What drives short duration premium

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ABSTRACT

Equity duration is the present value weighted cash flow maturity. It measures the sensitivity of the price to the change of interest rate. Using a present value decomposition approach, I calculate the contribution of cash flow news and discount rate news to the unexpected returns for portfolios based on equity duration. Surprisingly, the cash flow news is the main driver across portfolios that are composed of stocks with long duration or short duration. Stocks characterized by a shorter duration earn a return premium over stocks with a longer duration. Though the short-duration premium embeds value premium, it cannot be a substitute for the intangible adjusted book-to-market ratio. Portfolio analyses indicate that the premium is concentrated on small stocks and stocks that are possibly short-sale constrained.

Keywords: Equity duration, Anomalies, Value premium, Short-sale constraints, Present value decomposition.

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1 Introduction

Equity duration, which is defined as the present value weighted average maturity of the equity cash flow, measures the discount rate risk. In the fixed-income market, securities with longer maturity usually exhibit larger yield to maturity, which is shown using the increasing yield curve. However, in the stock market, the life of a firm is assumed to be infinite and we do not have a well-defined concept of maturity. Dechow, Sloan, and Soliman (2004), borrowing the idea of Macaulay duration from the fixed-income market, propose a new measure for stock risk, the equity duration. Unlike the increasing term structure in fixed-income market, many papers document a decreasing term structure for equity (see Van Binsbergen and Koijen (2017) for a summary) and suggest a negative relation between equity duration and future stock returns—the so called short-duration premium (see e.g. Lettau and Wachter (2007), Weber (2018)). Intuitively, smaller duration implies that cash flow of the stock comes early and thus the stock price is not sensitive to discount rate news. In this paper, we explore the following research questions: are stocks with high duration empirically more sensitive to discount rate news (DR news)? Is the duration premium just a reflection of value premium as duration and book-to-market ratio are negatively related? Is this anomaly risk-based or behavior-based? To this end, our paper makes use of Campbell-Shiller present value decomposition to explore the role of cash-flow news (CF news) and discount rate news for returns of portfolios with different duration. Furthermore, we provide new evidence on if duration premium could subsume value premium using intangible adjusted book-to-market ratios. Consistent with Weber (2018), our evidence supports the short-sale constraints to be a cause for the premium.

The main contribution of this paper is to employ present value decomposition in the context of duration anomaly. This approach enables us to study directly the contribution of cash flow news and discount rate news to the unexpected return news of stocks with different duration. Theoretically, as duration is the measure of price sensitivity to the change of interest rate, we expect that the discount rate news becomes a more important driver of the unexpected returns as stocks' duration increases. Besides, we also assume that for portfolios composed of stocks with high (low) duration, the contribution of DR news should be more (less) significant than that of CF news. To test these arguments, we first estimate the equity duration following Santa-Clara (2004). Unlike fixed-income securities, the stock is (theoretically) long-lived with infinite life, and we do not have certain cash flows in the future as the dividends paid by firms are highly uncertain. Santa-Clara (2004) tackle these two problems by assuming a level perpetuity for the terminal cash flow stream after T periods, and forecasting future cash flows based on financial performance measures. Then we rank stocks by the ascending order of duration, and group them into 10 portfolios composed of similar number of stocks. Since Campbell-Shiller decomposition requires dividends information, we aggregate firm-level information to portfolio-level and do the analyses for each portfolio. The logic of aggregation is similar to that of forming market-level information. The results indicate that cash flow news is the main driver of returns across different portfolios, as its contribution is larger than that of discount rate news. This is quite surprising. But, as argued in Dechow, Erhard, Sloan, and Soliman (2021), duration can also measure the sensitivity to unexpected macroeconomic events that mainly impact short-term cash flows. One possible explanation for the significant contribution of cash flow news can be that investors are short-sighted and care more about near-term cash flows. Another potential interpretation is that there are more events affecting short-run cash flows than events influencing long-run discount rate.

As shown both theoretically and empirically in Santa-Clara (2004), book-to-market ratio is a crude measure for equity duration and they are negatively related. Some papers (see Schröder and Esterer (2016), Weber (2018), Gormsen and Lazarus (2021)) attribute cash-flow relevant anomalies like value factor, profitability factor to duration. However, the performance of value strategy is deteriorating in recent decades. Does it imply that duration premium is also decreasing or even not significant any more in the later sample period? I explore the duration premium in further detail using sub-sample analysis, and compare its power to predict future stock returns with different book-to-market ratios. The results demonstrate that the magnitude of short-long value-weighted duration premium is quite stable across time and the premium is larger within stocks with higher possibility of short-selling constraints. Fama-Macbeth regression shows that duration subsumes the explanatory power of traditional book-to-market ratio, but the intangible adjusted book-to-market ratios still strongly predicts future stock returns even when duration is included. Thus We challenge the view that duration explains value strategy as Chen (2017) does but from a different perspective.

Finally, we would like to test the explanation for the short duration premium. To be specific, we explore if it is the market friction—the short-sale— constraint, that prevents investors from freely selling stocks and thus leads to excess returns. The logic behind it is that, in a complete and perfect market, the price is fairly valued and nobody can earn excess returns. But in reality, too large lending fees, excess demand of borrowing stocks and short selling them hinder investors from freely holding a short position. If the short duration premium is indeed caused by this constraint, we expect to see significant and large premium for stocks more likely to be short-sale constrained. Weber (2018) use the residual institutional ownership (RIOR) as the proxy for short-sale constraint and corroborate this source of mispricing. However, the RIOR only represents the constraint from the supply side. Instead, I also use the short interest rate over institutional ownership, which proxies for the relative demand over supply, to stand for the possibility of being short-selling constrained. Consistent with Weber (2018), we find the duration premium larger and more significant for stocks more likely to be constrained. Stock size also plays a role. By doing so, we tend to reject the explanation proposed by Gonçalves (2021b). Gonçalves (2021b) leverage intertemporal capital asset pricing model (ICAPM) to argue that the short duration premium is a compensation for exposure to reinvestment risk (the wealth change caused by discount rate). If this rationale is correct, we should anticipate the existence of short duration premium across stocks with different possibility of short-sale constrained because the constraint does not affect the reinvestment risk.

The rest parts of this dissertation are organized as follows. Section 2 provides a literature review on duration premium, present value decomposition and short-sale constraint. Section 3 records the data sources, the variable definitions and the procedure of Campbell-Shiller decomposition adapted to our paper. Section 4 displays the results from variance decomposition. Section 5 studies the duration premium in sub-samples and compare its explanatory power with book-to-market ratios. Section 6 provides double sorting analyses exploring the reason for duration premium. Section 7 concludes.

2 Literature review

Stock return predictability has long been a focus in finance. So many characteristics such as size, book-to-market ratio, liquidity, momentum etc. have been proposed to be predictors for future stock returns in the cross-section, leading to the so called 'factor zoo' (see De Nard and Zhao (2022), Chen and Zimmermann (2022) for example). In the time series, the term spread, dividend yield, consumption growth, the aggregate short interest rate among others are shown to have a strong power in predicting future market returns (see Koijen and Nieuwerburgh (2011), Cooper and Gulen (2006)). Our paper concentrates on the role of equity duration in the cross-sectional stock market predictability, but also relates to methodology and variables used in the time-series analysis. To be more specific, our paper builds upon the following three branches of papers: duration premium, present value decomposition, and short-sale constraints.

2.1 Duration premium

Duration, a concept from fixed-income markets, is the weighted average of the times until those fixed cash flows are received, and measures the price sensitivity to a change in interest rates. Santa-Clara (2004) introduce and adapt this definition to equity markets by detailing the approach to estimate the duration for a single stock using financial information. They view it as a measure of risk, and show that it is positively associated with price volatility and beta, but negatively related to future stock returns. Besides, the duration measure subsumes book-to-market factor in stock returns and exhibits a downward sloping equity yield. van Binsbergen, Brandt, and Koijen (2012), on the other hand, recover the prices of dividend strips associated with index, and argue that the term structure of equity is indeed downward sloping.

Some papers propose new estimation methods for duration. Da (2009), borrowing the idea of consumption-based asset pricing model, measures the stocks' exposure to risk using fundamental cash flow characteristics instead of using returns and prices. The duration the author proposes is entirely cash-flow based, which differs from price-based Macaulay duration. He also points out that duration affects risk premia via its interaction with cash flow covariance between long-run accounting returns and long-run consumption innovations. Chen (2011) takes the possibility of bankruptcy into consideration when calculating the duration, and contribute the stronger book-to-market effect among small stocks to their shorter equity duration. Schröder and Esterer (2016) use analysts' forecasts and implied cost of capital to estimate the duration, and provide a risk-based explanation for value premium as a compensation for the value firms' higher exposure to cash-flow risk. Mullins (2021) derive and summarize three models from different theoretical underpinnings to estimate the duration, and find strong co-movements among them. Gonçalves (2021b) leverages VAR to estimate the firm-level duration and shows that the short duration premium (8.6% per year in value-weighted decile portfolios) subsumes the value and profitability premia. Instead of relying on fundamental cash flow information to estimate the duration and assuming irrelevance between discount rates and expected cash-flow growth as most papers do, Chen (2022) leverages the FOMC announcements as events to measure the sensitivity of stock prices to change of discount rates, which also captures the effects of expected cash-flow growth changes associated with changes in discount rates. Using this novel duration measure, the authors finds a hump-shaped equity yield curve and argues that this duration captures information other than monetary policy risk.

Is the duration premium a compensation for risk, or due to behavioral mispricing? Weber (2018) focus on the downward-sloping term structure. They find that the short duration premium only exists for short-sale constrained stocks proxied by lower institutional ownership, and that the premium is larger after periods of high sentiment. These results suggest both the market friction and the sentiment-based mispricing to be the reason for this short duration premium. In contrast, Dechow et al. (2021) suggest a novel role of equity duration as measuring the sensitivity of prices to short-term cash-flow change, rather than only measuring the sensitivity to discount rate changes. They show that the short-duration stocks are more heavily influenced by the pandemic as the pandemic mainly impacts short-term cash-flow. For this reason, the under-performance is rational as investors expect the shock has a larger negative impact on short-duration firms than on long-duration firms whose mainly value comes from cash-flow in the long future. The discussion above is empirically based. Gonçalves (2021b), however, manages to apply the intertemporal capital asset pricing model (ICAPM) to argue that the premium is a compensation for exposure to reinvestment risk which is undesirable from the perspective of long-term investor. Therefore, stocks with long duration, as they are more sensitive to return changes, provide a hedge when future expected returns decreases because their present value will increase and leads to a large wealth effects. By contrast, the short duration stocks are exposed to this reinvestment risk and thus requires a higher return to be held.

As shown in Santa-Clara (2004), book-to-market ratio is a crude measure for duration, and they are negatively related. Consistent with that, Santa-Clara (2004) and Schröder and Esterer (2016) among others demonstrate that the value factor is subsumed by duration. Gormsen and Lazarus (2021) explain several cash-flow relevant anomalies including value, profitability, investment, low-risk, and payout factors using duration. This paper is promising as the data of single-stock dividend futures, which are claims on dividends of individual firms, ensures the same characteristics but changing duration of underling assets, thus the return difference is only caused by duration difference, while separating the effects of other characteristics. It is also encouraging as it provides a economic intuition to reduce the number of factors, rather than the reliance on the statistical analysis. Mullins (2021) also show that the duration is closely related to value factor, but the former out-performed a value-strategy in the period following the Great Financial Crisis. However, Chen (2017) argues that duration-based explanation alone is unlikely to resolve the value premium by examining directly the dividend growth of BM-sorted portfolios different methods from duration-driven returns. It shows that the growth rates of dividends paid by growth stocks are not substantially larger than that of value stocks and thus growth stocks do not have substantial longer-duration than value stocks (the difference of average long run growth rate between value and growth stocks is much smaller than assumed in duration estimation).

The only paper which links duration and present value decomposition is written by Golez and Koudijs (2020). Instead of exploring the role played by duration in equity term structure, or cross-sectional differences in returns, suggests that duration explain the relative predictability of returns and growth rates. They argue that relative contribution of expected returns to stock price variation is large after 1945 as the duration of the equity market as a whole has increased substantially over time.

2.2 Present value decomposition

The present value identity literature establishes theoretical guidance for the predictability of returns, rather than those obtained based on empirical findings which are subject to the data mining problem.

Starting with the definition of return, Campbell and Shiller (1988) propose a log-linear return approximation between the relation of returns, dividend yield, and dividend growth. Based on this approximation, Campbell (1991) further shows that the unexpected return news can be decomposed into cash flow news (N_{CF}) and discount rate news (N_{DR}):

$$r_{t+1} - \mathrm{E}_t r_{t+1} = (\mathrm{E}_{t+1} - \mathrm{E}_t) \sum_{j=0}^{\infty} \rho^j \Delta d_{t+1+j} - (\mathrm{E}_{t+1} - \mathrm{E}_t) \sum_{j=1}^{\infty} \rho^j r_{t+1+j} = N_{CF,t+1} - N_{DR,t+1} \quad (1)$$

where r_t is the stock return, ρ is the discount rate and set to be 0.96 for annual data, Δd is the change in dividends, $(\mathrm{E}_{t+1} - \mathrm{E}_t)(X)$ means $\mathrm{E}_{t+1}(X) - \mathrm{E}_t(X)$ and is sometimes written as $\Delta \mathrm{E}(x)$.

Ever since then, the academic saw a growing number of papers leveraging the decomposition through VAR (see Campbell (2008), Campbell, Polk, and Vuolteenaho (2010) among others), examining the accuracy of the approximation (see Chen and Zhao (2009), Engsted, Pedersen, and Tanggaard (2012a), Engsted, Pedersen, and Tanggaard (2012b), Gao and Martin (2021)), extending the present value identity (Callen and Segal (2004), Cho, Kremens, Lee, and Polk (2022)), measuring the news component directly through data instead of computing from the VAR system (see Knox and Vissing-Jorgensen (2022), De La O and Myers (2021)).

The decomposition is important as it helps us to understand what drives the price fluctuation and its underlying economic implication. For example, the cash-flow news is regarded as a permanent shock and is the fundamental component of firm returns, while the discount rate news is viewed as a temporary shock, related to the investor's risk aversion or sentiment (see Campbell, Polk, and Vuolteenaho (2010) for example).

There are also some variants of decomposition. Larrain and Yogo (2008) modifies the measure of cash flow to include interest, and net repurchases of equity and debt, besides the dividend, and studies the present value identity between net payout and asset value. Gonçalves (2021a) relates the stock return with equity strips (i.e. dividends with different maturities) and develops a term structure return decomposition. He finds roughly 60% of equity volatility comes from the present value of dividends with maturities beyond 20 years and that cash flow shocks drive volatility in short-term present values whereas discount rate news are responsible for volatility in long-term present value. Knox and Vissing-Jorgensen (2022), on the other hand, propose a new decomposition approach for stock returns that does not rely on log-linearization or VAR estimation, and can be implemented at a daily frequency using observable data. Antolin-Diaz, Petrella, and Rubio Ramírez (2021) highlight the necessity of including dividend growth as a state variable and develop methods to estimate the system from the Bayesian perspective.

The problem with Campbell (1991) decomposition is that it requires dividend data which are missing in most periods for individual firms as many publicly listed firms do not pay dividends. Therefore this decomposition is feasible only at the aggregate level (either portfolio level or market level). To solve this problem, Vuolteenaho (2002) starts from the definition of return and clean surplus identity for book value, and enables the decomposition at firm level by replaying dividend growth with return on equity. The results indicate that firm-level stock returns are mainly driven by cash-flow news, and that cash-flow news can largely be diversified away in aggregate portfolios. Many papers apply this approach to explore firm level information (see Cohen, Polk, and Vuolteenaho (2003), Chaves (2009), Lochstoer and Tetlock (2020), and Cho, Kremens, Lee, and Polk (2021) for example).

2.3 Short-sale constraint

The short-sale constraints prevents investors from freely selling stocks and thus leads to over-pricing and excess returns. Most studies use the short interest rate, institutional holdings, or loan fees on equity lending market to proxy or estimate the short-sale constraints.

The short interest rate, which is the number of shares that have been sold short but have not yet been covered or closed out over the total shares outstanding, are measured and reported by stock exchanges. It can be viewed as a coarse proxy for short-selling demand. Asquith and Meulbroek (1995) is the first one to empirically propose the relation between short interest and future stock returns at the individual stock level. Prior to that, as a large percentage of firms have little or no short interest in any given month, researches could not lead to a consistent and strong connection between them. Ever since, many papers (see Arnold, Butler, Crack, and Zhang (2005), Boehmer, Huszar, and Jordan (2010) for example) record the same pattern. Chung, Liu, and Wang (2021) confirm its predictability at the industry level. At the aggregate market level,Rapach, Ringgenberg, and Zhou (2016) use the equal-weighted short interest to construct the market-level short interest, and show that it is arguably the strongest known predictor of aggregate stock returns both in and out of sample. Priestley (2019), however, refute Rapach et al. (2016) by claiming that the predictability of short interest disappears once the the financial crisis in 2008 is excluded from the sample. Akbas, Boehmer, Erturk, and Sorescu (2017) justify the predictability of short interest by illustrating the information content of short interest regarding future fundamental events as it is associated with negative earnings surprises, bad public news, and downgrades in analyst earnings forecasts several months ahead.

Nagel (2005) and Chen, Hong, and Stein (2002), instead, use the institutional ownership, a proxy for the short-selling supply, relevant estimation to proxy for the short-sale constraints. Since institutions are and record the relation with future stock returns. The reason of substituting for short interest is that most stocks have little or no short interest outstanding, and that a low short interest may not necessarily imply less-constrained condition but be caused by the high transaction costs of shorting. Asquith, Pathak, and Ritter (2005) define short-sale constrained stocks as those in the 99th percentile of short interest ratios and the lowest third of institutional ownership. The constrained stocks underperform significantly on an equally-weighted basis, but insignificantly on a value-weighted basis. Engelberg, Reed, and Ringgenberg (2018) explain the short interest premium from the point view of short-selling risk. To be specific, they estimate the short-selling risk by regressing the variance of the daily loan fees on equity lending market characteristics and firm characteristics. The predictability of short interest is stronger among stocks with larger risk of short-selling. Beneish, Lee, and Nichols (2015) compute a measure of "specialness" (hard-to-borrow) that captures the extent to which short-sale constraints are binding for each firm-month observation using loan supply and demand conditions in the lending market. Moreover, they show that the abnormal returns to the short-side of nine well-known market anomalies including profits to assets, payout ratio, O-score and so on, are attributable solely to “special” stocks.

3 Data and methodology

I use data from the center for research in security prices (CRSP) for stocks’ prices, returns, delisting returns, shares outstanding and so on, from Compustat for firms’ financial statistics like book value of equity, goodwill, and short interest etc. We include all stocks with available data from the NYSE, Amex and NASDAQ. Institutional ownership is constructed using Refinitiv Eikon which provides information about IBES, 13F-fillings. We obtain the aggregate predictors on Amit Goyal’s website, and the Fama-French factors, small stock value spread from French Kenneth’s library.

3.1 Vairable calculation

For the fixed income securities like a 15-year company bond or a treasury bill, the price of the contract, the payment in each period, and the maturity are all decided when designing or signing the trade contract. Therefore, the Macaulay duration for a fixed security that pays yearly is easily calculated as:

$$MacD = \sum_{f=1}^{n} \frac{f \times (CF_f/(1+r)^f)}{P} \tag{2}$$

where CF_f is the cash flow paid in period f, r is the yield to maturity, n is the number of years to maturity, P is the par value of the contract.

However, for the stock, we only have knowledge of the price (P) and, under the best case, dividends (CF_f) up to future several years if the firm initiates a dividend payment and strictly executes it. More generally, the future cash flows of a stock is uncertain as the dividend payment is subject to change, including initiation, increase, decrease or even omission. The maturity is therefore also affected, in addition to the fact that the stock might be delisted. But usually, we assume that the stock has a infinite life, though Chen (2011) also takes into the account the possibility of bankruptcy when estimating the stock duration.

The estimation of stock duration in this paper follows Dechow et al. (2004) closely and relies only on Compustat items. For each firm-year observation, we estimate future cash flows as:

$$CF_t = Earnings_t - \Delta BE_t = BE_{t-1}(ROE_t - g_t) \tag{3}$$

for $t = 1, 2, ..., 10$, where $Earnings_t$ is the earnings, ΔBE_t is the change in the book value of equity, the ROE_t is the predicted value from running AR(1) process with a long-run mean of 0.12 and persistence coefficient of 0.57, and g_t is the predicted value from running AR(1) with a long run mean of 0.06 and persistence coefficient of 0.24. ROE_0 is current year’s income before extraordinary items (IB) divided by last year’s book value of equity (CEQ). g_0 is current year’s sales (SALE) divided by last year’s sales.

Then the duration is calculated as

$$Dur = \frac{\sum_{t=1}^{T} t \times CF_t/(1+r)^t}{ME} + (T + \frac{1+r}{r}) \times (1 - \frac{\sum_{t=1}^{T} CF_t/(1+r)^t}{ME}) \tag{4}$$

where $T = 10$, $r = 0.12$, ME is the market capitalization calculated as the product of common shares outstanding (CSHO) and price close (PRCC).

The short interest rate (SIR) is the short interest divided by common shares outstanding. The calculation of institutional ownership (IOR) follows Chen et al. (2002), and is the total shares owned by institutions divided by common shares outstanding. The book-to-market ratios, with or without intangible capital adjustment, are summarized in my chapter 1. Instead of using directly SIR or IOR, we also calculate the ratio of SIR over IOR (SIIO), and the residual institutional ownership in Nagel (2005) to proxy for short-selling constraints. When combining Compustat and CRSP, we ensure that the financial information, or sorting variables are available when forming the portfolios.

Our final sample consists of 204,285 annual firm-year observations from 1965 to 2020, and 2,346,298 firm-month observations from 1965 July to 2020 June. When short interest rate and institutional ownership are used, the sample usually starts from 1980 to ensure data availability. Table 1 displays the mean, standard deviation, minimum, 25, 50, 75 percentiles, and max for equity duration, book-to-market ratios, annualized returns and S&P index value weighted returns. We winsorize equity duration at 1% in both tails because it contains extreme values that affect the standard deviation heavily. Before doing that, we carefully check that these extreme values are not caused by miscalculation, but attribute to significant change of financial information. For example, the company Mr. Cooper, with gvkey 13888, has a common equity of 93,592 thousand dollars in 2017, and it jumps to 1,945 million dollars in 2018 due to a merge, and its stock prices soar from less than 1 dollar to more than 100 dollars, leading to a equity duration of -12458.8 in that year. Regardless, the winsorization does not affect the portfolio sorting as we use deciles to form portfolios. We see from the table that the average equity duration is 16.09 years, and the minimum is -17.22 years. Duration should be positive theoretically, the negative value comes from the case that the present value of future cash flows exceeds the current market value so that the last term in parentheses of equation 4 is negative:

$$(1 - \frac{\sum_{t=1}^{T} CF_t/(1+r)^t}{ME}) < 0$$

Santa-Clara (2004) suggest that it might be caused by underpricing.

3.2 Variance decomposition

The stock return decomposition starts from the standard definition of returns,

$$R_t = \frac{P_t + D_t}{P_{t-1}} \tag{5}$$

where R_t is the stock return at period t, P_t is the stock price at t, D_t is the dividend paid by firm at time t.

Campbell (1991) shows that, after a series of transformation (taking logs, iterating, first order Taylor approximation, taking expectations...), we can obtain equation 1. It implies the following variance decomposition:

$$\mathrm{Var}(r_{t+1} - \mathrm{E}_t r_{t+1}) = \mathrm{Var}(CF_{t+1}) + \mathrm{Var}(DR_{t+1}) - 2\mathrm{Cov}(CF_{t+1}, DR_{t+1}) \tag{6}$$

Therefore the portions of the variance of unexpected returns that are attributed to the variance of discount rate news (contr (DR)), the variance of cash flows news (contr (CF)), and the covariance of cash flow news and discount rate news are defined respectively as:

$$\text{contr (DR)} = \frac{\text{Var}(DR)}{\text{Var}(\Delta \text{E}(r))} \tag{7}$$

$$\text{contr (CF)} = \frac{\text{Var}(CF)}{\text{Var}(\Delta \text{E}(r))} \tag{8}$$

$$\text{cocontr (DR,CF)} = \frac{\text{Cov}(DR, CF)}{\text{Var}(\Delta \text{E}(r))} \tag{9}$$

The variance decomposition literature mainly concentrates on the role played by the variance of DR news (contr (DR)), and CF news (contr (CF)). When contr (DR) is the largest, we usually say the the (variance of) the DR news contributes more to the unexpected return news, or the DR news predominates over returns.

In order to recover the CF news and DR news, we use the following vector autoregression (VAR) to obtain the infinite sum terms:

$$Z_t = AZ_{t-1} + \varepsilon_t \tag{10}$$

with $Z_t = [r_t, \Delta d_t, pd_t, ty_t, dfy_t, valuespread_t]$, where r_t is return, Δd_t is the dividends, pd_t is market capitalization over dividends. The other variables, ty, dfy are term yield, default yield constructed using predictors from Amit Goyal's website, and $valuespread$ is the small stocks' value spread constructed using factors information from French's library. They are most often controlled state variables in previous papers studying variance decomposition.

Define $e1' = [1, 0, ..., 0]$, then the unexpected return news is $e1'\varepsilon$, and the DR news is $e1'\rho A(I - \rho A)^{-1}\varepsilon$. The CF news can be directly calculated or backed out as $e1'\varepsilon+$ DR news. To ensure the total contribution sums up to one, we use the later approach.

Since firms may or may not pay dividends, we solve this problem by focusing on portfolio level decomposition. Each year, firms are grouped into 10 portfolios based on their equity duration. Within each portfolio, we get the return as the value-weighted return, the dividends as the sum of all dividends paid, the market capitalization as the sum of all firms' market capitalization. Then the Campbell-Shiller decomposition is applied to each portfolio. That is, we run the time-series VAR, calculate the news, and compute the contribution of news for each portfolio.

4 Variance decomposition

In this section, I use Campbell-Shiller variance decomposition to check if the contribution of discount rate news to unexpected returns is higher within stocks with larger duration, and if the contribution of cash flow news is higher within stocks with shorter duration. As duration increases, stocks are more sensitive to yield change, so we expect that the contribution of DR news increases as stocks' duration increases while the contribution of CF news decreases. More than that, we should see the contribution of DR news is larger than that of CF news among stocks with longer duration.

Table 2 presents the contribution of discount rate news (varDR) and cash flow news (varCF) using returns and other variables contemporary with duration. At the end of June in year y, we have equity duration available, the returns of each portfolio is the value weighted cumulative returns of each stock in that portfolio from July in year $y - 1$ to June in year y. It is not the usual way of constructing portfolios where we use information in June to form portfolios and hold them for next 12 months. The justification for doing so is that the duration may change a lot in the next year.

From portfolio 1 to portfolio 10, the duration increases. Column 'Full sample' contains all the firms in our sample. Column '$sir >= med(sir)$' stands for short-sale constraints, and limits to firms with sir larger than or equal to the contemporary median of sir, and firms with missing sir. We include firms with missing sir in this subsample is because high sir implies high short-selling demand and missing sir means that even if there is a demand, it is not possible to short sell the stocks due to various reasons. Nevertheless, excluding firms with missing short interest rate does not affect the conclusion significantly. Sample is confined to firms with less short-sale constraints in column '$sir < med(sir)$'. The same logic applies column '$ior >= med(ior)$' where we only include firms with ior larger than or equal to contemporary median ior, and coumn '$ior < med(ior)$' where firms with smaller ior or missing ior are contained. We see that CF news is the main driver for the unexpected return news as the contribution of CF news is larger than that of DR news under most cases. Take portfolio 1, full sample for example, the contribution of discount rate news is 56%, and the contribution of cash flow news is 106%. Notice that the contribution of each news can be larger than 1, and it simply suggests that the covariance of CF news and DR news is positive. There are indeed cases where the contribution of discount rate news is larger than cash flow news, but they are rare and concentrates in portfolio 5, 6, or 7. We do not observe the pattern we expect in the beginning of this part.

Table 3 displays the results using next period's returns and other variables. It accords with the common way of forming portfolio to be held during next 12 months. We see that the comments on Table 2 still apply.

The observation that the CF news is the main driver at the portfolio level contradicts the fact that DR news is the main driver at the aggregate level as documented by many papers. Table 4 reports the Campbell-Shiller decomposition at the market level across different time periods. The contribution of discount rate news is larger than that of cash flow news. And the variance of computed DR news and CF news are much larger than the variance of unexpected return news during sample period form 1965 to 1993.

We can make two conclusions. First, there is no trend of increasing (decreasing) contribution of discount rate (cash flow) news to unexpected returns, which is quite surprising, as we expect stocks with long duration to be sensitive to discount rate changes. Second, in most cases, the cash flow news is the main driver of returns across different portfolios, though discount rate news remains most important at the aggregate market level.

5 Superiority over (traditional) value strategy

Santa-Clara (2004), Schröder and Esterer (2016), Gormsen and Lazarus (2021) among others support the view that the duration premium subsumes the value premium. We also know that the performance of value strategy is deteriorating in the recent decades. Since the book-to-market ratio is a crude measure for duration, does it indicate a smaller duration premium as well in recent decades? However, except Dechow et al. (2021) and Weber (2018) who checks the duration premium during 2008-2009 crisis and during the Covid pandemic, no other paper checks duration premium in later sample period. It might be caused by the fact that the duration is less influential than the book-to-market ratio. Therefore, in this part, I explore the premium in further detail using sub-sample analysis, and compare its power to predict future stock returns with different book-to-market ratios.

The returns of the portfolios sorted by duration during different time periods are shown in Table 5. We use 1999 as the division year because number of listed firms reaches the peak in 1997 and decreases rapidly afterward, achieving a steady number of around 3,800. We see that the long-short value-weighted return is -0.1050 for the full sample period, -0.1050, -0.1049 respectively for periods from 1965 to 1998, and from 1999 to 2020. Though the premium is only marginal significant in the later sample period, the magnitude of the value-weighted returns remain similar. For the equal-weighted portfolios, the premium is much smaller in the later sample period. At least for long-short value-weighted returns, the short duration premium is more stable and robust than the value premium (Recall that the value premium is around 0.2 for the early sample period and around 0.04 for the later sample period). Though the difference between value-weighted and equal-weighted premium suggests that a size effect plays a role in later period.

Table 6 displays the univariate portfolio analyses for stocks with high SIR and low SIR. If the duration premium is caused by short-sale constraints, we would expect a larger premium (in the absolute magnitude) for stocks with higher possibility of being short-sale constrained (highSIR). It is so though 0.0636 is not much smaller than 0.0943. The small difference might be attributed to the poor proxy for constraints using short interest rate. Table 7 confirms this argument. When we combine short interest and institutional ownership, a higher SIIO implies relative high demand over supply, and the stock is thus more likely to be short-sale constrained. The long-short duration premium for short-sale constrained stocks is around 0.23 while premium for not constrained stocks is only around 0.03.

We regress the excess return on duration and different book-to-market ratios separately, while controlling for size and short-sale proxy. Table 8 exhibits the Fama-MacBeth regression results. Only the traditional book-to-market is subsumed by duration as its associated coefficient is no longer significant (t value is only -0.35). For other intangible adjusted book-to-market ratios, the coefficient associated with the book-to-market ratios is larger in magnitude and more significant than the coefficient associated with duration. The column (5) exhibits confounding figures. However, as noted by Cochrane (2011), running multiple panel-data forecasting regressions is full of pitfalls of course. Besides, the different book-to-market ratios are highly related with each other, raising more statistic problems. There are two possible explanations for why duration cannot succeed in replacing intangible adjusted book-to-market ratio. One is that the calculation of duration involves book value of equity. As we follow Santa-Clara (2004), the intangible capital is missing from the book value of equity, leading to a mismeasurement in the equity duration. Another explanation is that, the intangible adjusted book-to-market ratio contains extra information to predict the future returns.

To conclude, the magnitude of short-long value-weighted duration premium is quite stable even in the later sample period when the value premium is shown to be not significantly different from zero. The premium is larger within stocks with higher possibility of short-selling constraints. However, the difference between value-weighted and equal-weighted in the later sample period suggests that the size may play a role. This phenomenon diverges from the recent underperformance of value stocks recorded in Chapter 1, suggesting that the duration premium is more robust than the value premium. If we emphasize the power to predict future returns, then the duration can only subsume the traditional book-to-market ratio (bm_{FF}), which is consistent with previous studies. But it fails to make the intangible adjusted book-to-market ratios redundant.

6 Duration and short-sale constraints

What explains the duration premium? Is it a compensation for exposure to risk, or behavioral mispricing? The cross-sectional sub-sample analyses in the section above suggest that the short duration premium is larger for stocks with high SIIO, and the market capitalization may have an effect on it. We explore these two factors, the short-sale constraint and size in more detail in this part.

The short interest rate is a proxy for short-sale demand. But a higher short interest rate defined as short interest over shares outstanding does not necessarily implies a more constrained situation. The short interest rate can be high because there is a large and active lending market for it, and thus it may instead imply that this stock is not constrained at all. Table 6 and Table 7 confirm this argument and suggest the relative demand and supply to be a better proxy for the possibility of short-sale constraints. When SIIO is larger, the excess demand is more likely, and so is constraint. Nagel (2005) and Weber (2018) also employ residual institutional ownership (RIOR) as the proxy for the constraints, so we present double-sorting results using these two variables.

Table 9 replicates Table 10 in Weber (2018), displaying the independent sorting based on RIOR and duration. Remember that from RIOR1 to RIOR5, the RIOR increases and the stocks are less likely to be short-sale constrained. We would at least expect that the duration premium is large and significant within stocks that are constrained (in portfolio RIOR1). Or more than that, the magnitude of short duration premium may decrease along this direction.

In panel A of Table 9, the value-weighted short duration premium is 0.0197 for the most constrained group (RIOR1), but it is not significant. The duration premium is 0.0197, 0.0502, 0.0099, 0.0552, respectively, for portfolios with higher residual institutional ownership. There is no decreasing trend in the duration premium. What surprises us is the non-significance of 0.0197 in the first row. RIOR only reflects the possibility of being constrained, so for stocks in RIOR2 to RIOR5, they might not be constrained at all. Therefore no obvious trend is not disappointing. However, for stocks most prone to be mispriced due to the incomplete market, the t value is only -0.6359, far from the critical value to be significantly different from zero. The only significant duration premium appears in the portfolio with the highest RIOR. Panel B of Table 9 exhibits the equal-weighted returns. Here we see the decreasing trend in the magnitude of duration premium. For the unconstrained portfolio, we even see long duration premium, though it is not significant. The duration premium is large and significant within stocks divided into the lowest RIOR group, 0.1262 with the t statistics of 4.2952. The long-short duration return is also significant for RIOR2 and RIOR3, but not for stocks with higher RIOR. Compared with results from Weber (2018) in which only the equal-weighted method is used, we have a consistent conclusion.

Table 10 reports the returns of double sorting based on SIIO and duration. Since from SIIO1 to SIIO5, the relative demand over supply increases, stocks are more likely to be short-sale constrained. We would at least expect that the duration premium is large and significant within stocks classified into portfolio SIIO5. Or more than that, the magnitude of short duration premium may increase along this direction. Panel A says that no long-short duration return is significantly different from 0. However, in panel B, we do observe that the duration premium is large and only significant for stocks with large SIIO (0.0691 with a t-statistics of 2.8576).

Table 5, Table 9 and Table 10 all present the divergence between value-weighted and equal-weighted duration premium, hence it is natural to do independent sorts conditional on stock size. Table 11 reports 3*3 independent sorting using duration and SIIO, conditional on whether the market capitalization of the stocks is not less than its cross-sectional median (Large stocks) or less than the median (Small stocks).

All the duration premia are not significant if the analysis is based on the sub-sample of large stocks. For the sub-sample composed of small stocks, we see that again the absolute magnitude of duration premium increases as stocks are more short-sale constrained, and that the premium becomes significant only under highest SIIO portfolio when using value-weighted method. Therefore, we suggest that the duration premium is mainly concentrated in small and short-sale constrained stocks.

7 Conclusion

In this paper, I apply the Campbell-Shiller decomposition to study the sources of unexpected returns for portfolios with different duration. The present value decomposition demonstrates that the cash flow news is the main driver of the unexpected returns across portfolios with different duration. This pattern is contrary to our intuition that the variation of unexpected returns of a portfolio with long duration should be attributed more to discount rate news, as long duration implies higher sensitivity to discount rate news. The result is brand new in the literature as it directly examines the role of both news in the context of equity duration. Possible explanations for the significant contribution of cash flow news can either be due to the short-sight of investors who care more about near-term cash flows, or due to the more frequency of events that impacts short-run cash flows than events that influence long-run discount rate.

The downward-sloping equity term structure is puzzling. Unlike the value strategy which suffers from big and persistent drawdowns in recent decades, the short duration premium is rather robust. Previous studies claim that duration explains many cash flow based anomalies. We also challenge this argument by showing that the intangible adjusted book-to-market ratios still have strong predictive power for future stock returns even when duration is included in the Fama-Macbeth regression. However, the duration premium mainly comes from stocks prone to be short-sale constrained. The reinvestment risk proposed by Gonçalves (2021b) can hardly explain why the duration premium disappears among stocks that are not likely to be short-sale constrained.

Table 1
Summary statistics
This table presents the summary statistics for the estimated stock equity (EquityDuration), the traditional book-to-market ratio defined by Fama French (bm_{FF}), the three intangible adjusted book-to-market ratios ($\mathrm{bm}_{Eisfeldt}$, bm_{Peters}, bm_{Ewens}) respectively, the annual returns of stocks from July to next June (ret_y), the S&P 500 index value weighted return in June timing twelve (CRSP_{SPvw}). The sample period is from 1965 to 2019. The mean (mean), standard deviation (sd), minimum(min), 25th percentile (p25), median (p50), 75th percentile (p75) and maximum (max) of each variable are calculated. The accounting variables used when calculating equity duration and book-to-market ratios for year y are of the fiscal year ending in calendar year y-1 to ensure the availability of information.

	mean	sd	min	p25	p50	p75	max
EquityDuration	16.09	5.70	-17.22	14.03	16.14	17.81	137.14
bm_{FF}	0.93	2.43	0.00	0.37	0.68	1.13	900.75
$\mathrm{bm}_{Eisfeldt}$	2.74	5.89	0.00	0.76	1.41	2.85	977.53
bm_{Peters}	1.57	3.18	0.00	0.59	1.01	1.75	923.79
bm_{Ewens}	1.46	2.99	0.00	0.57	0.97	1.66	916.27
ret_y	0.15	0.69	-1.00	-0.21	0.06	0.34	42.52
CRSP_{SPvw}	0.07	0.40	-0.99	-0.19	0.05	0.36	0.83

Table 2

Variance decomposition of contemporary returns

This table presents the results of variance decomposition for portfolios formed using equity duration. The returns and other variables in the VAR system we use is contemporary with the duration. The numbers denote the contribution of the variance of discount rate news (varDR) and cash flow news (varCF) to the total variance of unexpected returns. The columns in the first row indicates the sample we use: the full sample (Full sample), the subsample composed of stocks whose short interest rate is no smaller than its cross-sectional median or whose short interest rate is missing ($sir >= med(sir)$, the subsample composed of stocks whose short interest rate is smaller than the cross-sectional mean ($sir < med(sir)$, the subsample composed of stocks whose institutional ownership ratio is no smaller than the cross-sectional median ($ior >= med(ior)$, the subsample composed of stocks whose institutional ownership ratio is smaller than its cross-secional median or whose institutional ownership ratio is missing. The first columns shows the portfolio groups sorted by equity duration with portfolio 10 consisting of stocks whose equity duration is larger than the top decile.

	Full sample		$sir >= med(sir)$		$sir < med(sir)$		$ior >= med(ior)$		$ior < med(ior)$	
port	varDR	varCF	varDR	varCF	varDR	varCF	varDR	varCF	varDR	varCF
1	0.56	1.06	0.84	1.00	0.45	0.54	0.50	0.75	0.30	0.53
2	0.37	1.13	0.97	1.00	0.34	0.48	0.74	0.66	0.39	0.68
3	0.83	0.92	0.58	0.43	0.41	0.64	0.66	0.46	0.42	0.60
4	0.32	0.61	0.48	0.74	0.42	0.59	0.37	0.65	0.47	0.57
5	0.42	0.42	0.48	0.36	0.48	0.48	0.38	0.42	0.52	0.42
6	0.53	0.37	0.38	0.35	0.59	0.40	0.49	0.38	0.33	0.48
7	0.42	0.37	0.22	0.45	0.59	0.39	0.38	0.51	0.30	0.51
8	0.12	0.57	0.15	0.55	0.28	0.40	0.21	0.53	0.18	0.63
9	0.16	0.63	0.16	0.55	0.60	0.54	0.17	0.62	0.38	0.50
10	0.77	0.87	0.37	0.46	0.34	0.74	0.11	0.55	0.20	0.70

Table 3

Variance decomposition of future returns

This table presents the results of variance decomposition for portfolios formed using past year's equity duration. Every year in June, we sort stocks based on available information of equity duration into 10 groups, and hold each portfolio for the next 12 months. The returns and other variables in the VAR system we use is therefore subsequent to the equity duration. The numbers denote the contribution of the variance of discount rate news (varDR) and cash flow news (varCF) to the total variance of unexpected returns. The columns in the first row indicates the sample we use: the full sample (Full sample), the subsample composed of stocks whose short interest rate is no smaller than its cross-sectional median or whose short interest rate is missing ($sir >= med(sir)$, the subsample composed of stocks whose short interest rate is smaller than the cross-sectional mean ($sir < med(sir)$, the subsample composed of stocks whose institutional ownership ratio is no smaller than the cross-sectional median ($ior >= med(ior)$, the subsample composed of stocks whose institutional ownership ratio is smaller than its cross-secional median or whose institutional ownership ratio is missing. The first columns shows the portfolio groups sorted by equity duration with portfolio 10 consisting of stocks whose equity duration is larger than the top decile.

	Full sample		$sir >= med(sir)$		$sir < med(sir)$		$ior >= med(ior)$		$ior < med(ior)$	
port	varDR	varCF	varDR	varCF	varDR	varCF	varDR	varCF	varDR	varCF
1	0.23	1.13	0.62	0.94	0.28	0.65	0.38	1.09	0.33	1.10
2	0.21	0.96	0.18	0.73	0.25	1.35	0.69	0.62	0.07	0.99
3	0.36	0.81	0.79	1.27	0.48	1.16	0.43	1.07	0.39	1.42
4	0.42	0.86	0.46	0.86	0.23	0.95	0.24	0.79	0.28	0.65
5	0.35	0.64	0.35	0.90	0.32	0.99	0.35	0.85	0.18	0.57
6	0.12	0.65	0.09	1.07	0.33	0.95	0.31	0.82	0.16	0.51
7	0.12	1.00	0.46	0.74	0.19	0.92	0.64	0.98	0.11	1.06
8	0.17	0.69	0.57	1.01	0.59	1.03	0.34	0.75	0.51	1.03
9	0.27	0.84	0.66	1.05	0.17	1.21	0.99	0.81	0.38	0.56
10	0.57	1.01	0.46	0.69	0.24	0.64	0.52	1.50	0.31	0.66

Table 4

Variance decomposition of the market portfolio

This table presents the results of variance decomposition for the market portfolio which is the value-weighted returns. To be consistent with previous results, we define year y as from July in year y to June in year $y+1$. The numbers denote the contribution of the variance of discount rate news (varDR) and cash flow news (varCF) to the total variance of unexpected returns. The columns in the first row indicates the sample we use: the full sample from July of 1965 to June of 2020 (1965-2020), the first half of the sample from July of 1965 to June of 1993 (1965-1993), the second half of the full sample from July of 1993 to June of 2020 (1993-2020).

	1965-2020		1965-1993		1993-2020	
	varDR	varCF	varDR	varCF	varDR	varCF
contr	0.83	0.32	4.03	2.72	0.78	0.43

Table 5

Univariate portfolio analyses

This table displays the univariate portfolio analyses for the full sample (1965-2020), and for the two subsamples (1965-1998, 1999-2020) using monthly data. At the end of June in each year, we sort stocks based on its equity duration, and then divide them into ten portfolios using deciles. Each portfolio is held for the next twelve months. We calculate the value-weighted (ret_{vw}) and equal-weighted (ret_{ew}) stock returns for each portfolio from 1 to 10, and also for the long-short portfolio ($10-1$). The numbers in this table are the time-series averages of these returns, except the last row in which the t statistics for the time-series of long-short portfolio returns are shown.

	1965-2020		1965-1998		1999-2020	
port	ret_{vw}	ret_{ew}	ret_{vw}	ret_{ew}	ret_{vw}	ret_{ew}
1	0.1373	0.1921	0.1715	0.2249	0.0818	0.1390
2	0.1317	0.1687	0.1616	0.1968	0.0834	0.1234
3	0.1324	0.1596	0.1606	0.1818	0.0868	0.1237
4	0.1206	0.1534	0.1431	0.1711	0.0842	0.1248
5	0.1204	0.1386	0.1409	0.1524	0.0872	0.1162
6	0.1027	0.1333	0.1213	0.1400	0.0725	0.1225
7	0.1144	0.1341	0.1302	0.1391	0.0888	0.1261
8	0.1045	0.1145	0.1176	0.1104	0.0832	0.1211
9	0.0993	0.1153	0.1098	0.0968	0.0824	0.1452
10	0.0323	0.1159	0.0665	0.1199	-0.0231	0.1095
10-1	-0.1050	-0.0762	-0.1050	-0.1049	-0.1049	-0.0296
$10-1$ (t)	5.0007	6.8415	5.2113	6.6338	1.6995	2.8460

Table 6

Univariate Portfolio Analysis for subsamples based on short interest rate

This table displays the univariate portfolio analyses for the subsamples based on the magnitude of short interest rate using monthly data. The column HighSIR (LowSIR) indicates that the subsample is composed of stocks with short interest rate larger (smaller) than its cross-sectional mean. At the end of June in each year, we rank stocks' equity duration in the subsample in ascending order, and then divide them into ten portfolios using deciles. Each portfolio is held for the next twelve months. We calculate the value-weighted (ret_{vw}) and equal-weighted (ret_{ew}) stock returns for each portfolio from 1 to 10, and also for the long-short portfolio ($10-1$). The numbers in this table are the time-series averages of these returns, except the last row in which the t statistics for the time-series of long-short portfolio returns are shown.

	HighSIR		LowSIR	
port	ret_{vw}	ret_{ew}	ret_{vw}	ret_{ew}
1	0.1156	0.0965	0.1587	0.1864
2	0.1156	0.1173	0.1431	0.1643
3	0.1245	0.1136	0.1272	0.1444
4	0.1270	0.1141	0.1199	0.1443
5	0.1370	0.1324	0.1236	0.1480
6	0.1189	0.1090	0.1214	0.1377
7	0.1159	0.1015	0.1154	0.1442
8	0.1350	0.1111	0.1381	0.1400
9	0.0946	0.0610	0.1246	0.1339
10	0.0212	-0.0032	0.0952	0.1312
$10-1$	-0.0943	-0.0997	-0.0636	-0.0552
$10-1$ (t)	3.1572	2.3521	5.1710	6.2766

Table 7

Univariate Portfolio Analysis for subsamples based on SIIO ratio

This table displays the univariate portfolio analyses for the subsamples based on the magnitude of SIIO (the short interest rate over the ownership ratio) using monthly data. The column HighSIIO (LowSIIO) indicates that the subsample is composed of stocks with SIIO larger (smaller) than its cross-sectional mean. At the end of June in each year, we rank stocks' equity duration in the subsample in ascending order, and then divide them into ten portfolios using deciles. Each portfolio is held for the next twelve months. We calculate the value-weighted (ret_{vw}) and equal-weighted (ret_{ew}) stock returns for each portfolio from 1 to 10, and also for the long-short portfolio ($10 - 1$). The numbers in this table are the time-series averages of these returns, except the last row in which the t statistics for the time-series of long-short portfolio returns are shown.

	HighSIIO		LowSIIO	
port	ret_{vw}	ret_{ew}	ret_{vw}	ret_{ew}
1	0.1289	0.1324	0.1371	0.1773
2	0.0472	0.0721	0.1328	0.1579
3	0.0833	0.1007	0.1389	0.1519
4	0.1536	0.1233	0.1217	0.1400
5	0.0635	0.0390	0.1272	0.1438
6	0.0224	0.0254	0.1208	0.1386
7	0.0529	-0.0098	0.1293	0.1393
8	-0.0207	0.0210	0.1323	0.1341
9	-0.0918	0.0130	0.1305	0.1326
10	-0.1118	-0.0865	0.1109	0.1380
$10 - 1$	-0.2472	-0.2254	-0.0262	-0.0394
$10 - 1$ (t)	2.0170	2.3933	4.4284	5.8757

Table 8

Fama-MacBeth regression

This table presents the results of Fama and MacBeth (1973) regression analyses of the relation between expected stock returns and equity duration, book-to-market ratios using sample period from 1975 to 2020 using monthly data. Each column in the table presents results for a different cross-sectional regression specification. The dependent variable in all specifications is the one-month-ahead excess stock return. The independent variables are indicated in the first column. Independent variables are winsorized at the 1% level on a monthly basis. The table presents average slope and intercept coefficients along with t-statistics (in parentheses), adjusted following Newey and West (1987) using six lags, testing the null hypothesis that the average coefficient is equal to zero. The row labeled R^2 shows the average R-squared of the cross-sectional regressions.

	(1)	(2)	(3)	(4)	(5)
	ret	ret	ret	ret	ret
EquityDuration	-0.0334**	-0.0275**	-0.0249*	-0.0249*	-0.0446***
	(-2.34)	(-2.02)	(-1.85)	(-1.82)	(-3.38)
bm_FF	-0.0340				-0.718***
	(-0.35)				(-3.92)
bm_Eisfeldt		0.0467**			-0.117**
		(2.09)			(-2.13)
bm_Peters			0.106**		0.0715
			(2.12)		(0.46)
bm_Ewens				0.124**	0.620***
				(2.21)	(3.38)
loglmktcap	-0.0666*	-0.0413	-0.0399	-0.0384	-0.0412
	(-1.83)	(-1.17)	(-1.16)	(-1.12)	(-1.17)
siior	-0.00179***	-0.00178***	-0.00176***	-0.00176***	-0.00185***
	(-5.54)	(-5.48)	(-5.45)	(-5.46)	(-5.78)
_cons	1.819***	1.468***	1.375***	1.352***	1.810***
	(5.45)	(4.68)	(4.35)	(4.30)	(5.38)
R^2	0.03	0.03	0.03	0.03	0.03

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9
Bivariate independent-sort portfolio analyses−−control for RIOR
This table presents the results of bivariate independent-sort portfolio analyses of the relation between Equity duration (Dur) and future stock returns after controlling for the effect of residual institutional ownership ratio (RIOR) from 1980 to 2020. Each month, all stocks in the CRSP sample are sorted into five groups based on an ascending sort of RIOR. All stocks are independently sorted into five groups based on an ascending sort of equity duration. The quintile breakpoints used to create the groups are calculated using all stocks in the CRSP sample. The intersections of the RIOR and duration groups are used to form twenty five portfolios. The table presents the average one-month-ahead return (in percent per month) and the associated t statistics (below) for each of the twenty five portfolios. Also shown are the average return and t statistics of a long-short zero-cost portfolio that is long the fifth duration (RIOR) quintile portfolio and short the first duration (RIOR) quintile portfolio in each RIOR (duration) quintile. The t statistics is Newey and West adjusted using six lags, testing the null hypothesis that the average return equal to zero. Panel A presents results for equal-weighted portfolios. Panel B presents results for value-weighted portfolios.

Panel A: value-weighted return

	Dur1	Dur2	Dur3	Dur4	Dur5	$Dur5-1$
RIOR1	0.1055	0.1230	0.1152	0.1349	0.0858	-0.0197
	3.3830	5.3144	4.9024	5.4422	2.4567	-0.6359
RIOR2	0.1325	0.1389	0.1329	0.1368	0.1128	-0.0197
	4.5191	5.4916	4.9667	4.9694	2.8504	-0.7127
RIOR3	0.1616	0.1507	0.1468	0.1374	0.1114	-0.0502
	5.0691	5.2840	5.1206	4.4499	2.7205	-1.9391
RIOR4	0.1493	0.1482	0.1415	0.1504	0.1394	-0.0099
	4.5253	4.9786	4.4405	4.3147	3.1790	-0.3728
RIOR5	0.1708	0.1483	0.1551	0.1508	0.1156	-0.0552
	4.7263	4.6133	4.4320	3.8647	2.4697	-2.1291
$RIOR5-1$	0.0653	0.0253	0.0398	0.0160	0.0298	
	2.4928	1.1115	1.5780	0.5700	0.9216	

Panel B: equal-weighted return

	Dur1	Dur2	Dur3	Dur4	Dur5	$Dur5-1$
RIOR1	0.1807	0.1470	0.1303	0.1243	0.0546	-0.1262
	6.6229	7.0737	5.5751	4.6188	1.1474	-4.2952
RIOR2	0.1648	0.1472	0.1408	0.1356	0.1056	-0.0592
	6.4685	6.4987	5.5717	4.7655	2.3111	-1.9151
RIOR3	0.1740	0.1552	0.1501	0.1348	0.1304	-0.0436
	6.1669	5.8944	5.3697	4.2443	2.9729	-1.6515
RIOR4	0.1625	0.1597	0.1451	0.1492	0.1528	-0.0096
	5.3700	5.6053	4.6409	4.3245	3.3591	-0.3519
RIOR5	0.1926	0.1633	0.1652	0.1624	0.2108	0.0182
	5.5000	5.1888	4.6634	4.1607	4.1811	0.6256
$RIOR5-1$	0.0119	0.0163	0.0349	0.0381	0.1563	

Table 9 continued from previous page

	0.5628	0.9446	1.7441	1.8599	6.5871	

Table 10
Bivariate independent-sort portfolio analyses—–control for SIIO
This table presents the results of bivariate independent-sort portfolio analyses of the relation between Equity duration (Dur) and future stock returns after controlling for the effect of the proxy for relative short-sale demand over supply (SIIO) from 1980 to 2020. Each month, all stocks in the CRSP sample are sorted into five groups based on an ascending sort of SIIO. All stocks are independently sorted into five groups based on an ascending sort of equity duration. The quintile breakpoints used to create the groups are calculated using all stocks in the CRSP sample. The intersections of the SIIO and duration groups are used to form twenty five portfolios. The table presents the average one-month-ahead return (in percent per month) and the associated t statistics (below) for each of the twenty five portfolios. Also shown are the average return and t statistics of a long-short zero-cost portfolio that is long the fifth duration (SIIO) quintile portfolio and short the first duration (SIIO) quintile portfolio in each SIIO (duration) quintile. The t statistics is Newey and West adjusted using six lags, testing the null hypothesis that the average return equal to zero. Panel A presents results for equal-weighted portfolios. Panel B presents results for value-weighted portfolios.

Panel A: value-weighted return						
	Dur1	Dur2	Dur3	Dur4	Dur5	$Dur5 - 1$
SIIO1	0.1387	0.1469	0.1249	0.1496	0.1567	0.0180
	4.9239	6.0859	4.9513	5.9250	4.8258	0.6308
SIIO2	0.1333	0.1172	0.1349	0.1266	0.1237	-0.0096
	4.4951	4.7232	5.2656	5.0631	4.3404	-0.3950
SIIO3	0.1487	0.1337	0.1083	0.1299	0.1142	-0.0345
	4.5955	4.9632	4.0963	4.8677	3.5817	-1.3673
SIIO4	0.1191	0.1346	0.1328	0.1217	0.1168	-0.0023
	3.7359	5.0072	4.6279	4.3586	3.4189	-0.0897
SIIO5	0.0819	0.1314	0.1240	0.1263	0.0892	0.0074
	2.2183	4.3959	3.6905	3.8780	2.2076	0.2484
$SIIO5 - 1$	-0.0568	-0.0155	-0.0009	-0.0233	-0.0675	
	-2.3806	-0.7430	-0.0377	-0.9235	-2.2354	

Panel B: equal-weighted return						
	Dur1	Dur2	Dur3	Dur4	Dur5	$Dur5 - 1$
SIIO1	0.1854	0.1643	0.1639	0.1658	0.1724	-0.0130
	7.2105	7.0182	6.3211	6.0874	4.6989	-0.5441
SIIO2	0.1707	0.1376	0.1539	0.1370	0.1509	-0.0198
	5.9465	5.2455	5.6237	5.1611	4.2894	-0.9658
SIIO3	0.1710	0.1396	0.1437	0.1373	0.1429	-0.0281
	5.3365	5.0520	5.0914	4.9039	3.9492	-1.4139
SIIO4	0.1617	0.1484	0.1250	0.1287	0.1360	-0.0257
	4.9968	5.3001	4.1508	4.2001	3.6158	-1.2702

Table 10 continued from previous page

SIIO5	0.1002	0.1111	0.0958	0.0934	0.0310	-0.0691
	2.5320	3.4899	2.9237	2.7271	0.7290	-2.8576
SIIO5 − 1	-0.0852	-0.0532	-0.0681	-0.0725	-0.1414	
	-3.5188	-2.9833	-3.7468	-3.7886	-6.0446	

Table 11

Bivariate independent-sort portfolio analyses in subsamples

This table presents the results of subsample bivariate independent-sort portfolio analyses of the relation between Equity duration (Dur) and future stock returns after controlling for the effect of the proxy for relative short-sale demand over supply (SIIO) from 1980 to 2020. We divide stocks into two subsamples: Small stocks, and large stocks. The former contains stocks whose market capitalization is smaller than or equal to its cross-sectional median, while the later contains stocks whose market capitalization is larger than its cross-sectional median. Each month, all stocks in the subsample are sorted into five groups based on an ascending sort of SIIO. All stocks are independently sorted into five groups based on an ascending sort of equity duration. The tertile breakpoints used to create the groups are calculated using all stocks in the subsample sample. The intersections of the SIIO and duration groups are used to form nine portfolios. The table presents the average one-month-ahead return (in percent per month) and the associated t statistics (below) for each of the nine portfolios. Also shown are the average return and t statistics of a long-short zero-cost portfolio that is long the fifth duration (SIIO) tertile portfolio and short the first duration (SIIO) tertile portfolio in each SIIO (duration) tertile. The t statistics is Newey and West adjusted using six lags, testing the null hypothesis that the average return equal to zero. Panel A presents results for equal-weighted portfolios. Panel B presents results for value-weighted portfolios.

Panel A: value-weighted return								
	Small stocks				Large stocks			
	Dur1	Dur2	Dur3	Dur3 − 1	Dur1	Dur2	Dur3	Dur3 − 1
SIIO1	0.1604	0.1615	0.1303	-0.0301	0.1249	0.1306	0.1359	0.0110
	6.0324	5.5976	3.5386	-1.2465	4.9394	5.4650	5.6655	0.6811
SIIO2	0.1767	0.1238	0.1384	-0.0383	0.1354	0.1170	0.1146	-0.0207
	5.4455	3.8036	3.4804	-1.6568	4.9633	4.5575	4.2344	-1.2307
SIIO3	0.0878	0.0971	0.0281	-0.0597	0.1166	0.1270	0.1158	-0.0008
	2.0723	2.5856	0.6528	-2.2300	4.0769	4.4978	3.5894	-0.0420
SIIO3 − 1	-0.0726	-0.0645	-0.1022		-0.0083	-0.0036	-0.0201	
	-2.6260	-2.8174	-3.6872		-0.6026	-0.2347	-1.1046	
Panel B: equal-weighted return								
	Small stocks				Large stocks			
	Dur1	Dur2	Dur3	Dur3 − 1	Dur1	Dur2	Dur3	Dur3 − 1
SIIO1	0.1842	0.1612	0.1700	-0.0142	0.1567	0.1512	0.1414	-0.0153
	6.2090	5.4633	4.1711	-0.4874	6.1010	5.9621	5.4053	-1.2669
SIIO2	0.1757	0.1365	0.1607	-0.0149	0.1491	0.1376	0.1357	-0.0134
	5.4273	4.119	3.7166	-0.5957	5.2155	4.9958	4.6272	-1.0169
SIIO3	0.1040	0.1094	0.0582	-0.0459	0.1237	0.1218	0.0938	-0.0299

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	2.4230	2.9489	1.2011	-1.5536	4.0249	4.0205	2.7012	-1.8198
$\mathrm{SIIO3}-1$	-0.0802	-0.0518	-0.1118		-0.0330	-0.0295	-0.0476	
	-2.7749	-2.4194	-3.7371		-2.6862	-2.5435	-3.3124	

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