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Working Paper

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CFR Working Paper, No. 12-08

Provided in Cooperation with:
Centre for Financial Research (CFR), University of Cologne

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Changes in the composition of publicly traded firms: Implications for the dividend-price ratio and return predictability*

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November 16, 2012

Abstract

This article documents how the changing composition of U.S. publicly traded firms has prompted a decline in the long-run mean of the aggregate dividend-price ratio, most notably since the 1970s. Adjusting the dividend–price ratio for such changes resolves several issues with respect to the predictability of stock market returns: The adjusted dividend-price ratio is less persistent, in-sample evidence for predictability is more pronounced, there is greater parameter stability in the predictive regression (particularly during the 1990s), and there is evidence of out-of-sample predictability.

Key words: return predictability, dividend-price ratio, payout policy, sample selection, choice of organizational structure

JEL: G10, G12, G14, G35

*I thank Lammertjan Dam, Martin Lettau, Pratish Patel, Michael Roberts, Monika Trapp, Michael Weber, and seminar participants at the Haas School of Business Finance PhD-Seminar at UC Berkeley, the Konstanz-Tübingen Empirical Finance Seminar, the CFR seminar at the University of Cologne, and the Annual Meeting of the German Finance Association (DGF) for helpful comments and suggestions. I retain responsibility for all remaining errors. This paper was partly written when I was visiting Haas School of Business, UC Berkeley.

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1 Introduction

The dividend-price (d-p) ratio has a long tradition as a predictive variable for market returns (e.g. Campbell and Shiller, 1988; Fama and French, 1988; Campbell, 1991; Hodrick, 1992), though in recent work several issues emerged regarding its use in predictive regressions. First, the dividend-price ratio exhibits strong persistence, which poses statistical problems in the predictive regression (Nelson and Kim, 1993; Stambaugh, 1999; Ferson, Sarkissian and Simin, 2003; Valkanov, 2003; Ang and Bekaert, 2007). Second, the parameters of predictive regressions are unstable over time (Viceira, 1997; Paye and Timmermann, 2006), and accordingly the in-sample predictability of returns seemed to disappear around the mid-1990s. Third, the out-of-sample performance of return forecasting regression is rather poor (Bossaerts and Hillion, 1999; Goyal and Welch, 2003, 2008).[1] Lettau and Van Nieuwerburgh (2008) reconcile these observations with return predictability by allowing for steady-state shifts in the dividend-price ratio. They provide strong evidence for structural breaks in the long-run mean of the dividend-price ratio and cite various possible reasons for these shifts, including persistent improvements in risk sharing, changes in the long-run growth rate of the economy, or changes in tax code, or payout policy.

Building on Lettau and Van Nieuwerburgh's (2008) work, this article explores a novel channel for steady-state shifts in the dividend-price ratio, namely, systematic changes in the composition of publicly listed corporations. I start by comparing the dividend-price ratio of all domestic corporations, including both publicly traded and closely held firms, against that of publicly traded firms. Over time, the all-domestic-equity d-p ratio increasingly differs from that of publicly traded firms. This divergence can be explained by changes in the composition of publicly listed firms. Systematic differences in the

[1] For recent surveys see Lettau and Ludvigson (2010) and Koijen and Van Nieuwerburgh (2011).

dividend policies of entering and exiting firms have prompted a decline in the steady state of the observed d-p ratio, particularly since the 1970s and 1980s. It appears that as it became easier for firms to go public, such as through NASDAQ, this route came to be used over-proportionately by low dividend-paying firms in need of capital. The decline since the 1980s also may be associated with the growing importance of S corporations as an organizational form, which provided tax incentives for high dividend-paying firms to be privately held, thereby leading to a population of public firms with lower average d-p ratios. To account for these composition changes, I subtract the cumulative steady state change that is due to entering/exiting firms from the ordinary CRSP d-p ratio.

In the second part of this article, I compare the all-domestic-equity d-p ratio and the d-p ratio adjusted for composition changes to the commonly used d-p ratio with respect to the aforementioned issues. The results can be summarized as follows. The all-domestic-equity and adjusted d-p ratio are more mean-reverting. In-sample evidence for return predictability is stronger and also present after correcting estimates for small-sample bias. Furthermore, the forecasting relation remains stable over time, especially throughout the 1990s. Finally, I obtain evidence of out-of-sample predictability.

The paper relates to the following fields of research. First and foremost, it extends the analysis by Lettau and Van Nieuwerburgh (2008) by providing a novel economic explanation for permanent shifts in the steady state of the d-p ratio, namely, composition changes. The structural changes of publicly traded corporations are also studied by Fama and French (2001); I expand their analysis by investigating how these changes in the composition influence the aggregate dividend-price ratio and by showing that ignoring these structural changes weakens the available evidence for return predictability. The article also relates to the study by Boudoukh, Michaely, Richardson and Roberts (2007), who investigate the altering dividend policy of firms and its effect on the dividend-price ratio. They argue that dividends alone might not fully capture cash flows to investors and thus amend the d-p ratio for repurchases, which improves evidence of return predictability.

Repurchases and composition changes for the most part represent two separate phenomena. Although repurchases have increased since the 1970s, Fama and French (2001) document that they are used mostly by firms that already pay dividends. The large decline of dividend-paying firms since the 1970s therefore cannot be effectively explained by repurchases; instead, it must be traced back to composition changes, in particular to the large number of new listings that do not pay dividends. That is, composition changes constitute a second channel, beyond repurchases, by which alterations in the payout policy affect the dividend-price valuation ratio.

2 Steady-state shifts in the dividend-price ratio of publicly traded corporations

The theoretical motivation for predictive regressions is the log-linear approximation of the present value relationship by Campbell and Shiller (1988), which Lettau and Van Nieuwerburgh (2008) extend to allow for time-varying steady state growth rates of dividends and returns:

$$dp_t = \overline{dp}_t + \mathbb{E}_t \sum_{j=1}^{\infty} \rho_t^{j-1} \left[(r_{t+j} - \overline{r}_t) - (\Delta d_{t+j} - \overline{\Delta d}_t) \right], \tag{1}$$

where dp_t is the dividend-price ratio, r_t is the market return, and Δd_t refers to dividend growth. All lower-case letters denote variables in logs. $\mathbb{E}_t$ is the expectation operator conditional on information at time t and $\rho_t = 1/(1 + exp(\overline{dp}_t))$. The long-term means of the dividend-price ratio, return, and dividend growth are denoted by an overscore: $\overline{dp}_t$, $\overline{r}_t$, and $\overline{\Delta d}_t$, where the time index indicates that the steady state can change over time. Equation (1) states that deviations of the dividend-price ratio from its steady state should forecast either future returns or dividend growth or both. This is generally the motivation for the predictive regressions of returns and dividend growth:

$$r_{t+1} - \overline{r}_t = \beta^r (dp_t - \overline{dp}_t) + \varepsilon^r_{t+1}, \text{ and} \tag{2}$$

$$\Delta d_{t+1} - \overline{\Delta d}_t = \beta^d (dp_t - \overline{dp}_t) + \varepsilon^d_{t+1}, \tag{3}$$

though this study focuses on Equation (2), the return predictability equation.

Lettau and Van Nieuwerburgh (2008) show that changes in the long-run mean of the dividend-price ratio can explain the high persistence of the d-p ratio; if not taken into account, these shifts distort the predictive regression, resulting in parameter instability and poor out-of-sample predictability. They find strong evidence of structural breaks in the d-p ratio, so they suggest using regime-specific means to demean the dividend-price ratio. Although structural breaks in the d-p ratio can be identified, the economic explanation for these changes is still unresolved. Lettau and Van Nieuwerburgh (2008) cite several possible explanations: improvements in risk sharing, changes in the long-run growth rate of the economy (e.g. Lustig and Van Nieuwerburgh, 2005; Krueger and Perri, 2006; Lettau, Ludvigson and Wachter, 2008), changes in tax code (e.g. McGrattan and Prescott, 2005), or changes in payout policy (e.g. Fama and French, 2001; Grullon and Michaely, 2002; Brav, Graham, Harvey and Michaely, 2005; Boudoukh et al., 2007).

I explore a new type of channel for steady-state shifts in the dividend-price ratio. Shifts can be caused by composition changes in the firms, which the researcher observes. In general, the challenge a researcher faces when estimating the relation between future market returns and the dividend-price ratio is that the overall return and d-p ratio are unobservable. This problem is similar to Roll's (1977) well-known critique that the overall market portfolio – including all possible assets – is unobservable when testing the CAPM.

In a predictive regression setting, the market value of all corporate equities is unobservable, because some stocks are not publicly traded.

When estimating predictive regressions as in Equations (2) or (3), the market-wide dividend-price ratio and returns usually get approximated with a broad stock market index, such as the S&P Composite or all stocks traded on NYSE, NASDAQ and AMEX – that is, the CRSP universe. The sample is thus usually restricted to publicly traded firms, while closely held firms remain unobservable. In this setting, observed and unobserved firms may differ systematically in the amount of dividends they pay. This difference between observed and unobserved firms on its own is not a problem as long as there are no changes in composition over time. If the composition of observed firms changes over time though, the long-run mean of the observed dividend-price ratio changes, while the overall d-p ratio stays constant. For example, if more firms that pay low dividends go public, which makes them observable to the researcher, the *observed* d-p ratio decreases, yet the *overall* d-p ratio remains stationary around its steady state, ceteris paribus. In this study I explore this potential channel for non-stationary shifts in the dividend-price ratio by contrasting the dividend-price ratio of publicly traded firms (i.e. the CRSP sample) with the overall dividend-price ratio of all domestic corporations.

3 Data

The dividend-price ratio of all domestic corporations is calculated by dividing all corporate dividends paid in the economy by the total market value of all domestic corporations. The source of dividend data is the National Income and Product Accounts (NIPA), which obtains the original data from the corporate income tax returns gathered by the Internal Revenue Service (IRS). I adjust this series for capital gain distributions and interest payments from regulated investment trusts (i.e. mutual funds) using the NIPA adjustment factors. The resulting figure reflects the dividends paid by all domestic corporations. (For further details on NIPA dividends see Petrick, 2002). I divide this figure by the total market capitalization of all domestic corporations including both publicly traded and privately held firms, gathered from the Flow of Funds Accounts (FFA). Appendix A provides further details on the construction of the all-domestic-equity d-p ratio. The earliest availability of annual total market capitalization from the Flow of Funds Accounts is 1945, and the latest divided figures (NIPA, IRS) are from 2008. Therefore, the main analysis of this paper focuses on the post-war period (1945-2008 for the d-p ratio, 1946-2009 for returns).

Because the overall market value in principle is unobservable, the figure provided by the Flow of Funds Accounts is an approximation and only an imperfect solution.[2] However, when measuring a market-wide d-p ratio, there generally is a trade-off between two non-perfect alternatives. One possibility is to rely on traded stocks, which allows an exact measurement of market value and dividends but restricts the researcher to a specified sub-sample, which faces the problems mentioned above. The other option is to look at all corporations in the economy. In this case there is a good measure for aggregate dividends originating from tax records; however, the total market value has to be approximated. I validate the quality of the Flow of Funds' approximation by comparing the relation of total market capitalization of publicly traded and all domestic firms to dividends and earnings. There is no divergence of the earnings-price ratios, which suggests that the Flow of Funds Accounts' approximation of the overall market value works quite well (see Figure A.3 in the online appendix; for a detailed discussion, see Section 6).

In the following analysis, I compare the overall d-p ratio to the d-p ratio of publicly traded firms (CRSP). Taking into account recent concerns noted by Chen (2009),

[2]The primary method used with the Flow of Funds Accounts to estimate the total market capitalization of all firms is the "perpetual inventory" approach, which uses data from net equity issuances and capital gains from a broad market index to calculate the total market value of all corporations.

Van Binsbergen and Koijen (2010) and Koijen and Van Nieuwerburgh (2011), I do not reinvest dividends at the market return but instead aggregate them over the year by summing up monthly dividends. In addition to dividend growth being less volatile (Van Binsbergen and Koijen, 2010), this approach has several advantages. First, the CRSP d-p ratio is directly comparable to the all-domestic-equity d-p ratio, which sums up dividends over the year as well. Second, the market-reinvested ratio shows a higher persistence than the zero-rate reinvested d-p ratio (Koijen and Van Nieuwerburgh, 2011). Third, reinvestment at the market return leads to an overstatement of return predictability in the pre-1945 sample (Koijen and Van Nieuwerburgh, 2011). Appendix A provides details on the construction of the CRSP d-p ratio.

[Insert Figures 1 and 2 about here]

Figure 1 compares the all-domestic-equity dividend-price ratio with the dividend-price ratio of publicly traded firms (CRSP). The two ratios are very similar in the first part of the sample; the all-domestic-equity d-p ratio is always slightly higher than the CRSP d-p ratio, which indicates that publicly traded firms have higher d-p ratios on average. Starting around the 1970s, the two ratios begin to diverge, and the wedge between them is increasing. More details appear in the left-hand graph of Figure 2, which plots the difference between the two ratios over time. Whereas the difference before 1970 averaged around -0.24, it widened to -0.32 in the 1970s, to -0.43 in the 1980s, to -0.73 in the 1990s, and to -0.97 in the years 2000-2008. In the following, I explore the degree to which new listings and de-listings can account for this divergence.

4 Changes in the composition of publicly traded firms and their effect on the dividend-price ratio

4.1 The time-varying steady state of the dividend-price ratio

My analysis builds on work by Fama and French (2001), who find a decline in the number of dividend-paying firms starting from the 1970s. Whereas 66.5% of all publicly listed firms paid dividends in 1968, only 20.8% paid dividends in 1999. Fama and French (2001) cite two reasons: an increase in the rate of dividend-paying firms that delist, and more important, a strongly increasing share of newly listed firms that do not pay dividends. In their analysis, Fama and French (2001) focus on individual firms and, when aggregating use equal weighting, whereas in this section, I look at the economic effect, that is the value-weighted effect of composition changes on the aggregate dividend-price ratio.

As a first step, I decompose the steady state of the d-p ratio into the steady state of the firms that were continuously listed from the previous to the present year $\overline{dp}_t^s$ and the change in steady state due to entering/exiting firms $\Delta\overline{dp}_t^e$:

$$\overline{dp}_t = \overline{dp}_t^s + \Delta\overline{dp}_t^e. \tag{4}$$

If there is no systematic difference between entering/exiting firms and the continuously listed firms with respect to their d-p ratio, $\Delta\overline{dp}_t^e$ equals zero, and all else being equal, the steady state of the d-p ratio is constant over time. If conversely entering or exiting firms have systematically lower or higher d-p ratios, the steady state $\overline{dp}_t$ shifts. Because the steady state of the continuously listed firms at time t equals the steady state of the previous period ($\overline{dp}_t^s = \overline{dp}_{t-1}$), we can iterate forward Equation (4) and rewrite it as:

$$\overline{dp}_t = \overline{dp}_0 + \sum_{i=1}^{t} \Delta\overline{dp}_i^e. \tag{5}$$

The d-p steady state at time t is the initial steady state at time zero plus the sum of changes in steady state due to entering or exiting firms.

To estimate the change in the d-p steady state induced by entering or exiting firms $\Delta\overline{dp}_t^e$, I proceed as follows. I only consider firms that are continuously listed in the previous and current year and calculate their d-p ratio: dp_t^s. The difference between the d-p ratio of continuously listed firms (dp_t^s) and the d-p ratio of all firms listed in the current year (dp_t) can be attributed to composition changes ($\Delta\overline{dp}_t^e$).[3]

The right-hand graph of Figure 2 plots the cumulative sum of changes in the d-p ratio due to entering/exiting firms, which is the path of the time-varying steady state $\overline{dp}_t$ relative to its initial value $\overline{dp}_0$, as stated in Equation (5). With the exception of the first years, the steady state of the d-p ratio is only slightly decreasing and remains quite stable in the first part of the sample. In the later part of the sample though, we observe a strong decline around the 1970s and in particular from the 1980s onwards.

4.2 Discussion: Economic reasons for composition changes in publicly traded corporations

What reasons explain systematic changes in the composition of publicly traded corporations? A possible explanation is that from the 1970s on, it became easier for firms to go public, such as through NASDAQ, which then was over-proportionately used by low dividend-paying firms in need of capital. Furthermore, the increasing divergence since the

[3] Another possibility to test for composition changes is to restrict the sample to those firms that survived for the entire sample period and compare this d-p ratio with the conventional d-p ratio. The number of firms that existed in 1945 and were continuously listed until 2008 (using the same unique CRSP-identifier PERMNO) is 94. The resulting d-p ratio is shown in the online appendix, Figure A.2. The d-p ratio of surviving firms is very similar to the overall CRSP d-p ratio in the first part of the sample, but they deviate in the later part of the sample. The continuously listed d-p ratio is higher than the overall CRSP d-p ratio, which suggests that due to the entry of lower dividend-paying firms, the mean of the d-p ratio changed. However, this approach suffers from survivorship bias. Only those firms that survived or did not choose to delist are considered. Fama and French (2001) find that dividend payers delist at a higher rate in the period 1978-1999 than previously, which explains why the wedge between the series is not as pronounced as for the all-domestic equity vs. CRSP series.

1980s can be connected to the rising importance of the S corporation as organizational form for closely held firms. The tax advantages of S corporations provide an increased incentive for high dividend-paying firms to be privately held, thus leading to a self-selected sample of low dividend-paying firms that are publicly traded.

The main difference between S corporations and "ordinary" corporations, that is so-called C corporations, is the taxation of income. For C corporations, income is first taxed at the business level, and then dividends received by shareholders are again taxed at the individual level. In contrast, S corporations are not subject to taxes at the business level. Their income or losses are passed through to its shareholders, and they must then report income or losses on their individual income tax returns. Although the single level of taxation is an attractive feature of S corporations, they also suffer additional restrictions. For example, S corporations are limited in the number and type of shareholders, allowing for only one class of stock, and foreign and corporate ownership is not permitted. Due to these restrictions publicly traded corporations must file their taxes as C corporations, and only closely held firms, given that they fulfill the requirements, can file their taxes as S corporations. Because of the tax advantage, payout ratios for S corporations are generally high, averaging around 83.9%, compared with 55.5% for C corporations.[4] The single taxation of income provides an incentive for corporations to choose an S corporation as organizational form, and this incentive is particularly high for firms that pay many dividends. The restrictions on the number of shareholders, however, does not allow these firms to be publicly traded, resulting in a selected sample of low-dividend paying firms that are publicly traded.

Over time an increasing number of companies have responded to this tax incentive and chosen to file their taxes under Subchapter S. These corporations are not necessarily small

[4]Figures are averages over the period 1991-2008 based on IRS statistics.

companies. More and more large corporations prefer to file their taxes as S corporations.[5] The number of S corporations was 2.1 million in 1980 but steadily increased, such that by 1997 S corporations became the most prevalent corporation type, with 4.1 million of them operating by 2008. The surge in the number of S corporations started in particular after the Tax Reform Act of 1986, which lowered the individual tax rate compared with the corporate tax rate, making it more attractive for a company to file its taxes under Subchapter S (Legel, Bennett and Parisi, 2003). Furthermore, the Small Business Job Protection Act of 1996 reduced several restrictions for S corporations, making this organizational form even more attractive. The number of C corporations instead slightly declined after 1986.

The rising number of S corporations is also important in economic terms. Before 1986, the amount of earnings generated by S corporations was small, averaging around 2.7% of all corporate earnings, but then it sharply increased in 1987 to 10.7%, and steadily rose in the following decades to 18.5% in the 1990s and 30.8% in the years 2000-2008. The share of dividends paid by S corporations (available only since 1991) shows a similar pattern: S corporations generated around 17.7% of all dividends in 1991, and then the share rose to 42.9% in 2008. Overall, S corporations are an increasingly attractive form of organization and generate a growing amount of earnings and dividends in the U.S. economy. A systematic difference between dividends paid by closely and publicly held corporations provides an explanation for the divergence of the CRSP and the all-domestic-equity d-p ratio since the mid-1980s.

4.3 Adjusting the dividend-price ratio for composition changes

When looking at Figure 2, we see that the cumulative change in the d-p ratio due to entering or exiting firms (right graph) matches the difference between the publicly traded

[5] See for example John D. McKinnon. (2010, September 18). U.S. News - Analysis: When Big Business Enjoys Being Small. The Wall Street Journal (Eastern Edition), p. A.4.

and the overall d-p ratio (left graph), both in magnitude and pattern. The overall change in the mean of the d-p ratio is also similar to the magnitude of the structural break reported by Lettau and Van Nieuwerburgh (2008), who estimate a break of -0.86 in 1991.

Now that I have estimated the time-varying steady state due to entering/exiting firms $\overline{dp}_t$, I can appropriately demean the dividend-price ratio as required by the Campbell-Shiller approximation: $dp_t - \overline{dp}_t$. The mechanism of the adjustment is in spirit similar to Lettau and Van Nieuwerburgh (2008), but instead of a regime switch, it is a continuous adjustment. The resulting dividend-price ratio (adjusted for composition changes), along with the unadjusted CRSP d-p ratio, is plotted in the right graph of Figure 1 and the series is quite similar to the all-domestic equity d-p ratio plotted in the left graph. As is apparent from the graph, the adjusted series is less persistent than the unadjusted one.

The dividend-price ratio adjusted for composition changes is not an extension of the Campbell-Shiller approximation but rather constitutes a better econometric measurement of the dividend-price ratio. At each point in time, the Campbell-Shiller approximation holds for the exact portfolio of all publicly traded corporations. A temporary deviation of the d-p ratio from its steady state at time t should either forecast future returns or dividend growth or both. For a researcher, however, a change in d-p ratio from time t to $t+1$ can mean two things: it is either a transitory divergence or a permanent change in the steady state. The latter holds if low dividend-paying firms go public or high dividend-paying firms go private, resulting in a decline of the observed d-p ratio. Looking only at the simple d-p ratio, an econometrician might mistakenly attribute this decline to a temporary divergence of the d-p ratio from its steady state, even though it is actually a persistent change of the d-p steady state. The procedure described above captures the persistent change of the steady state and thus provides a way to appropriately demean the d-p ratio.

The all-domestic-equity d-p ratio is very useful when we want to understand the underlying economic process of structural shifts, but it has the disadvantage that macroeconomic data, in particular tax data from the IRS, are only published after a delay. The d-p ratio adjusted for composition changes instead can be computed without a time lag. Thus, an out-of-sample forecast in real time is not feasible for the all-domestic-equity d-p ratio but is implementable for the adjusted d-p series.

Next, I compare the CRSP d-p ratio, the all-domestic-equity d-p ratio, and the CRSP d-p ratio adjusted for composition changes, regarding their time-series properties and ability to predict future market return. The main focus lies on the post-1945 sample, for which all three d-p ratios are available. The sample extended to 1926, for which only the CRSP d-p ratio and the CRSP d-p ratio adjusted for composition changes are available, serves as a robustness check.

5 Comparison of different dividend-price ratios

5.1 Descriptive statistics

Table 1 reports the summary statistics for the three d-p ratios. The casual observations from Figure 1 regarding the ratios' persistence are confirmed. In the post-1945 sample, the augmented Dickey-Fuller test fails to reject the null hypothesis of non-stationarity for the CRSP d-p ratio with a p-value of 0.41. Even though the Dickey-Fuller test cannot reject the null hypothesis of non-stationarity for the all-domestic-equity and adjusted d-p ratio in the post-war period, p-values are considerably lower. Constraining the analysis to a smaller sub-sample naturally reduces the test's power to reject the null. In the full sample from 1926-2008, the Dickey-Fuller test yields a result comparable to that of Lettau and Van Nieuwerburgh (2008). The null hypothesis of non-stationarity is not rejected for the unadjusted CRSP d-p ratio but is rejected for the adjusted one with a p-value of 0.013.

[Insert Table 1 about here]

The reduction in persistence is also evident when we compare the autocorrelation of the series. Whereas the first-order autocorrelation of the commonly used d-p ratio is 0.92, it is 0.81 and 0.82 for the whole economy and the adjusted series in the post-war sample. In the overall sample, the first-order autocorrelation is further reduced to 0.89 (CRSP) and 0.71 (CRSP, adjusted for composition changes). Note that the autocorrelation of the all-domestic-equity d-p ratio and the CRSP d-p ratio adjusted for composition changes is considerably lower than those commonly used in the literature, so the time series is much better behaved. For example, Ferson et al. (2003) show by means of simulation that for regressors with autocorrelation coefficients less than or equal to 0.90, no serious spurious regression bias arises in the t-statistics or in the R^2. Comparable to the break-adjusted series of Lettau and Van Nieuwerburgh (2008), I find that the standard deviation of the all-domestic-equity and adjusted d-p ratio is lower than that of the unadjusted CRSP series, with a reduction of about one-third.

5.2 In-sample predictability

In the following, I compare the different dividend-price ratios with respect to their ability to predict market returns. I start with the in-sample predictive regression over the post-war sample, ranging from 1945-2008 for dividend-price ratios and from 1946-2009 for market returns, then in a second step, I continue to analyze the extended sample ranging from 1926-2008 and 1927-2009 for market returns. Table 2 displays the OLS regression results (with Newey-West t-statistics of one lag) of market return, market excess return, and dividend growth, on different lagged d-p ratios, all in logs. Generally, the estimates of the predictive regressions are similar, irrespective of whether returns or excess returns are used.

[Insert Table 2 about here]

In the post-1945 sample, the regression of returns on the CRSP d-p ratio yields a slope coefficient β^r of 0.12, which is significant at conventional significance levels, and the R^2 is 10.8%. Both the all-domestic-equity and the adjusted CRSP d-p ratio provide a considerable improvement in the predictive regression. For example, the slope coefficient increases to 0.21 and the R^2 to 14.4% when the all-domestic-equity d-p ratio is used. Furthermore, statistical significance is more pronounced. These results are in line with Lettau and Van Nieuwerburgh (2008), who find a comparable improvement in the predictive regression once they adjust for structural breaks. Consistent with prior literature (e.g. Chen, 2009), I find no evidence of dividend growth predictability in the post-war sample.[6]

In the extended sample (1926-2009) evidence for return predictability is weaker with the CRSP d-p ratio, and there is some marginal evidence for dividend predictability. When I employ the d-p ratio adjusted for composition changes, return predictability is more pronounced, in both statistical and economic terms, compared with the unadjusted series. However, the explained return variation is still lower than in the post-war sample. When using the adjusted d-p ratio, there is even evidence of dividend predictability in the extended sample.

[Insert Table 3 about here]

An important issue when dealing with the d-p ratio in a predictive regression is its strong persistence, which biases the slope coefficient upward if innovations of the predictor variable are correlated with return innovations (Nelson and Kim, 1993; Stambaugh, 1999).

[6] Van Binsbergen and Koijen (2010) find dividend growth predictability for the post-war period when using a latent variables approach, but not with OLS.

To address this issue, I calculate the small-sample bias correction proposed by Stambaugh (1999). Table 3 contains the bias-adjusted slope coefficients β^r and, following the practice of Stambaugh (1999), the p-value for the null hypothesis $\beta^r = 0$ against the alternative $\beta^r > 0$. Inference is based on a residual re-sampling bootstrap similar to Nelson and Kim (1993), Mark (1995), Kothari and Shanken (1997) and Kilian (1999). The table also reports the estimates for the autoregressive coefficient ϕ of the predictive variable and the correlation coefficient ρ of the return and predictor variable innovations. In the post-war sample, the slope coefficient of the conventional d-p ratio is considerably reduced by around 40%, to 0.07 for returns and 0.06 for excess returns. In both cases, the regressors are no longer statistically significant at the 10% significance level, which is in line with findings by Stambaugh (1999). The bias correction also reduces the slope coefficient of the overall and adjusted dividend-price ratio, but the reduction is less, ranging around 22-29%. Moreover, the overall and the adjusted d-p ratio continue to be significant. The lower bias can be attributed to the lower autocorrelation ϕ of the all-domestic-equity and composition changes adjusted series whereas the correlation of innovations ρ is very similar across different series. The results for the extended sample (1926-2009) are qualitatively the same.

5.3 Parameter stability of the predictive regression

Viceira (1997) and Paye and Timmermann (2006) document considerable instability of the forecasting relationship over time. To evaluate the stability of the forecasting relationship, I run rolling regressions for the different d-p ratios. To ensure the results are comparable to those from previous studies (Lettau and Van Nieuwerburgh, 2008; Koijen and Van Nieuwerburgh, 2011), I closely follow their settings, using a rolling window of 30 years, and report the time-varying slope coefficient estimates (for market returns) plus or minus one standard deviation. Estimation results for excess returns are similar but not reported here for brevity. The results of the rolling regressions are displayed in Figure 3.

[Insert Figure 3 about here]

Similar to previous studies, the slope coefficient of the CRSP d-p ratio varies considerably over time, with a maximum of 0.45 and a minimum of 0.03 in the late 1990s. The all-domestic-equity d-p ratio instead shows a stable slope coefficient in the forecasting regression, fluctuating only slightly around the overall estimate of 0.21, even throughout the 1990s. A similar improvement in parameter stability can be observed when the d-p ratio is adjusted for composition changes. In particular, in the post-1945 sample period, the slope coefficient is fairly stable over time and comparable with that of the all-domestic-equity d-p ratio. As already seen in Figure 1, the adjustment for composition changes matters mostly in the post-war sample. There also is no substantial difference in the rolling regressions between the adjusted and unadjusted CRSP d-p ratios in the pre-war sample. Therefore, the weaker evidence for return predictability in this period likely can be traced back to other structural changes, such as the shift from dividend to return predictability documented by Chen (2009) and Chen, Da and Priestley (2012).

Instability in the predictive regression can be the reason for poor out-of-sample forecasts. In the following, I analyze whether and how the better parameter stability of the overall and adjusted d-p ratio manifests itself in better out-of-sample performance.

5.4 Out-of-sample predictability

Evidence of return predictability has recently been challenged by Goyal and Welch (2003, 2008), who find only poor out-of-sample predictability for the dividend-price ratio and other variables. Poor out-of-sample predictability does not necessarily contradict return predictability, because it can be attributed to the lower power of the out-of-sample tests compared with in-sample tests, as argued by Inoue and Kilian (2005) and Cochrane (2008). Furthermore, Campbell and Thompson (2008) show that prediction variables exhibit better out-of-sample predictability once restrictions are imposed on the sign of the coefficients.

Following prior literature, I compare the out-of-sample performance of the different dividend-price ratios to the performance of a simple random walk model, which uses the past average market return as a naïve guess for the future market return. The initial forecasting regression contains 20 years of data, so the out-of-sample period is 1965-2009 for the post-war sample and 1946-2009 for the entire sample. I calculate the mean absolute error (MAE) and the root mean squared error (RMSE) of the predictive regression models and of the benchmark random walk model. The out-of-sample R^2 of model i is defined as $R^2_{OS,i} = 1 - MSE_i/MSE_{rw}$, where MSE_i is the mean squared error of model i and MSE_{rw} the mean squared error of the benchmark random walk model (see Campbell and Thompson, 2008). Furthermore, I test whether the reduction in MSE of regression model i compared with the random walk model is significant in statistical terms using McCracken's (2007) MSE-F statistic: $MSE\text{-}F = T \cdot (MSE_{rw} - MSE_i)/MSE_i$, where T is the size of the out-of-sample period. Inference regarding the MSE-F statistic is based on a residual re-sampling bootstrap. As mentioned, the out-of-sample results for the all-domestic-equity d-p ratio are merely a pseudo out-of-sample forecast, because of the delayed publication of macroeconomic data; the adjusted d-p ratio, on the contrary, can be calculated in real time and used for real out-of-sample forecasts.

Table 4 compares the out-of-sample forecast performance of the different dividend-price ratios. Overall, there is only poor evidence of out-of-sample predictability when the ordinary CRSP d-p ratio is used. There is a slight reduction in RMSE compared with the random walk model, which is also significant at the 10% level; however, economically speaking, the out-of-sample R^2 is rather small.[7] Moreover, the MAE points in the other direction, favoring the naïve random walk model.

Evidence of out-of-sample return predictability is much clearer when the overall d-p ratio and the d-p ratio adjusted for composition changes are used. Both ratios show a reduction in RMSE and MAE for all sample periods, and for returns as well as excess returns. The forecast improvement is evident in both statistical and economic terms. For example, when predicting returns in the post-war sample, the adjusted d-p ratio reduces the RMSE of the benchmark model by -1.01 percentage points, and the p-value of the MSE-F statistic is well below the 1% significance level. This reduction in mean squared prediction error corresponds to an out-of-sample R^2 of 11%.

5.5 Long-horizon predictability

Much literature on return predictability, starting with Campbell and Shiller (1988) and Fama and French (1988), looks at return predictability over longer horizons finding that returns become more predictable as the horizon grows. Thus, I compare the forecasting performance of the different d-p ratios over multiple horizons in the following regression setup:

$$r_{t,t+H} = \alpha^r(H) + \beta^r(H) dp_t + \varepsilon^r_{t,t+H}, \tag{6}$$

where $r_{t,t+H}$ is the H-year return over the time period t until $t+H$. I compute standard errors following Hodrick (1992) because Ang and Bekaert (2007) show that the properties of Hodrick standard errors are superior to Newey-West standard errors in multiple horizon regressions.

[7] Goyal and Welch (2008) and Lettau and Van Nieuwerburgh (2008) find that the CRSP d-p ratio has a higher RMSE compared with the random walk model. The slightly better performance of the unadjusted CRSP d-p ratio in Table 4 can be attributed to a different sample period and to the reinvestment of dividends at a zero rate. Using the CRSP d-p ratio with market-reinvested dividends to predict returns yields a RMSE of 17.62 for the out-of-sample period 1946-2009, which, as in the aforementioned studies, is higher than that of the random walk model with a RMSE of 17.06.

Boudoukh, Richardson and Whitelaw (2008) argue that the use of long-horizon regressions can be problematic. Even under the null hypothesis of no return predictability, overlapping return data in conjunction with persistence in the predictive variable leads to a rising long-horizon R^2. As a solution to this problem, Lettau and Ludvigson (2010) suggest using regression coefficients and R^2 statistics implied by a vector autoregressive (VAR) model (Hodrick, 1992), which I report as a robustness check in addition to the OLS estimates.[8]

[Insert Table 5 about here]

Table 5 shows the OLS regression results of Equation (6), along with the coefficients and R^2 statistics implied by a fist-order VAR model. As in previous studies, I find that for the CRSP d-p ratio the coefficient estimates and R^2 rise with increasing horizon. The explained variation of 5-year returns is up to 37.9% (OLS) for the post-war sample. Slope coefficient estimates and R^2 values from OLS and those implied by the VAR model are quite similar, so results are unlikely to be driven by spurious inference from overlapping return data (see also Lettau and Ludvigson, 2010).

We now turn to the comparison of the CRSP d-p ratio with the all-domestic-equity d-p ratio and the d-p ratio adjusted for composition changes. As for the one-year regressions reported in Table 2, the evidence for return predictability for multiple horizons is more pronounced. Both the magnitude of the slope coefficient $\beta^r(H)$ and the t-value are considerably larger throughout all horizons. For example, in the post-1945 sample the 5-year predictability regression for the all-domestic-equity d-p ratio yields a slope coefficient β^r of 0.75 with a t-value of 2.92, compared with a β^r of 0.43 with a t-value of 1.89 for the CRSP d-p ratio.

[8] See also Campbell and Shiller (1988), Campbell (1991), and Kandel and Stambaugh (1989) for further details on long-horizon statistics based on VAR models.

Moreover, the all-domestic-equity and adjusted d-p ratio are able to explain a larger variation in long-horizon returns. In the post-1945 sample period, the explained variation of 5-year returns is up to 56.6% for the all-domestic-equity d-p ratio and 49.1% for the adjusted d-p ratio compared with 37.9% for the unadjusted CRSP ratio (OLS estimates). The corresponding R^2s implied by the VAR model are 46.3% (all domestic equity), 44.2% (CRSP, adjusted) and 39.5% (unadjusted CRSP). Recall that the persistence of the all-domestic-equity d-p and adjusted d-p ratio is considerably lower than that of the CRSP d-p ratio (see Table 1). That is, possible spurious inference regarding the magnitude of the long-horizon R^2 in the OLS estimation would be reduced. Even though persistence is weaker, we observe a higher R^2 for these d-p ratios, supporting the notion that long-horizon returns are indeed more predictable. Also in the larger sample period (1926-2009) evidence of long-horizon predictability is more pronounced for the adjusted d-p ratio than for the common d-p ratio.

Overall, the all-domestic-equity and adjusted dividend-price ratio provide an improvement over the commonly used dividend-price ratio with respect to several issues. The ratios show no sign of structural breaks and are less persistent. The in-sample prediction results are considerably better and persist when small-sample bias adjustments are taken into account. For long-horizon predictions, the explained return variation is higher, even though persistence of the ratios is lower. Furthermore, the prediction relation is stable over time, and there is evidence of out-of-sample predictability.

6 Further analyses

Comparison with repurchase-adjusted ratios

Recent evidence shows that within traded firms, the payout policy has changed and shifted from dividends toward repurchases (e.g. Grullon and Michaely, 2002; Boudoukh et al., 2007). For this reason, Boudoukh et al. (2007) adjust the traditional d-p ratio for repurchases, which improves evidence of return predictability.

I compare the all-domestic-equity d-p ratio and the d-p ratio adjusted for composition changes to the repurchase adjusted ratios with respect to their ability to forecast market returns and excess returns in a "horse race".[9] Results can be found in the online appendix, Table A.1. Overall, there is no clear winner in this race. None of the variables can entirely drive out the other, and in the single forecasting regressions, there is no clear-cut winner in terms of higher explanatory power. I conclude that both repurchases and composition changes are important sources of shifts in the payout policy of publicly traded corporations, and both contribute to the non-stationarity of the dividend-price ratio.

Comparison of different earnings-price ratios

In Section 4.1, I provided evidence that the divergence between the d-p ratio of all corporations and publicly traded corporations is driven by differences in dividends. An alternative explanation for the divergence could be a systematic difference in the measurement of the total market capitalization. For example, perhaps there is a mis-measurement in the total market value of all domestic equity. An overly conservative estimate of the market value of closely held firms would reduce the all-domestic-equity d-p ratio and explain the observed pattern. Because the true market value of all (publicly and closely held) equity is unknown, it is not possible to rule out this alternative explanation entirely. However, we can relate the total market value to other firm fundamentals and determine if there is a divergence, similar to that observed for the d-p ratio. Thus, I compare the log earnings-price ratio (e-p) of all domestic equity against that of the CRSP-Compustat merged sample and, as an additional robustness check, against that of the S&P Composite. A diver-

[9]I thank Michael Roberts for providing the payout data on his website. As advocated by Koijen and Van Nieuwerburgh (2011) and to make results comparable, I also use the zero-reinvestment of dividends for the repurchases-adjusted series.

gence of the overall e-p ratio and the e-p ratios of publicly traded firms would indicate that the overall market value is systematically under- or overestimated. When comparing these figures one has to bear in mind that earnings aggregates of the all domestic equity (NIPA) are not entirely comparable to the e-p ratio of the S&P and CRSP-Compustat merged sample due to different accounting standards. Nevertheless, we do not observe such a divergence for the e-p ratio in the later part of the sample. The relationship of earnings to market value is similar for traded firms and the overall population of all firms, whereas the relationship of dividends to market value differs. This suggests that differences in dividends and not in market value are the main driver for the divergence of the two dividend-price ratios. The results can be found in the online appendix, Figure A.3.[10]

The impact of NASDAQ on the dividend-price ratio

Figure 2 shows that the steady state of the d-p ratio changed in the course of time with entering and exiting firms. To what degree can this change be ascribed to the introduction of NASDAQ? To answer this question, I re-run the analysis described in Section 4.1, excluding all firms listed on NASDAQ.

With the inclusion of NASDAQ data in the CRSP database in 1972, a strong decline occurred in the d-p steady state. Furthermore, the overall CRSP sample's d-p steady state declines at a faster rate than that of the sample without NASDAQ, indicating that firms with systematically lower d-p ratios preferably chose NASDAQ when going public. However, the overall decline in the d-p steady state cannot be explained by NASDAQ alone. These findings are consistent with prior literature. Fama and French (2001) also document that the lower number of dividend-paying firms is not concentrated

[10] There is a slight divergence in the e-p ratios in the early years of the sample, which corresponds to the divergence in d-p ratios in these years, indicating that the market value of all domestic corporations might be underestimated in the early years of the Flow of Funds Accounts statistic. However, from the mid-1950s onward there is no considerable divergence of the series.

to NASDAQ but also is the case for AMEX and NYSE. As part of their analysis, Koijen and Van Nieuwerburgh (2011) exclude NASDAQ firms from the sample, which improves the return predictability results slightly, but the structural break problem remains as documented by Lettau and Van Nieuwerburgh (2008). Thus, the composition changes of publicly traded corporations are partly driven by the introduction of NASDAQ, but not entirely. Figure A.4 in the online appendix shows the results of this analysis.

7 Concluding remarks

This paper compares the all-domestic-equity dividend-price ratio, consisting of publicly traded and privately held firms, against the dividend-price ratio of publicly traded firms. Although the two d-p ratios follow each other closely from 1945 until about 1970, they substantially diverge afterward. I provide evidence that this divergence can be explained by the systematic composition changes of publicly traded firms. I adjust the dividend-price ratio for composition changes and, in the following, use this adjusted d-p ratio and the all-domestic-equity d-p ratio as predictors for stock market returns.

These variables provide improvements on several issues. The all-domestic-equity and adjusted d-p ratios are less persistent. In-sample evidence for return predictability is strengthened and is also present after correcting estimates for small-sample bias. Moreover, the forecasting relation remains stable over time, even during the 1990s, and there is evidence for out-of-sample predictability.

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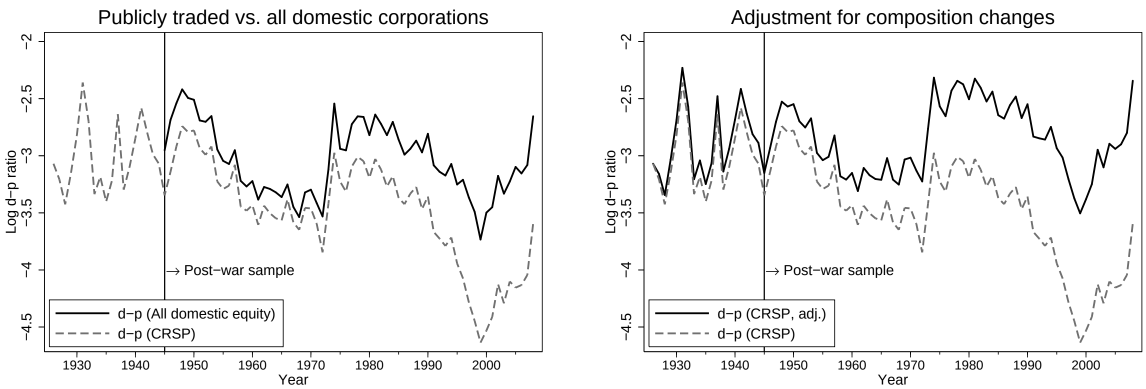


Figure 1:
Comparison of dividend-price ratios

The left-hand graph shows the log dividend-price ratio (d-p) of all publicly traded corporations, i.e. traded on NYSE, NASDAQ or AMEX (CRSP), and the d-p ratio all domestic corporations. The right-hand graph displays the CRSP d-p ratio and the d-p ratio adjusted for composition changes. The sample period is 1926-2008. Data for the all-domestic-equity d-p ratio are available from 1945 onwards.

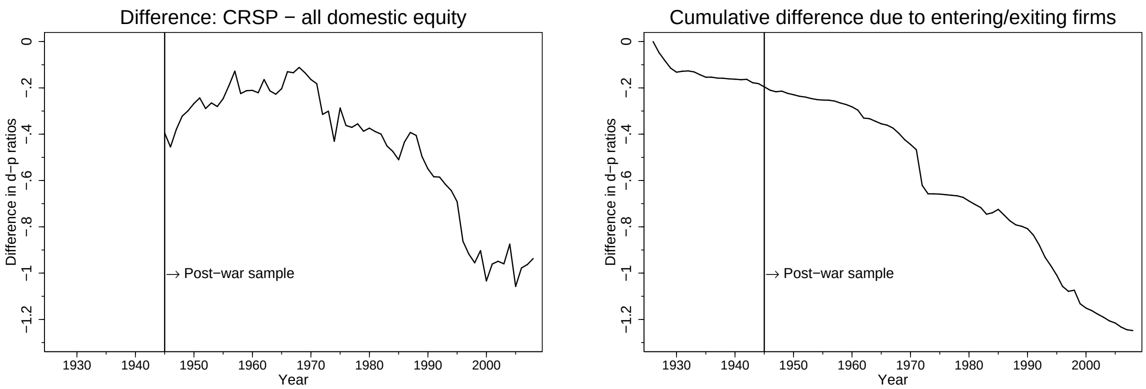


Figure 2:
Differences in dividend-price ratios and adjustment for composition changes
The left-hand graph displays the difference between the all-domestic-equity d-p ratio and the CRSP d-p ratio. The right-hand graph displays the cumulative difference in d-p ratio that is due to entering or exiting firms in the CRSP database. The sample period is 1926-2008. Data for the all-domestic-equity d-p ratio are available from 1945 onwards.

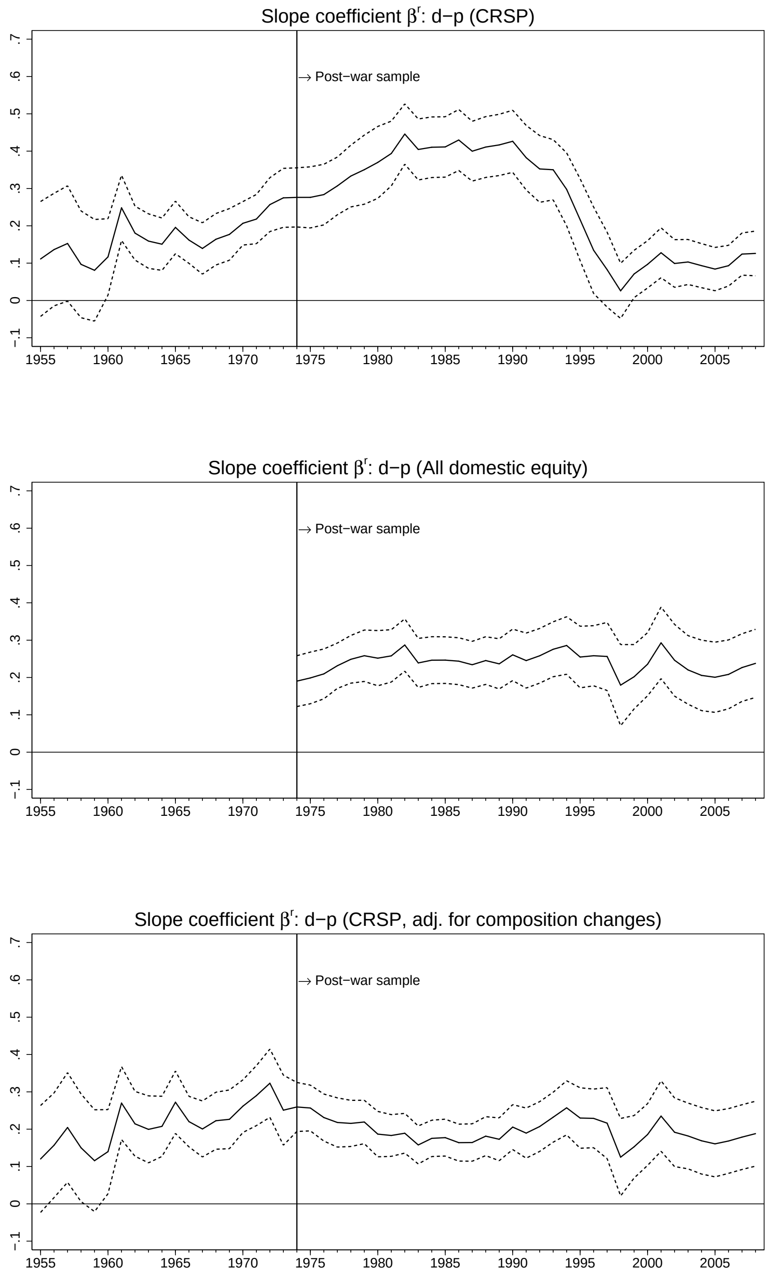


Figure 3:
Rolling regression: parameter stability comparison
This figure displays the results of a 30-year rolling regression of future log market return on the present log dividend-price ratio: $r_{t+1} = \alpha^r + \beta^r dp_t + \varepsilon^r_{t+1}$. The top graph shows the CRSP d-p ratio, the middle graph the all-domestic-equity d-p ratio, and the bottom graph the CRSP d-p ratio adjusted for composition changes. The graphs plot the estimate of the slope coefficient β^r (solid line) plus/minus one standard deviation (dotted lines). Standard errors are calculated by Newey-West using one lag.

Table 1:
Summary statistics

This table provides descriptive statistics for the three different dividend-price ratios: d-p (CRSP) is the dividend-price ratio of all corporations traded on NYSE, NASDAQ and AMEX based on the CRSP database; d-p (All domestic equity) covers all corporations, i.e. publicly traded and privately held, available from 1945; d-p (CRSP, adj.) is the CRSP d-p ratio adjusted for composition changes in publicly traded corporations. The table reports mean, standard deviation, first and second order auto-correlations, the augmented Dickey-Fuller (ADF) test and its p-value.

	Mean	S.D.	AC(1)	AC(2)	ADF	p-val.
Sample period: 1945-2008						
d-p (CRSP)	-3.50	0.46	0.92	0.84	-1.74	(0.410)
d-p (All domestic equity)	-3.04	0.31	0.82	0.70	-2.17	(0.216)
d-p (CRSP, adj.)	-2.86	0.31	0.81	0.67	-2.11	(0.240)
Sample period: 1926-2008						
d-p (CRSP)	-3.39	0.47	0.88	0.77	-2.25	(0.187)
d-p (CRSP, adj.)	-2.86	0.31	0.71	0.49	-3.35	(0.013)

Table 2:
Predictive regressions

This table reports the OLS estimation results for the following predictive regressions using the dividend-price ratio dp_t:

$$\begin{aligned} r_{t+1} &= \alpha^r + \beta^r dp_t + \varepsilon^r_{t+1} \\ \Delta d_{t+1} &= \alpha^d + \beta^d dp_t + \varepsilon^d_{t+1}, \end{aligned}$$

where r_{t+1} is either log market return or log market excess return (Panel A) and Δd_{t+1} log dividend growth (Panel B). It displays the estimate of the slope coefficient β, t-statistics (based on Newey-West standard errors using one lag), and the regression R^2 in percentage terms. Furthermore, the table reports the p-value for the one-sided test of $\beta^r = 0$ versus $\beta^r > 0$ (Panel A) and $\beta^d = 0$ versus $\beta^d < 0$ (Panel B).

Panel A: Return predictability

Sample period: 1945-2009

	Return_{t+1}				$\text{Excess Return}_{t+1}$			
	β^r	t-val.	p-val.	R^2	β^r	t-val.	p-val.	R^2
d-p_t (CRSP)	0.12	2.54	(0.007)	10.84	0.12	2.45	(0.009)	9.63
d-p_t (All domestic equity)	0.21	3.80	(<0.001)	14.39	0.20	3.69	(<0.001)	13.22
d-p_t (CRSP, adj.)	0.20	4.13	(<0.001)	12.75	0.16	3.07	(0.002)	8.32

Sample period: 1926-2009

	Return_{t+1}				$\text{Excess Return}_{t+1}$			
	β^r	t-val.	p-val.	R^2	β^r	t-val.	p-val.	R^2
d-p_t (CRSP)	0.07	1.38	(0.086)	3.02	0.08	1.60	(0.056)	3.88
d-p_t (CRSP, adj.)	0.16	2.96	(0.002)	6.36	0.14	2.47	(0.008)	4.60

Table 2 – Continued.

Panel B: Dividend growth predictability

Sample period: 1945-2009

	Dividend growth$_{t+1}$			
	β^d	t-val.	p-val.	R^2
d-p$_t$ (CRSP)	0.02	0.99	(0.837)	1.85
d-p$_t$ (All domestic equity)	0.01	0.46	(0.676)	0.45
d-p$_t$ (CRSP, adj.)	-0.02	-0.56	(0.290)	0.70

Sample period: 1926-2009

	Dividend growth$_{t+1}$			
	β^d	t-val.	p-val.	R^2
d-p$_t$ (CRSP)	-0.06	-1.29	(0.101)	5.68
d-p$_t$ (CRSP, adj.)	-0.16	-2.31	(0.012)	14.85

Table 3:
Return predictability regressions: small sample bias adjustment

This table repeats the return predictability analysis of Table 2, Panel A, using the Stambaugh (1999) small sample bias adjustment for coefficient estimates. The estimated forecasting model is:

$$\begin{aligned} r_{t+1} &= \alpha^r + \beta^r dp_t + \varepsilon^r_{t+1} \\ dp_{t+1} &= \theta + \phi dp_t + \eta_{t+1}, \end{aligned}$$

where r_{t+1} is either log market return or market excess return and dp_t is the log dividend-price ratio. The table reports the β-coefficient adjusted for small sample bias and the p-value for the test of $\beta^r = 0$ versus $\beta^r > 0$, obtained from bootstrapped distributions. The table also shows the estimate of the autoregressive parameter ϕ of the d-p ratio and the correlation ρ of the innovations ε^r_{t+1} and η_{t+1}.

Sample period: 1945-2009

	Return$_{t+1}$				Excess Return$_{t+1}$			
	β^r	p-val.	ϕ	ρ	β^r	p-val.	ϕ	ρ
d-p$_t$ (CRSP)	0.07	(0.174)	0.92	-0.91	0.06	(0.192)	0.92	-0.90
d-p$_t$ (All domestic equity)	0.16	(0.045)	0.84	-0.89	0.16	(0.051)	0.84	-0.89
d-p$_t$ (CRSP, adj.)	0.15	(0.055)	0.84	-0.91	0.12	(0.097)	0.84	-0.90

Sample period: 1926-2009

	Return$_{t+1}$				Excess Return$_{t+1}$			
	β^r	p-val.	ϕ	ρ	β^r	p-val.	ϕ	ρ
d-p$_t$ (CRSP)	0.04	(0.215)	0.88	-0.84	0.05	(0.172)	0.88	-0.84
d-p$_t$ (CRSP, adj.)	0.13	(0.051)	0.74	-0.84	0.11	(0.084)	0.74	-0.84

Table 4:
Out-of-sample predictability comparison

This table displays the out-of-sample predictability comparison for market return and excess return. The table shows the out-of-sample mean absolute prediction error (MAE) and the root mean squared error (RMSE) in percentage terms for a simple random walk model and regression models using different d-p ratios. The out-of-sample R^2 of regression model i is computed as $R^2_{OS,i} = 1 - MSE_i/MSE_{rw}$, where MSE_{rw} is the mean squared error of the random walk model. Furthermore, the table shows the MSE-F statistic along with bootstrapped p-values, testing for equal out-of-sample MSEs of the random walk model and the respective regression model.

	MAE	RMSE	R^2_{OS}	MSE-F	p-val.
Sample period: 1945-2009, out-of-sample period: 1965-2009					
	Return_{t+1}				
Random walk	14.21	17.85	-	-	-
d-p (CRSP)	14.71	17.68	1.93	0.89	(0.094)
d-p (All domestic equity)	13.14	16.62	13.36	6.94	(0.003)
d-p (CRSP, adj)	13.27	16.84	10.97	5.55	(0.004)
	$\text{Excess Return}_{t+1}$				
Random walk	14.90	19.22	-	-	-
d-p (CRSP)	15.65	18.95	2.73	1.26	(0.077)
d-p (All domestic equity)	14.32	18.22	10.06	5.03	(0.008)
d-p (CRSP, adj)	14.32	18.71	5.14	2.44	(0.027)
Sample period: 1926-2009, out-of-sample period: 1946-2009					
	Return_{t+1}				
Random walk	13.64	17.06	-	-	-
d-p (CRSP)	14.01	16.91	1.85	1.20	(0.061)
d-p (CRSP, adj)	12.92	16.20	9.85	6.99	(0.002)
	$\text{Excess Return}_{t+1}$				
Random walk	14.16	18.16	-	-	-
d-p (CRSP)	14.65	17.88	3.13	2.07	(0.038)
d-p (CRSP, adj)	13.62	17.60	6.12	4.17	(0.008)

Table 5:
Long-horizon predictability

This table displays the results of the long-horizon predictability regressions:

$$r_{t,t+H} = \alpha^r(H) + \beta^r(H)dp_t + \varepsilon^r_{t,t+H},$$

where $r_{t,t+H}$ is the H-year continuously compounded log return over the time period t until $t+H$. The table first reports the OLS estimate of the slope coefficient $\beta^r(H)$, its t-value based on Hodrick (1992) standard errors, and the regression R^2 in percentage terms. The table also shows the slope coefficient $\beta^r(H)$ and R^2 implied by a vector autoregressive model (VAR) of order one.

Sample: 1945-2009

			Horizon H in years				
			1	2	3	4	5
d-p (CRSP)	β^r	(OLS)	0.12	0.23	0.29	0.34	0.43
	t-val.	(OLS)	2.56	2.48	2.09	1.88	1.89
	R^2	(OLS)	[10.01]	[20.67]	[27.06]	[31.84]	[37.91]
	β^r	(VAR)	0.12	0.22	0.32	0.41	0.50
	R^2	(VAR)	[10.41]	[19.22]	[26.95]	[33.66]	[39.46]
d-p (All domestic equity)	β^r	(OLS)	0.21	0.39	0.50	0.60	0.75
	t-val.	(OLS)	4.02	3.72	3.19	2.91	2.92
	R^2	(OLS)	[14.39]	[27.38]	[37.58]	[46.20]	[56.59]
	β^r	(VAR)	0.20	0.37	0.51	0.64	0.75
	R^2	(VAR)	[14.27]	[25.31]	[34.11]	[41.00]	[46.30]
d-p (CRSP, adj.)	β^r	(OLS)	0.20	0.38	0.49	0.57	0.70
	t-val.	(OLS)	3.95	3.83	3.25	2.91	2.99
	R^2	(OLS)	[13.24]	[25.52]	[35.85]	[41.16]	[49.19]
	β^r	(VAR)	0.19	0.35	0.50	0.62	0.72
	R^2	(VAR)	[13.11]	[23.61]	[32.09]	[38.87]	[44.21]

Table 5 – Continued.

Sample: 1926-2009

			Horizon H in years				
			1	2	3	4	5
d-p (CRSP)	β^r	(OLS)	0.07	0.17	0.22	0.26	0.31
	t-val.	(OLS)	1.52	1.84	1.66	1.54	1.45
	R^2	(OLS)	[3.02]	[7.55]	[8.97]	[10.45]	[12.37]
	β^r	(VAR)	0.08	0.17	0.26	0.34	0.42
	R^2	(VAR)	[5.67]	[9.04]	[12.46]	[15.65]	[18.53]
d-p (CRSP, adj.)	β^r	(OLS)	0.16	0.40	0.58	0.73	0.84
	t-val.	(OLS)	2.88	3.58	3.70	3.72	3.94
	R^2	(OLS)	[6.36]	[17.16]	[27.23]	[35.65]	[42.11]
	β^r	(VAR)	0.15	0.33	0.49	0.62	0.73
	R^2	(VAR)	[9.47]	[15.59]	[20.72]	[24.65]	[27.52]

A Data appendix

All domestic equity

The log dividend-price ratio of all domestic equity is calculated by dividing the sum of all dividends paid by domestic corporations (D^{all}) by the total market value (MV^{all}) of all domestic corporations and taking the natural logarithm. Dividend data are from the National Income and Product Accounts (NIPA), whereas market value data are from the Flow of Funds Accounts (FFA). D^{all} are dividends paid by domestic corporations adjusted for capital gains passed through by mutual funds and mutual funds' interest payments: D^{all} = (NIPA, Table 7.16, line 30) + (NIPA, Table 7.16, line 31) + (NIPA, Table 7.16, line 35). Total market value (MV^{all}) represents all domestic corporate equity issues (total - foreign): MV^{all} = (FFA, FL893064105) - (FFA, FL263164103).

Publicly listed corporations, CRSP:

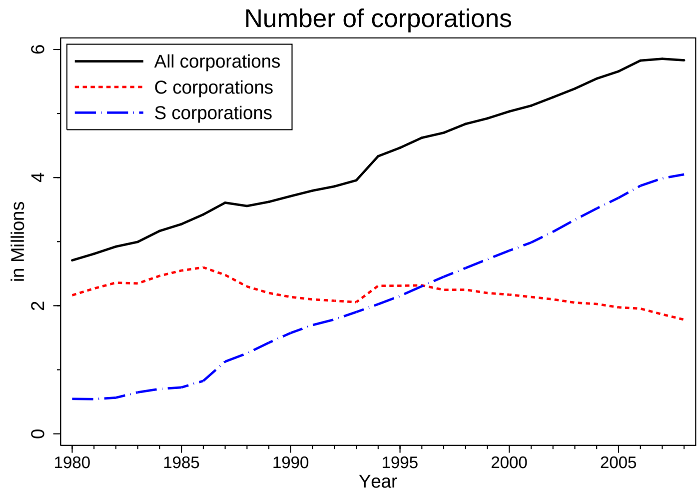
I consider ordinary common stock (share code 10 and 11) for the construction of the CRSP dividend-price ratios, such that: $R_t = (D_t + P_t)/P_{t-1}$ is the value-weighted return of common stock including dividends, and $Rx_t = P_t/P_{t-1}$ the value-weighted return excluding dividends. I compute for each month the level of dividends implied by the return, including and excluding dividends: $D_t = (R_t - Rx_t)MV_{t-1}$. The dividends are then aggregated over the year by summing up monthly dividends. Annual log dividend growth is calculated as $\Delta d_t = \ln(D_t/D_{t-1})$. The log dividend-price ratio is calculated by dividing aggregate annual dividends by end-of-year market value: $dp_t = \ln(D_t/MV_t)$.

The annual log market return is the log return (including dividends) of the value-weighted portfolio of common stocks. The annual log market excess return is calculated by subtracting the log risk-free rate measured by the 90-day Treasury-Bill rate.

Online appendix accompanying

Changes in the composition of publicly traded firms: Implications for the dividend-price ratio and return predictability

- Figure A.1 shows trends in U.S. corporations. The upper panel provides the number of C and S corporations in the US from 1980-2008. The bottom panel provides the S corporations' share of net income and dividends (see pages 10-11)
- Figure A.2 shows the CRSP d-p ratio and the d-p ratio of all stocks continuously listed from 1945-2008 (see page 9, footnote 3).
- Figure A.3 compares the log earnings-price ratios of all domestic corporations to the merged CRSP-Compustat sample and the S&P Composite (see page 23).
- Figure A.4 shows the impact of entering/exiting firms on the d-p steady state for the entire CRSP sample vs. a sample where NASDAQ firms are excluded (see page 23).
- Table A.1 compares the all-domestic-equity and composition change-adjusted d-p ratio to the d-p ratio adjusted for repurchases, with regard to their ability to predict market and market excess returns (see page 21).



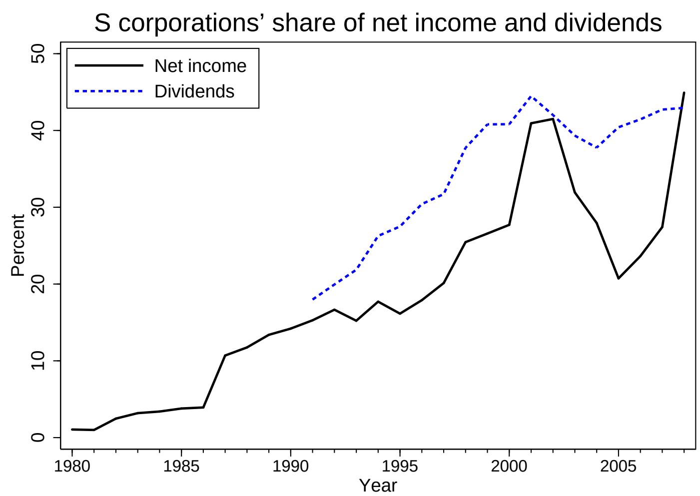


Figure A.1:
C and S corporations: Number of firms, net income and dividends

The top graph shows the total number of firms and the number of C and S corporations over time. The bottom graph displays the percentage of net income (less deficit) and dividends of S corporations relative to all domestic corporations. All corporations excludes Regulated Investment Companies (RICs). The sample period is 1980-2008, and dividend data are available from 1991 only. Data source: IRS/NIPA.

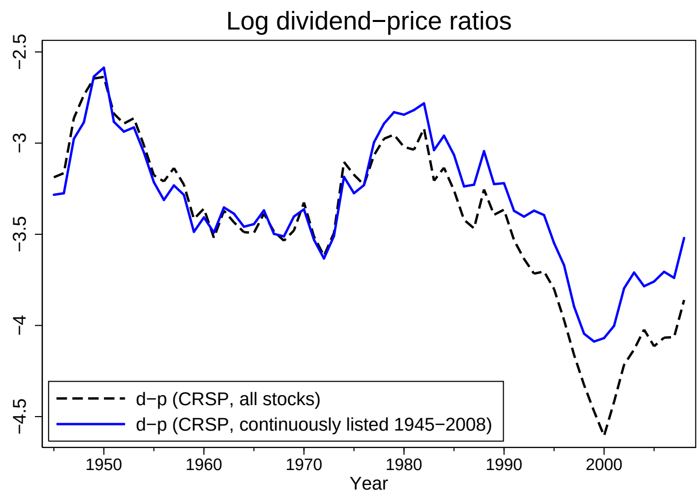


Figure A.2:
Comparison of dividend-price ratios: all stocks vs. continuously listed stocks
This figure displays the log dividend-price ratio of all stocks in the CRSP sample to the dividend-price ratio of all stocks that were continuously listed in the sample period 1945-2008.

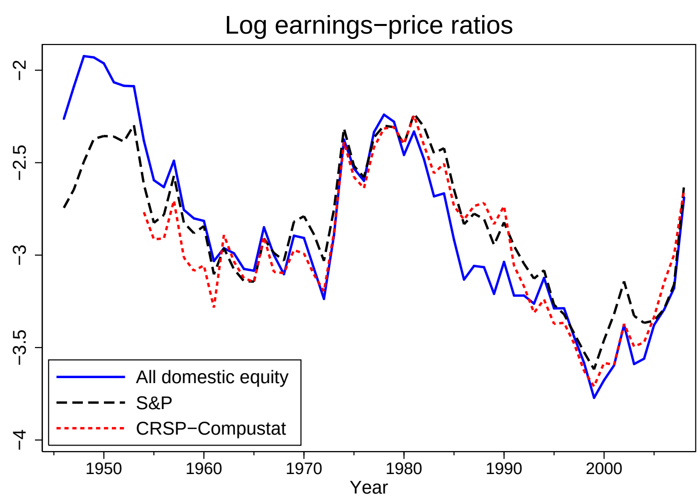


Figure A.3:
Comparison of earnings-price ratios
This figure shows the log earnings-price ratio (e-p) of the all domestic equity, S&P Composite, and CRSP-Compustat merged data set over time. Earnings are smoothed by taking a 5-year moving average. The sample period is 1945-2008 (1954-2008 for CRSP-Compustat).

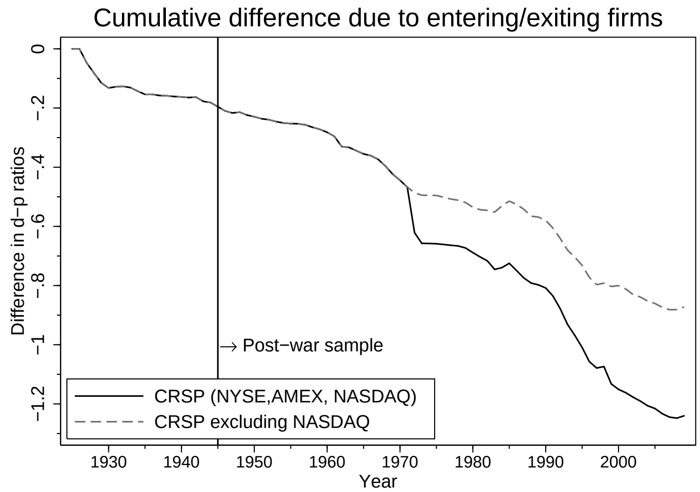


Figure A.4:
The impact of entering and exiting firms on the steady state of the d-p ratio
This figure displays the cumulative difference in d-p ratio that is due to entering or exiting firms (see right graph of Figure 2) for the entire CRSP sample (NYSE, AMEX and NASDAQ) and when NASDAQ firms are excluded. The sample period is 1926-2008.

Table A.1:
Forecast comparison with repurchase-adjusted dividend-price ratios

This table compares the forecasting performance of the all-domestic-equity dividend-price ratio and composition-adjusted d-p ratio to the d-p ratio adjusted for repurchases (for details, see Boudoukh et al., 2007). [CF] is the cash flow-based measure, and [TS] is the Treasury stock-based measure of repurchases. The table shows slope coefficient estimates, Newey-West t-statistics (using one lag) in parentheses, and the adjusted R^2 in percentage terms for each regression. Panel A provides the results for returns, Panel B the results for excess returns.

Panel A: Return

Sample period: 1945-2003

	Return$_{t+1}$							
d-p$_t$ (all domestic equity)	0.20				0.06	0.16		
	(3.55)				(0.33)	(1.03)		
d-p$_t$ (CRSP, adj)		0.20					0.09	0.13
		(4.03)					(0.71)	(1.54)
d-p$_t$ (repurch. adj., CF)			0.21		0.15		0.13	
			(3.76)		(0.80)		(0.98)	
d-p$_t$ (repurch. adj., TS)				0.18		0.04		0.08
				(2.86)		(0.24)		(0.75)
Adj. R^2	15.0	14.9	15.7	13.4	14.4	13.6	14.9	14.4

Sample period: 1926-2003

	Return$_{t+1}$							
d-p$_t$ (CRSP, adj)		0.17					0.17	0.17
		(2.87)					(1.20)	(1.65)
d-p$_t$ (repurch. adj., CF)			0.13				-0.00	
			(1.78)				(-0.03)	
d-p$_t$ (repurch. adj., TS)				0.10				-0.01
				(1.47)				(-0.05)
Adj. R^2		5.7	3.6	2.5			4.4	4.4

Table A.1 – Continued

Panel B: Excess Return

Sample period: 1945-2003

	Excess return$_{t+1}$							
d-p$_t$ (all domestic equity)	0.19				0.13	0.15		
	(3.47)				(0.74)	(0.96)		
d-p$_t$ (CRSP, adj)		0.16					-0.04	0.03
		(2.95)					(-0.29)	(0.35)
d-p$_t$ (repurch. adj., CF)			0.20		0.07		0.23	
			(3.44)		(0.39)		(1.59)	
d-p$_t$ (repurch. adj., TS)				0.17		0.04		0.15
				(2.82)		(0.26)		(1.36)
Adj. R^2	13.2	8.5	12.7	11.9	11.8	11.7	11.2	10.4

Sample period: 1926-2003

	Excess return$_{t+1}$							
d-p$_t$ (CRSP, adj)		0.14					0.04	0.07
		(2.36)					(0.31)	(0.68)
d-p$_t$ (repurch. adj., CF)			0.14				0.11	
			(1.97)				(0.65)	
d-p$_t$ (repurch. adj., TS)				0.12				0.07
				(1.75)				(0.64)
Adj. R^2		3.5	4.3	3.8			3.1	3.1

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