Equity Duration: A Puzzle on High Dividend Stocks *

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Abstract

This paper examines the duration of individual stocks, i.e., the sensitivities of their prices to changes in interest rates. Counter to the intuition from the dividend discount model, we find that stocks that pay higher dividends tend to have longer duration, experiencing greater price declines (increases) when interest rates rise (fall). Using data on mutual fund flows and institutional investor holdings, we find evidence of "reaching for dividends": when interest rates fall, investors switch more funds to income-oriented equity mutual funds, and the weights of high dividend stocks in the portfolios of income-dependent institutions such as income funds and insurance companies increase. The resulting higher demand for high dividend stocks appears to increase the sensitivities of their prices to interest rate changes, thereby contributing to their long duration puzzle.

JEL: G10, G11, G12, G23

Keywords:: Equity Duration; Interest Rate Risk; Dividends; Income Funds; Flows; Institutional Investors.

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1 Introduction

Central banks around the world have been rushing to lower interest rates to uncharted territories. The globally universal accommodative monetary policies have created an ultra-low interest rate environment. Between December 2014 and May 2015, approximately $2 trillion long-term sovereign debt was trading at negative yields (Bank for International Settlements, 2015). In the U.S., the Federal Funds Rate has hovered around zero for more than six years since 2009, with long-term nominal and real interest rates (yields on 10-year Treasury notes and Treasury Inflation-Indexed Security) diminishing to merely 2.16% and 0.33% in May 2015, respectively. Across the investment community, the ultra-low interest rates near the zero lower bound heighten the concern for interest rate risk when central banks "normalize" the monetary policy, which has important implications for investors' asset allocation decisions.

Despite the pressing need to understand the impact of changes in interest rates on the value of financial assets, empirical literature on equity duration has been limited. This study proposes to fill the gap. In particular, we build on the intuition from popular valuation models such as the dividend discount model and test if stocks with lower dividends have longer duration, i.e., larger sensitivities in prices to changes in interest rates. To gain intuition, we may view a common stock as a claim to a portfolio of future cash flows like a series of zero-coupon bonds. High-growth firms tend to have lower dividend payouts but higher future growth rates, which skew the distribution of their cash flows towards the most distant future. In contrast, firms with higher dividend payouts tend to have lower retention ratios and lower future growth rates; the distribution of their cash flows is relatively denser in the closer future. As a result, the valuation model predicts that duration, which is the weighted average maturity of the series of zero-coupon bonds, tends to be longer for stocks with lower dividend payouts.[1]

We empirically examine this prediction by computing value-weighted returns to portfolios of stocks formed on the basis of their dividend to price ratios (dividend yield), and estimating their empirical duration as the percentage price increase associated with a one-percent decline

[1] In Section 3, we formalize this intuition.

in interest rates (e.g., yields on 10-year Treasury notes). Our results indicate that during the period from 1963 to 2014, ceteris paribus, when interest rates decline by 1.00%, high dividend stocks tend to experience an increase in returns by 1.35%, whereas low dividend stocks tend to have a decrease in returns by 1.12%, with both effects statistically significant at the 1% level. The difference in estimated duration between high and low dividend stocks is 2.46 with high statistical significance. Using dividend payout ratios (dividends divided by book equity) as an alternative measure of dividend payments, we obtain a similar pattern. These results indicate that contrary to the intuition from the valuation model, high dividend stocks appear to have longer duration.

The longer duration of high dividend stocks does not simply reflect the possibility that they may have higher stock market beta. In our estimation of equity duration, we control for the influence of aggregate stock market movements. In fact, over our sample period, high dividend stocks tend to have lower stock market beta. In an alternative specification, we also control for other commonly used stock market factors that drive the comovement in stock prices, such as the size, value, and momentum factors (see, e.g., Fama and French, 1993; Jegadeesh and Titman, 1993). The long duration of high dividend stocks remains economically large and statistically significant in this alternative specification. Moreover, despite the highly volatile correlation between aggregate stock market and bond market returns ranging from very negative to very positive (e.g., Baele, et al., 2013; Campbell, et al., 2013) the long duration of high dividend stocks remains stable in the past five decades.

As another illustration, Figure 1 shows the market-adjusted returns to high and low dividend stocks during the episode of "taper tantrum." In the press conference concluding the two-day Federal Open Market Committee Meeting on 19 June 2013, the Federal Reserve Chairman Ben Bernanke expressed optimism about economic conditions and suggested a reduction in purchases of long-term bonds by the Fed (as one of its tools for accommodative monetary policy) later in 2013: "[T]he Committee currently anticipates that it would be appropriate to moderate the monthly pace of purchases later this year." Shocked by this news, long-term interest rates ascended, with, e.g., the yields on 10-year Treasury notes jumping up from 2.00% to 2.33% from 18 June to 19 June 2013. On the same day, high

dividend stocks tumbled more than the aggregate stock market, whereas low dividend stocks increased in value relative to the stock market. The spread in daily market-adjusted returns between high and low dividend stocks is 67 basis points (bps) for dividend yield-sorted portfolios and 97 bps for dividend payout-sorted portfolios. The evidence from this natural experiment illustrates the longer duration of high dividend stocks.

What accounts for the high duration of high dividend stocks? The popular dividend discount model does not take into account the effect of uncertainty on stock prices. If firms with less volatile cash flows tend to retain less of their earnings and distribute more to shareholders, high dividend stocks may enjoy lower discount rates (due to lower cash flow volatility) that penalize less the contribution of their more distant cash flows to their market value. The resulting larger share of more distant cash flows in the firm value then implies a longer duration of high dividend stocks. To examine this conjecture, we use stock price volatility as a proxy for the cash flow volatility and test for its influence on the duration of high dividend stocks. Our results indicate that after controlling for the influence of volatility, the longer duration of high dividend stocks remains large and statistically significant.

From a related perspective, less profitable firms may have weaker ability to pay dividends. If less profitable firms have higher likelihood of falling into distress, i.e., lower distance to default, their cash flows can have shorter duration. We evaluate this possibility by computing a firm-level distance to default measure based on the Merton (1974) model. We find strong evidence that controlling for the distance to default, high dividend stocks still have longer duration than low dividend stocks. Hence, these results reinforce the long duration puzzle for high dividend stocks.

What is special about dividend payout in and of itself? In the pioneering paper by Miller and Modigliani (1961), dividend policy is irrelevant to a firm's value in the world with uncertainty but perfect capital markets, because investors are indifferent between the income (dividend) and capital gain components of returns. The intuition is straightforward: in the idealized capital market, investors can transform income to capital gain and vice versa without costs according to their own preferences; as a result, dividends play no special role in driving investor demand. In real capital markets with frictions, however, the transformation

between income and capital gains incurs transaction costs. For investors demanding regular income streams over a long period, e.g., retirees who demand regular monthly income flows to finance their desired consumption plans in the next 15 years, the income component of returns, i.e., the dividend yield, may have desirable attributes that attract their demand.

A natural place for investors to gain income-driven assets is the bond market. In particular, long-term bonds may have special advantages for long-horizon investors with relatively well defined income demand. The ability of long-term bonds to finance future consumption streams, however, depends on the level of interest rates. Under the environment with persistently low interest rates (e.g., nominal and real interest rates hovering slightly above zero in the current extremely accommodative monetary policy regimes), long-term bonds tend to lose their superior long-term investment value. A greener pasture for income-oriented investors in such an environment may be dividend paying stocks, especially those with high dividend yields that offer sufficiently powerful income streams to support desirable consumption plans. We argue that this hypothesis of "reaching for dividends" in a low interest rate environment is an important contributor to the longer duration of high dividend stocks.

Delving into this hypothesis, we exploit a comprehensive data set of quarterly institutional investor holdings of U.S. equities from 1980 to 2014 to study their portfolio decisions of high and low dividend stocks under different interest rate environments. This data set, available to us due to the Securities and Exchange Commission's required 13F filings, allows us to classify institutions according to their legal types into banks, insurance companies, mutual funds, investment advisors, and others (pension funds, endowments and others) at the level of individual investment companies. We find that under high interest rate environments (top 20% of quarters with high long-term interest rates), all five types of institutions tend to underweight high dividend stocks in their portfolios relative to the market, in line with the idea that institutional investors tend to prefer share repurchases to dividends as distributions. Under low interest rate environments (bottom 20% of quarters with low long-term interest rates), however, the institutional aversion to high dividend stocks universally shrinks, with mutual funds and insurance companies tending to overweight high dividend stocks in their portfolios relative to the market. This pattern is particularly pronounced for mutual funds:

when interest rates are high, they underweight high dividend stocks by more than 4% relative to the market portfolio; however, when interest rates are low, they overweight high dividend stocks by more than 2% relative to the market.

Among mutual funds, income-oriented equity funds are natural buyers of high dividend stocks. We find that the aggregate preference for high dividend stocks by mutual funds appears to be driven by the behavior of income funds. First, over 1963 to 2014, mutual fund investors send disproportionately more money to income funds when interest rates are low. The time-series correlation between excess flows into income funds over those into the entire equity funds and long-term interest rates is -50% and highly statistically significant. This impetus for the expansion of income funds within the mutual fund sector due to fund flows is important for the aggregate preference of mutual funds for high dividend stocks. Second, income funds as a group appear to more aggressively overweight high dividend stocks when interest rates are lower. Despite their overall tilting toward stocks with higher dividends, when interest rates are high, income funds on average underweight stocks in the top quintile with the highest dividend yields by 1.3% relative to the market, but overweight stocks in the fourth quintile with high dividend yields by 5%. When interest rates are low, income funds overweight stocks with the highest dividend yields in the top quintile by 4.5% and those in the fourth quintile by 9.3% relative to the market.

What may be driving this change in the behavior of income fund managers across different interest rate environments? Our analysis of flows across income funds indicates that flows are sensitive not only to net fund returns but also to their dividend yields, and the influence of dividends on fund flows depends crucially on the level of interest rates. In particular, when interest rates are low, the tournament for clients' money among income funds rewards funds' ability to generate income (dividends), incremental to their ability to generate total return. The pressure of competition naturally leads income funds to reach further for dividends in low interest rate environments.

This tilting in the demand for high dividend stocks when interest rates fall to a lower level can impact the prices of high dividend stocks, increasing their sensitivities to interest rate changes. As an illustration of this view, we form portfolios on the basis of dividend

yields and the weights of stocks in the income fund portfolio in excess of those in the market portfolio. We find that, for high dividend stocks, stocks with high income fund holdings tend to have duration longer than those with low income fund holdings by 1.24 years. That is, when interest rates decline by 1%, the prices of high dividend stocks with high income fund holdings on average increase by an additional 1.24% relative to those of high dividend stocks with low income fund holdings. This result shows that "reaching for dividends is an important contributor to the high duration puzzle of high dividend stocks.

The rest of this article is organized as follows. Section 2 reviews the related literature. Section 3 starts with a motivating theoretical framework for our empirical design and then introduces the data and sample. Section 4 presents a long duration puzzle for high dividend stocks. Section 5 studies investor demand for high dividend stocks and the resulting impact on their duration. Section 6 includes robustness tests and Section 7 concludes.

2 Related Literature

The literature on equity duration is scarce. Earlier studies of equity duration (e.g., Lanstein and Sharpe (1978); Cornell (1999)) emphasize the connection between stock market beta and duration, and point to the importance of controlling for the exposures to aggregate stock market when estimating equity duration. Sharing with us a common theme on firm-level equity duration, Dechow, Sloan, and Soliman (2004) follow a different route with a different focus. They construct a measure of implied equity duration for individual firms, using the formula of Macaulay duration as the weighted average of the time to the receipt of prospective cash flows on the firms' common shares. Their main innovation is to exploit financial statement analysis to create a forecasting model for individual firms' future cash flows, which leads to an estimate of the firms' imputed equity duration. They then explore how duration risk may be priced in the cross-section of stock returns. We instead use an empirical approach to estimate firms' equity duration, and examine the actual behavior of equity duration from the perspective of an equity valuation model. Identifying a long duration puzzle for high dividend stocks, we explore the market force contributing to this

puzzle and flesh out new evidence on "reaching for dividends."

Our study contributes also to several other strands of literature. First, it extends the growing literature that studies the comovement between aggregate stock and bond markets. This literature emphasizes the time-varying nature of stock and bond correlations (e.g., Baele, et al., 2010; Campbell, et al., 2013). Our study focuses on the cross-section of stocks. In our empirical estimation of equity duration, we use various specifications that control for aggregate stock market movements, and other commonly used broad return factors such as the value, size and momentum factors. This design allows us to focus on the heterogeneity of interest rate exposures across stocks, after we tease out the common variation in stock returns due to their exposures to equity risk. The rich information from individual stocks can provide useful information to better understand the determinants of equity duration. Therefore, our work can be an important extension of this literature.

Second, there is a new but growing literature on equity yields (see, Binsbergen and Koijen, 2015 for an excellent review). So far this literature focuses primarily on a few major stock indices for a short period due to data limitation. Our study of the *behavior* of equity duration for the broad cross-section of stocks over a long time span can provide a micro-foundation to better understand the *price* of equity duration.

Third, our paper builds on the earlier literature on the interest rate elasticity of stock prices and extends the literature on inflation risk in equity markets. Specifically, Haugen and Wichern (1979) provide an analytic framework for interest rate elasticity of both bonds and stocks. They recognize that the notion of duration can be quite useful for understanding movements in bond and stock prices. Our study can be viewed as building on their analytic results and pioneer important drivers of the actual behavior of equity duration. Moreover, our focus on the interest rate sensitivities of stock prices makes our study related to but distinct from the large literature on how inflation influences stock prices (e.g., Fama and Schwert, 1977; Modigliani and Cohn, 1979; Boudoukh and Richardson, 1993; Bekaert and Engstrom, 2010). Simply put, movements in long-term interest rates contain information on the variation in expected inflation, expected future real short-term interest rates, and the term premium that reflects, e.g., compensation for inflation and future interest rate

uncertainty. As a result, equity duration has distinctive features from equity inflation risk.

Finally, the proposed study contributes to the important literature on how the behavior of institutions impacts asset prices (e.g., He and Krishnamurthy, 2013; Vayanos and Woolley, 2013). To the best of our knowledge, our paper is the first to document how dividend payouts affect the competition among income funds for their clients' money and how the strength of competition among this dimension varies across different interest rate environments. Considering the explosion of mutual fund assets in the past decades and the increasingly important role of monetary policy in asset markets, our paper deepens our understanding of mutual fund behavior and its impact on asset markets.

3 Equity Duration: A Motivating Framework

In this section, we set up a framework of equity duration that motivates our empirical analyses, and then introduce the data and empirical methodology.

3.1 Equity Duration in Dividend Discount Model

Our notion of equity duration is conceptually similar to the bond duration, which points to both the sensitivities of bond prices to changes in interest rates and the average maturity of a bond's cash flows. Despite the popularity of duration in valuing fixed income securities since the seminal work by Macaulay (1938), equity duration has received much less attention in the literature.[2] In what follows, we start with a simple dividend discount model to gain intuition regarding equity duration.

In the dividend discount model, stock price is determined by:

$$P_t = \frac{D_{t+1}}{R} + \frac{D_{t+2}}{R^2} + \cdots + \frac{D_{t+n}}{R^n} + \ldots,$$

[2]Hicks (1938) notes the striking similarities between the elasticities of the asset value with respect to the discount rate to capitalize the future payments accruing to the asset, and the average maturity, i.e., duration, of these future payments. In his rather general treatment, this notion of elasticities applies well to both bonds and equity. Haugen and Wichern (1974) build on this insight and provide an elaborate analysis of bond and equity elasticities.

where P_t denotes the stock price at time t, D_{t+i} is the stock's dividend payment during the period between $t+i-1$ and $t+i$ with i ranging from 1 to ∞, and R is the discount rate for the stock's dividend payments. The (Macaulay) duration for this stock is defined as follows:

$$Duration_t = \frac{D_{t+1}/R}{P_t} \times 1 + \frac{D_{t+2}/R^2}{P_t} \times 2 + \cdots + \frac{D_{t+n}/R^n}{P_t} \times n + \ldots. \tag{1}$$

If we make the simplifying assumption that the stock's dividend after period t grows at a constant rate of g such that $D_{t+1} = (1+g) \times D_t = G \times D_t$, then we obtain the constant dividend growth valuation:

$$P_t = \frac{D_{t+1}}{R-G}.$$

This equation implies that the duration of the stock will be as follows:

$$Duration_t = -\frac{\partial P_t/P_t}{\partial R/R} = \frac{R}{R-G} = \frac{R}{D_{t+1}/P_t}, \tag{2}$$

and the modified duration, $Duration_t^m$ which equals $Duration/R$, will be determined by:

$$Duration_t^m = -\frac{\partial P_t/P_t}{\partial R} = \frac{1}{R-G} = \frac{1}{D_{t+1}/P_t}. \tag{3}$$

Equation (3) indicates that a stock's modified duration depends critically on its dividend to price ratio. In particular, stocks with higher dividend yields tend to have lower duration. This result is intuitive because stocks with high dividend yields tend to have lower future dividend growth rates G and/or higher discount rates R. All else equal, lower dividend growth rates tend to result in smaller magnitudes of dividend payments farther in the future, which implies that the more distant future tends to have lower weights in the stock's weighted average maturity, or duration in Equation (1). Similarly, all else equal, higher discount rates imply lower contribution of dividend payments in the farther future to the present value of the stock's dividend stream, which results in lower duration. The prediction of lower duration for high dividend stocks by the dividend discount model conforms well with the well-known relation in fixed income securities: bonds with higher coupon payments tend to lower duration.

Before leaving this subsection, we shall note that whereas we use the special case of a constant dividend growth model to derive an exact formula of equity duration, the qualitative relation between the timing of dividend payments and equity duration is rather general.[3] Moreover, our empirical tests should not be viewed as literally testing the constant dividend growth model.

3.2 Empirical Methodology and Data

Guided by the intuition of the dividend discount model, we estimate the empirical (modified) duration for an asset i by performing the following regression:

$$R_{i,t} - R_{f,t} = \alpha + Duration \times (-\Delta Interest_t) + \beta \times Factor_t + \epsilon_{i,t}, \tag{4}$$

where $R_{i,t}$ is the return to asset i in month t, $R_{f,t}$ is the one-month Treasury bill rate in month t, $\Delta Interest_t$ is the change in long-term interest rates, and $Factor_t$ is the return to stock market factors in month t. Consistent with the convention in bond duration, we use the negative of $\Delta Interest_t$ in our regression so that the our *Duration* estimate can be interpreted as the percentage decrease in prices associated with a one-percent increase in interest rates. In our baseline specification, we use the excess return to the aggregate stock market portfolio as the return factor. We augment the market factor with the size and value factors from the Fama and French (1993) model and the Jegadeesh and Titman (1993) momentum factor as an alternative specification. To proxy for long-term interest rates, we use the yields on 10-year Treasury notes. Our results are robust to alternative interest rate proxies such as yields on 5-year Treasury notes.

Our sample includes common stocks listed on the New York Stock Exchange (NYSE), American Stock Exchange (AMEX), and National Association of Securities Dealers Au-

[3]The case of constant dividend growth rate can easily be extended to accommodate multiple stages of firm growth. For instance, consider a firm that pays no dividends during its initial growth stage from year t to $t+\tau-1$. The firm initiates dividend payments in year $t+\tau$ with a growth of rate G. It is straightforward to show that the Macaulay duration for this firm equals $R/(R-G)+\tau-1$, and modified duration equals $1/(R-G)+(\tau-1)/R$. Therefore, the firm's equity duration is increasing with τ, the length of the period the firm retains all the (or does not generate) earnings.

tomated Quotations (NASDAQ) during the period from July 1963 to December 2014, as available from the Center for Research in Security Prices (CRSP). Consistent with prior literature, we require the CRSP share codes to be either 10 or 11 and exclude stocks with prices below $5 as of the portfolio formation date.

Accounting data such as dividends to common shareholders are from the Compustat. Macroeconomic data such as the Treasury bond yields come from the Federal Reserve Economic Data (FRED) maintained by the St. Louis Fed. Our institutional holdings data come from the SEC 13 F filings and mutual fund holdings data from the SEC N-30D filings, both collected by the Thomson Reuter. Mutual fund returns, flows, dividends and other fund-specific information come from the CRSP. Data on stock return factors and risk-free rates are from Kenneth French.

4 A Long Duration Puzzle of High Dividend Stocks

4.1 Baseline Results

We start by estimating how the interest rate sensitivity of stocks prices is related to their dividend payouts. To reduce the estimation error, we follow the standard approach in the asset pricing literature by estimating stock duration on portfolio levels. Specifically, at the end of each June from year 1963 to year 2014, we sort stocks into quintile portfolios based on their dividend to price ratios (or dividend to book equity ratio) measured at the most recent fiscal year end. We compute the value-weighted returns for each quintile portfolio, and then estimate the duration of each portfolio by performing regression (4). Our proxy for the interest rate is the yield on 10-year Treasury notes.[4]

Table 1 presents the estimation results. Counter to the intuition from the dividend discount model, which predicts a negative association between equity duration and dividend

[4]We have used the yield on 5-year Treasury notes as an alternative measure of the interest rate and obtained qualitatively similar results. For even longer maturities, the U.S. Treasury discontinued the 20-year constant maturity series at the end of calendar year 1986 and reinstated that series on October 1, 1993. As a result, there are no 20-year rates available for the time period January 1, 1987 through September 30, 1993. Similarly, 30-year Treasury constant maturity series was discontinued on February 18, 2002 and reintroduced on February 9, 2006. We therefore focus on the yield on 10-year Treasury notes.

yield, we find that the duration of the portfolios increases monotonically with the dividend yields. Stocks with high dividends tend to experience decreases in returns when long term bond yields increase, while those with low dividends tend to earn higher returns when interest rates hike up. Economically, when long-term bond yields increase by 1%, the returns on the high dividend stocks in Quintile 5 decrease by 1.35%, and the returns on the low dividend stocks in Quintile 1 increase by 1.11%. The difference in duration between the high and low dividend stocks is 2.46%, both economically large and statistically significant. The result is robust when we use dividend to book equity ratios to form portfolios.

The tendency of high dividend stocks to have a long duration is robust throughout our sample period. In Figure 2, we estimate the duration for the high and low dividend quintile portfolios using a 10-year rolling window regression. It indicates that the equity duration for high dividend stocks is consistently positive and above 1 most of the time. In contrast, the duration for the low dividend counterparts is consistently below 0. The effect is particularly strong toward the end of our sample period. The duration for the high dividend stocks reaches to above 3 when estimated using the most recent 10 years of data.

We shall note that the high duration of high dividend stocks does not simply reflect their high exposures to movements in the aggregate stock market. For all the regressions in Table 1 and Figure 2, we estimate equity duration after controlling for the variation in stock market returns. Moreover, in the alternative specification in Table 1, we control for the influence of other systematic risk factors such as the size, value, and momentum factors. We conclude from these results that high dividend stocks tend to have longer duration, which contradicts the prediction from the dividend discount model.

Before digging into this puzzle, we examine the broad characteristics of high dividend stocks to better understand what types of firms tend to have high dividend payouts. Table 2 shows the loadings of returns on high and low dividend stocks to the market, size, value, and momentum factors over our sample period. The results indicate that high dividend stocks tend to have lower stock market beta, which is consistent with the idea that high dividend stocks tend to be more defensive, with less cyclical cash flows moving with the aggregate economy. Another strong result from Table 2 is the higher loadings of high dividend stocks on

the value factor, which is consistent with the intuition exposited in Subsection 3.1 that firms with lower (higher) future growth prospects tend to pay higher (lower) dividends. These two salient features are robust to using the dividend yield or dividend to book equity ratio to measure dividend payouts. When we use the dividend to book equity ratio to form portfolios, we find that high dividend stocks tend to be larger, although this result disappears when we measure dividend payouts using the dividend yield. In summary, in line with our intuition, we find firms with less cyclical cash flows and lower future growth prospects tend to pay out more dividends, which nevertheless have a longer duration.

4.2 Cash Flow Volatility and Distance to Default

One caveat of the dividend discount model is that it does not take into account the uncertainty of the cash flows. As argued by Haugen and Wichern (1974), risky securities may be less sensitive to interest rate changes and have shorter duration, because the relative contribution from distant cash payments to the total present value is small as compared with a risk free security. In other words, the certainty equivalents of risky securities' future cash flows decay with increasing terms.

The link between cash flow risk and dividends is strongly rooted in the dividend literature. Lintner (1956) reports that managers are reluctant to distribute higher dividends if they face high uncertainty and may have to reduce the future dividend payment due to lower earnings. This finding of conservatism in dividend policy is confirmed by a more recent study by Brav et al. (2005). Hoberg and Prabhala (2009) provide empirical evidence that dividends are negatively related to firms' cash flow risk. If stocks with higher dividends tend to have lower cash flow risk, then their sensitivity to interest rate changes will be relatively larger. This consideration leads us to examine whether the long duration of high dividend stocks may be driven by their low cash flow risk. As shown in a recent stream of studies documenting a secular increase in idiosyncratic risk and its importance in driving firms' cash flow risk (Campbell et al., 2001; Campbell and Taksler, 2003; Pastor and Veronesi, 2003; Brandt, Brav, and Graham, 2005), we study whether the high interest rate sensitivity of the high dividend stocks is due to their potential lower idiosyncratic risk.

We perform double sorts. Specifically, at the end of each June, we independently sort stocks into five quintile portfolios on the basis of their dividend to price ratios along one dimension and idiosyncratic volatilities in the past year along another dimension. Twenty-five portfolios thus emerge from the intersection of the double sorts. We then estimate the interest rate sensitivities of the portfolios using Regression (4). As shown in Table 3, conditional on the level of idiosyncratic volatility, stocks with high dividends continue to have higher duration. Impressively, the duration puzzle remains strong even for the groups of stocks with low idiosyncratic volatility, suggesting that cash flow risk cannot fully explain the duration puzzle.

Another related explanation is the distance to default, which determines the expected life expectancy of firms' cash flows. When a firm files for bankruptcy, it may pay a liquidating dividend to its shareholders, which truncates the distribution of its future cash flows to zero and results in a lower duration. Intuitively, a financially distressed firm with a low distance to default may have limited ability and/or willingness to distribute dividends to shareholders. If the portfolio of low dividend stocks contains a large proportion of financially distressed firms with a low distance to default, the portfolio's duration may be low for this reason.

In Table 4, we test whether distance to default could explain the duration puzzle. We measure the distance to default following Bharath and Shumway (2008). Their measure is based on the Merton (1974) bond pricing model, but does not require solving for the implied asset value and volatility. Similar to what we did in Table 4, we double sort stocks into 25 portfolios based on firms' distances to default and dividend to price ratios. We find that controlling for the distance to default, stocks with high dividends continue to have higher duration than those with low dividends. These results reinforce the long duration puzzle of high dividend stocks, and motivate us to search for an explanation based on the behavior of investors in dividend-paying stocks.

5 A Hypothesis of "Reaching for Dividends"

Inspired by the growing literature on how investor demand moves asset prices, in this section we explore the demand for high dividend stocks and its potential influence on their prices, advancing a hypothesis of reaching for dividends when interest rates fall. While a full explanation of the long duration puzzle for high dividend stocks should involve many forces and clearly goes beyond the scope of this paper, we believe that the particular mechanism of interest rate-sensitive investor demand represents an important factor contributing to this phenomenon.

5.1 Reaching for Dividends when Interest Rates Fall: A Hypothesis of Investor Demand

What is special about dividend payout in and of itself? According to Miller and Modigliani (1961), a firm's dividend policy per se is irrelevant to its value in the world with perfect capital markets, because investors can transform income to capital gain and vice versa without costs according to their own preferences, e.g., creating "home-made" dividends by realizing capital gains. In real capital markets with frictions, however, the transformation between income and capital gains incurs transaction costs.[5] For investors demanding regular income streams over a long period, e.g., retirees who demand regular monthly income flows to finance their desired consumption plans in the next 15 years, or insurance companies that offer annuities so that they are obligated to make regular cash payments to the policy holders for a long period of time, the income component of returns may have desirable attributes that attract their demand.

A natural place for investors to gain income-driven assets is the bond market. In particular, long-term bonds may have special advantages for long-horizon investors with relatively well defined income demand. The ability of long-term bonds to finance future consumption

[5]Huberman (1990) presents a model in which dividends may be irrelevant even in capital markets with transaction costs. In his model economy, investors have a flexible liquidity account that absorbs any shocks from dividend payments so that their optimal portfolio choice is not affected by dividend payments. In our hypothesis, however, certain investors are liquidity-constrained so that income from dividend-paying firms is an important attribute influencing their demand.

streams, however, depends on the level of interest rates. Under the environment with persistently low interest rates (e.g., nominal and real interest rates hovering slightly above zero in the current extremely accommodative monetary policy regimes), long-term bonds tend to lose their superior long-term investment value. A greener pasture for income-oriented investors in such an environment may be dividend paying stocks, especially those with high dividend yields that offer sufficiently powerful income streams to support desirable consumption plans. We argue that this hypothesis of "reaching for dividends" in a low interest rate environment is an important contributor to the longer duration of high dividend stocks.

5.2 Initial Empirical Support

Motivated by this hypothesis, we first examine if the relative valuation ratio of high dividend stocks varies with the level of interest rates. The idea is that if lower interest rates lead income-oriented investors to tilt their demand for dividend-paying stocks, their higher demand could drive up the prices of those stocks and their valuation ratios.

To examine this conjecture, we study the relative valuation of high and low dividend stocks and its relation with long-term interest rate. At the end of each June we form quintile portfolios based on the dividend to price ratio, which are rebalanced at the end of next June. Monthly market to book ratio (M/B) is calculated as the total market capitalization of equity divided by the total beginning-of-quarter book value of equity for each portfolio. We calculate the spread in M/B between the top and bottom quintile portfolios. We then perform a monthly time-series regression of the M/B spread on 10-year Treasury note yield. Column (1) of Table 5 shows that the coefficient on the long term bond yield is negative and significant, which suggests that when interest rate decreases, the high dividend stocks tend to become more expensive relative to low dividend stocks.

Whereas our hypothesis of reaching for dividends focuses on how the level of interest rate can drive investor demand between high dividend stocks and fixed income assets such as long-term bonds, another factor that may affect investors' investment decisions between dividend paying stocks and bonds is the relative risks of the stock and bond markets. For instance, high equity risk may deter investors from allocating a high portion of wealth to

stock markets. Therefore, controlling for the risks of the two markets would allow us to draw a sharper inference of the marginal contribution of the level of interest rate to the valuation spread. Column (2) shows that the negative relation between long-term bond yield and the valuation spread is indeed stronger once we control for the volatility of stock and bond markets. Also, consistent with relative risks being a factor that influences investors' relative preference for bonds versus dividend paying stocks, the relative valuation of high dividend stocks decreases when stock volatility is high, but increases when bond volatility is high.

For a detailed dynamic description, Figure 3 plots the relation between the valuation spread and interest rate. We filter out the effect of stock and bond market volatility to focus on the marginal contribution of interest rate to the valuation spread. Consistent with Table 5, high dividend stocks tend to experience an increase (decrease) in valuation relative to low dividend stocks when interest rate is low (high). The correlation between the two time series is -0.42 with a p-value of 0.0001. The negative relation between the two series tends to hold during most of the sample period, and the pattern is particularly strong after 1990, with a correlation coefficient of -0.57.

Our hypothesis of reaching for dividends hinges upon the dynamic relation between the level of interest rates and investor demand for high dividend stocks. To explicitly investigate investor demand for high dividend stocks, we exploit a data set of comprehensive stock holdings by institutional investors. We seek to examine if the demand for high dividend stocks by institutions varies with the level of interest rates. To this end, we first divide stocks into five portfolios based on their dividend yields and compute each portfolio's weight in an aggregate value-weighted market portfolio in each quarter. Then we partition institutional investors' stock holdings into five legal types: banks, insurance companies, mutual funds, independent advisors, and pension funds (including endowments and others) and compute their holdings of high dividend stocks in the aggregate portfolio of each institutional type. We use the weights of high dividend stocks in a particular institutional type's portfolio in excess of the weight of high dividend stocks in the market portfolio as our initial proxy for the demand tilt by the particular institutional type. Finally, to evaluate how the excess demand of each type of institutions varies with the level of interest rates, we group calendar

quarters in our sample into high and low interest rate periods, which refer to the top and bottom 20% of quarters ranked on the basis of the 10 year Treasury note yields.

Figure 4 plots the average excess portfolio weights of high dividend stocks in the portfolio of each institutional type under low and high interest rate regimes. The results indicate that despite the widespread underweighting of high dividend stocks across institutional types in high interest rate environments, they all tend to increase the weights of high dividend stocks in their portfolios relative to the market when interest rate declines. Among the five types of institutions, mutual funds are especially responsive to interest rate changes. Although they underweight high dividend stocks relative to the market portfolio by 4.5% when interest rate is high, they overweight those stocks by 2.3% during the low interest rate period. Another institutional type that stands out is insurance companies, which choose to underweight high dividend stocks by 3.6% when interest rates are high, but overweight them by 0.7% when interest rates are low.

We then perform multivariate regressions to formally test how the demand by each type of institutions varies with the level of interest rates. We are able to find reliable evidence for the dynamic preference for high dividend stocks by insurance companies, mutual funds, and independent advisors, which is reported in Table 6. Specifically, we run panel regressions of the fraction of stocks owned by each type of institutional investors on the dividend price ratio of the stocks, an interaction term between dividend price ratio and the level of yields on 10-year Treasury notes, and a battery of control variables including firm size, book-to-market ratio, past annual return (momentum), the membership in the Standard & Poors 500 Index, and time fixed effects. The first column in Table 6 shows that unconditionally, there is a tendency for institutional investors to avoid high dividend stocks, which is consistent with the findings by other studies that individual investors prefer high dividend stocks. The second column shows that the preference of insurance companies, mutual funds, and independent advisors for high dividend stocks significantly increases when the interest rate decreases.

5.3 Income-Oriented Equity Funds

In this subsection, we build on the evidence in the previous subsection that mutual funds as a group exhibit a strong preference for high dividend stocks when interest rate is low. We exploit detailed information on individual mutual funds and study the behavior of fund flows and fund managers' portfolio selection in different interest rate regimes. Among mutual funds, income-oriented funds constitute the most natural buyers of high dividend stocks, which leads to our focus. We flesh out fresh evidence that when interest rate is low, mutual fund investors particularly favor the high income flows from income funds. They switch more money to those funds that generate particularly high dividends, the effect of which is incremental to funds' performance based on total returns. The resulting higher demand for high dividend stocks when interest rate is lower appears to drive up their interest rate sensitivity.

The main objective of income-oriented funds, as typically stated in their prospectus, is to seek relatively high current income and growth of income by investing primarily in dividend-paying stocks. Consistent with their stated objective, we find in Table 7 that income funds on average indeed overweight dividend paying stocks. During the period from 1980 to 2014 when detailed information on individual fund holdings is available, Column 1 of Table 7 shows that income funds overweight the stocks in the highest 20% dividend yield bracket by 3% and those in the second highest bracket by 6.8%. In contrast, they on average underweight stocks in the lowest 20% dividend yield portfolio by 8.1%.

The allocation between low and high dividend stocks by income funds appears to depend on the level of interest rates. When interest rate is low, we find that income funds exhibit strong preferences for holding high dividend stocks: They overweight stocks in the top quintile with the highest dividend yields by 4.5%, and overweight stocks in the fourth highest dividend yield quintile by 9.3%. When interest rate is high, however, income funds tend to be more reluctant to overweight high dividend stocks. In fact, they underweight stocks in the top quintile with the highest dividend yields by 1.3%, and reduce the overweighting of stocks in the second highest dividend bracket to 5%. It is this dynamic shift of the strength

of preferences for dividend paying stocks that is central to our hypothesis.[6]

How to understand the dynamic investment behavior of income funds? Viewed through the perspective of financial intermediation, mutual funds amount to pools of money from ultimate investors seeking to achieve their own investment objectives. Income funds naturally aggregate the stock of money from investors with an objective of income generation. Since fixed income assets and dividend paying stocks provide a reliable source of cash flows for the purpose of income generation, they are the natural habitat for income-oriented investors and mutual funds. The investment opportunities in fixed income markets depend critically on the level of interest rates. In particular, when both real and nominal interest rates trend down, bond valuation is inflated and the income-generating ability of bonds is weakened. Accordingly, the relative attractiveness of dividend paying stocks is accordingly increased. This mechanism, which is at the heart of our reaching for dividends hypothesis, yields three testable predictions in the context of income funds, which we will examine one by one.

Prediction (1): When interest rates go down, investors switch more money to income-oriented equity funds. Figure 5 provides evidence consistent with this prediction. It shows a strong comovement between flows to income-oriented equity funds and long-term interest rates. To tease out the influence of aggregate flows into and out of equity funds, we measure proportional flows to income mutual funds in excess of the proportional flows to all equity mutual funds. The results indicate that during the high interest rate regime such as early 1980s, income funds tend to receive less flows compared with other equity mutual funds. In contrast, during the low interest rate period, such as the period post the millennium, income funds receive more money flows than their peer equity mutual funds. The excess flows to income funds reaches to its apex around 2011–2013 period, where the long term interest rate is reaching its lowest historical level. Over the entire sample period, the excess flows to income funds and long-term interest rates have a correlation of -0.50, which is statistically significant at 1% level.

[6] As a back-of-envelope calculation, since the average stock holdings of equity income funds represent 72% of the total mutual fund equity holdings as computed from the SEC 13F filings, their overweighting of the top quintile dividend stocks by 4.5%, all else equal, translates into 3.2% overweight of high dividend stocks in the aggregate mutual fund portfolio. This computation suggests that income funds drive the 2.3% aggregate mutual fund portfolio tilt toward high dividend stocks when the interest rate is low as shown in Figure 4.

Prediction (2): When interest rates are low, investors reward income funds with higher dividend yields by allocating more money to those funds. Table 8 provides evidence consistent with this prediction. It reports the flow-performance relation for income funds. Unlike the previous flow-performance analyses, we separately examine of the effects of funds' past net returns and their dividend yield components on fund flows. A fund's dividend yield is measured as the ratio between the amount of dividend distribution and the NAV at which the dividends can be reinvested. To capture the dependence of the flow-performance relation on the level of interest rates, we include in the regression interaction terms between the two performance measures and long-term interest rates. We find that unconditionally investors are indifferent between receiving capital gains or dividend yields, which is evidenced by the significant positive coefficient on fund return yet insignificant coefficient on dividends. However, investors tend to switch attention from net fund returns to dividends when interest rates are low. For example, when quarterly interest rate is at its lowest 20% quintile over the sample period, a 1% increase in past quarter fund returns increases flows to income funds by 0.253%. In contrast, a 1% increase in past quarter dividend yields increases flows by 2.762%, which is 11 times stronger than the effect of fund returns.

Overall, Figure 5 and Table 8 provide supporting evidence that mutual fund investors reward income-oriented mutual funds and especially the income funds with high dividend yields by switching more money to those funds, when long-term interest rate is low. Consistent with the evidence in Table 7, as mutual fund investors prefer to receive dividends rather than capital gains, income fund managers rationally respond to their clients by reaching for high dividend stocks during the low interest rate period.

Prediction (3): Stocks with large holdings by income funds have a longer duration, i.e., their prices are particularly sensitive to interest rate movements. Finally, we examine whether income funds' demand for high dividend stocks during the low interest rate period serves as a contributing factor to the duration puzzle documented in our paper. To this end, we test whether the duration of high dividend stocks varies with the amounts held by income funds. Previous literature finds that to accommodate flows into or out of mutual funds, their managers tend to at least partially scale up or down their existing portfolio positions (Lou,

2012). This result implies that stocks held more by income funds may experience stronger flow-induced demand pressure, which, combined with the sensitivity of income fund flows to interest rates, leads those stocks to a higher interest rate sensitivity. Table 9 presents the duration estimates for the 25 portfolios sorted by stocks' dividend to price ratios and their weights held by income funds in excess of their weights in the market portfolio. We find for high dividend stocks, those with high income fund holdings tend to have longer durations than those with low income fund holdings. The interest rate sensitivity for high dividend stocks is the strongest for the portfolio with the highest income fund holdings. 1% increase in interest rate would decrease the returns of the portfolio by 1.84%, which is three times the effect on their low income-fund-holding counterparts.

6 Conclusions

The persistently low interest rate around the globe has highlighted the importance of interest rate risk in driving the value of financial assets. This paper studies the duration of individual stocks, i.e., the sensitivities of stock prices to changes in interest rates, to advance our understanding of this important issue. We find that, counter to the intuition from the dividend discount model, stocks that pay higher dividends tend to have longer duration, experiencing greater price declines (increases) when interest rates rise (fall). We refer to this phenomenon as the long duration puzzle on high dividend stocks.

We then focus on one particular mechanism based on investor demand to explore the potential driving forces of this puzzle. Specifically, we use data on mutual fund flows and institutional investor holdings, and find evidence of "reaching for dividends": when interest rates fall, investors switch more funds to income-oriented mutual funds, and the weights of high dividend stocks in the portfolios of income-dependent institutions such as income mutual funds and insurance companies increase. The resulting higher demand for high dividend stocks appears to increase the sensitivities of their prices to interest rate changes, thereby contributing to their long duration puzzle.

Our results point to interesting future research. One direction is to deepen the study

of investment behavior of retail and institutional investors across asset classes, especially between long-term bonds and high dividend stocks. Our evidence suggests that these two asset classes compete to win investors' wealth allocation, and that the flows of funds across the asset classes vary through different interest rate regimes and thus the business cycle. This naturally connects to the widely known but very controversial Fed model, which states that the valuation ratios of stocks and bonds, i.e., the stock earnings yield and long-term bond yield, tend to move in unison in equilibrium. We plan to explore this question in subsequent research.

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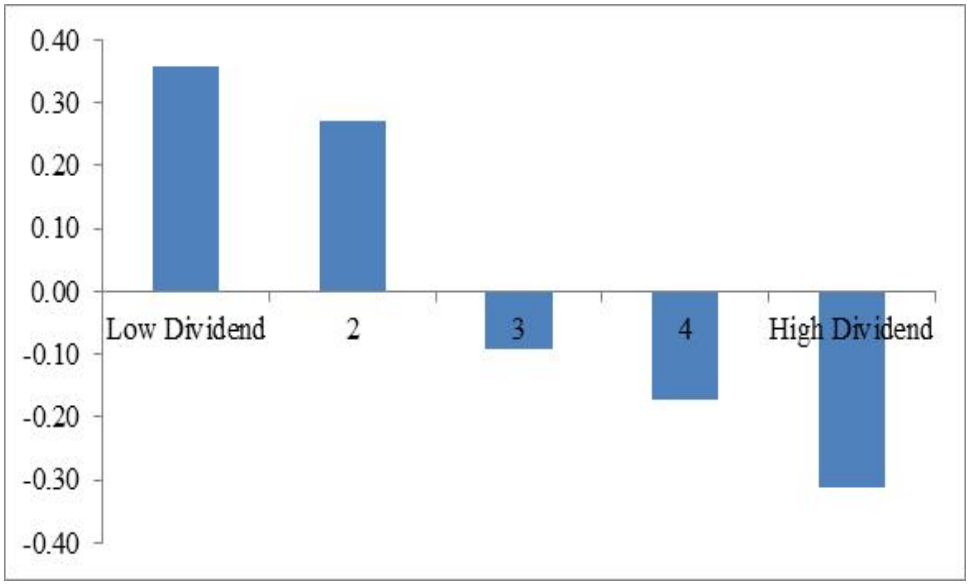
Panel A Dividend Yield Sorted Portfolios



Panel B Dividend Payout D/BE Sorted Portfolios

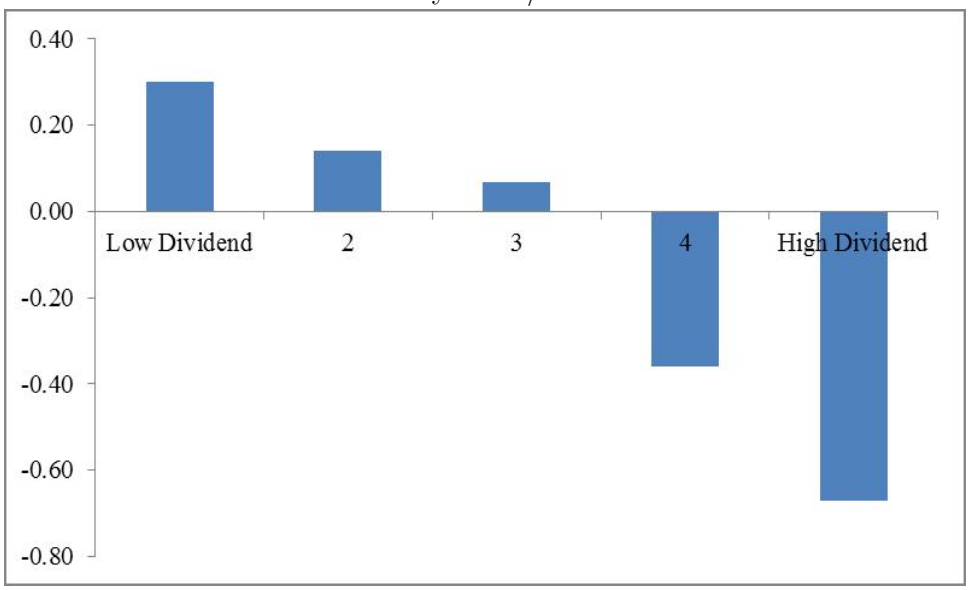
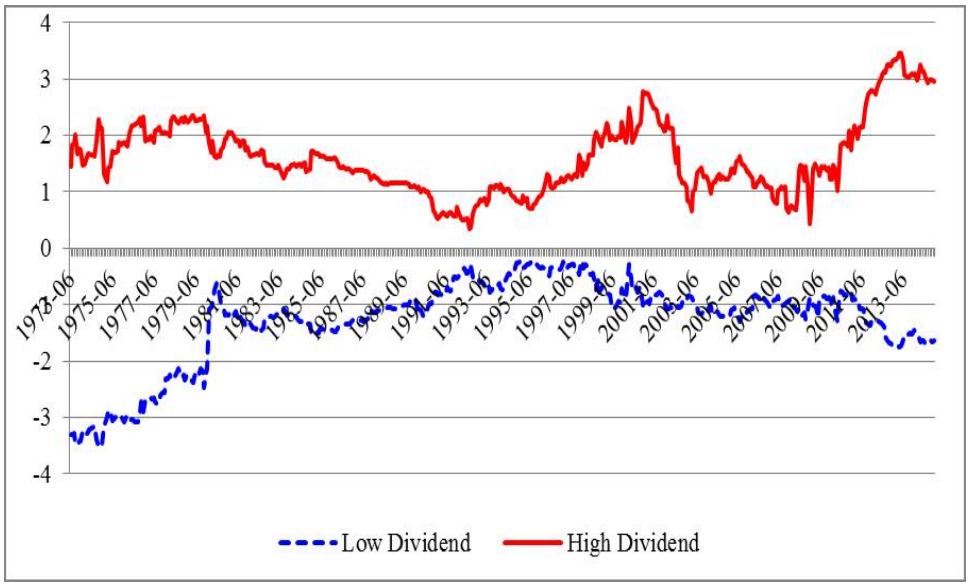


Figure 1: Market Adjusted Returns to High Dividend Stocks during Taper Tantrum

This figure shows the market adjusted returns for high and low dividend stock portfolios during the episode of taper tantrum, when the Federal Reserve Chairman Ben Bernanke expressed optimism about economic conditions and suggested a reduction in asset purchases by the Fed later in 2013: [T]he Committee currently anticipates that it would be appropriate to moderate the monthly pace of purchases later this year. The yields on 10-year Treasury notes jumped from 2.00% to 2.33% from 18 June to 19 June 2013. To form dividend yield portfolios, we rank stocks into quintiles based on their dividend to price ratios (Panel A) or dividend to book equity ratios (Panel B) at the end of June of 2012 and hold the portfolio until the end of June of 2013. The graph shows the daily value-weighted portfolio returns in excess of the CRSP value-weighted stock market return on 19 June 2013.

Panel A Dividend Yield Sorted Portfolios



Panel B Dividend Payout D/BE Sorted Portfolios

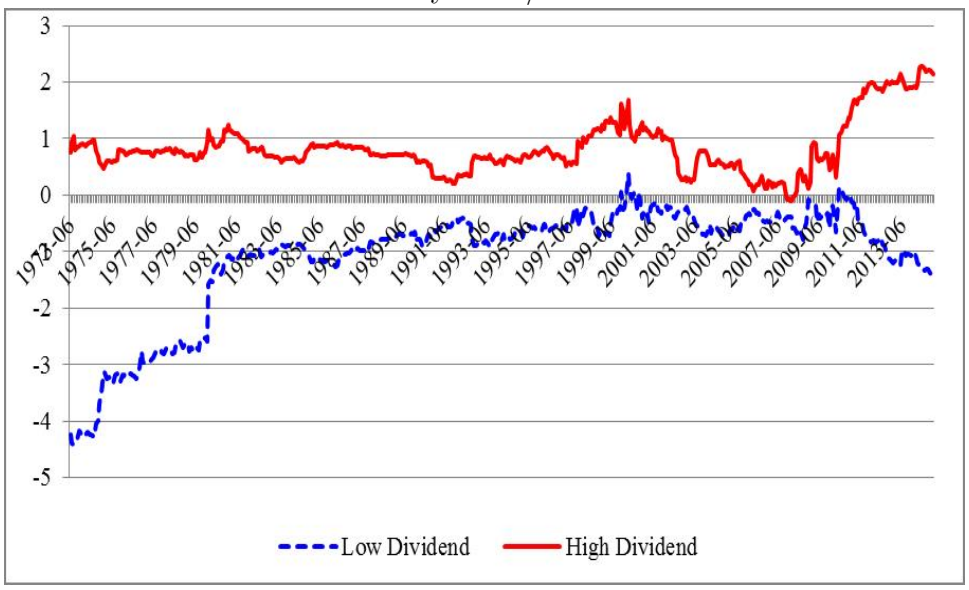


Figure 2: Time-Varying Duration Estimates for High and Low Dividend Stocks

This figure shows the estimates of duration for high and low dividend stocks over the period July 1963 to December 2014. Duration is estimated as the negative of the slope coefficients for changes in yields on 10-year Treasury notes from regressions of excess stock returns on changes in yields and stock market returns over a 10-year rolling window. In Panel A (B), high and low dividend stocks refer to stocks in the top and bottom 20% of stocks ranked on the dividend to price (dividend to book equity) ratios. We compute value-weighted return on portfolios formed at the end of each June from 1963 and rebalanced at the end of next June.

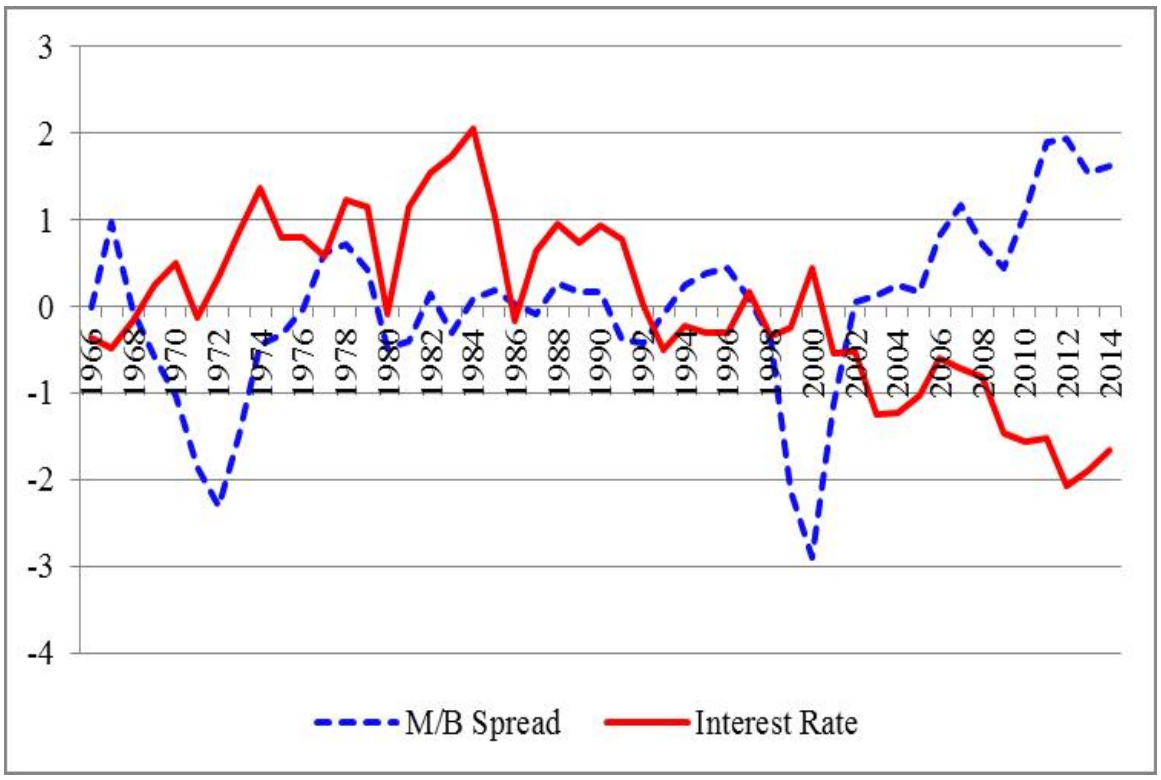


Figure 3: Valuation Spread Between High and Low Dividend Stocks and Interest Rates

This figure shows the time-series plot of difference in Market/Book ratio between the high and low dividend portfolios. We form quintile portfolios based on dividend to price at the end of each June from 1966 and rebalanced at the end of next June. Monthly market to book ratio is calculated as the total market capitalization of equity divided by the total beginning-of-quarter book value of equity for each portfolio. We calculate the difference in M/B between the top and bottom quintile portfolios. We then filter out the effect of stock and bond market volatility by regressing the valuation spread (and 10-year Treasury note yield) on the monthly volatility of daily stock market excess return and daily yield change on 10-year Treasury notes, and obtain the residuals. For ease of comparison, the figure shows the yearly average of the residuals standardized to mean 0 and unit standard deviation, with the interest rate similarly standardized.

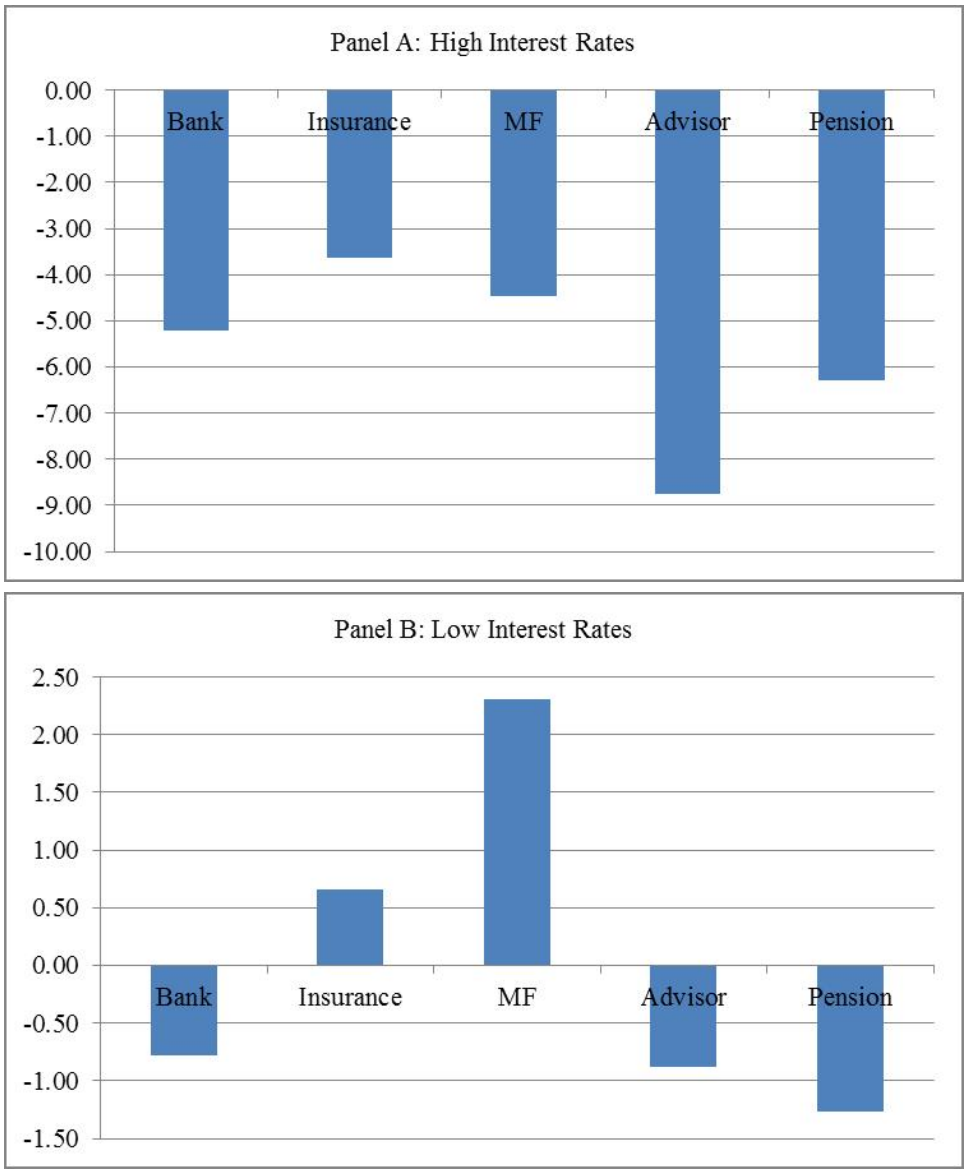


Figure 4: Portfolio Decisions of Institutional Investors for High Dividend Stocks under Low and High Interest Rate Environments

This figure shows the portfolio weights of high dividend stocks in institutional portfolios in excess of those in the market portfolio under low and high interest rate environments each quarter from 1980 to 2014. High dividend stocks include stocks in the top 20% on the basis of their ranks of the dividend price ratios. High and low interest rate periods are top and bottom 20% of quarters ranked on the basis of long-term interest rates as measured by the 10-year Treasury note yields.

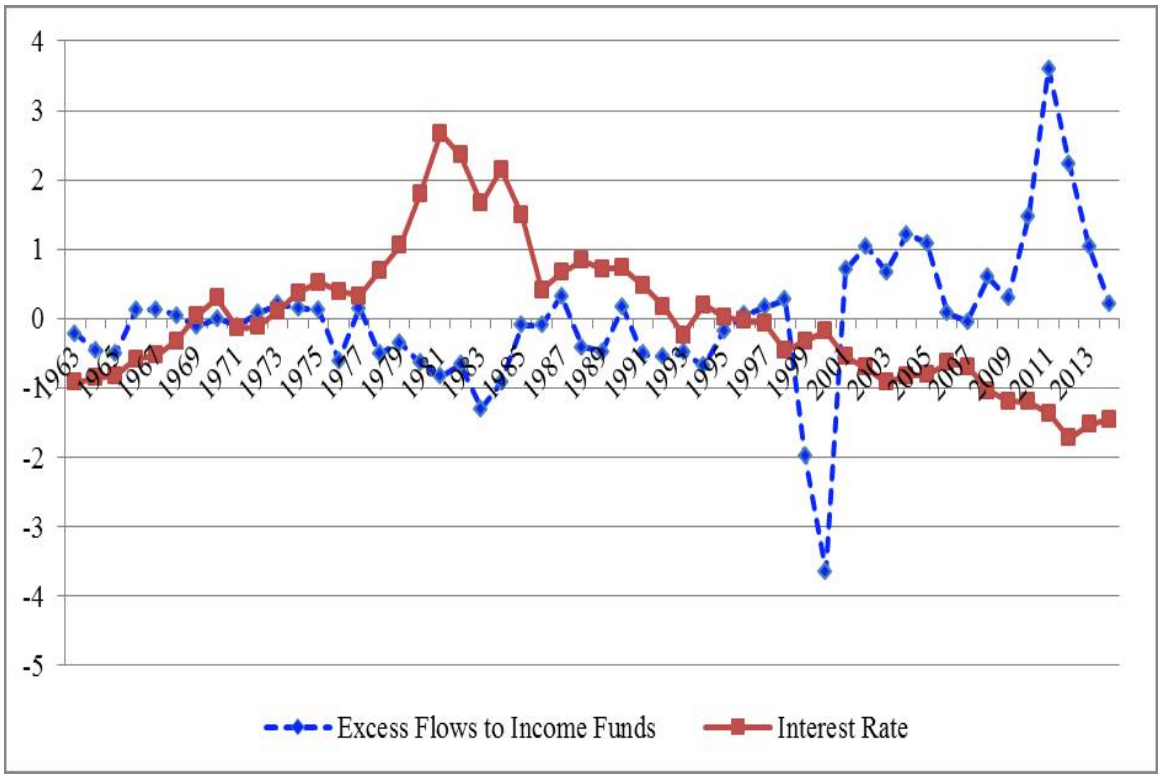


Figure 5: Fund Flows to Income-Oriented Mutual Funds and Long-Term Interest Rates

This figure shows the evolution of flows to income-oriented open-end mutual funds and long-term interest rates as proxied by the yields on 10-year Treasury notes on a yearly basis from 1963 to 2014. Flows to income mutual funds are calculated as net dollar flows divided by total net assets at the end of the previous year and are in excess of proportional flows to all equity mutual funds. For ease of interpretation, the series of fund flows and long-term interest rates are scaled to have a mean of zero and standard deviation of one. The two series have a correlation coefficient of -0.50 with a p-value of 0.0001.

Table 1: **Duration Estimates for Dividend Sorted Portfolios**

This table shows the estimates of duration for high and low dividend stocks over the period July 1963 to December 2014. Duration is estimated as the negative of the slope coefficients for changes in yields on 10-year Treasury notes from regressions of excess stock returns on changes in yields and stock market return factors. In the specification for Duration 1, we include excess aggregate stock market return; in that for Duration 2, we include excess market returns, the Fama and French (1993) size and value factors, and the Jegadeesh and Titman (1993) momentum factor. In Panel A (B), high and low dividend stocks refer to stocks in the top and bottom 20% of stocks ranked on the dividend to price (dividend to book equity) ratios. We compute value-weighted return on portfolios formed at the end of each June from 1963 and rebalanced at the end of next June. *** stands for statistical significance at the 1% level; ** 5%; and * 10%.

	Low Dividends				High Dividends	High−Low
			Dividend Yield D/P			
$Duration^1$	-1.112	0.0726	0.598	1.008	1.348	2.460***
	(-4.49)	(0.30)	(2.42)	(3.71)	(3.53)	(4.70)
$Duration^2$	-0.911	-0.0724	0.323	0.572	0.694	1.605***
	(-3.93)	(-0.31)	(1.45)	(2.76)	(2.67)	(4.18)
			Dividend Payout D/BE			
$Duration^1$	-0.978	-0.628	0.454	0.396	0.873	1.851***
	(-3.47)	(-2.67)	(2.23)	(1.69)	(3.53)	(4.50)
$Duration^2$	-0.861	-0.653	0.285	0.108	0.543	1.403***
	(-3.18)	(-2.91)	(1.55)	(0.53)	(2.77)	(3.93)

Table 2: **Characteristics of High Dividend Stocks**

This table shows the exposures of high and low dividend stocks to the market, size, value, and momentum over the period July 1963 to December 2014. In Panel A (B), high and low dividend stocks refer to stocks in the top and bottom 20% of stocks ranked on the dividend to price (dividend to book equity) ratios. We compute value-weighted return on portfolios formed at the end of each June from 1963 and rebalanced at the end of next June. *** stands for statistical significance at the 1% level; ** 5%; and * 10%.

	Low Dividends				High Dividends	High−Low
	Dividend Yield D/P					
Market	1.125	1.027	0.979	0.949	0.877	-0.248***
	(67.09)	(60.69)	(60.70)	(63.35)	(46.60)	(-8.89)
SMB	-0.0449	-0.173	-0.183	-0.16	-0.0831	-0.0382
	(-1.97)	(-7.54)	(-8.37)	(-7.86)	(-3.25)	(-1.01)
HML	-0.247	0.0491	0.185	0.381	0.672	0.919***
	(-9.82)	(1.93)	(7.64)	(16.92)	(23.79)	(22.00)
Momentum	-0.0611	-0.0274	-0.00941	-0.0638	-0.103	-0.0417
	(-3.78)	(-1.68)	(-0.61)	(-4.42)	(-5.67)	(-1.55)
$AdjR^2$	0.91	0.877	0.873	0.883	0.819	0.583
	Dividend Payout D/BE					
Market	1.189	1.148	1.059	0.974	0.885	-0.304***
	(61.60)	(71.91)	(81.45)	(67.53)	(63.48)	(-11.87)
SMB	0.169	0.0552	-0.042	-0.183	-0.29	-0.459***
	(6.32)	(2.50)	(-2.33)	(-9.16)	(-15.03)	(-12.94)
HML	-0.0251	0.0613	0.169	0.201	0.186	0.211***
	(-0.85)	(2.51)	(8.48)	(9.12)	(8.74)	(5.40)
Momentum	-0.102	-0.115	-0.0857	-0.025	-0.0585	0.0434*
	(-5.37)	(-7.31)	(-6.69)	(-1.76)	(-4.26)	(1.72)
$AdjR^2$	0.893	0.914	0.927	0.889	0.876	0.492

Table 3: **High Dividends or Low Risk?**

This table tests whether the high duration of high dividend stocks is driven by their low risk. Specifically, at the end of each June we independently sort stocks into five quintile portfolios on the basis of their dividend to price ratio along one dimension and idiosyncratic volatilities in the past year along another dimension. Twenty five portfolios thus emerge from the intersection of the double sorts. We compute value-weighted returns to these portfolios and estimate their duration as the negative of the slope coefficients for changes in yields on 10-year Treasury notes from regressions of excess stock returns on changes in yields and excess stock market returns using data from July 1963 to December 2014. *** stands for statistical significance at the 1% level; ** 5%; and * 10%.

	Idiosyncratic Volatility (IV)				
	Low IV	2	3	4	High IV
Low Dividends	-0.609	-0.704	-1.636	-1.959	-2.175
	(-1.68)	(-2.28)	(-4.20)	(-3.58)	(-3.11)
2	0.119	-0.00274	-0.0797	-0.26	0.0999
	(0.37)	(-0.01)	(-0.21)	(-0.49)	(0.11)
3	0.786	0.224	0.112	0.155	-0.496
	(2.42)	(0.74)	(0.27)	(0.29)	(-0.55)
4	1.193	0.925	0.054	0.0356	-1.558
	(3.75)	(2.83)	(0.12)	(0.05)	(-1.50)
High Dividends	1.722	0.831	-0.631	-0.082	-0.200
	(4.20)	(1.62)	(-1.15)	(-0.11)	(-0.17)
High−Low	2.331***	1.535***	1.005	1.877**	1.975
	(4.11)	(2.38)	(1.47)	(2.03)	(1.61)

Table 4: **High Dividends or Low Distance to Default?**

This table tests whether the high duration of high dividend stocks is driven by their low distance to default. This table tests whether the high duration of high dividend stocks is driven by their low risk. Specifically, at the end of each June we independently sort stocks into five quintile portfolios on the basis of their dividend to price ratio along one dimension and the distance to default along another dimension. Twenty five portfolios thus emerge from the intersection of the double sorts. We compute value-weighted returns to these portfolios and estimate their duration as the negative of the slope coefficients for changes in yields on 10-year Treasury notes from regressions of excess stock returns on changes in yields and excess stock market returns using data from July 1963 to December 2014. *** stands for statistical significance at the 1% level; ** 5%; and * 10%.

	Distance to Default (DD)				
	Low DD	2	3	4	High DD
Low Dividends	-0.732	-1.555	-0.429	-0.861	-0.888
	(-1.02)	(-2.57)	(-0.92)	(-2.12)	(-2.51)
2	-0.673	-0.339	0.478	0.0132	0.203
	(-0.80)	(-0.63)	(1.10)	(0.03)	(0.54)
3	0.521	-0.0882	0.53	0.463	0.228
	(0.76)	(-0.17)	(1.07)	(1.10)	(0.68)
4	-0.177	0.325	1.53	1.016	1.256
	(-0.24)	(0.57)	(3.68)	(2.94)	(3.36)
High Dividends	0.802	0.759	1.915	1.777	1.345
	(0.99)	(1.42)	(4.26)	(4.20)	(2.68)
HighLow	1.534*	2.314***	2.344***	2.638***	2.233***
	(1.70)	(3.08)	(3.54)	(4.52)	(3.19)

Table 5: **Valuation Spread Between High and Low Dividend Stocks**

This table examines the difference in valuation between high and low dividend stocks and its relation with long-term bond yield. We form quintile portfolios based on dividend to price at the end of each June from 1966 and rebalanced at the end of next June. Monthly market to book ratio is calculated as the total market capitalization of equity divided by the total beginning-of-quarter book value of equity for each portfolio. We calculate the spread in M/B between the top and bottom quintile portfolios. We then perform a monthly time-series regression of the M/B spread on 10-year Treasury note yield. In column (2), we control for monthly volatility of daily stock market excess return and daily yield change on 10-year Treasury notes. The standard errors are corrected for heteroscedasticity and autocorrelation. *** stands for statistical significance at the 1% level; ** 5%; and * 10%.

	(1)	(2)
10 Year Treasury Note Yield	-0.078**	-0.147***
	(-2.36)	(-3.97)
Stock Vol		-0.340*
		(-1.92)
Bond Vol		9.992***
		-3.71
Intercept	-0.858***	-0.692**
	(-3.05)	(-2.39)
# of Obs.	567	567
$AdjR^2$	0.046	0.122

Table 6: **Time-Varying Preference for High Dividend Stocks: Different Types of Institutions**

This table shows the dynamic preference of insurance companies, mutual funds, and advisors for high dividend stocks, which varies with the level of interest rates. Specifically, over the period 1980Q1 to 2014Q4, we run panel regressions of the ownership of stocks by each institutional type on the dividend price ratio, the interaction between the dividend price ratio and the level of interest rates, and several firm characteristics including size, book-to-market, past one year return (MOM), and membership in the Standard & Poors 500 Index. These regressions include time fixed effect with standard errors clustered by firm. *** stands for statistical significance at the 1% level; ** 5%; and * 10%.

	Insurance Companies		Mutual Funds		Advisors	
DY	-0.0120***	0.0236***	-0.00864*	0.0474***	-0.101***	0.0515*
	(-2.98)	(3.71)	(-1.66)	(5.92)	(-6.37)	(1.85)
$DY \times InterestRate$		-0.569***		-0.897***		-2.433***
		(-4.91)		(-6.75)		(-5.20)
$Size$	0.00655	0.0066	0.00626	0.00634	0.0183	0.0186
	(21.67)	(21.68)	(27.50)	(27.72)	(28.32)	(28.61)
BM	0.00254	0.00269	0.000508	0.000757	0.00238	0.00306
	(5.78)	(6.01)	(1.08)	(1.59)	(2.04)	(2.56)
MOM	-0.00156	-0.00144	0.000233	0.000421	0.00312	0.00363
	(-3.77)	(-3.46)	(0.51)	(0.92)	(2.74)	(3.14)
$SP500$	-0.00099	-0.00101	-0.00069	-0.00072	-0.00578	-0.00588
	(-0.70)	(-0.71)	(-0.59)	(-0.62)	(-1.86)	(-1.89)
No. of Obs	262,529	262,529	262,529	262,529	262,529	262,529
$AdjR^2$	0.141	0.141	0.34	0.341	0.382	0.383

Table 7: **Time-Varying Preference for High Dividend Stocks: Income Funds**

This table reports income funds portfolio weights in excess of the market weight for stocks of different dividend yield levels. For each quarter, we short stocks into quintile portfolio based on its beginning of year dividend-price ratio. We calculate income funds weights in each of the portfolios and subtract their weights in the market portfolio. We report the time series average of the excess weights for the whole sample period, as well as the average excess weights during the different interest rate regimes. High and low interest rate periods are top and bottom 20% of quarters ranked on the basis of long-term interest rates as measured by the 10-year Treasury note yields. *** stands for statistical significance at the 1% level; ** 5%; and * 10%.

		Interest Rate Regime					
	Whole Sample	Low	2	3	4	High	High −Low
Low Dividends	-0.081	-0.103	-0.112	-0.09	-0.061	-0.042	0.061***
	(-25.79)	(-41.22)	(-20.52)	(-9.45)	(-20.84)	(-15.06)	(16.31)
2	-0.034	-0.063	-0.027	-0.035	-0.033	-0.008	0.055***
	(-13.00)	(-17.45)	(-4.04)	(-8.57)	(-7.23)	(-2.32)	(10.78)
3	0.016	0.029	0.03	0.02	-0.013	0.01	-0.019**
	(5.80)	(4.65)	(4.97)	(3.08)	(-2.33)	(2.08)	(-2.46)
4	0.068	0.093	0.053	0.07	0.067	0.05	-0.039***
	(32.08)	(19.90)	(17.42)	(20.15)	(17.85)	(18.38)	(-7.06)
High Dividends	0.03	0.045	0.056	0.036	0.04	-0.013	-0.058***
	(8.48)	(12.28)	(8.63)	(14.37)	(7.05)	(-1.48)	(-5.98)

Table 8: **Dividend Yield and Competition among Income Funds**

This table reports the flow-performance relation for income funds. We separately examine the effects of funds past quarter net returns (Fund Return) and their dividend yield component on the current-quarter flows. Dividend yield is measured as the ratio between the amount of dividend distribution and the NAV at which the dividends can be reinvested. We also include interaction terms between the performance measures and long-term interest rates, i.e., the yield on 10-year Treasury notes. In column 2, Interest Rate is a continuous variable during the quarter of flow. In column 3 and 4, Low Interest Rate is an indicator variable that takes a value of 1 if the interest rate during the quarter is among the lowest 50% and 20% over the entire sample period. Past flow is the flow over the past quarter. We conduct panel regression with time fixed effects. The standard errors are clustered on the fund share class level. *** stands for statistical significance at the 1% level; ** 5%; and * 10%.

	(1)	(2)	(3)	(4)
$FundReturn$	0.573***	-0.135	0.630***	0.697***
	(6.39)	(-0.43)	(4.59)	(6.69)
$Dividends$	0.634	3.629***	-0.841	-0.538
	(1.30)	(2.67)	(-1.23)	(-0.98)
$FundReturn \times InterestRate$		0.138***		
		(2.52)		
$Dividends \times InterestRate$		-0.605***		
		(-2.59)		
$FundReturn \times LowInterestRate$			-0.085	-0.444**
			(-0.48)	(-2.17)
$Dividends \times LowInterestRate$			2.128**	3.047***
			(2.30)	(2.90)
$PastFlow$	0.304***	0.304***	0.304***	0.304***
	(27.46)	(27.43)	(27.46)	(27.42)
$Intercept$	-0.003	0.005	-0.004	0.002
	(-0.18)	(0.32)	(-0.28)	(0.15)
# of Obs	35,976	35,976	35,976	35,976
$AdjR^2$	14.89%	14.93%	14.90%	14.94%

Table 9: **Duration and Income Fund Holdings**

This table tests whether the duration of high dividend stocks varies with the holdings by income funds. Over the period of 1980Q1 to 2014Q4, we sort stocks first by their dividend to price ratio and then by their beginning-of-quarter weights held by income funds in excess of their weights in the market portfolio. 25 portfolios thus emerge. We calculate the monthly returns of these portfolios and estimate their duration as the negative of the slope coefficients for changes in yields on 10-year Treasury notes from regressions of excess stock returns on changes in yields and excess stock market returns using data from January 1980 to December 2014. *** stands for statistical significance at the 1% level; ** 5%; and * 10%.

	Rank by Excess Weights Held by Income Funds					
	Low	2	3	4	High	High−Low
Low Dividends	-0.301	-0.628	-0.349	0.106	-0.614	-0.313
	(-0.71)	(-2.20)	(-0.89)	(0.22)	(-1.47)	(-0.82)
2	0.147	0.556	0.191	0.006	0.041	-0.106
	(0.34)	(1.72)	(0.51)	(0.01)	(0.11)	(-0.26)
3	0.434	0.515	0.69	0.627	0.766	0.332
	(0.98)	(1.54)	(1.68)	(1.38)	(2.14)	(0.73)
4	0.56	0.951	0.95	1.091	1.113	0.553
	(1.35)	(2.68)	(1.88)	(2.29)	(3.16)	(1.26)
High Dividends	0.596	1.404	0.837	0.594	1.836	1.240**
	(1.31)	(3.05)	(1.39)	(0.87)	(3.97)	(2.51)