INVESTING IN THE TWENTY-FIRST CENTURY: WITH OCCAM'S RAZOR AND BOGLE'S WIT

Sir William of Occam taught us to focus on the essentials, and John Bogle showed us how to apply that lesson to forecasting the long-term returns of stock markets. Taking a cue from both, the author evaluates the forecasting ability of a returns decomposition model.

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At the beginning of the 1990s, John Bogle wrote an article entitled "Investing in the 1990s" in which he proposed to forecast the long-term performance of stock markets on the basis of three variables: the initial dividend yield, the expected growth of earnings, and the expected change in the price-to-earnings (P/E) ratio.[2] This simple model, he argued, sets the framework for a rational discussion on expected returns based on plausible forecasts for the last two variables.

In a follow-up article, Bogle proposed to assume that both the growth of earnings and the P/E ratio would revert to their long-term mean and tested the model's ability to predict the returns of the US market.[3] The simplicity of this forecasting framework led Bogle to claim that his proposal would please Sir William of Occam; as is well known, Occam's razor refers to the idea that the simpler an explanation, the more likely it is to be correct. The comparison between the predicted and the observed long-term returns led Bogle to further claim that this forecasting technique gives "very good results."

In this article, I widen the scope of Bogle's inquiry in several dimensions. First, I consider not only the US but also eleven non-US stock markets. Second, I consider not only mean reversion but also three scenarios for the expected change in P/E ratios. And third, I use the model to forecast the mean annual compound return of all twelve markets over the coming 2006–2015 period. I find that, on average, this number is 10.5%, sixty basis points higher than the mean annual compound return of these same twelve markets over the 1900–2000 period.

The returns decomposition model

Most reasonable investors consider short-term trading a losing game. In fact, most of them are likely to agree with Bogle in considering the behavior of individual securities largely unpredictable, both in the short and long term, and the behavior of portfolios of securities largely unpredictable in the short term.[4] That leaves some hope for the predictability of portfolios of secu-

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rities in the long term, which is the issue addressed in this article.

I follow here Bogle's suggestion of forecasting the long-term performance of stock markets using three variables: the initial dividend yield, the expected growth of earnings, and the expected change in the P/E ratio.[5] A fourth variable, the expected growth of dividends, is not considered by Bogle but is added to the model for the reasons discussed below.

This simple framework follows from a straightforward decomposition of returns. To see this, let

$$R_t = \frac{P_t - P_{t-1} + D_t}{P_{t-1}} , \qquad (1)$$

where *R*, *P*, and *D* denote returns, prices, and dividends, respectively, and the subscript *t* indexes time. A bit of algebra makes it possible to rewrite expression (1) as

$$R_t = \left(\frac{D_{t-1}}{P_{t-1}}\right)\cdot\left(1 + g_t^D\right) + \left(1 + g_t^E\right)\cdot\left(1 + \Delta(\mathrm{P/E})_t\right) - 1 , \qquad (2)$$

where g_t^D, g_t^E, and $\Delta(\mathrm{P/E})_t$, which denote the growth of dividends, the growth of earnings, and the change in the P/E ratio, respectively, are given by

$$g_t^D = \frac{D_t - D_{t-1}}{D_{t-1}} , \quad g_t^E = \frac{E_t - E_{t-1}}{E_{t-1}} , \quad \text{and} \quad \Delta(\mathrm{P/E})_t = \frac{P_t/E_t - P_{t-1}/E_{t-1}}{P_{t-1}/E_{t-1}} ,$$

where *E* denotes earnings.

Setting expression (2) one year forward we get

$$R_{t+1} = \left(\frac{D_t}{P_t}\right)\cdot\left(1 + g_{t+1}^D\right) + \left(1 + g_{t+1}^E\right)\cdot\left(1 + \Delta(\mathrm{P/E})_{t+1}\right) - 1 , \qquad (3)$$

which shows that expected returns are determined by the observed dividend yield, the expected growth of dividends and earnings, and the expected change in the P/E ratio. Given that expression (3) follows from a decomposition of returns, I will refer to this forecasting framework as the *returns decomposition model* (RDM).

Data and methodology

Forecasting returns out of any model requires two steps: first, assess the empirical plausibility of the model, and second, produce the actual forecasts. The first step is discussed in later sections; this section discusses the data used in this article and the assumptions imposed on the forecasting model.

Data. Prices, earnings, and dividends of non-US stock markets usually have shorter available histories than US markets. The data I use in this article consist of the Datastream indexes and their associated earnings and dividends, all of which start at the beginning of 1973. Exhibit 1 shows the twelve countries considered along with their stock market's arithmetic and geometric mean annual return, volatility, minimum value, and maximum value (and when these last two occurred) over the January 1973 to December 2005 period.

As the exhibit shows, from 1973 to 2005, the highest mean annual compound returns were obtained in Ireland (16%) and the lowest in Japan (6.3%), with an average across all markets of 11.7%. All markets but one had their low during the second half of 1974 and their high either at the top of the Internet bubble (late 1999 or early 2000) or at the end of 2005.

Exhibit 2 shows the minimum, maximum, and average value of P/E ratios and dividend yields over the 1973 to 2005 period for all markets. Ireland was the market with the lowest average P/E (11.8) and Japan the market with the highest (39.0), with an average across all markets of 16.3. Japan was the market with the lowest dividend yield (1.2%) and the UK the market with the highest (4.4%), with an average across all markets of 3.2%.[6]

Earnings and dividends grew steadily in all markets, the former at a mean annual compound rate of 8.7% and the latter at 7.6%. Both earnings and dividends grew at the fastest rate in Denmark (13.9% and 11%) and at the slowest rate in Japan (3.8% and 3%). In all markets but two (Australia and Switzerland) earnings grew at a faster rate than dividends did.

Methodology. The RDM only requires an assumption about the expected behavior of three variables: the growth of dividends, the growth of earnings, and the change in the P/E ratio. Bogle did not consider the first variable and assumes mean reversion in the other two.[7] More precisely, he assumes that the mean annual compound growth of earnings in each ten-year period reverts to the mean annual compound growth over the previous three decades, and that the P/E ratio at the end of each ten-year period reverts to the aver-

EXHIBIT 1 Indexes and Returns (1973–2005)

Market	AM	GM	SD	Min	When	Max	When
Australia	15.7%	13.0%	20.3%	42.9	Sep/74	1578.0	Dec/05
Belgium	13.6%	11.5%	16.7%	64.3	Sep/81	1090.5	Dec/05
Canada	12.4%	11.3%	15.8%	73.6	Sep/74	1281.3	Dec/05
Denmark	17.3%	13.5%	18.4%	83.7	Nov/74	4361.0	Dec/05
France	17.2%	13.7%	21.1%	59.0	Sep/74	2656.8	Aug/00
Germany	11.2%	8.6%	17.9%	68.4	Sep/74	967.8	Feb/00
Ireland	21.8%	16.0%	22.5%	36.2	Dec/74	3402.0	Dec/05
Japan	8.9%	6.3%	17.7%	63.8	Oct/74	768.2	Dec/89
Netherlands	14.4%	12.2%	16.6%	54.3	Oct/74	1535.5	Aug/00
Switzerland	11.6%	9.2%	15.7%	48.3	Dec/74	950.0	Aug/00
UK	17.6%	14.1%	20.6%	79.5	Nov/74	4461.0	Dec/99
USA	12.7%	11.2%	15.5%	52.1	Sep/74	1366.8	Mar/00
Average	**14.5%**	**11.7%**	**18.2%**				

Arithmetic mean returns (AM), geometric mean returns (GM), and standard deviations (SD) are annual figures over the January 1973–December 2005 period. Minimum value (Min) and maximum value (Max) indicate the highest and lowest values of the indexes over the same period. All figures are based on Datastream indexes in local currency.

age over the preceding three decades. Armed with those assumptions and with observed dividend yields, he forecasts the mean annual compound return of the US market for all rolling ten-year periods between 1928–1937 and 1981–1990.

The assumptions of the base case in this article are similar. More precisely, both the mean annual compound growth of earnings and dividends over each forecasted ten-year period are assumed to revert to the mean annual compound growth between 1973 (when data coverage starts) and the point when each prediction is made. Similarly, the P/E ratio at the end of each ten-year period is assumed to revert to the average P/E between 1973 and the point when each prediction is made. The dividend yield, in turn, is that observed the year before each prediction is made.

To illustrate, the first mean annual compound return predicted, for the 1986–1995 period, is based on the mean annual compound growth of dividends and earnings over the 1973–1985 period, a P/E ratio reverting at the end of 1995 to the average P/E over the 1973–1985 period, and the observed dividend yield for 1985. Mean returns are predicted in this fashion on a rolling ten-year basis until the last prediction, for the 1996–2005 period, which is based on the mean annual compound growth of dividends and earnings over the 1973–1995 period, a P/E reverting at the end of 2005 to the average P/E over the 1973–1995 period, and the dividend yield observed for 1995. Given that P/E ratios are expected to revert to their long-term mean, I call this the *mean reversion scenario*.

Siegel argued that P/E ratios in the US would not revert to their long-term mean of fourteen to fifteen but may settle around twenty.[8] Although the numbers may be somewhat different, the reasons for expect-

EXHIBIT 2 Earnings, Dividends, P/E Ratios, and Dividend Yields (1973–2005)

Market	P/E Ratio				Dividend Yield			
	Min	Max	Avg	g^E	Min	Max	Avg	g^D
Australia	5.5	24.8	14.7	8.8%	2.5%	9.0%	4.0%	9.6%
Belgium	5.9	37.2	13.1	9.8%	1.4%	8.6%	3.8%	9.4%
Canada	6.2	31.5	15.3	7.4%	1.2%	6.2%	3.1%	6.0%
Denmark	5.4	60.3	16.8	13.9%	0.9%	4.9%	2.0%	11.0%
France	5.8	28.2	13.1	11.0%	1.6%	8.5%	3.8%	9.1%
Germany	8.4	26.0	15.4	6.8%	1.2%	5.2%	2.6%	4.4%
Ireland	4.1	26.2	11.8	12.1%	1.3%	11.4%	4.2%	10.8%
Japan	13.2	84.4	39.0	3.8%	0.4%	3.0%	1.2%	3.0%
Netherlands	4.3	31.8	12.6	7.5%	1.7%	8.3%	4.4%	6.2%
Switzerland	6.0	28.4	14.1	5.8%	0.9%	4.0%	2.1%	6.4%
UK	3.0	26.7	13.3	9.7%	2.3%	11.3%	4.4%	8.8%
USA	6.8	31.4	16.2	8.3%	1.0%	6.6%	3.2%	6.6%
Average	**6.2**	**36.4**	**16.3**	**8.7%**	**1.4%**	**7.3%**	**3.2%**	**7.6%**

Minimum value (Min), maximum value (Max), and average value (Avg) denote the lowest, highest, and average values of P/E ratios and dividend yields, respectively, over the January 1973—December 2005 period. Mean annual compound growth in earnings (g^E) and dividends (g^D) are calculated over the same period. All figures are based on Datastream indexes in local currency.

ing P/Es to settle at a higher-than-historical level (declining transaction costs, declining risk, investor learning) seem to apply to other markets just as well. For this reason, I consider a second scenario for P/Es, namely, that they stay at the level observed at the time each prediction is made. Therefore, I call this the *random walk scenario*.[9]

Finally, I consider a case in which investors forecast P/Es by giving more weight to the more recent past than to the more distant past. More precisely, I assume that investors estimate the P/E at the end of each forecasted period as an equally weighted average of 1) the mean P/E over the five years before the prediction is made, and 2) the mean P/E between 1973 and the beginning of those five years. To illustrate, when predicting the mean annual compound return over the 1986–1995 period, the P/E at the end of 1995 is predicted as an equally weighted average of the mean P/E over the 1981–1985 period and the mean P/E over the 1973–1980 period. Similarly, when predicting the mean return over the 1996–2005 period, the P/E at the end of 2005 is predicted as an equally weighted average of the mean P/E over the 1991–1995 period and the mean P/E over the 1973–1990 period. For lack of a better name, I call this the *adaptive expectation scenario*.

Armed with the assumption of mean reversion in the growth of earnings and dividends; three forecasts of terminal P/Es based on the mean reversion, random walk, and adaptive expectations scenarios; and observed dividend yields, I use expression (3) to predict mean annual compound returns for all rolling ten-year periods between 1986–1995 and 1996–2005 in all markets. Then I assess the forecasting abil-

EXHIBIT 3 Forecasting Ability

Market	Mean Reversion			Random Walk			Adaptive Expectations		
	Rho	MFE	MAFE	Rho	MFE	MAFE	Rho	MFE	MAFE
Australia	0.84	1.1%	2.8%	0.78	−1.6%	1.6%	0.82	0.5%	2.4%
Belgium	0.66	−3.2%	3.5%	0.55	−3.7%	3.7%	0.69	−3.2%	3.3%
Canada	0.21	5.4%	5.8%	0.07	3.2%	3.6%	0.21	4.7%	5.2%
Denmark	0.28	−5.1%	7.1%	0.15	−4.8%	5.3%	0.28	−5.0%	6.7%
France	0.87	−3.3%	3.3%	0.67	−4.3%	4.3%	0.89	−3.5%	3.5%
Germany	0.85	3.2%	3.2%	0.56	1.6%	2.9%	0.86	2.7%	2.8%
Ireland	0.61	3.9%	3.9%	0.66	0.3%	1.9%	0.55	3.0%	3.4%
Japan	0.04	−1.0%	3.5%	−0.19	−6.4%	6.4%	−0.06	−2.5%	4.0%
Netherlands	0.67	6.9%	6.9%	0.58	3.5%	3.9%	0.67	6.1%	6.1%
Switzerland	0.93	11.6%	11.6%	0.16	9.1%	9.1%	0.88	11.0%	11.0%
UK	0.92	−0.9%	1.5%	0.99	−4.6%	4.6%	0.87	−1.9%	2.2%
USA	0.85	5.8%	5.8%	0.89	3.2%	3.6%	0.80	5.2%	5.2%
Average	**0.64**	**2.0%**	**4.9%**	**0.49**	**−0.4%**	**4.2%**	**0.62**	**1.4%**	**4.7%**

Correlation between observed and predicted returns (Rho), mean forecast error (MFE) and mean absolute forecast error (MAFE) all calculated over all observed and predicted rolling ten-year mean annual compound returns between 1986–1995 and 1996–2005. All figures are based on Datastream indexes in local currrency.

ity of the model by comparing the predicted returns to the observed returns. And finally I forecast mean annual compound returns in all twelve markets over the coming 2006–2015 period.

Results

Exhibit 3 summarizes the results on the forecasting ability of the RDM. For each of the twelve markets and each of the three scenarios for P/E ratios, the exhibit reports the correlation between the observed and the predicted mean annual compound returns (Rho), the mean forecast error (MFE), and the mean absolute forecast error (MAFE), over all the rolling ten-year periods for which predictions are made. The MFE and MAFE are defined as the average annual difference between the predicted and the observed mean annual compound returns, and the average of the absolute value of these annual differences, respectively.

To illustrate, consider the UK (where the model works best) and the mean-reverting P/E scenario. The correlation between the predicted and the observed mean annual compound returns over all ten-year rolling periods, beginning with 1986–1995 and ending in 1996–2005, is a whopping 0.92. The average difference between these predicted and observed mean returns (MFE) is–0.9%, with the model underestimating mean returns in three periods, and overestimating them in the other eight. Finally, the average of the absolute value of the differences between predicted and observed mean returns (MAFE) is 1.5%.

Across all twelve markets, the average correlation between predicted and observed mean annual compound returns is a high 0.64, with an MFE of 2.0% and a MAFE of 4.9%. These results are very similar to those obtained by Bogle for the US, who found a correlation of 0.54, an MFE of 1.6%, and an MAFE of 4.3%.[10] For further perspective, consider that a "naïve" predictor that forecasts mean annual compound returns simply as the geometric mean return between the beginning of 1973 and the point when each prediction is made has, on average, a *negative* correlation with observed returns (-0.41), an MFE of 0.3%, and an MAFE of 4.5%.

Whether the random walk or adaptive expectations scenarios are more or less plausible than mean reversion largely depends on whether correlation, MFE, or MAFE is viewed as the key measure of success. On average, both scenarios yield a lower correlation than mean reversion (0.49 for the random walk scenario and 0.62 for the adaptive expectations scenario), but they also yield lower MFEs and MAFEs. In the case of the US, all three models are quite successful, with very high correlations between observed and predicted mean annual compound returns, as well as with relatively low MFEs and MAFEs.[11] Much the same can be said about Australia, France, Germany, and the UK. All models, on the other hand, provide very poor forecasts for Japan, and rather poor for Canada and Denmark.

There is little point in elaborating much further on the relative merits of these three scenarios. Besides the fact that, on average, there is a trade-off between correlations on the one hand and MFEs and MAFEs on the other, the results also vary by market.

Expected returns

Exhibit 3 shows that the RDM quite successfully predicts long-term returns. In many cases, in fact, this simple tool is surprisingly accurate; forecasting models that yield expected returns with correlations to observed returns over 0.6 or so are not common. As this exhibit shows, this simple model yields correlations in excess of 0.8 and 0.9 in many cases and, in some of those cases, also with very low MFEs and MAFEs.

Exhibit 4 shows the mean annual compound returns predicted for the 2006–2015 period by the RDM under the three different scenarios for P/E ratios. The next-to-last column shows, for each market, the average forecast across P/E scenarios; the last row shows, for each P/E scenario, the average forecast across markets; and the last column shows, for each market, the historical mean annual compound return over the 1900–2000 period as reported by Dimson, Marsh, and Staunton.[12]

On average, the most bullish forecasts stem from the random walk scenario (11.1%), and the most bearish from the mean reversion scenario (9.9%). Averaging across scenarios, the highest returns are expected in Denmark (14.7%) and the lowest in Japan (5.3%). Besides Denmark, returns in excess of 10% are expected in six other markets, namely, Australia, Belgium, France, Ireland, the Netherlands, and the UK. Across all twelve markets, the mean annual compound return expected for the 2006–2015 period is 10.5%.

The last two columns of Exhibit 4 show that in six markets the mean annual compound returns expected over the 2006–2015 period are higher than their respective historical mean returns, whereas the opposite is the case in the other six markets. On average, the mean annual compound return of 10.5% expected over the 2006–2015 period is slightly higher than the historical figure of 9.9%.

THE RETURNS DECOMPOSITION MODEL IS PARSIMONIOUS, INTUITIVE, AND BASED ON THE EXPECTED EVOLUTION OF FUNDAMENTAL VARIABLES.

An even simpler model

The expected returns on Exhibit 4 follow from expression (3), which is the correct expression for the RDM. As this expression shows, long-term expected returns can be predicted from the initial dividend yield, the expected growth in dividends and earnings, and the expected change in the P/E ratio. Bogle,[13] however, argues that not much accuracy is lost by simply adding three of these variables, the initial dividend yield, the expected growth in earnings, and the

$$R_{t+1} = \left(\frac{D_t}{P_t}\right) + g^E_{t+1} + \Delta(\mathrm{P/E})_{t+1} \,. \qquad (4)$$

EXHIBIT 4 Expected Returns (2006–2015) and Historical Returns (1900–2000)

Market	MR	RW	AE	Avg	DMS
Australia	10.7%	12.7%	11.9%	11.7%	11.9%
Belgium	11.2%	13.1%	10.9%	11.7%	8.2%
Canada	7.0%	9.6%	7.9%	8.2%	9.7%
Denmark	14.4%	15.6%	14.3%	14.7%	8.9%
France	12.5%	13.8%	13.0%	13.1%	12.1%
Germany	9.8%	8.9%	9.2%	9.3%	9.7%
Ireland	11.9%	14.3%	12.6%	13.0%	9.5%
Japan	5.7%	4.8%	5.3%	5.3%	12.5%
Netherlands	9.9%	10.5%	10.4%	10.3%	9.0%
Switzerland	4.7%	7.3%	5.9%	6.0%	7.6%
UK	12.4%	13.1%	13.3%	12.9%	10.1%
USA	8.8%	10.1%	10.3%	9.7%	10.1%
Average	**9.9%**	**11.1%**	**10.4%**	**10.5%**	**9.9%**

MR (mean reversion), RW (random walk), and AE (adaptive expectations) refer to the scenarios considered for P/E ratios, and 'Avg' denotes the average for each market across P/E scenarios. All predictions follow from expression (3) and indicate mean annual compound returns. 'DMS' denotes mean annual compound returns over the 1900–2000 period as reported by Dimson, Marsh, and Staunton (2002).

expected change in the P/E ratio, in which case expression (3) simplifies to

In order to evaluate the accuracy of this simplification, Exhibit 5 puts side by side the expected returns from expression (3), reported on Exhibit 4, and those from expression (4). As this exhibit clearly shows, across markets and scenarios, the differences between the predictions from the exact RDM and those from its simplified version are negligible.

In short, then, the long-term (mean annual compound) return of equity markets can be quite accurately predicted by adding to the initial dividend yield, the expected (mean annual compound) growth in earnings and the expected (mean annual compound) change in the P/E ratio. As simple and successful models go, it probably does not get much better than this.

An assessment

Warren Buffett has humbly claimed that he never has "the faintest idea what the stock market is going to do in the next six months, or the next year, or the next two." But he went on to claim that "it is very easy to see what is likely to happen over the long term."[14] Perhaps it is not *that* easy. But most reasonable investors agree that the short-term predictability of individual securities and portfolios (and the long-term predictability of individual securities) is, at best, poor.

The long-term predictability of markets, however, is not a lost cause; simple models like the one considered in this article seem to work surprisingly well. The RDM is parsimonious, intuitive, and based on the expected evolution of fundamental variables (earnings, dividends, and P/E ratios).

The long-term forecasting ability of the RDM is highly satisfactory, both in terms

EXHIBIT 5 Exact RDM and Simplified RDM

Market	Exact RDM				Simplified RDM			
	MR	RW	AE	Avg	MR	RW	AE	Avg
Australia	10.7%	12.7%	11.9%	11.7%	10.5%	12.3%	11.6%	11.5%
Belgium	11.2%	13.1%	10.9%	11.7%	11.1%	12.8%	10.8%	11.5%
Canada	7.0%	9.6%	7.9%	8.2%	7.1%	9.5%	7.9%	8.2%
Denmark	14.4%	15.6%	14.3%	14.7%	14.3%	15.4%	14.3%	14.7%
France	12.5%	13.8%	13.0%	13.1%	12.4%	13.6%	12.8%	12.9%
Germany	9.8%	8.9%	9.2%	9.3%	9.7%	8.8%	9.1%	9.2%
Ireland	11.9%	14.3%	12.6%	13.0%	11.9%	14.1%	12.6%	12.9%
Japan	5.7%	4.8%	5.3%	5.3%	5.6%	4.7%	5.3%	5.2%
Netherlands	9.9%	10.5%	10.4%	10.3%	9.7%	10.3%	10.2%	10.1%
Switzerland	4.7%	7.3%	5.9%	6.0%	4.7%	7.3%	5.9%	6.0%
UK	12.4%	13.1%	13.3%	12.9%	12.1%	12.8%	13.0%	12.6%
USA	8.8%	10.1%	10.3%	9.7%	8.8%	10.0%	10.2%	9.6%
Average	**9.9%**	**11.1%**	**10.4%**	**10.5%**	**9.8%**	**11.0%**	**10.3%**	**10.4%**

'Exact RDM' and 'Simplified RDM' predictions follow from expressions (3) and (4), respectively, and indicate mean annual compound returns. MR (mean reversion), RW (random walk), and AE (adaptive expectations) refer to the scenarios considered for P/E ratios, and 'Avg' denotes the average for each market across P/E scenarios.

of correlation to observed returns and in terms of the mean forecasting errors the model yields. The RDM is quite successful in Australia, France, Germany, the UK, and the US; quite poor in Canada, Denmark, and Japan; and exhibits different degrees of success in the remaining markets in the sample.

Over the 2006–2015 period, the RDM yields bullish forecasts for some markets (mean compound returns in excess of 10% in Australia, Belgium, Denmark, France, Ireland, the Netherlands, and the UK); bearish in some others (Japan and Switzerland); and, on average, 10.5%. That is slightly higher than the average historical (1900–2000) figure of 9.9% for these same markets.

The combination of simplicity and long-term forecasting ability of the RDM sets the bar quite high for other forecasting models. In fact, the evidence discussed in this article shows that, just as Bogle claimed some years ago, "Occam's razor is indeed alive and well."[15] ■

NOTES

1 I would like to thank John Bogle for his comments. Lydia Nikolova and Gabriela Giannattasio provided valuable research assistance. The views expressed within this article and any errors that may remain are entirely my own.

2 J. Bogle, "Investing in the 1990s," *Journal of Portfolio Management* (Spring 1991): 5–14.

3 J. Bogle, "Investing in the 1990s: Occam's Razor Revisited," *Journal of Portfolio Management* (Fall 1991): 88–91.

4 Bogle, op. cit. at note 2.

5 Bogle, op. cit. at notes 2 and 3.

6 The dividend yield for the UK is 4.39%, slightly higher than that of the Netherlands (4.36%).

7 Bogle, op. cit. at note 3. His reasons for neglecting the expected growth rate of dividends are twofold. He argues, first, that the other two variables dominate the equation; and, second, that the effort of forecasting this variable is not justified in terms of the additional predictive power it brings to the model. I have evaluated the forecasting ability of the RDM with and without the expected

growth rate of dividends and the results are virtually identical. For that reason, though Sir William would advise otherwise, I report here only the results that do include the expected growth rate of dividends.

[8] J. Siegel, *Stocks for the Long Run* (McGraw-Hill: 2002); and "Historical Results I," in *Equity Risk Premium Forum*, AIMR monograph (June 2002).

[9] In fact, Dickey-Fuller tests show that the hypothesis of nonstationary P/E ratios is rejected in only three markets (Australia, Belgium, and Denmark) out of the twelve considered; in the other nine markets, P/E ratios are nonstationary.

[10] Bogle, op. cit. at note 3.

[11] It may be interesting to note that in the US the forecasting ability of the RDM in the random walk scenario outperforms that of the RDM in the mean reversion scenario. This seems to support Siegel's argument that P/Es should no longer be expected to revert to their long-term mean.

[12] E. Dimson, P. Marsh, and M. Staunton, *Triumph of the Optimists* (Princeton University Press, 2002).

[13] Bogle, op. cit. at notes 2 and 3.

[14] W. Buffet and C. Loomis, "Warren Buffett on the Stock Market," *Fortune* (December 10, 2001): 92.

[15] Bogle, op. cit. at note 3.