(2.950)	***	(3.702)	***	(0.854)		(3.406)	***
β	0.2426		0.2998		-0.0777		0.3461		-0.1262	
	(1.900)	*	(2.458)	**	(-0.509)		(2.154)	**	(-1.152)	
Test: β = 1, Chi-Sq	35.20	***	32.96	***	49.90	***	16.56	***	105.64	***
R-Squared	0.0318		0.0654		0.0030		0.0461		0.0130	
# of OBS	90		91		88		93		92	

Notes: Value Line Forecast Uncertainty (VLFU) is calculated as $(P_{high} - P_{low}) / 0.5(P_{high} + P_{low})$, where P_{high} and P_{low} are, respectively, Value Line's 3-5 year projected high and low stock prices. We normalize the uncertainty variable by dividing each firm's result by the average calculated uncertainty of all Dow stocks in the same cohort year. Thus, firms with VLFU exceeding one have above average forecast uncertainty relative to all Dow stocks in a given year, and vice-versa. The quintiles vary slightly in number of observations because we did not allow breakpoints to occur between firms that had the exact same VLFU. *,** and *** denote, respectively, statistical significance at the 10%, 5% and 1% levels.

Table 5
Realized Values for Portfolios Formed Based on Value Line Predictions

Panel A: Portfolios sorted based on Value Line's Predicted Stock Return (VLR48)

VLR48 Quintile:	P1 (low)	p2	p3	p4	p5 (high)	#OBS
R48	8.89	11.21	12.45	11.43	6.86	519
ORTHR48	7.91	10.41	11.98	11.53	8.21	511
VLR48	10.83	16.22	19.56	23.04	31.74	519
PCEPS	28.50	25.94	35.53	59.39	6.01	434
VLPCEPS	54.23	62.55	102.73	95.56	189.37	434
DPM	-1.13	-0.73	-0.80	0.06	-1.64	451
VLDPM	0.46	0.65	1.04	1.58	2.43	451

Panel B: Portfolios sorted based on Value Line's Predicted %Change in EPS (VLPCEPS)

VLPCEPS Quintile:	P1 (low)	p2	p3	p4	p5 (high)	#OBS
R48	11.41	8.89	8.79	13.12	6.37	434
ORTHR48	9.58	7.81	8.41	13.88	7.78	429
VLR48	18.74	18.93	20.14	19.95	24.97	434
PCEPS	-3.30	9.01	18.30	42.49	90.65	434
VLPCEPS	19.42	40.09	59.89	84.62	289.44	434
DPM	-2.19	-1.40	-1.26	-0.44	-0.48	432
VLDPM	-0.50	0.27	0.81	1.40	2.79	432

Panel C: Portfolios sorted based on Value Line's Predicted Change in Profit Margin (VLDPM)

VLDPM Quintile:	P1 (low)	p2	p3	p4	p5 (high)	#OBS
R48	10.07	11.94	8.94	8.91	9.25	451
ORTHR48	8.91	11.05	8.65	9.17	10.97	446
VLR48	21.27	20.62	19.52	19.45	22.91	451
PCEPS	-3.83	17.73	22.39	62.13	67.34	432
VLPCEPS	35.94	50.31	70.00	115.15	254.13	432
DPM	-2.75	-1.14	-0.81	-0.48	1.01	451
VLDPM	-1.15	0.14	0.71	1.60	4.82	451

Notes: Portfolios are formed ex-ante every 4 years beginning September 30, 1969 based on Value Line 3-5 year horizon predictions published between July 1 and September 30 of the same year. We report quintiles for the means of the following variables (a "VL" prefix in a variable name indicates a Value Line forecast): R48 = average annual stock return over subsequent 48 months; ORTHR48 = average annual realized stock return orthogonal to relative market capitalization, book-to-market, stock return over previous 48 months, and beta (as reported in Value Line); PCEPS = % change in EPS between year t-1 and the average of years t+3, t+4 and t+5; DPM = change in profit margin between year t-1 and the average of years t+3, t+4 and t+5.

Table 6
Robustness Tests

Panel A: Tests with outliers trimmed

Unbiasedness Tests. Note: VL Forecast Error = VL Prediction - Realized

	Stock Return(%)		%CH in EPS		%CH in Sales per Share		Change in Profit Margin (%)		Change in Earnings Yield
Mean VL Prediction	19.962		76.369		45.315		1.076		-1.436
Mean Realized Value	10.297		22.712		39.965		-0.826		-2.009
Mean VL Forecast Error	9.665		53.656		5.350		1.902		0.573
t-Statistic	14.166	***	9.350	***	2.471	**	12.373	***	1.451
# of OBS	494		412		429		429		427

Tests for Predictive Power: Realized Value = $\alpha + \beta$ (VL Prediction)

Coefficient:	Stock Return(%)		%CH in EPS		%CH in Sales per Share		Change in Profit Margin		Change in Earnings Yield	
α	8.443		22.367		24.178		-1.260		-1.621	
	(6.975)	***	(4.783)	***	(7.664)	***	(-8.436)	***	(-3.944)	***
β	0.0929		0.0045		0.3484		0.4037		0.2701	
	(1.739)	*	(0.085)		(5.758)	***	(4.667)	***	(1.808)	*
Test: β = 1, Chi-Sq	288.42	***	347.83	***	116.00	***	47.54	***	23.86	***
R-Squared	0.0065		0.0000		0.0840		0.0703		0.0412	
# of OBS	494		412		429		429		427	

Note: In these tests, the extreme 5% of realized values (top and bottom 2.5%) included in Tables 2 and 3, along with firm-matched VL predicted values, are trimmed.

Panel B: Tests with alternative variable definitions

Unbiasedness Tests. Note: VL Forecast Error = VL Prediction - Realized Value

	Orthogonal Stock Return (%)		Change in EPS as percent of Initial Stock Price	
Mean VL Prediction	20.407		8.365	
Mean Realized Value	10.025		1.504	
Mean VL Forecast Error	10.382		6.860	
t-Statistic	14.752	***	8.274	***
# of OBS	511		453	

Tests for Predictive Power: Realized Value = $\alpha + \beta$ (VL Prediction) + e_{it},

Coefficient:	Orthogonal Stock Return (%)		Change in EPS as percent of Initial Stock Price
α	8.395		-0.0143
	(4.151)	***	(-0.772)
β	0.0798		0.3504
	(0.847)		(1.309)
R-Squared	0.0022		0.0567
# of OBS	511		453

Note: The orthogonal stock return is defined as the constant term plus the residual from a regression of, respectively, R48 and VLR48 on RMC (relative market capitalization), BM (book-to-market), PR48 (average annual stock return over prior 48 months) and BETA (as reported in Value Line). All independent variables in the regression are in deviation from the mean form. *,** and *** denote, respectively, statistical significance at the 10%, 5% and 1% levels.

Table 7
Ex-Post Performance of 100 Stocks Listed in Value Line as Having the Greatest Appreciation Potential

	All Top 100 Stocks	Safety Rank=1,2,3	Safety Rank=4	Safety Rank=5	Timeliness Rank=1,2,3	Top 33 Stocks
Mean Excess Return	0.6957	0.5481	0.7536	0.9010	0.7276	0.5889
	(1.6477)	(1.4757)	(1.5861)	(1.5131)	(1.7130)*	(1.1788)
Jensen's Alpha	0.0637	-0.0294	0.0883	0.2045	0.0889	-0.0629
	(0.2415)	(-0.1355)	(0.2716)	(0.4317)	(0.3374)	(-0.1714)
FF 3-Factor Model Alpha	-0.2530	-0.3385	-0.1642	-0.1065	-0.1584	-0.3673
	(-1.4722)	(-2.2653)**	(-0.6761)	(-0.2736)	(-0.8394)	(-1.2739)
4-Factor Model Alpha	0.1646	-0.0193	0.2922	0.5686	0.2383	0.3096
	(1.0405)	(-0.1359)	(1.2410)	(1.4914)	(1.3267)	(1.1553)

Notes: Portfolios are formed ex-ante every 4 years beginning September 30, 1969 based on Value Line's listing of the top 100 stocks by appreciation potential (these stocks have the greatest predicted total returns over a 3-5 year horizon). The "All Top 100 Stocks" column is for an equally-weighted portfolio holding all stocks on the list. The Safety Rank = 1,2,3, Safety Rank=4, and Safety Rank=5 portfolios, respectively, contain stocks on the top 100 list with the indicated safety ranks, and the Timeliness Rank =1,2,3 portfolio contains stocks on the top 100 list with a timeliness rank of 3 or higher. The Top 33 Stocks portfolio is an equally weighted combination of the top one-third of stocks (ranked by predicted return) on the top 100 list. Figures in parentheses below coefficient estimates are t-statistics. *, ** and ***, respectively, indicate significance at the 10%, 5% and 1% levels.

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An examination of Value Line's long-term projections

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Abstract

Unlike previous papers, which have focused on the timeliness ranks, we examine Value Line's 3–5 year projections for stock returns, earnings, sales and related measures. We find that Value Line's stock return and earnings forecasts exhibit large positive bias, although their sales predictions do not. For stock returns, Value Line's projections lack predictive power; for other variables predictive power may exist to some degree. Our findings suggest the spectacular past performance of the timeliness indicator reflects either close alignment with other known anomalies or data mining, and that investors and researchers should use Value Line's long-term projections with caution.

JEL classification: G11; G12; G14

Keywords: Value Line; Long-term projections; Analyst forecasts; Cost-of-capital

1. Introduction

The Value Line Investment Survey follows approximately 1600 stocks. It has been continuously published for many decades and is widely used by investors. Value Line publishes a timeliness rank that forecasts stock price performance over the following 6–12 months. The performance of this indicator has been the focus of dozens of published articles beginning with Shelton (1967). Other notable studies include Kaplan and Weil (1973), Holloway (1981), Stickel (1985), Huberman and Kandel (1987, 1990), Affleck-Graves and Mendenhall (1992) and Choi (2000). The consensus of these and other studies is that after controlling for systematic risk factors, Value Line timeliness ranks have substantial predictive power for future short-term stock returns. Although it is true that much of the abnormal returns occur shortly after *changes* in the timeliness ranking, and it is not clear that one can "beat the market" once transactions costs are taken into account, Value Line's record is impressive. As Choi (2000) notes, it has captured the imagination of the finance community like few others.

In addition to its timeliness rank, Value Line publishes a large amount of information in its quarterly stock reports that may be useful to investors. In particular, once every quarter, for each stock, Value Line reports 3–5 year projections for annual total return, sales per share, earnings per share, dividends per share and historical data for these measures.[1] Unlike virtually all previous studies, which focus on the timeliness ranks, our study concentrates on Value Line's long-term projections. In the spirit of past studies using timeliness ranks, we examine whether Value Line's 3–5 year projections for common stock returns, earnings, sales, profit margins or earnings yields have *predictive power* with regard to realized values over that horizon, e.g. whether purchasing stocks with higher predicted returns would really enable investors to earn higher realized returns, or if firms with higher predicted growth in earnings per share actually do exhibit higher earnings growth ex-post than firms with lower predicted growth.

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[1] Current Value Line reports for each of the 30 stocks comprising the Dow Jones Industrial Average can be freely accessed even by non-subscribers at http://www.valueline.com. A brief perusal reveals the enormous range of information these reports contain beyond the timeliness rank that has been the focus of most prior studies.

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Furthermore, because many previous studies of analyst forecasts have focused on forecast bias, we also examine whether Value Line's 3–5 year projections exhibit significant bias, i.e. whether mean predicted values for stock returns, earnings, etc. differ from mean realized values.

Beyond the fact that Value Line's long-term projections have received little past scrutiny, our study is motivated by three broader considerations. First, while at least dozens of studies have examined various aspects of analysts' short-term (under one year horizon) earnings and stock price forecasts, surprisingly little research has been conducted concerning longer horizon projections. La Porta (1996) sorts stocks into portfolios based on analysts' five-year earnings projections. He finds that stocks with low expected earnings growth earn considerably higher returns, ex-post, than those with high expected growth, partly because analysts subsequently revise earnings forecasts upward for stocks with low expected earnings growth (and vice-versa). Dechow and Sloan (1997) find that analysts' five-year earnings projections are biased upward in general, and that stock prices appear to naively reflect these biased forecasts.[2] Our study, which uses a long sample period and examines the record of an independent advisory service, may shed further light on whether (and if so, why) analyst forecasts are biased.

The second motivation for our study arises from the extensive debate about *why* Value Line's record has been so impressive when compared with those of other security analysts. Several recent studies, notably Desai and Jain (1995), Barber et al. (2001, 2003) have examined security analyst recommendations, and report some evidence that purchasing stocks with the most favorable consensus recommendations (and/or selling short stocks with the least favorable ratings) yield abnormal returns. However, these returns are generally not as large as has been documented for portfolios constructed from Value Line rankings, and the performance of the analysts varies greatly over time (for example, relative to the market as a whole, their buy recommendations performed extremely poorly in 2000 and 2001, while their sell recommendations handily outperformed the market). One possible reason Value Line's record stands out is that Value Line, being an independent subscription service, is not beholden to the firms whose stocks it covers. In contrast, most analysts are employed by investment banks that are dependent on client firms for business. These analysts are notoriously reluctant to issue sell recommendations, and their buy recommendations may depend more on self-interest than on objective analysis of a firm's prospects. Moreover, as Bradshaw et al. (2006) show, analysts' overoptimism is systematically related to corporate financing activities: overoptimism is greatest for firms issuing securities and smallest for firms repurchasing securities. However, an alternative possible reason for Value Line's superior record that has been suggested by many (see for example, Gregory, 1983) is that this record is a product of luck. If a large number of independent advisory services exist and Value Line is the only one that has managed to outperform the market substantially ex-post, then this finding is unsurprising in a statistical sense and does not necessarily imply that markets are inefficient. Finally, some studies suggest that Value Line's timeliness rankings are highly correlated with other known anomalies such as post-earnings announcement drift (Affleck-Graves and Mendenhall, 1992) and that Value Line's record is an artifact of this alignment.[3] By examining Value Line's long-term return predictions, we believe we can contribute towards a resolution of this debate. If it turns out that Value Line's long-term predictions perform as well as their short-term predictions, this would support the argument that Value Line's forecasts are inherently of high quality. Conversely, finding that Value Line's long-term prediction record is not good would suggest that the performance of its timeliness ranks might be a product of data mining or alignment with other anomalies.

The third important motivation for our study is that Value Line's 3–5 year return projections have been extensively used to estimate the cost of equity capital, and to test asset pricing models in ex-ante (rather than the traditional ex-post) form. The performance of these projections is therefore an important issue in its own right. Botosan (1997), Botosan and Plumlee (2002, 2005) and Francis et al. (2004) have all used Value Line 3–5 year projected stock returns as proxies for the cost of equity capital. Ang and Peterson (1985) use ex-ante data from Value Line to investigate the relation between expected stock returns and dividend yield. Similarly, in an interesting recent paper, Brav et al. (2005) use Value Line 3–5 year predicted returns as a proxy for consensus expected returns. Unlike prior studies (e.g. Fama and French, 1992) using realized returns, Brav, Lehavy and Michaely find a robust positive relation between Value Line's expected returns and market

[2] Among studies investigating short-term analyst forecasts, results regarding bias vary depending on the time period and variable examined; for example, Brown et al. (1985), along with O'Brien (1988) find no compelling evidence of bias in security analyst earnings forecasts over their 1976–1980 and 1975–1981 (respectively) sample periods, while Butler and Lang (1991) show analysts were sharply overoptimistic in predicting earnings between 1983 and 1986, and Easterwood and Nutt (1999) report similar evidence for the period 1982–1995. More recently, Agrawal and Chen (2005) find little evidence of systematic bias in earnings forecasts between 1994 and 2003, but Bradshaw and Brown (2005) document substantial overoptimism in 12-month horizon target stock price predictions over their 1997–2002 sample period, and Asquith et al. (2005) find that the probability of achieving a 12-month price target is inversely related to the favorability of an analyst's recommendation.

[3] Some studies have claimed, however, that information contained in Value Line reports can move the market in ways that cannot be completely explained by post-earnings announcement drift. For example, Peterson (1987) documents that initial reviews of stocks in Value Line generate abnormal returns around a three-day window surrounding publication; Peterson (1995) shows that post-earnings announcement drift does not fully explain abnormal returns around publication of stock highlights in Value Line.

beta, a negative relation between expected return and firm size, and no significant relation between expected return and book-to-market. However, none of these studies explores the relation between Value Line's predictions and future realized returns. The sharp disparity in results obtained when the cost of capital is estimated using Value Line predicted returns vis-à-vis other approaches, and when asset pricing models are tested with these predicted returns instead of realized returns, both underscore the need to examine how Value Line predicted returns and realized returns are related.

The balance of this paper is organized as follows. In Section 2, we describe the two datasets we construct from the Value Line surveys and the Center for Research in Security Prices (CRSP) database in order to examine how well Value Line's 3–5 year forecasts predict subsequently realized values. Descriptions of our basic empirical tests and results are provided in Section 3, while robustness tests are reported in Section 4. Section 5 concludes the paper.

2. Dataset construction

The study uses data collected from the Value Line Investment Survey once every four years beginning in the third quarter of 1969 and ending with the third quarter of 1997. The publication dates of the Value Line surveys we sample are between July 1 and September 30 of 1969, 1973, 1977, 1981, 1985, 1989, 1993 and 1997. For each of these periods we collect data for the 65 Stocks included in the Dow Jones Indexes at that time (30 Industrials, 20 Transports and 15 Utilities), providing us (potentially) with 520 pairs of predicted and realized values for each of the variables we study. We thus focus on eight non-overlapping, approximately four-year periods for the following: common stock return (r48), percent change in split-adjusted earnings per share (PCEPS), percent change in split-adjusted sales per share (PCSPS), change in profit margin (DPM), and change in earnings yield (DEY).[4] In order to construct both predicted and realized values for these variables, and to provide us with necessary controls, for each firm-year we collect the following information from Value Line: current stock price and estimated book value per share, number of common shares outstanding, low and high 3–5 year predicted target prices, Value Line's estimated beta, (split-adjusted) sales, earnings and dividends per share for each firm for the eighth, fourth and first years prior to the publication year, and Value Line's sales, earnings and dividends per share forecasts for the publication year and for 3–5 years in the future.[5]

We interpret Value Line's 3–5 year horizon projections as 4-year predictions. This interpretation is merely an approximation. For example, a Value Line report dated August 15, 1997 will contain a high and low projected stock price for the 2000–2002 period. To estimate the "4-year horizon" predicted annual return, we first compute a dividend growth rate as $g = (\mathrm{DIV}_{2000-2002}/\mathrm{DIV}_{1997})^{.25} - 1$, where DIV is Value Line's predicted dividend per share. Next, we project yearly cash flows over a four year period by assuming the estimated publication year dividend grows at the rate of g each year, and by assuming the stock is sold at the average of the high and low target prices taken from Value Line.[6] Finally, we define the Value Line predicted annual return ($\mathrm{VLR48}_t$) as the internal rate of return earned by buying the stock at the "recent stock price" recorded in the Value Line survey and by receiving the cash flows constructed in the previous step. The reason the presumed 4-year forecast horizon is only approximate is that the midpoint of the 2000–2002 range is June 30, 2001; if the report containing the projection is dated August 15, 1997 then in this case the actual forecast horizon would be only 3 years and 10.5 months. This degree of shortfall would be fairly typical, given that the Value Line reports we sample are all dated between July 1 and September 30. Similar considerations prevail regarding the horizons of the sales, earnings, profit margin and earnings yield forecasts of companies that report results for calendar years. For financial statement-based variables, the horizon discrepancies may be greater in the case of a minority of firms whose fiscal years do not coincide with calendar years.[7]

From CRSP, we match monthly realized returns for up to 48 months prior, and 48 months subsequent to the last trading day of September for each firm and publication year in the study to the Value Line data. There were relatively few instances where we could not obtain at least a four-year returns history for the stocks in this dataset. More frequently, however, due to mergers and the occasional bankruptcy, we could not obtain post-forecast returns from CRSP for a full 4-year period. Because we wished to avoid selection bias, we retained such stocks in the study. The CRSP returns we used included partial month delisting returns; in subsequent months, when we could not obtain a return from CRSP, we substituted the CRSP value-weighted portfolio return for the missing return on the individual stock. For each stock, the actual realized return is defined as

[4] Here and throughout the study a "pc" prefix in a variable name indicates a percentage change, and a "d" prefix a first difference.

[5] Value Line does not provide annual forecasts of sales, earnings and dividends per share; rather, a single point forecast is provided for 3–5 years in the future. For example, in a Value Line Investment Survey stock report from the third quarter of 1997, figures are provided for 1997, 1998 and 2000–2002. As explained below, we would interpret the 2000–2002 projection in this case as a 4-year horizon forecast.

[6] Our use of the average of the high and low prices as an implicit point forecast for the future stock price is consistent with Value Line's (2000, p. 24) definition of the target price range. The guide explicitly states that "the midpoint of the range is our estimate of the average annual price three to five-years from now".

[7] Stock return forecasts are not affected if fiscal and calendar years differ, because dividend and target stock price projections in Value Line are always for calendar years. In addition, as explained below, we obtain realized values for sales and earnings from future issues of Value Line, insuring that even when the true horizon differs from 4 years, the horizons are always the same for predicted and actual values.

$$R48_{it,t+48} = \left[\prod_{k=1}^{48}(1 + r_{it+k})\right]^{.25} - 1, \quad (1)$$

where $R48_{it,t+48}$ is the annual average realized return on stock i from the end of publication month t to month $t+48$, and r_{it+k} is the actual return on stock i in month $t+k$.[8]

Financial statement data presents several distinct challenges not encountered with stock returns. Value Line reports historical and projected earnings per share before extraordinary items; nevertheless, earnings are sometimes negative, and a percent change can be calculated only if EPS is positive in the base year. We cannot use an annual growth rate in earnings because such a calculation would further require that EPS be positive at the horizon date (thus forcing us to drop observations where this criterion is not met). Furthermore, no proxy for actual earnings can be obtained for firms that do not survive four years after the forecast date (due to either merger or bankruptcy). Finally, unlike stock prices, earnings are available only with a considerable lag. Consequently, during the July–September period each year when EPS data is obtained from Value Line, only the previous year's actual earnings are known.

In light of these difficulties, we focus on the total percent change in earnings over an approximate 4-year horizon. Value Line's predicted percent change in earnings per share is defined as

$$\text{VLPCEPS}_{i,t+4} = \frac{(\text{VLEPS}_{i,t+4} - \text{EPS}_{i,t-1})}{\text{EPS}_{i,t-1}}, \quad (2)$$

where $\text{VLEPS}_{i,t+4}$ is Value Line's predicted EPS for 3–5 calendar years after the publication date for firm i, and $\text{EPS}_{i,t-1}$ is the EPS for firm i in year $t-1$ (the latest known annual EPS at the time the Value Line report is published). We construct a matching actual total percent change in earnings per share as

$$\text{PCEPS}_{it,t+4} = \left(\frac{\text{EPS}_{i,t+3}+\text{EPS}_{i,t+4}+\text{EPS}_{i,t+5}}{3} - \text{EPS}_{i,t-1}\right)\Big/\text{EPS}_{i,t-1}, \quad (3)$$

where $\text{EPS}_{i,t+n}$ is the split-adjusted EPS for firm i in year $t+n$, as reported in Value Line six years after the year in which the forecasted earnings were obtained. We use an average of earnings per share in years $t+3$ to $t+5$ to reduce cyclical fluctuations and to match Value Line's stated 3–5 year forecast horizon.[9]

The predicted and actual percent change in sales per share are calculated similarly to their earnings counterparts. We define profit margin (PM) as the (Value Line definitions of) earnings per share divided by sales per share. We then calculate the predicted and actual change in profit margin as

$$\text{VLDPM}_{it,t+4} = \text{VLPM}_{i,t+4} - PM_{i,t-1}$$

$$\text{DPM}_{it,t+4} = \left(\frac{PM_{i,t+3} + PM_{i,t+4} + PM_{i,t+5}}{3}\right) - PM_{i,t-1}, \quad (4)$$

where $\text{VLPM}_{it,t+4}$ is Value line's predicted profit margin for firm i 3–5 years after the publication year, and PM for years $t+3$ through $t+5$ are taken from future issues of Value Line. Predicted and actual changes in the earnings yield, respectively, are calculated as

$$\text{VLDEY}_{it,t+4} = \text{VLEY}_{i,t+4} - \text{EY}_{i,t} \quad \text{and}$$

$$\text{DEY}_{it,t+4} = \left(\frac{\text{EY}_{i,t+3} + \text{EY}_{i,t+4} + \text{EY}_{i,t+5}}{3}\right) - \text{EY}_{i,t}, \quad (5)$$

where $\text{EY}_{i,t}$ is the forecasted EPS for the publication year divided by the current stock price as reported in Value Line, $\text{VLEY}_{i,t+4}$ is the forecast EPS for 3–5 years after publication divided by the average of the high and low predicted 3–5 year horizon stock prices, and $\text{EY}_{i,t+n}$ is the actual EPS for firm i, year n as reported in future issues of Value Line divided by the average annual stock price as reported by CRSP.[10]

Although useful, the Dow dataset has one substantial limitation. Because all of the Dow stocks are large and actively traded, with extensive analyst following, investors would incur relatively lower transactions costs in trading them, and the pricing of these stocks may be more efficient than the typical stock that Value Line follows. To ensure that at least those findings in our study pertaining to stock returns are not primarily driven by the subset of stocks we analyze, we construct a second dataset. Each week, Value Line publishes a summary that contains a table of the top 100 stocks ranked by appreciation potential over a 3–5 year horizon. We sample this table every four years on the final week of September starting in 1969 and ending in 1997. From the table, we obtain the recent stock price, predicted total appreciation, and Value Line's timeliness and safety ranks, and we match return data from CRSP for up to 48 months prior, and 48 months subsequent to the last trading day of September.[11]

[8] In constructing the realized return, the publication month is considered to be September even if the actual stock report from which we obtained data from Value Line was published in July or August.

[9] Following some previous studies, we also calculate an alternative definition of earnings, DEPSP, defined as the split-adjusted change in EPS (average of years $t+3$ to $t+5$ minus year $t-1$) divided by the initial stock price at the time the EPS forecast is made. Results for this alternative definition are reported in a separate robustness section.

[10] For a small number of firms, we were able to obtain financial statement information for four (but not five) post-publication years. In these cases, rather than drop the observations from the sample, we used only the fourth post-publication year (rather than an average of years $t+3$ to $t+5$) in calculating actual earnings, sales, etc.

[11] As before, when we could not obtain post-publication returns for a stock from CRSP for a full 4-year period, we include partial month delisting returns. However, unlike in the case of the Dow dataset, because we perform only portfolio tests for these top 100 firms, we substitute the average of the remaining firms' returns for the missing firm's returns in subsequent months. Otherwise, we construct average annual realized returns in this dataset in exactly the same way as for the Dow stocks.

Table 1
Descriptive Statistics

Variable	Number of observations	Mean	Standard deviation	Minimum	$P = .05$	$P = .25$	Median	$P = .75$	$P = .95$	Maximum
Value line four-year horizon predictions										
VLR48	519	20.26	10.95	−16.06	5.79	12.88	18.66	26.35	39.68	102.47
VLPCEPS	434	98.78	214.30	−25.93	15.71	35.26	59.66	92.07	214.50	2703.03
VLDEPSP	453	8.36	11.24	−5.00	1.58	3.43	5.27	8.34	30.69	118.65
VLPCSPS	451	45.27	34.97	−65.74	9.47	26.04	39.78	56.80	100.39	398.69
VLDPM	451	1.22	2.39	−6.81	−1.55	0.02	0.69	1.85	5.70	17.05
VLDEY	449	−1.54	7.95	−90.42	−9.18	−3.95	−1.28	1.06	5.95	61.17
Realized values over four-year horizons										
R48	519	10.17	14.29	−51.78	−13.41	2.15	10.55	18.70	32.94	57.57
PCEPS	434	31.46	197.39	−545.07	−145.07	−9.24	24.47	70.90	144.06	3122.22
DEPSP	453	1.50	16.54	−120.78	−16.98	−0.67	2.10	5.91	16.59	146.27
PCSPS	451	43.14	58.08	−63.71	−31.47	10.30	37.12	65.03	127.79	626.34
DPM	451	−0.83	4.07	−18.31	−7.57	−2.56	−0.58	1.06	5.22	24.56
DEY	449	−4.85	30.21	−415.65	−21.95	−4.03	−0.76	2.37	7.84	38.08
Risk factors and other control variables										
RMC	519	1.00	1.69	0.01	0.04	0.20	0.38	0.88	4.12	12.37
BM	519	0.91	0.62	−2.77	0.20	0.52	0.78	1.14	2.15	3.80
PR48	511	10.41	12.94	−27.64	−9.22	1.87	10.06	18.10	32.31	57.57
BETA	514	1.00	0.27	0.32	0.63	0.80	1.00	1.15	1.44	2.46
VLFU	454	1.00	0.31	0.35	0.55	0.77	0.96	1.22	1.52	2.06

Variables are defined as follows (a "VL" prefix indicates an ex-ante 4-year horizon value line forecast): R48 = average annual realized stock return over subsequent 48 months, PCEPS = % change in EPS, DEPSP = change in EPS as a percent of the initial stock price, PCSPS = % change in sales per share, DPM = change in profit margin, DEY = change in earnings yield, RMC = relative market capitalization, BM = ratio of book value to market value of common stock, PR48 = average annual common stock return over prior 48 months, BETA = stock's beta as reported in Value Line, VLFU = Value Line forecast uncertainty as computed from width of high–low target stock price range.

3. Tests for unbiasedness and predictive power of value line forecasts

Descriptive statistics for predicted and actual (realized) values for the Dow dataset are reported in Table 1, wherein we report the number of observations, means, standard deviations and various points along the distribution. In the table, we report similar statistics for control variables used in our study. For ease of exposition, we multiply most variables by 100, i.e. we report percentages as whole numbers. We were forced to drop one observation from the sample for predicted and realized stock returns (Penn Central in 1973, for which Value Line did not supply target stock prices), leaving us 519 matching paired observations for VLR48 and R48. For other variables, as explained previously, more observations had to be dropped (this was particularly true in the case of VLPCEPS and PCEPS, where EPS in year $t-1$ had to be positive for the figures to be meaningful); consequently, for financial statement-based variables, number of observations ranges from 434 for PCEPS to 453 for DEPSP. Apart from the large differences in means between many of the Value Line predictions and their matching realized values, examined in much greater depth in Table 2 below, the most striking aspects of the distributions in Table 1 are the extreme values observed for some variables. For example, while the mean for PCEPS (total percent change in earnings over an approximately 4-year horizon) is 31.46, the minimum is −545.07 and the maximum 3122.22.[12] This aspect of the distributions cautions us to test whether our major findings still hold if extreme values are removed, which we do in a separate robustness section below.

Formal tests of Value Line forecast bias are reported in Table 2. Mean predicted and subsequently realized four-year horizon stock returns, broken down by cohort year, are reported in Panel A. These results show that Value Line's analysts have been incredibly overoptimistic in predicting future returns for the Dow stocks in our sample period, insofar as the mean predicted annual return (20.255%) has been almost twice the mean realized return (10.173%), with a t-statistic for the difference in means of 12.966. Indeed, in six of the eight cohort years, the mean predicted return greatly exceeds the mean realized return, and t-tests reject the equality of the two measures at better than 1%.

Evidence concerning the unbiasedness of Value Line's earnings, sales, profit margin and earnings yield forecasts is provided in Panels B through E of Table 2. The EPS and profit margin projections are strikingly overoptimistic on average. The null hypothesis that predicted and actual values overall are equal is rejected at any conventional level

[12] Because PCEPS measures the total percent change in EPS, and EPS can be negative, it is possible for PCEPS to be less than −100%. For example, if a firm has an EPS of $1 in year $t-1$, and average EPS for years $t+3$ to $t+5$ were −$2, then PCEPS would equal −300%.

Table 2
Tests for value line forecast bias

Panel A: Annualized common stock return, month (t) to month ($t+48$)					
Cohort year	Number of observations	Mean VLR48	Mean R48	Mean prediction – actual	t-Statistic
1969	65	19.389	3.049	16.341	9.454***
1973	64	24.730	6.184	18.545	10.776***
1977	65	28.307	7.539	20.769	10.473***
1981	65	32.141	19.232	12.909	5.072***
1985	65	18.682	19.323	−0.641	−0.375
1989	65	15.638	8.423	7.216	3.119***
1993	65	13.526	17.829	−4.303	−2.643**
1997	65	9.697	−0.257	9.955	5.644***
Overall	519	20.255	10.173	10.083	12.966***

Panel B: Total percent change in earnings per share, year ($t-1$) to year ($t+4$)					
Cohort year	Number of observations	Mean VLPCEPS	Mean PCEPS	Mean prediction – actual	t-Statistic
1969	61	71.613	27.914	43.700	2.943***
1973	62	114.106	82.063	32.043	2.167**
1977	62	81.527	2.227	79.300	3.263***
1981	53	147.851	20.587	127.264	3.095***
1985	49	61.779	18.945	42.834	3.573***
1989	57	72.215	−11.741	83.956	6.380***
1993	41	158.072	155.085	2.986	0.117
1997	49	100.261	−20.070	120.331	4.059***
Overall	434	98.781	31.461	67.320	8.025***

Panel C: Total percent change in sales per share, year ($t-1$) to year ($t+4$)					
Cohort year	Number of observations	Mean VLPCSPS	Mean PCSPS	Mean prediction – actual	t-Statistic
1969	62	35.090	55.569	−20.478	−3.450***
1973	63	47.159	85.427	−38.269	−3.301***
1977	63	48.636	56.409	−7.773	−1.550
1981	56	57.096	7.431	49.665	9.980***
1985	52	42.168	35.015	7.152	0.952
1989	57	47.991	25.292	22.700	4.935***
1993	49	39.406	23.808	15.598	3.655***
1997	49	43.855	45.510	−1.655	−0.169
Overall	451	45.269	43.140	2.129	0.753

Panel D: Total change in profit margin, year ($t-1$) to year ($t+4$)					
Cohort year	Number of observations	Mean VLDPM	Mean DPM	Mean prediction – actual	t-Statistic
1969	62	1.353	−1.782	3.135	7.066***
1973	63	0.911	−1.285	2.195	6.265***
1977	63	0.542	−1.802	2.344	4.380***
1981	56	0.773	0.163	0.610	1.118
1985	52	1.098	−0.298	1.395	2.597**
1989	57	0.915	−1.524	2.439	5.604***
1993	49	3.123	2.728	0.395	0.870
1997	49	1.439	−2.277	3.716	6.484***
Overall	451	1.223	−0.834	2.057	11.595***

Panel E: Total change in earnings yield, year ($t-1$) to year ($t+4$)					
Cohort year	Number of observations	Mean VLDEY	Mean DEY	Mean prediction – actual	t-Statistic
1969	62	−1.047	−5.088	4.042	0.595
1973	63	−3.952	2.276	−6.228	−7.880***
1977	62	−5.886	−13.712	7.826	1.242
1981	54	−5.636	−7.415	1.779	1.228
1985	52	−0.068	−4.243	4.175	2.555**
1989	57	0.870	−6.555	7.425	3.501***
1993	50	3.711	1.515	2.196	5.405***
1997	49	1.202	−4.787	5.988	2.221**
Overall	449	−1.543	−4.846	3.303	2.401**

Notes: Within each panel, the mean Value Line prediction is provided in column 3, the mean of the subsequently realized values in column 4 and the mean difference between the predicted and realized values in column 5. The t-statistic in column 6 is for the two-tailed test that the mean of the predicted minus actual values equals zero. See Table 1 for further variable definitions. *, ** and ***, respectively, indicate significance at the 10%, 5% and 1% levels.

for these variables. Indeed, for both EPS in Panel B and profit margin in Panel D, predicted values are larger than realized values *for every single cohort year*, and the forecast error is significantly positive in a large majority of cohort years. In sharp contrast, Value Line appears to be considerably less biased when predicting sales or earnings yields. For sales overall, we cannot reject the null that the predicted and actual values are equal. In the case of earnings yields, Value Line's analysts have actually been slightly too *pessimistic*, as the mean predicted decline in EY has been significantly smaller (at the 5% level) than the mean actual decline. As EY is simply the reciprocal of the P/E ratio, this indicates stock valuations have risen relative to earnings more than Value Line predicted.[13]

Taking a bottom-up view, the overall tenor of the results in Table 2 strongly indicates that the key variable is profit margin. Because Value Line's analysts consistently overpredict the profit margin, their earnings forecasts also tend to be too high despite the fact that their sales forecasts appear unbiased. The grossly inflated earnings forecasts, in turn, produce inflated stock return predictions despite the apparent pessimism with regard to valuations. If one takes a top-down view, however, Value Line's overoptimism with respect to future returns is difficult to understand, because the ex-post performance of the stock market as a whole over the period 1969–2001, and the performance of the Dow stocks, has not been out of line when compared with longer historical periods.[14] Finally, we note that mean VL predicted returns for the Dow stocks are very similar to mean VL predicted returns on a much broader cross-section of stocks, as can be seen by closely comparing our results in Table 2, by cohort year, to those in Francis et al. (2004, Table 2). Thus, it is unlikely that Value Line's overoptimism is confined to the Dow stocks.

We next examine whether Value Line's long-term forecasts of stock returns, earnings, sales, profit margins and earnings yields have power to predict realized values of these variables in a cross-sectional sense, e.g. do firms for which Value Line predicts relatively greater stock returns actually perform better than firms for which Value Line predicts lower returns? To examine predictive power, we begin by modeling the simple relation between predicted and realized values in a regression framework. While our dataset is primarily cross-sectional, it does have a subtle time series component, and Value Line's long-term forecasts might therefore conceivably have power to predict realized values in two ways. First, as already shown in Table 2 Panel A, Value Line's aggregate predicted return for the "market" (as proxied by the Dow stocks) is time-varying. Similarly, predicted aggregate changes in earnings, profit margins and earnings yields vary substantially based on the cohort year, and might forecast subsequent aggregate realized values. Second, Value Line's analysts might have purely cross-sectional predictive power, i.e. they may successfully predict which stocks will outperform others over a given time period, or which firms will experience rapid earnings growth relative to other firms. Because time-varying market expected returns are generally considered consistent with efficiency, our primary interest lies in the second, purely cross-sectional component of Value Line's predictive power.

We examine the relations between predicted and realized values both with and without controlling for the time series component using the following regressions:

$$\text{Realized value} = \alpha + \beta(\text{VL Prediction}) + e_{it}, \tag{6}$$

$$\begin{aligned}\text{Realized value} = {} & \alpha_1\text{D69} + \alpha_2\text{D73} + \alpha_3\text{D77} + \alpha_4\text{D81} \\ & + \alpha_5\text{D85} + \alpha_6\text{D89} + \alpha_7\text{D93} \\ & + \alpha_8\text{D}\,m97 + \beta(\text{VL Prediction}) + e_{it},\end{aligned} \tag{7}$$

where D69...D97 are 0,1 dummy variables representing the cohort year of the Value Line forecast. Here and in other regression tests in the study, we use the White (1980) correction to ensure that our estimated coefficient standard errors are robust to heteroskedasticity in the residuals.[15] We interpret the slope coefficient from model (6) as a measure of the total predictive power of the Value Line forecasts, and the coefficient β from regression (7) as measuring only the cross-sectional component of Value Line's predictive ability. If these coefficients are significantly positive, then the Value Line forecasts can be interpreted as having predictive power.

The results from estimating models (6) and (7) are provided in Table 3, Panels A and B, respectively. As one

[13] Like their sales projections, Value Line's economic projections do not appear to have been systematically biased for the most part. Every issue of Value Line contains a statement of the hypothesized economic environment 3–5 years in the future, with detailed annual projections for nominal and real GDP, industrial production and a few other variables. We collected these "forecasts" (Value Line does not formally characterize them as such) every four years and compared them with actual realizations for the annual percent change in real GDP, industrial production and the GDP deflator. These results (not reported) showed that while Value Line's economic predictions are often wide of the mark, there generally is no strong bias in these predictions on average. The mean predicted annual growth in real GDP was 3.42%, which is only slightly above mean actual growth of 3.22%. Similarly, the mean predicted inflation rate (4.10%) was only slightly below the mean actual inflation rate (4.44%). The only economic variable for which Value Line appears to have been systematically overoptimistic is industrial production: here Value Line's mean annual growth prediction overall (4.26%) was well above actual growth (2.80%), and the predicted growth rate exceeded the actual for seven of the eight 4-year periods we examined.

[14] Between September 1969 and September 2001, the geometric mean annual return on an equally weighted portfolio of the 65 Dow stocks was about 9.9% in nominal terms, or 5.3% in real terms using the GDP deflator to measure inflation. Over the same period, the CRSP value-weighted NYSE/AMEX/NASDAQ portfolio returned 11.1% per annum in nominal terms and 6.4% in real terms. Both of these measures are roughly in accord with geometric average long-run returns for US stocks reported in Siegel (1998), which are 8.4% per annum in nominal terms (7.0% in real terms) over the 1802–1997 period.

[15] Our error terms are not serially correlated given the largely cross-sectional nature of the dataset, and the fact that we do not use overlapping data.

Table 3
Tests for cross-sectional predictive power

Coefficient	Model estimated for:				
	Stock return	%CH in EPS	%CH in sales per share	Change in profit margin	Change in earnings yield
Panel A: Realized value = $\alpha + \beta$ *(VL Prediction) +* e_{it}					
α	9.304	−26.986	24.697	−1.700	−3.305
	(6.321)***	(−1.546)	(5.365)***	(−8.832)***	(−2.516)**
β	0.0429	0.5917	0.4074	0.7084	0.9984
	(0.630)	(2.652)***	(5.067)***	(5.671)***	(3.516)***
Test: $\beta = 1$, χ^2	197.78***	3.35*	54.31***	5.45**	0.00
R^2	0.0011	0.4126	0.0602	0.1726	0.0691
Number of observations	519	434	451	451	449
Panel B: Realized value = $\alpha_1 D69 + \alpha_2 D73 + \alpha_3 D77 + \alpha_4 D81 + \alpha_5 D85 + \alpha_6 D89 + \alpha_7 D93 + \alpha_8 D97 + \beta$ *(VL Prediction) +* e_{it}					
α_1	6.099	−13.827	39.492	−2.638	−3.986
	(3.055)***	(−0.727)	(5.903)***	(−6.472)***	(−0.589)
α_2	10.075	15.555	63.822	−1.860	6.437
	(4.286)***	(0.618)	(5.673)***	(−5.899)***	(4.717)***
α_3	11.992	−45.292	34.127	−2.145	−7.515
	(4.659)***	(−1.802)*	(4.790)***	(−4.192)***	(−1.379)
α_4	24.289	−65.590	−18.727	−0.326	−1.482
	(9.169)***	(−2.049)**	(−2.604)***	(−0.625)	(−0.642)
α_5	22.262	−17.063	15.697	−0.992	−4.171
	(11.233)***	(−1.002)	(1.909)*	(−1.941)*	(−2.546)**
α_6	10.883	−53.833	3.305	−2.103	−7.471
	(4.783)***	(−2.733)***	(0.510)	(−4.709)***	(−3.590)***
α_7	19.957	62.951	5.755	0.753	−2.391
	(9.878)***	(2.465)**	(0.937)	(1.266)	(−2.168)**
α_8	1.268	−78.508	25.418	−3.187	−6.052
	(0.694)	(−2.632)***	(2.374)**	(−5.258)***	(−2.249)**
β	−0.1573	0.5828	0.4581	0.6322	1.0527
	(−1.930)*	(2.754)***	(4.357)***	(4.792)***	(3.743)***
Test: $\beta = 1$, χ^2	201.51***	3.88**	26.55***	7.777***	0.04
R^2	0.2601	0.4558	0.2350	0.2524	0.0902
Number of observations	519	434	451	451	449

Where D69–D97 are dummy variables representing the year during which the Value Line prediction was obtained.
Figures in parentheses below coefficient estimates are *t*-statistics. *, ** and ***, respectively, indicate significance at the 10%, 5% and 1% levels.

might expect based on the efficient markets hypothesis, the results vary depending on the forecasted variable. For stock returns, there is no evidence that Value Line has any predictive power. The slope coefficient in Panel A, while positive, is very small and indistinguishable from zero; the slope coefficient in Panel B is actually marginally significant and negative, indicating that stocks for which Value Line predicts relatively high appreciation in a given cohort year actually tend to do worse than stocks for which they predict lower appreciation. For earnings, sales, profit margins and earnings yields, our results are more favorable to Value Line. Regardless of whether we do (Panel B) or do not (Panel A) control for time series components, the slope coefficients for all of these variables are positive and statistically significant at the 1% level, indicating that Value Line's analysts do have predictive power over an approximately 4-year horizon vis-à-vis these variables. In both panels of Table 3, we also test the hypothesis that the slope coefficients equal one. A slope that is positive but significantly below one would be in accordance with La Porta's (1996) finding that analysts' growth expectations are too extreme. Clearly, our findings for earnings, sales and profit margins support this interpretation, as in both panels the slopes for these variables are significantly less than one. We do find, however, that Value Line's earnings yield forecasts are not extreme, because for this variable the slopes are very close to one.[16]

For stock prices (but not for other variables, for which only single point forecasts are provided), Value Line reports 3–5 year projected high and low prices. As explained earlier, we use the mean of these price projections (combined with forecasted dividends) to compute 4-year horizon projected stock returns. We now use these same high-low price projections to measure forecast uncertainty, and to determine whether the bias and predictive power of Value Line's stock return forecasts is related to this uncertainty. We define Value Line Forecast Uncertainty (VLFU) as $(P_{high}–P_{low})/0.5(P_{high} + P_{low})$, where P_{high} and P_{low} are, respectively, Value Line's 3–5 year projected high and low

[16] The R^2 statistics reported in Table 3, Panel B for model (7) should be interpreted with caution. While they are uniformly higher than for model (6), R^2 in this context is an ex-post measure and does not indicate greater ex-ante predictability using model (7). We believe the slope coefficients in the two models are comparable, and these generally do not indicate greater predictability with model (7).

Table 4
Tests for value line stock return forecast bias and predictive power, by degree of forecast uncertainty

Panel A: Tests for forecast bias

VL forecast uncertainty quintile	Number of observations	Mean VL forecast uncertainty	Mean VL predicted annual stock return (%)	Mean realized annual stock return (%)	Mean prediction – actual stock return (%)	*t*-Statistic
p1 (low)	90	0.5726	17.837	12.152	5.685	3.7828***
p2	91	0.8164	19.816	14.048	5.769	3.9815***
p3	88	0.9737	18.669	10.668	8.002	5.0519***
p4	93	1.1831	20.209	9.997	10.212	5.8309***
p5 (high)	92	1.4399	25.232	9.142	16.090	6.0239 ***

Panel B: Tests for predictive power. Model: Realized annual return = $\alpha + \beta$ (VL Predicted annual return) + e_{it}

Coefficient:	Model estimated For VL forecast uncertainty quintile:				
	p1 (low)	p2	p3	p4	p5 (high)
α	7.826	8.107	12.119	3.002	12.327
	(2.995)***	(2.950)***	(3.702)***	(0.854)	(3.406)***
β	0.2426	0.2998	−0.0777	0.3461	−0.1262
	(1.900)*	(2.458)**	(−0.509)	(2.154)**	(−1.152)
Test: $\beta = 1$, χ^2	35.20***	32.96***	49.90***	16.56***	105.64***
R^2	0.0318	0.0654	0.0030	0.0461	0.0130
Number of observations	90	91	88	93	92

Notes: Value Line Forecast Uncertainty (VLFU) is calculated as $(P_{high}–P_{low})/0.5\ (P_{high} + P_{low})$, where P_{high} and P_{low} are, respectively, Value Line's 3–5 year projected high and low stock prices. We normalize the uncertainty variable by dividing each firm's result by the average calculated uncertainty of all Dow stocks in the same cohort year. Thus, firms with VLFU exceeding one have above average forecast uncertainty relative to all Dow stocks in a given year, and vice-versa. The quintiles vary slightly in number of observations because we did not allow breakpoints to occur between firms that had the exact same VLFU. *,** and *** denote, respectively, statistical significance at the 10%, 5% and 1% levels.

stock prices. We normalize the uncertainty variable by dividing each firm's result by the average calculated uncertainty of all Dow stocks in the same cohort year. Thus, firms with VLFU exceeding one have above average forecast uncertainty relative to all Dow stocks in a given year, and vice-versa. We then sort firms into quintiles based on VLFU, and examine whether stock return forecast bias and predictive power varies across these quintiles using the same procedures used previously.[17]

The forecast uncertainty findings are reported in Table 4. It appears from the results in Panel A that Value Line's positive forecast bias increases with forecast uncertainty: the mean difference between predicted and actual annual stock return increases from 5.685% for firms in the lowest VLFU quintile to 16.09% for firms in the highest quintile. We note, however, that a significant positive forecast bias remains across all of the quintiles. The regression tests for predictive power, sorted by VLFU quintile, are reported in Panel B. While the slope coefficients do appear to vary across quintiles, and are significantly positive in three cases, the results fail to conclusively demonstrate that predictive power and VLFU are related, because the slope is actually highest for the fourth VLFU quintile.[18]

To gain further insight into how Value Line's predicted and realized values are related, as well as into how Value Line's predictions for different variables for the same firm are linked, we next examine how predicted and realized values differ across portfolios that are formed based on (ex-ante) Value Line predictions. These results are reported in Table 5, wherein we form portfolios based on quintiles of VLR48 (Value Line predicted stock returns) in Panel A, VLPCEPS (predicted % change in EPS) in Panel B and VLDPM (predicted change in profit margin) in Panel C. For each quintile resulting from each of these three sorts, we report the mean annual realized stock return over the subsequent 48 months (R48), the mean realized stock return orthogonal to market capitalization, book-to-market, past 4-year stock return, and beta (ORTHR48), the mean Value Line predicted stock return (VLR48), the realized % change in EPS (PCEPS), the predicted % change in EPS (VLPCEPS), the realized change in profit margin (DPM) and the predicted change in profit margin (VLDPM). By forming portfolios every four years and reporting average results across eight cohorts, we deliberately remove any impact of time series predictability in returns; thus, our portfolio tests should closely complement the regressions with dummy variables approach in Table 3 Panel B.

If Value Line has predictive power with respect to stock returns, then we would expect that the portfolio composed of the top 20% of firms each cohort year ranked on the basis of VLR48 (p5 in Panel A) would have higher R48 than the portfolio composed of the bottom 20% of firms (p1). Consistent with the regression tests of predictive power in Table 3, however, we find that this is not the case: the mean p5 stock returns are actually lower than the mean

[17] We are unable to calculate VLFU for the 1969 cohort because Value Line provides only a single point forecast for the 3–5 year horizon stock price in its Investment Survey issues in that year. We thank an anonymous referee for suggesting that we examine if stock return forecast bias and predictive power are related to forecast uncertainty.

[18] The regressions in Table 4, Panel B were also estimated using a variant of Model 7, in which the constant term is allowed to vary by cohort year. While some of the estimated slope coefficients were quite different, the evidence regarding a clear relation between the slope coefficients and VLFU remained inconclusive.

Table 5
Realized values for portfolios formed based on value line predictions

Quintile	p1 (low)	p2	p3	p4	p5 (high)	Number of observations
Panel A: Portfolios sorted based on value line's predicted stock return (VLR48)						
R48	8.89	11.21	12.45	11.43	6.86	519
ORTHR48	7.91	10.41	11.98	11.53	8.21	511
VLR48	10.83	16.22	19.56	23.04	31.74	519
PCEPS	28.50	25.94	35.53	59.39	6.01	434
VLPCEPS	54.23	62.55	102.73	95.56	189.37	434
DPM	−1.13	−0.73	−0.80	0.06	−1.64	451
VLDPM	0.46	0.65	1.04	1.58	2.43	451
Panel B: Portfolios sorted based on value line's predicted %change in EPS (VLPCEPS)						
R48	11.41	8.89	8.79	13.12	6.37	434
ORTHR48	9.58	7.81	8.41	13.88	7.78	429
VLR48	18.74	18.93	20.14	19.95	24.97	434
PCEPS	−3.30	9.01	18.30	42.49	90.65	434
VLPCEPS	19.42	40.09	59.89	84.62	289.44	434
DPM	−2.19	−1.40	−1.26	−0.44	−0.48	432
VLDPM	−0.50	0.27	0.81	1.40	2.79	432
Panel C: Portfolios sorted based on value line's predicted change in profit margin (VLDPM)						
R48	10.07	11.94	8.94	8.91	9.25	451
ORTHR48	8.91	11.05	8.65	9.17	10.97	446
VLR48	21.27	20.62	19.52	19.45	22.91	451
PCEPS	−3.83	17.73	22.39	62.13	67.34	432
VLPCEPS	35.94	50.31	70.00	115.15	254.13	432
DPM	−2.75	−1.14	−0.81	−0.48	1.01	451
VLDPM	−1.15	0.14	0.71	1.60	4.82	451

Notes: Portfolios are formed ex-ante every 4 years beginning September 30, 1969 based on Value Line 3–5 year horizon predictions published between July 1 and September 30 of the same year. We report quintiles for the means of the following variables (a "VL" prefix in a variable name indicates a Value Line forecast): R48 = average annual stock return over subsequent 48 months; ORTHR48 = average annual realized stock return orthogonal to relative market capitalization, book-to-market, stock return over previous 48 months, and beta (as reported in Value Line); PCEPS = % change in EPS between year $t-1$ and the average of years $t+3$, $t+4$ and $t+5$; DPM = change in profit margin between year $t-1$ and the average of years $t+3$, $t+4$ and $t+5$.

p1 stock returns. If realized stock returns are adjusted to make them orthogonal to factors that prior research has shown to affect cross-sectional returns, then there is virtually no difference in the realized adjusted returns between p5 and p1. Two other results in Panel A are worth noting. First, Value Line overpredicts stock returns, on average, for all five quintiles, thus underscoring the pervasive optimistic bias of the Value Line stock return projections. Second, the results demonstrate internal consistency in the form of a positive relation, at the firm level, across the set of Value Line predictions: firms that are predicted to experience higher stock returns are also predicted to have higher earnings growth and larger profit margin increases. For example, mean VLPCEPS for p5 firms with high VLR48 is 189.37%, while mean VLPCEPS for p1 firms with low VLR48 is only 54.23%.

The results for portfolios sorted based on predicted earnings (Panel B) and predicted profit margin (Panel C) confirm earlier regression findings that Value Line does have some power to predict (approximately) 4-year horizon changes in these variables. For example, in Panel B, the realized % change in EPS for the lowest prediction quintile is −3.30% vs. 90.65% for the highest quintile. Similarly, in Panel C, the realized change in profit margin for the lowest quintile is −2.75 vs. +1.01 for the highest quintile. We also confirm earlier findings that Value Line analysts are uniformly overoptimistic: for all quintiles the realized change in EPS or profit margin is lower than the predicted change. Finally, the results continue to show internal consistency, in that firms with higher VLPCEPS or VLDPM also tend to have higher predicted stock returns, albeit not by large margins.[19]

4. Robustness tests

As an initial measure of the robustness of our basic findings regarding unbiasedness and predictive power, we test whether these findings are sensitive to outliers. These results are reported in Panel A of Table 6. Here we repeat some of the tests conducted in Tables 2 and 3, except that

[19] We also examined the internal consistency of Value Line's forecasts by running cross-sectional regressions of forecast errors for each variable on forecast errors for other variables. These results confirm the finding that forecast errors across firms for stock returns, earnings and profit margins are significantly positively related to each other.

Table 6
Robustness tests

Panel A: Tests with outliers trimmed

Unbiasedness tests (Note: VL Forecast Error = VL Prediction – Realized)

	Stock return (%)	%CH in EPS	%CH in sales per share	Change in profit margin (%)	Change in earnings yield
Mean VL prediction	19.962	76.369	45.315	1.076	−1.436
Mean realized value	10.297	22.712	39.965	−0.826	−2.009
Mean VL forecast error	9.665	53.656	5.350	1.902	0.573
t-Statistic	14.166***	9.350***	2.471**	12.373***	1.451
Number of observations	494	412	429	429	427

Tests for predictive power: Realized value = $\alpha + \beta$ (VL Prediction)
Coefficient:

	Stock return (%)	%CH in EPS	%CH in sales per share	Change in profit margin (%)	Change in earnings yield
α	8.443	22.367	24.178	−1.260	−1.621
	(6.975)***	(4.783)***	(7.664)***	(−8.436)***	(−3.944)***
β	0.0929	0.0045	0.3484	0.4037	0.2701
	(1.739)*	(0.085)	(5.758)***	(4.667)***	(1.808)*
Test: $\beta = 1$, χ^2	288.42***	347.83***	116.00***	47.54***	23.86***
R^2	0.0065	0.0000	0.0840	0.0703	0.0412
Number of observations	494	412	429	429	427

Panel B: Tests with alternative variable definitions

Unbiasedness tests (Note: VL Forecast error = VL Prediction – Realized value)

	Orthogonal stock return (%)	Change in EPS as percent of initial stock price
Mean VL prediction	20.407	8.365
Mean realized value	10.025	1.504
Mean VL forecast error	10.382	6.860
t-Statistic	14.752***	8.274***
Number of observations	511	453

Tests for predictive power: Realized value = $\alpha + \beta$ (VL prediction) + e_{it}
Coefficient:

	Orthogonal stock return (%)	Change in EPS as percent of initial stock price
α	8.395	−0.0143
	(4.151)***	(−0.772)
β	0.0798	0.3504
	(0.847)	(1.309)
R^2	0.0022	0.0567
Number of observations	511	453

Notes: In these tests, the extreme 5% of realized values (top and bottom 2.5%) included in Tables 2 and 3, along with firm-matched VL predicted values, are trimmed (Panel A). The orthogonal stock return (Panel B) is defined as the constant term plus the residual from a regression of, respectively, R48 and VLR48 on RMC (relative market capitalization), BM (book-to-market), PR48 (average annual stock return over prior 48 months) and BETA (as reported in Value Line). All independent variables in the regression are in deviation from the mean form. *,** and *** denote, respectively, statistical significance at the 10%, 5% and 1% levels (Panel B).

the extreme 5% of observations of the *realized values* (2.5% in each tail), along with firm-matched Value Line predicted values, are trimmed. As regards bias, for the stock returns, earnings and profit margins, the overall trimmed results are very similar to the untrimmed and confirm that Value Line has grossly overpredicted these variables on average. For sales, the trimmed results show a slight tendency to overpredict (forecast error significantly positive at the 5% level), whereas the untrimmed results did not. Conversely, for earnings yields, the trimmed results show no significant difference between the means of the actual and predicted values, whereas the untrimmed results indicated that Value Line was slightly too conservative in predicting earnings yields.

We also report simple tests for predictive power with the trimmed data in Table 6, Panel A. For brevity, we only report trimmed results without cohort year dummy variables, but the conclusions are unchanged when the latter are included. For stock returns, sales and profit margins, the regressions estimated with trimmed data yield very similar conclusions to those estimated with untrimmed data (as reported in Table 3, Panel A), although the slope coefficient in Table 6 is 0.0929 in the case of stock returns and is marginally significant. Some interesting differences do emerge, however, for the remaining variables. For earnings, using the trimmed data, the slope is very nearly zero and insignificant, indicating that in non-extreme cases Value Line has no predictive power with respect to earnings growth. Similarly, we find that Value Line's predictive power with respect to earnings yields is notably lower with the trimmed data than with the untrimmed, albeit in this case some degree of predictive power may remain.

We further examine the robustness of our findings by repeating our basic tests using alternative variable definitions, focusing on what we consider the two most important variables. We create an orthogonal stock return by taking the constant term plus the residual from a regression of (respectively) R48 and VLR48 on relative market capitalization, book-to-market, stock return over the prior 48 months, and beta as reported in Value Line, with all independent variables in deviation from the mean form. We use these variables because previous studies, e.g. DeBondt and Thaler (1985, 1987) and Fama and French (1992), suggest they are important determinants of the cross-section of stock returns, and we want to ascertain if Value Line's stock return predictions have any value beyond what can be explained by these measures. As shown in Panel B of Table 6, neither unbiasedness nor predictive power using orthogonal stock returns are markedly different than when unadjusted returns are used; the severe optimistic bias and lack of evidence of predictive power remain evident in the case of the orthogonal returns.

In many previous studies of analyst forecasts, earnings changes are normalized by dividing both predicted and realized earnings per share by the initial stock price. To see if our results are sensitive to this normalization, we reran our basic tests using this alternative measure of earnings, defined in footnote 9. We find (Table 6, Panel B) that Value Line's earnings forecasts remain grossly overoptimistic, as the forecast error (predicted–realized) is large and significantly positive at any conventional level.[20] However, unlike with the simpler definition of earnings change used in Table 3, we now find no evidence of predictive power: the slope coefficient in a regression of realized values on predicted values (albeit positive) is insignificantly different from zero. Clearly, therefore, one important conclusion that emerges from Table 6 is that Value Line's ability to predict earnings across this cross-section of firms depends crucially on how the earnings change variable is defined. Results are much less favorable to Value Line when outliers are trimmed or when earnings changes are normalized by the current stock price.[21]

Another issue which arises with respect to earnings is the treatment of extraordinary (non-recurring) gains and losses. Value Line excludes these items from its historical and forecast EPS tables, but provides the total amounts, by year, in footnotes to its stock reports. Because Value Line only provides forecasts for EPS excluding extraordinary items, we believed it best to exclude these items in all of the tests reported in this study. However, to ascertain if our results are sensitive to this treatment, we randomly selected 50 stock reports and repeated the tests reported in Tables 2 and 3, Panel A for percent change in EPS, change in profit margin, and change in earnings yield, where the earnings were defined as alternately including and excluding extraordinary items. These results (not reported) show that the findings we report in this paper are not highly sensitive to this choice.[22]

All of the results we have presented thus far are for the Dow dataset. As discussed earlier, one potentially severe limitation is that the included stocks are not representative of the typical stock Value Line covers. To ascertain if our stock return prediction results for the Dow stocks are likely to hold for a broader cross-section, we conduct portfolio tests for the "top 100" database, described earlier. These test results are reported in Table 7. Specifically, we form portfolios every 4 years beginning September 30, 1969 based on Value Line's listing of the top 100 stocks by appreciation potential (these stocks have the greatest predicted total returns over a 3–5 year horizon). The "All Top 100 Stocks" column is for an equally weighted portfolio holding all stocks on the list. The safety rank $= 1, 2, 3$, safety rank $= 4$, and safety rank $= 5$ portfolios, respectively, contain stocks on the top 100 list with the indicated safety ranks, and the timeliness rank $= 1, 2, 3$ portfolio contains stocks on the top 100 list with a timeliness rank of 3 or better.[23] Finally, the "top 33" portfolio is an equally weighted combination of the top one-third of stocks (ranked by predicted return) on the top 100 list. We estimate time series regressions of the portfolio excess returns against various combinations of factors shown in previous studies (e.g. Fama and French, 1992; and Carhart, 1997) to be strongly related to realized stock returns.[24]

The results in Table 7 are very easy to summarize. Not one single portfolio we construct from stocks on the top 100 list significantly outperformed the market, regardless

[20] Note that DEPSP (change in earnings as a percent of stock price) and DEY (change in earnings yield) differ. When computing the earnings yield in year $t+4$, the average of realized earnings per share in years $t+3$ to $t+5$ is divided by the stock price in year $t+4$ rather than by the stock price in year t.

[21] We also examined Value Line forecast bias and predictive power broken down by type of firm (industrial, transport or utility). These results (available from the authors on request) showed that firm type did not matter in evaluating forecast bias: Value Line's stock return, earnings and profit margin forecasts were significantly optimistic for all classifications. However, for reasons we cannot fully explain, Value Line did appear to have significant predictive power vis-à-vis utility stock returns, even though their record in forecasting earnings and profit margins for utilities is no better than for other types of firms.

[22] If anything, the positive bias in predicted PCEPS and DPM is actually *larger* when extraordinary items are included in historical and realized EPS, probably because these items are more often negative than positive. As regards predictive power, our results for the randomly selected subsample indicate less ability by Value Line to predict changes in earnings and profit margins (compared to the full sample) regardless of whether extraordinary items are included in EPS; there is no marked difference in predictive power with respect to including or excluding these items, other things held constant.

[23] Value Line defines its safety rank as a measurement of potential risk associated with an individual stock. The Safety Rank is computed by averaging two other Value Line indexes – the Price Stability Index and the Financial Strength Rating. Safety Ranks range from 1 (Highest) to 5 (Lowest).

[24] The factors are ERM (market return less T-Bill return), SMB (excess return on small cap stocks relative to large cap), HML (excess return on high book-to-market relative to low book-to-market stocks) and UMD (excess return on stocks with high return momentum relative to those with low momentum). All of the factors, along with the monthly T-bill returns used to construct the excess portfolio returns, were downloaded from Kenneth French's website at Dartmouth College.

Table 7
Ex-post performance of 100 stocks listed in value line as having the greatest appreciation potential

	All Top 100 Stocks 0.6957	Safety Rank = 1, 2, 3	Safety Rank = 4	Safety Rank = 5	Timeliness Rank = 1, 2, 3	Top 33 Stocks
Mean excess return	0.6957	0.5481	0.7536	0.9010	0.7276	0.5889
	(1.6477)	(1.4757)	(1.5861)	(1.5131)	(1.7130)*	(1.1788)
Jensen's alpha	0.0637	−0.0294	0.0883	0.2045	0.0889	−0.0629
	(0.2415)	(−0.1355)	(0.2716)	(0.4317)	(0.3374)	(−0.1714)
FF 3−Factor model	−0.2530	−0.3385	−0.1642	−0.1065	−0.1584	−0.3673
alpha	(−1.4722)	(−2.2653)**	(−0.6761)	(−0.2736)	(−0.8394)	(−1.2739)
4−Factor model	0.1646	−0.0193	0.2922	0.5686	0.2383	0.3096
alpha	(1.0405)	(−0.1359)	(1.2410)	(1.4914)	(1.3267)	(1.1553)

Notes: Portfolios are formed ex-ante every 4 years beginning September 30, 1969 based on Value Line's listing of the top 100 stocks by appreciation potential (these stocks have the greatest predicted total returns over a 3–5 year horizon). The "All Top 100 Stocks" column is for an equally weighted portfolio holding all stocks on the list. The Safety Rank = 1, 2, 3, Safety Rank = 4, and Safety Rank = 5 portfolios, respectively, contain stocks on the top 100 list with the indicated safety ranks, and the Timeliness Rank = 1, 2, 3 portfolio contains stocks on the top 100 list with a timeliness rank of 3 or higher. The Top 33 Stocks portfolio is an equally weighted combination of the top one-third of stocks (ranked by predicted return) on the top 100 list. Figures in parentheses below coefficient estimates are *t*-statistics. *,** and ***, respectively, indicate significance at the 10%, 5% and 1% levels.

of the performance evaluation model used.[25] These results for the top 100 dataset are consistent with the earlier conclusion, based on the Dow data, that Value Line demonstrates no predictive power vis-à-vis long run stock returns.

5. Conclusion

In sharp contrast to the previously well-documented ability of Value Line timeliness ranks to predict future short-run stock performance, we find that Value Line's long-term stock return projections are extremely overoptimistic and have no predictive power. Predicted returns for the Dow stocks have averaged 20.3% per annum; this figure is about twice the level of realized returns on these stocks over the 1969–2001 period, and considerably above the long-term average stock market return in the US. When we regress future realized returns over a 4-year horizon on Value Line's predicted 3–5 year returns for our Dow dataset, we find that the predicted returns are not significantly related to the future realized returns. This finding holds regardless of whether we control for time series effects and/or for other factors that previous studies have shown to be related to realized returns.

We shed additional light on Value Line's poor performance in predicting long-horizon stock returns by also examining their forecasts of earnings, sales, profit margins and earnings yields. We note, first, that there is a strong degree of consistency across Value Line's forecasts of various measures: Table 5 shows that firms with higher predicted stock returns also tend to have higher predicted growth in earnings and profit margins. It is, therefore, perhaps unsurprising that Value Line's record forecasting earnings changes over 3–5 year horizons is (at best) only marginally better than their stock return prediction record. We do find a significant positive cross-sectional relation between predicted and actual earnings changes; however, this relation essentially disappears if extreme observations are trimmed from the sample or if earnings changes are normalized based on initial stock prices. Moreover, Value Line's earnings projections are even more upwardly biased than their stock return predictions. In contrast to this poor performance in predicting earnings, we find little evidence of bias in forecasts of earnings yields, and there is even some robust evidence of predictive power with respect to this variable. Consequently, our results indicate that Value Line's overoptimism and poor predictive power vis-à-vis stock returns is driven primarily by similar problems predicting earnings growth at the firm level, rather than by systematic mistakes in forecasts of future valuations as reflected in earnings yields.

Because earnings can be further decomposed into sales and profit margins, our examination of these predictions yields further insights into why Value Line's earnings and stock return forecasts perform so poorly. Value Line's sales predictions exhibit, at most, only a slight degree of upward bias, and there is robust evidence that Value Line displays cross-sectional predictive power in forecasting sales. The profit margin predictions are strongly upwardly biased, but there is robust evidence that they have predictive power as well. Thus, we can conclude that the *bias* in earnings forecasts appears to be entirely due to the extreme upward bias in projected profit margins, but we cannot easily explain the lack of predictive power with respect to earnings revealed by the robust tests reported in Table 6.

[25] When using the Fama and French 3-factor model, we obtain negative alphas for all of the portfolios, and the alpha is significantly negative when we restrict it to hold stocks with a Value Line safety rank of 3 or better. The closest our results come to economic (if not statistical) significance are the 4-factor alphas for the "all top 100," "timeliness rank = 1, 2, 3" and "top 33 stocks." These alphas are all in the range of 0.16–0.31% per month (about 2.0–3.8% annualized). However, when we segregate the top 100 stocks by Value Line safety rank, we find that only those with safety ranks below 3 appear to have positive 4-factor alphas, indicating that the positive alpha on the top 100 portfolio is most likely due to unobserved risk factors that are not captured by even the 4-factor model.

The poor overall record Value Line exhibits in its long-term stock return and earnings forecasts supports the view that the spectacular past performance of Value Line's timeliness indicator likely reflects either its close alignment with other known anomalies such as momentum and/or post-earnings announcement drift, data mining, or some combination of these factors. At a minimum, Value Line's long-term forecast record as documented herein should caution investors not to rely mechanically on these projections for either stock selection, valuation or planning purposes. Similarly, the extreme upward bias and lack of predictive power exhibited by Value Line's stock return projections calls into question the common practice of using these predictions as proxies for the cost of equity in cost-of-capital studies, and their use as proxies for aggregate ex-ante expected returns in tests of asset pricing models.

Acknowledgement

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Capital Market Assumptions Five Year Perspective | 2022

In-depth analysis and insights to inform your decision-making.

We are pleased to present the fourth annual publication of T. Rowe Price's Capital Market Assumptions. Since the onset of the COVID-19 crisis, investors have experienced a wide range of environments over a compressed timeline. At the start of 2021, the global impact of government policies had turned many financial markets skeptics into optimists. But persistent dislocations within regional economies and the shifting positions of central bank policymakers tested the resolve of financial markets throughout the year. Looking ahead, open questions remain about the strength of the cyclical recovery, the speed of normalization for monetary policy, and the durability of recent changes to the global economy brought on by the pandemic.

Our forecasts for most equity markets are comparable to, or slightly more bullish than they were at this time last year, reflecting our continued confidence in the cyclical earnings recovery, which we believe has further room to run. In contrast, we think the same expected economic strength could negatively impact fixed income assets due to an expectation that rates will rise from their current low levels. Lastly, our forecasts for alternative investment strategies generally have improved, driven both by higher risk asset premia forecasts and our expectations for increased return dispersion and greater opportunities for active management to add value across investment universes.

T. Rowe Price's capital market assumptions are best understood as forecasts of the central tendency of forward returns. We do not seek to predict actual or realized returns, as there is bound to be material variation around this central tendency in any given historical or future period. For this reason, our approach to portfolio construction relies on multiple optimization methods and robustness checks.

Our baseline forecasts incorporate the insights of senior portfolio managers and analysts across our equity, fixed income, and multi-asset divisions. We believe this interdisciplinary approach, which seeks to capture both fundamental and quantitative insights, delivers the best thinking of T. Rowe Price.

We encourage your questions, comments, and feedback as they truly impact the improvements we make to this publication. Please feel free to contact your T. Rowe Price relationship manager and/or any of the investment professionals who contributed to this effort.

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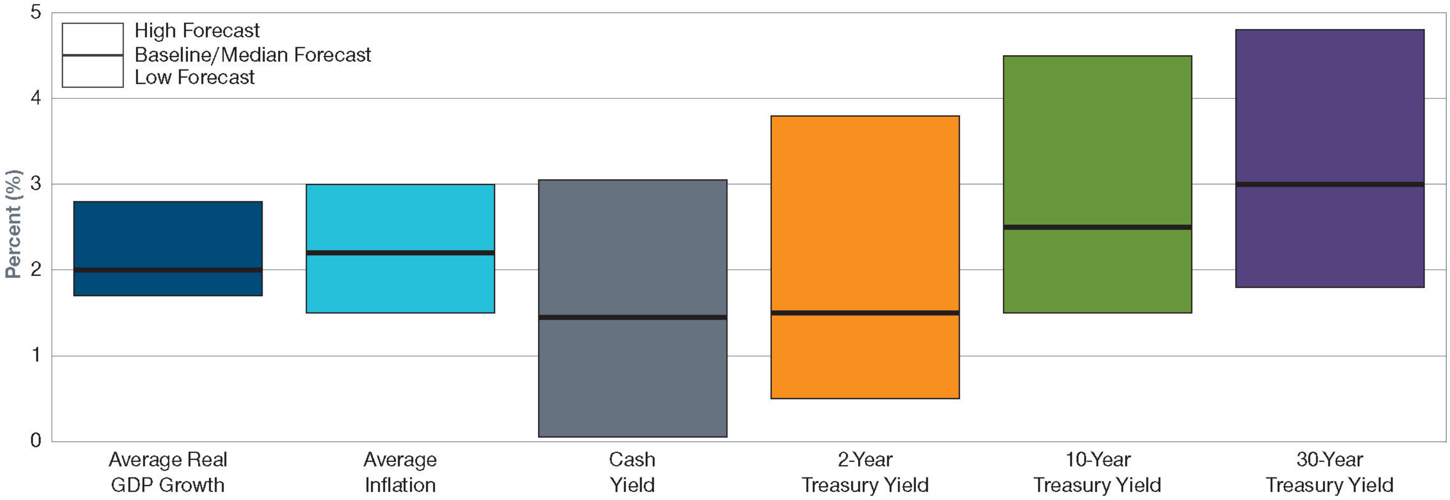
(Figures in U.S. Dollars)

RANGE OF U.S. ECONOMIC FORECASTS FOR 5-YEAR PERIOD ENDING 2026



COMMENTARY ON BASELINE FORECASTS

Economies and financial markets saw varying degrees of normalization in 2021, and contrasts across investments were stark, or even paradoxical at times. Vaccine distribution and adoption in developed countries allowed for some return to economic normalcy, while developing countries still had to contend with the lingering virus.

Within financial markets, pockets of euphoria drove cryptocurrencies and meme stocks "to the moon," while bond markets–aided by central bank accommodation–kept interest rates near rock bottom. These conflicting observations present a greater challenge to our 2022 forecasts and impose wider bands around our confidence levels, but our base case is outlined below.

Investment outlooks are always uncertain, but investment decisions can be made easier by the margin of protection provided by valuations. Heading into 2022, valuations for most asset classes appear full — particularly equity market multiples, but also extending to credit spreads and government bond yields.

Economic

Economic performance since the onset of the pandemic has been driven primarily by government action. The unprecedented fiscal stimulus seen during the pandemic has diminished, and our forecasts for real GDP reflect a muted outlook globally. We expect Inflation to meet or exceed 2% in the U.S., Australia, and UK but to remain well below central bank targets in much of the Eurozone and in Japan.

Notably, the dispersion of GDP growth, inflation expectations, and yield curve views expressed by T. Rowe Price investment professionals has increased from last year, highlighting the extent of uncertainty "Commentary on Baseline forecasts"in the markets. Overall, our economic growth forecast remains positive, but headwinds from fiscal run-off and lingering supply bottlenecks stemming from the pandemic temper our expectations.

Equity

Our five-year expectations for equity returns are generally stable to slightly higher versus last year. Globally, our baseline forecast of modest earnings growth and a slight contraction in valuations, produces five-year total return expectations that would rank in the bottom third of realized returns historically.

As the comparatively slow recovery of emerging markets (EMs) from the pandemic takes shape, we expect EM equities to outperform their counterparts in the developed markets. In a similar reversal of recent history, our expectations for Eurozone, UK, and Japanese equities generally outpace the U.S. Our change in regional equity market relative performance is primarily driven by valuations, which we view as marginally stretched at present and declining through our forecast horizon.

Fixed Income

Across the government yield curves covered by our publication, we expect interest rates to rise over the next five years. While we recognize the despair of those who have predicted rising rates over the past decade, we believe the combined effects of recent fiscal and monetary policies have created an environment that is unique for the era that has followed the 2008-2009 global financial crisis.

Generally, our investment professionals expect yield curves to flatten as economic recovery prompts central banks to raise short rates. We believe the duration impact will be most sharply felt in government bond indexes, where we expect total returns of less than one percent, with some dipping into negative territory. This shouldn't be surprising given the current negative yields in many Eurozone countries and in Japan.

We anticipate that credit spreads for investment grade and high yield corporate debt will widen slightly in developed markets but expect this to have a relatively muted impact on returns. While this forecast may seem inconsistent with our generally positive outlook for risk assets, we believe a stronger economic backdrop and higher interest rates may relieve some of the downward pressure on spreads.

Alternatives

Our slightly more bullish expectations for public equity markets relative to our 2021 outlook carries through to forecasts of alternative asset

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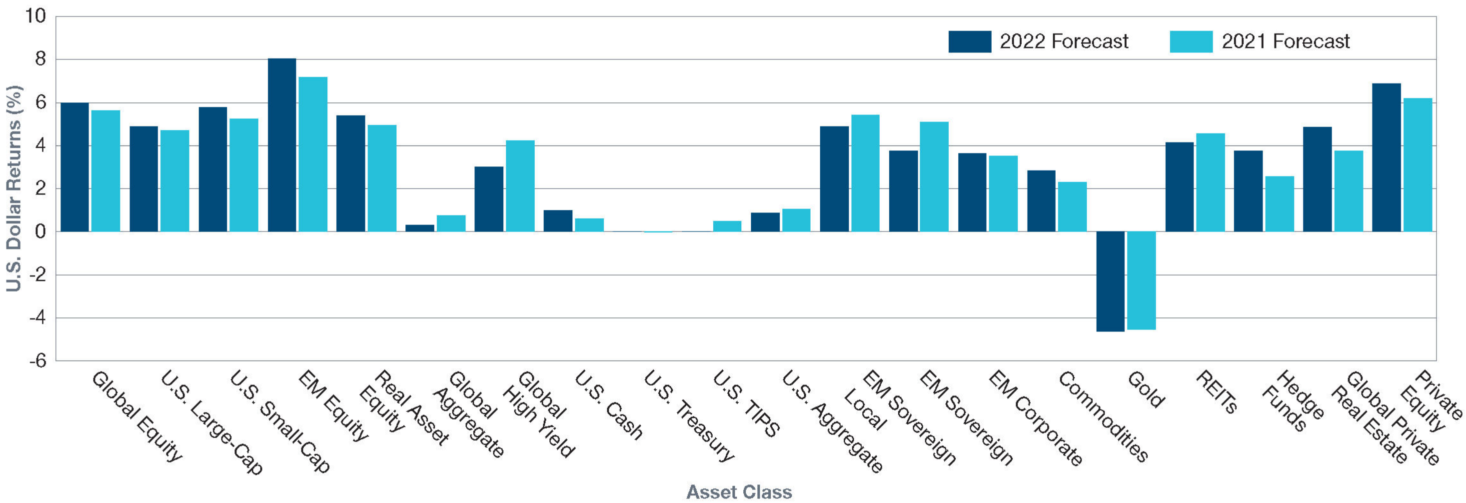
COMPARISON OF 2022 AND 2021 RETURN FORECASTS



classes which have some structural equity beta. We also believe the backdrop for active management will be more favorable, leading to higher return expectations for asset classes like hedge funds and private equity which rely on active management for a significant amount of their value proposition.

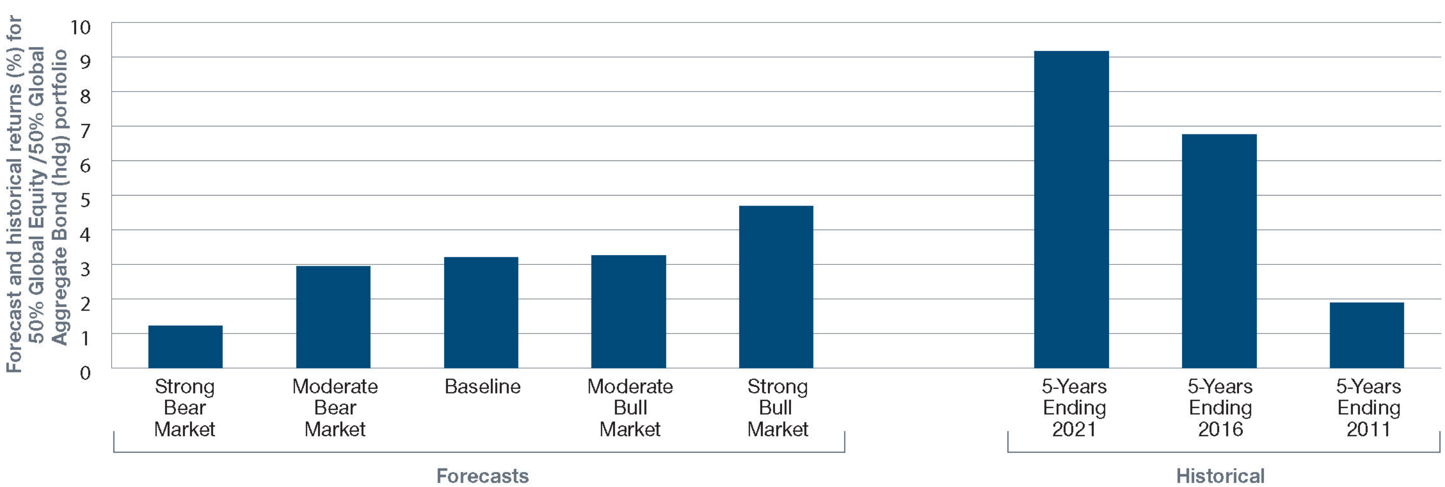
Our higher return expectations for commodities logically follow from our inflation forecasts. Our expectations for private assets continue to include a slight liquidity premium, but we believe they will not offer dramatically higher returns than their public market equivalents. We continue to expect negative total returns from gold, continuing 2021's momentum.

United States

Our U.S. forecast incorporates our expectation of improving economic growth, with near-term tailwinds driven by pent-up demand from both consumers and corporates. Within U.S. equities, this economic baseline translates into moderate growth in corporate earnings, tempered by inflation and wage pressures. Valuation compression could detract from performance, as discount rates rise along with the U.S. Treasury yield curve. We expect return differentials between U.S. large- and small-cap equities to be driven primarily by valuations retracing, with large-cap faring better over our time horizon.

Given our expectations for economic strength and the high liquidity on household balance sheets, our forecast sees the U.S. rates curve shift up 100-150 basis points (bps), depending on tenor, with a flattening of the curve overall by the end of 2026. This curve movement contributes to relatively muted multi-asset portfolio return expectations relative to recent history. We present five forecast scenarios for returns for a 50% global equity and 50% global fixed income U.S. dollar hedged portfolio along with historical returns for five-year periods ended December 31, 2021, 2016, and 2011, respectively. Our forecasts, while relatively bullish, are not as strong as recent historical returns. Much of that is due to low fixed income yields and stretched equity valuations at the beginning of the forecast period.

IMPACT OF LOW EXPECTED RETURNS ON MULTI-ASSET PORTFOLIOS



Past performance is not a reliable indicator of future performance.

Representative indexes are MSCSI ACWI and Bloomberg Global Aggregate Bond (hdg) Index.

Refer to page 18, "Methodology – Scenarios" for definition of Bear and Bull Markets..

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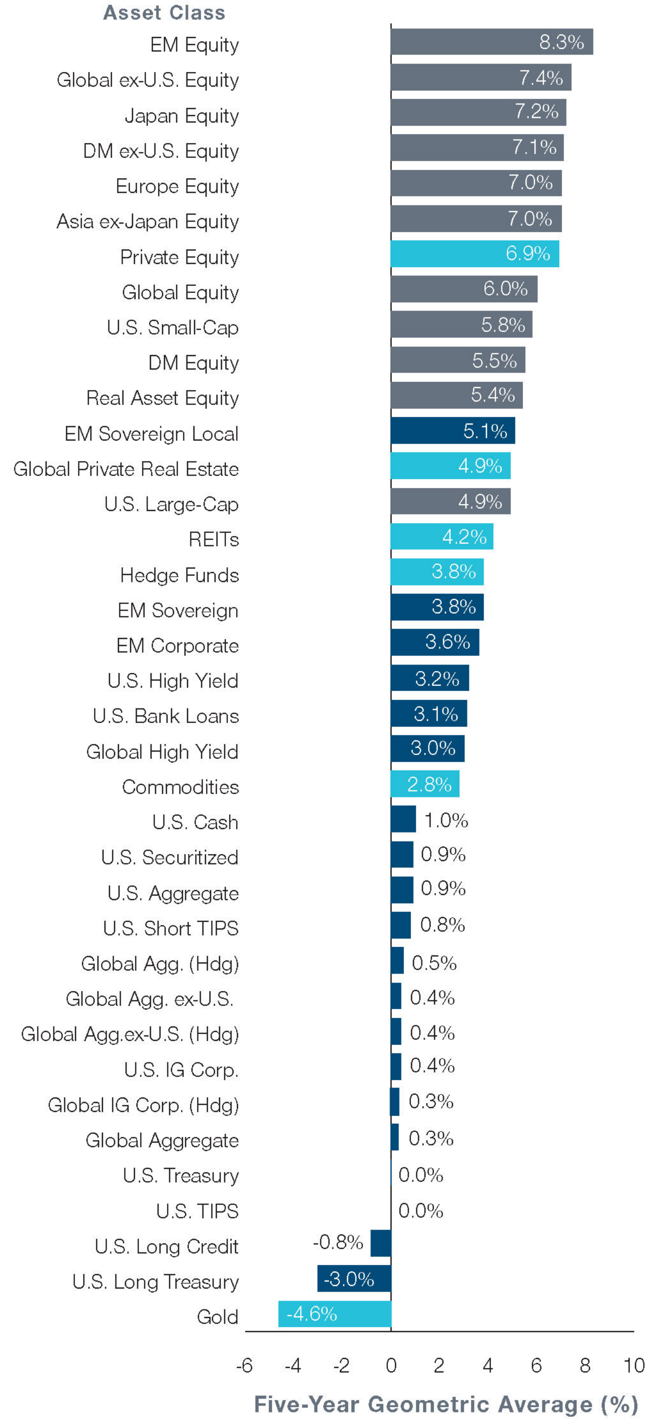
ANNUALIZED FORECAST AND HISTORICAL NOMINAL RETURNS

	ASSET CLASS	2022 5-YEAR RETURN FORECAST	HISTORICAL 5-YEAR RETURNS, ENDED 31 DECEMBER 2021	2016	2011
EQUITY	Global Equity	6.0%	14.9%	9.9%	-1.4%
EQUITY	Global ex-U.S. Equity	7.4	10.1	5.4	-2.5
EQUITY	DM Equity	5.5	15.6	11.0	-1.8
EQUITY	DM ex-U.S. Equity	7.1	10.1	6.5	-3.7
EQUITY	U.S. Large-Cap Equity	4.9	18.4	14.7	0.0
EQUITY	U.S. Small-Cap Equity	5.8	12.0	14.5	0.1
EQUITY	Europe Equity	7.0	10.7	6.8	-4.7
EQUITY	Asia ex-Japan Equity	7.0	11.6	5.1	2.8
EQUITY	Japan Equity	7.2	8.3	8.8	-5.9
EQUITY	EM Equity	8.3	10.2	1.5	2.6
EQUITY	Real Asset Equity	5.4	7.4	4.5	4.5
FIXED INCOME	Global Aggregate	0.3	3.4	0.2	6.5
FIXED INCOME	Global Aggregate (Hdg)	0.5	3.4	3.6	5.2
FIXED INCOME	Global Agg. ex-U.S.	0.4	3.1	-1.4	6.4
FIXED INCOME	Global Agg. ex-U.S. (Hdg)	0.4	3.1	4.5	4.3
FIXED INCOME	Global IG Corp.(Hdg)	0.3	4.8	4.8	5.1
FIXED INCOME	Global High Yield	3.0	5.9	7.0	7.2
FIXED INCOME	U.S. Cash	1.0	1.1	0.1	1.4
FIXED INCOME	U.S. Treasury	0.0	3.1	1.2	6.8
FIXED INCOME	U.S. TIPS	0.0	5.3	0.9	8.0
FIXED INCOME	U.S. Short TIPS	0.8	3.5	0.5	5.5
FIXED INCOME	U.S. IG Corp.	0.4	5.3	4.1	6.8
FIXED INCOME	U.S. Long Credit	-0.8	7.6	5.2	8.6
FIXED INCOME	U.S. Long Treasury	-3.0	6.5	2.5	11.0
FIXED INCOME	U.S. Aggregate	0.9	3.6	2.2	6.5
FIXED INCOME	U.S. High Yield	3.2	6.3	7.4	7.5
FIXED INCOME	U.S. Bank Loans	3.1	4.5	5.4	4.3
FIXED INCOME	U.S. Securitized	0.9	2.6	2.1	6.4
FIXED INCOME	EM Sovereign Local	5.1	2.8	-1.3	9.2
FIXED INCOME	EM Sovereign	3.8	4.7	5.9	7.9
FIXED INCOME	EM Corporates	3.6	5.3	5.9	7.6
ALTERNATIVES	Commodities	2.8	3.7	-9.0	-2.1
ALTERNATIVES	Gold	-4.6	8.4	-6.5	18.5
ALTERNATIVES	REITs	4.2	12.5	12.0	-1.4
ALTERNATIVES	Hedge Funds	3.8	4.1	3.8	2.9
ALTERNATIVES	Global Private Real Estate	4.9	7.6	10.9	3.1
ALTERNATIVES	Private Equity	6.9	21.5	13.0	8.6

FIVE-YEAR ANNUALIZED EXPECTED RETURNS



Past performance is not a reliable indicator of future results.

Hdg = Hedged currency treatment. EM =Emerging Markets. DM = Developed Markets.

Sources: T. Rowe Price, MSCI, Bloomberg Index Services Limited, S&P, J.P. Morgan Chase & Co., HFR, Cambridge Associates, NCREIF, and FTSE/Russell. See Additional Disclosures in Appendix for further source information. January 2022. See Appendix for a representative list of indexes. This information is not intended to be investment advice or a recommendation to take any particular investment action. The forecasts contained herein are for illustrative purposes only and are not indicative of future results. Forecasts are based on subjective estimates about market environments that may never occur. See the Methodology section for additional information.

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(Figures in U.S. Dollars)

FIVE-YEAR SCENARIO ANNUALIZED RETURNS

	ASSET CLASS	BASELINE	STRONG BEAR MARKET	MODERATE BEAR MARKET	MODERATE BULL MARKET	STRONG BULL MARKET
EQUITY	Global Equity	6.0%	1.9%	5.5%	6.2%	8.8%
	Global ex-U.S. Equity	7.4	3.5	6.8	7.6	9.3
	DM Equity	5.5	1.7	5.1	5.8	8.3
	DM ex-U.S. Equity	7.1	3.4	6.4	7.3	9.1
	U.S. Large-Cap Equity	4.9	1.0	4.5	5.1	8.0
	U.S. Small-Cap Equity	5.8	0.1	5.2	6.0	9.9
	Europe Equity	7.0	3.2	6.8	7.3	9.5
	Asia ex-Japan Equity	7.0	3.0	6.6	7.3	8.5
	Japan Equity	7.2	3.7	5.6	7.4	8.5
	EM Equity	8.3	3.8	7.7	8.5	10.0
	Real Asset Equity	5.4	2.2	5.0	5.6	7.5
FIXED INCOME	Global Aggregate	0.3	0.5	0.4	0.3	0.6
	Global Aggregate (Hdg)	0.5	0.5	0.4	0.3	0.6
	Global Agg. ex-U.S.	0.4	0.6	0.5	0.3	0.4
	Global Agg. ex-U.S. (Hdg)	0.4	0.6	0.5	0.3	0.4
	Global IG Corporate (Hdg)	0.3	0.1	0.2	0.3	1.3
	Global High Yield	3.0	-0.4	3.0	3.1	4.6
	U.S. Cash	1.0	0.5	0.7	0.9	1.0
	U.S. Treasury	0.0	0.7	0.0	0.0	0.0
	U.S. TIPS	0.0	-0.3	0.0	0.0	0.6
	U.S. Short TIPS	0.8	0.4	0.9	0.8	1.2
	U.S. IG Corporate	0.4	0.2	0.4	0.4	1.6
	U.S. Long Credit	-0.8	-1.3	-0.8	-0.7	1.0
	U.S. Long Treasury	-3.0	1.5	0.9	-3.1	-3.1
	U.S. Aggregate	0.9	0.5	0.8	0.8	1.3
	U.S. High Yield	3.2	-0.1	3.2	3.3	4.7
	U.S. Bank Loans	3.1	0.7	3.1	3.1	4.0
	U.S. Securitized	0.9	0.7	0.9	0.9	1.1
	EM Sovereign Local	5.1	2.4	4.8	5.1	6.1
	EM Sovereign	3.8	1.3	2.8	4.0	4.8
	EM Corporate	3.6	1.7	2.8	3.7	4.9
ALTERNATIVES	Commodities	2.8	1.7	2.4	2.7	2.6
	Gold	-4.6	-2.1	-2.8	-4.8	-5.1
	REITs	4.2	0.2	3.9	4.4	8.7
	Hedge Funds	3.8	3.1	3.5	3.7	3.5
	Global Private Real Estate	4.9	3.5	4.6	4.9	5.5
	Private Equity	6.9	5.5	6.6	6.9	7.5

Past performance is not a reliable indicator of future results.

Hdg = Hedged currency treatment. EM =Emerging Markets. DM = Developed Markets.

Source: T. Rowe Price. January 2022. This information is not intended to be investment advice or a recommendation to take any particular investment action. The forecasts contained herein are for illustrative purposes only and are not indicative of future results. Forecasts are based on subjective estimates about market environments that may never occur. See the Methodology section for additional information.

CURRENCY | U.S. DOLLAR

(Figures in U.S. Dollars)

EXPECTED VOLATILITIES AND CORRELATIONS

Volatility and Correlation Matrix		EQUITY											FIXED INCOME							
		Global Equity	Global ex-U.S. Equity	DM Equity	DM ex-U.S. Equity	U.S. Large-Cap Equity	U.S. Small-Cap Equity	Europe Equity	Asia ex-Japan Equity	Japan Equity	EM Equity	Real Asset Equity	Global Aggregate	Global Aggregate (Hdg)	Global Agg. ex-U.S.	Global Agg. exU.S. (Hdg)	Global IG Corporate (Hdg)	Global High Yield	U.S. Cash	U.S. Treasury
EQUITY	Global Equity	1.0																		
	Global ex-U.S. Equity	1.0	1.0																	
	DM Equity	1.0	1.0	1.0																
	DM ex-U.S. Equity	1.0	1.0	1.0	1.0															
	U.S. Large-Cap Equity	1.0	0.9	1.0	0.9	1.0														
	U.S. Small-Cap Equity	0.9	0.8	0.9	0.9	0.9	1.0													
	Europe Equity	1.0	1.0	1.0	1.0	0.9	0.8	1.0												
	Asia ex-Japan Equity	0.9	0.9	0.9	0.9	0.8	0.7	0.9	1.0											
	Japan Equity	0.8	0.8	0.8	0.8	0.7	0.7	0.8	0.7	1.0										
	EM Equity	0.9	1.0	0.9	0.9	0.8	0.7	0.9	1.0	0.7	1.0									
	Real Asset Equity	0.9	0.9	0.9	0.9	0.9	0.8	0.9	0.8	0.7	0.9	1.0								
FIXED INCOME	Global Aggregate	0.2	0.3	0.2	0.3	0.1	0.0	0.3	0.3	0.1	0.3	0.4	1.0							
	Global Aggregate (Hdg)	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2	-0.1	0.0	-0.2	-0.1	0.0	0.7	1.0						
	Global Agg. ex-U.S.	0.3	0.4	0.3	0.4	0.2	0.1	0.4	0.4	0.2	0.4	0.4	1.0	0.5	1.0					
	Global Agg. ex-U.S. (Hdg)	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.1	-0.1	-0.2	-0.1	0.0	0.6	1.0	0.5	1.0				
	Global IG Corporate (Hdg)	0.6	0.6	0.6	0.6	0.5	0.4	0.6	0.6	0.4	0.6	0.7	0.6	0.6	0.6	0.6	1.0			
	Global High Yield	0.9	0.9	0.8	0.9	0.8	0.7	0.8	0.8	0.6	0.9	0.9	0.3	0.0	0.3	-0.1	0.7	1.0		
	U.S. Cash	0.0	0.0	-0.1	0.0	-0.1	-0.2	0.0	0.1	-0.1	0.1	0.0	0.1	0.1	0.1	0.0	-0.2	-0.1	1.0	
	U.S. Treasury	-0.6	-0.5	-0.6	-0.6	-0.6	-0.6	-0.5	-0.4	-0.5	-0.5	-0.4	0.5	0.8	0.3	0.7	0.1	-0.5	0.2	1.0
	U.S. TIPS	0.1	0.1	0.1	0.1	0.0	-0.1	0.1	0.2	-0.1	0.2	0.3	0.5	0.5	0.4	0.4	0.5	0.3	0.0	0.4
	U.S. Short TIPS	0.3	0.4	0.3	0.3	0.3	0.2	0.3	0.4	0.1	0.5	0.5	0.3	0.0	0.3	0.0	0.3	0.5	0.2	-0.1
	U.S. IG Corporate	0.5	0.5	0.4	0.5	0.4	0.3	0.5	0.5	0.3	0.5	0.6	0.7	0.7	0.6	0.6	1.0	0.6	-0.1	0.3
	U.S. Long Credit	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.4	0.7	0.8	0.6	0.7	0.9	0.4	-0.1	0.4
	U.S. Long Treasury	-0.6	-0.5	-0.6	-0.5	-0.6	-0.6	-0.5	-0.5	-0.4	-0.5	-0.4	0.4	0.8	0.2	0.7	0.2	-0.5	0.1	0.9
	U.S. Aggregate	-0.2	-0.1	-0.2	-0.1	-0.2	-0.3	-0.1	0.0	-0.2	-0.1	0.0	0.7	0.9	0.5	0.8	0.6	0.0	0.1	0.8
	U.S. High Yield	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.8	0.9	0.2	0.0	0.3	-0.1	0.7	1.0	-0.2	-0.5
	U.S. Bank Loans	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.5	0.8	0.8	0.0	-0.2	0.1	-0.2	0.5	0.9	-0.1	-0.6
	U.S. Securitized	-0.2	-0.2	-0.2	-0.2	-0.3	-0.3	-0.2	0.0	-0.3	-0.1	0.0	0.6	0.8	0.4	0.7	0.5	0.0	0.2	0.7
	EM Sovereign Local	0.7	0.7	0.7	0.7	0.6	0.5	0.7	0.7	0.5	0.8	0.8	0.6	0.2	0.6	0.2	0.6	0.7	0.1	-0.2
	EM Sovereign	0.7	0.7	0.7	0.7	0.6	0.6	0.7	0.7	0.5	0.7	0.8	0.5	0.4	0.5	0.3	0.8	0.8	-0.1	-0.1
	EM Corporate	0.7	0.8	0.7	0.7	0.7	0.6	0.7	0.8	0.5	0.8	0.8	0.4	0.2	0.4	0.2	0.8	0.9	-0.1	-0.3
ALTERNATIVES	Commodities	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.5	0.7	0.8	0.2	-0.3	0.3	-0.3	0.3	0.7	0.1	-0.5
	Gold	0.1	0.1	0.0	0.1	0.0	-0.1	0.1	0.2	0.0	0.3	0.2	0.6	0.4	0.5	0.3	0.3	0.2	0.3	0.4
	REITs	0.7	0.7	0.7	0.7	0.8	0.8	0.7	0.6	0.5	0.6	0.8	0.2	0.1	0.2	0.1	0.5	0.7	-0.1	-0.3
	Hedge Funds	0.3	0.3	0.3	0.3	0.4	0.4	0.3	0.4	0.3	0.4	0.3	0.0	0.0	0.0	0.0	0.3	0.3	-0.1	-0.3
	Global Private Real Estate	0.4	0.3	0.4	0.3	0.4	0.3	0.3	0.3	0.2	0.3	0.4	-0.2	-0.3	-0.2	-0.3	0.0	0.4	0.0	-0.3
	Private Equity	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.8	0.8	0.1	-0.3	0.2	-0.3	0.4	0.8	0.0	-0.6

Past performance is not a reliable indicator of future results.

Hdg = Hedged currency treatment. EM =Emerging Markets. DM = Developed Markets.

Sources: T. Rowe Price, MSCI, Bloomberg Index Services Limited, S&P, J.P. Morgan Chase & Co., HFR, Cambridge Associates, NCREIF, and FTSE/Russell. See Additional Disclosures in Appendix for further source information. January 2022. See Appendix for a representative list of indexes. This information is not intended to be investment advice or a recommendation to take any particular investment action. The forecasts contained herein are for illustrative purposes only and are not indicative of future results. Forecasts are based on subjective estimates about market environments that may never occur. See the Methodology section for additional information.

CURRENCY | U.S. DOLLAR

(Figures in U.S. Dollars)

EXPECTED VOLATILITIES AND CORRELATIONS (CONTINUED)

Volatility and Correlation Matrix		FIXED INCOME												ALTERNATIVES						VOLATILITY (%)
		U.S. TIPS	U.S. Short TIPS	U.S. IG Corporate	U.S. Long Credit	U.S. Long Treasury	U.S. Aggregate	U.S. High Yield	U.S. Bank Loans	U.S. Securitized	EM Sovereign Local	EM Sovereign	EM Corporate	Commodities	Gold	REITs	Hedge Funds	Global Private Real Estate	Private Equity	
EQUITY	Global Equity																			17.5
EQUITY	Global ex-U.S. Equity																			19.2
EQUITY	DM Equity																			17.1
EQUITY	DM ex-U.S. Equity																			18.6
EQUITY	U.S. Large-Cap Equity																			16.6
EQUITY	U.S. Small-Cap Equity																			21.9
EQUITY	Europe Equity																			20.0
EQUITY	Asia ex-Japan Equity																			21.3
EQUITY	Japan Equity																			16.2
EQUITY	EM Equity																			22.9
EQUITY	Real Asset Equity																			22.0
FIXED INCOME	Global Aggregate																			5.6
FIXED INCOME	Global Aggregate (Hdg)																			2.9
FIXED INCOME	Global Agg. ex-U.S.																			8.0
FIXED INCOME	Global Agg. ex-U.S. (Hdg)																			2.9
FIXED INCOME	Global IG Corporate (Hdg)																			4.9
FIXED INCOME	Global High Yield																			12.0
FIXED INCOME	U.S. Cash																			0.8
FIXED INCOME	U.S. Treasury																			4.9
FIXED INCOME	U.S. TIPS	1.0																		4.8
FIXED INCOME	U.S. Short TIPS	0.8	1.0																	3.2
FIXED INCOME	U.S. IG Corporate	0.5	0.2	1.0																6.0
FIXED INCOME	U.S. Long Credit	0.5	0.1	1.0	1.0															9.6
FIXED INCOME	U.S. Long Treasury	0.4	-0.2	0.3	0.5	1.0														13.4
FIXED INCOME	U.S. Aggregate	0.6	0.1	0.7	0.8	0.8	1.0													3.3
FIXED INCOME	U.S. High Yield	0.3	0.5	0.6	0.4	-0.5	0.0	1.0												10.8
FIXED INCOME	U.S. Bank Loans	0.2	0.6	0.4	0.2	-0.6	-0.2	0.9	1.0											10.5
FIXED INCOME	U.S. Securitized	0.7	0.3	0.5	0.6	0.7	0.9	0.0	-0.1	1.0										2.4
FIXED INCOME	EM Sovereign Local	0.3	0.4	0.6	0.5	-0.2	0.2	0.7	0.5	0.2	1.0									11.6
FIXED INCOME	EM Sovereign	0.5	0.5	0.8	0.7	-0.1	0.4	0.8	0.7	0.3	0.8	1.0								8.5
FIXED INCOME	EM Corporate	0.5	0.6	0.7	0.6	-0.3	0.2	0.9	0.8	0.3	0.7	0.9	1.0							8.4
ALTERNATIVES	Commodities	0.3	0.6	0.3	0.1	-0.5	-0.2	0.7	0.6	-0.2	0.5	0.5	0.6	1.0						19.1
ALTERNATIVES	Gold	0.6	0.5	0.4	0.4	0.3	0.5	0.1	0.1	0.6	0.4	0.4	0.3	0.3	1.0					14.2
ALTERNATIVES	REITs	0.1	0.2	0.4	0.3	-0.3	0.0	0.7	0.6	0.0	0.5	0.6	0.6	0.4	0.0	1.0				22.3
ALTERNATIVES	Hedge Funds	0.0	0.1	0.2	0.2	-0.2	-0.1	0.3	0.4	-0.1	0.3	0.4	0.3	0.1	0.0	0.2	1.0			5.9
ALTERNATIVES	Global Private Real Estate	0.1	0.3	0.0	-0.1	-0.3	-0.2	0.4	0.5	-0.1	0.1	0.2	0.2	0.4	0.0	0.5	0.1	1.0		11.8
ALTERNATIVES	Private Equity	0.1	0.4	0.3	0.1	-0.6	-0.3	0.7	0.7	-0.3	0.6	0.6	0.6	0.7	0.1	0.5	0.4	0.5	1.0	24.0

Past performance is not a reliable indicator of future results.

Hdg = Hedged currency treatment. EM =Emerging Markets. DM = Developed Markets.

Sources: T. Rowe Price, MSCI, Bloomberg Index Services Limited, S&P, J.P. Morgan Chase & Co., HFR, Cambridge Associates, NCREIF, and FTSE/Russell. See Additional Disclosures in Appendix for further source information. January 2022. See Appendix for a representative list of indexes. This information is not intended to be investment advice or a recommendation to take any particular investment action. The forecasts contained herein are for illustrative purposes only and are not indicative of future results. Forecasts are based on subjective estimates about market environments that may never occur. See the Methodology section for additional information..

METHODOLOGY

Fixed Income

Basic Model

We decompose fixed income sector returns into three components: the average yield over the five-year period, the average roll-down yield over the five-year period, and the average annual return due to changes in valuation of the five-year period:

Return = average yield + roll-down + valuation change

These three components are calculated from the following inputs: current yield, forecast yield, and current duration for a given asset class.

Current Yield

The current yield is calculated using linear interpolation—matching the yield on the appropriate sovereign yield curve for the maturity that matches the current duration of the sector. For spread sectors, the current option-adjusted spread is added to the yield of the sovereign maturity that matches the duration of the spread sector.

Forecast Yield

The forecast yield is calculated similar to the current yield, with the inputs provided by the survey results. For a non-government index (e.g., credit), the five-year spread forecast from our survey is then added to the forecast sovereign yield.

Current Duration

The current duration is used in two ways. First, to find current yield through duration matching to the sovereign curve, as discussed above. Second, it is used to calculate the average annual roll-down yield and return due to valuation change. These calculations assume the sector will maintain a constant duration throughout the subsequent five-year period. Our research shows that this assumption, while not perfect, is reasonable since modified durations typically vary within +/- one year over rolling five-year windows.

Average Yield

The average yield is the simple average of the current yield and the forecast yield five years forward, incorporating expectations for spread capture ratios in non-Treasury asset classes:

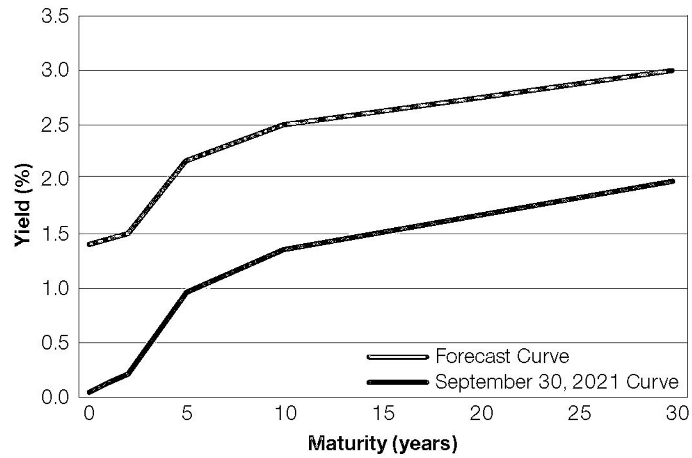
Average yield = (current yield + forecast yield) / 2

Change in Yield

The change in yield is the annual average change from the current yield to the five-year forecast yield:

Yield change = (forecast yield – current yield) / 5

FORECAST U.S. TREASURY CURVE



Roll-Down Return

The roll-down return is earned through rebalancing each year to maintain a constant duration. The return is due to the convergence of a bond's end-of-period yield to the beginning-of-period yield of an equivalent bond with a one-year shorter maturity. Thus, we estimate the roll-down return as follows:

1. First, we use the same estimation methods as for the current and forecast rolled-down yields, except that we interpolate to the maturity points on the current and future yield curves that are one year less than the current average maturity of the index.

2. Second, we estimate the average rolled-down yield over the five-year period as the simple average of the current and forecast rolled-down yields from step 1:

Average rolled-down yield = (current rolled-down yield + forecast rolled-down yield) / 2

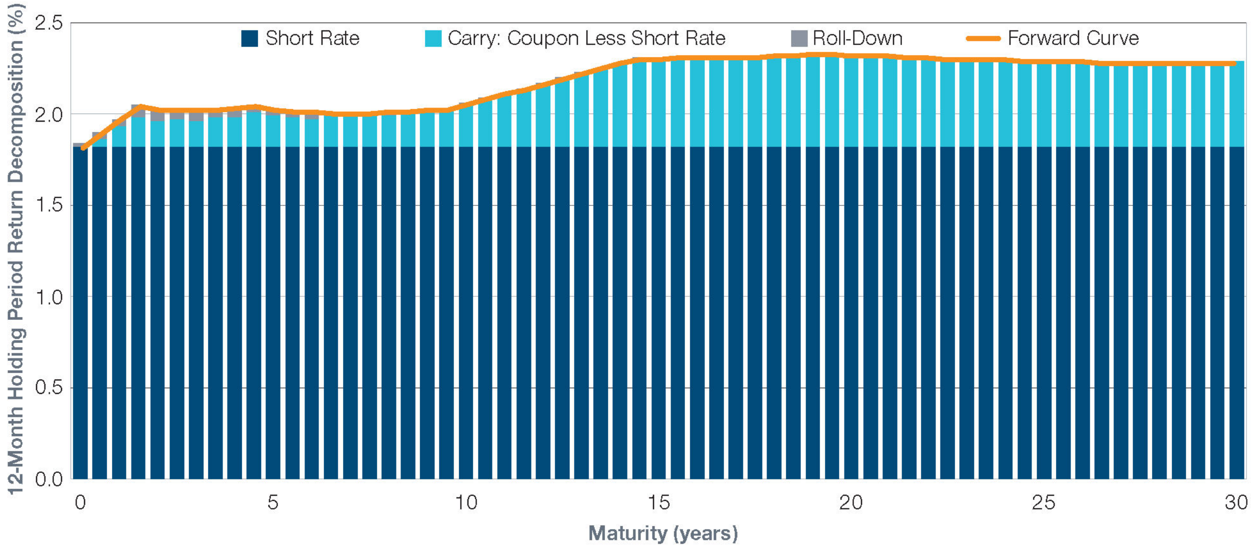
3. Third, we calculate the average annual change in yield due to rolling down the curve (roll-down change):

Average roll-down change = (average rolled-down yield – average yield) / 5

4. Last, we multiply the current duration by the roll-down change to get the average annual return to the index from rolling down the yield curve:

Average roll-down return = current duration x average roll-down change

CARRY AND ROLL-DOWN FOR GOVERNMENT BONDS



Valuation Change

Valuation change has two components: the return due to changes in the level of the underlying sovereign curve and the return due to changes in the spread over the sovereign curve.

Average level change return = current duration x yield change

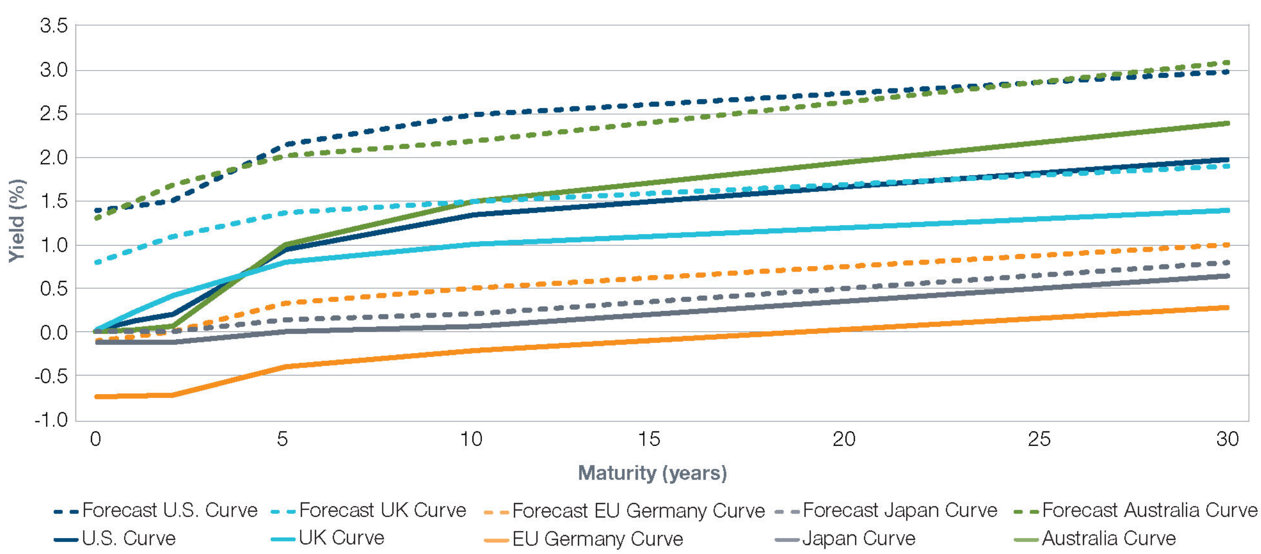
Comment on Durations

We use analytical modified adjusted durations to ascertain the correct point on the yield curve for interpolation. However, we use empirical durations for estimating the returns from valuation changes so that we can ensure that we can cleanly separate the duration due purely to level changes in the underlying sovereign curve and changes in spread levels for a sector.

Inflation-Linked Bonds

We decompose inflation-linked bonds returns into two components: the portion of return due to underlying changes in the nominal sovereign curve and the portion attributable to unexpected changes in inflation. The nominal government bond return is developed using the same process as described previously. The unexpected inflation return is computed by subtracting the current five-year consensus inflation estimate from our inflation forecast and then multiplying by the current duration of the index.

GLOBAL YIELD CURVES



Note: Curves shown as of September 30, 2021

METHODOLOGY

Equities

The capital market assumptions for equities provide return forecasts for the U.S., UK, Europe, Japan, Australia, and emerging markets. U.S. returns are further broken out by large-cap and small-cap returns. Our survey process leverages the knowledge and expertise of our global equity portfolio manager and analyst teams via forecasts for each market and are combined to arrive at a global equity forecast. We blend the survey results with market data to develop our equity market assumptions.

Survey Data:

1. Expected Inflation—headline consumer price index annualized over next five years

2. Real earnings per share (EPS) growth—arithmetic average over the next five years

3. Future price/earnings ratio (P/E)—multiple in five years' time

Market Data:

1. Dividend yield—historical average percentage yield

2. Current P/E—Last 12-month P/E

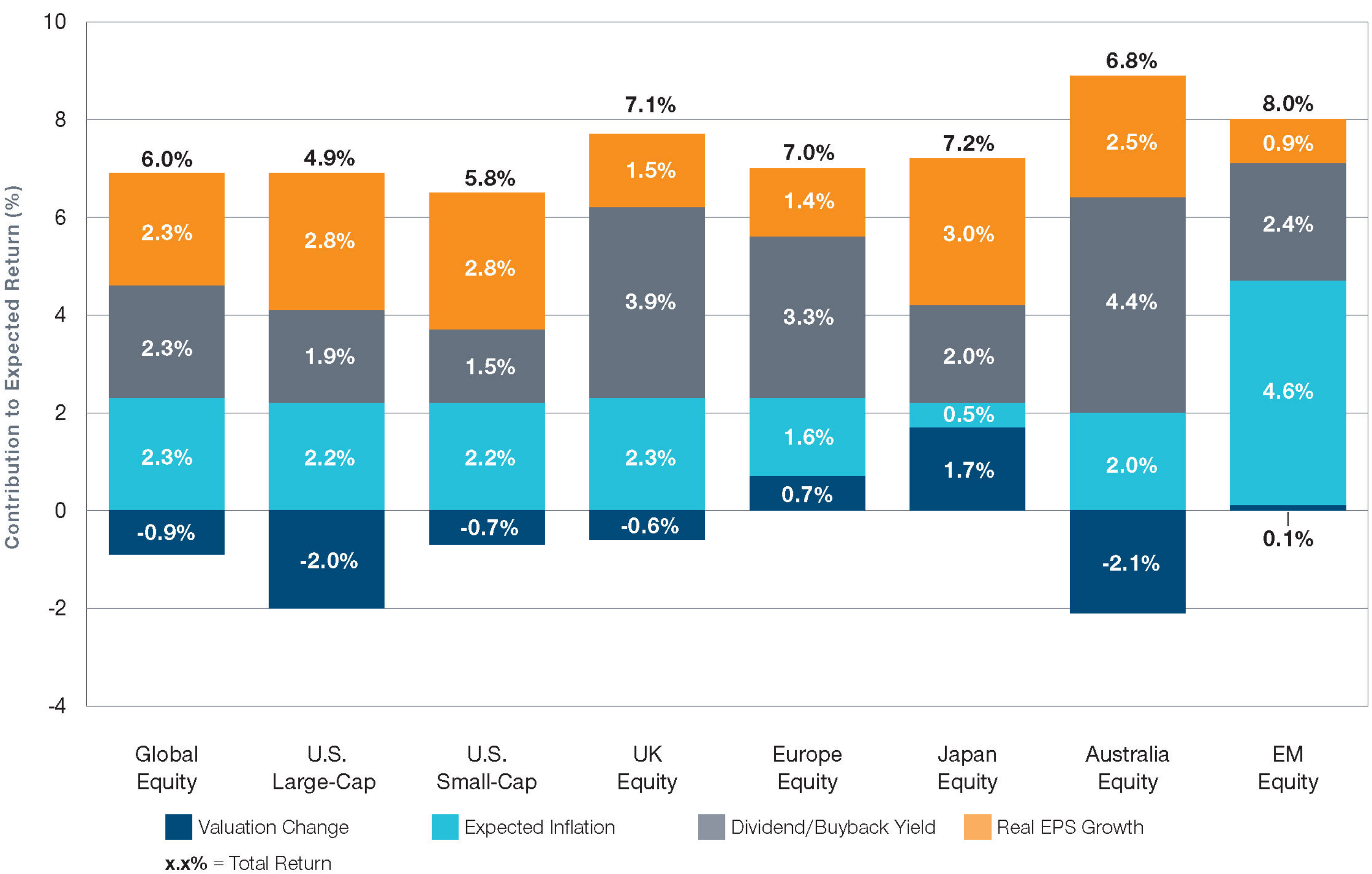
For each equity asset class, the above inputs are used to calculate expected average annual returns, according to vthe equation:

Expected Inflation + Real EPS Growth + Dividend Yield + ΔValuation

Where annual ΔValuation for each of the next five years is given by:

$$\left(\frac{\text{Future P/E}}{\text{Current P/E}}\right) \times \frac{1}{5}$$

EQUITY MARKET EXPECTED RETURNS FROM 2022 TO 2026 (IN LOCAL CURRENCY)



Source: T. Rowe Price. January 2022. This information is not intended to be investment advice or a recommendation to take any particular investment action. The forecasts contained herein are for illustrative purposes only and are not guarantees of future results. Forecasts are based on subjective estimates about market environments that may never occur.

Real Asset Equity

The returns for real asset equities reflect the three components that make up the underlying benchmark: inflation-sensitive equities, real estate investment trusts (REITs), and physical commodities. Returns for the asset class reflect a 50% MSCI ACWI ex-USA equity, 25% REITs, and 25% commodities weighting. MSCI ACWI ex-USA Index returns were selected to give higher notional weight to commodities-producing countries at the expense of the U.S.

Impacts of Buybacks and New Issuance

Two components purposefully absent from our equity-return model are share buybacks and net issuance. When companies buy their own stock, the remaining outstanding shares each represent a larger ownership percentage and should, therefore, appreciate in price. However, the positive effects of share buybacks may be offset by initial and secondary stock offerings. Published academic literature has been inconclusive on the net effect at the market level.

In favor of a negative buyback effect, on the order of -2% per year, William Bernstein and Rob Arnott argue that share issuances and initial public offerings have consistently outpaced buybacks. Their observation that the market capitalizations of global stock markets consistently grow faster than the price level of indexes that follow the same markets supports this argument. On the other side of the debate, Philip Straehl and Roger Ibbotson have argued for a positive buyback effect on the order of +1.5%, based on aggregating net issuance at the individual company level divided by beginning market capitalization for all stocks in the S&P 500 Index from 1970–2014.

Rather than align directly with either side of the debate, we have chosen a middle ground by assuming no net change in return due to buybacks and new issuance.

METHODOLOGY

Alternatives

To forecast the returns of the alternative asset classes, we use a factor regression model with the following premia used as the predictive variables:

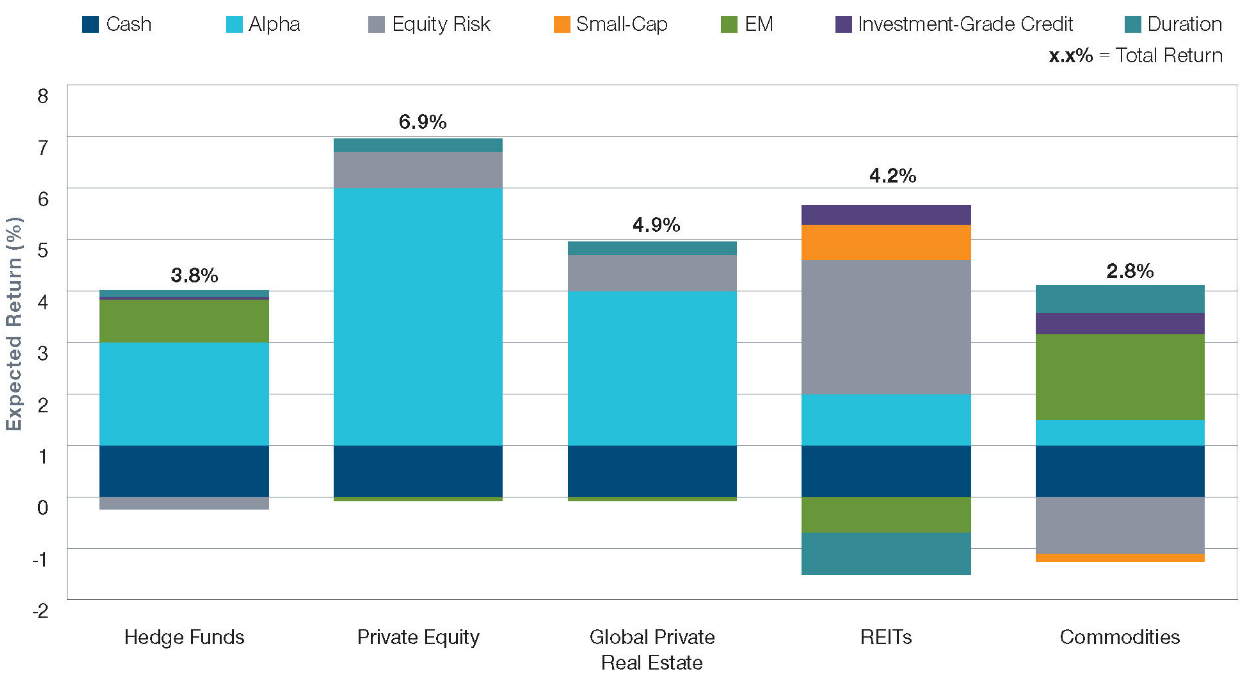
- Equity risk premium (Equity return in excess of cash)
- Small-cap premium (Small-cap return in excess of large-cap)
- EM premium (EM equity return in excess of DM equity)
- Investment-grade credit premium (Investment grade credit return in excess of duration matched government bonds)
- Duration premium (Government bonds return in excess of cash)

We use data starting in 2002 to help estimate the exposure of each asset class to the premia. Additionally, asset classes such as hedge funds and private equity/real estate have a non-negligible active management component that is a foundational portion of the asset class's value proposition.

Based on our survey results, we quantify each premium as shown below and apply each asset class's historical beta to the premia to calculate an expected return.

Premia	Forecasted Value Over Next 5 Years (Arithmetic Averages)
Equity Risk	3.9%
Small-Cap	0.9%
EM	3.4%
Investment-Grade Credit	0.3%
Duration	-1.0%

COMPONENT OF EXPECTED RETURN



Source: T. Rowe Price. January 2022. This information is not intended to be investment advice or a recommendation to take any particular investment action. The forecasts contained herein are for illustrative purposes only and are not guarantees of future results. Forecasts are based on subjective estimates about market environments that may never occur.

Commodities

In addition to the factor model described above, for commodities we also use gold and oil forecasts from our sector specialists as inputs into our estimates. Generally, we are bearish on commodities, as supply/demand imbalances in oil have continued to place downward pressure on the asset class.

Our investment professionals forecast the average spot price in five years for a barrel of Brent crude oil and an ounce of gold as $60 and $1,388, respectively.

EM =Emerging Markets. DM = Developed Markets.

METHODOLOGY

Survey

The foundation of our CMAs is a survey provided to a wide range of senior T. Rowe Price portfolio managers, economists, and analysts across our equity, fixed income, and multi-asset divisions. The survey requests forecasts for many inputs: GDP growth, inflation, commodity prices, equity valuations, earnings growth, fixed income yields, slopes of yield curves, and spread levels. Respondents are asked to offer insights for their respective areas of expertise and are invited to add thoughts for other categories. After all surveys are collected, baseline forecasts are developed for each asset class. The Capital Market Assumptions Governance and Investment Committee then reviews the results for internal consistency and reasonableness.

Correlations and Volatility

Empirical research has shown that over short time horizons (days and months), volatility regimes tend to cluster—i.e., today's volatility environment is highly correlated to that which investors are likely to experience in the near future. However, these results are less conclusive over longer time horizons. Similarly, certain asset classes, like EM debt, have experienced significant structural declines in volatility over the past decade, while others, like developed market investment-grade debt, recently have increased in volatility as the duration of the asset class has extended in a low interest rate environment.

The volatility and correlation matrix shown is based on approximately 15 years of historical data, making adjustments as necessary to reflect recent developments within each asset class. We "unsmooth" return histories of alternative asset classes, which have significant auto-correlation, to better reflect the economic volatility of the underlying assets.

Currency Treatment

Estimating returns for assets domiciled in a different currency than the base currency invites several questions:

- Should currency movements be hedged and does that view change by asset class?
- What is a reasonable approach for estimating currency return?

For the 2022 assumptions, we presume that developed market currencies contribute no return relative to each other. This approach contrasts with uncovered interest rate parity – essentially the difference in nominal interest rates between two countries is equal to the expected depreciation of one currency relative to the other. Although intuitive, empirically uncovered interest-rate parity does not hold well, so our 2022 currency approach reflects this evidence. We do expect slight depreciation in emerging market currencies, reflecting the higher economic growth, inflation expectations, and cash yields available in those markets.

In terms of hedging considerations, historical data demonstrates that better risk-adjusted returns potentially can be earned by investors hedging high-quality fixed income versus leaving investment-grade foreign bond exposures unhedged. This is generally true for investors domiciled across the globe. The data is less conclusive for equities and the results are more country specific. We have elected to forecast returns for global aggregate bonds and global investment-grade corporates with hedging, while leaving all other foreign currency exposures unhedged. The difference between our hedged and unhedged return expectations are driven by differences between our interest-rate views and the five-year forward cash rate implied by the market.

Longer-Term Expectations

Many, if not most, investors have a time horizon longer than the five-year forecasts included in this document. As examples, the T. Rowe Price Target Date and Target Allocation franchises offer strategies targeted to investors with 40+ year accumulation and 30+ year retirement cycles. We are often asked for the forecasts we use to inform the construction and design of those portfolios. While we strongly advise against using any single set of assumptions for portfolio construction, investors with a longer-term or perpetual time horizon should consider market conditions beyond the current market environment, which, admittedly, heavily influences many of the forecasts we share here. Included below are several of the risk premia we believe the markets tend to reward over long investment horizons, along with estimates of their average magnitudes over multiple market cycles. By definition, these are long term and relatively stable over time, but they are subject to revisions and revalidation as necessary. The table below shows includes the same premia we use for estimating alternative asset class returns, but are just a subset of the premia potentially available over long investment horizons.

Premia	Forecasted Value Over Market Cycles (Arithmetic Averages)
Equity Risk	5.5%
Small-Cap	1.0%
EM	1.0%
Investment-Grade Credit	0.5%
Duration	1.0%