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.

Available online at www.sciencedirect.com
ScienceDirect
Journal of Banking & Finance 32 (2008) 820–833
Journal of BANKING & FINANCE
www.elsevier.com/locate/jbf

An examination of Value Line's long-term projections

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Received 22 June 2005; accepted 11 June 2007
Available online 24 August 2007

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.

0378-4266/$ - see front matter
doi:10.1016/j.jbankfin.2007.06.002

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

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

where $\mathrm{VLEPS}_{i,t+4}$ is Value Line's predicted EPS for 3–5 calendar years after the publication date for firm i, and $\mathrm{EPS}_{i,t-1}$ 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

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

where $\mathrm{EPS}_{i,t+n}$ 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

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

where $\mathrm{VLPM}_{it,t+4}$ 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

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

where $\mathrm{EY}_{i,t}$ is the forecasted EPS for the publication year divided by the current stock price as reported in Value Line, $\mathrm{VLEY}_{i,t+4}$ 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 $\mathrm{EY}_{i,t+n}$ 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:					
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:		
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

We thank Richard Mendenhall, David Peterson and two anonymous reviewers for helpful comments and suggestions on previous versions of this paper.

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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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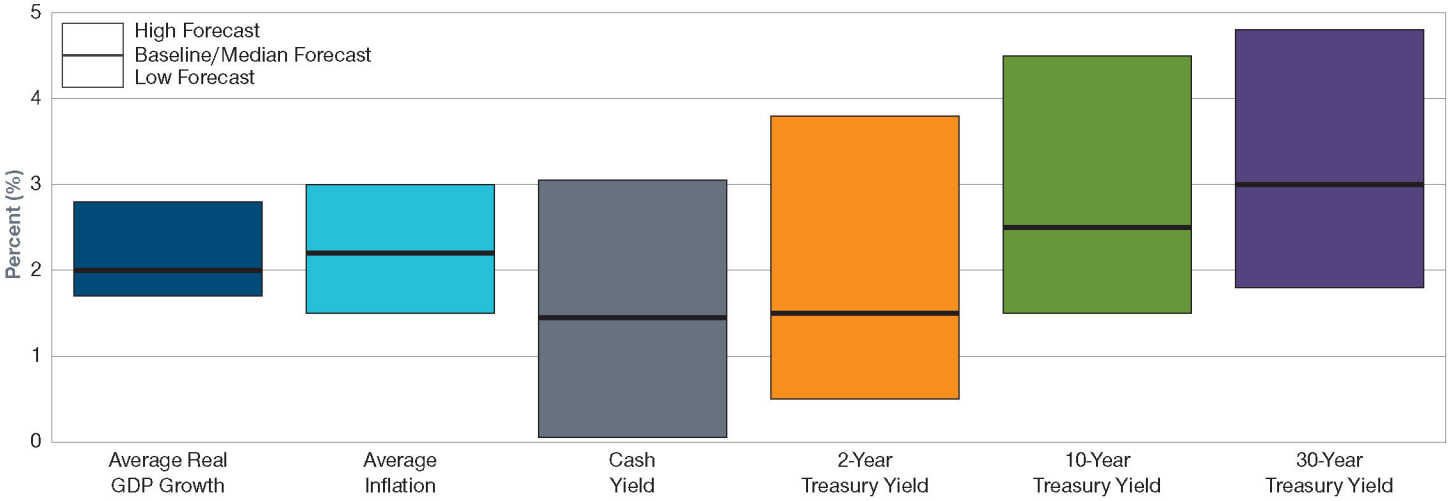
(Figures in U.S. Dollars)

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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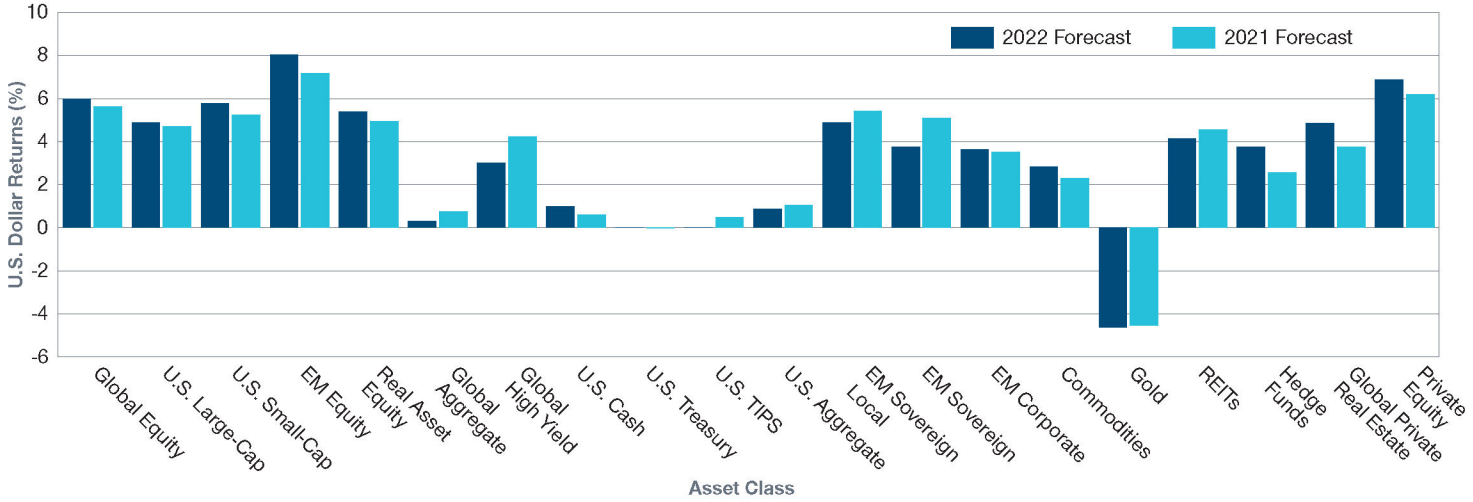
(Figures in U.S. Dollars)

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.

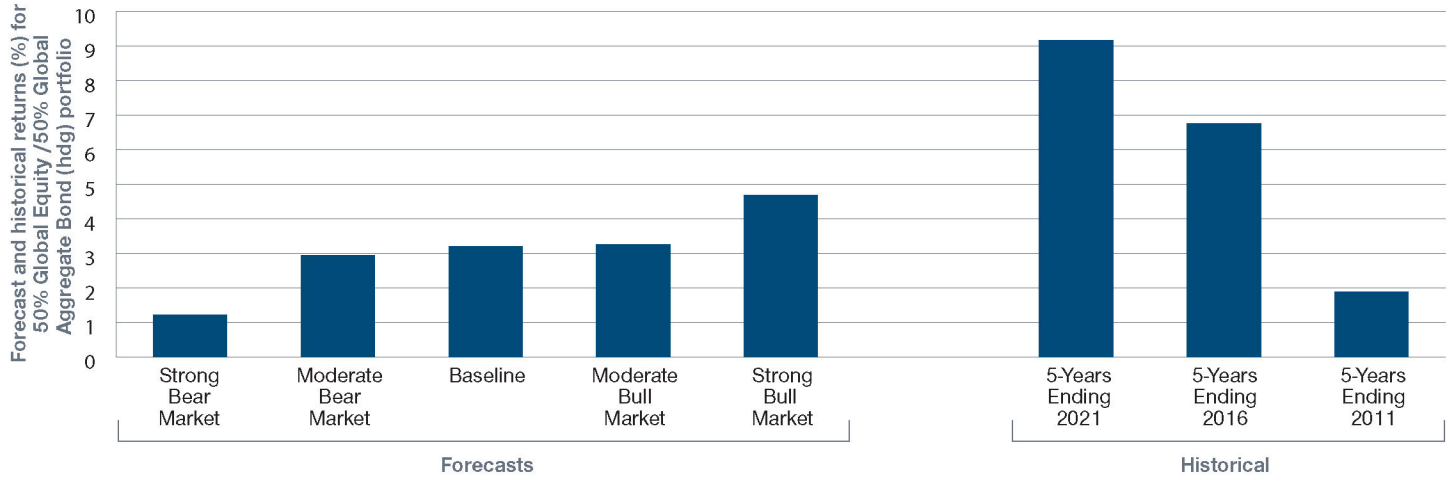
Our higher return expectations for commodities logically follow from our inflation forecasts. Our expectations for private assets continue to include a slight liquidity premium, but we believe they will not offer dramatically higher returns than their public market equivalents. We continue to expect 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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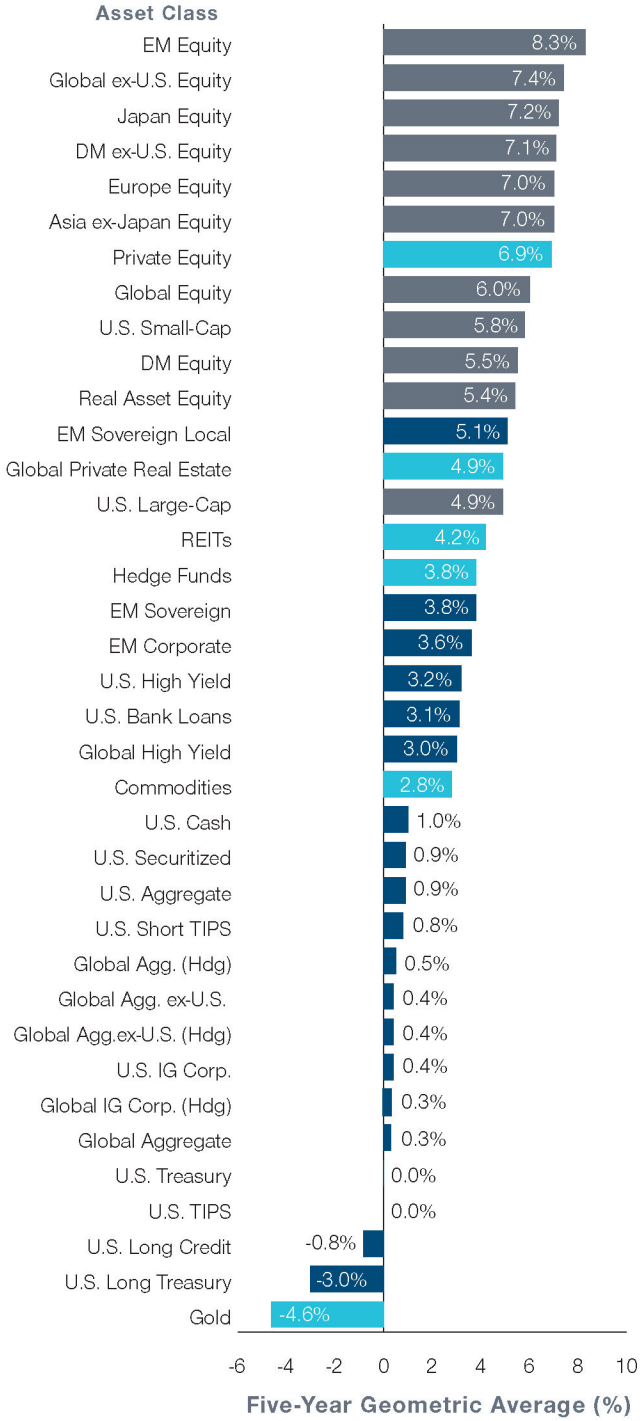
(Figures in U.S. Dollars)

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

CURRENCY | U.S. DOLLAR

(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

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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. ex-U.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

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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
	Global ex-U.S. Equity																			19.2
	DM Equity																			17.1
	DM ex-U.S. Equity																			18.6
	U.S. Large-Cap Equity																			16.6
	U.S. Small-Cap Equity																			21.9
	Europe Equity																			20.0
	Asia ex-Japan Equity																			21.3
	Japan Equity																			16.2
	EM Equity																			22.9
	Real Asset Equity																			22.0
FIXED INCOME	Global Aggregate																			5.6
	Global Aggregate (Hdg)																			2.9
	Global Agg. ex-U.S.																			8.0
	Global Agg. ex-U.S. (Hdg)																			2.9
	Global IG Corporate (Hdg)																			4.9
	Global High Yield																			12.0
	U.S. Cash																			0.8
	U.S. Treasury																			4.9
	U.S. TIPS	1.0																		4.8
	U.S. Short TIPS	0.8	1.0																	3.2
	U.S. IG Corporate	0.5	0.2	1.0																6.0
	U.S. Long Credit	0.5	0.1	1.0	1.0															9.6
	U.S. Long Treasury	0.4	-0.2	0.3	0.5	1.0														13.4
	U.S. Aggregate	0.6	0.1	0.7	0.8	0.8	1.0													3.3
	U.S. High Yield	0.3	0.5	0.6	0.4	-0.5	0.0	1.0												10.8
	U.S. Bank Loans	0.2	0.6	0.4	0.2	-0.6	-0.2	0.9	1.0											10.5
	U.S. Securitized	0.7	0.3	0.5	0.6	0.7	0.9	0.0	-0.1	1.0										2.4
	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
	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
	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
	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
	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
	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
	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
	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

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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

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:

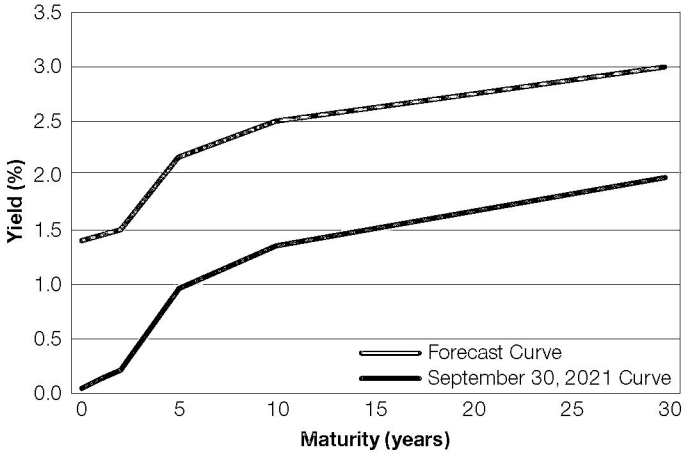
Average yield = (current yield + forecast yield) / 2

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

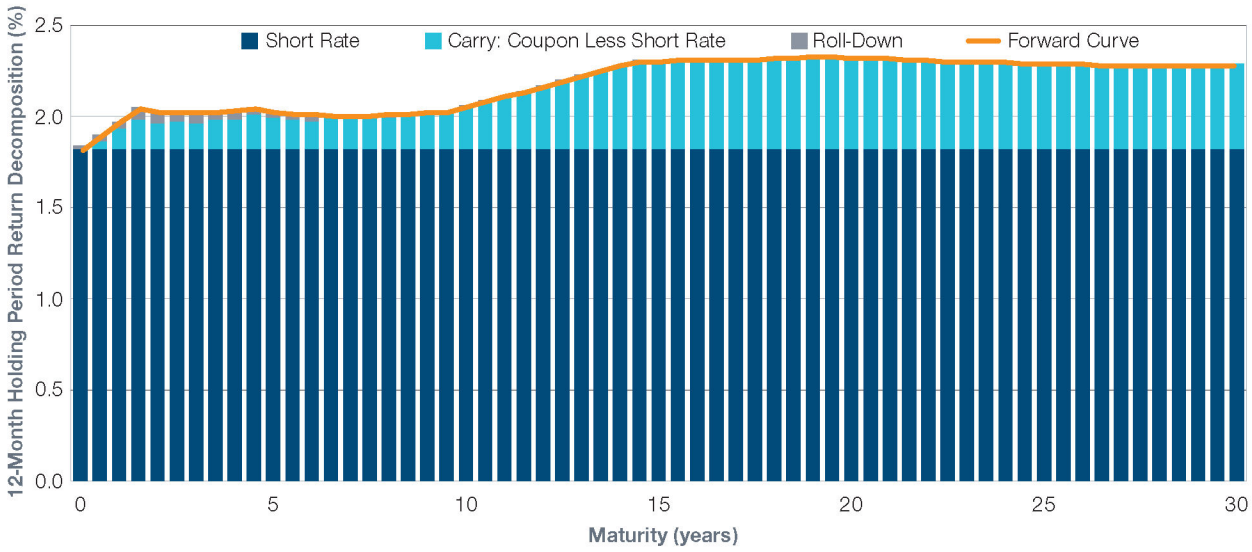
3. Third, we calculate the average annual change in yield due to rolling down the curve (roll-down change):

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

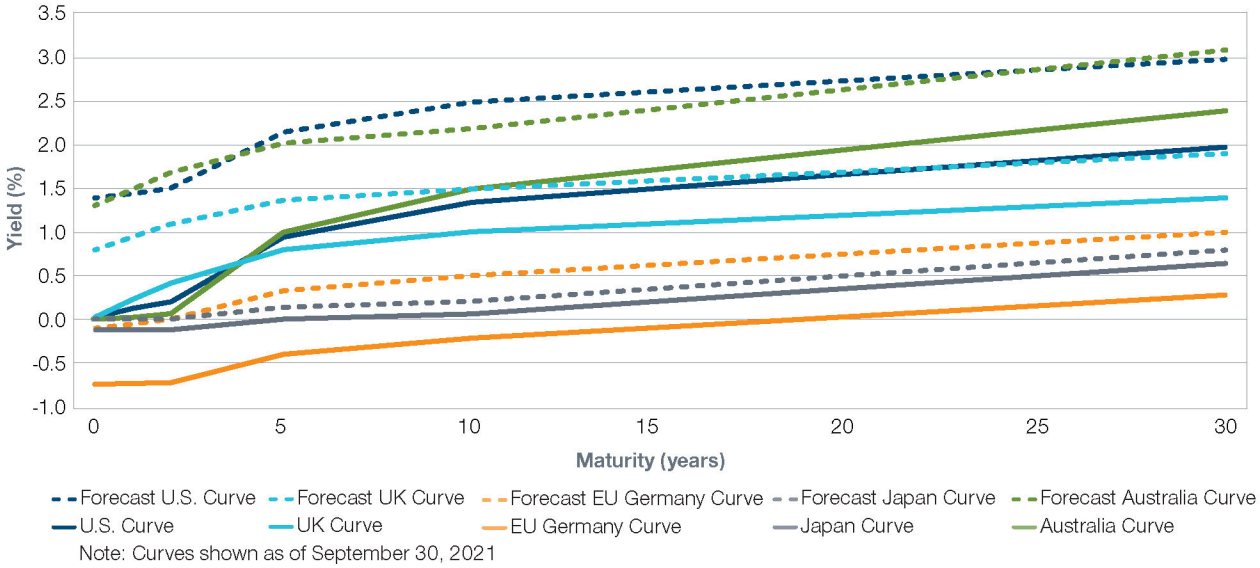
Comment on Durations

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

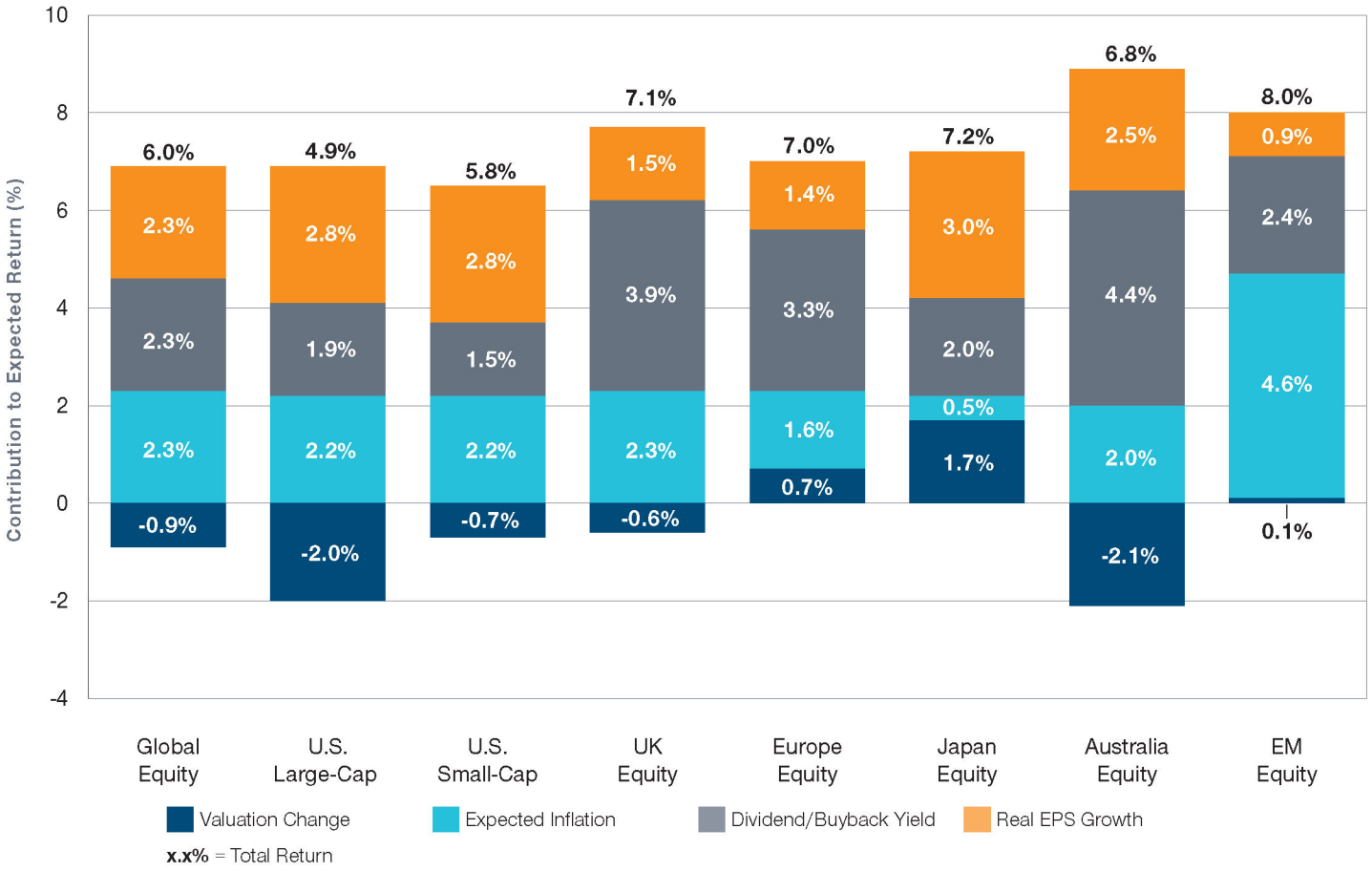
For each equity asset class, the above inputs are used to calculate expected average annual returns, according to vthe equation:

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:

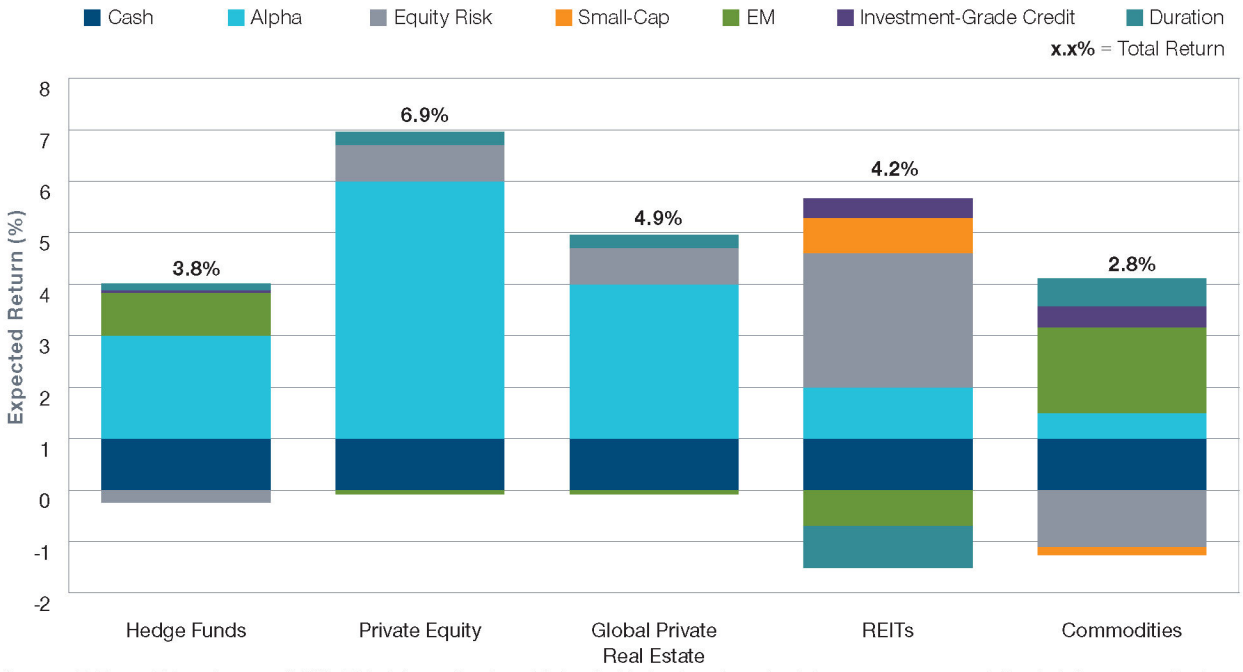
- Equity risk premium (Equity return in excess of cash)
- Small-cap premium (Small-cap return in excess of large-cap)
- EM premium (EM equity return in excess of DM equity)
- Investment-grade credit premium (Investment grade credit return in excess of duration matched government bonds)
- Duration premium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

METHODOLOGY

Scenarios

Point estimates of future returns are implicitly accompanied by some level of uncertainty. For that reason, we have constructed four additional sets of capital market assumptions that represent strong bear, moderate bear, moderate bull, and strong bull outlooks. These scenarios are intended to bookend our baseline scenarios, allowing for consideration of a range of economic and return scenarios.

The scenarios are underpinned by the belief that the level of aggregate investor risk appetite is the primary driver of investment returns over short- to medium-term horizons. With this in mind, our scenario generation process begins by analyzing historical periods of differing investor sentiment towards risk. Using global equity returns as a proxy for risk, we divide the past 15 years of common asset class performance into quartiles and estimate the volatility of each asset class and its correlation to global equities during those periods. This approach explicitly acknowledges that average correlations ands volatilities do not adequately represent asset class behaviors during all risk regimes. We then divide the past 30 years of rolling 5-year periods into quartiles and reconstruct the broader set of asset class returns using their previously estimated volatilities and correlations. These quartiles correspond to the strong bear, moderate bear, moderate bull, and strong bull market scenarios.

The resulting asset class returns from this quantitative process form the starting point for the Capital Market Assumptions Governance and Investment Committee's oversight. The Committee makes adjustments to returns, often due to structural changes of an asset class that are not reflected through a solely backwards-looking quantitative lens. These qualitative insights are important in assessing the forward-looking potential behavior of investments.

We believe that considering portfolio designs across multiple regimes is necessary for aligning investor objectives and asset allocation.

APPENDIX

APPENDIX
Acknowledgments

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The Capital Market Assumptions Governance and Investment Committee would like to thank the following T. Rowe Price investors for their contribution to the Capital Market Assumptions:

Roy Adkins, Steve Bartolini, Scott Berg, Brian Brennan, Christopher Brown, Sheldon Chan, Archibald Ciganer, Mike Connelly, Rick de los Reyes, Mike Delle Vedova, Christina Dove, Shawn Driscoll, Quentin Fitzsimmons, Erin Garrett, Arif Husain, Randal Jenneke, Niklas Jeschke, Keir Joyce, Andrew Keirle, Shinwoo Kim, Aadish Kumar, Matt Lawton, Alan Levenson, Kevin Loome, Yoram Lustig, Paul Massaro, Colin McQueen, Raymond Mills, Samy Muaddi, Tim Murray, Ken Orchard, Gonzalo Pangaro, Thomas Poullaouec, Larry Puglia, Rodney Rayburn, Darren Scheinberg, Scott Solomon, David Stanley, Hajime Takigawa, Ju Yen Tan, Lauren Wagandt, Michael Walsh, Ernest Yeung, and Josh Yocum.

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APPENDIX

REFERENCE INDEXES

	ASSET CLASS	REPRESENTATIVE INDEX
EQUITY	Global Equity	MSCI ACWI
	Global ex-U.S. Equity	MSCI ACWI ex-USA
	Global ex-Japan Equity	MSCI Kokusai
	Global ex-Australia Equity	MSCI ACWI ex-Australia
	DM Equity	MSCI World
	DM ex-U.S. Equity	MSCI World ex-USA
	U.S. Equity	Russell 3000
	Europe ex-UK Equity	MSCI Europe ex-UK
	UK Equity	FTSE 100
	U.S. Large-Cap Equity	Russell 1000
	U.S. Small-Cap Equity	Russell 2000
	Europe Equity	MSCI Europe
	Asia ex-Japan Equity	MSCI Asia ex-Japan
	Japan Equity	MSCI Japan
	Australia Equity	S&P/ASX 200
	EM Equity	MSCI Emerging Markets
	Real Asset Equity	S&P Real Assets Index
FIXED INCOME	Global Aggregate	Bloomberg Global Aggregate
	Global Aggregate (Hdg)	Bloomberg Global Aggregate (Hdg)
	Global Agg ex-U.S. (Hdg)	Bloomberg Global Aggregate ex-U.S. (Hdg)
	Global Agg ex-U.S.	Bloomberg Global Aggregate ex-U.S.
	Global IG Corporate (Hdg)	Bloomberg Global-Aggregate Corporate (Hdg)
	Global High Yield	Bloomberg Corporate High Yield
	U.S. Cash	Bloomberg 1–3M Treasury Bills
	U.S. TIPS	Bloomberg Global Inflation-Linked U.S. TIPS
	U.S. Short TIPS	Bloomberg Global Inflation-Linked 1-5 Year U.S. TIPS
	U.S. Treasury	Bloomberg U.S. Treasury
	U.S. IG Corporate	Bloomberg U.S. Aggregate Corporate
	U.S. IG Coporate (Hdg)	Bloomberg U.S. Aggregate Corporate (Hdg)
	U.S. Long Credit	Bloomberg U.S. Long Credit
	U.S. Long Treasury	Bloomberg U.S. Long Treasury
	U.S. Aggregate	Bloomberg U.S. Aggregate Bond
	U.S. High Yield	Bloomberg U.S. Corporate High Yield
	U.S. Bank Loans	S&P/LSTA Leveraged Performing Loan
	U.S. Securitized	Bloomberg U.S. Securitized
	UK Cash	Bloomberg Sterling Treasury Bills 0-3 Month
	UK Gilts	Bloomberg UK Gilts
	UK IG Corporate	Bloomberg UK Aggregate Corporate
	Europe Cash	Bloomberg EUR Treasury Bills 0-3 Month
	Europe Treasury	Bloomberg EUR Treasury
	Europe IG Corporate	Bloomberg EUR Aggregate Corporate
	Europe IG Corporate (Hdg)	Bloomberg EUR Aggregate Corporate (Hdg)
	Europe High Yield	Bloomberg EUR High Yield
	Japan Cash	Bloomberg Japan Treasury Bills 1-3 Months
	Japan Treasury	Bloomberg Japan Treasury
	Japan IG Corporate	Bloomberg Japan Aggregate Corporate
	Australia Cash	Bloomberg Ausbond Bank Bill
	Australia Bonds	Bloomberg Ausbond 0+ Composite
	EM Sovereign Local	JP Morgan GBI – EM Global Diversified
	EM Sovereign	JP Morgan EMBI Global Diversified
	EM Corporate	JP Morgan CEMBI
ALTERNATIVES	Hedge Funds	HFRI Fund of Funds Composite
	Private Equity	Cambridge Associates LLC Global Private Equity
	Commodities	Bloomberg Commodity
	Gold	S&P GSCI Gold Total Return
	Global Private Real Estate	NCREIF Property
	REITs	FTSE EPRA/NAREIT Developed

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

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Suedeen G. Kelly, Marc Spitzer,
Philip D. Moeller, and Jon Wellinghoff.

Composition of Proxy Groups for Determining Gas and Oil Pipeline Return on Equity — Docket No. PL07-2-000

PROPOSED POLICY STATEMENT

(Issued July 19, 2007)

1. In this proposed Policy Statement, the Commission is proposing to update its standards concerning the composition of the proxy groups used to decide the return on equity (ROE) of natural gas and oil pipelines. Firms engaged in the pipeline business are increasingly organized as master limited partnerships (MLPs). Therefore, the Commission proposes to modify its current policy regarding the composition of proxy groups to allow MLPs to be included in the proxy group. This proposed Policy Statement explains the standards that the Commission would require to be met in order for an MLP to be included in the proxy group. The Commission proposes to apply its final Policy Statement to all gas and oil pipeline rate cases that have not completed the hearing phase as of the date the Commission issues its final Policy Statement. The Commission intends to decide on a case-by-case basis whether to apply the final Policy Statement in cases that have completed the hearing phase. Finally, the Commission is requesting comments on this proposed Policy Statement. Initial comments are due 30 days after publication of this order in the *Federal Register*, with reply comments due 50 days after publication in the *Federal Register*.

I. Background

2. Since the 1980s, the Commission has used a Discounted Cash Flow (DCF) model to develop a range of returns earned on investments in companies with corresponding risks for determining the ROE for natural gas and oil pipelines. The DCF model was originally developed as a method for investors to estimate the value of securities, including common stocks. It is based on "the premise that a stock is worth the present value of its future cash flows, discounted at a market rate commensurate with the stock's risk."[1] Unlike investors, the Commission uses the DCF model to determine the ROE to be included in the pipeline's rates, rather than to estimate a stock's value. Therefore, the Commission solves the DCF formula for the discount rate, which represents the rate of

[1] *Ozark Gas Transmission System*, 68 FERC ¶ 61,032 at 61,104, n. 16 (1994).

return that an investor requires in order to invest in a firm. Under the resulting DCF formula, ROE equals current dividend yield (dividends divided by share price) plus the projected future growth rate of dividends.

3. The Commission uses a two-step procedure for determining the constant growth of dividends: averaging short-term and long-term growth estimates.[2] Security analysts' five-year forecasts for each company in the proxy group, as published by Institutional Brokers Estimate System (IBES), are used for determining growth for the short term; long-term growth is based on forecasts of long-term growth of the economy as a whole, as reflected in the Gross Domestic Product. The short-term forecast receives a 2/3 weighting and the long-term forecast receives a 1/3 weighting in calculating the growth rate in the DCF model.[3]

4. Most gas pipelines are wholly-owned subsidiaries and their common stock is not publicly traded, and this is also true for some jurisdictional oil pipelines. Therefore, the Commission uses a proxy group of firms with corresponding risks to set a range of reasonable returns for both natural gas and oil pipelines. The Commission then assigns the pipeline a rate within that range or zone, to reflect specific risks of that pipeline as compared to the proxy group companies.[4]

5. The Commission historically required that each company included in the proxy group satisfy the following three standards.[5] First, the company's stock must be publicly traded. Second, the company must be recognized as a natural gas or oil pipeline company and its stock must be recognized and tracked by an investment information service such as Value Line. Third, pipeline operations must constitute a high proportion of the company's business. Until the Commission's 2003 decision in *Williston Basin*

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[2] *Northwest Pipeline Co.,* 71 FERC ¶ 61,309 at 61,989-92 (1995) (Opinion No. 396), 76 FERC ¶ 61,068 (1996) (Opinion No. 396-A), 79 FERC ¶ 61,309 (1997) (Opinion No. 396-B), *reh'g denied*, 81 FERC ¶ 61,036 (1997) (Opinion No. 396-C); *Williston Basin Interstate Pipeline Co.*, 79 FERC ¶ 61,311, *order on reh'g*, 81 FERC ¶ 61,033 (1997), *aff'd in relevant part, Williston Basin Interstate Pipeline Co.,* 165 F.3d 54 (D.C. Cir. 1999)(*Williston Basin*).

[3] The Commission presumes that existing pipelines fall within a broad range of average risk, and thus generally sets pipelines' return at the median of the range. *Transcontinental Gas Pipe Line Corp.,* 84 FERC ¶ 61,084 at 61,423-4 (1998) Opinion No. 414-A, *reh'g*, 85 FERC ¶ 61,323 (1998) (Opinion No. 414-B), *aff'd North Carolina Utilities Commission v. FERC*, 340 U.S. App. D.C. 183 (D.C. Cir) (unpublished opinion).

[4] *Williston Basin* at 57 (*citation omitted*).

[5] *Transcontinental Gas Pipe Line Corp.*, 90 FERC ¶ 61,279 at 61,933 (2000).

Interstate Pipeline Co.,[6] the third standard could only be satisfied if a company's pipeline business accounted for, on average, at least 50 percent of a company's assets or operating income over the most recent three-year period.

6. As a result of mergers, acquisitions, and other changes in the natural gas industry, fewer and fewer interstate natural gas companies have satisfied the third requirement. Thus, in *Williston*, the Commission relaxed this requirement for the natural gas proxy group. Instead, the Commission approved a pipeline's proposal to use a proxy group based on the corporations listed in the Value Line Investment Survey's list of diversified natural gas firms that own Commission-regulated natural gas pipelines, without regard to what portion of the company's business comprises pipeline operations.

7. In *HIOS*[7] and *Kern River*, the only fully litigated section 4 rate cases decided since *Williston*, the Commission again drew the proxy group companies from the same Value Line list. When those cases were litigated, there were six such companies: Kinder Morgan Inc., the Williams Companies (Williams), El Paso Natural Gas Company (El Paso), Equitable Resources, Inc., Questar Corporation, and National Fuel Gas Corporation. The Commission excluded Williams and El Paso on the ground that their financial difficulties had lowered their ROEs to a level only slightly above the level of public utility debt, and the Commission stated that investors cannot be expected to purchase stock if lower risk debt has essentially the same return. This left a four-company proxy group, three of whose members derived more revenue from the distribution business, rather than the pipeline business. In *Kern River*, the Commission adjusted the pipeline's return on equity 50 basis points above the median in order to account for the generally higher risk profile of natural gas pipeline operations as compared to distribution operations.

8. In both *Kern River* and *HIOS*, the Commission rejected pipeline proposals to include MLPs in the proxy group. The pipelines contended that MLPs have a much higher percentage of their business devoted to pipeline operations, than most of the corporations that the Commission currently includes in the proxy group.

9. Unlike corporations, MLPs generally distribute most available cash flow to the general and limited partners in the form of quarterly distributions. Most MLP agreements define "available cash flow" as (1) net income (gross revenues minus operating expenses) plus (2) depreciation and amortization, minus (3) capital investments the partnership must

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[6] *Williston Basin Interstate Pipeline Company*, 104 FERC ¶ 61,036 at P 35, n. 46 (2003).

[7] *High Island Offshore System, L.L.C.*, 110 FERC ¶ 61,043, *reh'g denied*, 112 FERC ¶ 61,050 (2005), *appeal pending*.

make to maintain its current asset base and cash flow stream.[8] Depreciation and amortization may be considered a part of "available cash flow," because depreciation is an accounting charge against current income, rather than an actual cash expense. As a result, the MLP's cash distributions normally include not only the net income component of "available cash flow," but also the depreciation component. This means that, in contrast to a corporation's dividends, an MLP's cash distributions generally exceed the MLP's reported earnings. Moreover, because of their high cash distributions, MLPs usually finance capital investments required to significantly expand operations or to make acquisitions through debt or by issuing additional units rather than through retained cash, although the general partner has the discretion to do so.

10. In rejecting the pipelines' proposals in *HIOS* and *Kern River* to include MLPs in the proxy group, the Commission made clear that it was not making a generic finding that MLPs cannot be considered for inclusion in the proxy group if a proper evidentiary showing is made.[9] However, the Commission pointed out that data concerning dividends paid by the proxy group members is a key component in any DCF analysis, and expressed concern that an MLP's cash distributions to its unit holders may not be comparable to the corporate dividends the Commission uses in its DCF analysis. In *Kern River*, the Commission explained its concern as follows:

> Corporations pay dividends in order to distribute a share of their earnings to stockholders. As such, dividends do not include any return *of* invested capital to the stockholders. Rather, dividends represent solely a return *on* invested capital. Put another way, dividends represent profit that the stockholder is making on its investment. Moreover, corporations typically reinvest some earnings to provide for future growth of earnings and thus dividends. Since the return on equity which the Commission awards in a rate case is intended to permit the pipeline's investors to earn a profit on their investment and provides funds to finance future growth, the use of dividends in the DCF analysis is entirely consistent with the purpose for which the Commission uses that analysis. By contrast, as Kern River concedes, the cash distributions of the MLPs it seeks to add to the proxy group in this case include a return *of* invested capital through an allocation of the partnership's net income. While the level of an MLP's cash distributions may be a significant factor in the unit holder's decision to invest in the MLP, the Commission uses the DCF analysis solely to determine the pipeline's return on equity. The Commission provides for the return of invested capital through a separate depreciation allowance.

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[8] The definition of available cash may also net out short term working capital borrowings, the repayment of capital expenditures, and other internal items.

[9] *Kern River Gas Transmission Company*, 117 FERC ¶ 61,077 (2006) (Opinion No. 486) at P 147, *reh'g pending.*

> For this reason, to the extent an MLP's distributions include a significant return of invested capital, a DCF analysis based on those distributions, without any adjustment, will tend to overstate the estimated return on equity, because the 'dividend' would be inflated by cash flow representing return of equity, thereby overstating the earnings the dividend stream purports to reflect.[10]

11. The Commission stated that it could nevertheless consider including MLPs in the proxy group in a future case, if the pipeline presented evidence addressing these concerns. The order suggested that such evidence might include some method of adjusting the MLPs' distributions to make them comparable to dividends, a showing that the higher "dividend" yield of the MLP was offset by a lower long-term growth projection, or some other explanation why distributions in excess of earnings do not distort the DCF results for the MLP in question. However, the Commission concluded that Kern River had not presented sufficient evidence to address these issues, and that the record in that case did not support including MLPs in the proxy group.

12. In addition, *Kern River* pointed out that the traditional DCF model only incorporates growth resulting from the reinvestment of earnings, not growth arising from external sources of capital.[11] Therefore, the Commission stated that if growth forecasted for an MLP comes from external capital, it is necessary either (1) to explain why the external sources of capital do not distort the DCF results for that MLP or (2) propose an adjustment to the DCF analysis to eliminate any distortion. The Commission's orders in *HIOS* reached the same conclusions.

13. In some oil pipeline rate cases decided before *HIOS* and *Kern River*, the Commission included MLPs in the proxy group used to determine oil pipeline return on equity on the ground that there were no corporations available for use in the oil proxy group.[12] In those cases, no party raised any issue concerning the comparability of an MLP's cash distribution to a corporation's dividend. However, that issue did arise in the first oil pipeline case decided after *HIOS* and *Kern River*, involving SFPP's Sepulveda Line.[13] The Commission approved inclusion of MLPs in the proxy group in that case on the grounds that the MLPs in question had not made distributions in excess of earnings. The Sepulveda Line order therefore analyzed the five MLPs that have been used to determine SFPP's ROE: Buckeye Partners, L.P., Enbridge Energy Partners, L.P., Enron

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[10] *Id.* at P 149-50.

[11] *Id.* at P 152.

[12] *SFPP, L.P.*, 86 FERC ¶ 61,022 at 61,099 (1999).

[13] *SFPP, L.P.*, 117 FERC ¶ 61,285 (2006) (SFPP Sepulveda order), *rehearing pending*.

Gas Liquids (Enron),[14] TEPPCO Partners, L.P., and Kaneb Partners, L.P. (later Valero Partners), now NuStar Energy, L.P. The order reviewed each entity for the year 1996 and the previous four years, and held that four of the firms had had income (earnings) in excess of distributions and that their incomes (earnings) were stable over that period with minor exceptions. The order found these facts sufficient to address the concerns expressed in *HIOS* and *Kern River*. The fifth firm, Enron, had distributions in excess of income (earnings) in four of the five years. While the Commission did not preclude use of such MLPs, Enron did not meet the *HIOS* test and was excluded as unrepresentative.

II. Discussion

14. As discussed below, the Commission proposes to permit inclusion of MLPs in a proxy group. However, the Commission proposes to cap the "dividend" used in the DCF analysis at the pipeline's reported earnings, thus adjusting the amount of the distribution to be included in the DCF model. The Commission would leave to individual cases the determination of which MLPs and corporations should actually be included in the natural gas or oil proxy group. However, participants in these cases should include as much information as possible regarding the business profile of the firms they propose to include in the proxy group, for example, based on gross income, net income, or assets.

15. The Supreme Court has stated that "the return to the equity owner should be commensurate with the return on investments in other enterprises having corresponding risks. That return, moreover, should be sufficient to assure confidence in the financial integrity of the enterprise, so as to maintain its credit and to attract capital."[15] The Commission is concerned that its current approach to determining the composition of the proxy group for determining gas and oil pipeline return on equity is, or will, require the use of firms which are less and less representative of either natural gas or oil pipeline business risk.

16. As has been discussed, there are fewer and fewer publicly traded diversified natural gas corporations that have interstate gas pipelines as their predominant business line, whether this is measured on a revenue, income, or asset basis. As such, there are fewer diversified natural gas companies available for inclusion in a natural gas pipeline proxy group which may reasonably be considered representative of the risk profile of a natural gas pipeline firm. Moreover, at this point the only publicly traded oil pipeline firms are controlled by MLPs, which makes the issue of a representative proxy group more acute.

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[14] Enron Gas Liquids was not affiliated with Enron, Inc. at that time, but was a former affiliate that was spun off in the early 1990's.

[15] *FPC v. Hope Natural Gas Co.*, 320 U.S. 591 (1944); *Bluefield Water Works & Improvement Co. v. Public Service Comm'n*, 262 U.S. 679 (1923).

17. Cost of service ratemaking requires that the firms in the proxy group be of comparable risk to the firm whose equity cost of capital is at issue in a particular rate proceeding. If the proxy group is less than clearly representative, this may require the Commission to adjust for the difference in risk by adjusting the equity cost-of-capital, a difficult undertaking requiring detailed support from the contending parties and detailed case-by-case analysis by the Commission. Expanding a proxy group to include MLPs whose business is more narrowly focused on pipeline activities would help ameliorate this problem. Thus, including MLP natural gas pipelines in the equity proxy group should reduce the need to make adjustments since the proxy group is more likely to contain firms that are representative of the regulated firm whose rates are at issue. Including MLPs will also recognize the trend to greater use of MLPs in the natural gas pipeline industry and address the reality of the oil pipeline industry structure.

18. The Commission's primary concern about including MLPs in the proxy group has arisen from the interaction between use of the DCF analysis to determine return on capital while relying on a depreciation allowance for return of capital. The Commission permits a pipeline to recover through its rates both a return *on* equity and a return *of* invested capital. The Commission uses the DCF analysis solely to determine the return *on* equity component of the cost-of-service. The Commission provides for the return *of* invested capital through a separate depreciation allowance. Given the purpose for which the Commission uses the DCF analysis, the cash flows included in that analysis must be limited to cash flows which may reasonably be considered to reflect a return *on* equity. Such cash flows include that portion of an MLP's cash distribution derived from net income, or earnings.

19. To the extent an MLP makes distributions in excess of earnings, it is able to do so because partnership agreements define "cash available for distribution" to include depreciation. This enables the MLP to make cash distributions that include return *of* equity, in addition to return *on* equity. However, because the Commission includes a separate depreciation allowance in the pipeline's cost-of-service, a DCF analysis including cash flows attributable to depreciation would permit the pipeline to double recover its depreciation expense, once through the depreciation allowance and once through an inflated ROE. Adjusting an MLP's cash distribution to exclude that portion of the distribution in excess of earnings addresses this problem.

20. The Commission recognizes that it raised several concerns in *Kern River* as to whether adjusting the MLP's cash distribution down to the level of its earnings would be sufficient to eliminate the distorting effects of including MLPs in the proxy group. The Commission pointed out that corporations generally do not pay out all of their earnings in dividends, but retain some earnings in order to generate future growth. The Commission also suggested that the DCF model is premised on growth in dividends deriving from reinvestment of current earnings, and does not incorporate growth from external sources, such as issuing debt or additional stock.

21. The Commission believes that these concerns should not render unreliable a DCF analysis using the adjusted MLP results. The market data for the MLPs used in the DCF analysis should itself correct for any distortions remaining after the adjustment to the cash distribution described above. For example, the IBES growth projections represent an average of the growth projections by professionals whose business is to advise investors.[16] The level of an MLP's cash distributions as compared to its earnings is a matter of public record and thus known to the security analysts making the growth forecasts used by IBES. Therefore, the security analysts must be presumed to take those distributions into account in making their growth forecasts for the MLP. To the extent an MLP's relatively high cash distributions reduce its growth prospects that should be reflected in a lower growth forecast, which would offset the MLP's higher "dividend" yield.

22. In order to test the validity of this assumption, the Commission reviewed the most recent IBES growth forecasts for five diversified energy companies and six MLPs in the natural gas business. The average IBES forecast for the corporations is 9 percent, while the average IBES forecast for the MLPs is 6.17 percent, or nearly 300 basis points lower.[17] Thus, the security analysts do project lower growth rates for the MLPs than for the corporations.

23. In addition, the fact MLPs may rely upon external borrowings and/or equity issuances to generate growth is not a reason to exclude them from the proxy group. Most pipelines organized as corporations also use external borrowings and to some extent equity issuances. To the extent that gas or oil pipelines are controlled by diversified energy companies with unregulated assets (either federal or state), the financial practices may be the same, although perhaps not as highly leveraged, and the results are likewise reflected in the IBES projections. A prudent investor deciding whether to invest in a security will reasonably consider all factors relevant to assessing the value of that security. The potential effect of future borrowings or equity issuances on share values of either MLPs or corporations is one such factor. Since a DCF analysis is a method for investors to estimate the value of securities, it follows that such an analysis may reasonably take into account potential growth from external capital.

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[16] Opinion No. 414-B, 85 FERC at 62,268-70.

[17] The IBES forecasts were prepared as of May 31, 2007 applying the current DCF model for the corporate sample and using distributions capped at earnings for the MLPs. Thus the short term growth rates for the five diversified gas corporations were: (1) National Fuel Gas Corporation, 5 percent; (2) Questar Corporation, 9 percent; (3) Oneok, Inc., 9 percent; (4) Equitable Resources Inc., 10 percent; and (5) Williams Companies, 12 percent. The short term growth rates for the six gas MLPs were: (1) Oneok Partners, L.P., 5 percent; (2) TEPPCO Partners, L.P., 5 percent; (3) TC Pipelines, L.P., 5 percent; (4) Boardwalk Pipeline Partners, L.P., 7 percent, (5) Kinder Morgan Energy Partners, L.P., 7 percent, and (6) Enterprise Products Partners, L.P., 8 percent.

24. The Commission does, however, recognize that an MLP's lack of retained earnings may render cash distributions at their current level unsustainable, and thus still unsuitable for inclusion in the DCF analysis. Therefore, the Commission intends to require participants proposing to include MLPs in the proxy group to provide a multi-year analysis of past earnings. An analysis showing that the MLP does have stable earnings would support a finding that the cash to be included in the DCF calculation is likely to be available for distribution, thus replicating the requirement of the corporate model of a stable dividend.

III. Procedure for Comments

25. The Commission invites interested persons to submit written comments on its proposed policy to permit the inclusion of MLPs in the proxy group to be used to determine the equity cost of capital of natural gas and oil pipelines. The comments may include alternative proposals for determining a representative proxy group given that (1) few natural gas companies meet the Commission's traditional standards for inclusion in the proxy group, and (2) the only publicly traded oil pipeline firms available for inclusion in the proxy group are controlled by MLPs. Comments may also address the analysis advanced in this proposed policy statement, alternative methods for adjusting the amount of the MLP's distribution to be included the DCF analysis, and the relevance of the stability of MLP earnings.

26. Comments are due 30 days from the date of publication in the *Federal Register* and reply comments are due 50 days from the date of publication in the *Federal Register*. Comments must refer to Docket No. PL07-2-000, and must include the commentor's name, the organization it represents, if applicable, and its address. To facilitate the Commission's review of the comments, commentors are requested to provide an executive summary of their position. Additional issues the commentors wish to raise should be identified separately. The commentors should double space their comments.

27. Comments may be filed on paper or electronically via the eFiling link on the Commission's web site at http://www.ferc.gov. The Commission accepts most standard word processing formats and commentors may attach additional files with supporting information in certain other file formats. Commentors filing electronically do not need to make a paper filing. Commentors that are not able to file comments electronically must send an original and 14 copies of their comments to: Federal Energy Regulatory Commission, Office of the Secretary, 888 First Street N.E., Washington, D.C. 20426.

28. All comments will be placed in the Commission's public files and may be viewed, printed, or downloaded remotely as described in the Document Availability section below. Commentors are not required to serve copies of their comments on other commentors.

IV. Document Availability

29. In addition to publishing the full text of this document in the *Federal Register*, the Commission provides all interested persons an opportunity to view and/or print the contents of this document via the Internet through the Commission's Home Page (http://www.ferc.gov) and in the Commission's Public Reference Room during normal business hours (8:30 a.m. to 5:00 p.m. Eastern time) at 888 First Street, N.E., Room 2A, Washington D.C. 20426.

30. From the Commission's Home Page on the Internet, this information is available in the Commission's document management system, eLibrary. The full text of this document is available on eLibrary in PDF and Microsoft Word format for viewing, printing, and/or downloading. To access this document in eLibrary, type the docket number (excluding the last three digits) in the docket number field.

31. User assistance is available for eLibrary and the Commission's website during normal business hours. For assistance, please contact the Commission's Online Support at 1-866-208-3676 (toll free) or 202-502-6652 (e-mail at FERCOnlineSupport@ferc.gov or the Public Reference Room at 202-502-8371, TTY 202-502-8659 (e-mail at public.referenceroom@ferc.gov)

By the Commission.

(S E A L)

Kimberly D. Bose,
Secretary.

The Economist

Discounting the bull

Sell-side share analysis is wrong

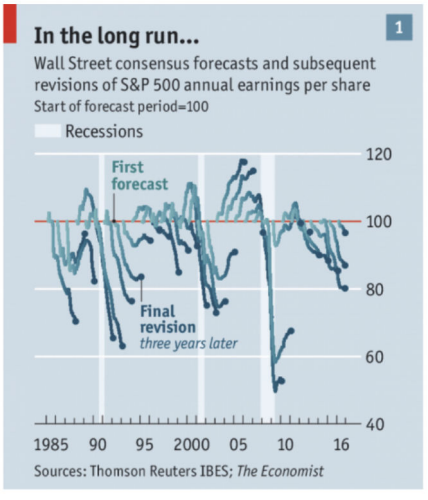
But in reassuringly predictable ways

Print edition | Finance and economics

Dec 1st 2016

"SELL-SIDE" analysts, whose firms make money from trading and investment banking, are notoriously bullish. As one joke goes, stock analysts rated Enron as a "can't miss" until it got into trouble, at which point it was lowered to a "sure thing". Only when the company filed for bankruptcy did a few bold analysts dare to downgrade it to a "hot buy".

Economic research shows that there is some truth to the ribbing. The latest figures from FactSet, a financial-data provider, show that 49% of firms in the S&P 500 index of leading companies are currently rated as "buy", 45% are rated as "hold", and just 6% are rated as "sell". In the past year, 30% of S&P 500 companies yielded negative returns.



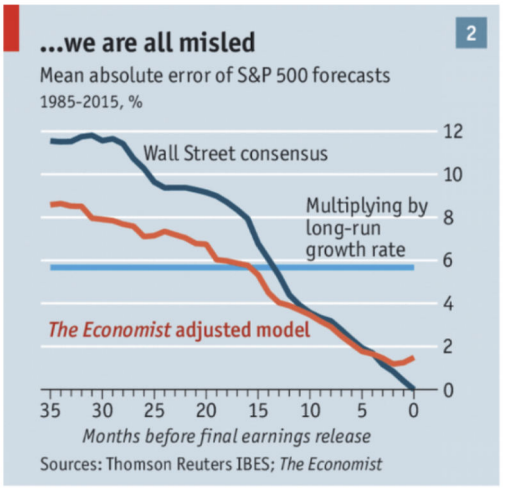
Profits forecasts made more than a few months ahead have a dismal record of inaccuracy. According to Morgan Stanley, a bank, forecasts for American firms' total annual earnings per share made in the first half of the year had to be revised down in 34 of the past 40 years. Studying their forecasts over time reveals a predictable pattern (see chart 1).

In theory, a diligent share analyst should do his own analysis—that is, by projecting a firm's future revenue and expenses, and discounting them to the present. Such models, however, are extremely sensitive to different assumptions of growth rates. Since no one can know the future, analysts cheat.

Three statistical sins are common. Analysts can look at comparable companies to glean reasonable profits estimates, and then work backwards from their conclusions. Or they can simply echo what their peers are saying, and follow the herd. Or, most important, they can simply ask the companies they are following what their actual earnings numbers are.

Surveys conducted by Lawrence Brown of Temple University found that two-thirds of sell-side analysts found private calls with company managements to be "very useful" in making their estimates. Analysts' need to maintain relationships with the companies they cover must colour their projections. They are judged primarily on the accuracy of their short-term forecasts, so there is little risk in issuing flattering, if unrealistic, long-term projections. In the short run, however, they have an incentive to issue ever-so-slightly pessimistic forecasts, so companies can "beat" expectations. Since the financial crisis, company profits have exceeded short-term analyst forecasts around 70% of the time.

So are forecasts are useless? Simply taking the market's earnings figures from the previous year and multiplying by 1.07 (corresponding with the stockmarket's long-run growth rate) can be expected to yield a more accurate forecast of profits more than a year in the future.



Yet the very predictability of the errors in analysts' forecasts suggests they could be informative, if they are properly interpreted. Taking forecasts of S&P 500 earnings from 1985-2015, The Economist has built a simple statistical model to try to take out the bias that taints Wall Street's prognostications. After controlling for the forecasts' lead time and whether or not they were made during a recession, we find that even our relatively crude model can improve upon the Wall Street consensus for forecasts made more than a quarter in advance (see chart 2).

Adjusting for bias in short-term forecasts is harder. It is tempting simply to accept the errors—after all, they tend to be off by just a little. Data from Bloomberg show that the 320 S&P 500 companies that beat earnings expectations in 2015 did so only by a median of 1.4%. An alternative is to look at crowdsourcing websites such as Estimize. There punters—some amateur, and some professional—are shown Wall Street consensus estimates and asked to make their own forecasts. Estimize users beat Wall Street estimates two-thirds of time.

To some extent, judging Wall Street by its ability to make accurate predictions is silly. Harrison Hong, an economist at Columbia University, reckons that stock analysts should be viewed "more like media". The latest forecasts aggregated by Thomson Reuters suggest that the S&P 500 will yield earnings per share of $130.83 in 2017 and $146.33 in 2018. According to our model, that would imply that they believe the actual numbers will be closer to $127.85 and $134.30. Share analysts want to tell the truth. They just like making it difficult.

This article appeared in the Finance and economics section of the print edition under the headline "Discounting the bull"

The Economist

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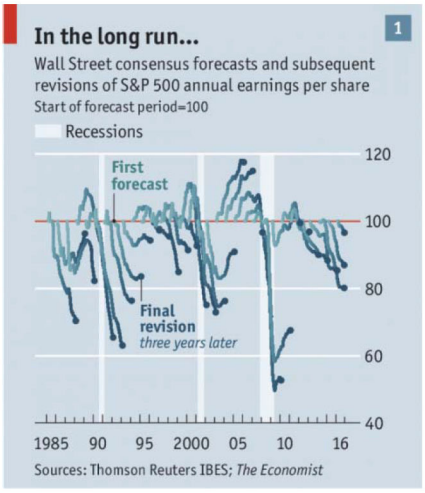

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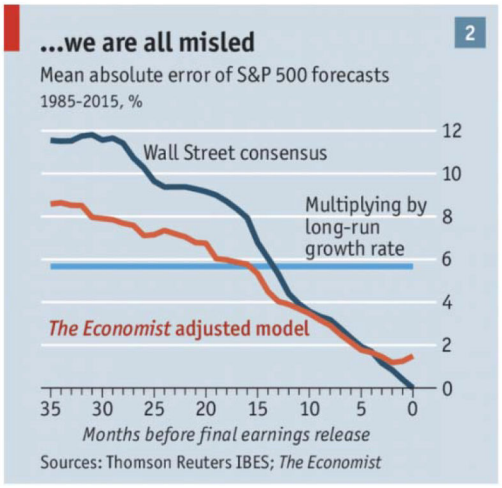

Yet the very predictability of the errors in analysts' forecasts suggests they could be informative, if they are properly interpreted. Taking forecasts of S&P 500 earnings from 1985-2015, The Economist has built a simple statistical model to try to take out the bias that taints Wall Street's prognostications. After controlling for the forecasts' lead time and whether or not they were made during a recession, we find that even our relatively crude model can improve upon the Wall Street consensus for forecasts made more than a quarter in advance (see chart 2).

Adjusting for bias in short-term forecasts is harder. It is tempting simply to accept the errors—after all, they tend to be off by just a little. Data from Bloomberg show that the 320 S&P 500 companies that beat earnings expectations in 2015 did so only by a median of 1.4%. An alternative is to look at crowdsourcing websites such as Estimize. There punters—some amateur, and some professional—are shown Wall Street consensus estimates and asked to make their own forecasts. Estimize users beat Wall Street estimates two-thirds of time.

To some extent, judging Wall Street by its ability to make accurate predictions is silly. Harrison Hong, an economist at Columbia University, reckons that stock analysts should be viewed "more like media". The latest forecasts aggregated by Thomson Reuters suggest that the S&P 500 will yield earnings per share of $130.83 in 2017 and $146.33 in 2018. According to our model, that would imply that they believe the actual numbers will be closer to $127.85 and $134.30. Share analysts want to tell the truth. They just like making it difficult.

This article appeared in the Finance and economics section of the print edition under the headline "Discounting the bull"

The S&P And GDP Are Not The Same Thing

Burt White and Jeff Buchbinder, LPL Financial Nov. 4, 2014, 2:31 PM

Business Insider - https://www.businessinsider.com/sp-is-not-gdp-2014-11

.S. economic growth has been subpar — right around 2% — during much of the ongoing economic expansion. Yet, the S&P 500 has returned nearly 230% cumulatively since the bear market low on March 9, 2009. How did that happen and is it justified?

Before trying to answer to those questions, it is worth pointing out that this situation is not all that unusual. In fact, since 1950, the S&P 500 median return is 13% (average is 12%) when real gross domestic product (GDP) grows less than 3%, with the S&P generating a positive return 68% of the time. However, a good portion of those returns come during recessions — historically, the best time to buy stocks is at recession troughs. But even if we take those periods in and around recessions out of the equation and look at annual returns when GDP growth is between 1-3%, the median (and average) S&P 500 return is a respectable 7-8%. Stocks tend to like average (or slightly below average) growth, which is not strong enough to generate worrisome inflation.

Now back to the question of what has driven this stock market to far outperform economic growth. Some might say quantitative easing (QE), which ended at the end of October 2014 in the United States (the Bank of Japan expanded its QE program last week on Halloween). While QE has benefitted U.S. stocks (how much is up for debate) by helping keep interest rates low and encouraging investors to buy riskier assets (see this week's Weekly Economic Commentary for details), the bull market has been driven by much more than that. Increasing confidence in the economic recovery — albeit a slow one — and greater policy clarity in Washington have also been factors. But we think the best answer is earnings. In fact, over the past four decades, earnings have provided solid support for equity market gains [Figure 1].

Screen shot 2014 11 04 at 2.25.59 PM

stocks LPL Financial

But this commentary is not a deep dive into earnings (that's coming soon). Instead, this week we highlight the differences between the S&P 500 and GDP, i.e., the U.S. economy, to shed some light on how corporate profits can grow so much faster than the economy, and bring stock prices right along with them.

stocks gdp

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How Is S&P Different from GDP?

S&P 500 companies have different drivers for earnings than the components that drive GDP. There are several key factors that differentiate the economic data from the earning power of corporate America that we think are important for investors to keep in mind:

Corporate profits are more manufacturing driven. Two-thirds of S&P 500 profits are from manufacturing, while two-thirds of U.S. consumption in GDP is services. The Institute for Supply Management (ISM) Manufacturing Survey has exceeded a solidly expansionary 55 level for five consecutive months, a positive signal for U.S. manufacturers. The recently released report on GDP for the third quarter of 2014 showed capital spending growth of 7% annualized, double the 3.5% growth rate of the overall U.S. economy. Many U.S. industrial and materials companies are benefiting from the U.S. energy renaissance that has brought greater access to cheaper energy sources and demand for infrastructure. The strength of the U.S manufacturing economy continues to support our positive industrials sector view.

Corporate profits are less consumer driven. While 70% of GDP is consumer spending, only one-third of it is from discretionary categories, while an even lower 15% of S&P 500 profits come from consumer discretionary spending. A more significant portion of S&P 500 earnings — estimated 20-25% — comes from business spending. As we move into the latter half of the economic cycle, we expect a stronger contribution from the business spending side than consumer spending side, suggesting the S&P 500 is better positioned than GDP as 2014 comes to a close and we enter 2015. Still, we expect U.S. GDP to sustain a growth rate at or around 3% through year end and well into 2015.

Corporate profits are more international trade driven. International trade only accounts for about 10% of GDP and acts as a drag on growth for most quarters because the United States imports more than it exports. Today, we estimate that 40% of S&P 500 profits are earned overseas — with about half of that from rapidly emerging market economies, including China. This makes S&P 500 earnings less dependent upon U.S. growth than 15-20 years ago, when roughly 20% of S&P profits were earned overseas, and 30 years ago when only a small portion of earnings were foreign sourced.

Corporate profits are hurt much less by higher commodity prices than GDP (see below). In fact, higher commodity prices generally benefit S&P 500 companies because most of them either produce commodities (energy and materials), supply commodity producers with equipment (largely industrials), or are not heavy commodity users and are therefore not impacted much by higher commodity prices (technology, healthcare, financials, and telecommunications). U.S. corporations are increasingly benefiting from access to cheaper energy as the energy renaissance continues, although the pace of oil and gas production and the corresponding infrastructure build-out may slow and be a modest drag on S&P 500 earnings should oil prices fall much further. Our view is that oil stabilizes at or near $80 and begins to move higher; but lower oil prices are a risk for energy producers and equipment manufacturers.

Solid Business Spending with Slower GDP Growth Trajectory

We believe the backdrop of solid business spending within a slower trajectory of overall GDP growth can be a favorable one for the stock market. The economic data, while good recently, do not accurately reflect the earning power of corporate America, which remains quite strong. The S&P is not GDP — S&P 500 companies have different drivers for earnings than the components that drive GDP growth. Stocks are fundamentally driven by earnings, which have supported the gains during the current bull market and left valuations still within a reasonable range. The earnings picture still looks quite good today, with the S&P 500 on track for 9% year-over-year earnings growth in the third quarter, with about three quarters of the index constituents having reported.

Although stocks are at the low end of our target 10-15% S&P 500 return range for 2014, we see further gains between now and year end may be likely, with profit growth as a primary driver—with perhaps some help from the calendar, as midterm elections have historically been positive for stock returns.

Corporate Profits Are Soaring. Here's Why It Can't Last

Fortune

http://fortune.com/2017/12/07/corporate-earnings-profit-boom-end/

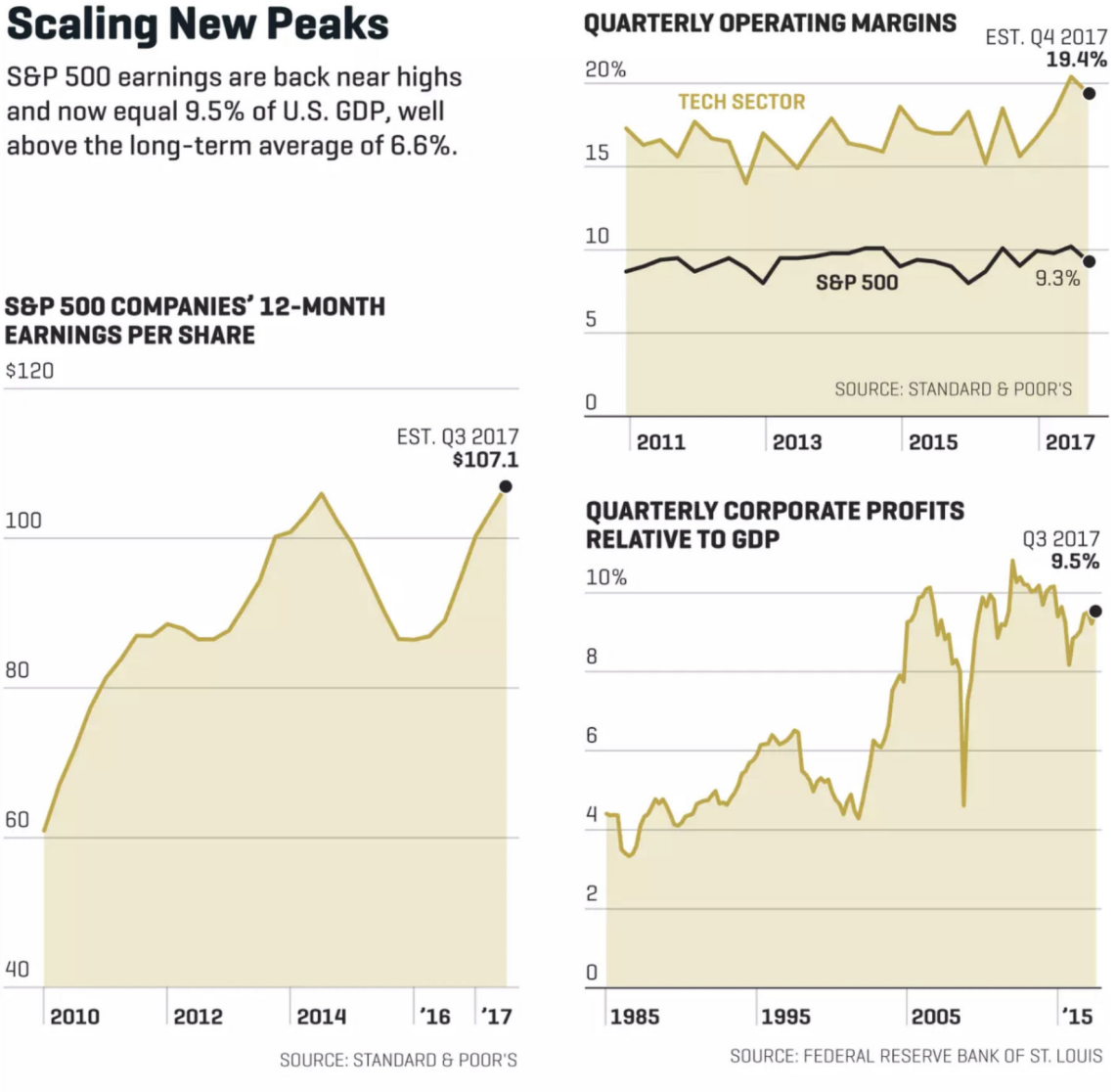
By SHAWN TULLY December 7, 2017

Some of the trends behind America's earnings boom and stock market surge are about to change. Investors beware.

Milton Friedman wasn't buying the profit boom. It was late 1997, corporate earnings had surged to heights unseen in over a decade, and the Wall Street crowd was predicting years of near-double-digit gains to come. So I called the Nobel Prize–winning economist, the most celebrated monetarist of the 20th century, to get his take on whether the bull case for long-term profit growth was reasonable—or mostly bull.

The 85-year-old Friedman phoned back, collect as usual, from his office at the Hoover Institution. "Would you accept the charges from Milton?" asked the operator. I said I would, and Friedman got straight to the point. "Beware of predictions that earnings can grow faster than the economy for long periods," he warned. "When earnings are exceptionally high, they don't just keep booming." Eventually, Friedman explained, profits must move back down to their traditional share of GDP. Earnings can get only so high, Friedman said. "They can't break loose from economic gravity."

Two decades later, Friedman's warning is as timely as ever. Earnings are again in the stratosphere: Consider that in the second quarter, corporate profits in the U.S. were equal to 9.5% of GDP vs. the long-term average since 1950 of 6.6%. And Wall Street analysts are forecasting that cumulative earnings per share for the S&P 500 will jump by 11% in 2018 and another 10% in 2019, according to analytics and data provider FactSet.



Nic Rapp

Here's one problem with that projection: The S&P 500's profit margins are now near all-time highs. Even if they remain elevated, a questionable assumption, earnings can grow only as fast as sales. "And sales grow along with the economy," says Roger Ibbotson, professor emeritus at Yale and chief of investment firm Zebra Capital. In other words, as Friedman preached, it's the fundamentals underpinning GDP—basics such as consumer spending and capital investment—that will guide earnings growth in the years ahead. Nobody is projecting GDP growth of 11% in 2018; the consensus, including inflation, is around 4%.

It's highly uncertain, however, that profits can even manage to climb in step with GDP. That's because they're already highly elevated thanks to those super-rich margins. Put simply, U.S. companies have benefited in recent years from an unusual combination of tailwinds—including flat labor costs, super-low interest rates, and, in 2017, a falling dollar. Those factors have outraced a plodding economy, so that the share of the economic pie flowing to corporate profits has swelled while the slice going to labor has shrunk. Last year, wages and salaries were just 43% of GDP—well below the long-term average of 47%.

Those factors are starting to reverse. Labor costs are rising, interest rates are poised to trend higher, and the greenback is starting to strengthen. It all adds up to a looming squeeze on profits. What does that mean for stocks?

To bring the profit picture into tighter focus, Fortune spoke to a number of market experts with strong academic credentials—all of whom are largely unswayed by the herd mentality of Wall Street. Although their outlooks varied, the differences in their forecasts were relatively narrow.

In the pessimistic camp is Rob Arnott, founder and CEO of Research Affiliates, a firm overseeing strategies for $200 billion in index funds. He says that workers are due for a raise. "Companies and shareholders have been taking a bigger and bigger share of the pie at the expense of labor," says Arnott. "That can't last. Labor's share will rise as wages and other factors normalize." He predicts that the crunch will slow earnings gains to at least a point below GDP growth over the next decade. That's at best 3% annual growth—or well below the Congressional Budget Office's estimate of an average of 4% nominal GDP growth over the next several years (consisting of 1.9% real increases annually, plus 2.1% inflation).

Mark Zandi, chief economist at Moody's Analytics, takes a middle position. "Earnings are peaking or have already peaked," he says. "At best, they'll track U.S. GDP going forward. And that includes a boost from the rebound in economic growth overseas." (All of our discussion on profits refers to earnings per share, or EPS, the number that really counts for investors.)

A notable optimist, relatively speaking, is Jeremy Siegel, the renowned professor of finance at the Wharton School. Siegel thinks that earnings per share can grow about half a point faster than nominal GDP—in the 5% range including inflation—chiefly because of big gains in the technology sector. "In tech

today, it's all about ideas that don't require much capital, not about building $100 million plants. Margins for the tech titans can expand from here," says Siegel. Still, he dismisses Wall Street's projections as bogus. "The idea of 8% or 10% or 12% growth is ridiculous," he says. "It will not happen."

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- MARK ZANDI, CHIEF ECONOMIST, MOODY'S ANALYTICS

All of the experts agree, however, that the sluggish outlook could improve if Congress enacts robust tax reform. (Republicans appeared to be closing in on a bill at press time.) The potential benefits are twofold. First, a reduction in the nominal corporate rate from 35% to 20% should give companies a healthy boost in after-tax profits. Not that the average U.S. company pays the official 35% rate now: Howard Silverblatt, senior industry analyst for S&P, calculated that the average effective levy for the S&P 500 in 2016 was 24.8%. Still, dropping down to 20% will have a significant impact.

It won't necessarily be America's big multinationals that gain the most under the tax plan proposed by Republicans. The GOP wants to erase their biggest shelter—deferring payments to the Treasury by leaving foreign-generated profits in overseas subsidiaries. That kind of strategy helped Alphabet (GOOGL, +1.94%), for instance, pay an effective tax rate of just 19.3% in its most recent fiscal year. Rather, the leading beneficiaries would be enterprises that do most of their business in the U.S. Grocery giant Kroger (KR, -4.43%), for example, pays over 30% in federal taxes. Michael Arone, chief investment strategist at State Street Global Advisors, reckons that new legislation that drops the rate all the way to 20%, and contains other levy-lowering provisions such as immediate expensing of capital expenditure, could raise EPS for the S&P 500 by 8% in the first year. A weaker package would deliver substantially less juice, he says.

Tax reform could also provide a more long-lasting tonic to earnings. A 20% corporate rate would greatly lower the break-even point for investments in the U.S. "Corporate profits right now are great," says Urooj Khan, a professor at Columbia Business School. "But they're not translating into economic growth in the U.S. And that's because of the way the U.S. taxes foreign earnings, as well as the drag from a rate that's extremely high by international standards." Khan cites research showing that companies invest in foreign projects and acquisitions that aren't as profitable as those available in the U.S. just to avoid taxes. Lower U.S. rates would make overseas shelters far less attractive and encourage companies to bring the money home, potentially causing a surge in capital expenditure, says Khan.

"Companies and share-holders have been taking a bigger and bigger share of the pie at the expense of labor. That can't last."

- ROB ARNOTT, CHAIRMAN AND CEO, RESEARCH AFFILIATES

Wall Street, meanwhile, is jacking up its forecasts based on recent history. Analysts at big banks are touting a big surge in earnings that started in 2016. In Q1 of that year, cumulative EPS for the S&P 500 was $23.97. That figure has risen strongly in every quarter since. For the most recent three months, ended Sept. 30, the S&P 500's EPS was $31.50—a robust 9.8% gain compared with the same quarter last year. Boosters on Wall Street are suggesting that springboard can turn into a trampoline going forward. But digging into the S&P's numbers over a longer stretch reveals a more discouraging picture.

In real terms, EPS actually peaked three years ago, in the third quarter of 2014. The reason the S&P 500's recent performance looks so good is that earnings cratered for six quarters (stretching from that peak in late 2014 to early 2016), thanks to a collapse in oil prices that pushed earnings for energy giants deeply into the red. EPS (specifically, "as reported" GAAP earnings per share) hit bottom in Q1 of 2016 at a trailing, 12-month reading of $86. Now that we're past that period of easy year-over-year comparison, the earnings hill will get harder to climb.

The profit boom looks even more mirage-like when you examine S&P profits in raw dollars. At its high point in Q3 2014, the S&P 500 had earned $943 billion in the previous 12 months. Three years later, the comparable number was $885 billion—or 6.2% lower. "Basically, we're just back to where we were at the previous peak," says Silverblatt of S&P.

Earnings per share have managed to stay flat partly because of a massive surge in share buybacks. But that's a departure from the norm that likely won't repeat. From Q3 of 2014 to Q3 of 2016, S&P members went on a rampage of stock repurchasing. "After their stocks took a big fall, they raised repurchases to extremely high levels," says Silverblatt.

A study of the S&P 500 by Research Affiliates finds that since 2012, buybacks have modestly boosted growth in earnings per share—adding around 0.16 percentage points per year. But that period has been highly unusual, the study concluded. Over the long term, new issuance exceeds repurchases by a large margin, eroding rather than bolstering EPS. From 1988 to 2017, the S&P 500 saw average dilution of 1.2% a year. That's because many big enterprises regularly issue more stock than they buy back, using the proceeds for repurchase of new shares from newly exercised options and vested restricted stock, for M&A, and for secondary offerings. Adding to dilution are IPOs that flood the market with new shares, funding the expansion of newly public companies that snatch profits from the established incumbents.

But annualized spending on buybacks has dropped by at least 15% from its high point last year, according to Silverblatt. And investors shouldn't count on another buyback boom. Given the long-term history of new issuance exceeding buybacks, it's more likely that future EPS could actually suffer from net dilution.

So if earnings growth has been so anemic, why have stocks continued to soar over the past few years—with the S&P 500 rising 29% since September 2014? "It's all multiple expansion," says Silverblatt, noting that the price-to-earnings ratio for the 500 has jumped over those three-plus years from 18.9 to the current, super-rich 24.3. Let's look at the S&P as one big company. Its current annualized earnings of $107 haven't budged in three years, yet its "price" has risen from 2,018 to 2,602. Hence, investors who three years ago paid less than $19 for $1 of earnings now pay $24.30—an extra $5.30, or an almost 30% premium, for a dollar of earnings.

Much of the bullishness driving that multiple expansion derives from enthusiasm about the tech sector. And indeed, tech is the star when it comes to profit growth. From Q3 2014 to Q3 2017, the sector boosted EPS by a phenomenal 31% while S&P 500's earnings overall remained flat. The jump wasn't primarily generated by annualized revenues, which rose a modest 11% per share over that period. The engine was an explosion in margins from 15.9% to 20.4%. By contrast, energy profits dropped over the same period by 76%, explaining in large part why EPS didn't budge overall.

The energy sector should rebound in 2018 because of the resurgence in oil prices. But it accounts for a surprisingly small portion of index earnings; Silverblatt reckons that the oil and natural-gas giants will contribute around 4% of the S&P 500's total in 2018. "The energy rebound is a nice tailwind, but it doesn't move the total much," he says. By comparison, tech is by far the dominant industry, accounting for around one-quarter of all S&P earnings. Financial services is No. 2, at approximately 18%.

The most powerful hit to profits will come from rising labor costs, which account for between two-thirds and three-quarters of all business expense. For years shareholders have garnered big returns while workers' incomes have remained flat. "Labor costs have been depressed for a long time, and that can't continue," says Zandi. "They will accelerate and cut into margins." That balance is already starting to flip. Today's 4.2% unemployment rate signals an extremely tight market for workers. The Department of Labor's Employment Cost Index calculates that total compensation rose at an annual rate of 2.51% in the third quarter of 2017. That's 1.2 percentage points higher than inflation, and far above the 1.77% increase in early 2014.

Let's step back and do a little math to see how this applies to stocks. Even if you hold on to some very bullish assumptions about the near future, the numbers argue that prices must come down. For example, let's assume that the S&P 500's P/E stays at its current elevated level. Then imagine that earnings drop from 9.5% of GDP to 8%—a figure that's still well above the historical average. In that scenario, the S&P 500 index would fall by 13%, even if economic growth meets expectations.

Earnings bulls invariably cite the recent, synchronized rise in global growth as a major boon to U.S. multinationals. And they're correct. What's mostly ignored is a heavy counterweight—the meager prospects at home. The S&P 500 is highly international: Around 30% of total sales, and 40% of profits,

flow from abroad. Increasingly, it's been fast-growing overseas operations supplying the juice. According to FactSet, S&P companies with more than 50% of their sales outside the U.S. raised their earnings 13.4% in Q3 of 2017 vs. the same quarter a year ago, compared with just 2.3% for those with more than half their sales in the U.S. Europe has turned from a millstone into a motor. Nike (NKE, +1.96%) recently reported seven straight quarters of rising sales in Europe. And DowDuPont (DD, +0.00%), Apple (AAPL, +1.00%), and McDonald's (MCD, +0.65%) all highlighted strong results in the most recent quarters from Europe, Asia, and emerging markets.

The dollar's 9% decline this year against a basket of global currencies helped greatly. But since the end of October, the greenback has stabilized and even gained slightly against the euro. The prospect of higher U.S. rates and lower corporate taxes is likely to arrest or even reverse the dollar's decline, curbing the recent pace of overseas profits.

Still, U.S. multinationals should benefit from robust growth abroad, especially in developing markets. The Organization for Economic Cooperation and Development (OECD) projects real global GDP of 3.7% in 2018. But non-OECD countries, including China, are forecasted to grow by 4.9% in aggregate, while the OECD estimates that U.S. GDP will grow just 2.5% next year. Among the top beneficiaries of this overseas growth story should be tech titans such as Apple, Google, Facebook (FB, +0.51%), and Amazon (AMZN, +1.95%). Technology is by far the most global sector in the S&P, garnering no less than 60% of revenues from abroad. "U.S. tech companies have tremendous market power globally," says Zandi. "Google and Facebook have 60% of all ad revenue. That power will continue to grow."

Chiefly because of tech's global strength, Zandi predicts that foreign profits for the S&P 500 will grow faster than U.S. national income. But he also projects that domestic earnings will lag GDP. The bottom line: The domestic drag will offset the global boost, so that future profits will simply track the economy. Even in a tech-driven global world, it comes back to cold, hard math.

Zandi's scenario isn't exciting, but unlike the Wall Street consensus, it makes sense. In 1999, Warren Buffett wrote an influential article for Fortune arguing that corporate profits as a share of GDP tend to go far higher after periods where they're depressed—and drop sharply after they've been hovering at historically high levels. So whom should you believe? Today's Wall Street crowd, or Buffett and Friedman? When two such sages agree, you should think twice before following the herd in the other direction.

A version of this article appears in the Dec. 15, 2017 issue of Fortune with the headline "When Will the Profit Boom Fizzle?"

How on Earth Can Profits Grow at 10% in a 2% Economy?

Fortune

By SHAWN TULLY July 27, 2017

Can profits really grow in double-digits in an economy bumping along at 2%?

http://fortune.com/2017/07/27/profits-economic-growth/

That's the question that investors should be asking, and instead ignore at their peril. We've all heard the Wall Street bulls' mantra, endlessly advanced by analysts and market strategists, that a renewed surge in profits will keep equity prices waxing. The current consensus among analysts forecasts that reported S&P earnings-per-share will jump from $100.29 in Q1 of 2017 (based on the past four quarters) to $133 by the end of 2018, an annualized increase of over 18%.

Of course, those consensus forecasts are always inflated. But even if we discount those projections by 45%, the bulls are still expecting 10% gains in EPS over the the seven quarters spanning Q2 2017 to Q4 2018.

But recent history, and projections from every agency from the IMF to the CBO, foresee GDP growth in the 2% range, or 4% including projected inflation, well into the future. So how can the profits expand 6 points faster than the overall economy that drives the sales that largely determine the course of those profits?

It's clear that over long periods, growth in profits and GDP are closely linked. But that's not necessarily the case in shorter timeframes. If EPS are stuck well below trend for an extended period, earnings can rapidly expand to regain their historic levels. But today, profits are hardly depressed. It's the opposite: Two key metrics confirm that earnings are extremely high by historical standards. On average, corporate profits have averaged 7.5% of GDP since 1951. Today, they absorb 9.2% of national income. How about margins? They're lofty as well. For the Fortune 500, the ratio of profits to sales was 7.4% in 2016, more than 2 points higher than the average over the 64 year history of the list, and the fourth highest annual reading.

Hence, the most likely outcome is that profits at best expand at the less-than-thrilling rate of GDP.

What does that mean for the future of stock prices? Let's assume that today's price-to-earnings ratio remains at the current, and extremely high, 24.6. Haven't heard that figure? That's the one in the books, the ratio of the current S&P 500 average of 2464 to 12-month, reported annual earnings of $100. In other words, what companies actually earned. The 18 multiple more routinely cited is bogus. It's based on the bluebird prognosticating that "forward" profits will reach $133 in seven quarters, a mathematical impossibility.

At a PE of almost 25, the S&P is producing $4 in earnings for every $100 you spend on stocks. You receive $1.90 of that $4 in dividends, for a puny yield of 1.9%. A constant PE of 25 predicts a total "real" return of the inverse of that ratio, or 4%. In addition to the 1.9% dividend yield, the other 2.1% comes in the form of profit gains that drive equivalent capital gains––quite reasonable given current projections of overall economic growth. The total comes to 6%, including 2% inflation. That's nowhere the double-digit future the earnings bulls are projecting, but with the 10 year treasury at 2.33%, it's not bad.

Or is it? The risks that future returns will fall far below our benchmark of 6% over the next decade are a lot greater than the chances they'll exceed that bogey. Since corporate profits are well above historic averages, they could finish in three or four years right where they are today, repeating the scenario since 2013. That's the danger signal flashed by the cyclically-adjusted price-earnings multiple developed by economist Robert Shiller, a yardstick that smoothes the peaks and troughs in earnings to get a normalized multiple; today, profits according to the CAPE are so far above normal that the CAPE adjusted PE looms at a terrifying 30.

Nor will low rates help. John Hussman of the Hussman Funds stated in a recent article that "if low interest rates emerge as a consequence of low expected nominal growth...prospective returns will be lower," because low economic growth causes both low interest rates and low profit growth. They're the stock market's ham and eggs. Hussman is projecting a 0 total return for the S&P over the next decade.

Hussman makes a crucial point on the interaction between rates, economic growth and gains in profits. All three are closely aligned over any extended period. It's sub-par economic growth that causes both low real rates and sluggish profit growth. So low rates shouldn't be a boon to stocks at all if they're signaling a mediocre business climate ahead, as is usually the case. As Hussman points out, the benefit of the "low discount rate" is fully offset by the slower growth in earnings. So flagging growth and declining rates cancel each other out.

It's true that a fall in real rates swells multiples. But that game is over. Now we're left with hugely expensive PEs that will saddle folks buying equities today with extremely low returns. That's the curse of mid-20s PEs.

Why, then, do stocks keep soaring? For Hussman, it's all about a speculative frenzy, an "overvalued, overbought, overbullish syndrome." The market keeps defying his warnings, but one thing is certain: A future where EPS grows at 10% in a 4% (2% real) economy, where profits gallop while GDP lopes, is a Wall Street fantasy.

Corporate Profits Are Soaring. Here's Why It Can't Last

By SHAWN TULLY December 7, 2017

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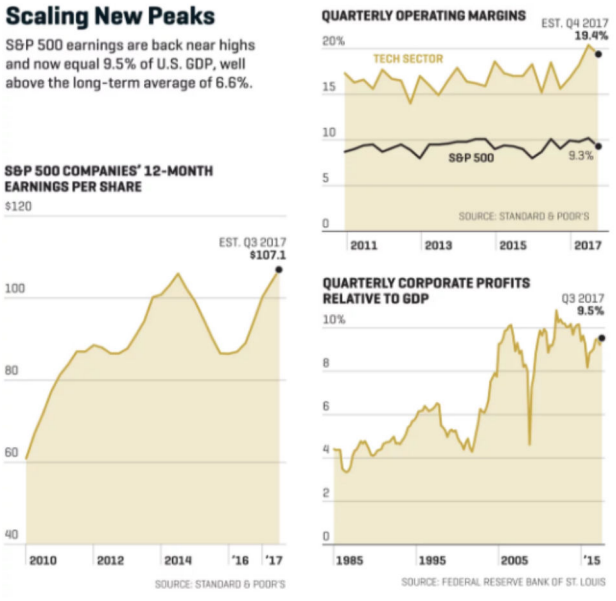

Nic Rapp

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June 2020

Looking ahead

Intermediate projections of the economy and capital markets – five-year outlook

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The equity rally that retraced much of the February through March drop signals that the market is pricing in a relatively quick economic rebound from the COVID-19 pandemic. However, many are concerned that the market has gotten ahead of economic realities. Is the crisis going to last two more months or will a second and third wave disrupt the economy into next year? Is there a distinction between the capital markets and underlying economic disruption? What will asset returns look like along these different paths? With tens of millions – probably hundreds of millions across the globe – now unemployed, there is a long road back.

In this paper we provide two sets of analyses of the possible outcomes over the next five years. In Part I, we use basic scenario analysis to lay out the range of possible economic and market outcomes with four different scenarios (Bull, Base, Stagnation and Stagflation) over the next five years. Although our focus in this section is on the United States, the analysis is representative of the broader global experience faced by developed and emerging markets. In Part II, we present an update of our capital market assumptions and discuss what has changed since their previous iteration in June 2019. In this section, we take a broader global view across the spectrum of investable assets.

Backdrop

As the pandemic crisis resolves, some industries may quickly bounce back to something very recognizable. Other industries – such as airlines, cruise lines, hotels, restaurants, sporting events, theater, concerts, and public transportation – may be impaired for a lot longer as we struggle to find a new balance. The impact on real estate is uncertain. Certainly, there is a short term hit to some sectors (namely, high density urban centers) and a benefit to others (suburban office parks), but we doubt the hit will be permanent in these real estate categories. The density of urban centers may decrease, but we believe that they will always have a certain dynamic element to them because of the economies of scale and high networking benefits.

Balancing disruption is innovation. We already see the creation of new businesses and models from low tech to high tech: personal protection equipment (masks and Plexiglas panels), video conferencing, and telemedicine. Moreover, interest in the biosciences has increased and new supply chains will be built.

One key drag on growth will be the continued deglobalization that began in the mid-2010s. A huge wave of globalization started in the post-WWII reconstruction period and was sustained by a series of positive shocks: for example, the fall of the Berlin Wall in the late 1980s and the entry of China into the WTO in the early 2000s. However, after the Global Financial Crisis (GFC), the appeal of free trade and immigration faded and reversed in the mid-2010s. At a minimum, we expect further deglobalization with tighter border controls and movement of strategic supply lines closer to home markets. In the long run, we believe that the drop in the expected growth rate will be minimal because there has been no destruction of physical capital and human capital has not diminished, though it may take quite a while for the markets to absorb and reallocate both factors.

Another drag on growth in the short run is the growth of precautionary savings by households. A lot of people will likely spend less and we already see the savings rate rising as they build a reserve fund for emergencies. This should put pressure on short term rates to stay low as this stock gets build up. Offsetting this are corporations which are systematically dissaving.

The pro-active policies of the central banks in an effort to stabilize the credit markets have been a substantial development. Credit spreads immediately tightened and inspired rebounds in the equity market before any of these facilities were operational. This response has taken some of

the refinancing risk and solves several liquidity problems, but many firms have long-term solvency issues that only an orderly restructuring can resolve.

Finally, the huge increase in government deficits across the globe is a natural reaction to the resulting slowdown from the COVID-19 pandemic, though perhaps unprecedented in size and speed. The market is pricing in very little inflation risk premium. But this could change; for example, if policymakers over-stimulate amid supply-side constraints, inflation pressures could emerge.

Part I: Deterministic scenario projections

We present four sets of projections of the economy and capital markets.

Bull Case

– The global economy and capital markets quickly return to the pre-pandemic world of moderate growth and low inflation, potentially as a result of a successful vaccine. The economy and markets re-adapt quickly. Few permanent disruptions occur, as airlines, hotels and other vulnerable industries survive much in their current form.

Base Case

– Growth returns in the latter half of 2020 and gradually trends back toward normal growth. Some de-globalization, lingering outbreaks of COVID-19 and precautionary behaviors by consumers and businesses hamper growth initially. Inflation starts low and rises back toward trend.

Stagnation

– This is a combination of sluggish growth and low inflation – Japanification. The economy rolls out of the pandemic-induced recession with a burst of growth, but this quickly subsides and continues at a low level.

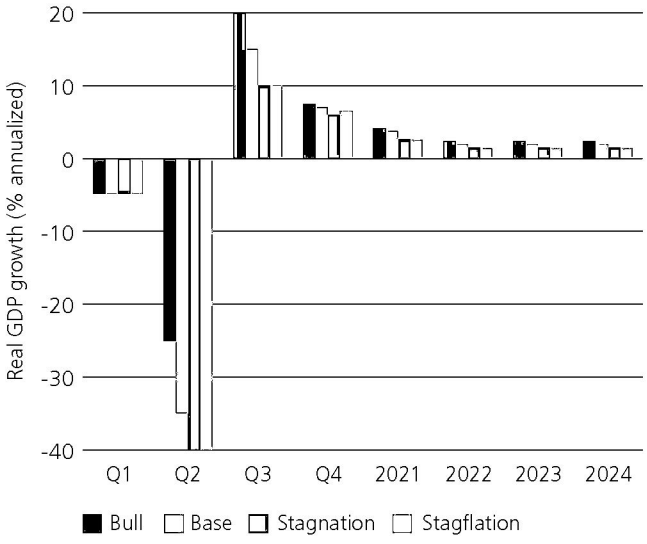
Stagflation

– We model this as a combination of a sharp recession followed by low growth and rising inflation. Supply-side constraints limit growth and ultimately trigger inflationary pressures. Eventually, bond vigilantism reappears as investors become nervous about inflation and higher interest rates. Central banks struggle with the direction of monetary policy: higher interest rates to fight inflation or lower interest rates to spur the economy.

While our research encompasses a large range of asset classes around the world, for simplicity we present scenarios focusing on the United States as the representative economy. The projections here can be extended to many regions without loss of direction and magnitude.

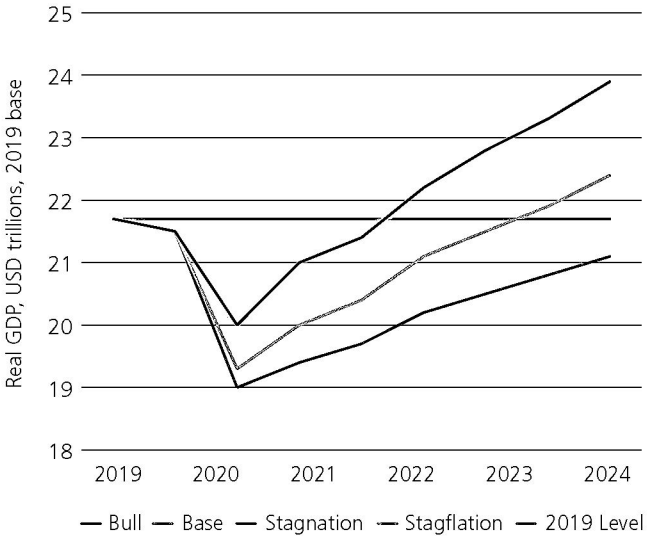
The following graphs show the paths of growth across the four scenarios. (These should broadly represent most of the developed world and many emerging markets.)

Real GDP growth across scenarios



Source: UBS Asset Management. Data as of 30 April 2020.

Real GDP across scenarios



Source: UBS Asset Management. Data as of 30 April 2020.

Real GDP in the US peaked in the fourth quarter of 2019 at $21.7 trillion and contracted sharply thereafter. In our Base case, we project real GDP will remain below $21.7 trillion until late 2022. In the Bull case, we expect that it will be early 2021, but in both our Stagnation and Stagflation cases, which have near identical levels of growth, it will take years to recover.

In all the scenarios, we expect the normal measures of inflation to decline sharply in the coming months. In the Bull case, it rebounds to a 2.0% level and the Fed starts to raise rates in 2023. In the Base case, inflation is slightly below most Central Banks' target levels (2.0%, usually). In the Stagnation case, it is initially low and stays low. In the Stagflation scenarios, inflation starts low, but aggressive monetary and fiscal stimulus triggers higher inflation, which creeps up and disrupts the markets.[1]

Now, let's extend these economic fundamentals to pricing in the capital markets for the four scenarios. First, below is a set of paths for the fixed income market.

In most scenarios, we expect the Federal Reserve to keep short interest rates low and on hold well into 2022, with the most likely hikes not occurring until at earliest 2023. And we don't expect the 10-year bond yield to get near its highs seen in 2018 (less than two years ago it was over 3.0%!). The Fed has several reasons to keep rates low: a historic recession with unprecedented levels of slack in the labor market and huge budget deficits that need to be financed. In recent communications, the Fed has indicated that they are willing to have inflation above their target level of 2% for a period of time in order to achieve full employment. We expect they will apply this in the coming future.

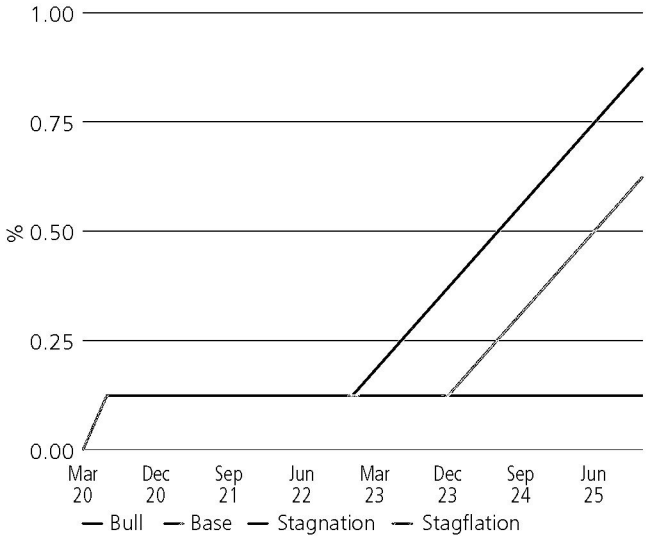
One difficulty in modeling the Stagflation scenario is the reaction of the Fed. We have the Fed being somewhat cautious here and focusing more on employment than inflation; thus, we model T-Bills rising modestly and lagging inflation. However, a more aggressive, hawkish Fed is clearly possible over time. A key question is how the Fed will react: does it suppress the yield curve to support weak growth or does it raise rates to trim inflation expectations starting to accelerate?

In our Base case, we expect 10-year government bond yields are steady through the next few months and then gradually rise as the economy shows moderate to strong growth. In our Stagnation case, we expect rates to stay low through the projection period.

After rising sharply earlier this year, credit spreads narrowed in March and April, especially in the US where the Fed established programs to buy a wide array of bonds to keep interest rates low, facilitate easier refinancing, and provide liquidity to stressed markets. In our Base Case we expect the recovery to be slower than what the market currently is pricing and we expect ongoing volatility in the credit market as the economy confronts challenges with restarting.

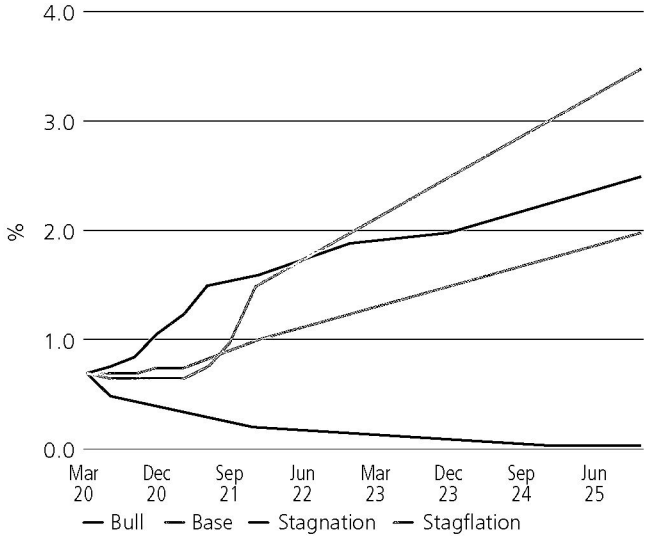
1 Inflation deserves a special note in the short run. In normal times, the basket of goods that are included in the definition of the consumption basket is stable. But in times of huge disruption, the measure of inflation may be difficult to interpret, potentially even misleading. How do we incorporate goods for which demand is plummeting (airfares and restaurant dining) with goods surging in demand (personal protection equipment)?

Projected US 1-month T-Bill yields by scenario



Source: UBS Asset Management. Data as of 30 April 2020.

Projected US 10-yr yields by scenario

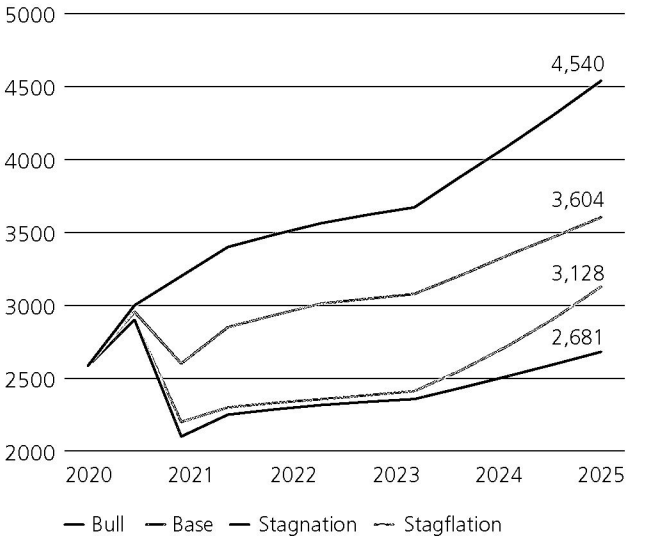


Source: UBS Asset Management. Data as of 30 April 2020.

In the equity market, we lay out the potential paths for the S&P 500 price level. Our Base Case projection has a renewed growth in equities after a near-term drop due to on-going stumbles as the economy recovers. We don't doubt that there is a long period of growth ahead of us; we just expect it to be bumpier than indicated by the recent rally. In the Bull case, we quickly reach new highs due to economic strength resulting from fiscal and monetary stimulus. In the two bearish cases, we don't reach the February highs for many years.

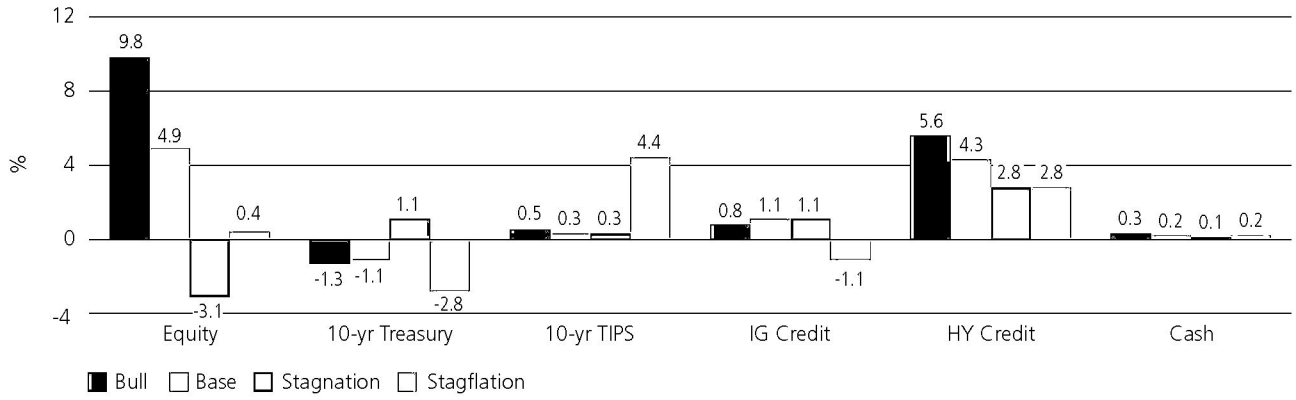
On a cumulative return basis over the five years ending June 2025, we project the following sets of returns in nominal and real terms.

Projected S&P 500 price levels across scenarios



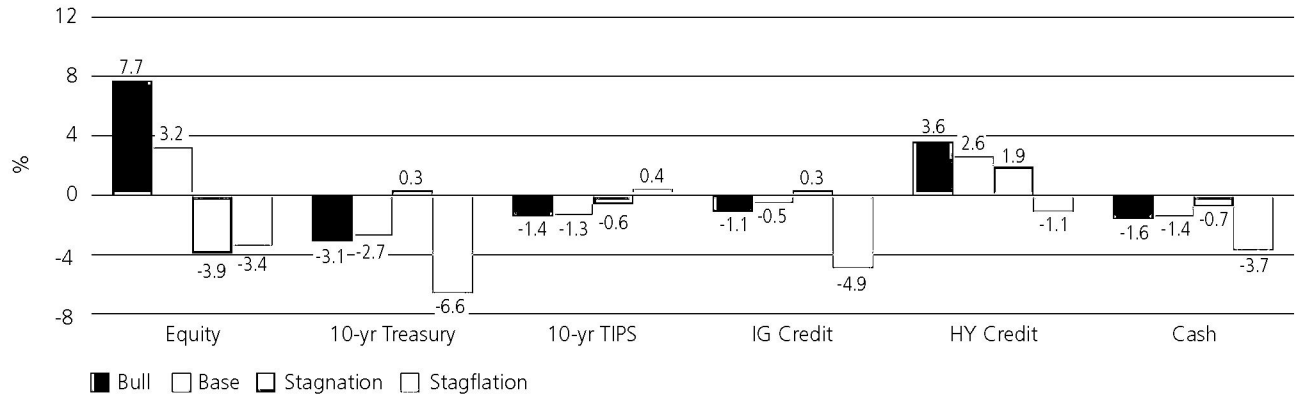
Source: UBS Asset Management. Data as of 30 April 2020.

Five-yr nominal returns through June 2025



Source: UBS Asset Management. Data as of 30 April 2020.

Five-yr real returns through June 2025



Source: UBS Asset Management. Data as of 30 April 2020.

Some observations:

- Despite the low starting yields, the possible return upside for Treasuries in the short run is the Stagnation case. The first year of this scenario has Treasuries earning a positive return and looks even better in real terms.
- Notice that TIPS perform best in the Stagflation scenario. Initially, the returns are poor as the economy bounces back and experiences a modest rebound. It really takes off in the 'out years' as inflation builds to levels higher than anticipated.
- High yield bonds look good in all the scenarios because of the high starting yield. Spreads continued to tighten into May, so the expected returns have declined.

Stock-bond correlation

One key area that we want to highlight across these scenarios is the stock-bond correlation. Over the last 22 years, the returns of stocks have been negatively correlated with the return on Treasury bonds. (In general, this is true for most developed countries, but there are exceptions such as Canada, Australia and several emerging market countries).

We believe that there is an increased likelihood that this negative correlation will break down sometime in the next five years. First, with central banks committed to low interest rates, QE, and potentially yield curve control, the correlation would go to zero because short-term rates would remain constant. Then, if inflation creeps up, investors will likely start to shun bonds, pushing yields up through the auctions (though central banks will not allow significant increases and will buy up the bonds to keep rates low). At some point central banks may relent and at least allow the yield curve to steepen in order to accommodate inflation risk premiums for holding longer dated bonds. In this case, we believe we would see a reversal and a positive stock-bond correlation.

The historic data indicate that the stock-bond relationship is regime dependent. The critical threshold is sustained 2.5% inflation; below this, we expect the relationship to be negative; above this, there has been a positive stock-bond correlation.

These scenarios provide a range of market events that investors need to prepare for. These scenarios not only affect returns, but the potential relationship of stocks and bonds as well as the relative performance of asset classes.

Global implications for returns

With adjustments, these scenarios project to other major markets and produce similar results, though the level may vary depending on local valuation, interest rates and policy reactions.

One major adjustment is for valuation outside the US. Non-US equity markets have done worse than the US, but we expect a rebound, as not only the markets are cheaper, but their currencies are as well.

Normally, in scenario analysis, it is difficult to comment on the direction of currencies. Currency performance is about relative performance. For example, if one region is growing more strongly than the other, the currency will typically appreciate relative to the other, though underlying fundamentals will alter this drift and rate. We will address our expectations for currency in our five-year capital market assumptions in the following section.

The negative stock-bond correlation appears to be robust for the US, Japan, Europe, and the non-commodity emerging markets. Again, until we see a burst of sustained inflation, we don't expect the relationship to turn positive.

Scenario	Stock-Bond Correlation	Implications
Bull	Stock-bond correlation **remains negative** as inflation does not go above 2.5% for an extended time period.	Diversified portfolios continue to provide low volatility and consistent returns. Risk-on/risk-off positioning has a natural hedge.
Base Case	Stock-bond correlation remains generally negative, but with yield curve controls, this may **drift towards zero**.	Bonds offer less diversification than has been the case of the last 20 years, increasing complexity for risk management.
Stagnation	Stock-bond correlation becomes **less stable**. At times this can be negative (with flight-to-quality events), but because of lower bounds, the relationship can drift to zero as well.	Diversified portfolios will be subject to more volatility as the stock-bond correlation is erratic. Investors take on more risk (higher exposure to credits over sovereigns, for example) to increase yield and expected return.
Stagflation	Initially, the stock-bond correlation remains negative, but as additional stimulus programs get rolled out and budget deficits rise, inflation rises as well. Short term rates are kept low for a while as central banks are conflicted on which front to fight: inflation or low growth. When inflation rises to 2.5% and is expected to stay there, we get an **eventual change to a positive** stock-bond correlation.	Risk management for traditional stock-bond portfolios becomes more difficult, requiring real or alternative assets to hedge against inflation. Although nominal returns start to rise, in real terms the markets do poorly. Enhanced risk controlled techniques needed; disciplined volatility management.

Part II: Capital Market Assumptions Update

UBS Investment Solutions provides estimates of capital market returns across a wide array of asset classes and from multiple currency perspectives.[2] For this paper, we focus on our 5-yr Baseline expected geometric returns. These 5-yr Baseline estimates closely match the Base Case in the deterministic scenario projections provided above. They are built to be very consistent with each other.

Our last publication highlighted our June 2019 assumptions. Since then, equities ended the decade with an admirable 10-year record and momentum continued with new highs into February.

Then the pandemic hit and the equity markets dropped more than 30% before rallying sharply. Government bond yields across all maturities declined in the US – which lowered expected return in local terms. Credit markets have had surprising ups and downs, but are still at relatively wide levels going into the end of May.

The main updates in our five-year capital market assumptions compared to our mid-2019 report are:

- Expected equity returns in nominal terms are higher, as valuation is improved.
- Government bond yields are even lower, so expected returns are lower. European yields did not drop as much as US yields, but were lower to start with.
  - In general, we lowered expected 10-year yields in developed countries in 2025 by 0.4% to 1.1%. This has offset some of the drop in yields in projected returns.
- Credit spreads are higher due to higher default risks, but returns are more attractive relative to governments. They bottomed out in early January 2020 before ballooning late in the first quarter of 2020. They tightened significantly in April and into May.
- The dollar appreciated against most, but not all currencies. Emerging markets had extremely large depreciations (Brazil -29.2% for example). In general, we view the dollar as overvalued against both developed market and emerging market currencies.

Global asset class returns

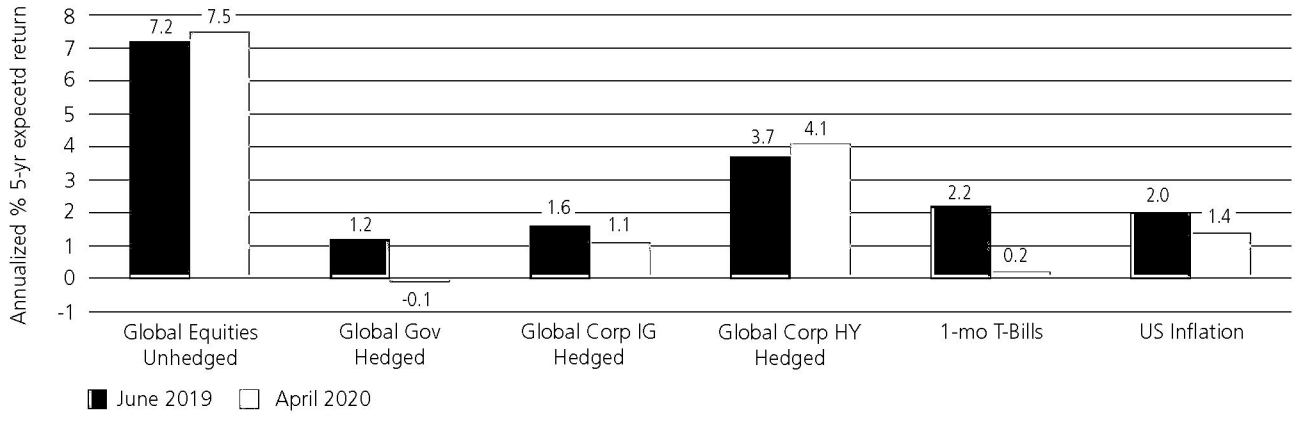
In nominal terms, the expected return of equities rises to 7.5%[3] in unhedged USD terms, an increase of 0.3% from the June 2019 version. A portfolio of global government bonds is expected to return -0.1% in hedged USD terms, a large drop from the 1.2% in June 2019. Global credit drops from 1.6% to 1.3% and high yield bonds grows from 3.7% to about 4%. Cash declines the most, dropping from 2.2% to 0.2%.

In general the expected returns for risk markets have improved while the expected returns for safe assets have declined. The improvement for equities is due to improved valuations (i.e., equity prices falling more than discounted future earnings). For most markets, this improvement is quite large, but it is somewhat offset by declines in expected growth and inflation. US Large Cap equity is one significant outlier to this, as this expected return declines due to the large bounce back in valuations. US large cap returns fell to 4.9%; the valuation improvement since last June (0.5% increase) is offset by lower expected inflation (0.6% decline) and decline in aggregate earnings growth (a 0.1% decline).

In inflation-adjusted terms, prospective returns in April 2020 look a bit better than the pure nominal rates indicates. With lower inflation, the real return is boosted. In the short run, it is possible that with negative inflation and unchanged bond rates, real returns could be 2% to 3%, well within its historic performance.

[2] We provide Equilibrium, 5-yr and 10-yr estimates of the capital markets that will vary over time. By far, the most interest from clients is on our 5-year expectations.
[3] Our convention is to report equity returns in unhedged terms and fixed income in hedged terms.

Five-year expected returns in USD terms

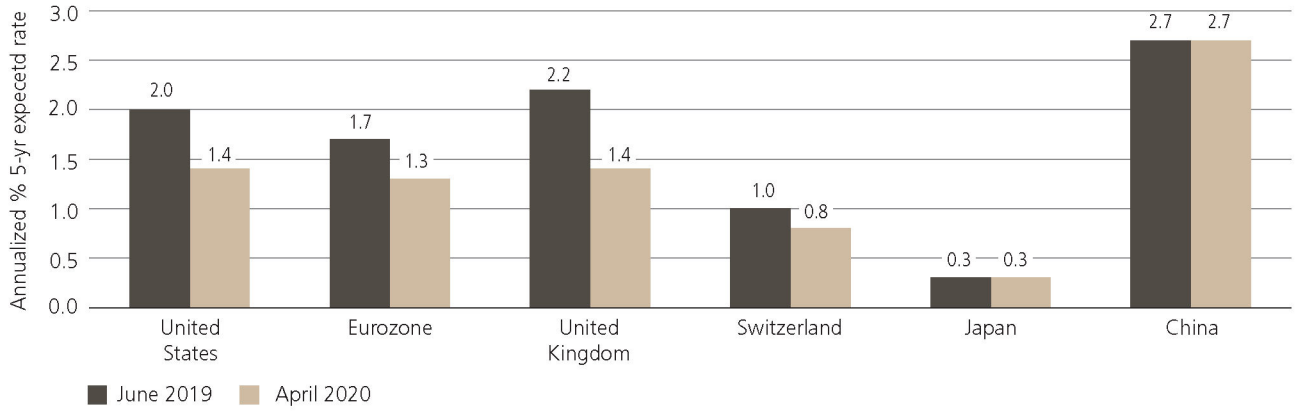


Source: UBS Asset Management. Data as of 30 April 2020.

Economic fundamentals

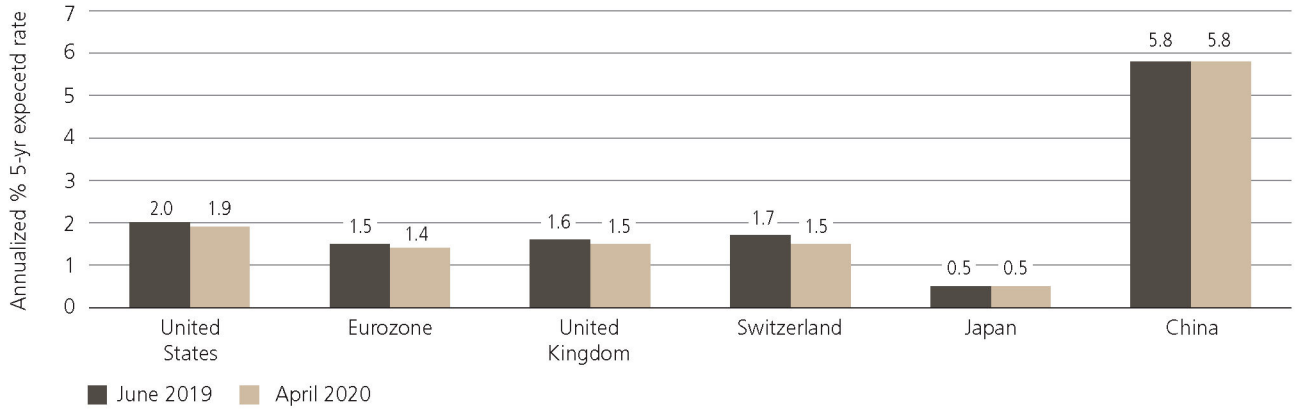
Our estimate of expected inflation dropped sharply in the last ten months. The 10-year breakeven inflation rate for the US, for example, declined from 1.7% in June 2019 to 1.1% at the end of April and reached a low of 0.9% in March.

Five-year expected inflation



Source: UBS Asset Management. Data as of 30 April 2020.

Five-year expected growth



Source: UBS Asset Management. Data as of 30 April 2020.

Equities

Over the last 10 months, there were wide variations in equity returns. The S&P 500 dropped 10.8%, but the Eurozone, UK, and Australia had larger declines (19.9%, 21.7%, and 21.3%, respectively). Japan and Switzerland had smaller declines than the US. The emerging markets dropped 18.2% in USD terms. China was one of the better equity market performers since last June, as their market fell earlier and recovered earlier.

For prospective returns, our 5-year Baseline estimates in local nominal terms have increased with the glaring exception of the US where returns are down slightly. For the US, the prospective valuation improves, but this is exactly offset by a lower inflation rate and growth path. Interestingly with inflation declining, expected real returns have generally increased.

There are some large increases in expected equity returns in USD terms for several regions: Eurozone, UK, China[4], and Australia. Most of the gain is through expected currency appreciation, as the dollar has soared in the last 10 months. We expect the large increase in the dollar in the last 10 months to abate and reverse slightly.

Emerging market countries are expected to have the higher return, but this is accompanied by the highest risk as well.

Equity market 5-year expected returns

	June 2019		April 2020		Real returns of Unhedged USD	
	Local	USD Unh	Local	USD Unh	June 2019	April 2020
US Large Cap	5.1	5.1	4.9	4.9	3.1	3.5
Eurozone	8.3	9.1	8.6	10.5	7.1	9.1
Switzerland	7.3	7.3	7.2	7.7	5.3	6.3
United Kingdom	8.6	9.5	8.7	10.6	7.5	9.2
Japan	5.7	8.3	5.9	8.6	6.3	7.2
China	8.2	8.0	11.3	11.4	6.0	10.0
Australia	8.5	8.7	9.4	10.2	6.7	8.8
Canada	6.8	7.6	7.0	8.5	5.6	7.1
Global		7.2		7.5	5.2	6.1
Developed Markets		6.6		6.8	4.6	5.4
Emerging Markets		11.2		11.8	9.2	10.4
Dev Mkts x US		8.7		9.6	6.7	8.2
Inflation		2.0		1.4		

Source: UBS Asset Management. Data as of 30 April 2020.

4 Our expected equity return for China increased because we only recently started to overlay a valuation metric with our April assumptions. The June 2019 estimate was based purely on expected inflation, earnings growth and dividends only.

Fixed income

In the last ten months, government bond yields in the developed markets dropped for most countries. In particular, the US saw its 10-year Treasury yield drop from 2.0% to 0.7% – one of the largest drops – and most other DM nations saw more modest declines. Germany saw only a 0.1% decline in already negative 10-year Bunds and the UK 10-year Gilt dropped 0.5%. Switzerland and Japan recorded slight increases.

In developing our intermediate views we have lowered the path of bond yields in the developed markets in the last ten months. In general, we have lowered them anywhere from 40 bps to 100 basis points.

10-year Government Bond yields and expected changes

	June 2019 baseline			April 2020 baseline		
	Starting yield	In 5 yrs	Rise in yields	Starting yield	In 5 yrs	Rise in yields
US	2.0	3.1	1.1	0.6	2.0	1.4
Australia	1.3	2.5	1.2	0.9	1.8	0.9
Canada	1.5	2.9	1.4	0.5	2.0	1.5
Germany	-0.3	0.9	1.2	-0.5	0.5	1.0
France	0.0	1.2	1.2	-0.1	0.8	0.9
Italy	2.1	2.2	0.1	1.8	2.1	0.3
Spain	0.4	1.6	1.2	0.7	1.5	0.8
Japan	-0.2	0.4	0.6	0.0	0.4	0.4
Switzerland	-0.6	0.9	1.4	-0.5	0.4	0.9
UK	0.8	2.5	1.7	0.2	1.5	1.3
China	3.2	3.5	0.3	2.5	3.0	0.5

Source: UBS Asset Management. Data as of 30 April 2020.

Fixed income (continued)

For the US, our expected returns on holding a government bond index for 5-years have fallen the most from 1.0% to -0.7%. Other countries – Switzerland, for example, have expected returns in CHF terms rise from -3.1% to -2.4%.[5] Credit spreads narrowed sharply going into the New Year, then widened to recession levels in a period of weeks and now have fallen back. On net, the expected return to investment grade credit has declined, but looks attractive relative to sovereigns.

In the credit markets, both investments grade and high yield credits rallied significantly in April and May, with IG option-adjusted spreads narrowing from 255 to 165 bps and high yield spread narrowing from 880 to 634 bps. This has produced two month returns of 6.3% for IG bonds and 9.1% for high yield. Consequently, we have updated our estimates of credit returns to reflect the end of May.

Selected bond market returns 5-yr baseline

	June 2019 Baseline		April 2020 Baseline	
	5yr Local	5yr Hdg USD	5yr Local	5yr Hdg USD
Government Bonds				
US Treasuries	1.0	1.0	-0.7	-0.7
Australia Gov	0.1	0.8	0.0	0.1
Canada Gov	0.2	0.5	-0.8	-1.0
Eurozone Gov	-0.8	1.6	-0.6	0.2
Japan Gov	-1.0	1.3	-0.5	0.0
Switzerland Gov	-3.1	-0.3	-2.4	-1.4
United Kingdom Gov	-2.1	-0.7	-2.4	-2.5
Global Government	-0.2	1.2	-0.5	-0.1
Other Markets				
US Corporates	1.4	1.4	1.0[1]	1.0[1]
US High Yield	3.7	3.7	4.2[1]	4.2[1]
US TIPS	1.5	1.5	0.2	0.2
EMD Hard Currency	4.5	4.5	7.3	7.3

[1] Updated to reflect change in spreads in May
Source: UBS Asset Management. Data as of 30 April 2020.

[5] When we look at real terms or excess return terms, things look better, but there still has been a decline in many markets.

Cash markets

In general, cash rates[6] have fallen sharply across the globe in both real and nominal terms in the last ten months, with the biggest drop coming at the end of the period. Countries with some room for them to drop (the US and many emerging markets) saw large declines in 1-month to 3-month yields. The US 1-month Bill rate dropped from 2.32% to 0.05%--a significant move in this market. The exceptions are Europe and Japan; European bill rates actually rose slightly and Japan's rates dropped only 6 basis points (a relatively large move for Japan).

The emerging markets mirrored the developed and there were sharp declines in countries with already high rates (Brazil, Mexico, South Africa) and more modest declines in countries with limited room for decreases (Korea, Taiwan). Turkey and Argentina, in particular, had large declines, recovering some from their dismal experiences in 2019.

Five-year expected return from rolling 1-month Treasury Bills

	Expected 5-yr T-Bills returns		Expected 5-yr inflation		Expected 5-yr real cash returns	
	June 2019	April 2020	June 2019	April 2020	June 2019	April 2020
United States	2.1	0.2	2.0	1.4	0.1	-1.2
Eurozone	-0.2	-0.4	1.7	1.3	-1.9	-1.7
China	2.6	1.5	2.8	2.7	-0.2	-1.2
United Kingdom	0.7	0.4	2.2	1.4	-1.5	-1.0
Japan	0.0	-0.2	0.3	0.3	-0.3	-0.5
Switzerland	-0.5	-0.3	1.0	0.8	-1.5	-1.1
South Korea	1.8	1.0	2.0	1.4	-0.2	-0.4
Taiwan	1.0	0.3	1.9	1.2	-0.9	-0.9
Brazil	5.5	3.1	4.2	3.2	1.3	-0.1
Mexico	7.1	5.3	3.3	2.7	3.8	2.6
South Africa	6.4	4.1	4.5	4.1	1.9	0.0
Turkey	19.6	8.5	11.5	9.5	8.1	-1.0

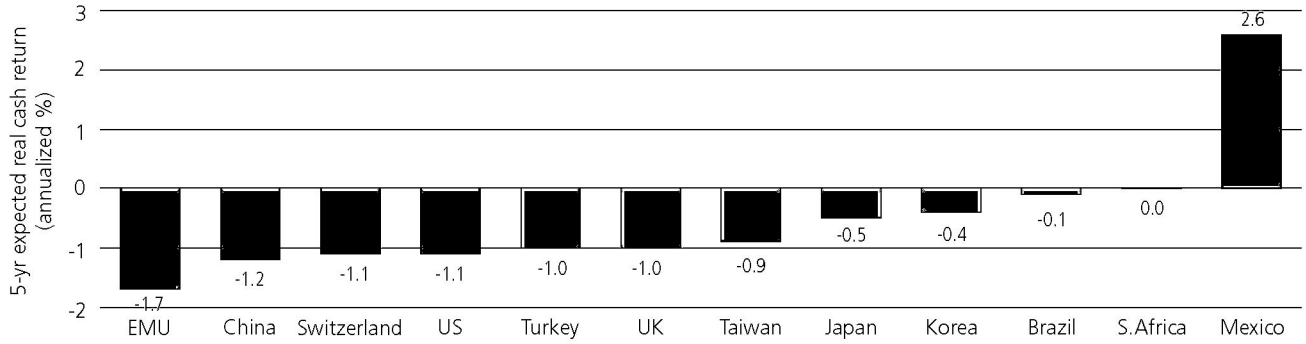
Source: UBS Asset Management. Data as of 30 April 2020.

[6] We follow several rates in the cash markets. Traditionally, we have used the 3-month Libor rate or an equivalent rate since this has been an important benchmark that is widely available for all currencies. With the transition away from Libor, we will also focus on 1-month, 3-month government bill and 1-year government bond rates where available and extrapolate them to all countries. 1-month bill yields are excellent estimates of what money market funds return, so they play an important role for investors needing the highest degree of liquidity. Libor rates and other deposit rates better estimate hedging costs in currency markets as well as what investor must pay to leverage or short positions. Another key rate that we follow is the 1-year government yield, as it is used in UBS's valuation calculations.

Cash markets (continued)
We expect real cash rates to be negative for quite a while. Rates will likely stay low as central banks will be reluctant to tighten prematurely.

Another development in the cash markets was a huge increase in risk premiums on the credit side. Libor rates (and other short rates with credit risks) saw increased spreads over government bill rates, but have subsided into April and May.

Five-year expected real cash returns



Source: UBS Asset Management. Data as of 30 April 2020.

Currencies

In the past ten months the US dollar rose against almost all currencies with the DXY gaining 3.0%.

Several emerging market countries had substantial currency declines: for example, Argentina (-36%), Brazil (-29%) and South Africa (-23%). Two developed market economies that had large declines were Norway (-17%) and Australia (-7%). The Japanese yen and the Swiss franc ended up with small changes relative to the US dollar, while the euro dropped about 4.0%.

Overall, we view the US dollar as overvalued on a long run basis against the EUR and EM currencies. As a result we expect the USD to decline slightly in the coming years, partly as a result of the flight-to-quality effect wearing off.

In the following table we compare the changes in currency effects from a USD investor's perspective. These estimates are based on purchasing power parity, the relative paths of inflation, and the degree of reversion to fair value. In June of 2019, a USD investor in Eurozone equities or bonds should have expected an additional return of 0.8% per year due to the euro rising in value relative to the dollar. Interest rate differentials were quite large at that point in time, so hedging would have improved expected returns by 2.4%. Since then the dollar appreciated and interest rate differentials narrowed. Consequently, by April 2020, we expect that this same investor now expects their euro investments to appreciate by 1.9%, but hedging 'income' to drop to 0.8%.

We also apply the same methodology when looking at multi-currency baskets such as global equities or global government bonds. For example, a USD investor investing in developed market equities ex US would have expected 1.1% gains per year from foreign currency appreciation in the June 2019 assumptions and this increased to 1.8% in our April 2020 assumptions.

Another effect of the narrowing of interest rate differentials is that hedged impacts are lower. For example, for a global government bond portfolio, the impact of hedging dropped from 1.4% to 0.4%. As can be seen in the chart below, this impact is across the board for this group of major currencies. Many investors on the wrong side of the hedging proposition have found the high negative income unattractive (for example, Japanese investors who are considering whether to hedge a US real estate portfolio). Now this consideration has narrowed, making hedging more attractive from their perspective.

Currency impacts in USD terms

	June 2019 Currency		April 2020 Currency	
	Unhedged	Hedged	Unhedged	Hedged
EUR	0.8	2.4	1.9	0.8
GBP	1.0	1.4	1.9	-0.1
JPY	2.6	2.3	2.7	0.6
CHF	0.0	2.8	0.5	1.0
CAD	0.8	0.3	1.5	-0.2
AUD	0.3	0.7	0.8	0.2
CNY	-0.2	-0.5	0.0	-1.3
Index Baskets				
Dev Mkt Eq x US	1.1	1.9	1.8	0.4
Global Equity	0.4	0.4	0.7	-0.1
Global Eq x US	0.9	0.9	1.5	-0.2
EME	0.2	-1.9	0.7	-2.0
Global Gov	0.9	1.4	1.4	0.4
Global Gov x US	1.4	2.2	2.1	0.6
Global Credit	0.2	0.3	0.4	0.0
EMD Local	0.3	-2.1	1.3	-2.9

Source: UBS Asset Management. Data as of 30 April 2020.

Alternatives

The prospects for real estate are highly uncertain. Some segments suddenly have a questionable future—is there a permanent hit to malls and central business district office buildings? We expect a lot of turnover and adjustment, but potential for great opportunities exist as well. We projected a relatively low return for real estate in 2019 (4.9%) and see little rationale for returns to be much higher, though we expect the dispersion of returns across funds to be higher.

We have updated our methodology for hedge funds and will use some factor adjustments to the returns. We would expect that with better valuation and an increased opportunity set, the expected hedge fund alpha has increased, though financing constraints may limit the scalability of opportunities. Although these returns appear to be low, they are net-of-fees and provide a fairly high premium over cash interest rates and should beat most bond markets (with the exception of high yield). Even with these low returns, if hedge funds can provide low correlation with other asset classes, they can play important roles in moderate and low risk portfolios.

In private equity, we expect a large discrepancy by vintage year. Vintages in the 2017 to 2019 years should start to see significant write-downs of NAVs over the next three quarters along with lower than expected distributions; however, vintages starting in 2020 are investing in a brighter market environment. Distressed debt investing and buy-out funds suddenly have a plethora of opportunities and could do quite well.

Alternatives: 5-yr expected returns in USD terms

	June 2019	April 2020
US Real Estate (unlevered)	4.9	4.8
Hedge Funds (Low Vol)	3.9	3.5
Hedge Funds (High Vol)	4.5	4.0
US Private Equity	7.7	7.5
Global Private Equity (unhedged)	9.1	9.0

Source: UBS Asset Management. Data as of 30 April 2020.

Summary

The pandemic of 2020 has dramatically shifted the starting point and path of the economy. More than ever, investors face a wider array of economic outcomes to prepare for. Along with bouts of volatility and normal rotations of performance, we need to prepare for regime shifts that alter some fundamental relationships in the markets.

Given the uncertainty in the markets, scenario analysis is another tool to evaluate the range of outcomes across specific economic and capital market paths. This analysis allows us to explore the downsides as well as the upsides in the different asset classes and allow investors to understand the driving forces. Complementing this with standard tools and modern risk control analytics should help prepare investors to build better, more resilient portfolios.

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Americas
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UBS

Vanguard

MARCH 2023

Market perspectives

Vanguard's monthly economic and market update

Note: Vanguard's views are as of February 27, 2023, unless otherwise stated.

KEY HIGHLIGHTS

- Vanguard has **revised its views for U.S. economic growth**, inflation, and how high the Fed will ultimately need to raise its interest-rate target.
- Our base case remains that there will be a **shallow recession in late 2023**, but that the odds of a "later landing" have increased.
- We expect the Personal Consumption Expenditures Price Index to **end 2023 around 3%**.

Asset-class return outlooks

Our 10-year annualized nominal return projections are shown below. The projections listed below are based on the December 31, 2022, running of the Vanguard Capital Markets Model® (VCMM). Please note the figures are based on a 2-point range around the 50th percentile of the distribution of return outcomes for equities and a 1-point range around the 50th percentile for fixed income.

EQUITIES	RETURN PROJECTION	MEDIAN VOLATILITY
U.S. equities	**4.4%–6.4%**	17.2%
U.S. value	**4.5%–6.5%**	19.8%
U.S. growth	**2.4%–4.4%**	18.3%
U.S. large-cap	**4.3%–6.3%**	16.9%
U.S. small-cap	**4.7%–6.7%**	22.6%
U.S. real estate investment trusts	**4.6%–6.6%**	20.3%
Global equities ex-U.S. (unhedged)	**6.7%–8.7%**	18.5%
Global ex-U.S. developed markets equities (unhedged)	**6.5%–8.5%**	16.7%
Emerging markets equities (unhedged)	**6.3%–8.3%**	26.3%

FIXED INCOME	RETURN PROJECTION	MEDIAN VOLATILITY
U.S. aggregate bonds	**4.0%–5.0%**	5.5%
U.S. Treasury bonds	**3.6%–4.6%**	5.8%
U.S. credit bonds	**4.5%–5.5%**	5.2%
U.S. high-yield corporate bonds	**6.1%–7.1%**	10.2%
U.S. Treasury Inflation-Protected Securities	**3.0%–4.0%**	5.0%
U.S. cash	**3.4%–4.4%**	1.4%
Global bonds ex-U.S. (hedged)	**3.9%–4.9%**	4.4%
Emerging markets sovereign bonds	**5.6%–6.6%**	10.6%
U.S. inflation	**2.0%–3.0%**	2.3%

The probabilistic return assumptions depend on market conditions at the time of the running of the VCMM and, as such, can change with each running over time.

IMPORTANT: The projections or other information generated by the Vanguard Capital Markets Model regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. Distribution of return outcomes from the VCMM are derived from 10,000 simulations for each modeled asset class. Simulations are as of December 31, 2022. Results from the model may vary with each use and over time. For more information, see the Important information section.

Source: Vanguard Investment Strategy Group.

Strong data could push U.S. recession down the road

"We're stuck in the messy middle." That's how Josh Hirt, Vanguard senior U.S. economist, described a U.S. economy that hasn't fully reacted to sharp Federal Reserve interest rate increases over the last year. It's a state that has led Vanguard to revise its views for U.S. economic growth, inflation, and how high the Fed will ultimately need to raise its interest-rate target.

"Activity has weakened in the most interest rate-sensitive sectors of the economy," Hirt said. "But core areas are still showing resilience. We are in this in-between period where the impact of rates has not fully worked through the economy."

That analysis is informed by a proprietary model, the Vanguard Leading Economic Indicators Index (VLEI), created to infer developing economic trends. VLEI incorporates a broad array of the most significant variables on housing, the consumer, manufacturing, financials, expectations surveys, price levels, interest rate spreads, and major economic indexes compiled by the Federal Reserve and other agencies. Within VLEI, each variable is assigned a weight based on its historical correlation with economic activity and its lead-time predictive power.

What VLEI is signaling now

Our index shows that the most interest-rate-sensitive indicators have reacted to the Fed's changes in policy rate and started to turn red and yellow (top right section of the dashboard shown on page 3 indicating weak and slowing activity, respectively). Notably, they include indicators on home prices, financial conditions, and the purchase of big-ticket items. What we haven't seen yet is a deterioration in indicators that respond to more restrictive policy later in a business cycle, such as consumption and the labor market. They continue to indicate strong activity.

"With the Fed expected to continue raising rates and the hikes it has already made working their way through the economy, we expect to see more red and yellow among these indicators in the months to come," said Vytas Maciulis, a Vanguard U.S. economist who works closely with the model. (See the bottom right section of the dashboard.)

For context, the left side of the chart reflects activity leading up to and during the global financial crisis. The Fed began raising rates in the second half of 2004 and we started to see significantly more red and yellow at the top of the VLEI dashboard two years later. We see a similar pattern developing in recent data.

Implications for our outlook

Given the above-trend activity in some core leading indicators, it could take longer for the business cycle to turn, and we have adjusted our outlook to reflect that.

Our base case remains that there will be a shallow recession in late 2023, but that the odds of a "later landing" have increased. The economy should nevertheless post GDP growth of around 0.75% this year—half a percentage point higher than our previous expectation—and just shy of 2% next year.

Unemployment slated to climb slightly

Stronger economic activity could lead to fewer job losses and more stubborn inflation readings. We expect the unemployment rate to climb a little more modestly from its current 54-year low to around 4.5%–5.0% by the end of this year and to be at a similar level at the end of 2024.

More rate hikes ahead

The Fed will need to keep raising rates given this backdrop. We now see its rate target peaking in a range of 5.50%–5.75%. "Our outlook has held that stubborn inflation would require restrictive policy well into 2024," said Hirt. "We believe the current state of the economy is providing evidence that this will indeed be necessary."

It will take longer to meet the Fed's inflation target

We expect the Personal Consumption Expenditures Price Index (the Fed's preferred inflation yardstick) to end 2023 around 3% before falling closer to the Fed's 2% target in 2024.

Core of the economy is showing resilience

Dashboard of Vanguard Leading Economic Indicators Index

Notes: For a given positively correlated variable in VLEI: red indicates weak activity, yellow indicates slowing activity, and green indicates strong activity. (The relationship is reversed for negatively correlated variables, or those that move in the opposite direction from that of the activity being measured.)

Data are from January 2006 through December 2009 and from January 2020 through February 2023.

Source: Vanguard.

All investing is subject to risk, including the possible loss of the money you invest.

Investments in bonds are subject to interest rate, credit, and inflation risk.

Investments in stocks and bonds issued by non-U.S. companies are subject to risks including country/regional risk and currency risk. These risks are especially high in emerging markets.

IMPORTANT: The projections and other information generated by the Vanguard Capital Markets Model regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. VCMM results will vary with each use and over time.

The VCMM projections are based on a statistical analysis of historical data. Future returns may behave differently from the historical patterns captured in the VCMM. More important, the VCMM may be underestimating extreme negative scenarios unobserved in the historical period on which the model estimation is based.

The Vanguard Capital Markets Model® is a proprietary financial simulation tool developed and maintained by Vanguard's primary investment research and advice teams. The model forecasts distributions of future returns for a wide array of broad asset classes. Those asset classes include U.S. and international equity markets, several maturities of the U.S. Treasury and corporate fixed income markets, international fixed income markets, U.S. money markets, commodities, and certain alternative investment strategies. The theoretical and empirical foundation for the Vanguard Capital Markets Model is that the returns of various asset classes reflect the compensation investors require for bearing different types of systematic risk (beta). At the core of the model are estimates of the dynamic statistical relationship between risk factors and asset returns, obtained from statistical analysis based on available monthly financial and economic data from as early as 1960. Using a system of estimated equations, the model then applies a Monte Carlo simulation method to project the estimated interrelationships among risk factors and asset classes as well as uncertainty and randomness over time. The model generates a large set of simulated outcomes for each asset class over several time horizons. Forecasts are obtained by computing measures of central tendency in these simulations. Results produced by the tool will vary with each use and over time.

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Capital Market Assumptions 2023

Our long-term return expectations for capital markets serve as key inputs into our strategic asset allocation process for multi-asset portfolios and provide context for shorter-term forecasting.

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INVESTMENT MANAGEMENT

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Contents

Foreword

Our annual capital market forecasting process is always a time for looking ahead and looking back for our investment teams. Looking ahead to define the trends and underlying forces that will determine asset class returns over the next decade and looking back to see whether our forecasting methodology and statistical techniques are still relevant and cutting edge.

In this document, we present our 10-year ahead forecasts for risk, return and correlation of returns for mainstream asset classes in the global investable universe. This year, we have modified our process to incorporate climate change, a subsegment of environmental, social and governance (ESG) factors, into our return forecasts. We specifically choose climate change as the most tangible factor within ESG-related considerations, as it can affect consumer behavior, investment needs, financing, supply chain organization, cross-border trade and stranded assets. Climate change's effect on these variables flows directly into GDP growth and inflation, the magnitude of which will be partly driven by increases in productivity-enabling technologies. For further discussion of climate change in our capital market forecasts please see page 14.

Our analysis points to a decade of subdued returns for most major asset classes.

The return profile for many assets classes remains below historical averages. For example, global equities are forecast to have an arithmetic return of 6%. The economy being mired in a low productivity regime leaves equity in solid shape, but offering what most investors consider somewhat limited upside potential. By contrast, fixed income is forecast to deliver decent returns. Global fixed income assets are forecast to gain 3.6% and we expect US long government bonds to return 4.5%. The rationale behind stronger than previously forecast fixed income gains is the starting point for real yields, which are positive for the first time since 2009. The more normal investment environment that positive real yields bring to investors is a welcome development.

We hope that you find our capital market forecasts useful and look forward to the year ahead. We wish you the very best for a successful 2023.

Sincerely,

Paul Zemsky, CFA
Chief Investment Officer,
Multi-Asset Strategies and Solutions

Barbara Reinhard, CFA
Head of Asset Allocation

Summary of findings

Compared to last year's projections, our 2023–2032 forecast calls for similar equity returns (6.0% for the S&P 500) and higher bond returns (4.2% for the US Agg).

Our capital market assumptions (CMA) 2023 report details our research on asset class returns, standard deviations of returns and correlations over the 10-year horizon from 2023 through 2032. These estimates represent key inputs into strategic asset allocation decisions for our multi-asset portfolios and provide context for shorter-term macroeconomic and financial forecasting.

Our forecasts were informed by historically low potential GDP growth, reduced labor supply and elevated inflation. To avoid using a single-point estimate forecast, we incorporate an alternative scenario, which has slightly better or worse macro inputs. This year, the alternative-case scenario was again based on inputs of marginally higher productivity and a lower terminal fed funds rate.

Some key results of our analysis:

- The next decade will likely be characterized by returns below historical averages across all major asset classes.
- Developed market equities are likely to deliver mid-single-digit returns, with returns for most non-US market assets lower than those for comparable US assets.
- Emerging market equities should outperform developed markets, albeit with higher expected volatility given a more uncertain path to growth than that of developed markets.
- Bond return assumptions have increased from last year but remain in the low single digits. These projections assume that moves in both bond term premiums and real interest rates will cap upside returns available to fixed income assets.

Forecast environment: Still a low-growth world, with upside for the US

Our forecast models an explicit process of convergence to a steady-state equilibrium for global economies and financial markets through 2032. In our modeling process, we worked with the economic consulting group at S&P Global, which provided quantitative support for our macro inputs.[1]

Cyclical fluctuations are an inevitable aspect of market economies, and we recognize that the steady-state equilibrium incorporated as the terminal point of our forecast is unlikely to be fully attained over any point-to-point 10-year period under real-world conditions. Nonetheless, we find that this theoretical construct is useful for anchoring the forecast. As a result, the forecast does not assume a recession or contraction over the 2023–2032 horizon.

Over the period covered by our forecasts, we believe the US will be constrained by labor force growth, but has the ability to move to a somewhat higher, sustained growth path than it experienced in the previous business cycle. The key is for the US to exit the current low-productivity regime that has constrained the economy.

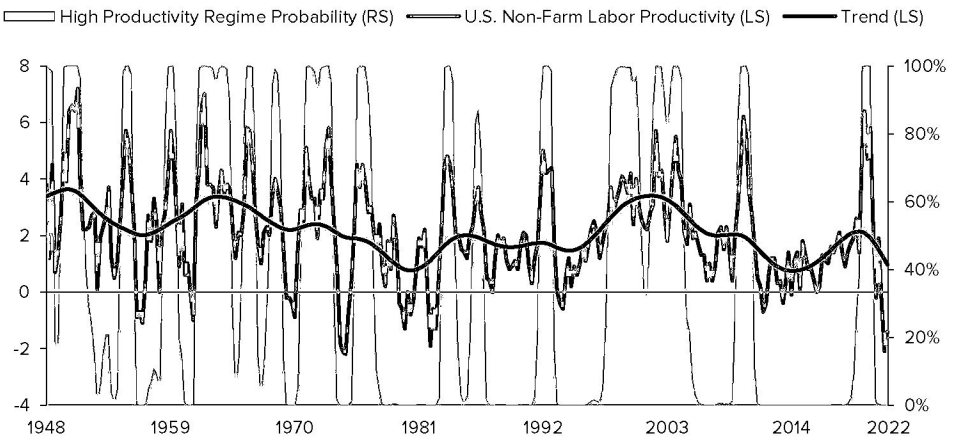
Productivity growth essentially comes from capital deepening and total factor productivity (TFP). The latter is an unobservable measure taken from the decomposition of real GDP growth — the remainder after accounting for the contributions of capital and labor, called the Solow residual. This residual could reflect improvements in technology, growth in the effectiveness of labor, strength in property rights and quality of labor. It also incorporates cultural attitudes, including risk and high levels of confidence in the outlook, which can contribute to a revival in productivity through the TFP channel.

[1] S&P Global is an independent research firm that provides a comprehensive global macroeconomic model, linking 68 individual country models with key global drivers of performance. The model accounts for 95% of global GDP, covering 250–500 time series per country.

Labor-force productivity growth typically alternates between high- and low-productivity regimes over time. To determine the current regime, we fit productivity data through a Markov model (Exhibit 1). The latest data show that US productivity growth has declined from –0.2% year-over-year in 3Q21 to –1.4% in 3Q22, signaling a "low-productivity" regime. The system had been in high-productivity equilibrium for four quarters following the Covid recession. (High-productivity regimes, indicated below in gray shading, average 3.8%, while low-productivity regimes average 1.1%.) A Hodrick-Prescott filter-based decomposition of year-over-year productivity growth into trend and cycle components also shows that the current trend of US productivity growth is 1.0%.

Over the next decade, the US has greater potential for higher, sustained growth than in the previous business cycle.

Exhibit 1. Productivity growth has decelerated



As of 06/30/22. Source: Voya Investment Management. Non-shaded areas in the chart denote low-productivity regimes.

As in the past, our CMA 2023 forecast is predicated on a "base" and an "alternative" scenario. The alternative scenario assumes that the US exhibits modest improvement in output per hour, largely the result of gains in total factor productivity as the labor share shifts away from brick-and-mortar to more productive firms. We generate our forecast based on a 60/40 weight to the base/alternative scenarios. Our forecast is for US GDP growth over the 10-year period to attain 1.9%. Exhibit 2 shows the 2032 values from this forecast, which are consistent with our estimates of longer-term, steady-state values for key US economic variables.

Exhibit 2. Our 2032 forecast for US economic and financial variables

	2032 Forecast
US GDP growth	**1.9%**
Inflation (CPI-U)	2.3%
CPI ex food and energy	2.4%
Federal funds rate	2.4%
10-year US Treasury yield	3.0%
Profit share	8.4%
Savings rate	9.4%

As of 11/21/22. Source: Voya Investment Management, S&P Global. Forecasts are subject to change.

Long-run assumptions

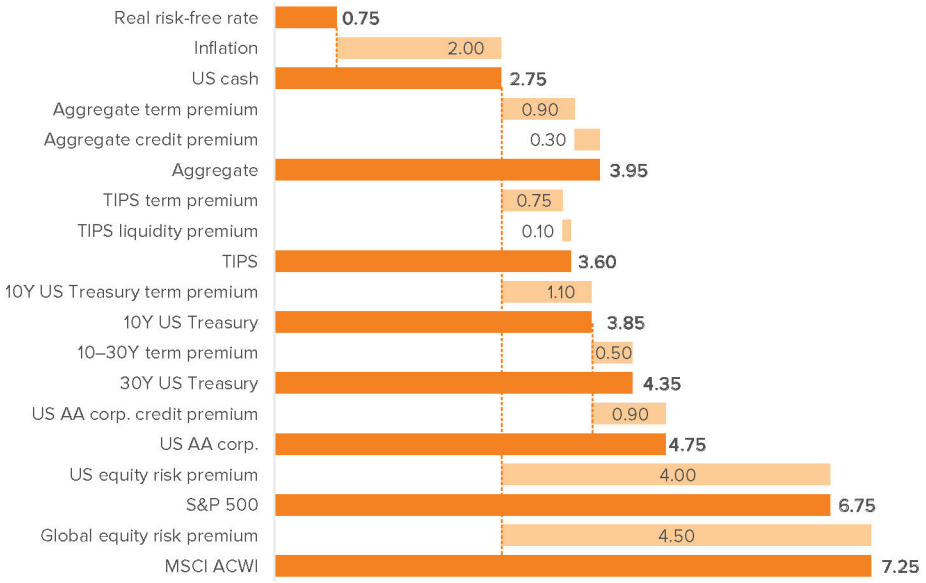
While 10-year forecasts guide our strategic asset allocations, our glidepath assumptions for target date strategies are based on long-run equilibrium return assumptions over much longer horizons, typically 40 years (Exhibit 3). At that point, we think of the economy as being in a steady state where GDP grows at its trend rate, inflation is at target, unemployment equals the non-accelerating inflation rate of unemployment, the real interest rate equals the "natural" rate of interest — neither contractionary nor inflation inducing — and all capital and goods markets are in equilibrium.[2]

These forecasts use a building block methodology. Starting with our expectations for real short-term yield and inflation, we generate a risk-free rate forecast and, from that, derive all equity and fixed income assets by adding the relevant risk premium:

- We derive the risk premium for US equities from the Gordon growth model, representing the sum of the dividend yield and the nominal earnings growth rate in excess of the risk-free rate. International equities add an international equity risk premium.
- Government bond return forecasts are the sum of the risk-free rate and an appropriate term premium. Corporate bond return forecasts add a credit-risk premium.

From a theoretical perspective, all risk premiums mean revert towards a long-run equilibrium, as the economy is in a steady state. The reason for mean reversion is that investment opportunities are time varying. Since the rate of arrival of new information is time varying, return volatility and covariance are time varying as well in the short run. Our econometric work (and that of academic researchers) confirms the stationarity of a number of risk premiums, which, in turn, justifies our assumption of constant average risk premiums, term premiums and credit spreads in the long-run equilibrium.

Exhibit 3. Long-run equilibrium return assumptions (%)



As of 11/21/22. Source: Voya Investment Management. Assumptions are subject to change.

[2] "Understanding Glide Path Design: Distribution of Labor Income among Participant Populations," Sinha, A. and Yuen, R., Voya Investment Management, 2Q18.

How we forecast returns

Our process for determining asset class risk and return estimates begins with a top-down forecast of economic growth, using a 60/40 blend of base-case and alternative scenarios. To develop these forecasts, we leverage S&P Global's economic modeling capabilities. These two scenarios capture the most important upside and downside risks facing the global economy and markets over the forecast horizon. Furthermore, in response to client demand and following guidance from organizations such as the Task Force on Climate-Related Financial Disclosures (TCFD), we have integrated climate scenarios into our economic forecasts this year, described on page 16 in Methodological considerations.

Our base-case scenario forecasts 2.6% US GDP growth through 2032, driven by strong consumer spending, below-trend productivity growth and subdued labor force growth. The alternative scenario incorporates slightly faster productivity growth, a higher dividend payout ratio, more inflation and an assumption that the Federal Reserve lets the economy run a little hotter than in the base case. Under these assumptions, returns for risk assets are modestly higher in the alternative scenario than in the base case.

For US stocks, we estimate earnings and dividends for the S&P 500 Index using our blended macroeconomic assumptions. Earnings growth is constrained by the neoclassical assumption that profits as a share of GDP cannot increase without limit but will converge to a long-run equilibrium. We then use a dividend discount model to determine fair value for the index each year during the forecast period. We construct returns for other US equity indexes, including REITs, using a single-index factor model in which beta sensitivities of each asset class, with respect to the market portfolio, are derived from our forward-looking covariance matrix estimation. Beta is by definition covariance over variance. (For additional detail, see "Covariance and correlation matrices methodology" on page 10.) Each equity asset class return is the sum of the risk-free interest rate and a specific risk premium determined from our estimate of beta sensitivity and market-risk premium forecasts.

For US bonds, we use the blended-scenario interest rate expectations to calculate expected returns for various durations. We model bond expected returns as the sum of current yield and a capital gain (or loss) based on duration and expected change in yields. For non-US bonds, the process is similar and includes an adjustment for expected currency movements. Return expectations for credit-related fixed income reflect yield spreads and expected default and recovery rates.

Exhibit 4. Ten-year return forecasts, 2023–2032

	Expected returns		Volatility (%)	Skewness	Kurtosis	Sharpe ratio
	Geometric mean return (%)	Arithmetic mean return (%)				
Stocks						
S&P 500	4.8	6.0	15.8	-0.53	1.2	0.23
S&P 500 Growth	4.1	5.6	18.0	-0.45	0.9	0.18
S&P 500 Value	5.4	6.4	15.3	-0.64	1.9	0.26
MSCI US Minimum Volatility	4.9	5.5	11.7	-0.66	1.4	0.26
Russell 3000	4.9	6.1	16.2	-0.58	1.4	0.23
Russell Midcap	4.8	6.3	17.8	-0.65	1.8	0.22
Russell 2000	4.2	6.7	22.2	-0.58	1.7	0.19
MSCI EAFE	3.6	5.3	18.7	-0.28	0.4	0.16
MSCI World	4.7	5.8	15.6	-0.61	1.3	0.22
MSCI EM	3.8	7.0	25.4	-0.34	0.8	0.18
MSCI ACWI	4.8	6.0	15.7	-0.63	1.3	0.22
Bonds						
Bloomberg US Aggregate	4.0	4.2	6.8	0.56	5.1	0.27
Bloomberg US Government Long	3.8	4.5	12.7	0.23	0.7	0.17
Bloomberg US TIPS	3.5	3.6	5.4	-0.89	4.4	0.23
Bloomberg US High Yield	6.9	7.3	11.2	-0.44	4.5	0.41
Credit Suisse Leveraged Loan	7.2	7.2	7.3	-1.67	22.9	0.26
Bloomberg Global Aggregate	3.3	3.6	7.7	0.14	1.0	0.16
Bloomberg Global Aggregate ex US	2.7	3.1	9.9	0.04	0.1	0.08
JPMorgan EMBI+	7.5	8.3	13.9	-1.09	7.9	0.37
US Treasury Bill 3M	2.3	2.3	1.0	1.02	1.4	0.00
Real assets						
Bloomberg Commodity	2.2	3.4	15.6	-0.47	1.8	0.07
FTSE EPRA Nareit Developed	3.4	5.5	20.6	-0.52	2.4	0.15

As of 11/21/22. Source: Voya Investment Management. Returns shown are in US dollar terms. Forecasts are subject to change.

Exhibit 5. Ten-year forecasted correlations matrix, 2023–2032

	S&P 500	Russell 1000 Growth	Russell 1000 Value	MSCI US Minimum Volatility	Russell 3000	Russell Midcap	Russell 2000	MSCI EAFE	MSCI World	MSCI EM	MSCI ACWI	Bloomberg Commodity	FTSE EPRA Nareit Developed	Bloomberg US Aggregate	Bloomberg US Government Long	Bloomberg US TIPS	Bloomberg US High Yield	Credit Suisse Leveraged Loan	Bloomberg Global Aggregate	Bloomberg Global Aggregate ex US	JPMorgan EMBI+	US Treasury Bill 3M
S&P 500	1.00																					
Russell 1000 Growth	0.96	1.00																				
Russell 1000 Value	0.95	0.83	1.00																			
MSCI US Minimum Volatility	0.90	0.83	0.89	1.00																		
Russell 3000	1.00	0.96	0.95	0.89	1.00																	
Russell Midcap	0.95	0.92	0.93	0.86	0.97	1.00																
Russell 2000	0.84	0.83	0.81	0.73	0.88	0.93	1.00															
MSCI EAFE	0.69	0.65	0.68	0.64	0.70	0.69	0.62	1.00														
MSCI World	0.96	0.93	0.92	0.87	0.97	0.94	0.84	0.86	1.00													
MSCI EM	0.53	0.51	0.50	0.47	0.54	0.55	0.52	0.56	0.58	1.00												
MSCI ACWI	0.95	0.91	0.91	0.85	0.95	0.93	0.84	0.86	0.99	0.70	1.00											
Bloomberg Commodity	0.29	0.26	0.31	0.24	0.30	0.34	0.32	0.35	0.34	0.35	0.36	1.00										
FTSE EPRA Nareit Developed	0.66	0.60	0.68	0.68	0.67	0.68	0.63	0.70	0.73	0.56	0.75	0.27	1.00									
Bloomberg US Aggregate	0.21	0.20	0.20	0.30	0.21	0.20	0.13	0.18	0.22	0.03	0.20	-0.04	0.25	1.00								
Bloomberg US Government Long	0.06	0.07	0.03	0.18	0.05	0.04	-0.02	0.02	0.05	-0.10	0.02	-0.16	0.12	0.88	1.00							
Bloomberg US TIPS	0.22	0.22	0.21	0.27	0.22	0.23	0.16	0.20	0.23	0.14	0.23	0.19	0.26	0.56	0.54	1.00						
Bloomberg US High Yield	0.58	0.56	0.57	0.54	0.59	0.61	0.59	0.51	0.60	0.47	0.62	0.27	0.55	0.21	0.06	0.29	1.00					
Credit Suisse Leveraged Loan	0.33	0.31	0.35	0.34	0.35	0.38	0.35	0.31	0.36	0.30	0.37	0.28	0.35	0.01	-0.18	0.18	0.57	1.00				
Bloomberg Global Aggregate	0.23	0.22	0.23	0.31	0.23	0.23	0.17	0.42	0.32	0.14	0.31	0.15	0.36	0.78	0.67	0.56	0.21	0.03	1.00			
Bloomberg Global Aggregate ex US	0.21	0.19	0.20	0.27	0.20	0.21	0.16	0.47	0.32	0.18	0.31	0.22	0.36	0.54	0.45	0.47	0.18	0.03	0.95	1.00		
JPMorgan EMBI+	0.44	0.42	0.43	0.47	0.44	0.45	0.39	0.38	0.45	0.57	0.50	0.19	0.50	0.38	0.27	0.33	0.43	0.21	0.35	0.28	1.00	
US Treasury Bill 3M	0.06	0.04	0.07	0.09	0.06	0.05	0.02	0.06	0.07	0.06	0.07	0.01	0.04	0.16	0.07	-0.03	0.05	0.05	0.12	0.08	0.09	1.00

As of 11/21/22. Source: Voya Investment Management. Projections are subject to change.

Appendix: Methodological considerations

Covariance and correlation matrices methodology

Asset class covariance and correlation matrices are crucial components of our capital market assumptions process, serving as the pillars of asset class standard deviation forecasts. This is a different process than forecasting returns, as correlations tend to wander over time. If we were to use a historical average or exponentially weighted methodology — which takes a long-run history and puts a heavier weight on recent observations — it could lead to risk forecasts that may represent the past but bear little resemblance to the future.

An example using stocks and bonds illustrates this point. Over the past 20 years, the correlation of returns between the S&P 500 Index and the Bloomberg US Aggregate Bond Index was –0.02; however, this offers little insight into the relationship between these two asset classes during unusual periods or when financial markets are in euphoric or pessimistic states. For example, over that same 20-year interval, the correlation of stocks and bonds was –0.10 during normal periods of returns, but 0.07 during unusual periods (Exhibit 6). Incorporating these periods of unusual correlation patterns can lead to a truer estimate of the durability of diversification between asset classes. We capture these unusual periods in our standard deviation and correlation forecasts using an academic framework called *turbulence*.

Our methodology incorporates periods of unusual correlation to develop truer estimates of the durability of diversification between asset classes.

Turbulence: An evolution from skull measurements to finance

The turbulence framework we use to estimate correlations and standard deviations of returns is derived from the academic work of the applied statistician Prasanta Chandra Mahalanobis. In the early 20th century, Mahalanobis analyzed human skull resemblances among castes and tribes in India. He created a formula to capture differences in skull size, which incorporated the standard deviation of measures of various skull parts. He then squared and summed the normalized differences, generating a single composite distance measure.[3]

This formula evolved into a statistical measure called the "Mahalanobis distance." The measure was groundbreaking in that it helped analyze data across standard deviations but also incorporated the correlations among data sets. More than 70 years later, the Mahalanobis distance was used by Kritzman and Li to formulate a concept called financial turbulence.[4] They postulated financial turbulence as a condition in which asset prices, given their historical patterns of returns, behave in an uncharacteristic way including extreme price moves. They further noted that financial turbulence often coincides with excessive risk aversion, illiquidity and price declines for risky assets. It is this turbulence framework (or unusualness of returns and correlations of returns) that we have used to forecast risk measures in our capital market assumptions.

Observing turbulence

Turbulence can be calculated for any given set of asset classes. Back to our example of US stocks and bonds, the two dimensions can be visualized as the equation of an ellipse using the returns of the S&P 500 Index and the Bloomberg US Aggregate Index (Exhibit 6). The center of the ellipse represents the average of the joint returns of the two assets. The boundary is a level of tolerance that separates normal from turbulent observations. This boundary takes the form of an ellipse rather than a circle because it accounts for the covariance of the asset classes.

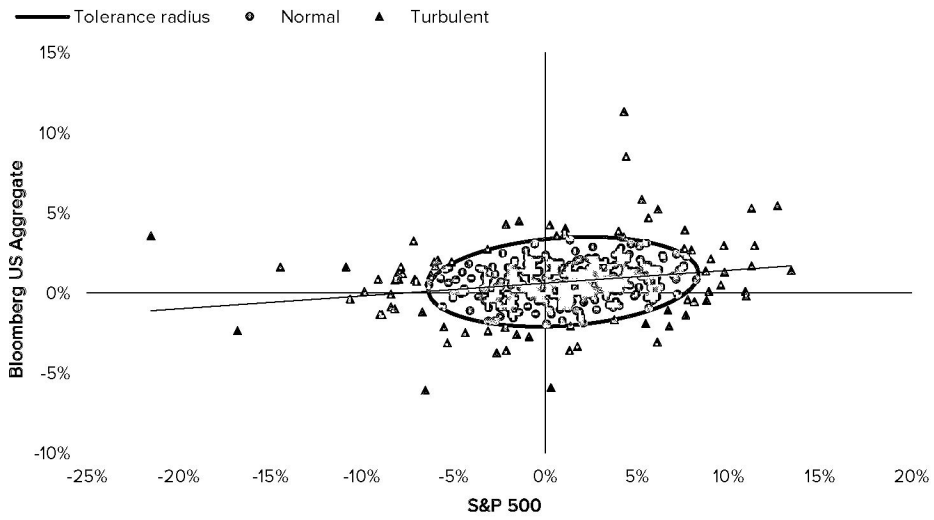
The idea captured by this measure is that certain periods are considered turbulent not only because returns are unusually high or low, but also because they moved in the opposite direction of what would have been expected based on the average correlation.

[3] Mahalanobis, P., "On the Generalized Distance in Statistics," *Proceedings of the National Institute of Sciences of India* vol. 2 no. 1 (1936): 49–55.

[4] Kritzman, M. and Y. Li, "Skulls, Financial Turbulence, and Risk Management," Financial Analysts Journal, vol. 66 no. 5 (2010): 30–41.

Exhibit 6. We account for non-normal observations by considering correlations

Normal and turbulent periods of stock and bond correlations, 20 years ended 09/30/22



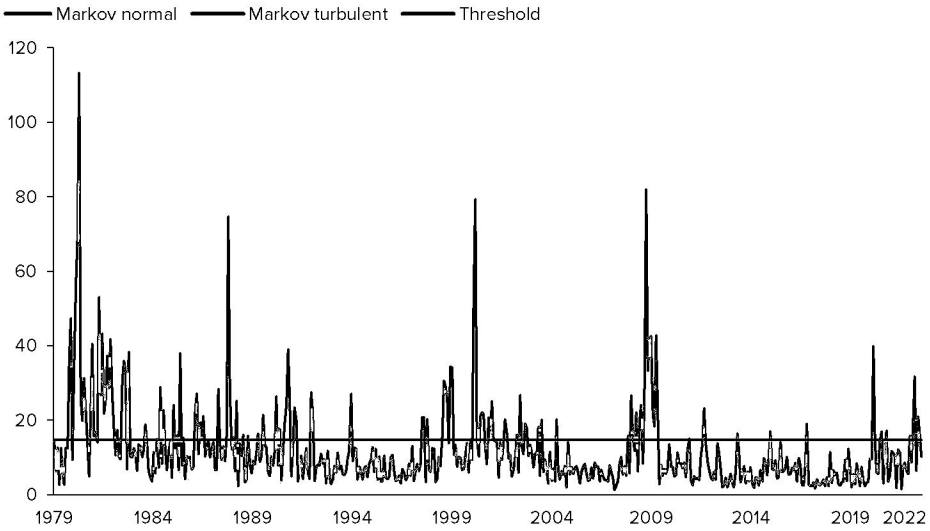
As of 09/30/22. Source: Voya Investment Management.

Using turbulence to create portfolios

The threshold for normalcy and turbulence shown in Exhibit 6 is not static; rather, it changes over time. Our process identifies turbulent market regimes by estimating a covariance matrix covering those periods of market stress alone, and is the outcome of a Markov model. The model classifies regimes rather than arbitrary thresholds, because thresholds would fail to capture the persistence of shifts in volatility. The Markov model output in Exhibit 7 illustrates turbulent and normal regimes.

Exhibit 7. Means and variances both matter when determining whether observations are turbulent

Markov normal and turbulent regimes over time



As of 08/31/22. Source: Voya Investment Management.

For turbulent market regimes, we make use of the concept of multivariate outliers in a return distribution. That is, we take into account not only the deviation of a particular asset class's return from the average, but also its volatility and correlation with other asset classes. We subsequently estimate a covariance matrix based on periods of normal and turbulent market performance. Finally, we blend these two covariance matrices using weights that allow us to express both views about the likelihood of each normal or turbulent regime and to capture the differential risk attitudes toward each. The weights we use to create our strategic asset allocation portfolios are 60% normal and 40% turbulent.

Although turbulent regimes have an observed frequency of only 30%, we overweight them at 40% to account for structural issues such as globalization, demographics and worldwide central bank intervention, which are prevalent today. Furthermore, overweighting turbulent periods increases the assumed risk, providing a more conservative matrix that emphasizes diversification during volatile periods. From this blended covariance matrix, we then extract the implied correlation matrix and standard deviations for each asset class. In our view, this process helps create a strategic asset allocation portfolio that can account for the empirical evidence that correlations will deviate through time.

Time dependency of asset returns and its impact on risk estimation

Recent research suggests that expected asset returns change over time in somewhat predictable ways, and that these changes tend to persist over long periods. Thus, changes among investment opportunities — all possible combinations of risk and return — are found to be persistent. This Appendix will set out the economic reasons for return predictability, its consequences for strategic asset allocation and the adjustments we have made to control for it in our estimation process.

Research suggests that expected asset returns change in somewhat predictable ways, which are persistent over time.

In our view, the common source of predictability in financial asset returns is the business cycle. The business cycle itself is persistent, and this makes real economic growth predictable, to some extent. The fundamental reason for the business cycle's persistence is that its components share the same quality. Consumers, for example, tend to smooth consumption since they dislike abrupt changes in their lifestyles. Research on permanent income and lifecycle consumption provides the theoretical basis for consumers' desire for a stable consumption path. When income is affected by transitory shocks, consumption should not change since consumers can use savings or borrowing to adjust consumption in well-functioning capital markets.

Robert Hall has formalized these ideas by showing that consumers will optimally choose to keep a stable path of consumption equal to a fraction of their present discounted value of human and financial wealth.[5] Investment, the second component of GDP, is sticky, as corporate investment in projects is usually long term in nature. Finally, government expenditures also have a low level of variability. Over a medium-term horizon, negative serial correlation sets in, as the growth phase of the cycle is followed by a contraction, and then that contraction is followed by renewed growth.[6]

How does this predictability of economic variables affect the predictability of asset returns? Consider stocks as an example.

Equity values are determined as the present discounted value of future cash flows, and they depend on four factors: expected cash flows, expected market risk premium, expected market risk exposure and the term structure of interest rates.

- Cash flows and corporate earnings tend to move with the business cycle.
- The market risk premium is high at business cycle troughs, when consumers are trying to smooth consumption and are less willing to take risks with their income, and it is low at business cycle peaks, when people are more willing to take risks. The market risk premium is a component of the discount rate in the present value calculation of the dividend discount model.

[5] Hall, R., "Stochastic Implications of the Life-Cycle-Permanent Income Hypothesis: Theory and Evidence," *Journal of Political Economy* 86 (1978): 971–988.

[6] Poterba, J. and Summers, L., "Mean Reversion in Stock Prices: Evidence and Implications," *Journal of Financial Economics* 22 (1988): 27–60.