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PVGO and expected stock returns

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INTRODUCTION

Forecasting stock returns successfully and consistently over time is arguably the holy grail of academics and practitioners. Whether the holy grail has been found, however, is a contentious issue on which the jury is largely still out. John Bogle, the late founder of Vanguard, perhaps attempting to summarize widely diverging points of view, argued with his characteristic down-to-earth perspective that

> "the performance of individual securities is unpredictable, … the performance of portfolios of securities is unpredictable on any short-term basis … Yet when we look at portfolios of securities on a longer-term basis, the unpredictable becomes far more predictable …"[1]

Taking a cue from Bogle, this article focuses on a variable to forecast broad portfolios of securities markets over the relative long term, 10 years. The variable highlighted here, the present value of growth opportunities (PVGO), has rarely been used to forecast stock market returns despite the fact that its underlying intuition makes it an ideal candidate for the job. In a nutshell, this variable reflects how much investors pay for expected growth; hence, when coupled with evidence showing that investors tend to get overly excited or gloomy when companies perform well or badly, thus resulting in overvalued or undervalued stocks, a high PVGO forecasts low stock returns, and a low PVGO forecasts high stock returns.

The evidence discussed here clearly supports the hypothesis of a negative relationship between PVGO and stock market returns. In fact, PVGO is more highly correlated to forward returns than are some widely used valuation multiples, such as the dividend yield (D/P) and the price-earnings (P/E) ratio. In terms of out-of-sample forecasting, both the PVGO and the multiples considered here have the tendency to underestimate stock returns.

[1] Bogle, John. 1991. "Investing in the 1990s." *Journal of Portfolio Management* 17(3): 5-14.

THE ISSUE

A glimpse of the literature

Few issues in finance have attracted more attention than the discussion about investors' ability to forecast stock returns. The literature is simply massive and the variety of results makes it possible to find a large number of articles by respected scholars justifying opinions on either side of the fence.[2]

The literature on behavioral biases and their impact on asset prices is also extensive. Most relevant to the issues discussed here are De Bondt and Thaler's (1985),[3] which suggests that investors overreact to current information, turning excessively optimistic or pessimistic when companies perform well or poorly, leading stocks to become overvalued or undervalued. Consistent with this hypothesis, they find that portfolios of prior "losers" outperform portfolios of prior "winners" by a substantial margin.

Also relevant to the issues discussed here is the 1994 paper by Lakonishok et al (1984), who find that value stocks outperform glamour (growth) stocks and argue that a likely reason is that investors consistently overestimate the future growth rate of glamour stocks. They also find that investor expectations of future growth are excessively tied to past growth despite the fact that growth rates are clearly mean reverting; in other words, investors expect fast-growing companies to keep growing at fast rates, and when that, typically, does not happen, stock returns disappoint.[4]

In a nutshell, then, the evidence seems to suggest that despite the fact that growth rates are mean reverting, investors have the

[2] For excellent overviews and as well as their own assessments, of the most influential references see, Cochrane, John. 2011. "Presidential Address: Discount Rates," *Journal of Finance* 66(4): 1047-1108; Harvey, Campbell, Yan Liu, and Heqing Zhu. 2016. "… and the Cross-Section of Expected Returns." *Review of Financial Studies* 29(1): 5-68; Feng, Guanhao, Stefano Giglio, and Dacheng Xiu. 2020. "Taming the Factor Zoo: A Test of New Factors." *Journal of Finance* 75(3): 1327-1370.

[3] De Bondt, Werner and Richard Thaler. 1985. "Does the Stock Market Overreact?" *Journal of Finance* 40(3): 793-805.

[4] On related research, in a 2009 paper, Robert Arnott et al. find that investors tend to pay too much for stocks with superior growth prospects (and too little for those with inferior growth prospects). See, Arnott, Robert, Feifei Li, and Katrina Sherrerd. 2009. "Clairvoyant Value and the Value Effect." *Journal of Portfolio Management* 35(3): 12-26.

tendency to extrapolate recent fast growth far into the future, leading stocks to become overvalued and therefore delivering disappointing returns; hence, the more investors pay for expected growth, which can be measured with the PVGO metric at the heart of this article, the lower are the long-term stock market returns.

Finally, the issues discussed here are also related to a series of articles that *Fortune* magazine used to run highlighting the best and worst wealth creators based on Stern Stewart's Economic Value Added (EVA) metric.[5] Those articles discussed the "sanity test" defined as the percent of a company's market value based on future growth, which is very similar to the PVGO/P ratio discussed below.

The present value of growth opportunities (PVGO)

The market value of a company can be broken down into two components, the market value of the assets already in place and the present value of future investments opportunities.[6] The former is usually expressed as the present value of current earnings, discounted at the required return on equity; the latter is typically referred to as the PVGO. Formally,

$$P = EPS/R + PVGO \quad (1)$$

where P and EPS are a company's current price per share and earnings per share, R is the required return on equity, and PVGO is the present value of growth opportunities, the variable highlighted in this article.

Expression (1) essentially says that the value of a company is based on its current reality and its growth perspectives. The former is given by the present value of the company's current earnings per share, assuming they will remain constant in perpetuity (EPS/R); the latter is given by the present value of earnings expected to grow beyond their current level.[7] This second component is the variable proposed here to forecast long-term stock market returns.

Exhibit 1 shows, for the S&P 500 at selected points in time, the relevant variables in Expression (1) including the value of the S&P 500, its earnings per share, its required return, the value of the assets in place, the PVGO, and the proportion of the price paid based on expected growth opportunities (PVGO/P). The figures show that at the end of the 1970s investors were pessimistic about growth opportunities and therefore paying less than the value of the assets in place; conversely, at the end of 2019, as well as at the end of 2021, investors were optimistic about growth opportunities and therefore paying a premium of more than 50% over the value of the assets in place.

The hypothesis to be tested here is that a high (low) PVGO/P forecasts low (high) long-term stock market returns. In other words, the higher the proportion of the price paid that is based not on current reality but on growth expectations, the lower is the expected return. The link between PVGO/P and expected returns is given, as already discussed, by the tendency of investors to extrapolate recent growth rates far into the future despite the fact that growth rates are mean reverting. If investors tend to assume that recent growth rates will persist in the future, stocks will tend to be overvalued (undervalued) during times of fast (slow) growth, which in turn leads to the negative relationship between PVGO/P and stock returns.

EVIDENCE

Data and methodology

The metric at the heart of this article is the PVGO that follows from Expression (1), and more precisely, the PVGO/P ratio; that is, the proportion of the price paid that is based on expectations of future growth. Data for the US stock market is based on the S&P 500 between December 1871 and December 2021, downloaded from Robert Shiller's web page.[8] The first step of the analysis consists of calculating the annualized return for the 10-year period between 1872 and 1881 in order to have a first estimate of the required return on equity (R). The first PVGO is calculated at the end of 1881 as the difference between the value of the S&P 500 (P) at the end of 1881 and EPS/R, with the numerator being the earnings per share of the S&P 500 at the end of 1881 and the denominator being the required return on equity over the 1872–1881 period.

Also at the end of 1881 the annualized return over the 1882–1891 period is calculated, thus obtaining a first estimate of a 10-year forward return. This results in the first pair of observations, the PVGO/P at the end of 1881 and the 10-year annualized return that followed that PVGO/P. The same process is repeated year after year until the data runs out. More precisely, at the end of each year R is estimated using an expanding window that adds one additional observation every year; the end-of-the-year values of P and EPS are used to calculate PVGO/P; and the 10-year forward returns that followed each PVGO/P are calculated. The last pair of observations are the PVGO/P at the end of 2011 and the forward annualized return over the 2012–2021 period. This process yields 131 observations for each of the two relevant variables.

RESULTS

A first glimpse of the explanatory power of the variable proposed here can be obtained from Exhibit 2, which shows the relationship between PVGO/P and forward annualized returns; panel A is based on nominal returns and panel B on real (inflation-adjusted) returns. The horizontal axis shows five brackets of PVGO/P ratios, and the vertical axis measures 10-year forward annualized returns. In both panels the relationship is clear; the higher is PVGO/P, the lower are the subsequent returns.

[5] See, for example, Geoffrey Colvin. 2000. "America's Best & Worst Wealth Creators." *Fortune*, December 18, 207-216; and David Stires. 2001. "America's Best & Worst Wealth Creators." *Fortune*, December 10, 137-142.

[6] Stewart Myers. 1977. "Determinants of Corporate Borrowing." *Journal of Financial Economics* 5(2): 147-175.

[7] Although Expression (1) is the typical way of presenting the PVGO model, it is clear that the value of a company is given by the present value of its expected *cash flows*, not earnings. More on this later when discussing variations of the model for its empirical implementation.

[8] http://www.econ.yale.edu/~shiller/data.htm

EXHIBIT 1 PVGO and PVGO/P

Year-end	P	EPS	R	EPS/R	PVGO	PVGO/P
1979	107.80	14.86	8.1%	184.32	(76.52)	(71.0)%
1989	348.60	22.87	8.8%	259.90	88.70	25.4%
1999	1428.68	48.17	9.5%	508.01	920.67	64.4%
2009	1110.38	50.97	8.7%	585.21	525.17	47.3%
2019	3176.75	139.47	9.0%	1547.33	1629.42	51.3%
2021	4674.77	197.87	9.2%	2153.15	2521.62	53.9%

This exhibit shows the value of the S&P 500 (P) at selected points in time, as well as its earnings per share (EPS), required return (R), value of the assets in place (EPS/R), present value of growth opportunities (PVGO), and proportion of the price paid based on expected growth opportunities (PVGO/P).

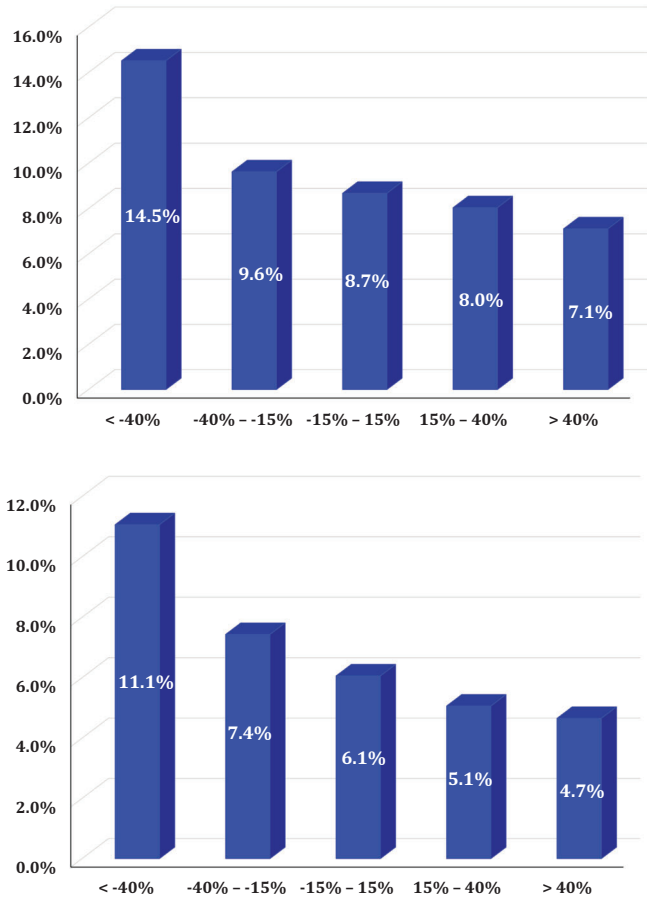

EXHIBIT 2 PVGO/P sorts

Exhibit 2 shows, for the S&P 500 over the 1872–2021 period, brackets of PVGO/P in the horizontal axis and 10-year forward annualized returns on the vertical axis. Panel A is based on nominal returns and panel B on real (inflation-adjusted) returns. The figures on the bars indicate the average 10-year forward annualized return across all the observations in each bracket.

To elaborate, panel A shows that across all the years that start with a PVGO/P lower than –40%, the average 10-year forward annualized return has been 14.5%. On the other hand, across all the years that start with a PVGO/P higher than 40%, the average 10-year forward annualized return has been more than half as low, at 7.1%. The rest of the bars in both panels is interpreted in the same way.

A second perspective on the explanatory power of the variable proposed here can be obtained from Exhibit 3, which shows correlations between PVGO/P and forward annualized returns over the whole sample period; panel A is based on nominal returns and panel B on real returns. As these figures show, the correlation between PVGO/P and nominal returns (–0.44) and that between PVGO/P and real returns (–0.44) is clearly significant.

The exhibit also shows correlations for three widely-used multiples, namely, the dividend yield (D/P), the price-earnings (P/E) ratio, and the cyclically-adjusted P/E ratio (CAPE).[9] As the figures show, PVGO/P is more highly correlated to forward returns than both D/P and P/E, and slightly less highly correlated than CAPE. In all cases the sign of the correlations are those expected; that is, negative for PVGO/P, P/E, and CAPE, and positive for D/P.

The correlations in Exhibit 3 do not change substantially if earnings and dividends are lagged 3 months to allow for their availability in real time. The correlations between PVGO/P and returns do decrease markedly (to –0.19 and –0.30 for nominal and real returns), however, if EPS in Expression (1) is replaced by DPS in order to have a better measure of cash flow. Finally, all the correlations shown in the exhibit go down if returns are forecasted over shorter 5-year periods, and the results are mixed (some correlations go slightly up and some slightly down) if returns are forecasted over longer 15-year periods.

The out-of-sample forecasting ability of PVGO/P and the three other multiples considered in this article is evaluated with regressions given by the expression:

$$F_{t+1} = \alpha + \beta \cdot V_t + u_t \qquad (2)$$

where F denotes 10-year forward annualized returns, V denotes one of the four explanatory variables considered here (PVGO/P, D/P, P/E, and CAPE), u is an error term, α and β are coefficients to be estimated, and t indexes time. More precisely, for any given variable V, a series of one-step-ahead forecasts are produced as follows:

- First estimate α and β using data over the 1881–1945 period.
- Use the α and β estimated to produce an annualized return forecast over the 1946–1955 period.
- Compare that forecast to the observed annualized return over the same (1946–1955) period.

[9] On related research, in a 2009 paper, Robert Arnott et al. find that investors tend to pay too much for stocks with superior growth prospects (and too little for those with inferior growth prospects). See, Arnott, Robert, Feifei Li, and Katrina Sherrerd. 2009. "Clairvoyant Value and the Value Effect." *Journal of Portfolio Management* 35(3): 12-26.

EXHIBIT 3 Correlations

	A: Nominal returns				B: Real returns			
	PVGO/P	D/P	P/E	CAPE	PVGO/P	D/P	P/E	CAPE
Correlation	–0.44	0.29	0.35	0.54	0.44	0.39	0.31	0.52
t-statistic	–5.63	3.47	4.30	7.23	5.51	4.80	3.76	6.82
p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

This exhibit shows, for the S&P 500 over the 1872–2021 period, correlations between 10-year forward annualized returns and four variables, namely, PVGO/P, the dividend yield (D/P), the price-earnings (P/E) ratio, and the cyclically-adjusted P/E ratio (CAPE). Panel A is based on nominal returns and panel B on real (inflation-adjusted) returns.

EXHIBIT 4 Forecasts

	A: Nominal returns			B: Real returns		
	Forecast	Observed	Difference	Forecast	Observed	Difference
PVGO/P	7.5%	11.0%	–3.4%	5.1%	7.2%	–2.1%
D/P	7.3%	11.0%	–3.7%	4.2%	7.2%	–3.0%
P/E	7.8%	11.0%	–3.2%	5.4%	7.2%	–1.8%
CAPE	7.3%	11.0%	–3.6%	4.9%	7.2%	–2.3%

This exhibit shows, for the S&P 500, average forecasts from Expression (2) over 66 10-year periods beginning with 1946–1955 and ending with 2012–2021, with PVGO/P, dividend yield (D/P), price-earnings (P/E) ratio, and cyclically-adjusted P/E ratio (CAPE) as explanatory variables.

- Re-estimate α and β using an expanded window over the 1881–1946 period.
- Use the α and β estimated to produce an annualized return forecast over the 1947–1956 period.
- Compare that forecast to the observed annualized return over the same (1947–1956) period.
- Repeat until the data runs out.

This iterative process generates 66 forecasts of 10-year annualized returns, which can be compared to observed 10-year annualized returns; the first comparison is for the 1946–1955 period and the last one is for the 2012–2021 period. Exhibit 4 summarizes the average forecast from each of the variables considered, the average observed return, and the difference between the two for both nominal (panel A) and real (panel B) returns.

All four variables tend to underestimate the observed returns, both in real and nominal terms. PVGO/P has slightly lower average errors than D/P and CAPE and slightly higher than the P/E for nominal returns, with rather similar results for real returns.

ASSESSMENT

The importance of forecasting stock returns accurately can hardly be overstated, although that does not necessarily imply that we have perfect tools for the job. A massive literature on the subject has resulted in a very large number of variables and models being proposed, but successful and consistent forecasting remains elusive. The humble goal of this article is to propose yet another variable, albeit one that has a plausible underlying justification.

The PVGO, a measure of how much investors pay not for the market's current reality but for expected growth beyond that, is the variable proposed in this article to forecast long-term stock market returns. Given that investors tend to overpay (underpay) for stocks during periods of fast (slow) growth, likely extrapolating future growth from past growth, and given the well-established pattern of mean reverting growth, the hypothesis here is that the higher is the proportion of the price paid based on growth expectations (PVGO/P), the lower are the expected returns.

The long-term evidence discussed here for the US market is consistent with this hypothesis. In fact, not only is it the case that periods that begin with high (low) PVGO/P are characterized by low (high) subsequent stock returns, but it is also the case that PVGO/P is more correlated to long-term stock market returns than widely used multiples such as D/P and P/E. That said, all four predictors discussed here tend to underestimate returns.

The search for variables that can help forecast stock returns successfully and consistently has a long history. In fact, nothing seems to indicate that the search has slowed down, let alone concluded. Many variables have been proposed for the job and surely many others will be. This article aims to add yet another tool to the forecasting toolkit, a variable supported by both underlying plausibility and empirical evidence.

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