Forecasting stock returns: What signals matter, and what do they say now?

Vanguard research | October 2012

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Executive summary. Some say the long-run outlook for U.S. stocks is poor (even "dead") given the backdrop of muted economic growth, already-high profit margins, elevated government debt levels, and low interest rates. Others take a rosier view, citing attractive valuations and a wide spread between stock earnings yields and Treasury bond yields as reason to anticipate U.S. stock returns of 8%–10% annually, close to the historical average, over the next decade. Given such disparate views, which factors should investors consider when formulating expectations for stock returns? And today, what do those factors suggest is a reasonable range to expect for stock returns going forward?

We expand on previous Vanguard research in using U.S. stock returns since 1926 to assess the predictive power of more than a dozen metrics that investors would know ahead of time. We find that many commonly cited signals have had very weak and erratic correlations with actual subsequent returns, even at long investment horizons. These poor

predictors include trailing values for dividend yields and economic growth, the difference between the stock market's earnings yield and Treasury bond yields (the so-called Fed Model), profit margins, and past stock returns.

We confirm that valuation metrics such as price/earnings ratios, or P/Es, have had an inverse or mean-reverting relationship with future stock market returns, although it has only been meaningful at long horizons and, even then, P/E ratios have "explained" only about 40% of the time variation in net-of-inflation returns. Our results are similar whether or not trailing earnings are smoothed or cyclically adjusted (as is done in Robert Shiller's popular P/E10 ratio).

The current level of a blend of valuation metrics contributes to Vanguard's generally positive outlook for the stock market over the next ten years (2012–2022). But the fact that even P/Es—the strongest of the indicators we examined—leave a large portion of returns unexplained underscores our belief that expected stock returns are best stated in a probabilistic framework, not as a "point forecast," and should not be forecast over short horizons.

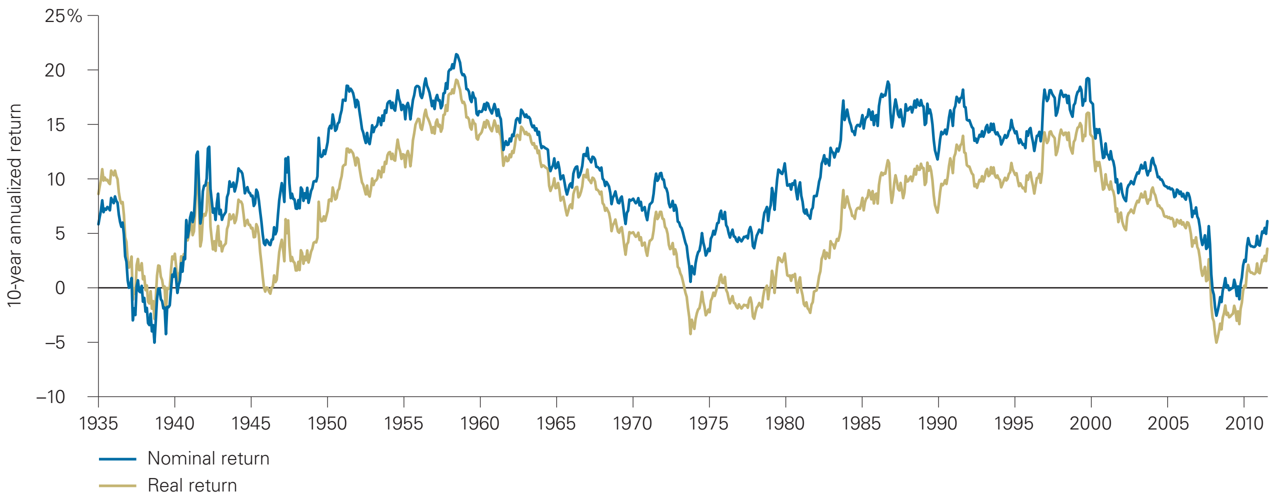
The variation of expected returns

Forming reasonable long-run return expectations for stocks and other asset classes can be important in devising a strategic asset allocation. But what precisely are "reasonable" expectations in the current environment, and how should they be formed?

For instance, should investors expect the returns on a broadly diversified portfolio of stocks to stay constant over time, based on their long-run historical average (i.e., a "static" or "equilibrium" forecast)? Alternatively, should the risk premium that strategic investors demand to own stocks (versus, say, cash or bonds) vary based on market conditions, in the same way that the expected return on bonds may vary based on present bond yields?

Figure 1. Long-run equity returns vary over time, but are they predictable?

Rolling 10-year annualized geometric returns of the broad U.S. stock market:
Periods ended December 1935 through June 2012



Summary: January 1926–June 2012

	Nominal	Real
Geometric annualized return	10.0%	6.8%
Arithmetic annualized return	12.0	8.8
Volatility	19.3	19.4

Note: The blue line represents the nominal geometric annualized return on the broad U.S. stock market over rolling monthly 10-year periods through the date shown. The tan line represents the real (or inflation-adjusted) return. See the Appendix for indexes used to represent stock market returns.

Source: Vanguard calculations based on the data sources listed in the Appendix.

As evident in **Figure 1**, *actual* returns on the broad U.S. stock market have varied over time, even over holding periods of a decade or more. The chart depicts the rolling 10-year annualized total return of the broad U.S. stock market since 1926. The blue line represents the nominal return, and the tan line represents inflation-adjusted or real return. One could think of this real stock return as the realized equity risk premium over inflation.[1] The correlation between the rolling nominal and real stock returns in Figure 1 is very high at 0.89.

Adjusted for inflation, real U.S. stock returns have oscillated notably, ranging from approximately –5% to 20% on a rolling 10-year annualized basis. Recent rolling returns (through June 2012) have resided toward the bottom range of the entire 1926–2012 sample.

1 No consensus yet exists on how to precisely define the equity risk premium. As discussed by The Research Foundation of CFA Institute (2011), the ERP is generally defined as the (expected or realized) return of a broad U.S. equity index in excess of either (a) the rate of inflation (our approach here), (b) the return on "cash" (e.g., the 3-month Treasury-bill rate), or (c) the return on a long Treasury or corporate bond portfolio. Arguably, approaches (a) and (b) are similar given the high correlation between inflation and the average cash rate at long horizons.

Not only have long-run U.S. stock returns varied over time, the persistent wave-like pattern in Figure 1 suggests some degree of predictability, at least visually. It also suggests that investors should *not* expect stock returns to stay constant over time, faithful to history (Cochrane, 2011; Ilmanen, 2011; Damodaran, 2012)—a fact that has significant implications for strategic long-term portfolios.

If investors cannot always look to a constant historical average return for guidance about the stock market's future performance, then what signals, if any, can help to explain the variation in equity returns? Our research explores the level of predictive ability—both short-term and long-term—to be found in various widely used indicators.

Predicting historical stock returns: A regression framework

List of potential predictors

We updated and expanded on previous Vanguard research to assess to what degree U.S. stock returns can be forecasted.[2] In doing so, we compiled data back to 1926 for more than a dozen "yardsticks" that investors would know ahead of time and that some believe or have shown to be correlated with future stock returns.[3]

We loosely categorize our metrics as follows:

Price/earnings ratios, or P/Es

1. P/E1, which uses trailing 1-year earnings.
2. P/E10, which uses trailing 10-year earnings (this is Shiller's cyclically adjusted P/E, or "CAPE").

Components of a simple "building block" dividend growth model (dividend yield + earnings growth)

3. Trailing 1-year dividend yield.
4. Trend of real corporate earnings growth (trailing 10-year average real earnings, or "E10").
5. "Consensus" expected real earnings growth (proxied by trailing 3-year average growth rate).

Economic fundamentals

6. Trend of U.S. real GDP growth (trailing 10-year average growth rate).
7. "Consensus" expected real GDP growth (proxied by trailing 3-year average growth rate).
8. Yield of the 10-year U.S. Treasury note (reflects inflation expectations and anticipated Fed policy).
9. Federal government debt/GDP ratio. (*Hypothesis*: Higher debt levels today imply a lower future return.)
10. Corporate profits as a percentage of GDP. (*Hypothesis*: Higher profit margins today imply a lower future return.)

Common multi-variable valuation models

11. Fed Model: the spread between U.S. stock earnings yield and the long-term government bond yield (the spread between the inverse of P/E1 and the level of the 10-year Treasury yield).
12. Building-block model with trend growth (a combination of 3 and 4 above).
13. Building-block model with consensus growth (a combination of 3 and 5 above).

2 For our previous research, see Vanguard's paper *What Does the Crisis of 2008 Imply for 2009 and Beyond?* (Davis et al., 2009).

3 See the Appendix for details and sources. Although our list of potential return predictors is not exhaustive, these are among the most commonly cited by analysts and have been used in other studies on stock market predictability (i.e., Campbell and Thompson, 2008; Welch and Goyal, 2008).

Simple or "unconditional" mean-reversion in returns

14. Trailing 1-year real stock returns. (*Hypothesis*: Higher past returns imply lower future returns.)

15. Trailing 10-year real stock returns. (*Hypothesis*: Higher past returns imply lower future returns.)

Reality check

16. Trailing 10-year average U.S. rainfall. (Hypothesis: This should have *no* relation to future returns.)

Predictability regressions

Based on these variables, we estimated a set of "predictability" regressions. In each regression, an independent variable was chosen from the list above to determine whether it had any association with the dependent variable—the actual real U.S. stock return.

For this exercise, we measured the dependent variable at two investment horizons:

1. The one-year-ahead real return.

2. The geometric average annualized 10-year-ahead or "long run" real return (e.g., the tan line in Figure 1).[4]

We can illustrate our approach with an example involving the trailing dividend yield. Here, the regression is designed to estimate to what extent the dividend yield on the U.S. stock market in year "t" has explained the variability of the rolling 10-year real return for the years t+1 through t+10. In this way, the regression is specified so that an investor would not have to guess at the future of the independent signal (here, the dividend yield) in order to alter her forecast for stock returns over the next ten years. In this sense, the regression is estimated "in real time," although the statistics we report are in-sample results, meaning that we measure each variable's predictive ability over the entire data set.

The most interesting output from our simple regression framework is the degree of *correlation* between the potential return predictors and the actual subsequent stock returns. An R^2 near 0 would imply that those metrics have little to no correlation with future stock returns; that is, the metrics are essentially useless as predictors. An R^2 near 1.00 would imply that those metrics correlate almost perfectly with future stock returns.

4 From this point on in the paper, the reader can assume that, unless stated otherwise, all returns are in real terms, adjusted using the Consumer Price Index described in the Appendix. Although not shown here, we also ran predictability regressions using nominal rather than inflation-adjusted rolling 10-year returns as the dependent variable. The resulting R^2s were similar to those we found using real returns, which is not surprising given the high correlation between the nominal and real returns in Figure 1. Our use of *annualized* returns inflates the R^2 values by about 0.05 across all variables, as taking the geometric average mutes some of the volatility in the return series. We chose to display the data this way as many investors think in terms of average annual returns.

Predicting historical stock returns: The empirical results

Figure 2 reports the results of the regressions for each metric in each of our two return series. The bars in Figure 2 represent the R^2 of the predictability regressions; that is, the bars represent the percentage of the variation in actual stock returns that was explained ahead of time by the independent variable.

Overall, Figure 2 provides three general conclusions about forecasting stock returns under our framework.

First, stock returns are essentially unpredictable at short horizons. As evident in the R^2s, the estimated historical correlations of most metrics with the 1-year-ahead return were close to zero. The highest correlation—an R^2 of just 0.12—was produced by the building-block model using trailing dividend yield and trend real earnings growth. Quite frankly, this lack of predictability is not surprising given the poor track record of market-timing and related tactical asset allocation strategies.

Second, many commonly cited signals have had very weak and erratic correlations with realized future returns even at long investment horizons. Poor predictors of the 10-year return included trailing values for dividend yields and economic growth, corporate profit margins, and past stock returns. Each of these variables explained less than one-fifth of the future pattern of long-run stock returns, with some displaying effectively zero correlation. In fact, many popular signals have had a lower correlation with the future real return than *rainfall*—a metric few would link to Wall Street performance.[5] Broadly speaking, our results here are consistent with several academic studies that have documented the difficulty of forecasting stock returns.[6]

We also found that some widely cited economic variables displayed an unexpected, counterintuitive correlation with future returns. The ratio of government debt to GDP is an example: Although its R^2 makes it seem a better performer than others, the reason is actually opposite to what one would expect—the government debt/GDP ratio has had a *positive* relationship with the long-term realized return. In other words, higher government debt levels have been associated with higher future stock returns, at least in the United States since 1926.[7] We would not expect such a correlation to persist, and the debt/GDP results are a reminder that the relationship between slow-moving and widely acknowledged economic trends and forward-looking financial markets can often be weaker than is commonly portrayed.

Also of interest is the result for the Fed Model, which we find has had poor success in predicting long-term stock returns; its R^2 with 10-year-ahead returns is 0.16. This is less effective than using the earnings yield by itself. Although some analysts may prefer employing the Fed Model to judge whether

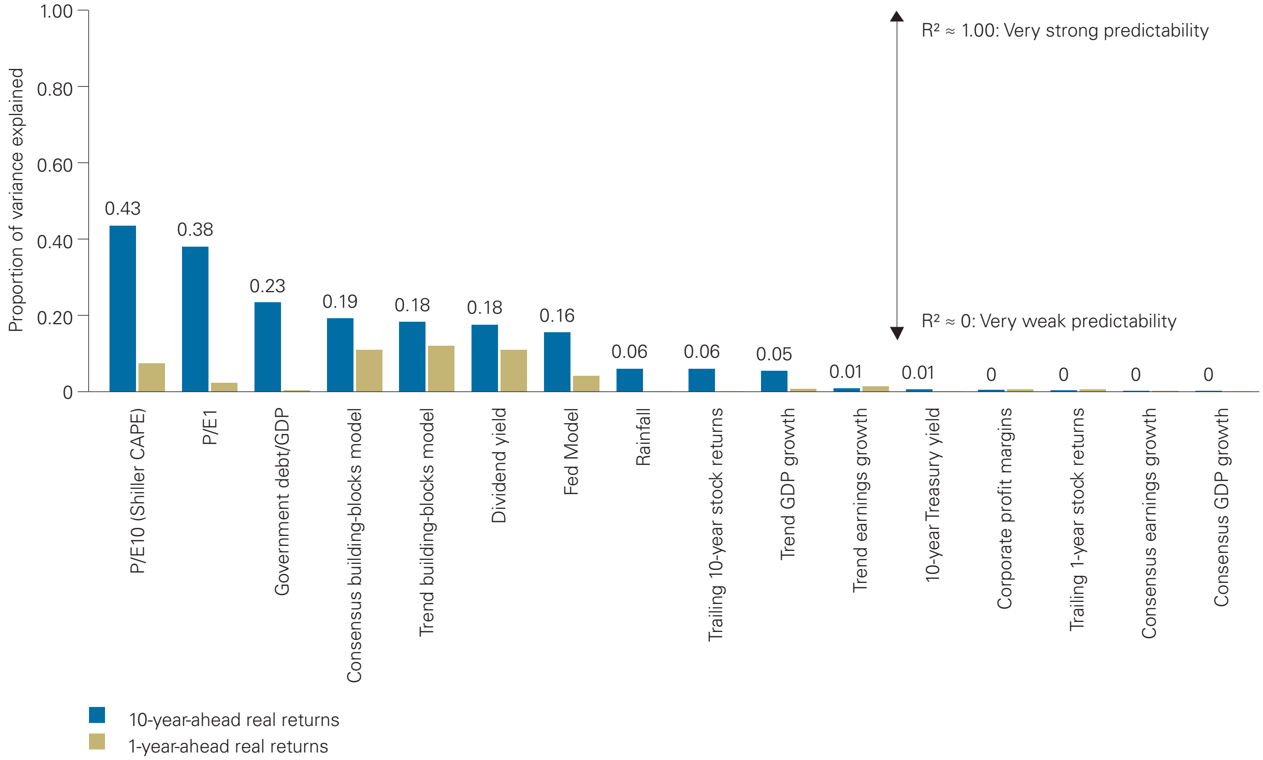
5 This result is consistent with a rather famous tongue-in-cheek example in which butter production in Bangladesh was found to have a high correlation with the level of the S&P 500 Index (Leinweber, 2007).

6 For a comprehensive and exhaustive academic treatment of stock market predictability, see Welch and Goyal (2008). In previous Vanguard research, Davis (2008) showed that neither consensus expectations for future economic growth nor recent trailing economic data have any meaningful association with future stock returns, presumably because such information is already discounted by financial markets. That said, we do find a positive contemporaneous correlation at short horizons between actual stock returns and economic growth surprises (i.e., deviations from consensus forecasts).

7 The slope of the regression coefficient is 0.12, indicating that, on average, for every 10% increase in federal government debt as a percentage of GDP, the future real annualized 10-year stock return increased by 1.2 percentage points. This counterintuitive result is driven by the run-up in government debt during World War II and the postwar period of strong market returns.

Figure 2. Most popular metrics have had little or no correlation with future stock returns

Proportion of variance of future real stock returns that is explained by various metrics, 1926–2011

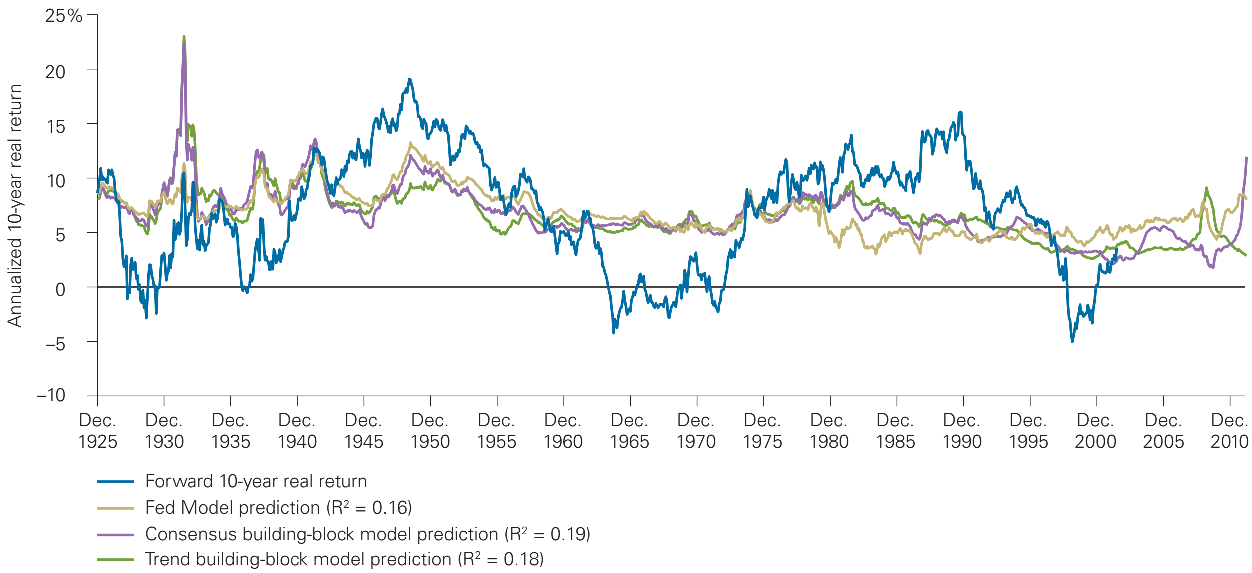


Notes: The bars display the R^2 of a regression model of 10-year-ahead and 1-year-ahead real annualized stock returns on each variable, fitted over the January 1926–June 2012 sample, with the exception of corporate profits, which are fitted for January 1929–June 2012 (because of data limitations). See the Appendix for further information about the data.

Source: Vanguard analysis based on the data sources listed in the Appendix.

Figure 3. Some popular stock-forecasting models have a poor track record

The Fed Model and two building-blocks models show low correlation with actual long-term real return, especially since the 1970s



Notes: The long-term real return is shifted to a forward basis for easier comparison with the current value of the Fed Model, meaning that the 10-year return through 2011 is shown in 2001. The Fed Model series is the fitted return from the regression model estimated in Figure 2: 5.83 + 0.55 × (earnings yield – 10-year Treasury yield). The consensus building-block series is the fitted return from the regression model estimated in Figure 2: 1.30 + 1.34 × (dividend yield) + 0.06 × (consensus real earnings growth). The trend building-block series is the fitted return from the regression model estimated in Figure 2: 2.04 + 1.25 × (dividend yield) – 0.13 × (trend real earnings growth). Note that sign for the trend earnings growth coefficient is opposite our hypothesis. See the Appendix for further information about the data.

Source: Vanguard analysis, using data described in the Appendix.

the stock market is fairly valued, our results mirror those of Asness (2003), who concludes that the model is theoretically flawed because it compares a real concept (earnings yield, or E/P) with a nominal one (Treasury bond yield). The Fed Model's lack of historical correlation with long-term real returns is clearly evident in **Figure 3**.

Even the popular building-block approach, in which forecasts are based on combining chosen components, has had a low and erratic association with future returns. Figure 3 compares actual 10-year returns with two such yardsticks. One combines the dividend yield with "consensus" real earnings growth, roughly measured by the trailing 36-month growth rate; the other combines the dividend yield with "trend" earnings growth, measured by the trailing 120-month growth rate.

The lack of strong or consistent predictability in this common approach is obvious from the historical patterns. In addition, the regression coefficients in both models are quite different from what might be commonly assumed. Most versions of a building-block approach simply add up the various components (assuming coefficients equal to 1). Our coefficient estimates for the earnings growth component in both the trend model and consensus models are not significantly different from 0 (and the sign for the trend growth model is negative), implying that the dividend yield component is the main driver. Despite their widespread use, historically, long-range forecasts using such metrics would not have produced useful estimates of future returns.

Our third primary finding is that valuation indicators—P/E ratios, in particular—have shown some modest historical ability to forecast long-run returns. Figure 2 confirms previous studies that valuation measures such as P/E ratios[8] have had an inverse or mean-reverting relationship with future stock market returns. In fact, the popularity of the previously discussed building-block approach likely stems from the modest success of those versions of the model that include a valuation term (e.g., see Bogle, 1991).

Figure 2 reveals that the predictability of valuation metrics has only been meaningful at the 10-year horizon. Even then, P/E ratios have explained only approximately 40% of the time variation in real stock returns.

Some readers may be further surprised to find that our results are similar whether or not trailing earnings are smoothed or cyclically adjusted, as is done in Shiller's CAPE ratio.[9] Some analysts view the Shiller CAPE as a superior alternative to the more volatile P/E1 ratio, which uses only trailing 1-year earnings figures.

Figure 4a, on page 10, however, shows that the correlation of various P/Es with 10-year returns has been virtually identical[10] on average regardless of the trailing or look-back period used to smooth "E." This is an important result that investors may wish to consider before relying on a single P/E ratio (whether P/E1 or P/E10) in forming expectations for stock returns. Although the various smoothing periods produce forecasts of similar accuracy, *on average*, the choice of the look-back period for smoothing "E" can produce different "point forecasts" for real returns *at particular points in time*. Figure 4b illustrates the sensitivity of long-run return forecasts based on P/E ratios ranging from P/E1 to P/E15. Put another way, we do not find a clear "winner" or "optimal" smoothing mechanism for earnings.

8 Results are substantially similar when using "earnings yields" or E/Ps.

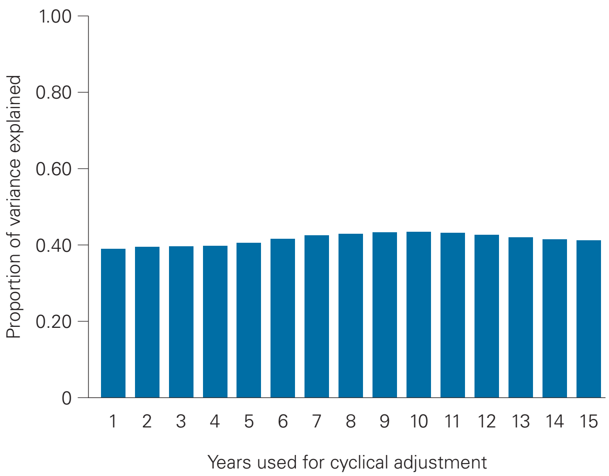
9 Campbell and Shiller (1998) and Shiller (2000), among others, argue that smoothing "E" by taking the average of the past 10 years of earnings removes potential business-cycle effects to arrive at a more precise measure of trend earnings.

10 R^2 statistics range from 0.38 to 0.43. Our interpretation is that the difference of 0.05 is not a wide enough margin to conclusively reject one model in favor of the other.

Figure 4. Different valuation measures are equally valid but produce different forecasts

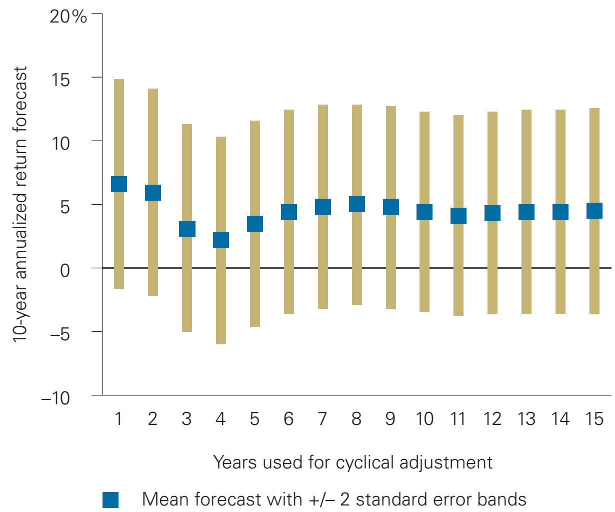
4a. Goodness-of-fit using different cyclical adjustments to forecast 10-year real returns

10-year-ahead real return on CAPE: 1926–2012

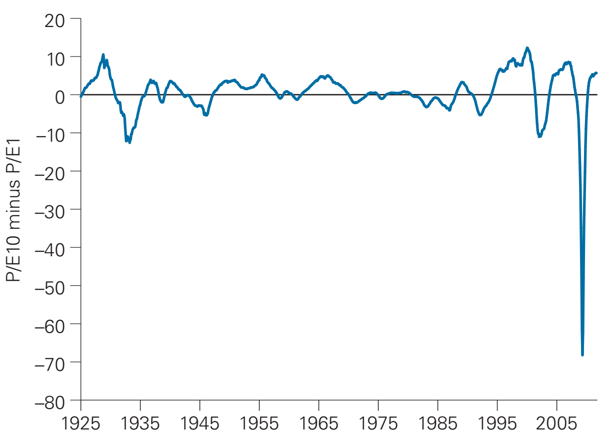


4b. Current 10-year real return forecast produced by each cyclical adjustment

Real return forecast: 10 years through March 2022

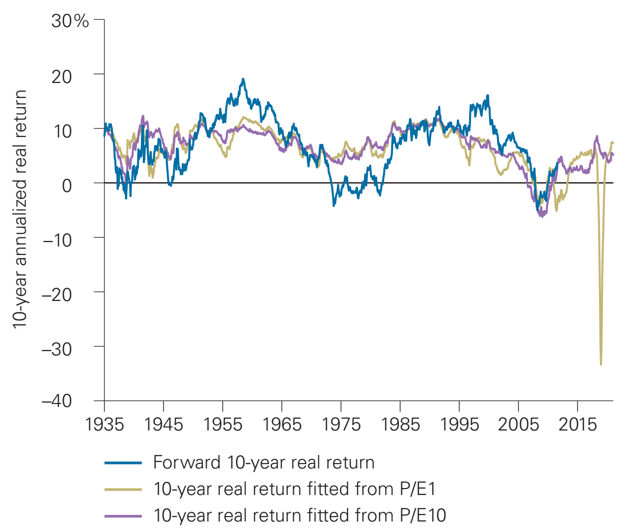


4c. Historical spread between P/E1 and P/E10



4d. Historical 10-year real return versus the fitted values from P/E1 and P/E10

10-year real return and forecasts from P/E measures



Notes: Figure 4a displays the R^2 statistic of a regression model of forward real 10-year annualized stock returns on a cyclically adjusted P/E ratio, using variable time horizons to smooth the earnings used in the denominator. For example, the 7-year cyclical adjustment takes the current real stock price divided by the average of the prior 84 months of real earnings. Figure 4b displays the current 10-year forward real return implied by each of the models in Figure 4a, with a 2 standard error band (approximately a 95% confidence interval). Figure 4c displays the historical difference between the P/E10 and P/E1 valuation measures. Figure 4d displays the fitted real 10-year return forecasts for the P/E10 and P/E1 measures. The long-term real return series is shifted to a forward basis for easier comparison with the forecasted values, meaning that the 10-year return through 2011 is shown in 2001. See the Appendix for further information about the data.

Source: Vanguard analysis based on the data sources listed in the Appendix.

While the difference in statistical performances of various valuation metrics is quite small, the uncertainty that can result from different analysts' use of their own "preferred" measures is considerable. As shown in **Figure 4c**, the spread between the two most commonly used P/E metrics (using 1-year average earnings and 10-year real average earnings) is time-varying, with significant discrepancies arising because of fluctuations in the earnings cycle. The fitted forecasts resulting from these valuation measures can likewise be quite different, as shown in **Figure 4d**. The upshot is often just plain confusion for investors, with some analysts commenting on historically high valuations at the same time others are pointing to "normal" or "attractive" valuation levels.

Why do valuations matter?

A debate exists over *why* P/E ratios seem to predict long-term stock returns, at least to a degree. One view centers on the fact that stocks represent a claim on the stream of future corporate earnings, discounted back to today using an appropriate discount rate (Cochrane, 2011). This discount rate can be thought of as the return an investor *requires and expects* to earn by investing in equity. Thus current valuations, by relating earnings to today's price, can provide insight into what this expected return actually is.

The fact that this discount rate tends to change over time, responding to changing market and economic conditions (Fama and French, 1989), explains the time variation in long-run returns that we observe historically. For instance, during weak economic times, risk-aversion and the cost of capital both increase. In such times, the risk premium required of equities should be expected to increase, thereby driving discount rates up and stock prices down. Thus, low valuations (low P/Es) are consistent with high discount rates and with high expected returns.

An alternative explanation is related to the existence of market bubbles and irrational aggregate investor behavior (De Bondt and Thaler, 1985; Shiller, 2000; Utkus, 2011). Under this view, investors in the stock market (and any other market) make decisions based on trailing returns or based on their peers' decisions (i.e., herd behavior). Higher subsequent returns can then create a feedback loop, fueling additional investment. Speculative price bubbles develop, with stock prices increasing above their underlying value (i.e., above the earnings trend) for some time before reverting to a "fair value" consistent with earnings. In this case, over- or under-valuations signal a temporary misalignment of prices relative to earnings that results from behavioral biases in the marketplace. Thus, the expected correction in prices would predict a period of relatively lower or higher equity returns, respectively.

These two views are not necessarily mutually exclusive. For example, movements in the discount rate could be driven by irrational investor behavior. What is important is that, while some disagreement exists regarding why valuation levels move over time, there is broad agreement that they can matter when forming long-run expectations for stock returns.

Vanguard's approach to generating forward-looking return expectations

We confirm modest evidence of predictability for long-term stock returns based on initial market valuations. Specifically, P/E ratios have had an inverse or mean-reverting relationship with future stock market returns, although it has been meaningful only at 5- to 10-year horizons.

This would suggest that the "risk premium" that strategic investors demand to own stocks could vary at times based on market valuations, in the same way that the expected return on bonds may vary based on present bond yields. To put this another way, the long-term outlook for the equity risk premium and U.S. stock returns can differ (perhaps significantly) from the historical average return depending on these forward-looking valuation indicators.

However, we feel it is important to stress that even conditioning on initial P/E ratios leaves approximately 60% of the historical variation in long-term real returns *unexplained*. Graphically, this negative-but-imperfect relationship between P/E ratios and future long-run stock returns is illustrated in **Figure 5**. The average negative relationship over long horizons is evident from the fitted lines, but so is the dispersion in actual returns around those lines.

Economically for investors, such fat-tailed deviations from any fitted "point forecast" have been and can be meaningful. The average is in fact a poor description of the norm: In Figure 5, about two-thirds of 10-year periods had realized returns that deviated from a 5% band around the best-fit line. In other words, for a majority of history, the forecast was wrong by a meaningful margin.

Are the "tails" wagging the dog (and reverting to the mean)?

How much are the extreme P/E values in our sample (the tails of the distribution) responsible for the 40% explanatory power that we observe? If just a few extreme situations, such as the high P/Es in the late 1990s, are driving all of the explanatory power we see, then valuations closer to the overall average level should have less ability to anticipate returns.

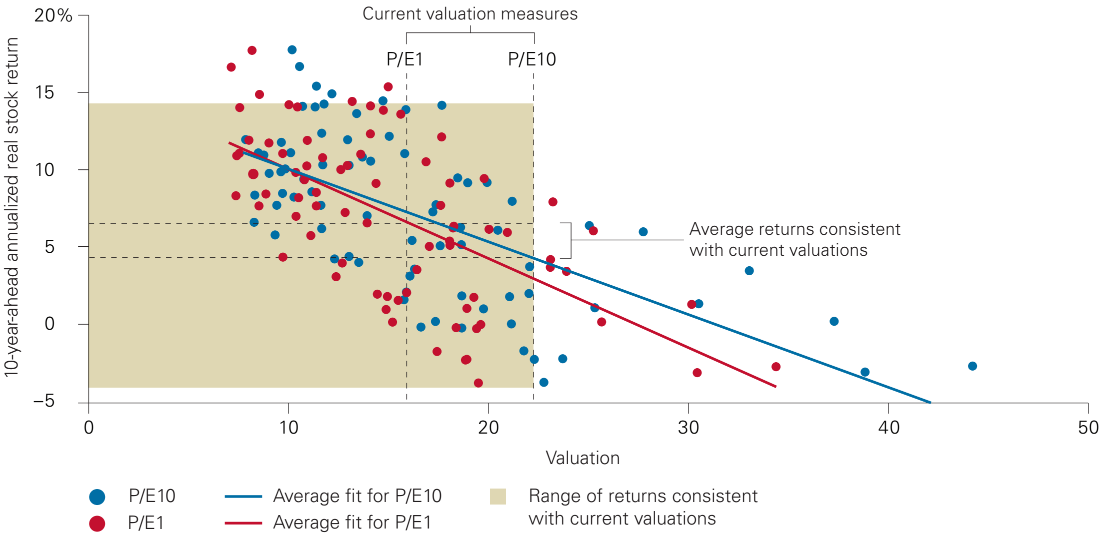
We test this hypothesis using the P/E10 valuation measure, by successively dropping tail P/E values from the sample and then measuring the R^2 for forecasting 10-year returns. We found little change from the R^2 results in Figure 2 until more than 25% of the sample was dropped (the 12.5% tails on either end). Examining just the middle 50% of P/E values results in much lower explanatory power than when using the full sample (R^2 = 0.20).

A related question revolves around whether it is the starting level of valuation that matters (as our analysis here has specified) or the movement of valuation throughout time. This is a difficult issue to resolve, however, given the limited sample of data that we have.

P/Es have tended to have a mean-reverting level throughout our sample, although there is some evidence that this level changes over time because of structural factors in the economy and markets (Lettau and Van Nieuwerburgh, 2008). With a mean-reverting level present in the data, distinguishing the effect of the starting level of valuations from their movement over the return horizon is not a straightforward process. In examining the impact of extreme values, the fact that a full 25% of the sample must be dropped before the R^2 is impacted suggests that mean-reversion may not be entirely responsible for the observed relationship.

Figure 5. What a "realistic return forecast" looks like when 60% is unexplained

Annual valuation versus the subsequent 10-year annualized real return, 1926–2011



Notes: The chart displays the P/E10 and P/E1 ratios in December of each year from 1925 through 2001 versus the subsequent 10-year annualized real U.S. stock return for periods ended each December from 1935 through 2011. See the Appendix for further information about the data.

Source: Vanguard analysis based on the data sources listed in the Appendix.

This point is further underscored by combining this result with our previous finding that there is no single "right" valuation measure. Using different measures of valuation can add further uncertainty to any return forecast. The spread between P/E10 and P/E1 is presently at the upper end of its distribution since 1925, mainly because the P/E10 includes two poor earnings cycles associated with the recessions in 2001 and 2008–2009, while P/E1 does not. Given our results in Figure 4, indicating that these two measures have very similar predictive power, the question of which one to use only adds uncertainty: Both are valid, yet they produce different forecasts.

We display this result in Figure 5 in the "average relationship" range. This represents future returns that, on average, have been associated with current valuation levels (P/E1 and P/E10). Not only is there uncertainty about what the "average" forecast is, there is considerable uncertainty around this average: Today's starting valuations have been consistent with future returns ranging from roughly –4% to nearly 15% (the shaded region in Figure 5).

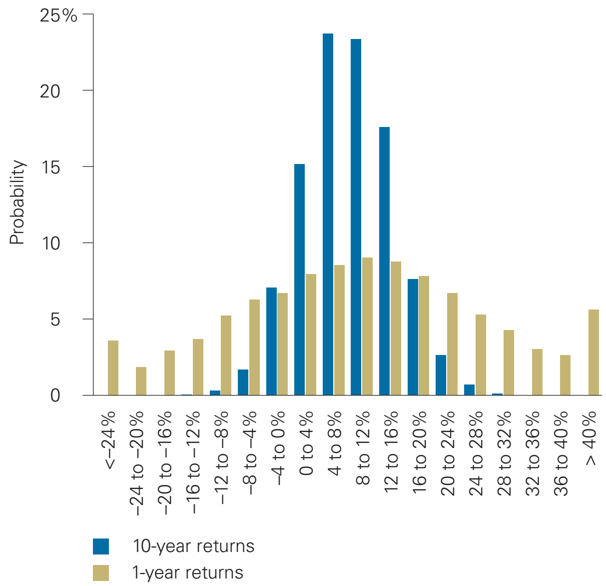
The imperfect and modest average relationship between P/E ratios and future long-run stock returns illustrates the merit of Vanguard's distinct approach to forecasting. As discussed in our annual analysis, *Vanguard's Economic and Investment Outlook* (Davis and Aliaga-Díaz, 2012), Vanguard believes that market forecasts are best viewed in a probabilistic framework and should not be made over short horizons. Therefore the Vanguard Capital Markets Model incorporates various valuation metrics (including those discussed here) blended in a proprietary manner[11] to produce a distribution of expected equity risk premiums.

11 Not only does a blend of valuation metrics eliminate uncertainty about which specific one is correct, but we find that it (marginally) improves the R^2. For example, taking an average of the CAPEs from Figure 4 (1 through 15 years smoothed earnings) resulted in a very slight (0.02) improvement in the R^2 relative to the best individual CAPE. Rather than call attention to the slim improvement, we focus on the fact that there is no negative impact to the R^2 from following this blended approach.

Figure 6. Projected U.S. stock returns

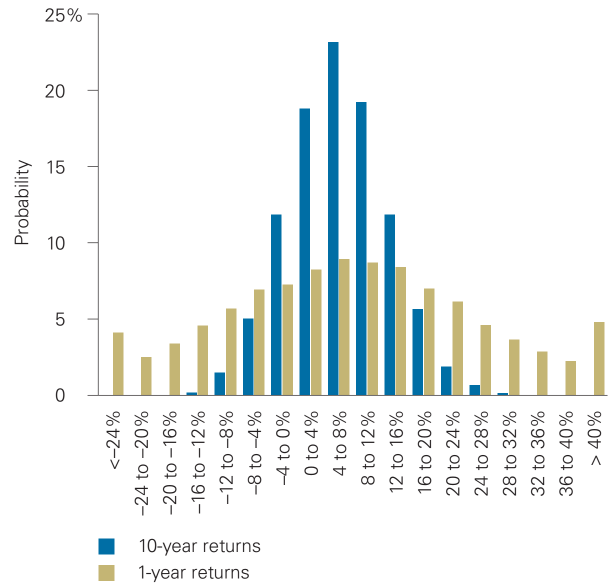
6a. Nominal returns

Estimated in June 2012



6b. Real returns

Estimated in June 2012



Notes: Projections are based on simulations by the Vanguard Capital Markets Model. See the Appendix for a description of the model's methodology and the benchmarks used.

Source: Vanguard, based on VCMM calculations.

Figure 6 shows the probability distribution of expected U.S. stock returns based on VCMM simulations using market valuations through June 2012. Centered in the 4%–12% nominal return range, the long-term median nominal return for the U.S. equity market is modestly below the historical average as a result of current market valuations and the probability of various inflation scenarios. Turning to real returns, we estimate a slightly greater than 50% likelihood that over the 2012–2022 period, the broad U.S. stock market will earn at least a 5% average annualized real return. As such, we feel our expectation for the forward real return is quite in line with the historical average of 6.8% that has been observed since 1926, and does not represent a drastic change in the risk–reward characteristics of the equity market.

This generally positive U.S. equity outlook may surprise some readers, considering the global economic outlook.[12] However, our results reaffirm our long-held view that, while market valuations may have modest correlation with future stock returns, consensus economic growth expectations do not. In fact, a positive realized future equity risk premium has tended to correlate with conditions similar to those of today: somewhat normal market valuations, heightened macroeconomic volatility, and higher risk-aversion.

Readers will also note that the projected distribution of annualized 10-year U.S. stock returns in Figure 6 displays *wide and fat* tails. A key reason is that, as we have discussed, nearly 60% of the variation in long-run stock returns is unexplained by valuations. As a result, our VCMM simulations in Figure 6 reveal that, although there is roughly a 35% probability of U.S. stocks achieving an average annual real return between 3% and 9% over the next 10 years, even greater odds favor average returns outside of this central tendency. The odds of another "lost decade" of negative average real U.S. stock returns are approximately 20% by our calculations; this alone provides a strong case for maintaining fixed income exposure despite a more muted outlook for nominal bond returns.

Asset allocation and the difficulty of predicting the future

We've shown that forecasting stock returns is a difficult endeavor, and essentially impossible in the short term. Even over longer time horizons, many metrics and rough "rules of thumb" commonly assumed to have predictive ability have had little or no power in explaining the long-run equity return over inflation. Although valuations have been the most useful measure in this regard, even they have performed modestly, leaving nearly 60% of the variation in long-term returns unexplained. What predictive power valuations do have is further clouded by our observation that different valuations, although statistically equivalent, can produce different "point forecasts" for future stock returns.

This underscores a key principle in Vanguard's approach to investing: *The future is difficult to predict*. As such, we encourage investors not to focus on the "point forecasts" that result from various forecasting models and instead turn their attention to the *distribution of potential future outcomes*.

Once future prospects are viewed in a distributional framework, the benefits of strategic asset allocation become clear. A focus on the distribution of possible outcomes highlights the benefits and trade-offs of changing a stock allocation: Stocks have a higher *average* expected return than many less-risky asset classes, but with a much wider *distribution*, or level of risk. Diversifying equities with an allocation to fixed income assets can be an attractive option for those investors interested in mitigating the "tails" in this wide distribution, and thereby treating the future with the humility it deserves.

12 See Davis and Aliaga-Díaz (2012).

Appendix

Data definitions and sources

Corporate profit margins. 12-month average of corporate profits with inventory valuation and capital consumption adjustments, as a percentage of nominal GDP, interpolated to monthly, from the Bureau of Economic Analysis.

Dividend yield. From Robert Shiller's website: Nominal price over the prior 12 months; nominal dividend payments.

Government debt. Gross federal government debt comes from U.S. Census Bureau Historical Statistics of the United States for January 1915–December 1975; from the U.S. Bureau of Public Debt thereafter. It is measured as a percentage of nominal GDP, from the same sources as real GDP above, interpolated to monthly.

Price/earnings ratios. From Robert Shiller's website.

- P/E1: Nominal price over the prior 12 months, average nominal earnings.
- P/E10: Real price over the prior 120 months, average real earnings.
- Various X-year cyclical adjustments: Real price over the prior X years' average real earnings.

Real GDP (gross domestic product). U.S. Census Bureau Historical Statistics of the United States from January 1916 through December 1928; U.S. Bureau of Economic Analysis thereafter. Series is interpolated to monthly.

- "Consensus" is defined as the 36-month trailing annualized growth rate.
- "Trend" is defined as the 120-month trailing annualized growth rate.

Real earnings. From Robert Shiller's website.

- "Consensus" is defined as the 36-month trailing annualized growth rate.
- "Trend" is defined as the 120-month trailing annualized growth rate.

10-year Treasury yield. From Robert Shiller's website for January 1926–March 1953; U.S. Federal Reserve H.15 statistical release thereafter.

U.S. Consumer Price Index. From Robert Shiller's website for January 1926–December 1946; thereafter, U.S. Bureau of Labor Statistics CPI-U (Consumer Price Index for All Urban Consumers).

U.S. rainfall. 120-month trailing average of monthly U.S. total precipitation; data from the National Oceanic and Atmospheric Administration's National Climatic Data Center.

U.S. stock market returns. S&P 90 from January 1926 through March 3, 1957; S&P 500 Index from March 4, 1957, through December 1974; Dow Jones Wilshire 5000 Index from January 1957 through April 22, 2005; MSCI US Broad Market Index thereafter. Returns are geometrically annualized and converted to real terms using the CPI data described above.

Vanguard Capital Markets Model

The Vanguard Capital Markets Model (VCMM) is a proprietary, state-of-the-art financial simulation tool developed and maintained by Vanguard's Investment Counseling & Research and Investment Strategy Groups. The VCMM uses a statistical analysis of historical data for interest rates, inflation, and other risk factors for financial markets to generate forward-looking distributions of expected long-term returns.

The VCMM is grounded on the empirical view that the returns of various asset classes reflect the compensation investors receive for bearing different types of systematic risk (or beta). Using a long span of historical monthly data, the VCMM estimates a dynamic statistical relationship among risk factors and asset returns. Based on these calculations, the model uses regression-based Monte Carlo simulation methods to project relationships in the future. By explicitly accounting for important initial market conditions when generating its return distributions, the VCMM framework departs fundamentally from more basic Monte Carlo simulation techniques found in certain financial software. The reader is directed to the research paper *Vanguard Capital Markets Model* (Wallick et al., 2009) for further details.

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ICRFSR 102012