Journal Of Investment Management, Vol. 16, No. 4, (2018), pp. 64–78

www.joim.com

EXPLAINING THE HIGH *P/E* RATIOS: THE MESSAGE FROM THE GORDON MODEL

Heinz Zimmermann[a]

Are the high valuation levels of equity prices, after controlling for the low interest rate level, driven by irrational exuberance and excessive growth expectations? The Gordon model helps for a consistent interpretation of commonly used valuation ratios. Overall, P/E ratios do not seem to be caused by irrational growth expectations, rather a decline can be observed over the past years. Discount rates are the major drivers of high valuation levels in Europe and particularly in Switzerland, while profitability is the major source in the US and Germany.

After more than a decade, relative equity valuations have reached a peak, and many investors are concerned whether stock market investments are still justified. Figures 1(a) and 1(b) display three commonly used valuation ratios; starting in the early 2010, the figures show a significant increase in the price–earnings (P/E) and price-to-book (P/B) ratios, for Swiss as well as US stocks. Within the past seven years, the Swiss Market Index (SMI) stocks appreciated from a P/E ratio of 12.5–17.8, the S&P500 stocks from 13.8 to 18.4 (January 2010 to April 2017).[1] The case is less extreme, in terms of levels and increase, for the continental European equity markets at large where the increase is from 11 to 15.2, and in particular for Germany where the ratio went from 12.1 to 14.1 in this time period; see Figures 1(c) and 1(d).

Do the valuation levels reflect more optimistic—perhaps excessively optimistic or exuberant—growth expectations or just lower discount rates? Are the historically low interest rates or declining required risk premiums, in times when many institutional investors complain about profitable investment opportunities, sufficient for explaining current valuation levels?

We address these questions using the simple textbook Gordon constant growth model, and we show that growth is not the driving force behind the valuations—except for Germany. The simplicity and limited applicability of this model is

[a]Department of Business and Economics (WWZ), Universität Basel, Switzerland. Mailing address: Peter Merian Weg 6, CH 4051 Basel, Switzerland. Phone: +41 61 207 33 16. E-mail: heinz.zimmermann@unibas.ch

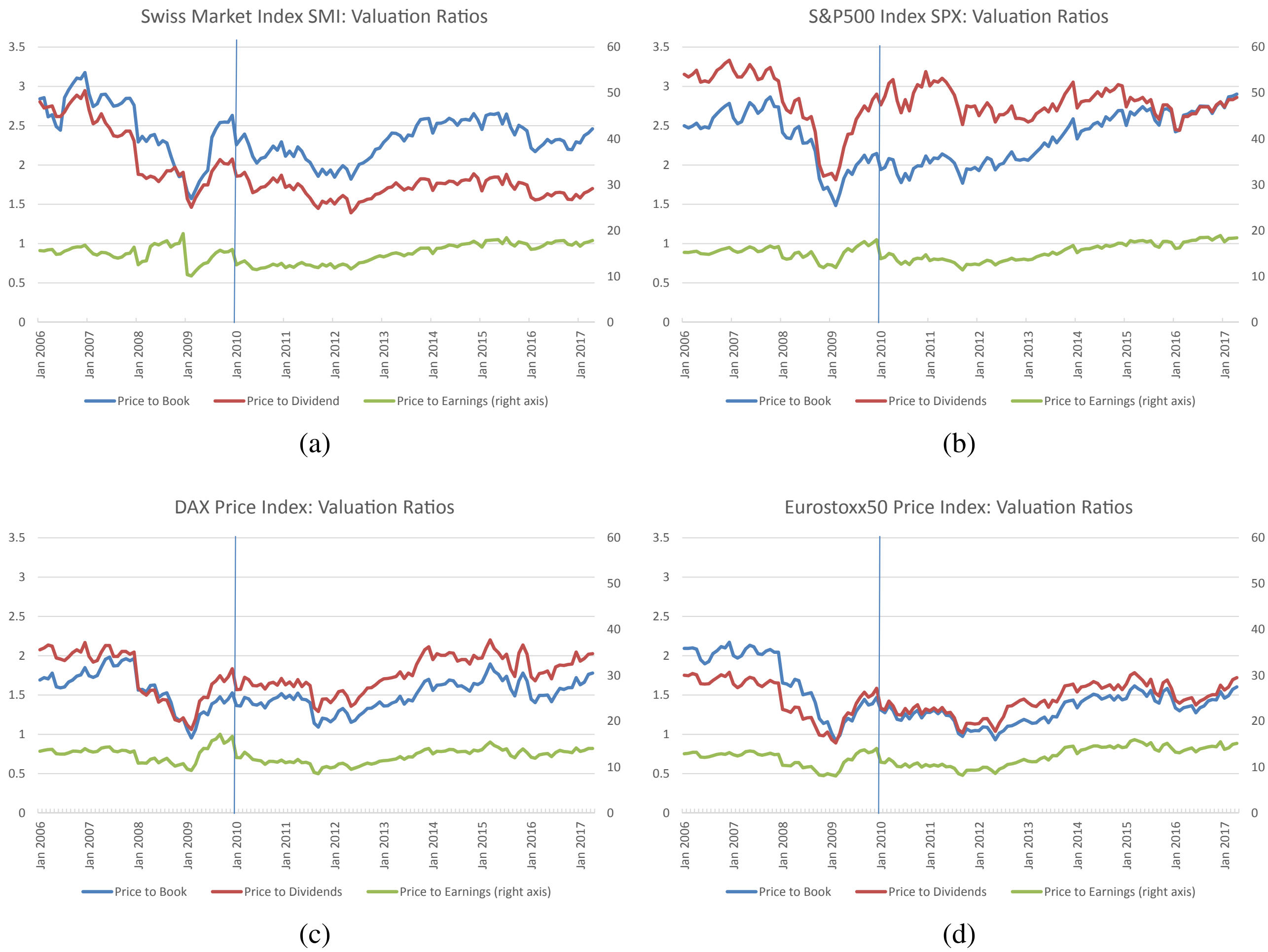

Figure 1 (a)–(d) Major valuation ratios (Data source: Bloomberg, details see Appendix).

well-known, but it is extremely useful to clarify our argument. The model has been regularly used as a starting point of more advanced asset-pricing tests; examples include the recent discussion about profitability and growth as priced factors of stock returns (Asness *et al.*, 2014; Novy-Marx, 2013), or the Campbell–Shiller–Cochrane predictability controversy[2] where variations in dividend–price (D/P) ratios are related to the predictability of growth rates or discount rates, as well as the Campbell (1991) variance decomposition of returns into discount rate and growth-related "news" components. Even more explicitly, Campbell (2008) demonstrates that with some modifications (using geometric rather than arithmetic mean returns) and under specific assumptions (a random walk for the log dividend–price ratio), the Gordon model provides the theoretical basis in terms of a "steady-state valuation model" for long-run return predictions. Campbell and Thompson (2008) extensively use Gordon model-type restrictions in their predictive analysis of valuation multiples. The first study which might have used a Gordon-type model for explaining the excess volatility of capital assets (specifically, real estate prices) is Niehans (1966).

The topic of this paper is not predictability or excess volatility of equity prices. Rather, the Gordon model is used as a simple device for extracting the implicit economic assumptions, or long-run expectations, that are reflected in typical valuation ratios: the price–earnings, price–dividend, and price-to-book ratios. The parameters which can be extracted from these ratios include the discount rate, the dividend payout rate (or its complement, the reinvestment rate), and the return on retained earnings (profitability). To the best of our knowledge, recovering this information from multiple valuation ratios, although simple and obvious, has not yet been done in the published literature.

The Gordon model (very briefly reviewed in Section 1 for presenting our notation) essentially provides a consistent interpretation of the three observed valuation ratios. Our analysis uses equity valuations from Switzerland, the US, Germany, and continental Europe at large to study the observed increases in P/E ratios (Section 2) and their variability (Section 3). We find that the causes underlying the trend and the volatility of the P/E ratio remarkably differ across the analyzed cases: Lower discount rates are the major drivers in Europe and particularly in Switzerland, while higher profitability explains most of the increase in the US and Germany. The role of the payout policy seems to be particularly different across the countries. For example, in Switzerland, increasing payouts attenuate the growth of the P/E. The heterogeneity of corporate payout policy across countries is well documented in the empirical literature and is explained by legal, cultural, and behavioral aspects apart from purely economic factors (Section 4). In this paper, we show that this heterogeneity also can also be found in *ex-ante* figures.

Apart from these specific results, this paper demonstrates a simple approach for recovering long-run (steady state) market expectations from observed valuation ratios using Gordon's formula. This information can be contrasted to personal expectations to get a rough idea about possible over- or undervaluation of markets.

Our analysis is purely descriptive. It does not address the question whether the revealed assumptions, or expectations, are justified or rational in a predictive sense, and whether the Gordon model provides an adequate theoretical framework. Nevertheless, the analyzed ratios provide a more detailed picture of the components of expected growth, i.e. reinvestment and profitability; this insight indicates how traditional predictability tests of fundamental ratios can be further improved.

1 The simple Gordon setting

We use the Gordon model[3] for a portfolio of firms (an index), not for individual companies, but the terminology is simpler when referring to a "firm". The Gordon model assumes that firms operating cash flow ("earnings")[4] over time, from which a constant proportion b is reinvested at an assumed rate of return r, the return-on-equity (ROE) for an all-equity firm, or shortly referred to as "profitability" subsequently. The process continues forever. This implies a perpetual earnings growth rate $w = rb$, which also corresponds to the growth rate of dividends, i.e. the earnings share $1 - b$ which is paid out to the shareholders. The stock price is equal to the present value of the perpetual stream of constantly growing dividends, using a constant discount rate k strictly smaller than the growth rate w, and is given by:

$$P = \frac{D}{k - w} = \frac{E(1 - b)}{k - rb} \tag{1}$$

where D and E are the next-period dividend and earnings level, respectively. Obviously, a high P/E ratio

$$\frac{P}{E} = \frac{1 - b}{k - rb} \tag{2}$$

is consistent with a low discount rate k and a high growth rate $w = rb$. But the same is also true for the price–dividend multiple P/D, which, however, lacks such a clear increase over the analyzed time interval. This is particularly true for Switzerland: The multiple increases from 47.4 to 49.0 for the US, and even decreases from 31.8 to 29.2 for Switzerland. What are the implications of this observation? In the following, we use three valuation multiples to extract the three "unknowns" k, b and r, and the implied growth rate w, underlying the Gordon valuation model.

2 Four case studies

Since the Swiss pattern slightly differs from the US and in particular from the German case, the discussion in this section focuses on the Swiss case first. The interpretation of the US and German multiples follows subsequently. We also add the analysis for the aggregate continental European stock market.

Also notice that while the figures display the variables starting in January 2006, the subsequent discussion focuses on the valuations and implied parameters between January 2010 and April 2017. Apparently, the financial crisis has interesting effects on its own, but this is not subject of this study.

Equity valuation ratios related to MSCI are used throughout the analysis. More details about the data can be found in Appendix 1.

Switzerland: Swiss Market Index (SMI)

An increase in the P/E ratio from 12.5 to 17.8 paired by a simultaneous decrease in the P/D ratio from 31.8 to 29.2 has an immediate interpretation; notice that

$$\frac{\frac{P}{E}}{\frac{P}{D}} = 1 - b = \frac{D}{E} \tag{3}$$

implies an increase in the dividend payout ratio from $12.5/31.8 = 0.4$ to $17.8/29.2 = 0.61$, i.e. an increase by roughly 50%! A bottom-up analysis of the payout behavior of SMI firms confirms this increase (see Huynh and Zimmermann, 2017). In Figure 2(a), the implied payout ratio is displayed since 2006: the trend is striking. It is apparent that this observation is not particularly sensitive to the time interval analyzed.

But this is a strange observation, because a higher payout ratio respectively a lower reinvestment rate b has a negative effect on the P/E ratio

$$\frac{\partial \frac{P}{E}}{\partial b} = \frac{r - k}{(k - rb)^2} > 0$$

whenever the return on retained earnings is above the cost of capital. Thus, either this condition is not satisfied or at least one of the remaining parameters, r or k, is not constant over the observation period.

This is revealed by analyzing the price-to-book ratio. Of course, it is conceptionally not obvious how to integrate book values into the market-value setting of the Gordon model. A convenient way is to rely on the definition of the ROE which relates earnings to the book value of equity, such that the implied return can be calculated from[5]

$$r = \frac{E}{B} = \frac{\frac{P}{B}}{\frac{P}{E}} \tag{4}$$

The P/B multiple of the SMI is 2.3 in January 2010, which implies a return of 18% (the P/E is 12.5); the P/B multiple at the end of the observation period is 2.5 implying a return of 14% (the P/E is 17.8), i.e. the return on retained earnings (the profitability of investments) decreased substantially.

But the joint decrease of b and r over the observation interval makes the increase in the P/E ratio even more puzzling, because it implies a substantial *reduction* in the growth rate: from

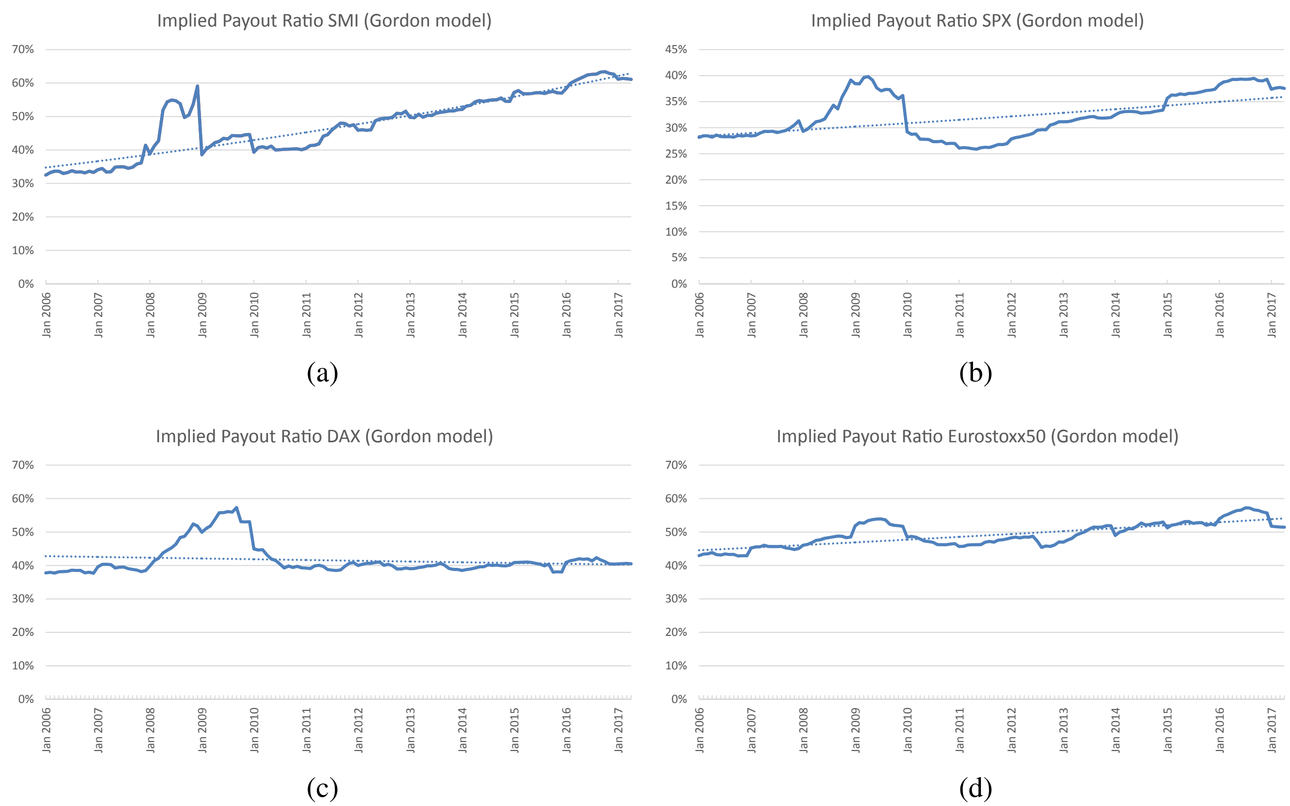

Figure 2 (a)–(d) Implied payout ratios.

$w = rb = 0.18 \times 0.6 = 0.109$ to $0.14 \times 0.39 = 0.054$, i.e. by 5.5%. Figure 3(a) displays the implied growth rate over the observation period: the almost continuous decrease since 2009 is striking.

But how can an increase in the P/E ratio be paralleled by a reduction in the growth rate? Notice first that the P/D ratio remains essentially unchanged over the sample period, i.e. the denominator of Equation (1) is almost constant. From

$$k = \frac{D}{P} + w$$

this requires an almost identical decrease in the discount rate, namely from 0.140 to 0.088, i.e. by 5.2% (compared to the 5.6% decrease in the growth rate). A useful formula which expresses the discount rate directly from the three valuation multiples is displayed in Appendix 2.

Summing up, the increase in the P/E ratio[6] from

$$\frac{P}{E} = \frac{1-b}{k-rb} = \frac{0.40}{0.140 - \underbrace{0.18 \times 0.60}_{0.109}}$$

$$= \frac{0.40}{0.0314} = 12.5 \tag{5a}$$

in January 2010 to

$$\frac{P}{E} = \frac{1-b}{k-rb} = \frac{0.61}{0.088 - \underbrace{0.14 \times 0.39}_{0.054}}$$

$$= \frac{0.61}{0.0343} = 17.8 \tag{5b}$$

in April 2017 is mainly a discount rate effect; the other implicit parameter changes (profitability, payout, and implied growth rate) support a lower valuation.

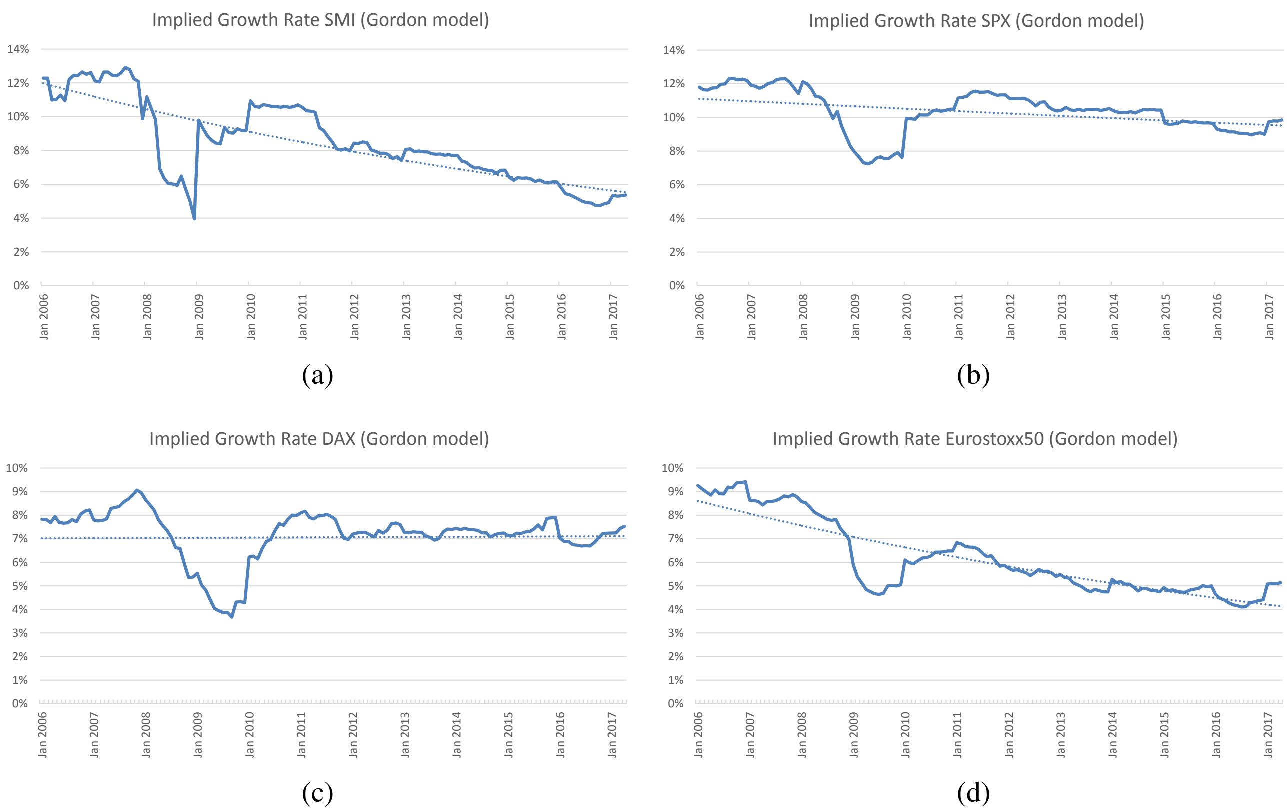

Figure 3 (a)–(d) Implied growth rates.

A side remark: Notice, that at first glance, one might be erroneously tempted to give Equations (5a) and (5b) quite a different interpretation, given that the denominator of the expression (the dividend return, i.e. the reverse of the P/D ratio) is virtually unchanged, the increase in the P/E ratio from

$$\frac{0.40}{0.0314} = 12.5$$

to

$$\frac{0.61}{0.0343} = 17.8$$

seems to be driven by an increase in the numerator, the payout ratio. This is a short-sighted interpretation because b not only shows up in the denominator of the expression, but also in the numerator as part of the growth rate b.[7] The correct interpretation is, of course, that the P/E ratio increases *despite* the increase in the payout ratio.

The role of the payout behavior of the SMI constituent companies can be further analyzed by decomposing profitability r in two components,

$$r = r - rb + rb = r(1 - b) + w \qquad (6)$$

where the first expression $r(1 - b)$ can be interpreted as "payout return", while the second component shows the "retained" return which contributes to earnings and dividend growth. Figure 4(a) displays the development of this decomposition over time: while the overall trend of the ROE is clearly decreasing, the relative share of the payout return goes up. In *absolute* terms, the payout return increases from 7.1% to 8.4%. As a consequence, the retained return—the growth rate—decreases substantially.

The figure also compares profitability r with the discount rate k (solid line); the difference is

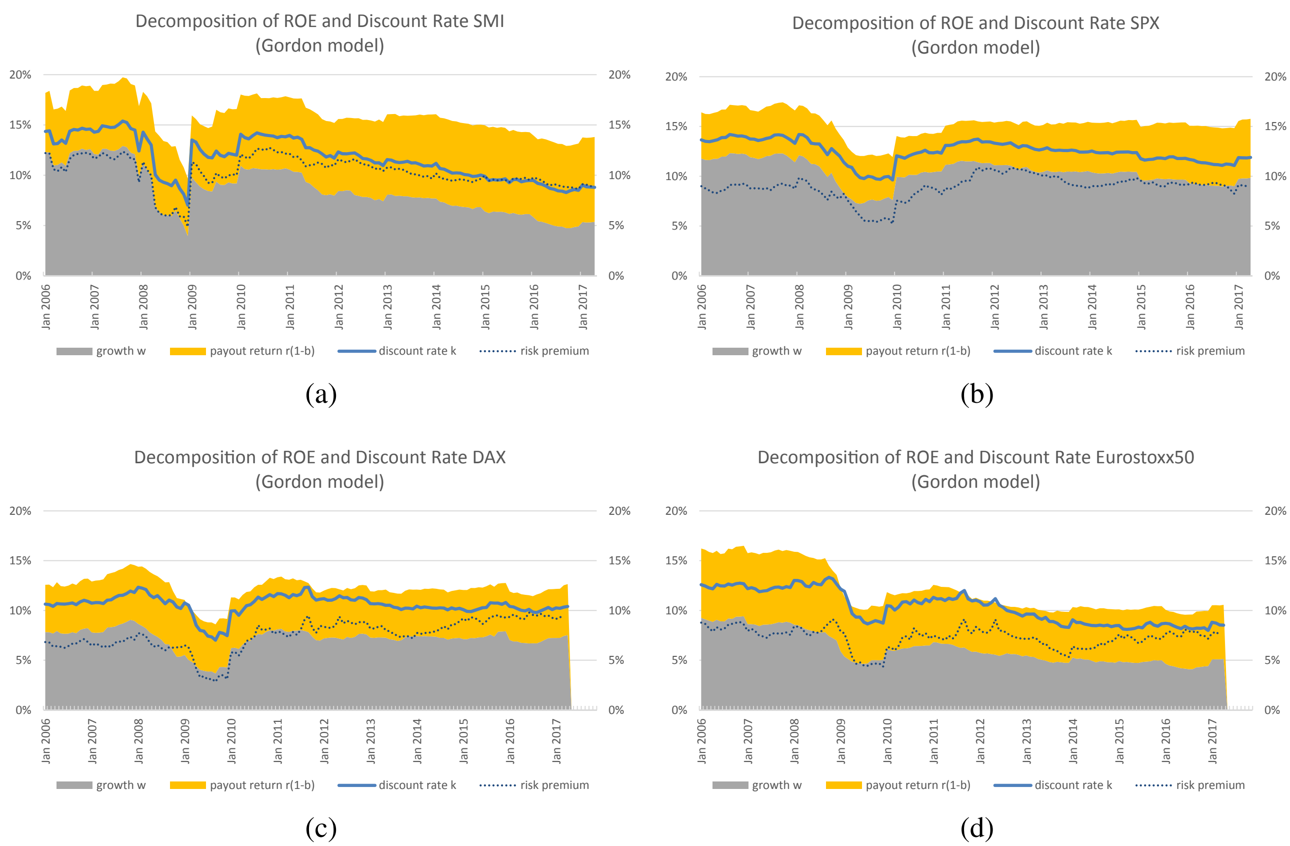

Figure 4 (a)–(d) Decomposition of return-on-equity (profitability) and discount rate.

Return-on-equity r: is the sum of the grey and yellow areas, i.e. the growth rate and the payout return.

Discount rate k (*solid line*): is the sum of the risk premium (dotted line) and the risk-free spot rate (based on 20-year government bonds).

Data source: Equity valuation ratios from Bloomberg, CH government spot rates from Swiss National Bank, US government rates from FRED data bank, German spot rates from Deutsche Bundesbank (these are also used as risk-free rate for Eurostoxx50).

directly related to the P/B ratio, namely

$$\frac{P}{B} = \frac{r - w}{k - w} \tag{7}$$

The discount rate is the sum of the risk-free rate and the expected risk premium. The exhibit reveals that the decrease in the discount rate is caused by lower interest rates (the area between the solid and the dotted line) *and* lower expected risk premiums (dotted line): the premium declines from 12% (January 2010) to roughly 9% (April 2017). However, the size of the premium is still surprising and may be far beyond the long-run estimate commonly applied by investment professionals.

USA: S&P500 Index

The temporal pattern of the valuation multiples is displayed in Figure 1(b). The only notable divergence from the SMI is the substantial increase in the price-to-book ratio P/B from 1.9 in January 2010 to 2.9 in April 2017. In contrast, the P/E ratio behaves very similarly to the SMI, while the P/D ratio marginally increases. The last two observations imply that the payout ratio exhibits a similar pattern as for the Swiss stocks, although the increase is less dramatic (still, from 29% to 38%); see Figure 2(b). The substantial increase in the P/B ratio primarily reflects the implied return-on-equity which does not decrease (as for the

SMI), but rather increases slightly, from 0.14 to 0.16. As a consequence, the growth rate—which is the product of the slightly smaller retention rate b and the slightly larger ROE r—is not substantially different (it is about 10%) in January 2010 and April 2017. Figure 3(b), however, reveals that the overall growth trend over an expanded observation period is negative, as in Switzerland, although much less pronounced. The implied discount rate k is displayed in Figure 4(b) which shows surprisingly little variation; from January 2010 to April 2017 it is essentially constant (10%), but the overall trend is negative again.

Replicating the numerical example from Equations (5a) and (5b) with S&P500 data, the P/E ratio increases from

$$\frac{P}{E} = \frac{1-b}{k-rb} = \frac{0.29}{0.12 - 0.14 \times 0.71} = \frac{0.29}{0.0211} = 13.8$$

in January 2010 to

$$\frac{P}{E} = \frac{1-b}{k-rb} = \frac{0.38}{0.12 - 0.16 \times 0.62} = \frac{0.38}{0.0204} = 18.4$$

in April 2017. At first glance, the increase seems puzzling—is it caused by the increase in the payout ratio, the numerator? After all, the discount rate as well as the growth rate are essentially constant. Of course, this is a short-sighted interpretation: the positive valuation effect comes from the increased profitability (14–16%) which would have an even stronger effect without a higher payout ratio. Therefore, as in the Swiss case, the S&P500 firms manage to keep the dividend return (the denominator of the expression, the inverse of the P/D ratio) *low* in spite of the increased payout. But unlike in Switzerland, this is accomplished by a higher profitability, not a lower discount rate. Or to put it differently: the US companies manage to keep growth expectations much more stable than in Switzerland, in spite of more generous (albeit less extreme) payouts; lower reinvestment is compensated by higher profitability. This is also revealed in Figure 4(b): the payout return increases from 4% to 5.9% (yellow area) from January 2010 to April 2017; while the payout in absolute terms is less than in Switzerland, the relative increase is even more pronounced. Overall, the decomposition of r is remarkably different form the Swiss case.

The figure moreover illustrates the temporal behavior of the risk premium, which does not reveal the declining trend as in the Swiss stock market. Its overall level at 9%, however, is very high compared to commonly used values.

Germany: DAX Price Index

The picture is again different for the German stock market. Compared to other markets, the P/E ratio only moderately increases from 12.1 to 14.1 from January 2010 to April 2017, and the valuation level is clearly lower. In contrast to the other two countries, the P/D ratio strongly increases, from 26.8 to 34.7, which implies a decrease in the payout ratio $1-b$ from 0.45 to roughly 0.41. As Figure 2(c) reveals, this is not a gradual adjustment; the payout ratio of 0.40 is immediately observed after the "shock" generated by the financial crisis and remains more or less constant over the seven post-crisis years. This sharply contrasts the payout behavior of the two previous countries. Also, the P/B ratios are substantially lower; they go up from 1.4 to 1.8 which reflects an increase in the return-on-equity from 0.113 to 0.126, which in turn implies an increase in the implied growth rate from 0.062 to 0.075.

Overall, compared to Switzerland and the US, this is the standard textbook case for explaining higher P/E ratios. Nevertheless, notice from Figure 4(c) that the implied cost of capital remains essentially constant after the financial crisis, although the risk-free interest rate substantially decreased since: the implied equity risk premium strongly increases from 5.7% to 9.4%. Unlike in January 2010, this premium is, however, in the same order of magnitude as for the Swiss and US markets (8.9% and 9.0%). Summarizing, the moderate increase in the P/E ratio from

$$\frac{P}{E} = \frac{1-b}{k-rb} = \frac{0.45}{0.100 - 0.113 \times 0.55} = \frac{0.45}{0.037} = 12.1$$

in January 2010 to

$$\frac{P}{E} = \frac{1-b}{k-rb} = \frac{0.41}{0.104 - 0.126 \times 0.59} = \frac{0.41}{0.029} = 14.1$$

in April 2017 is not a discount rate effect, but mainly driven by a slightly larger profitability coupled with a small increase in payout ratios. But the implied change in growth expectations is minor (roughly one percentage), and Figure 3(c) shows rather stable growth rates since the financial crisis. As shown below, this is in sharp contrast to the other European countries and, to a lesser extent, to the US where we observe, however, a significantly higher *level* of anticipated growth.

Europe: Eurostoxx50

Is the German stock market special within Europe? This is indeed the case if we look at the multiples from the Eurostoxx50 Index, which includes the 50 major continental European stocks. Bearing in mind that German stocks make one-third of the capitalization of this index, the increase in the P/E ratio is much stronger than for Germany (from 11.0 to 15.2), but the increase in the P/D multiple is in the same order of magnitude (22.8 to 29.5). As a consequence, the payout ratio does *not* decrease as for the German stocks, but moderately increases, however, much less than in the US and particularly in Switzerland. The moderate level and increase in the P/B ratio (from 1.3 to 1.6) implies an essentially constant profitability of roughly 11%, which implies a slightly decreasing implied growth rate (from 6.1% to 5.1%). The cost of capital decreases from 10.5% to 8.5%, but the risk premium slightly increases (6.3% to 7.5%).

Therefore, the same numerical exercise as for the previous countries implies an increase in the P/E ratio from

$$\frac{P}{E} = \frac{1-b}{k-rb} = \frac{0.48}{0.105 - 0.118 \times 0.52} = \frac{0.48}{0.044} = 11.0$$

in January 2010 to

$$\frac{P}{E} = \frac{1-b}{k-rb} = \frac{0.52}{0.085 - 0.106 \times 0.48} = \frac{0.52}{0.034} = 15.2$$

in April 2017. As in Switzerland, the higher valuation is strongly driven by a lower discount rate. Similarly, profitability and reinvestment rates are declining although to a much lesser extent than in the Swiss case. The implied decrease in growth expectations is only minor and does not compensate the discount rate effect.

3 A variance decomposition

In the previous sections, we have derived the unobserved parameters from the Gordon model using conventional valuation ratios. We have analyzed the implied levels of payout, profitability, growth, and discount rates, and their change over the past decade.

Here, we address the question whether the conclusions reached from explaining the level shifts

Table 1 Descriptive statistics.

		Mean	Volatility	AC(1)	AC(2)	AC(3)	AC(6)	AC(12)
Reinvestment Δb	SMI	−0.0021	0.0229	−0.15	−0.06	−0.08	0.03	**0.31**
	S&P500	−0.0007	0.0084	0.08	0.07	**0.24**	0.06	0.17
	DAX	−0.0002	0.0110	0.12	0.09	**0.31**	0.12	0.10
	EUROSTOXX50	−0.0006	0.0081	0.12	0.07	0.11	−0.10	−0.09
Profitability Δr	SMI	−0.0003	0.0076	−0.10	−0.02	−0.10	**0.24**	**0.25**
	S&P500	0.0000	0.0030	0.06	0.13	0.17	0.10	0.01
	DAX	0.0000	0.0031	0.17	0.10	**0.35**	0.21	−0.06
	EUROSTOXX50	−0.0004	0.0026	**0.30**	**0.26**	**0.31**	0.01	−0.07
Growth Δw	SMI	−0.0005	0.0070	−0.12	−0.02	−0.09	0.17	**0.32**
	S&P500	−0.0001	0.0030	0.05	0.10	0.20	0.08	0.07
	DAX	0.0000	0.0028	0.18	0.10	**0.31**	0.20	0.01
	EUROSTOXX50	−0.0003	0.0021	0.21	0.18	**0.23**	−0.03	−0.08
Discount rate Δk	SMI	−0.0004	0.0076	−0.13	−0.05	−0.13	0.12	**0.39**
	S&P500	−0.0001	0.0031	−0.02	−0.02	0.15	−0.03	0.10
	DAX	0.0000	0.0035	0.07	−0.11	**0.24**	−0.02	0.13
	EUROSTOXX50	−0.0003	0.0033	0.07	−0.07	0.14	**−0.22**	0.03

The displayed statistics are means, volatilities, and autocorrelations (AC) at lags 1, 2, 3, 6, and 12 of first differences of reinvestment rate (b), profitability (r), growth (w), and discount rate (k) which are extracted from three valuation ratios (price–earnings, price–dividend, price–book) using the Gordon model. Monthly data are used from January 2006 to April 2017.
Bold figures indicate 95% significance.

of the P/E ratio are also valid for explaining the monthly *variability* of the ratio.

First, some descriptive statistics about first differences of b, r, w, and k are displayed in Table 1. The Swiss parameters exhibit the largest volatility throughout, exceeding the other cases by a factor 2 at least. Also their time series characteristics are different: they are significantly autocorrelated at annual lags, while we mostly observe significant quarterly lags for Germany and aggregate Europe. The implied US parameters exhibit essentially no serial correlation.

In order to accomplish a variance decomposition of the P/E ratio into the underlying Gordon parameters, we use a linear approximation

$$PE_{lin} = (1 - b) - k + \frac{w}{k} \tag{8}$$

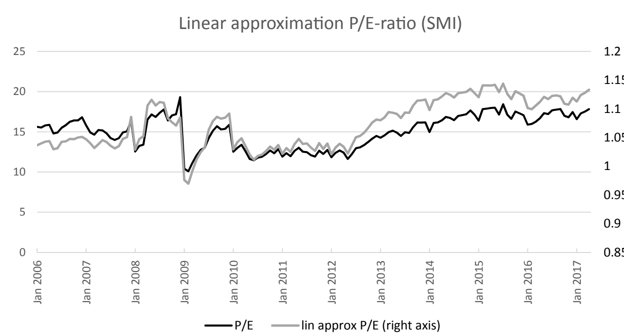

Figure 5 Linear approximation of P/E ratio (Swiss Market Index, SMI).

which is displayed in Figure 5 for the Swiss stock market. The correlation coefficient is 0.96 between the first differences of the original and approximated series. The decomposition allows to separate the valuation effects of the monthly changes (first differences) in payout, discount

Table 2 Variance decomposition of first differences of linearized P/E ratio.

		Total variance = 100%, all variables in first differences						
		Reinvestm b (1)	Disc rate k (2)	Rel growth w/k (3)	2 cov b, k (4)	−2cov $k, w/k$ (5)	−2cov $b, w/k$ (6)	corr $b, w/k$ (7)
Switzerland	SMI	198%	22%	150%	121%	−87%	−304%	*0.88*
USA	S&P500	72%	10%	77%	47%	−18%	−87%	*0.58*
Germany	DAX	52%	5%	108%	25%	−3%	−88%	*0.59*
Europe continental	EUROSTOXX50	25%	4%	99%	10%	14%	−53%	*0.53*

The table displays a variance decomposition of the first differences of a linearized price–earnings ratio (Equation (8) in the Text). The variance is decomposed into the variability of (first differences of) the reinvestment rate b, the discount rate k, the relative growth rate w/k, and the covariances in between. Total variance is 100%, i.e. the decomposition is in relative terms. The parameters are extracted from three valuation ratios (price–earnings, price–dividend, price–book) using the Gordon model. Monthly data are used from January 2006 to April 2017.

rate, relative growth, and their interaction:

$$\begin{aligned} Var[PE_{lin}] &\\ &= Var[b] + Var[k] + Var\left[\frac{w}{k}\right] \\ &\quad + 2Cov[b,k] - 2Cov\left[k, \frac{w}{k}\right] \\ &\quad - 2Cov\left[b, \frac{w}{k}\right] \end{aligned} \tag{9}$$

As a matter of fact, the decomposition does not allow to explicitly account for the *separate* effect of profitability; this is only indirectly reflected in the covariance between b and w. If r is constant, reinvestment and growth are perfectly correlated. Therefore, to gauge the relevance of the volatility of r, the correlation coefficient is displayed in the last column of Table 2.

The results reveal that the volatility of the payout ratio accounts by far for most of the P/E variability in the Swiss stock market, in terms of its own variability (Column 1) as well as its covariance with the discount rate (Column 6). The correlation coefficient close to one (Column 7) indicates that the payout rate is the major driver of the growth rate while profitability is rather constant.

These observations are in contrast to the other countries analyzed in this paper. The volatility of the payout ratio contributes much less to the variability of the P/E ratio, particularly in Germany and the other European countries. The same is true for the discount rate. Thus, most of the variability comes from the monthly changes in profitability, which is reflected in much lower correlation coefficients (Column 7).

Overall, the results demonstrate that the sources of variation in P/E ratios differ substantially between the (small sample of) countries analyzed here.

4 The results in a broader perspective

One of the results of this paper is the apparent heterogeneity in expected dividend payout ratios and profitability among the analyzed countries, as summarized in Figures 4(a)–4(d). The case of Switzerland—declining profitability while increasing payout—is particularly striking. The increase is typically explained by the possibility of tax-privileged dividends after 2008, if paid from contributed equity (instead of retained earnings). However, this privilege holds only for private investors while substantial ownership in

Swiss shares is institutional. Moreover, our figures reveal long-run expectations, not realized dividend payoffs, and it is questionable whether the tax explanation is able to explain a long-run pattern: first, the tax privilege is limited to specific parts of companies' funds, and second, there is substantial political pressure to abandon the privilege.

Apart from this specific case, our implied figures do not seem to support the case of disappearing dividends, at least not for the companies included in the analyzed "major market" type indices which include only the largest companies. This is consistent with the findings in other papers: e.g. Denis and Osobov (2008) find in a cross-country study that aggregate dividends have not declined and are concentrated among the largest, most profitable firms; the same or result has been reported for US firms by DeAngelo *et al.* (2006).

Our methodology is easy enough to be expanded to analyze dividend heterogeneity across national jurisdictions in much more detail. This is a challenging research topic which gets only partial attention in empirical research. This is an ambitious research agenda because differences in dividend policy are reflected in the level of payments (e.g. in relation to earnings or stock prices), their trend and variability over time, as well as their composition.

The academic literature offers basically three strands of explanations for dividend heterogeneity across countries: On the *institutional* side, differences in dividend policy are mostly explained by the tax system, or agency issues related to the legal system which determines minority rights (La Porta *et al.*, 2000) or creditor rights (Brockman and Unlu, 2009). But there are differences in dividend policies across countries even after controlling for nations' legal regime and corporate governance system. Therefore, a second strand of literature puts emphasis on *cultural* aspects (norms, beliefs), such as conservatism and mastery (Shao *et al.*, 2010.), uncertainty avoidance, masculinity, and long-term orientation (Bae *et al.*, 2012). The evidence of these studies, which is based on individual firms across more than 20 respectively 30 countries, are pretty strong that cultural factors determine firms' dividend decisions. However, cultural factors do not substitute institutional explanations; their complementarity is tested by Fidrmuc and Jacob (2010) who conclude that the normative nature of culture influences agency relations and "determines the acceptance and legitimacy of different dividend payout strategies".

A third strand of literature addresses the role of *behavioral* patterns of individual investors across countries. Behavioral explanations of dividend policy trace back to Shefrin and Statman (1984). A recent study by Breuer *et al.* (2014) finds that behavioral patterns such as loss aversion and the level of time-discounting are the main determinants for corporate dividend policy across the 32 countries included in the study. They also reach critical conclusions with respect to the independent role of cultural factors.

The conclusion from this growing body of empirical research is that legal, cultural, and behavioral aspects are as important for the understanding dividend policies across national borders as purely economic factors. It is therefore not surprising that there are no immediate—and simple—explanations for the results documented in this paper. But the results confirm a major insight from the large number of cross-country studies (as reviewed by Ferris and Sanjiv, 2012), namely that stylized facts about dividend policy of US firms cannot be generalized to other countries. Interestingly, this observation seems also to be true for *expected*—implied—magnitudes as analyzed in this paper.

A final remark: the heterogeneity of observed fundamentals, in particular discount rates, should not be interpreted as mispricing or arbitrage opportunities. Without a formal model of international capital market equilibrium, the expected returns (discount rates) for the individual markets cannot be determined, and no conclusions about fair equity prices can be drawn.

5 Conclusions

Are the high current valuations of the stock markets driven by low discount rates or excessive growth expectations, or both?

The simple Gordon model allows a consistent interpretation of widely used valuation multiples of equity markets with respect to their underlying economic assumptions. Overall, P/E ratios do not seem to be caused by irrational growth expectations, which is a surprising and important finding. However, the increase in P/E ratios from January 2010 to April 2017 is related to different economic sources in the analyzed stock markets: Low discount rates are the major drivers in Europe and particularly in Switzerland, while high profitability is the major source in the US and Germany. The payout behavior plays a particularly interesting role in these markets. A moderately restrictive payout policy can only be observed in Germany, without significant impact on growth however. In Switzerland and the US, larger payouts attenuate the growth of P/E ratios. However, the magnitude of these effects differs across markets, and over time.

While the discount rate decreases in all cases analyzed here, it is interesting to notice that the effect is mainly driven by the interest rate. The risk premium decreases in Switzerland, only slightly in the US, while the effect is unclear for the European markets at large, and even opposite in Germany.

An interesting, general observation is the stability of the implied parameters over time (with the exception of the months surrounding the financial crisis), given the strong sensitivity of the Gordon model upon the parameters in the denominator of the formula.

Our simple analysis shows how to disentangle the effects of reinvestment and profitability as components of expected (earnings or dividend) growth. This can be directly exploited to augment the Campbell–Shiller–Cochrane predictability tests from two magnitudes, growth and discount rates, to payout, profitability, and discount rates. Moreover, as documented here and known from numerous empirical studies, payout patterns differ across jurisdictions and sectors. Thus, predictability tests focusing on payout ratios (and hence, profitability) can expected to be particularly insightful when applied to cross-sectional valuation data of countries and sectors. This opens an avenue of new interesting empirical research.

Appendix 1: Data

Valuation multiples:

Valuation multiples are downloaded from Bloomberg. P/E ratios (BEST_PE_RATIO) rely on estimated earnings (Bloomberg estimates) of the four subsequent quarters. P/D ratios are the reciprocal values of the dividend yields (BEST_DIV_YLD) which relate the dividends in a specific month to the market price at the beginning of that month. P/B ratios (BEST_PX_BPS_RATIO) relate market prices to estimated book values (Bloomberg estimates). End-of-month values are used throughout the analysis.

Risk-free interest rates:

Swiss-franc denominated risk-free interest rates are spot rates for a time-horizon of 20 years calculated from government bonds. End-of-month observations are used (source: Swiss National Bank). A long-run maturity is selected since the discounting horizon of the Gordon model is infinite. For Germany and the Eurostoxx50 countries, Euro-denominated risk-free interest rates are spot rates for a time-horizon of 20 years extracted from listed Federal securities. End-of-month observations are used (source: Deutsche Bundesbank).

USD-denominated risk-free interest rates are yields on government bonds with a maturity of 20 years. Only monthly averages are available (source: FRED database, Federal Reserve Bank of St. Louis). Thus, risk-free interest rates—and thus risk premiums—are not directly comparable with the spot rates used for Switzerland, Germany, and the Eurostoxx50 countries.

Appendix 2: A compact formula summarizing the implied Gordon parameters

The derivation in the text can be used to express the implicit discount rate directly as a function of the valuation multiples. Given the expressions for the payout ratio $1 - b$ and profitability r, the growth rate can be expressed by

$$w = rb = \frac{\frac{P}{B}}{\frac{P}{E}} \cdot \left(1 - \frac{\frac{P}{E}}{\frac{P}{D}}\right) = \frac{P}{B} \cdot \left(\frac{1}{\frac{P}{E}} - \frac{1}{\frac{P}{D}}\right)$$

Using the dividend–price ratio rather than P/D, the discount rate can then be expressed by

$$k = \frac{D}{P} + w = \frac{D}{P} + \frac{P}{B} \cdot \left(\frac{1}{\frac{P}{E}} - \frac{D}{P}\right) \qquad \text{(A.1)}$$

Notice that these relations are only valid under the simple setting of the Gordon model.

Acknowledgments

I am grateful to an anonymous referee as well as Michael Huynh and Yvonne Seiler for their helpful comments which improved the paper.

Notes

1 Much higher ratios are often reported in the financial press or in analyst reports. The figures here are downloaded from Bloomberg and represent equity prices in relation to projected earnings four quarters ahead. See Appendix 1 for a more detailed description of the data source.

2 Representative papers include Campbell and Shiller (1988, 1998) and Cochrane (2008).

3 We refer to "Gordon" model for simplicity and convenience, although the model borrows from Williams (1938) and Gordon and Shapiro (1956) apart from the original reference, Gordon (1959).

4 In this simplified setting, no distinction is made between earnings and cash flows.

5 An equivalent way to define the book value is by replacing the discount factor k in the Gordon formula (1) by the return-on-equity r.

6 The displayed values are correct, but rounded to a few digits; manual recalculation causes small deviations.

7 Similar misinterpretations are not uncommon in the literature. For example, Asness *et al.* (2014) split-up the price-to-book ratio of stocks into discount rate, payout, profitability, and growth components. Of course, growth and payout are inversely related and should not be treated as separate pricing components.

References

Asness, C. S., Frazzini, A., and Pedersen, L. H. (2014). Quality Minus Junk. Working Paper.

Bae, S. C., Chang, K., and Kang, E. (2012). "Culture, Corporate Governance, and Dividend Policy: International Evidence," *Journal of Financial Research* **35**, 289–316.

Breuer, W., Rieger, O., and Soypak, K. C. (2014). "The Behavioral Foundations of Corporate Dividend Policy. A Cross-Country Analysis," *Journal of Banking and Finance* **42**, 247–265.

Brockman, P. and Unlu, E. (2009). "Dividend Policy, Creditor Rights, and the Agency Costs of Debt," *Journal of Financial Economics* **92**, 276–299.

Campbell, J. Y. (2008). "Estimating the Equity Premium," *Canadian Journal of Economics* **41**(1), 1–21.

Campbell, J. Y. and Shiller, R. J. (1988). "The Dividend-Price Ratio and Expectations of Future Dividends and Discount Factors," *Review of Financial Studies* **1**(3), 195–228.

Campbell, J. Y. and Shiller, R. J. (1998). "Valuation Ratios and the Long-Run Stock Market Outlook," *The Journal of Portfolio Management* **24**(2), 11–26.

Campbell, J. Y. and Thompson, S. B. (2008). "Predicting Excess Stock Returns Out of Sample: Can Anything Beat the Historical Average?," *Review of Financial Studies* **21**(4), 1509–1531.

Cochrane, J. H. (2008). "The Dog That Did Not Bark: A Defense of Return Predictability," *Review of Financial Studies* **21**(4), 1533–1575.

Denis, D. J. and Osobov, I. (2008). "Why Do Firms Pay Dividends? International Evidence on the Determinants of Dividend Policy," *Journal of Financial Economics* **89**(1), 62–82.

DeAngelo, H., DeAngelo, L., and Stulz, R. M. (2006). "Dividend Policy and the Earned/Contributed Capital Mix: A Test of the Life-Cycle Theory," *Journal of Financial Economics* **81**(2), 227–254.

Ferris, S. P. and Sanjiv, S. (2012). "Dividend Policy Across Countries," in: H. K. Baker and L. A. Riddick (Eds.), *International Finance: A Survey* (Oxford University Press), pp. 485–502.

Fidrmuc, J. and Jacob, M. (2010). "Culture, Agency Costs and Dividends," *Journal of Comparative Economics* **38**, 321–339.

Gordon, M. J. and Shapiro, E. (1956). "Capital Equipment Analysis: The Required Rate of Profit," *Management Science* **3**(1), 102–110.

Gordon, M. J. (1959). "Dividends, Earnings, and Stock Prices," *The Review of Economics and Statistics* **41**(2), 99–105.

Huynh, M. and Zimmermann, H. (2017). "Payout Behavior of SMI Firms (Die aggregierten Ausschüttungen der SMI-Gesellschaften, 1998–2015)," *Expert Focus* **91**(Journal of the Swiss Expert Association for Audit, Tax and Fiduciary), 929–936.

La Porta, R., Lopez-de-Silanes, F., Schleifer, A., and Vishny, R. W. (2000). "Agency Problems and Dividend Policies around the World," *Journal of Finance* **55**, 1–33.

Niehans, J. (1966). "A Neglected Relation Between the Price of Land, Economic Growth and Return on Capital (Eine vernachlässigte Beziehung zwischen Bodenpreis, Wirtschaftswachstum und Kapitalzins)," *Swiss Journal of Economics and Statistics* **102**, 195–200.

Shao, L., Kwok, C., and Guedhami, O. (2010). "National Culture and Dividend Policy," *Journal of International Business Studies* **41**, 1391–1414.

Shefrin, H. M. and Statman, M. (1984). "Explaining Investor Preference for Cash Dividends," *Journal of Financial Economics* **13**(2), 253–282.

Williams, J. B. (1938). "The Theory of Investment Value," (Harvard University Press).

Keywords: Stock market valuation; multiples; Gordon model