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# PREDICTABILITY OF RETURNS WITH BUYBACK CASH FLOWS

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## ABSTRACT

*This article re-evaluates return and cash flow predictability, extending beyond dividends to include repurchases and issuances cash flows. Employing total distribution in the Campbell-Schiller decomposition, I examine how prices respond to discount rate and cash flow growth changes. Contrary to conventional wisdom, the results indicate that while dividend yield predicts returns, distribution yield, encompassing all distributions, emerges as a more effective predictor of future cash flows. This challenge established literature, emphasising the significance of considering all cash flow components in asset pricing analyses.*

**Keywords:** Cash flow, Return predictability, Dividend, Buyback, Issuances

## INTRODUCTION

The dividend-price ratio's role in predicting expected excess returns, while showing no direct correspondence with future cash flows, is well-documented in financial literature. This disconnects stems primarily from two factors. Firstly, the variation in expected cash flows tends to be idiosyncratic, whereas the variation in expected returns is more systematic. Secondly, the persistence of the dividend-price ratio provides robust long-term price signals. Historically, dividends were the main source of cash flow until around 1980; however, the significance of the

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dividend-price ratio has markedly diminished over the past few decades, declining from approximately 0.05 in 1980 to about 0.02 in recent years. It suggests that the predictive power of this ratio may weaken as its proportional contribution to total cash flows decreases.

The declining trend in the dividend-price ratio does not necessarily reflect a diminishing role of cash flows in future financial outcomes but rather indicates a rise in alternative sources of cash flows. Notably, in the last decade, cash flows from repurchases have begun to exceed those from dividends. This observation challenges the traditional view that the dividend-price ratio lacks predictive power for future cash flows, especially when considering that it now represents only a fraction of total distributions. The implications become more evident with firms that distribute all their cash flows through buybacks, highlighting the need to reassess the predictive utility of the dividend-price ratio under these evolving financial dynamics.

These developments raise several critical questions: How does the inclusion of all cash flows—dividends and non-dividend sources alike—affect predictability outcomes? Do non-dividend cash flows, such as repurchases and issuances, convey the same future signals as dividends? If these non-dividend sources provide similar forecasts, we might expect the total distributions to continue predicting returns but not cash flows. However, if investors interpret signals from non-dividend cash flows differently, it could alter the existing predictability models. Moreover, the impact of the potentially lower persistence of repurchases and issuances compared to dividends on the predictability in both long and short terms warrants investigation.

To delve deeper into these issues, I explore the extensive body of literature that has been segmented into various branches pertinent to this study. Figure 1 illustrates the progression through the literature, from general concepts of return predictability to specific discussions on the impact of distribution types.

To frame my discussion, I revisits the concept of return predictability. Initially, the prevailing belief was that returns were not predictable and that expected returns were constant over time. This view has evolved as subsequent research identified various predictive variables, leading to a more nuanced understanding. For clarity and relevance to this paper, I categorises these variables into two distinct groups: "Dividends" and "Non-dividend" variables.

There is substantial evidence suggesting that stock returns can be predicted by variables primarily related to macroeconomic factors. For instance, Fama and Schwert (1977) tested various assets to determine which could serve as hedges against inflation. They concluded that the stock market exhibits a negative correlation with inflation. Extending these findings, Fama (1981) introduced additional real economy variables into the analysis, arguing that the negative correlation arises due to inflation's adverse relationship with real economic growth. Similarly, T. S. Campbell and Glenn (1984) utilised interest rates on the U.S. government securities to predict returns, while Keim and Stambaugh (1986) employed price variables, and French et al. (1987) investigated how the volatility of stock returns could predict future returns.

Fama and French (1988) focused on mean reversion and the presence of a decaying price component, finding that portfolio returns over periods longer than a year exhibit significant negative autocorrelation. They demonstrated that, under certain assumptions about the nature of the price process, these autocorrelations imply that time-varying expected returns account for 25%–40% of the variance in three- to five-year returns. Using variance-ratio tests, Poterba and Summers (1987) also found that long-horizon stock returns contain substantial predictable components. These improvements in understanding the predictability of returns opened the door to exploring other variables, with dividend yield becoming a central focus. The relationship between dividend-related variables and overall asset pricing has a lengthy history. Although Miller and Modigliani (1961) were not the first to examine this connection, their dividend irrelevance theorem lays the groundwork for understanding the link between dividends and asset pricing. According to their theorem, under certain conditions such as market completeness, dividends and the patterns of their payment streams play no role in determining equity price levels or equity returns. However, the questionable assumptions made and the lack of a strong connection between dividend yield and the fundamentals of asset pricing in their theory prompted further exploration into how dividend yield could influence asset pricing. To delve deeper into the literature, this topic can be divided into two streams: "Cross section" and "Time series," with a particular focus on the latter, which is more relevant to this study.

Unlike Miller and Modigliani's (1961) dividend irrelevance theorem, subsequent research has indicated that factors such as tax heterogeneity, agency issues, and information asymmetry can significantly influence the effect of dividend policy on asset pricing across firms. For example, Allen et al. (2000) discovered that dividends tend to induce "ownership clientele" effects; firms that pay dividends attract more institutional investors, especially when these investors are taxed less than individual investors. Other notable studies in this cross-sectional stream include those by Litzenberger and Ramaswamy (1979), Jensen (1986), John and Williams (1985), and Grullon et al. (2002).

In the time-series aspect of dividend policy research, the argument centres on how the current level of dividends or dividend yield influences subsequent period returns. This paper focuses on two primary theoretical models within this stream: the "consumption-based" and "Gordon growth" models. According to consumption-based models, firm dividends covary with aggregate consumption; the covariance of consumption is thought to drive marginal utility, which in turn influences expected returns. Pioneering studies in this area include those by Lucas Jr (1978) and Shiller (1981). More recently, Foroughfard (2023) find that buyback cash flows exhibit significantly higher co-variation with consumption growth, making them riskier for investors who seek to smooth their consumption.

The Gordon growth model suggests that dividend yield represents the discount rate minus the dividend growth rate. This model forms the basis of many studies that examine the predictability of returns based on dividend yield, primarily exploring how dividend yield correlates with returns and dividend growth.

Over time, the literature has evolved significantly. Initially, numerous studies affirmed the impact of dividend yield on returns. However, as research progressed, many scholars began to question this relationship, with a third wave of researchers providing new insights that either refuted or significantly modified previous findings.

Fama and French (1988) were among the early researchers highlighting the positive impact of dividend yield on returns, adding statistical evidence that predictable components of returns account for a significant portion of the variance in long-horizon returns. Their analysis suggested that regressions of returns on dividend-price ratios could explain more than 25% of the variance in returns spanning two to four years. This finding was supported by later works, such as those by J. Y. Campbell and Shiller (1988), Hodrick (1992), and Cochrane (1998). In contrast, Charest (1978) and Benartzi et al. (1997) found limited support for the notion that dividends predict future earnings, although they noted that firms increasing dividends typically experienced significant positive excess returns in subsequent years.

In conclusion, while the literature offers diverse perspectives on the predictability of returns based on dividend policies, it clearly indicates a complex interaction between dividends and broader economic factors that merits continued exploration.

Cochrane's studies in 2008 and 2011 bolster the evidence supporting the predictability of returns based on dividend yields. Utilising simple regression models and the Campbell-Shiller decomposition, Cochrane examines the influence of dividend yields on future returns and dividend growth. His time-series regressions reveal that dividend yield not only significantly explains future returns but also shows that its explanatory power increases with the time horizon. Specifically, his analyses demonstrate that most variations in dividend yield correlate strongly with returns rather than with dividend growth.

Publication of these findings, several researchers, particularly those focusing on shorter forecasting horizons (less than a few years), have argued against the predictive power of the log dividend-price ratio for returns. Notable studies expressing this skepticism include those by Nelson and Kim (1993), Stambaugh (1999), Ang and Bekaert (2002), Valkanov (2003), and Goyal and Welch (2003). These studies suggest that a meticulous statistical analysis provides scant evidence supporting the predictive utility of dividend-price ratios over these shorter periods.

Ludvigson et al. (2002) address changes in the time-series processes of dividends themselves, noting that increasing persistence of dividend-price ratios contributes significantly to their failure in predicting equity premia over shorter horizons. They contend that Cochrane's 1997 accounting identity—which posits that dividend ratios must predict long-run dividend growth or stock returns—holds true empirically only for periods longer than 5 to 10 years. For shorter durations, dividend yields tend to predict their own future values more than anything else.

The literature extensively documents the challenges associated with predicting dividend growth using dividend-price ratios, especially over extended horizons. Key contributions to this discussion by Cochrane (1991), and subsequent works in 1994, 1997 and 2001 by Cochrane, underscore the limited predictability of dividend growth from dividend-price ratios even as they affirm the ratios' utility in forecasting returns over longer durations.

Researchers have explored various facets of the decline in the predictability of returns, each proposing modifications to traditional models. Lettau and Van Nieuwerburgh (2008), for example, argue that relaxing the assumption of a fixed steady-state mean in the economy allows dividend yield to still significantly predict returns. They find strong empirical evidence supporting shifts in the steady state, which weakens the explanatory power of dividend yield on returns.

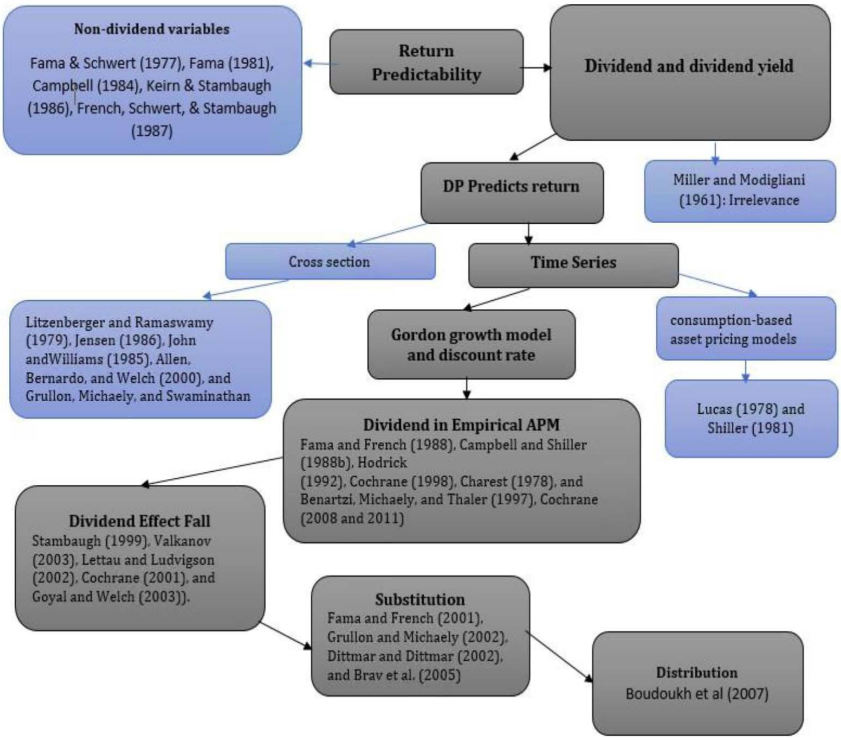


*Figure 1:* The chronological development of research on the predictability of stock returns.

*Notes*: This figure traces the evolution of stock return predictability research, from early foundational studies to recent advanced models and diverse predictors. Key shifts in theory and methodology highlight significant studies, showing how contemporary insights build on extensive prior work.

Kelly and Pruitt (2013) revitalise the concept of return predictability by introducing a model that links aggregate market expectations to disaggregated valuation ratios within a latent factor system. Their findings suggest that when disaggregated dividend yields are optimally integrated into forecasts, they significantly enhance out-of-sample return predictability. Foroughfard (2023) find that the ratio of net buybacks to dividends serves as a proxy for cash flow cyclicality due to the flexibility of buyback cash flows.

Lettau and Ludvigson (2001) discover that excess stock returns are forecastable over horizons where the dividend-price ratio exhibits comparatively weak forecasting power, typically at business cycle frequencies. They demonstrate that such predictable variations in returns are not indicated by the slow-moving dividend-price ratio but rather by an empirical proxy for the log consumption-wealth ratio, denoted by $cay_t$; a variable capturing deviation from the common trend in consumption, asset wealth and labour income.

The possibility of a substitution in payout policy has also re-emphasised the impact of dividend yield on returns. Evidence indicates that repurchases have increasingly substituted for dividend payments. According to Fama and French (2001), the proportion of firms paying cash dividends significantly declined from 1978 to 1999, with firms across all characteristics becoming less likely to pay dividends. Grullon and Michaely (2002) show that repurchases have become the preferred form of initial payout, with firms gradually substituting dividends for repurchases. Dittmar (2002) find that repurchases increase with both permanent and transitory earnings, whereas dividends are only related to permanent shifts in earnings, thus positioning repurchases as a substitute for dividends. Brav et al. (2005) note that many managers favour repurchases due to their flexibility compared to dividends, and because they can potentially be used to time the equity market or to enhance earnings per share.

Following the acceptance and development of the substitution effect, some researchers have attempted to replace dividend yield with payout yield, which incorporates net repurchases alongside dividends. They discovered that payout yield continues to predict future returns, suggesting that the loss of predictive power of the dividend yield was due to mismeasurement. Boudoukh et al. (2007) find statistically and economically significant return predictability in the time series when payout (dividends plus repurchases) and net payout (dividends plus repurchases minus issuance) yields are employed instead of the dividend yield. They confirm that returns are still predictable, although they do not speculate about cash flow predictability.

More recently, Eaton and Paye (2017) compare the stock return forecasting performance of alternative payout yields. They find that the net payout yield produces more accurate forecasts relative to alternatives, including the traditional dividend yield. Pettenuzzo et al. (2023) put daily CRSP (Centre for Research in Security Prices) data into a Bayesian persistent temporary-jump component model for dividend growth and find the persistent component forecasts future dividend growth. De La O and Myers (2021) use analyst expectations to argue that short-run dividend-growth expectations are the most important driver of the price-dividend ratio, perhaps due to biased subjective expectations. Chen et al. (2013) use analyst-forecast data, and Golez (2014) extracts dividend-growth expectations from the S&P 500 using options prices, 10 and both find dividend-growth news an important driver of prices. Foroughfard (2023) focuses on the flexibility of buybacks versus the persistence of dividends and finds that firms dominated by buybacks are riskier because their cash flows are distributed during favourable economic periods.

This article aims to advance the discourse by recognising non-dividend distributions as another source of cash flow and by investigating return and cash flow predictability together. By doing so, it seeks to interpret non-dividend cash flow signals and compare them with dividend signals. An advantage of this study is that the trend in repurchases can serve as an experimental lab for predictability analysis. Previously, dividends were the sole source of cash flow; however, after 1980, repurchases became the dominant source. This shift allows me to capture the trend and study the behaviour of different cash flows.

## DATA DESCRIPTION

The data utilised for analysing return predictability are sourced from the Centre for Research in Security Prices (CRSP) and COMPUSTAT databases. This section details the data, variable constructions and summaries statistics.

Repurchase captures all cash flows generated from any repurchase activity and is defined as the total expenditure on the purchase of common and preferred stocks (Compustat item 115) plus any reduction in the value of the net number of preferred stocks outstanding (Compustat item 56). These data are available from the statement of cash flows from 1971. I examine a measure of equity issuances defined as the sale of common and preferred stock (Compustat data item 108) minus any increase in the value of the net number of preferred stocks outstanding (Compustat item 56). These data are available from the statement of cash flows from 1971. All the data related to dividend and dividend yields follow the same approach as Cochrane (2011).

In cleaning the data, I follow the process explained in Boudoukh et al. (2007). Nonfinancial firms in the intersection of the CRSP return file and Compustat files form the core of my sample. I also require that each firm have a strictly positive value for book equity from Compustat for its fiscal year ending in calendar year $t – 1$. All fiscal year-end accounting variables in year $t – 1$ are merged with the monthly returns for July of year $t$ to June of year $t + 1$, ensuring that the accounting information is known prior to the returns that they are used to explain.

To compute the dividend yield, the methodology aligns with common practices in the literature, employing the annual value-weighted return series from CRSP, both including and excluding dividends. These series are defined by the following equations:

$$R_{t+1} = \frac{P_{t+1} + D_{t+1}}{P_t} \tag{1}$$

where $R_{t+1}$ represents the return including dividends, $P_{t+1}$ is the price at time $t+1$, and $D_{t+1}$ is the dividend paid at time $t + 1$.

$$RX_{t+1} = \frac{P_{t+1}}{P_t} \tag{2}$$

where $RX_{t+1}$ denotes the return excluding dividends.

To construct the dividend yield, the following formula is used:

$$\text{Dividend yield} = \frac{R_{t+1}}{RX_{t+1}} - 1 = \frac{\frac{P_{t+1} + D_{t+1}}{P_t}}{\frac{P_{t+1}}{P_t}} - 1 = \frac{D_{t+1}}{P_{t+1}} \tag{3}$$

which simplifies to the ratio of dividends paid at time $t + 1$ to the price at time $t + 1$, thus providing a direct measure of dividend yield based on the prices and dividends from the specified financial databases.

To calculate dividend growth, the following equation is employed:

$$\frac{D_{t+1}}{D_t} = \frac{\frac{D_{t+1}}{P_{t+1}}}{D_t/P_t} \frac{P_{t+1}}{P_t} \tag{4}$$

where $D_t$ and $D_{t+1}$ are the dividend amounts at time $t$ and $t+1$, and $P_t$ and $P_{t+1}$ are the stock prices at those times. This formulation captures the relative change in dividends, adjusted for stock price fluctuations.

To examine the total distribution to shareholders, it is essential to consider all sources of cash flows: dividends, repurchases, and issuances. These components are divided into two categories: "dividend" cash flows and "non-dividend" cash flows, where the latter represents net buybacks (repurchases minus issuance). The total distribution is then the sum of dividends and net buybacks.

To compute the aggregate dividend, I multiply the dividend-price (DP) ratio by the year-end market capitalisation, reflecting that the denominator in the DP ratio is the year-end market cap. Data on repurchases and issuances are sourced from COMPUSTAT, which reports annual expenditures on buybacks for individual firms. By aggregating these values across all firms, I obtain the annual total for repurchases. Similarly, the total value of issuances is calculated by summing the reported values for each firm. The distribution-price ratio is then determined using the formula:

$$\text{Distribution to price ratio} = \frac{D_t + REP_t - ISS_t}{MC_{t-1}} \tag{5}$$

where $REP_t$ and $ISS_t$ represent total repurchases and issuances at time $t$, respectively, and $MC_{t-1}$ is the market capitalisation at the end of the previous year.

Table 1 presents the summary statistics of the variables from 1927 to 2021, except for the last three variables which start from 1971. The variables are divided into two groups: outcome variables, displayed in the first six rows, and signal variables, shown in the last four rows. The average return is 12% with a standard deviation of approximately 0.2. Notably, the average dividend growth closely matches the average return but exhibits less volatility. Decomposing the return into dividends, other distributions, and price appreciation reveals that deviations in one component (such as price appreciation) are typically offset by the others (other distributions). This observation aligns with the Campbell-Shiller decomposition, providing a snapshot of how returns are distributed across different financial metrics.

All level variables are expressed in billions. Data for repurchase and issuance are sourced from COMPUSTAT, while all other variables are obtained from CRSP. The summary includes mean, median, standard deviation, minimum, and maximum values for each variable.

The dividend-price ratio (DP) and the total distribution-price ratio (TDP) are particularly noteworthy. DP, on average, is higher than TDP but exhibits less volatility. Their standard deviations are 1.2% and 1.6%, respectively. Figure 2 illustrates the trends of these ratios. Before 1971, DP and TDP fully overlap. Post-1971, two main trends emerge: from 1971 to 1982, before repurchase activity began to rise significantly following the institution of Securities and Exchange Commission (SEC) rule 10b-18 in 1982, which provided a safe harbour for firms conducting repurchases from stock price manipulation charges. In the first period, while DP was increasing, TDP was falling. Post-1982, even as DP fell, TDP demonstrated greater persistence against declines. Moreover, TDP's response to economic cycles is notably more pronounced than that of DP. Just before financial crises, TDP typically falls sharply, then surges immediately afterward, a trend observed during the three major crises of 2000, 2008 and 2020.

Table 1
*Summary statistics of financial variables across different periods.*

| Variables | Label | Mean | Median | S.D. | Min | Max |
|---|---|---|---|---|---|---|
| Return | R | 12% | 15.6% | 0.1989 | −44.39% | 57.41% |
| Ex-dividend return | Rx | 8% | 11% | 0.193 | −48% | 51% |
| Dividend growth | DD | 1.0784 | 1.0678 | 0.1496 | 0.6846 | 1.4631 |
| Dividend/price | DP | 4.66% | 4.66% | 1.23% | 2.54% | 7.57% |
| Distribution/ price | TDP | 3.56% | 3.50% | 1.57% | 0.25% | 7.19% |
| Capital appreciation | dMC | 600 | 1.7 | 3,229,500 | −8154 | 11,981 |
| Dividend | D | 137.8 | 25 | 209,250 | 1.2 | 849 |
| Dividend (post-1971) | D | 230 | 138 | 232,800 | 2 | 849 |
| Repurchase | REP | 322 | 115 | 378,650 | 1.3 | 1,326 |
| Issuance | ISS | 222 | 170 | 213,530 | 7.6 | 828 |

*Notes*: The statistics are based on annual data from 1927 to 2021, with the exception of Dividend, Repurchase, and Issuance, which are reported from 1971 to 2021. Level variables are expressed in billions of dollars

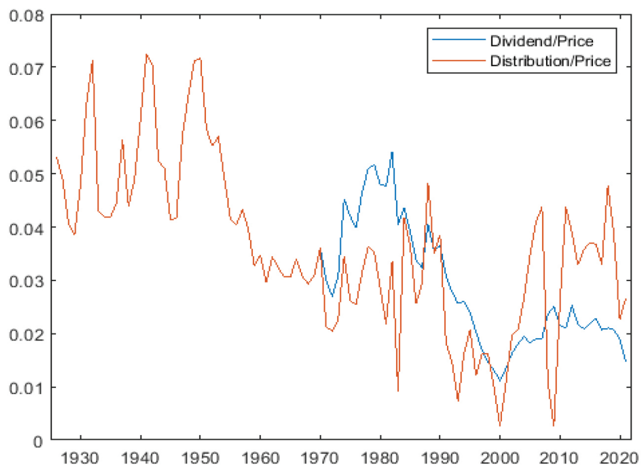


*Figure 2:* Trends of the dividend-price ratio (DPR) and the distribution-price ratio (DistrPR)

Figure 2 illustrates the trends of the dividend-price ratio (DPR) and the distribution-price ratio (DistrPR), where distribution is calculated by adding repurchases to and subtracting issuances from dividends.

Figure 3 shows similar trends in the levels of these variables. Before a crisis, distributions reach local maximums; post-crisis, they hit local minimums, indicating that firms significantly increase their repurchases before a crisis and raise their share outstanding afterward, likely in anticipation of future price movements. However, it is important to note that the relationship between cash flow news (particularly issuances and repurchases) and short-term price movements is only evident after 2005. Before this period, the graph does not support such a conclusion. Consequently, if there were a predictive relationship, it should manifest as a negative correlation between non-dividend cash flows and next year's returns in the period after 2005.

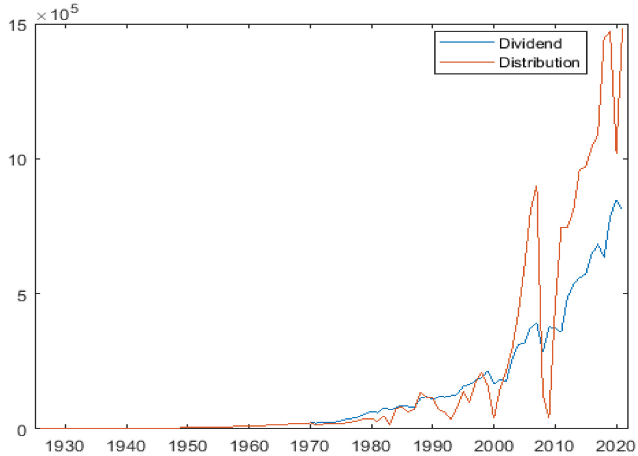


*Figure 3:* The trends of various level variables.

*Notes:* Dividend data is sourced from CRSP, while repurchase and issuance data are sourced from COMPUSTAT. Distributions" are defined here as the total of dividends plus net buybacks, where net buybacks are calculated as repurchases minus issuances. This distinction allows for a more precise analysis of the predictive capabilities of these financial components on market prices, ensuring a clearer understanding of their individual and combined effects on short-term and long-term financial outcomes. As one can see, during good times, the total distribution significantly exceeds dividends alone, indicating that firms prefer to distribute cash via buybacks, which offer more flexibility. However, during bad times, repurchases approach zero and issuances increase.

Figure 4 highlights the relationship between non-dividend cash flows and subsequent market behaviour. It demonstrates that there is an inverse relationship between the level of net buybacks each year (depicted in red) and capital appreciation in the following year (depicted in blue). This consistent opposite directionality suggests that signals related to non-dividend cash flows, such as net buybacks, may predict returns in the subsequent year.

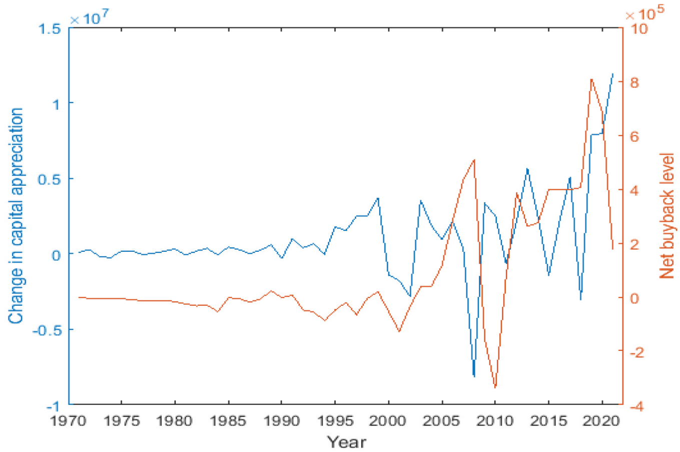


*Figure 4:* The relationship between non-dividend cash flows and subsequent market behaviour.

*Notes:* This figure displays two related trends: the red graph, plotted against the right axis, represents the levels of net buybacks at year *t*, and the blue line shows changes in capital appreciation in year *t* + 1 (price increase from *t* to *t* + 1). This illustrates that the first data points for the two graphs correspond to total buybacks in 1971 and the change in prices in 1972.

## METHODOLOGY AND RESULTS

In this study, I investigate the predictability of returns using dividend yield and net buybacks as signal variables. In Appendix, a theoretical justification of how both dividend and net buyback cash flow should drive prices has been provided. The analysis relies on data from CRSP and COMPUSTAT, covering the period from 1927 to 2021. The dependent variable in the regressions is the CRSP value-weighted return less the 3-month Treasury bill return. To examine the predictability of returns, following Cochrane (2011), I use the following regression equation:

$$R_{t \to t+k} = a + b \times \frac{D_t}{P_t} + \varepsilon_{t+k} \tag{6}$$

where $R_{t \to t+k}$ is the excess return over the 3-month Treasury bill return, $D_t$ is the dividend-price ratio or total distribution to price ratio, and $\varepsilon_{t+k}$ is the error term. The coefficients *b* and their significance levels are used to determine the predictive power of the dividend (total distribution)-price ratio.

To understand the long-term relationship between returns, dividend (total distribution) growth, and price-dividend ratios, I employ the Campbell-Shiller (1988) approximate present value identity:

$$dpt \approx \sum_{j=1}^{k} p^{j-1} r_{t+j} - \sum_{j=1}^{k} p^{j-1} \Delta d_{t+j} + p^k dp_{t+k} \tag{7}$$

where $dp_t = d_t - p_t$ is the log dividend (total distribution)-price ratio, $r_{t+1}$ is the log return, and $\rho \approx 0.96$ is a constant of approximation. This identity is used to decompose the variations in the price-dividend ratio into components attributed to future returns and distribution growth.

The long-run regression coefficients are estimated using both direct regression and vector autoregression (VAR) approaches, as outlined in Cochrane (2011). These coefficients help in understanding the proportion of price-dividend ratio variations explained by expected returns and expected dividend growth.

The dependent variable in this study is the total return, defined as the CRSP value-weighted return less the 3-month Treasury bill return. To address the issue of persistency in returns and the dividend/price ratio, I incorporate the Hansen-Hodrick (1980) correction for standard errors in the long-term regressions. This correction accounts for serial correlation and ensures robust standard error estimates.

Table 2 shows the result of estimations for both the dividend and distribution scenario. The first two panels display the results of the time series regressions and the last panels discuss the results for Campbell-Shiller (C-S) decomposition.

Table 2
*Summary of time series regressions and Campbell-Shiller (C-S) decomposition results from 1927 to 2021.*

| **Panel 1: Regression results for dividend scenario** | | | | | |
|---|---|---|---|---|---|
| Horizon | $\beta$ | $t(\beta)$ | $R^2$ | $s(ER)$ | $s(ER)/ER$ |
| 1 year | 2.702 | 2.106 | 0.041 | 4.11 | 0.505 |
| 2 year | 5.11 | 2.3 | 0.06 | 7.77 | 0.46 |
| 3 year | 8.28 | 2.5 | 0.10 | 12.61 | 0.48 |
| 4 year | 12.45 | 3.0 | 0.15 | 18.95 | 0.51 |
| 5 year | 14.99 | 3.0 | 0.16 | 22.83 | 0.45 |
| **Panel 2: Regression results for distribution scenario** | | | | | |
| Horizon | $\beta$ | $t(\beta)$ | $R^2$ | $s(ER)$ | $s(ER)/ER$ |
| 1 year | 3.127 | 2.271 | 0.059 | 4.93 | 0.604 |
| 2 year | 5.91 | 2.4 | 0.09 | 9.30 | 0.55 |
| 3 year | 8.81 | 2.4 | 0.13 | 13.87 | 0.53 |
| 4 year | 11.22 | 2.2 | 0.13 | 17.67 | 0.47 |
| 5 year | 12.65 | 2.1 | 0.13 | 19.93 | 0.40 |

(*Continued on next page*)

Table 2 (*Continued*)

| **Panel 3: C-S Decomposition under the dividend scenario** | | | | |
|---|---|---|---|---|
| Horizon | *r* | *dd* | *dp* | SUM |
| Direct $k = 15$ | 0.60 | –0.13 | 0.20 | 0.93 |
| VAR $k = 15$ | 0.63 | –0.02 | 0.28 | 0.93 |
| VAR $k = \infty$ | 0.87 | –0.03 | 0.00 | 0.90 |
| **Panel 4: C-S Decomposition under the distribution scenario** | | | | |
| Horizon | *r* | *dd* | *dp* | SUM |
| Direct $k = 15$ | 0.29 | –0.46 | 0.10 | 0.85 |
| VAR $k = 15$ | 0.10 | –0.87 | 0.00 | 0.97 |
| VAR $k = \infty$ | 0.10 | –0.87 | 0.00 | 0.97 |

*Notes*: Panels 1 and 2 predict returns using dividend- and distribution-price ratios; Panels 3 and 4 show C-S decomposition for each. Direct regressions use 15-year returns; "VAR" estimates derive long-run coefficients from 1-year data.

As shown in column 2 of Panel 1, the coefficients of the dividend-price ratio are all statistically significant. For instance, for a one-year horizon, the coefficient is approximately 2.7. This implies that a one percentage point increase in the current period's dividend-price ratio predicts a 2.7 percentage point increase in return for the following year. To elucidate the macroeconomic implications, consider a scenario involving a single investor who invests at the beginning of year *t*. This investor observes the capital gain and sum of dividends at the end of the year and compares the dividend with the year-end market cap, influencing his demand for the next period. An increase in this ratio would lead to an increased demand for the next year, thereby boosting the subsequent period's price and return. Conversely, a decrease in the ratio would lead to a reduction in demand.

Further exploration into the predictability implications reveals more when the changes in the DP ratio are dissected into two scenarios. Firstly, an increase in DP due solely to an increase in dividends, while the market cap remains unchanged, suggests that the alteration is driven purely by cash flow news. Under this scenario, it is evident that cash flow signals (changes in dividends) significantly affect the expected return. In the second scenario, assume dividends remain constant but the market cap decreases. The investor, observing a decrease in price without negative cash flow signals (since dividends are unchanged), would likely perceive the price drop as temporary and would maintain or increase demand, suggesting mean reversion in prices occurs in the absence of significant cash flow news.

Moreover, a notable result is the increase in $R^2$ across different horizons. $R^2$ at a one-year horizon is 0.04, but it escalates to 0.15 at a five-year horizon, representing a substantial threefold increase. This trend indicates that cash flow news, particularly dividend types, generally have more long-run implications; they are more predictive of returns over longer horizons, aligning with what literature terms as dividend persistence. The last column of the table also shows that the standard deviation of expected returns slightly decreases over the horizon.

Panel 2 presents the results under the distribution scenario, which includes net buybacks added to dividends, thus considering total distributions as cash flows, not solely dividends. It is noteworthy that returns remain predictable under this scenario. However, both coefficients and $R^2$ are higher in the one-year horizon, but show no significant changes in longer horizons. This could suggest that net buybacks provide more short-term signals and are less persistent compared to dividends. Trends also indicate that the yield from total distributions generally exhibits less persistence than that from dividends alone. The fact that repurchases and issuance predict shorter-term returns is unsurprising, given that firms often have more immediate financial incentives when deciding on repurchase and issuance. However, firms tend to be more consistent in maintaining dividends even if expected prices are declining.

Although it can be speculated that non-dividend cash flow news predominantly sends more short-term signals, some uncertainty remains. An assumption was made that repurchase and issuance were zero before 1971. To ensure this does not affect the results, I will report the outcomes separately for pre- and post-1971 periods in subsequent sections.

Panels 3 and 4 present the results of the C-S decomposition for both scenarios, revealing significant shifts in predictability. When dividends are considered the sole source of cash flow, all variations in the current DP ratio correspond to future returns.[1]

This implies that a one percentage point increase in the current DP fully translates into the next period's return, with no correlation to future cash flows. Essentially, while dividends predict future returns, they do not predict future dividends. To elucidate this further, let's decompose the return into its price and cash flow components. If the return itself is predictable but one of its components (cash flow) is not, then the other component (price) must be highly predictable. If this holds true, we can infer that cash flow news primarily signals future prices rather than future cash flows, especially as dividends, which are more persistent, are involved. Despite being statistically insignificant, the cash flow coefficients are negative, suggesting that an increase in DP forecasts a decrease in future cash flow growth. The last columns aggregate all three factors, highlighting some discrepancies due to approximations in the decomposition process.

Panel 4 focuses on the scenario where net buybacks are also considered as part of cash flows. Here, the return coefficients are nearly zero out, and the distribution growth coefficients rise sharply towards one, indicating that almost all variations in the current distribution yield correlate with future distribution growth. While dividend yield predicts returns, the total distribution (dividend plus net buyback) forecasts dividend growth. This suggests that dividends predict the price component of returns, whereas net buybacks are indicative of future cash flows. Given that non-dividend cash flows typically signal short-term returns, it is not surprising to find that they also indicate long-term cash flow growth.

From an investor's perspective, observing a repurchase might predict an increase in the return for the following year. However, only a naive investor would anticipate higher returns over the next decade solely based on a repurchase action. This is likely because repurchases, unlike dividends, might be less relevant in scenarios modeled by Miller and Modigliani's (1961) dividend irrelevance theorem.

**Pre- and Post-1971**

To discern the impact of non-dividend cash flows, the time series was divided into two periods: 1927 to 1970, and 1971 to 2021. The year 1971 marks a significant juncture, coinciding with the start of increased repurchase activity and the availability of corresponding data. Tables 3 and 4 present the findings for these respective periods.

In Table 3, where dividends serve as the sole source of cash flow, the results from Panel 1 indicate a substantial increase in coefficients, *t*-statistics, and $R^2$. Specifically, a one percentage point rise in the DP ratio forecasts a 6 percentage point increase in return for the following year. Over the long term, the impact is even more pronounced: a one percentage point increase in DP predicts a 32 percentage point surge in returns over five years, corresponding to an explanatory power of 45% at this horizon. Panel 2 results further illustrate that all variations in DP during this period correlate directly with future returns, with no link to dividend growth. The insignificance of dividend growth coefficients during this era, compared to the entire period, underscores the potency of cash flow news as a predictor of future market behaviour prior to 1971.

Table 3
*Results of time series regression and C-S decomposition for the period 1927 to 1971. During this period, dividends were the only source of cash flow.*

| **Panel 1: Regression results** | | | | | |
|---|---|---|---|---|---|
| Horizon | $b$ | $t(b)$ | $R^2$ | *S(ER)* | *S(ER)/ER* |
| 1 year | 6.057 | 3.985 | 0.121 | 7.93 | 0.889 |
| 2 years | 12.51 | 5.8 | 0.22 | 16.37 | 0.89 |
| 3 years | 20.71 | 5.1 | 0.36 | 27.10 | 0.92 |
| 4 years | 29.10 | 3.7 | 0.44 | 38.08 | 0.86 |
| 5 years | 31.60 | 5.2 | 0.45 | 41.35 | 0.68 |
| 6 years | 36.51 | 5.4 | 0.49 | 47.78 | 0.61 |
| **Panel 2: C-S Decomposition** | | | | | |
| Horizon | *r* | *dd* | *dp* | SUM | |
| Direct $k$ = 15 | 1.62 | 0.38 | –0.24 | 1.00 | |
| VAR $k$ =15 | 0.99 | 0.01 | 0.04 | 1.02 | |
| VAR $k = \infty$ | 1.03 | 0.01 | 0.00 | 1.02 | |

Post-1971, the scenario evolves as data on repurchases and issuances begin to be considered, providing a unique experimental setup to distinguish between different cash flow signals. Table 4 outlines the outcomes for this later period, showing a stark reversal in both estimations' results. In Panel 1, coefficients dwindle, lose significance, and $R^2$ nears zero, indicating that the aggregate of dividends and repurchases no longer offers insights into future prices. Previously, a one percentage point uptick in the DP ratio would have allowed investors to confidently predict future prices. However, a similar increase in the distribution-price ratio now leaves them unable to make reliable predictions.

Panel 2 of Table 4 reveals perhaps the most critical findings of this study. There is almost a complete shift from future returns to future cash flows in the effects of current distribution-price ratio variations. Only 8% of these variations correlate with future returns, while a staggering 91% predict future cash flows. The predominantly negative coefficients suggest that a one percentage point increase in the distribution-price ratio is interpreted by investors as indicative of a 0.91 percentage point decrease in future cash flows. This stark contrast highlights how investors differently interpret signals from dividends versus repurchases and issuances: viewing one as a predictor of returns and the other as a predictor of cash flows.

Table 4
*Results of time series regression and C-S decomposition from 1971 to 2021. This period reflects the inclusion of net buybacks along with dividends as sources of cash flow, influencing the dynamics of market predictions.*

| **Panel 1: Regression results for distribution scenario** | | | | | |
|---|---|---|---|---|---|
| Horizon | *b* | *t*(*b*) | $R^2$ | *S(ER)* | *S(ER)/ER* |
| 1 year | 2.528 | 0.861 | 0.030 | 3.09 | 0.414 |
| 2 years | 3.46 | 0.7 | 0.02 | 4.24 | 0.28 |
| 3 years | 3.28 | 0.5 | 0.01 | 4.02 | 0.17 |
| 4 years | 0.21 | 0.0 | 0.00 | 0.25 | 0.01 |
| 5 years | 1.02 | 0.1 | 0.00 | 1.25 | 0.03 |
| **Panel 2: C-S Decomposition under the distribution scenario** | | | | | |
| Horizon | *r* | *dd* | *dp* | SUM | |
| Direct $k = 15$ | 0.39 | –0.77 | –0.15 | 1.01 | |
| VAR $k = 15$ | 0.08 | –0.91 | 0.00 | 0.99 | |
| VAR $k = \infty$ | 0.08 | –0.91 | 0.00 | 0.99 | |

## A Puzzle in Dividend Predictability

The lack of predictability in the sum of dividends and net buybacks, as evidenced in Panel 1 of Table 4, poses a significant puzzle. Historically, dividends alone highly predicted returns in the pre-1971 period. However, post-1971, the combination of "dividend plus net buyback" does not demonstrate the same predictive power for returns. This discrepancy invites several possible explanations:

1. **Changing Nature of Dividends:** It is possible that the inherent characteristics and predictability of dividends have evolved over time, altering their effectiveness as predictive variables.
2. **Masked Effects in Regression Models:** Dividends might still retain their predictive power, but this effect could be obscured in regression models that only account for the combined effects of dividends and net buybacks.
3. **Decreasing Relative Importance:** As the share of dividends in total yields diminishes over time, with price appreciation and other cash flows becoming more dominant, dividends might be perceived by investors as less predictive of future market behavior.

To further investigate these hypotheses, subsequent analyses are conducted. Table 5 presents the results for the post-1971 period considering only dividends as a source of cash flow, treating repurchases as a component of capital appreciation. Contrary to the pre-1971 findings, dividends in this setup do not predict returns, reflecting the increasing dominance of repurchases in the cash flow structure. Panel 2 of Table 5 confirms that while variations in the DP ratio are entirely correlated with future returns, the actual magnitude of these variations is minimal. This minimal variation is attributed to the significant decline in the DP ratio over time and its lack of predictive power concerning future cash flows. Thus, even though the entirety of DP variations correlates with future returns, these variations are too slight to provide substantial information about future market movements as depicted in Panel 1.

Table 5
*Results of time series regression and Campbell-Shiller decomposition for the period 1971 to 2021. In this analysis, dividends are treated as the sole source of cash flow, and net buybacks are considered as part of price appreciation.*

| **Panel 1: Regression results for the dividend scenario** | | | | | |
|---|---|---|---|---|---|
| Horizon | *b* | *t*(*b*) | $R^2$ | *S(ER)* | *S(ER)/ER* |
| 1 year | 1.148 | 0.591 | 0.005 | 1.33 | 0.178 |
| 2 years | 0.86 | 0.3 | 0.00 | 1.00 | 0.06 |
| 3 years | 0.92 | 0.2 | 0.00 | 1.07 | 0.04 |
| 4 years | 2.74 | 0.5 | 0.01 | 3.18 | 0.09 |
| 5 years | 5.67 | 0.8 | 0.02 | 6.57 | 0.14 |
| **Panel 2: C-S Decomposition under the dividend scenario** | | | | | |
| Horizon | *r* | *dd* | *dp* | SUM | |
| Direct $k = 15$ | 0.82 | –0.10 | 0.01 | 0.93 | |
| VAR $k$ =15 | 1.00 | 0.43 | 0.31 | 0.88 | |
| VAR $k = \infty$ | 1.45 | 0.62 | 0.00 | 0.83 | |

These findings illustrate the complex dynamics between dividend payouts, net buybacks, and their combined influence on stock price predictability. Further investigation, as detailed in Table 6, examines whether separating dividends and buybacks in the regression models clarifies the predictive contributions of each component independently.

Table 6 responds to the second speculation by differentiating between different types of cash flows. The dividend-price ratio and the net buyback-price ratio are considered as two distinct independent variables. The results confirm that dividends no longer predict returns effectively, suggesting a decrease in their predictive power. This decline could be due to macroeconomic structural shifts or the recent dominance of repurchases over dividends. There is evidence indicating a significant reduction in the predictability of returns by dividend yield post-2009.

Table 6

*Regression results for the period post-1971, with the return as the dependent variable and both dividend-price ratio (DP) and net buyback-price ratio (TDP) as independent variables.*

| Horizon | *b(DP)* | *b(TDP)* | *t(DP)* | *t(TDP)* | $R^2$ |
|---|---|---|---|---|---|
| 1 year | 2.7 | 2.3 | 0.9 | 0.7 | 0.03 |
| 2 years | 3.1 | 3.2 | 0.6 | 0.6 | 0.02 |
| 3 years | 3.0 | 3.0 | 0.5 | 0.4 | 0.01 |
| 4 years | 1.8 | –1.4 | 0.2 | –0.2 | 0.01 |
| 5 years | 4.5 | –1.8 | 0.6 | –0.2 | 0.02 |

Table 7 provides a comprehensive summary of the predictive capabilities of dividend and non-dividend signals across different time horizons. It delineates how these signals forecast short-term and long-term future prices and cash flow growth. Throughout the entire period studied, dividend signals moderately predict short-term future prices and highly predict long-term future prices, although their predictability wanes in the latter period. Conversely, while non-dividend signals also moderately predict short-term prices, they do not forecast long-term prices effectively. However, they are robust predictors of both short-term and long-term future cash flow growth.

Table 7

*Summary results depicting the predictive capabilities of signal variables on outcome variables. For instance, dividend signals moderately predict short-run prices but highly predict long-run prices.*

| Outcome variables | Dividend signals | Non-dividend signals |
|---|---|---|
| Future prices (Short-run) | Moderately predict | Moderately predict |
| Future prices (Long-run) | Highly predict | Do not predict |
| Future cash flow growth (Short-run) | Do not predict | Highly predict |
| Future cash flow growth (Long-run) | Do not predict | Highly predict |

## CONCLUSIONS

The analysis reveals significant insights about the roles of dividend and net buyback as crucial signal variables on which investors rely to predict outcomes such as future returns and cash flow growth. While the results do not definitively conclude how each signal variable influences investor predictions, several key findings emerge.

Firstly, the dividend-price ratio reliably predicts returns both in the short-run and longrun but offers no predictive power regarding future cash flows. This outcome largely stems from the persistence of dividends as a component of cash flow, suggesting a more stable expectation of returns from dividends over time. However, the predictive strength of dividends has diminished, potentially due to macroeconomic structural shifts or a consistent decrease in the dividend-price ratio over the years.

Secondly, the analysis indicates that while repurchases and issuances might predict short-term returns, they do not provide insights into long-term returns. Instead, these financial activities are strong predictors of future cash flow changes. This observation aligns with the expectation that short-term market movements may respond to buybacks and issuances, but these actions lack a fundamental link to long-term market returns. Such findings underscore the complexity of market dynamics, where different financial signals interact with varying degrees of influence over time.

This study highlights the evolving nature of financial signals like dividends and net buy-backs in equity markets, reflecting changes in corporate financial strategies and their perceived implications by investors. Further research could explore the causal mechanisms behind these shifts and their broader economic implications.

Consistent with previous findings, the dividend-price ratio predicts returns both in the short and long run but offers no information about future cash flows, likely due to the persistent nature of dividends Cochrane (2011) and Eaton and Paye (2017). However, the predictive power of dividends has diminished over time, possibly due to structural shifts in the macroeconomy or the decreasing share of dividends in total cash flow Fama and French (2001). In contrast, repurchases and issuances, while not predictive of long-term returns, provide significant insights into future cash flow growth. This aligns with studies suggesting that buybacks are often used for short-term financial strategies Grullon and Michaely (2002). Future research could further explore the differential impacts of these cash flow components, especially in the context of recent shifts in corporate payout policies. Additionally, examining the period after 2005 more closely could reveal how changes in market conditions and regulatory environments have influenced these dynamics.

## NOTE

1. Cochrane (2011) demonstrates that return coefficients approach unity when bubble effects are controlled.

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## APPENDIX

This appendix delves into how dividends and net buybacks, as distinct sources of cash flows, exhibit different predictive behaviours. Specifically, dividends predict future prices effectively, while the sum of dividends and buybacks is indicative of future cash flows. Given these differences, it would be insightful to revisit the present value identity, this time distinguishing between dividends and buybacks. The decomposition leads to Equation (19), which elucidates how each component separately forecasts "return", "dividend" and "net buybacks".

### Redefining Return with Distinct Cash Flows

Lets redefine return, distinguishing between cash flow sources. Here, buybacks are denoted by $B$:

$$R_{t+1} = \frac{P_{t+1} D_{t+1} + B_{t+1}}{P_t} \tag{8}$$

$$\log R_{t+1} = \log(P_{t+1} + D_{t+1} + B_{t+1}) - \log P_t \tag{9}$$

Using lowercase for log-transformed variables: $\log R_t = r_t, \log P_t = p_t, \log D_t = d_t, \log B_t = b_t$.

$$r_{t+1} = P_{t+1} - p_t + \log\left(1 + \frac{D_{t+1} + B_{t-1}}{P_{t-1}}\right) \tag{10}$$

$$r_{t+1} = P_{t+1} - p_t + \log\left(1 + e^{\log} \frac{D_{t+1} + B_{t-1}}{P_{t-1}}\right) \tag{11}$$

Applying a first-order Taylor approximation around the sample mean of $\log (\bar{D} + \bar{B}) - \bar{p}$:

$$\log\left(1 + e^{\log} \frac{D_{t+1} + B_{t-1}}{P_{t-1}}\right) = k + (1-p) \log \frac{D_{t+1} + B_{t-1}}{P_{t-1}} \tag{12}$$

$$= k + (1-p) \log(D_{t=1} + B_{t+1}) - (1-p) p_{t+1} \tag{13}$$

Defining $k$ and ρ as:

$$k = -\log(p) + (1-p) \log\left(\frac{1}{p} - 1\right) \tag{14}$$

$$p = \frac{1}{1 + e^{\overline{d-p}}} \tag{15}$$

Substituting into the return equation:

$$r_{t+1} = p_{t+1} - p_t + k(1-p)\log(D_{t+1} + B_{t+1}) - (1-p)p_{t+1} \tag{16}$$

Further decomposition:

$$\log(D_{t+1} + B_{t+1}) = d_{t+1} + \log\left(1 + \frac{B_{t+1}}{D_{t+1}}\right) \tag{17}$$

$$\log\left(1 + \frac{B_{t+1}}{d_{T+1}}\right) = \log(1 + e^{bt+1-dt+1}) \tag{18}$$

Applying another approximation around the mean of $b - d$:

$$\log(1 + e^{bt+1-dt+1}) = k' + (1-p')(b_{t+1} - d_{t+1}) \tag{19}$$

Combining the expressions:

$$r_{t+1} = pP_{t+1} - P_t + k + (1-p)(d_{t+1} + k' + (1-p')(b_{t+1} - d_{t+1})) \tag{20}$$

For simplification, let $k'' = k + (1 - \rho)k'$, and rewrite in terms of $p_t$:

$$P_t = pP_{t+1} + k'' - p'(1-p)d_{t+1} + (1-p)(1-p')b_{t+1} - r_{t+1} \tag{21}$$

Next, we derive pt − dt for both sides and iterate forward to obtain:

$$dp_t = \sum_{j=1}^{n} p^j r_{t+1+j} - \sum_{j=1}^{n} p^j \Delta d_{t+1+j} - \beta \sum_{j=1}^{n} p^j b_{t+1+j} - \frac{k''}{p} - p^n dp_k \tag{22}$$

Equation (19) results from this decomposition. Here, $n$ denotes the number of years, and $b$ is the log of buybacks at time $t$. The subsequent section will estimate the predictability of return, dividend, and net buyback by dividend yield and net buyback yield separately.

## Normality Test Results

Table 8

*Results of Normality tests for return distributions. The table presents the results of the Anderson-Darling (A-D) test and the Kolmogorov-Smirnov (K-S) test. The A-D test indicates no evidence against normality, whereas the K-S test suggests a deviation from normality.*

| Test | Statistic | $p$-value | Result |
|---|---|---|---|
| Anderson-Darling | A = 0.619 | $p$ = 0.12344 | Fail to reject null hypothesis |
| Kolmogorov-Smirnov | D = 0.089 | $p$ = 2.1501e-46 | Reject null hypothesis |

## Discussion of Normality Test Results

To evaluate the normality of the return distributions, I conducted both the Anderson-Darling (A-D) test and the Kolmogorov-Smirnov (K-S) test. The results are summarised in Table 8.

The Anderson-Darling test, which gives more weight to the tails of the distribution, did not reject the null hypothesis of normality ($p$ = 0.12344). This result suggests that the return distribution could be considered normal based on this test. In contrast, the Kolmogorov-Smirnov test, which is more sensitive to deviations in the centre of the distribution, rejected the null hypothesis with a very small $p$-value ($p$ = 2.1501e-46), indicating a significant deviation from normality.

Despite the conflicting results, the A-D test's failure to reject the null hypothesis provides stronger support for the normality of the return distribution in this context. This finding is crucial for my subsequent analyses, which rely on the assumption of normality. Visual inspections using Q-Q plots further support this conclusion, showing that while there are some deviations, they are not substantial enough to undermine the assumption of normality. Given these results, I proceed with the assumption of normality for our return data, while acknowledging the K-S test's indication of potential deviations, particularly in the centre of the distribution.