The Term Structure of Equity Returns: Risk or Mispricing?

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Abstract

The term structure of equity returns is downward sloping. High duration stocks, whose cashflows are concentrated in the future, earn lower returns than low duration stocks. I provide evidence consistent with temporary overpricing of short-sale constrained, high duration stocks. Using institutional ownership as a proxy for short-sale constraints, I find that low returns of high duration stocks are contained within short-sale constrained portfolios: the spread in Fama & French alphas between low and high duration portfolios is 1.52% per month for the most constrained stocks. This difference decreases monotonically with less binding short-sale constraints to an insignificant 0.29% per month for the least short-sale constrained stocks. These effects are stronger after periods of high investor sentiment, lending support to sentiment-based overpricing when short-sale constraints keep sophisticated investors out of the market. My findings are independent of size and book-to-market.

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I Introduction

High duration stocks – stocks whose cash flows are more weighted towards the future – empirically earn lower returns than short duration stocks implying a *downward* sloping term structure of equity returns.[1] This result is surprising as the term structure of interest rates is, on average, upward sloping. The downward sloping term structure of equity returns, however, does not necessarily constitute a puzzle as exposure to priced risk factors might explain this pattern. An alternative explanation is mispricing. High duration stocks are typically young firms with low payout ratios, returns on equity but historically high growth in fundamentals. Some investors might be overly optimistic about the growth prospects of firms with high duration, bidding up the prices of these stocks. This temporary overpricing is subsequently reversed which results in low future returns.

In this paper, I take first steps to disentangle these opposing explanations. Looking at portfolios of stocks sorted on duration, I document that exposure to risk factors cannot explain the low excess returns of high duration stocks. High duration stocks have higher CAPM betas than low duration stocks, leading to large unexplained excess returns. Correcting for exposure to the three Fama & French factors (Fama and French (1993)) and momentum does not change this conclusion.[2]

If, on the contrary, the downward sloping term structure represents mispricing, we should find it to be more prevalent following periods of high investor sentiment.[3] The most optimistic views about difficult to value, high duration stocks in periods of high sentiment are likely overly optimistic, resulting in overpricing. In times of low investor sentiment, on the contrary, the most optimistic investors are likely sophisticated institutions and

[1] I use the notion term structure of equity returns as the empirical relationship between realized holding period returns and cash flow duration as in the original work of Dechow et al. (2004) and use duration and cash flow duration interchangeably.

[2] Estimating a conditional version of the consumption CAPM as in Lettau and Ludvigson (2001) or a consumption CAPM with ultimate consumption risk as in Parker and Julliard (2005) and Malloy, Moskowitz, and Vissing-Jørgensen (2009) – has no impact on my findings. It is however still possible that other, not tested here, priced risk factors can explain the variation in returns across duration-sorted portfolios.

[3] Antoniou, Doukas, and Subrahmanyam (2012a) provide evidence that momentum only arises during optimistic periods and experiences long run reversal. Antoniou et al. (2012b) show that the CAPM holds in times of low investor sentiment while Stambaugh, Yu, and Yuan (2012) study 11 anomalies and demonstrate that they are larger following periods of high investor sentiment.

mispricing is less likely to occur. This is indeed what I find in the data. The difference in abnormal returns between high and low duration stocks is about three times larger following periods of high sentiment. This finding is further confirmed in time series regressions. Excess returns of high duration portfolios exert a significantly positive relationship with changes in sentiment.

Understanding the determinants of stock returns and dissecting the temporal composition of risk prices is one of the key questions in financial economics. In a fully rational environment, we can employ information in the term structure of equity returns to infer how investors make risk-return tradeoffs over different investment horizons and ultimately better understand investors' risk preferences. Neither of the two conclusions can be drawn if the negative relationship between duration and equity returns is solely due to mispricing.

A key ingredient of any mispricing explanation for the downward sloping term structure is an explanation why rational arbitrageurs do not take sufficiently large short positions in overpriced stocks. I argue that short-sale constraints might be a major impediment for sophisticated investors to fully exploit this overpricing. Miller (1977) argues that short-sale constrained stocks can become overpriced in the presence of differences in opinion. Market prices only reflect the opinions of the most optimistic investors while pessimists are forced to sit on the sideline due to binding short-sale constraints.[4]

To empirically test this hypothesis, I closely follow Nagel (2005) and use institutional ownership, the fraction of shares held by institutions, as a proxy for short-sale constraints.[5] He argues that both direct short-sale constraints, such as loan supply and rebate rates, as well as indirect, such as institutional and cultural reasons, bind more for stocks with low institutional ownership. The overpricing explanation implies that the spread in returns between high and low duration stocks is largest among short-sale constrained stocks.

Before I can test this hypothesis, I have to address the empirical regularity that

[4]Miller (1977) implicitly assumes that agents are overconfident about their own information or precision of private signals as e.g. in Gervais, Heaton, and Odean (2011) and Daniel, Hirshleifer, and Subrahmanyam (1998). The model can easily be adjusted so that investors are not overconfident but rather draw inaccurate inference about others' signals.

[5]Choi, Jin, and Yan (2012) provide empirical evidence consistent with the premise that institutional ownership measures short-sales constraints. They look at changes in institutional breadth, the number of institutions with long positions in a particular stock, and document that positive changes predict high stock returns.

institutional ownership and size are strongly positively correlated. Previous research shows that anomalies are more pronounced among small stocks, possibly due to transaction costs and non-tradability.[6] To disentangle the effects of short-sale constraints from size, I follow Nagel (2005) and sort on residual institutional ownership, which is the residual from cross sectional regressions of institutional ownership on size. In addition, I restrict my sample to firms above the 20% size percentile. Neither of the two provisions has material impact on any of my findings.

I find evidence consistent with an overpricing-induced downward sloping term structure of equity returns. The spread in excess returns is strongest among stocks with low residual institutional ownership: low duration stocks outperform high duration stocks on average by 1.35% per month in the lowest residual ownership class. This difference monotonically decreases in residual institutional ownership to a statistically insignificant 0.25% per month for the highest residual institutional ownership category. The difference between high and low duration portfolios across the two extreme institutional ownership sorts is more than 1% per month. Correcting for risk exposure has no impact on this observation. This difference is 1.14% per month for the CAPM, 1.23% for the Fama & French three factor model and 1.04% when I augment the previous model with a momentum factor. The difference in excess returns across residual institutional ownership categories is driven by high duration stocks in line with temporal overpricing due to divergence of opinion and short-sale constraints. Returns to short duration portfolios which have their cash flows concentrated in the near term future are independent of institutional ownership and, hence, short-sale constraints.

In a final test of the mispricing hypothesis, I investigate the temporal interplay of short-sale constraints and investor sentiment. If the Miller (1977) hypothesis is driving my results, I should see that prices of short-sale constrained, high duration stocks are bid up in times of high investor sentiment resulting in low returns when the mispricing is corrected. My results support this hypothesis: stocks in the low residual institutional ownership, high duration bin earn on average a Fama & French adjusted excess return of -2.35% per month following periods of high sentiment; this abnormal return decreases to

[6]See e.g. Griffin and Lemmon (2002) and Israel and Moskowitz (2012) for the value premium.

-0.72% in low sentiment times. For unconstrained stocks, on the contrary, I do not find a significant effect of duration. The spread in abnormal returns between low and high duration stocks is indistinguishable from zero both in high and low sentiment periods.

This paper is related to several strands of the literature. First, the asset pricing literature investigating the relation between duration and stock returns. Dechow et al. (2004) construct a measure of equity duration based on financial statement data and show that stocks with high implied cash flow duration are more volatile, have higher CAPM betas and lower returns than short duration stocks. Van Binsbergen et al. (2012) study the prices of dividend strips. Using derivative instruments, they show that a synthetically constructed short term asset has higher returns than the aggregate market, implying a downward sloping term structure of equity risk premia. Lettau and Wachter (2007) develop a model to explain the value premium based on duration of the underlying cash flows. They model growth firms as high duration assets. Lettau and Wachter (2011) extend that model to also explain the term structure of interest rates. Croce, Lettau, and Ludvigson (2010) study the long-run risk model of Bansal and Yaron (2004) and show that it implies an upward sloping term structure of equity returns in a full information environment. Allowing for limited information about long run risk, they show that the term structure is downward sloping. Santos and Veronesi (2010) extend the external habit persistence model of Campbell and Cochrane (1999) to multiple assets. Allowing for cross sectional heterogeneity in cash flow risk, they are able to generate a premium for short-horizon stocks. Belo, Collin-Dufresne, and Goldstein (2012) introduce endogenous dividend dynamics in the external habit formation model of Campbell and Cochrane (1999) and the long run risk model of Bansal and Yaron (2004) to produce stationary leverage ratios in line with empirical evidence. They document that this modification leads to a downward sloping term structure of expected returns. Ai, Croce, Diercks, and Li (2012) show in a production economy featuring long run risk and vintage capital that the term structure of dividends is downward sloping for up to 10 years before it starts to increase again. Adding intangible capital, their model also produces a negative cross sectional relationship between cash flow duration and expected returns.[7]

[7] Cornell (1999), Cornell (2000) and Da (2009) also study the impact of duration on stock returns.

Second, my paper is also related to the literature looking at the role of short-sale constraints on stock returns. Diether, Malloy, and Scherbina (2002) empirically test the Miller (1977) hypotheses. They use dispersion in analyst forecasts as proxy for differences in opinion and show that higher dispersion in earnings forecasts lead to lower subsequent returns. Chen et al. (2002) propose the breadth of institutional ownership as a measure of short-sale constraints. They find that stocks with decreases in breadth significantly underperform stocks with increases in breadth. Nagel (2005) further develops this measure. He provides evidence that several cross-sectional anomalies are stronger among stocks with low institutional ownership.

The structure of the paper is as follows: Section II describes my data sources and provides summary statistics. Section III updates previous evidence that portfolios sorted on duration exhibit a statistically and economically significant negative relationship between duration and returns. To my knowledge, however, I am the first to document that this spread in returns cannot be explained by traditional risk factors and almost triples following periods of high investor sentiment. I provide evidence consistent with the premise that market participants extrapolate the high historical growth rate of high duration stocks into the future.[8] Section IV relates the term structure of equity returns to short-sale constraints. I show that the negative relationship between returns and duration is contained within short-sale constrained stocks even after controlling for exposure to risk factors. I then link this observation to time periods most likely leading to mispricing before I discuss some robustness tests and contrast my results to previous findings in the literature. Section V concludes.

II Data

Stock return data comes from the Center for Research in Security Prices (CRSP) Monthly Stock file. I follow standard conventions and restrict my analysis to common stock of firms incorporated in the United States trading on NYSE, Amex or Nasdaq. I exclude financials ($6000 \leq \text{SIC} < 7000$) and utilities ($4900 \leq \text{SIC} < 5000$). To account for the delisting

[8]This finding is reminiscent of Chen (2012) who shows that value and growth portfolios show little difference in future growth rates of fundamentals in both buy and hold and rebalanced portfolios.

bias in the CRSP database, I investigate the reason for the stocks' disappearance. If a company is delisted for cause (delisting codes 400-591) and has a missing delisting return, I follow the findings in Shumway (1997) and assume a return of -30%. In some cases, CRSP reports delisting returns several months after the security stopped trading. In these instances, I pro-rate the delisting return over the intervening period as Cohen, Polk, and Vuolteenaho (2009). Market equity (ME) is the total market capitalization at the firm level.

Balance sheet data is obtained from the Standard and Poor's Compustat database. I define book equity (BE) as total stockholder's equity plus deferred taxes and investment tax credit (if available) minus the book value of preferred stock. Based on availability, I use the redemption value, liquidation value or par value (in that order) for the book value of preferred stock. I prefer the shareholders' equity number as reported by Compustat. In case this data is not available, I calculate shareholders' equity as the sum of common and preferred equity. If none of the two are available, I define shareholders' equity as the difference of total assets and total liabilities. I supplement the book equity data with hand collected book equity data from the Moody's manual used in Davis, Fama, and French (2000). The book-to-market (BM) ratio of year t is then the book equity for the fiscal year ending in calendar year t-1 over the market equity as of December t-1.

I define the payout ratio (PR) as net payout over net income. Net payout is the sum of ordinary dividends and net purchases of common and preferred stock. Return on equity (ROE) is the ratio of income before extraordinary items over lagged book equity. Sales growth (Sales_g) is the percentage growth rate in net sales. As for the book-to-market ratio, I calculate these numbers for the fiscal year ending in calendar t-1. Age is the number of years a firm has been on Compustat. To alleviate a potential survivorship bias due to backfilling, I require that a firm has at least two years of Compustat data.

I obtain data on institutional ownership from the Thomson Reuters 13F (TR-13F) database. This data includes quarterly observations on long positions of mutual funds, hedge funds, insurance companies, banks, trusts, pension funds and other entities with holdings of more than $100 million of 13F assets. I calculate the institutional ownership ratio (IOR) by first summing the holdings of all reporting institutions at the security level and then dividing by the total shares outstanding from CRSP. If a common stock is on CRSP but not in the TR-13F database, I assign an institutional ownership ratio of 0. I use the CRSP cumulative adjustment factor to account for stock splits and other distributions between the effective ownership date and the reporting date. The TR-13F database carries forward institutional reports up to eight quarters. In calculating the institutional ownership ratio, I only keep the holding data as it first appears in the database.

Data on analyst forecasts for earnings per share, long term growth in earnings and realized five year growth in earnings is provided by the Institutional Brokers Estimates System (I/B/E/S).

The three Fama & French factors, the momentum factor and the one month Treasury bill rate come from the Fama & French data library on Ken French's webpage.

Dur is the implied cash flow duration measure of Dechow et al. (2004).[9] It resembles the traditional Macaulay duration for bonds and hence reflects the weighted average time to maturity of cashflows. The weights are determined by the ratio of discounted cashflows to price:

$$Dur_{i,t} = \frac{\sum_{s=1}^{T} s \times CF_{i,t+s}/(1+r)^s}{P_{i,t}} \tag{1}$$

where $Dur_{i,t}$ is the duration of firm i at the end of fiscal year t, $CF_{i,t+s}$ denotes the cash flow at time $t+s$, $P_{i,t}$ is the current price and r is the expected return on equity.[10]

Contrary to bonds, stocks do not have a well defined finite maturity, $t+T$, and cash flows are not known in advance.

To deal with the first complication, Dechow et al. (2004) split the duration formula into a finite detailed forecasting period and an infinite terminal value and assume that the latter

[9] Constructing a cash flow duration measure based on analyst forecasts of earnings per share and long term earnings growth leads to similar results.

[10] Dechow et al. (2004) assume that the expected return on equity is constant both across stocks and time. Allowing for firm specific discount rates ceteris paribus amplifies cross sectional differences in the duration measure as high duration firms tend to have lower returns on equity. This, however, would not change the ordering and hence had no effect on my later results. The relative ranking is also insensitive to changes in the level of r.

is paid out as level perpetuity.[11] With this assumption I can write equation 1 as

$$Dur_{i,t} = \frac{\sum_{s=1}^{T} s \times CF_{i,t+s}/(1+r)^s}{P_{i,t}} + T + \frac{1+r}{r} \times \frac{P_{i,t} - \sum_{s=1}^{T} CF_{i,t+s}/(1+r)^s}{P_{i,t}}.^{12} \quad (2)$$

To address the second complication, the authors start from an accounting identity and forecast cash flows via forecasting return on equity, $E_{i,t+s}/BV_{i,t+s-1}$ and growth in book equity, $(BV_{i,t+s} - BV_{i,t+s-1})/BV_{i,t+s-1}$

$$CF_{i,t+s} = E_{i,t+s} - (BV_{i,t+s} - BV_{i,t+s-1}) \quad (3)$$

$$= BV_{i,t+s-1} \times \left[\frac{E_{i,t+s}}{BV_{i,t+s-1}} - \frac{BV_{i,t+s} - BV_{i,t+s-1}}{BV_{i,t+s-1}}\right] \quad (4)$$

Dechow et al. (2004) model both returns on equity and growth in equity as autoregressive processes based on recent findings in the financial statement analysis literature.

I follow their general procedure and calculate duration at the end of the fiscal year. I employ updated autoregressive parameters and assume a detailed planning horizon of 15 years instead of ten years. For more details about the methodology and the data, I refer to the original source or the online appendix of this paper.

My sample period is July 1963 till June 2011. The sample is restricted to July 1981 till June 2011 when I make use of the institutional ownership and June 1982 to June 2006 when employing I/B/E/S data. To minimize the impact of outliers, I winsorize all variables at the 1% and 99% level.

Table 1 reports summary statistics in Panel A and cross-sectional correlations for various firm characteristics and return predictors used in the subsequent analysis in Panel B. All statistics are calculated annually and then averaged over time.

[11] As long as the finite forecasting horizon is sufficiently long to account for extraordinary growth opportunities at the firm and industry level the assumption that cash flows are paid out as level annuity has no impact on my results as a potentially terminal growth rate would be constant and had therefore no impact on my cross-sectional ordering.

[12] Equation 2 indicates and Dechow et al. (2004) emphasize that this measure of cash flow duration depends on current market prices and hence growth expectations of market participants. It might therefore not necessarily measure rational cash flow forecasts but overly optimistic expectations reflected in current prices. One goal of this study is to discriminate between these two alternative explanations. I also constructed a duration measure scaling by book value of equity instead of market value and a measure considering only a detailed planning horizon. Results are very similar.

The average payoff horizon implied by stock prices is about 18 years. An average standard deviation of 7 years hints towards substantial cross-sectional heterogeneity in this variable. Institutions hold about one third of all shares during my sample period and the average firm size is $1.3 billion.

Panel B shows that duration is strongly negatively correlated with book-to-market. In addition, high duration is associated with low payout rates, return-on-equity and firm age but high growth in sales. There is no linear association between duration and institutional ownership or size. Book-to-market has a negative relationship with the institutional-ownership-ratio, sales growth and size and is slightly positively correlated with the payout ratio. The institutional-ownership-ratio is strongly positively correlated with return-on-equity and size. Lastly, high sales growth tends to come along with low payout ratios.

III Duration and the Term Structure of Equity Returns

Previous research provides direct evidence of a negative relationship between duration and stock returns. In this section, I first establish this fact for my more recent sample. I then investigate whether the low returns of high duration stocks can be explained by their exposure to classical risk factors. I proceed by relating duration to investor sentiment and lastly look at analyst forecasts and fundamentals across duration portfolios.

A. Portfolios Sorted on Duration

At the end of June each year t from 1963 to 2010, I sort stocks into 10 deciles based on duration for the fiscal year ending in calendar year t-1. Portfolios are rebalanced on an annual basis and returns within portfolio equally weighted. Figure 1 plots the time series average annual portfolio return as a function of the average median portfolio duration. This figure exhibits a negative relationship between duration and holding period return: low duration stocks in portfolio 1 have, on average, a one year holding period return of more than 25%. The high duration stocks in the last basket, on the contrary, earn less than 10% per annum.

I regress excess returns at the portfolio level on various risk factors to test whether traditional risk factors can explain this feature of the data

$$R_{i,t} = \alpha_i + \beta_i X_{i,t} + \epsilon_{i,t} \tag{5}$$

where $R_{i,t}$ is excess return of portfolio i at time t, α_i is a model specific pricing error and β_i are the time-series loadings of returns on risk factors, X_i.

Table 2 presents monthly mean excess returns, OLS regression coefficients and pricing errors for the CAPM with standard errors in parentheses. In contrast to the negative relationship for returns, duration is strongly positively related to CAPM betas. High duration stocks have a CAPM beta of 1.41 compared to low duration stocks which have an exposure to the market of only 1.05. These two observations result in a monotonic negative relationship between duration and pricing errors. A strategy going long low duration stocks and shorting high duration stocks (D1 - D10 in the following) leads to a statistically significant excess return of 1.33% per month.

To allow for additional risk exposure besides market risk, Table 3 measures the betas and alphas for the Fama & French three factor model. Exposure to market risk still increases in duration. Factor loadings on SMB show a slightly U-shaped pattern and loadings on HML decrease in the portfolio number. The Fama & French factors alpha of the D1 - D10 strategy is 1.15% per month and highly statistically significant.

Table 4 also adjusts for exposure to momentum. There is a negative relationship between duration and past performance. High duration stocks tend to have experienced low returns in the past. Controlling for momentum has little impact on the other factor loadings and leaves an unexplained monthly excess return of 0.74 to the D1 - D10 strategy.

The results so far show that exposure to traditional risk factors cannot explain the historically low returns of high duration stocks. I now investigate a potential mispricing explanation for this finding. I present Fama & French adjusted monthly excess returns following periods of high and low investor sentiment. Stambaugh et al. (2012) argue that anomalies should be stronger following periods of high investor sentiment if mispricing is at the root of the anomaly. In periods of high investor sentiment, the views about the prospects of many stocks could be overly optimistic leading to temporal overpricing. If sentiment has a market-wide component, we should see lower returns following periods of high sentiment for all stocks when overvaluation is corrected. This effect should be strongest for stocks which are hard to value. This implies that a positive return to the D1 - D10 strategy should be mainly attributable to the short leg.[13]

The mean level of the sentiment index of Baker and Wurgler (2006) determines periods of high and low investor sentiment. Following Stambaugh et al. (2012), I define a high sentiment month as one in which the sentiment index was above the mean value in the previous month.

Table 5 presents Fama & French adjusted excess returns following periods of high and low investor sentiment in Panel A. The benchmark adjusted excess returns conditional on high and low sentiment are the estimates of α_H and α_L in the following equation

$$R_{i,t} = \alpha_{i,H} d_{H,t} + \alpha_{i,L} d_{L,t} + \beta_{Market} Market_t + \beta_{SMB} SMB_t + \beta_{HML} HML_t + \epsilon_{i,t} \qquad (6)$$

where $d_{H,t}$ and $d_{L,t}$ are dummies indicating high and low investor sentiment months.

There is a strong negative relationship between duration and Fama & French adjusted excess returns in high sentiment months: the D1 - D10 strategy earns a highly statistically significant abnormal return of 1.72% per month. Looking at the numbers for the individual portfolios we see that more than 80% of this abnormal return is due to the large negative risk adjusted return for the high duration portfolio. The profitability of the D1 - D10 strategy is reduced by a factor of three to 0.66% in low sentiment months.

Comparing the results within portfolios across high and low sentiment months indicates that high duration stocks could be prone to overpricing in periods of high investor sentiment. High duration stocks earn negative risk-adjusted returns after periods of high sentiment. There are no abnormal returns in either direction following periods of low sentiment for high-duration stocks.

Panel B of Table 5 measures the relationship of changes in the sentiment index and

[13]High duration firms tend to be younger firms with negative payout ratios, returns on equity but historically strong growth in sales and are therefore potentially difficult to value (see Table 1).

abnormal portfolio returns. I run separate time series regressions for each of the ten portfolios of Fama & French adjusted returns on changes in the sentiment index. I find that low and intermediate duration portfolios show no significant relationship, while high duration portfolios load strongly on changes in the sentiment index.

This piece of evidence lends further support to temporary overpricing of high duration stocks.

Table 6 reports historical cash flow fundamentals and analyst forecasts.[14] Panel A presents the evolution of the average portfolio long term earnings growth forecast (LTG) from June of year t till June of year t+4. LTG is a forecast of the growth rate in earnings per share before extraordinary items over the next three to five years. LTG for year t increases monotonically in duration from 13% for low duration stocks to about 26% for portfolio D10. This forecast remains fairly stable for low duration stocks as we look at years *t+1* till *t+4*. For high duration stocks on the contrary, LTG falls by more than 7% over the next 4 years.[15] This drop in expected long term growth of high duration stocks could be due to overly optimistic initial forecasts or mean reversion in earnings. To discriminate between these two explanations, I report realized five year growth in earnings between years *t-6* to *t-1* and *t* and *t+5* in Panel B. For the pre-portfolio formation period, we see again a strong positive association between realized five year growth in earnings and duration. Low duration stocks grow on average by 6% whereas high duration stocks grow by more than 31%. This difference in growth rates disappears over the following five years; both high and low duration stocks grow at an annual rate of roughly 10% per annum. This finding hints towards an extrapolation bias in analyst forecasts for the long term growth prospects of high duration firms and further indicates that market participants perceive the prospects of high duration stocks overly optimistic.

[14] Analysts mainly cover large companies and therefore the following results might not be representative for the universe of CRPS/Compustat stocks considered so far. In untabulated results I also find a downward sloping term structure of equity returns for the subset of IBES firms with a difference in excess returns of 0.85% per month for the sample period July 1982 till June 2006.

[15] I report results for all firms with non-missing LTG forecasts for all periods. Results are effectively unchanged if I look at all firms with non-missing forecasts at any point in time. This is not unexpected as analysts mainly provide forecasts for large firms and I therefore observe few firms leaving the I/B/E/S sample.

IV Short-Sale Constraints and the Term Structure of Equity Returns

The previous section illustrates that overpricing could be at the core of a downward sloping term structure of equity returns. For overpricing to temporarily persist, however, rational arbitrageurs have to be restrained from taking sufficiently large short positions to correct the mispricing.

In this section, I investigate whether low returns of high duration stocks are concentrated among short-sale constrained stocks as proxied by low institutional ownership. I first derive the testable implications of the Miller (1977) hypothesis. I then motivate institutional ownership as proxy for short-sale constraints and analyze the interplay of duration and short-sale constraints. I close this section by briefly discussing the robustness of my results.

A. Hypotheses

Hypothesis 1 *The positive abnormal return of going long low duration stocks and short high duration stocks (D1 - D5 in the following) should be contained in portfolios with low institutional ownership.*

Hypothesis 1 is a direct implication of the Miller (1977) theory. Divergence of opinion about the future prospects of difficult to value, high duration stocks paired with short-sale constraints leads first to overpricing and then to low return once the mispricing is corrected. If the downward sloping term structure of equity returns is due to mispricing, the negative relationship between duration and returns should become weaker with less binding short-sale constraints.

Hypothesis 2 *Differences in returns of the D1 - D5 strategy across categories of institutional ownership should be driven by high duration portfolios.*

Hypothesis 2 follows from the fact that short-sale constraints only allow for overpricing but not for underpricing. If a specific stock is underpriced, sophisticated investors can take sufficiently large long positions independent of short-sale constraints. Furthermore, short duration stocks pay off most of their cash flows in the near term future, have high returns on equity and low growth in sales and are therefore unlikely candidates for overpricing.

Hypothesis 3 *The abnormal returns of strategy D1 - D5 for short-sale constrained stocks should be larger following periods of high investor sentiment.*

This hypothesis follows from the observation that many investors are overly optimistic in periods of high sentiment, resulting in overpricing if rational arbitrageurs are prevented from correcting this mispricing. In times of low investor sentiment, on the contrary, the most optimistic investors are likely sophisticated institutions and mispricing is less likely to occur. If stocks are undervalued, arbitrage capital can flow in until the mispricing is eliminated.

B. Institutional Ownership and Short-Sale Constraints

Institutional and cultural considerations potentially restrict short-sale activities of institutional investors. Almazan, Brown, Carlson, and Chapman (2004) report that about 70% of mutual funds are precluded by their charters to pursue any short selling activities and only 2% actually do sell short. Restricted institutions also do not synthetically engineer short positions. Koski and Pontiff (1999) report that only 21% of equity mutual funds make use of any derivative instruments. Therefore, the only possibility for institutions to express negative opinions about the outlook of specific stocks is to reduce existing long positions. Once positions have been completely sold, institutional investors have to sit on the sidelines and their negative opinions are no longer reflected in market prices. A direct implication of these arguments is that arbitrage capital increases in institutional ownership.

Contrary to the centralized market for shorting NYSE stocks in the early 20th century, nowadays short sellers have to search for a stock lender in opaque shorting markets. A lower level of stock loan supply therefore implies tighter short-sale constraints due to higher search cost (see Duffie, Gârleanu, and Pedersen (2002)). D'Avolio (2002) shows that institutional ownership is the most important cross-sectional determinant of stocks loan supply. He also reports that custody banks which engage in stock lending on behalf of their institutional clients are the most reliable stock lenders while discount brokers are the least dependable.

Short sellers could also have a preference for borrowing stocks from institutional owners. Dechow et al. (2001) highlight that short squeezes, the recall of stock loans by lenders, are less likely for stocks with high institutional ownership. In addition, transaction and borrowing costs also decrease in institutional ownership.

These arguments indicate that short-sale constraints are tighter and the cost of shorting higher for stocks with low institutional ownership.

C. Descriptive Statistics

Table 1 illustrates that institutional ownership and size are strongly positively correlated. Previous research has shown that return anomalies are stronger within smaller stocks potentially due to lower liquidity and higher transaction costs. To purify my proxy for short-sale constraints from confounding size effects, I follow Nagel (2005) and sort on residual institutional ownership. In each sorting year, I run a cross sectional regression of logit transformed institutional ownership on a constant, the natural logarithm of size, $\log(ME)$, as well as the former variable squared and use the residual, $RIOR_{it}$, of this regression as my sorting variable:[16]

$$\log \frac{IOR_{it}}{1 - IOR_{it}} = \alpha + \beta_1 \log(ME) + \beta_2 (\log(ME))^2 + RIOR_{it} \tag{7}$$

In addition, I also delete the 20% smallest stocks from my sample.[17]

Table 7 provides time series averages of annual cross sectional means of firm characteristics for the 25 portfolios sorted on duration and residual institutional ownership. At the end of June each year t from 1981 to 2010, I sort all common stocks listed on NYSE, AMEX and NASDAQ above the 20% size percentile into quintiles based on duration for all firms

[16] I replace institutional ownership ratios below 0.0001 and above 0.9999 with these threshold values.

[17] Jones and Lamont (2002) point out that controlling for confounding size effect can be crucial to disentangle cost of short selling form size effects. Excluding the quintile of smallest stocks also ensures that my findings are not driven by stock picking skills of institutions. Lewellen (2011) – also using institutional ownership data from the TR 13F database – shows that institutions in the aggregate have little stock picking skills and institutional ownership has no predictive power for returns. For micro caps, however, he finds a quarterly abnormal return of 0.57%.

with fiscal years ending in calendar year t-1. These quintiles are then intersected with an independent sort on residual institutional ownership as of December t-1. Using a six month time lag for institutional ownership ensures that my results are not driven by short-term outperformance of institutional trades as documented among Chen et al. (2000).

Panel A shows that low duration stocks in portfolios D1 have on average a duration of about 11 years whereas high duration firms have an average duration of roughly 25 years. Duration within duration sorts, on the contrary, is constant across residual institutional ownership classes: the difference in duration between low and high residual institutional ownership bins (I1 - I5) is less than one year in each duration category. Panel B captures the negative correlation between duration and book-to-market and suggests that institutions tend to hold stocks with higher book-to-market ratios. Panel C verifies that institutional ownership is quite homogeneous within residual institutional ownership category but varies substantially with residual institutional ownership. According to Panel D and E, high duration stocks have lower or even negative payout ratios and returns-on-equity, while there is no strong relationship with residual institutional ownership. Across portfolios of residual institutional ownership, high-duration stocks have higher sales growth and tend to be younger than low duration stocks (Panels F and G). Sales growth and the number of years a firm has been on Compustat is fairly stable within portfolios of the same duration. As for size in Panel G, similar to Nagel (2005), I find an inverse U-shaped relationship with residual institutional ownership. Compared to the variation of size in the CRSP universe, the variation of size across sorts on residual ownership however is negligible. The sorting on residual ownership is therefore successful in engineering variation in my short-sale constraints proxy, independent of size.

Overall, this table shows that my double sorting generates portfolios which are fairly similar across residual institutional ownership portfolios, while they exhibit large variation across duration categories. High duration stocks tend to have characteristics which Baker and Wurgler (2006) and Griffin and Lemmon (2002) associate with speculative, hard to value stocks which are prone to divergence of opinion. Daniel et al. (1998) draw on the insights from the psychology literature (see e.g. Einhorn (1980)) and argue that mispricing should be stronger for stocks requiring more judgement in valuing them and where feedback on this evaluation is ambiguous in the short run. They mention stocks for which the bulk of cash flows is expected to be paid out far ahead in the future as an example. In the next subsection, therefore, I test whether short-sale constraints keep smart money out of the market so that market prices temporarily reflect only the opinions of the most optimistic investors leading first to overpricing and then to negative abnormal returns once this overpricing is corrected.

D. Effect of Short-Sale Constraints on the Term Structure of Equity Returns

Table 8 measures monthly mean excess returns for the 25 portfolios. Looking first at the results for stocks with low residual institutional ownership which are potentially most short-sale constrained, we see a pronounced downward sloping term structure of equity returns. Low duration stocks earn, on average, an excess return of 1.02% per month. This return decreases monotonically in duration. High duration stocks earn an excess return -0.33% per month. The spread in excess returns for the two extreme duration portfolios is 1.35% per month and highly statistically significant.

Focusing on the D1 - D5 strategy in the last column, excess returns decrease monotonically in residual institutional ownership. For stocks that are potentially least short-sale constrained, this strategy has a statistically insignificant excess return of 0.25% per month, confirming Hypothesis 1. The difference in returns across residual institutional ownership portfolios of more than 1% per month comes entirely from variation in returns for high duration stocks. Excess returns increase from -0.33% to 0.80% from low to high residual institutional ownership resulting in a spread of 1.12% per month, as predicted by Hypothesis 2. Low duration stocks, on the contrary, exhibit no variation with my proxy of short sale constraints. Institutional ownership only matters for stocks that are potentially prone to differences in opinion. A strategy going long the low residual institutional ownership portfolio and short the high residual institutional ownership portfolio (I1 - I5) earns an insignificant excess return of -0.02% for stocks in the D1 portfolios. This spread decreases monotonically to a highly significant -1.12% per month for high duration stocks. This is in line with the prediction of the Miller (1977) theory. Differences in opinion paired with short-sale constraints lead to temporal overpricing. High duration, short-sale constrained stocks earn low returns once the overpricing is corrected. The alternative hypothesis that institutional ownership reflects smart money is not backed by the data. Returns increase in residual institutional ownership only for stocks within the highest duration categories.[18]

Given the similarity in fundamentals of stocks in the same duration portfolios across categories of residual institutional ownership in Table 7, it is unlikely that the heterogeneous effect of institutional ownership across duration categories is driven by specific investment styles or superior analysis and information of institutions.[19] Nevertheless, I correct for the portfolios' exposure to risk in the following to rule out that covariances with risk factors explain the pattern in excess returns presented in Table 8.[20]

Table 9 presents the CAPM factor loadings for the 25 portfolios. CAPM betas increase from about 1 for low duration stocks to about 1.45 for high duration stocks. This pattern is independent of institutional ownership. Even though the standard errors are fairly tight, the difference in betas between portfolios I1 and I5 is never statistically significant. Given the loadings on the market, it is not surprising that correcting for market exposure does not materially change any of the previous findings for raw excess returns. Table 10 shows that the D1 - D5 strategy earns a risk adjusted excess return of 1.62% per month for stocks with low institutional ownership. This differential decreases to a statistically insignificant 0.48% for stocks that are potentially least short-sale constrained.

The CAPM has little explanatory power after 1963 (see e.g. Campbell and Vuolteenaho

[18]Another alternative is that short-sale constraints are also more binding for high duration stocks. Diether, Lee, and Werner (2009), however, show that short selling activity is higher for growth stocks.

[19]Piotroski and So (2012) use a measure of financial improvement based on accounting data, FSCORE, and show that the value premium is stronger for firms whose implied market estimates differ from their financial strength as indicated by FSCORE. Given the homogeneity of duration portfolios in firm characteristics across residual institutional ownership categories, it is unlikely that FSCORE varies with institutional ownership.

[20]Lewellen (2011) shows that even though institutions as a whole have no stock picking skills for large stocks, different types of institutions have modest ability compared to the CAPM. Controlling for book-to-market and momentum, however, subsumes this effect.

(2004)). Table 11 therefore presents loadings on the Fama & French three factor model. High duration stocks have a higher exposure to market risk and load stronger on SMB but show less common variation with HML. Again, the factor loadings are remarkably similar across categories of residual institutional ownership. Adjusting for exposure to the three Fama & French risk factors has no significant impact on previously reported pricing errors. We see in Table 12 that the abnormal excess returns of the D1 - D5 strategy again decrease monotonically in institutional ownership, resulting in a spread across institutional ownership categories of 1.23% per month. This spread is even slightly larger than the spread in raw or CAPM-adjusted excess returns.[21]

Table 13 contains time series regression coefficients of portfolio excess returns on the Fama & French factors and momentum. We see that adding momentum as explanatory variable slightly decreases the loading of high duration stocks on the market return and SMB, whereas the exposure to HML is reduced by a larger margin. High duration stocks have a negative exposure to momentum and the I1 - I5 strategy leads consistently to negative loadings on momentum hinting towards feedback trading strategies of some institutional investors.

Adjusting as well for momentum reduces pricing errors for high duration stocks somewhat, while having minor impacts for other categories. The D1 - D5 abnormal return is reduced to a still highly significant 0.97% per month within the class of low residual institutional ownership stocks. For the least short-sale constrained stocks this differential abnormal return is -0.07% per month and statistically indistinguishable from zero.

Until this point, the results suggest that the negative relationship between duration and returns cannot be explained by exposure to traditional risk factors but are consistent with mispricing. Table 15 looks at Fama & French adjusted excess returns conditional on high and low investor sentiment estimated as in equation 6 to further scrutinize this hypothesis.

[21] The effect is nevertheless largely driven by differences in mean excess returns compared to differences in factor loadings. In four robustness checks I set the loadings on SMB equal to 1 for all stocks, the loadings on HML to 1 for all low duration stocks, 0 for all high duration stocks and 0.75, 0.5 and 0.25 for stocks of intermediate duration, I combine the previous two exercises in a third test and finally assume an equal loading on the market of 1 across stocks. The spread between low and high duration stocks across the two extreme categories of residual institutional ownership is 1.19%, 1.17%, 1.13% and 1.10%, respectively.

Looking first at results for short-sale constrained stocks in high investor sentiment months, we see that benchmark adjusted excess returns for low duration stocks are statistically indistinguishable from zero. High duration stocks on the contrary earn a Fama & French adjusted excess returns of -2.35% per month, resulting in a highly statistically significant spread of 2.51%. The excess return for the D1 - D5 strategy monotonically decreases in residual institutional ownership to an insignificant excess return of 0.68% per month in the highest residual institutional ownership category. This difference across residual institutional ownership sorts is again fully driven by high duration stocks. For low duration stocks, all pricing errors are statistically indistinguishable from zero and the I1 - I5 strategy only delivers significant excess returns for stocks within the highest duration classes.

The profitability of the D1 - D5 strategy is reduced by a factor of 2.5 in the low residual ownership category following periods of low investor sentiment, confirming Hypothesis 3. Individual excess returns are not different from zero.[22] Sentiment betas in Panel B tend to increase in duration and lower residual institutional ownership confirming that short-sale constrained, high duration stocks are particularly exposed to swings in investor sentiments.

My results are consistent with a mispricing explanation for the downward sloping term structure: it is the interplay of short-sale constraints and differences in opinion which seems responsible for a large part of the empirical regularity that high duration stocks earn lower returns compared to low duration stocks as predicted by Miller (1977). In times of high sentiment, many investors are overly optimistic about the prospects of firms with strong growth in fundamentals, which burn money but might possibly be the next Google. Short-sale constraints keep sophisticated traders out of the market, so that market prices only reflect the opinions of the most optimistic market participants. Once this overpricing is corrected, previously short-sale constrained high duration stocks earn negative abnormal excess returns.

[22]The only exception is the high duration, low residual ownership portfolio. This finding could potentially indicate that part of the downward sloping term structure of equity returns is due to a duration factor as in Lettau and Wachter (2007).

E. Robustness

I have performed several robustness checks to corroborate my previous results and distinguish them from findings in the literature. Table 16 contains Fama - French adjusted pricing errors conditional on size. I first sort all stocks into two bins based on market capitalization. Within each size bin, I then sort firms into tertiles based on duration which are then intersected with an independent sort on residual institutional ownership. Panel I reports Fama - French alphas for small stocks, whereas Panel II contains alphas for large stocks. For both small and large stocks, we see a pronounced downward sloping term structure of equity returns for the lowest residual institutional ownership portfolios. The differential in abnormal returns between high and low duration stocks is 1.73% per month for small stocks and 1.17% for large stocks. This differential abnormal return again decreases in residual institutional ownership leaving a highly significant spread of 1.36% between high and low residual institutional ownership categories for small stocks and 0.69% for large stocks.

Table 17 reports results for a similar exercise with book-to-market as a conditioning variable. We see that my previous findings hold both for value stocks in Panel I and growth stocks in Panel II. There is a negative relation between duration and returns only for the most constrained portfolios.

Previous research documents that the value premium is most pronounced within short-sale constrained portfolios. Table 18 replicates this finding for my more recent sample. Sorting stocks into 25 portfolios based on book-to-market and residual institutional ownership, I find a highly significant value premium of 1.08% per month for stocks in the lowest residual institutional ownership category. This spread is decreasing to 0.39% for the least constrained stocks, leaving a difference of 0.69%, which is about 50% smaller than the spread in abnormal returns I find using duration as sorting instrument in Table 12.[23]

To further disentangle book-to-market from duration effects, I report Fama - French pricing errors of the previous double sorting conditional on duration in Table 19. Similar

[23]The difference between sorts on book-to-market and duration is largely driven by differences in mean excess returns across the two sets of test assets. The difference in mean excess returns between low and high duration stocks across the two extreme residual institutional ownership categories is 0.56% per month for book-to-market sorts and 1.10% per month for the duration portfolios.

to previous exercises, I first sort stocks into two basket based on duration. Within each duration-sorted bin, I then perform a double sorting along independent book-to-market and residual institutional ownership dimensions. Panel I shows that there is a value premium for all low duration stocks independent of the degree of short-sale constraints. High duration stocks in Panel II, on the contrary, do not show any significant association between book-to-market and returns.

The online appendix contains additional results for all stocks, i.e., without excluding the 20% of smallest stocks, a sorting on raw instead of residual institutional ownership, using a three month lag between the reporting date of institutional ownership data and portfolio formation as well as a quarterly resorting along the institutional ownership dimension. None of these additional tests has any impact my findings.

V Conclusion

In this paper, I provide evidence that the negative slope of the term structure of equity returns cannot be explained by exposure to traditional risk factors but is consistent with a mispricing explanation. Overly optimistic investors drive up prices of high duration stocks - stocks of young firms with low payout rates and negative returns on equity, but historically strong growth in sales. Short-sale constraints prevent rational arbitrageurs from taking sufficiently large short positions necessary to correct the mispricing. I document evidence that it is the interplay of differences of opinion and short-sale constraints which drives my results as predicted by Miller (1977). Within the category of low institutional ownership stocks, I find a statistically and economically large spread in excess returns between high and low duration stocks of more 1.35% per month. On the contrary, there is no difference in returns across duration categories for the least constrained stocks. In line with my proposed explanation for the empirical facts, returns do not vary with institutional ownership for short duration stocks. Any variation in returns is driven by high duration portfolios, which exhibit a spread in excess returns across institutional ownership categories of more than 1% per month without differing in firm characteristics or exposure to risk factors. Correcting for standard risk factors has no impact on any of these conclusions. Perhaps most insightful, I find that the degree of mispricing systematically varies with investor sentiment. In times of high investor sentiment, optimistic investors bid up prices of short-sale constrained, high duration stocks. This mispricing is corrected subsequently, resulting in negative risk corrected abnormal returns of these stocks of more than -2.35% per month. This negative abnormal performance is reduced by a factor of 2.5 following periods of low investor sentiment. The results caution to use information in the term structure of equity returns to infer how investors trade off risk and returns over different horizons.

My findings also have policy implications. Short-sale constraints may hold negative opinions off the market, leading to overpricing and bubble-like periods. The correction of this mispricing can have large and pronounced effects on the macroeconomy. Historically, periods of large decreases of asset prices were followed by declines in economic activity, financial instability and budgetary imbalances. Bernanke (1983), for example, shows that a disruption of the financial system was one major reason for the severity and the propagation of the Great Depression. Lowering the cost and impediments of short selling and increasing the transparency in the opaque market for short selling might be an efficient policy action to prevent asset pricing bubbles and, ultimately, increase macroecomic stability.

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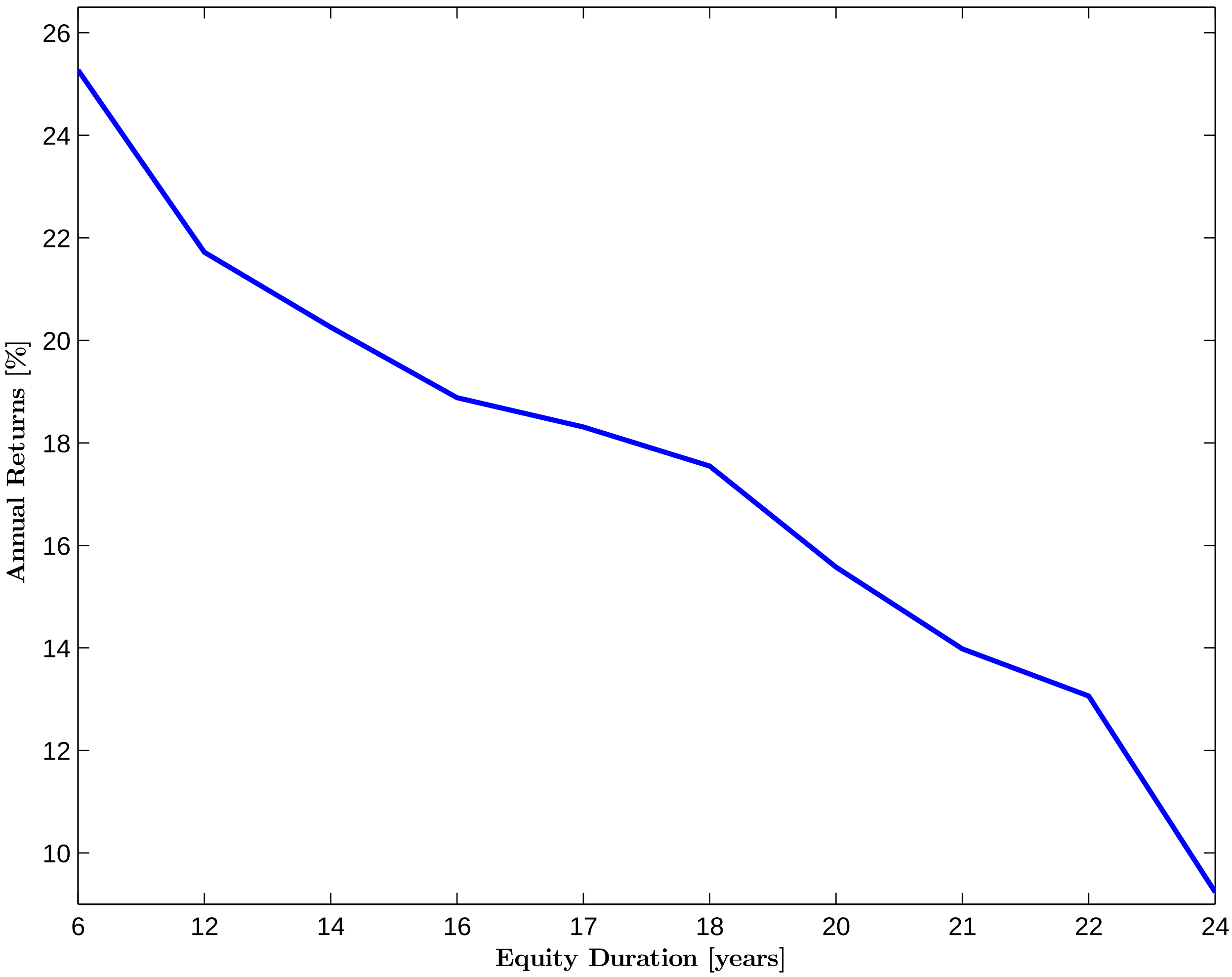
Figure 1: **Average Term Structure of Equity**



This figure plots the time series average annual portfolio return as a function of the average median portfolio duration. At the end of June each year t from 1963 to 2010 all common stocks listed on NYSE, AMEX and NASDAQ are sorted into ten deciles based on duration for all firms with fiscal years ending in year t-1. Returns are equally weighted and delisting returns included. If a firm is delisted for cause (delisting code between 400 and 591) and has missing delisting return, I assume a delisting return of -30% following Shumway (1997). Duration is the equity duration measure of Dechow et al. (2004). Financial statement data comes from Compustat. For missing Compustat book equity values I use the Moody's book equity information collected by Davis et al. (2000).

Table 1: **Summary Statistics and Correlations for Firm Characteristics and Return Predictors**

This table reports time series averages of annual cross sectional means and standard deviations for firm characteristics and return predictors used in the subsequent analysis in Panel A and contemporaneous correlations of these variables in Panel B. Dur is the equity duration measure of Dechow et al. (2004); BM is the book-to-market ratio; IOR is the fraction of shares held by institutions; PR is net payout over net income; ROE is return on equity; Sales_g is sales growth, ME is the market capitalization in millions and Age is the number of years a firm has been on Compustat. Institutional ownership information is obtained from the Thomson Reuters 13F database. Financial statement data comes from Compustat. For missing Compustat book equity values I use the Moody's book equity information collected by Davis et al. (2000). The sample period is June 1981 to June 2010.

	Dur	BM	IOR	PR	ROE	Sales_g	ME	Age
	Panel A. Means and Standard Deviations							
Mean	18.35	0.81	0.34	-0.09	0.00	0.21	1273	16.00
Std	7.17	0.76	0.25	2.21	0.55	0.63	4034	10.61
	Panel B. Contemporaneous Correlations							
Dur		-0.65	-0.02	-0.10	-0.37	0.33	0.04	-0.16
B/M			-0.12	0.07	-0.06	-0.16	-0.12	0.06
IOR				0.07	0.22	-0.05	0.30	0.31
PR					-0.04	-0.22	0.08	0.20
ROE						-0.01	0.11	0.12
Sale_g							-0.03	-0.18
ME								0.32

Table 2: **Mean Excess Returns of 10 Portfolios sorted on Duration**

This table reports monthly mean excess returns, time series factor loadings (β) and pricing errors (α) for the CAPM for 10 portfolios sorted on duration (Dur) with OLS standard errors in parentheses. At the end of June each year t from 1963 to 2010 all common stocks listed on NYSE, AMEX and NASDAQ are sorted into ten deciles based on duration for all firms with fiscal years ending in calendar year t-1. Returns are equally weighted and delisting returns included. If a firm is delisted for cause (delisting code between 400 and 591) and has a missing delisting return, I assume a delisting return of -30% following Shumway (1997). Market is the value weighted return on all NYSE, AMEX, and NASDAQ common stocks minus the one-month Treasury bill rate. Duration is the equity duration measure of Dechow et al. (2004). Financial statement data comes from Compustat. For missing Compustat book equity values, I use the Moody's book equity information collected by Davis et al. (2000).

	Low Dur	D2	D3	D4	D5	D6	D7	D8	D9	High Dur	D1–D10
Mean	1.44	1.22	1.11	1.02	0.97	0.93	0.77	0.66	0.57	0.28	1.16
SE	(0.26)	(0.25)	(0.25)	(0.24)	(0.25)	(0.25)	(0.26)	(0.27)	(0.31)	(0.37)	(0.21)
β_{CAPM}	1.05	1.06	1.08	1.10	1.13	1.15	1.19	1.26	1.40	1.41	-0.37
SE	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.06)	(0.04)
α_{CAPM}	0.95	0.72	0.61	0.50	0.44	0.39	0.21	0.07	-0.08	-0.38	1.33
SE	(0.17)	(0.15)	(0.14)	(0.13)	(0.13)	(0.13)	(0.13)	(0.14)	(0.18)	(0.25)	(0.20)

Table 3: **Fama & French Factor Loadings of 10 Portfolios sorted on Duration**

This table reports time series factor loadings (β) and pricing errors (α) for the Fama & French three factor model for 10 portfolios sorted on duration (Dur) with OLS standard errors in parentheses. At the end of June each year t from 1963 to 2010 all common stocks listed on NYSE, AMEX and NASDAQ are sorted into ten deciles based on duration for all firms with fiscal years ending in calendar year t-1. Returns are equally weighted and delisting returns included. If a firm is delisted for cause (delisting code between 400 and 591) and has a missing delisting return, I assume a delisting return of -30% following Shumway (1997). Market is the value weighted return on all NYSE, AMEX, and NASDAQ common stocks minus the one-month Treasury bill rate, SMB is the average return on three small portfolios minus the average return on three big portfolios and HML is the average return on two value portfolios minus the average return on two growth portfolios. Duration is the equity duration measure of Dechow et al. (2004). Financial statement data comes from Compustat. For missing Compustat book equity values, I use the Moody's book equity information collected by Davis et al. (2000).

	Low Dur	D2	D3	D4	D5	D6	D7	D8	D9	High Dur	D1–D10
β_{Market}	0.89	0.90	0.92	0.94	0.97	0.99	1.02	1.05	1.14	1.11	-0.23
SE	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.03)	(0.05)	(0.04)
β_{SMB}	1.10	1.03	1.00	0.93	0.93	0.93	0.93	0.97	1.13	1.36	-0.26
SE	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)	(0.07)	(0.06)
β_{HML}	0.55	0.47	0.40	0.34	0.29	0.27	0.18	0.03	-0.05	-0.04	0.58
SE	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.06)	(0.06)
$\alpha_{F\&F}$	0.54	0.35	0.27	0.20	0.16	0.12	-0.03	-0.12	-0.27	-0.61	1.15
SE	(0.10)	(0.07)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.07)	(0.11)	(0.20)	(0.18)

Table 4: **Four Factor Loadings of 10 Portfolios sorted on Duration**

This table reports time series factor loadings (β) and pricing errors (α) for the four factor model for 10 portfolios sorted on duration (Dur) with OLS standard errors in parentheses. At the end of June each year t from 1963 to 2010 all common stocks listed on NYSE, AMEX and NASDAQ are sorted into ten deciles based on duration for all firms with fiscal years ending in calendar year t-1. Returns are equally weighted and delisting returns included. If a firm is delisted for cause (delisting code between 400 and 591) and has a missing delisting return I, assume a delisting return of -30% following Shumway (1997). Market is the value weighted return on all NYSE, AMEX, and NASDAQ common stocks minus the one-month Treasury bill rate, SMB is the average return on three small portfolios minus the average return on three big portfolios, HML is the average return on two value portfolios minus the average return on two growth portfolios and Mom is the average return on two high prior return portfolios minus the average return on two low prior return portfolios. Duration is the equity duration measure of Dechow et al. (2004). Financial statement data comes from Compustat. For missing Compustat book equity values, I use the Moody's book equity information collected by Davis et al. (2000).

	Low Dur	D2	D3	D4	D5	D6	D7	D8	D9	High Dur	D1–D10
β_{Market}	0.90	0.90	0.92	0.94	0.96	0.97	1.00	1.02	1.09	1.06	-0.16
	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.05)	(0.04)
β_{SMB}	1.11	1.03	1.00	0.93	0.93	0.92	0.92	0.94	1.09	1.31	-0.20
	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)	(0.07)	(0.06)
β_{HML}	0.59	0.49	0.42	0.34	0.27	0.22	0.10	-0.09	-0.24	-0.26	0.85
	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)	(0.07)	(0.06)
β_{Mom}	0.07	0.02	0.03	0.00	-0.02	-0.07	-0.10	-0.17	-0.27	-0.31	0.38
	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.05)	(0.05)
$\alpha_{4-Factor}$	0.47	0.33	0.25	0.20	0.19	0.19	0.08	0.07	0.02	-0.28	0.74
	(0.10)	(0.07)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.07)	(0.11)	(0.20)	(0.18)

Table 5: **Fama & French Alphas of 10 Portfolios sorted on Duration Conditional on Investor Sentiment**

This table reports benchmark adjusted mean excess returns following periods of high and low investor sentiment in Panel A as well as sentiment betas in Panel B for 10 portfolios sorted on duration (Dur) with OLS standard errors in parentheses. At the end of June each year t from 1963 to 2010 all common stocks listed on NYSE, AMEX and NASDAQ are sorted into ten deciles based on duration for all firms with fiscal years ending in calendar year t-1. Returns are equally weighted and delisting returns included. If a firm is delisted for cause (delisting code between 400 and 591) and has a missing delisting return, I assume a delisting return of -30% following Shumway (1997). High and low sentiment periods are defined by the mean level of the sentiment index of Baker and Wurgler (2006). Sentiment betas are the time series factor loadings of the benchmark adjusted mean excess returns on a constant and changes in the sentiment index. Duration is the equity duration measure of Dechow et al. (2004). Financial statement data comes from Compustat. For missing Compustat book equity values, I use the Moody's book equity information collected by Davis et al. (2000). The Fama & French three factor model is used as benchmark. The sample period is July 1965 to December 2010 due to the availability of the sentiment index.

	Low Dur	D2	D3	D4	D5	D6	D7	D8	D9	High Dur	D1–D10
Panel A. Sentiment Alphas											
$\alpha_{HighSent}$	0.31	0.30	0.24	0.17	0.15	0.05	-0.14	-0.31	-0.59	-1.41	1.72
$SE_{HighSent}$	0.14	0.11	0.09	0.09	0.08	0.09	0.09	0.11	0.16	0.29	0.27
$\alpha_{LowSent}$	0.76	0.42	0.31	0.20	0.16	0.15	0.06	0.03	-0.02	0.10	0.66
$SE_{LowSent}$	0.14	0.10	0.09	0.09	0.08	0.09	0.09	0.10	0.16	0.28	0.27
Panel B. Sentiment Betas											
β_{Sent}	0.12	0.09	-0.04	-0.06	-0.03	-0.02	0.06	0.18	0.46	0.71	-0.59
SE	(0.10)	(0.07)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.07)	(0.11)	(0.20)	(0.19)

Table 6: **Earnings Growth of 10 Portfolios sorted on Duration**

This table reports time series averages of long term earnings growth (LTG) forecasts in Panel A as well as mean realized five year growth in earnings per share (EG) in Panel B for 10 portfolios sorted on duration (Dur). At the end of June each year t from 1982 to 2006 all common stocks listed on NYSE, AMEX and NASDAQ are sorted into ten deciles based on duration for all firms with fiscal years ending in calendar year t-1. Duration is the equity duration measure of Dechow et al. (2004). Financial statement data comes from Compustat. For missing Compustat book equity values, I use the Moody's book equity information collected by Davis et al. (2000). The earnings and price data comes from the Institutional Brokers' Estimate System (I/B/E/S) for the June statistical periods. The sample period is June 1982 to June 2006 due to the availability of the I/B/E/S data.

	Low Dur	D2	D3	D4	D5	D6	D7	D8	D9	High Dur	D1–D10
	Panel A. Long Term Earnings Growth Forecasts										
LTG_t	13.23	13.65	14.43	15.22	15.48	16.38	16.94	18.47	20.43	26.40	-13.17
LTG_{t+1}	13.05	13.57	14.21	14.76	15.16	15.86	16.37	17.61	19.27	24.16	-11.11
LTG_{t+2}	13.00	13.56	14.08	14.48	14.73	15.46	15.90	16.87	18.21	22.04	-9.04
LTG_{t+3}	12.77	13.17	13.75	14.11	14.26	15.08	15.32	15.98	17.28	20.32	-7.55
LTG_{t+4}	12.78	12.87	13.45	13.69	13.90	14.50	14.82	15.40	16.56	18.92	-6.14
	Panel B. Realized 5 Year Growth in Earnings										
$EG_{t-6:t-1}$	5.69	7.04	9.80	9.33	11.98	15.03	15.90	19.41	23.52	31.00	-25.31
$EG_{t:t+5}$	10.89	7.19	8.51	8.64	8.17	9.45	8.40	9.10	10.03	10.75	0.14

Table 7: **Summary Statistics of 25 Portfolios sorted on Duration and Residual Institutional Ownership**

This table reports time series averages of annual cross sectional means for firm characteristics and return predictors used in the subsequent analysis for 25 portfolios sorted on duration (Dur) and residual institutional ownership (RIOR). At the end of June each year t from 1981 to 2010 all common stocks listed on NYSE, AMEX and NASDAQ are sorted into quintiles based on duration for all firms with fiscal years ending in calendar year t-1. These quintiles are then intersected with an independent sort on residual institutional ownership as of December t-1. Dur is the equity duration measure of Dechow et al. (2004); BM is the book-to-market ratio; IOR is the fraction of shares held by institutions; RIOR is the residual in a cross sectional regression of IOR on size; PR is net payout over net income; ROE is return on equity; Sales_g is sales growth; ME is the market capitalization in millions and Age is number of years a firm has been on Compustat. Institutional ownership information is obtained from the Thomson Reuters 13F database. Financial statement data comes from Compustat. For missing Compustat book equity values, I use the Moody's book equity information collected by Davis et al. (2000). Only stocks above the 20th percentile are included.

	Duration					Duration				
	Low	D2	D3	D4	High	Low	D2	D3	D4	High
	Panel A. Dur					**Panel B. BM**				
Low RIOR	10.49	17.12	19.33	21.17	25.45	1.25	0.74	0.53	0.36	0.25
I2	11.51	17.07	19.30	21.14	25.03	1.23	0.77	0.54	0.35	0.28
I3	11.50	17.08	19.29	21.11	25.20	1.29	0.78	0.55	0.37	0.31
I4	11.13	17.03	19.30	21.10	24.69	1.38	0.81	0.59	0.42	0.35
High RIOR	10.73	16.99	19.29	21.08	24.93	1.53	0.89	0.64	0.47	0.43
	Panel C. IOR					**Panel D. PR**				
Low RIOR	0.18	0.21	0.22	0.22	0.13	0.07	0.03	0.07	-0.26	-1.19
I2	0.33	0.38	0.41	0.41	0.31	0.28	0.28	0.16	-0.06	-0.58
I3	0.38	0.45	0.49	0.50	0.39	0.24	0.18	0.04	-0.15	-0.88
I4	0.41	0.48	0.52	0.54	0.45	0.31	0.11	-0.08	-0.33	-0.99
High RIOR	0.51	0.56	0.59	0.61	0.55	0.26	0.03	-0.30	-0.56	-1.26
	Panel E. ROE					**Panel F. Sales_g**				
Low RIOR	0.43	0.17	0.16	0.17	-0.50	0.10	0.12	0.14	0.21	0.77
I2	0.28	0.13	0.15	0.18	-0.32	0.06	0.09	0.13	0.20	0.63
I3	0.20	0.12	0.14	0.16	-0.32	0.05	0.10	0.14	0.21	0.60
I4	0.16	0.11	0.12	0.13	-0.32	0.04	0.10	0.15	0.21	0.59
High RIOR	0.12	0.09	0.11	0.11	-0.37	0.03	0.09	0.15	0.23	0.53
	Panel G. AGE					**Panel H. ME**				
Low RIOR	16.36	18.07	17.71	15.85	9.99	1238	1483	2031	2299	887
I2	20.40	21.91	21.24	18.91	12.08	1686	2236	3019	4149	2121
I3	20.09	21.50	20.09	18.01	11.93	1251	1431	2063	3856	1997
I4	19.51	19.47	17.65	15.07	11.17	526	781	1455	2642	1215
High RIOR	17.36	16.46	14.12	12.24	10.64	296	468	884	1055	754

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Table 8: **Mean Excess Returns of 25 Portfolios sorted on Duration and Residual Institutional Ownership**

This table reports monthly mean excess returns for 25 portfolios sorted on duration (Dur) and residual institutional ownership (RIOR) with OLS standard errors in parentheses. At the end of June each year t from 1981 to 2010 all common stocks listed on NYSE, AMEX and NASDAQ are sorted into quintiles based on duration for all firms with fiscal years ending in calendar year t-1. These quintiles are then intersected with an independent sort on residual institutional ownership as of December t-1. Returns are equally weighted and delisting returns included. If a firm is delisted for cause (delisting code between 400 and 591) and has a missing delisting return, I assume a delisting return of -30% following Shumway (1997). Duration is the equity duration measure of Dechow et al. (2004). RIOR is the residual in a cross sectional regression of the fraction of shares held by institutions on size. Institutional ownership information is obtained from the Thomson Reuters 13F database. Financial statement data comes from Compustat. For missing Compustat book equity values, I use the Moody's book equity information collected by Davis et al. (2000). Only stocks above the 20th percentile are included.

		Low Dur	D2	D3	D4	High Dur	D1–D5
Mean	Low RIOR	1.02	0.82	0.68	0.42	-0.33	1.35
		(0.31)	(0.30)	(0.30)	(0.35)	(0.49)	(0.30)
	I2	1.04	0.92	0.79	0.68	0.09	0.95
		(0.31)	(0.30)	(0.30)	(0.31)	(0.45)	(0.26)
	I3	1.04	0.88	0.91	0.77	0.43	0.62
		(0.31)	(0.29)	(0.30)	(0.32)	(0.45)	(0.28)
	I4	0.98	0.96	0.88	0.54	0.46	0.52
		(0.30)	(0.31)	(0.32)	(0.35)	(0.46)	(0.30)
	High RIOR	1.04	0.96	0.85	0.69	0.80	0.25
		(0.33)	(0.33)	(0.33)	(0.35)	(0.45)	(0.28)
	I1–I5	-0.02	-0.15	-0.17	-0.27	-1.12	1.10
		(0.14)	(0.14)	(0.13)	(0.14)	(0.24)	(0.25)

Table 9: **CAPM Betas of 25 Portfolios sorted on Duration and Residual Institutional Ownership**

This table reports time series factor loadings (β) for the CAPM for 25 portfolios sorted on duration (Dur) and residual institutional ownership (RIOR) with OLS standard errors in parentheses. At the end of June each year t from 1981 to 2010 all common stocks listed on NYSE, AMEX and NASDAQ are sorted into quintiles based on duration for all firms with fiscal years ending in calendar year t-1. These quintiles are then intersected with an independent sort on residual institutional ownership as of December t-1. Returns are equally weighted and delisting returns included. If a firm is delisted for cause (delisting code between 400 and 591) and has a missing delisting return, I assume a delisting return of -30% following Shumway (1997). The market portfolio is the value weighted return on all NYSE, AMEX, and NASDAQ stocks minus the one-month Treasury bill rate. Duration is the equity duration measure of Dechow et al. (2004). RIOR is the residual in a cross sectional regression of the fraction of shares held by institutions on size. Institutional ownership information is obtained from the Thomson Reuters 13F database. Financial statement data comes from Compustat. For missing Compustat book equity values, I use the Moody's book equity information collected by Davis et al. (2000). Only stocks above the 20th percentile are included.

		Low Dur	D2	D3	D4	High Dur	D1–D5
β_{CAPM}	Low RIOR	0.99	1.04	1.07	1.19	1.45	-0.47
		(0.04)	(0.04)	(0.04)	(0.04)	(0.08)	(0.06)
	I2	1.05	1.08	1.11	1.17	1.48	-0.43
		(0.04)	(0.03)	(0.03)	(0.03)	(0.06)	(0.05)
	I3	1.05	1.07	1.11	1.20	1.50	-0.45
		(0.04)	(0.03)	(0.03)	(0.03)	(0.06)	(0.06)
	I4	1.00	1.06	1.15	1.27	1.45	-0.45
		(0.04)	(0.04)	(0.04)	(0.04)	(0.07)	(0.06)
	High RIOR	1.03	1.09	1.12	1.21	1.43	-0.40
		(0.05)	(0.04)	(0.04)	(0.04)	(0.06)	(0.06)
	I1–I5	-0.04	-0.05	-0.06	-0.02	0.03	-0.07
		(0.03)	(0.03)	(0.03)	(0.03)	(0.05)	(0.06)

Table 10: **CAPM Alphas 25 Portfolios sorted on Duration and Residual Institutional Ownership**

This table reports pricing errors (α) for the CAPM for 25 portfolios sorted on duration (Dur) and residual institutional ownership (RIOR) with OLS standard errors in parentheses. At the end of June each year t from 1981 to 2010 all common stocks listed on NYSE, AMEX and NASDAQ are sorted into quintiles based on duration for all firms with fiscal years ending in calendar year t-1. These quintiles are then intersected with an independent sort on residual institutional ownership as of December t-1. Returns are equally weighted and delisting returns included. If a firm is delisted for cause (delisting code between 400 and 591) and has a missing delisting return, I assume a delisting return of -30% following Shumway (1997). Market is the value weighted return on all NYSE, AMEX, and NASDAQ stocks minus the one-month Treasury bill rate. Duration is the equity duration measure of Dechow et al. (2004). RIOR is the residual in a cross sectional regression of the fraction of shares held by institutions on size. Institutional ownership information is obtained from the Thomson Reuters 13F database. Financial statement data comes from Compustat. For missing Compustat book equity values, I use the Moody's book equity information collected by Davis et al. (2000). Only stocks above the 20th percentile are included.

		Low Dur	D2	D3	D4	High Dur	D1–D5
α_{CAPM}	Low RIOR	0.45	0.22	0.06	-0.28	-1.17	1.62
		(0.20)	(0.17)	(0.16)	(0.20)	(0.34)	(0.28)
	I2	0.43	0.29	0.15	0.00	-0.77	1.20
		(0.18)	(0.15)	(0.13)	(0.14)	(0.27)	(0.24)
	I3	0.43	0.26	0.27	0.07	-0.45	0.88
		(0.19)	(0.15)	(0.14)	(0.15)	(0.28)	(0.26)
	I4	0.40	0.35	0.21	-0.19	-0.38	0.78
		(0.19)	(0.17)	(0.17)	(0.18)	(0.30)	(0.28)
	High RIOR	0.45	0.33	0.19	-0.01	-0.03	0.48
		(0.22)	(0.20)	(0.19)	(0.20)	(0.29)	(0.27)
	I1–I5	0.00	-0.12	-0.13	-0.26	-1.14	1.14
		(0.14)	(0.14)	(0.13)	(0.14)	(0.25)	(0.26)

Table 11: **Fama & French Factor loadings of 25 Portfolios sorted on Duration and Residual Institutional Ownership**

This table reports time series factor loadings (β) for the Fama & French three factor model for 25 portfolios sorted on duration (Dur) and residual institutional ownership (RIOR) with OLS standard errors in parentheses. At the end of June each year t from 1981 to 2010 all common stocks listed on NYSE, AMEX and NASDAQ are sorted into quintiles based on duration for all firms with fiscal years ending in calendar year t-1. These quintiles are then intersected with an independent sort on residual institutional ownership as of December t-1. Returns are equally weighted and delisting returns included. If a firm is delisted for cause (delisting code between 400 and 591) and has a missing delisting return, I assume a delisting return of -30% following Shumway (1997). Market is the value weighted return on all NYSE, AMEX, and NASDAQ stocks minus the one-month Treasury bill rate, SMB is the average return on three small portfolios minus the average return on three big portfolios and HML is the average return on two value portfolios minus the average return on two growth portfolios. Duration is the equity duration measure of Dechow et al. (2004). RIOR is the residual in a cross sectional regression of the fraction of shares held by institutions on size. Institutional ownership information is obtained from the Thomson Reuters 13F database. Financial statement data comes from Compustat. For missing Compustat book equity values, I use the Moody's book equity information collected by Davis et al. (2000). Only stocks above the 20th percentile are included.

		Low Dur	D2	D3	D4	High Dur	D1–D5
β_{Market}	Low RIOR	0.89	0.95	0.96	1.06	1.22	-0.33
		(0.03)	(0.03)	(0.02)	(0.03)	(0.06)	(0.06)
	I2	0.96	1.00	1.03	1.06	1.26	-0.30
		(0.02)	(0.02)	(0.02)	(0.02)	(0.04)	(0.05)
	I3	0.98	1.01	1.02	1.08	1.28	-0.30
		(0.02)	(0.02)	(0.02)	(0.02)	(0.04)	(0.05)
	I4	0.91	0.96	1.05	1.12	1.21	-0.30
		(0.02)	(0.02)	(0.02)	(0.02)	(0.05)	(0.06)
	High RIOR	0.94	0.97	1.00	1.05	1.22	-0.28
		(0.03)	(0.02)	(0.02)	(0.03)	(0.05)	(0.05)
	I1–I5	-0.05	-0.02	-0.04	0.01	0.00	-0.05
		(0.03)	(0.03)	(0.03)	(0.03)	(0.06)	(0.06)
β_{SMB}	Low RIOR	0.98	0.81	0.86	0.97	1.53	-0.54
		(0.04)	(0.04)	(0.03)	(0.05)	(0.09)	(0.09)
	I2	0.89	0.77	0.68	0.69	1.31	-0.42
		(0.04)	(0.03)	(0.03)	(0.03)	(0.07)	(0.08)
	I3	0.89	0.68	0.75	0.78	1.32	-0.42
		(0.04)	(0.03)	(0.03)	(0.03)	(0.07)	(0.08)
	I4	0.92	0.94	0.89	0.95	1.41	-0.49
		(0.04)	(0.03)	(0.03)	(0.04)	(0.07)	(0.09)
	High RIOR	1.08	1.07	1.07	1.06	1.34	-0.26
		(0.04)	(0.04)	(0.04)	(0.04)	(0.07)	(0.08)
	I1–I5	-0.09	-0.25	-0.21	-0.10	0.19	-0.28
		(0.05)	(0.05)	(0.04)	(0.05)	(0.09)	(0.09)

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Table 11: **Continued from Previous Page**

		Low Dur	D2	D3	D4	High Dur	D1–D5
β_{HML}	Low RIOR	0.46	0.34	0.23	0.15	0.09	0.37
		(0.03)	(0.03)	(0.03)	(0.04)	(0.07)	(0.07)
	I2	0.42	0.29	0.25	0.07	-0.03	0.46
		(0.03)	(0.02)	(0.02)	(0.03)	(0.05)	(0.06)
	I3	0.53	0.38	0.23	0.03	-0.04	0.57
		(0.03)	(0.03)	(0.02)	(0.03)	(0.05)	(0.06)
	I4	0.48	0.35	0.28	0.08	-0.04	0.52
		(0.03)	(0.03)	(0.03)	(0.03)	(0.06)	(0.07)
	High RIOR	0.62	0.38	0.33	0.11	0.04	0.57
		(0.03)	(0.03)	(0.03)	(0.04)	(0.06)	(0.07)
	I1–I5	-0.16	-0.04	-0.10	0.05	0.04	-0.20
		(0.04)	(0.04)	(0.04)	(0.04)	(0.07)	(0.07)

Table 12: **Fama - French Alphas of 25 Portfolios sorted on Duration and Residual Institutional Ownership**

This table reports reports pricing errors (α) for the Fama & French three factor model for 25 portfolios sorted on duration (Dur) and residual institutional ownership (RIOR) with OLS standard errors in parentheses. At the end of June each year t from 1981 to 2010 all common stocks listed on NYSE, AMEX and NASDAQ are sorted into quintiles based on duration for all firms with fiscal years ending in calendar year t-1. These quintiles are then intersected with an independent sort on residual institutional ownership as of December t-1. Returns are equally weighted and delisting returns included. If a firm is delisted for cause (delisting code between 400 and 591) and has a missing delisting return, I assume a delisting return of -30% following Shumway (1997). Market is the value weighted return on all NYSE, AMEX, and NASDAQ stocks minus the one-month Treasury bill rate, SMB is the average return on three small portfolios minus the average return on three big portfolios and HML is the average return on two value portfolios minus the average return on two growth portfolios. Duration is the equity duration measure of Dechow et al. (2004). RIOR is the residual in a cross sectional regression of the fraction of shares held by institutions on size. Institutional ownership information is obtained from the Thomson Reuters 13F database. Financial statement data comes from Compustat. For missing Compustat book equity values, I use the Moody's book equity information collected by Davis et al. (2000). Only stocks above the 20th percentile are included.

		Low Dur	D2	D3	D4	High Dur	D1–D5
$\alpha_{F\&F}$	Low RIOR	0.23	0.05	-0.07	-0.39	-1.29	1.52
		(0.12)	(0.11)	(0.10)	(0.14)	(0.26)	(0.25)
	I2	0.23	0.15	0.02	-0.06	-0.83	1.06
		(0.11)	(0.09)	(0.08)	(0.09)	(0.19)	(0.22)
	I3	0.19	0.09	0.14	0.02	-0.51	0.70
		(0.10)	(0.09)	(0.09)	(0.09)	(0.20)	(0.23)
	I4	0.18	0.17	0.06	-0.28	-0.45	0.62
		(0.11)	(0.09)	(0.10)	(0.11)	(0.21)	(0.24)
	High RIOR	0.16	0.13	0.02	-0.11	-0.13	0.29
		(0.12)	(0.11)	(0.11)	(0.13)	(0.21)	(0.24)
	I1–I5	0.07	-0.09	-0.09	-0.27	-1.16	1.23
		(0.14)	(0.14)	(0.13)	(0.14)	(0.24)	(0.25)

Table 13: **Four Factor loadings of 25 Portfolios sorted on Duration and Residual Institutional Ownership**

This table reports time series factor loadings (β) for the four factor model for 25 portfolios sorted on duration (Dur) and residual institutional ownership (RIOR) with OLS standard errors in parentheses. At the end of June each year t from 1981 to 2010 all common stocks listed on NYSE, AMEX and NASDAQ are sorted into quintiles based on duration for all firms with fiscal years ending in calendar year t-1. These quintiles are then intersected with an independent sort on residual institutional ownership as of December t-1. Returns are equally weighted and delisting returns included. If a firm is delisted for cause (delisting code between 400 and 591) and has a missing delisting return, I assume a delisting return of -30% following Shumway (1997). Market is the value weighted return on all NYSE, AMEX, and NASDAQ stocks minus the one-month Treasury bill rate, SMB is the average return on three small portfolios minus the average return on three big portfolios, HML is the average return on two value portfolios minus the average return on two growth portfolios and Mom is the average return on two high prior return portfolios minus the average return on two low prior return portfolios. Duration is the equity duration measure of Dechow et al. (2004). RIOR is the residual in a cross sectional regression of the fraction of shares held by institutions on size. Institutional ownership information is obtained from the Thomson Reuters 13F database. Financial statement data comes from Compustat. For missing Compustat book equity values, I use the Moody's book equity information collected by Davis et al. (2000). Only stocks above the 20th percentile are included.

		Low Dur	D2	D3	D4	High Dur	D1–D5
β_{Market}	Low RIOR	0.89	0.92	0.94	0.99	1.08	-0.19
		(0.03)	(0.03)	(0.02)	(0.03)	(0.06)	(0.06)
	I2	0.96	1.00	1.01	1.02	1.14	-0.18
		(0.03)	(0.02)	(0.02)	(0.02)	(0.04)	(0.05)
	I3	1.00	1.03	1.01	1.03	1.16	-0.15
		(0.02)	(0.02)	(0.02)	(0.02)	(0.04)	(0.05)
	I4	0.94	0.98	1.03	1.06	1.11	-0.17
		(0.03)	(0.02)	(0.02)	(0.02)	(0.05)	(0.05)
	High RIOR	0.96	0.97	0.99	1.01	1.15	-0.19
		(0.03)	(0.03)	(0.03)	(0.03)	(0.05)	(0.05)
	I1–I5	-0.07	-0.04	-0.05	-0.02	-0.07	0.00
		(0.03)	(0.03)	(0.03)	(0.03)	(0.06)	(0.06)
β_{SMB}	I1 (Low RIOR)	0.98	0.79	0.84	0.91	1.40	-0.42
		(0.04)	(0.04)	(0.03)	(0.05)	(0.09)	(0.08)
	I2	0.89	0.77	0.66	0.64	1.20	-0.31
		(0.04)	(0.03)	(0.03)	(0.03)	(0.06)	(0.07)
	I3	0.91	0.69	0.74	0.74	1.21	-0.30
		(0.04)	(0.03)	(0.03)	(0.03)	(0.06)	(0.07)
	I4	0.94	0.95	0.87	0.90	1.32	-0.38
		(0.04)	(0.03)	(0.03)	(0.03)	(0.07)	(0.08)
	I5 (High RIOR)	1.09	1.06	1.06	1.03	1.28	-0.18
		(0.04)	(0.04)	(0.04)	(0.04)	(0.07)	(0.08)
	I1 - I5	-0.12	-0.27	-0.22	-0.12	0.13	-0.24
		(0.05)	(0.05)	(0.05)	(0.05)	(0.09)	(0.09)

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Table 13: **Continued from Previous Page**

		Low Dur	D2	D3	D4	High Dur	D1–D5
β_{HML}	Low RIOR	0.45	0.23	0.16	-0.07	-0.37	0.82
		(0.04)	(0.04)	(0.04)	(0.05)	(0.09)	(0.09
	I2	0.42	0.29	0.18	-0.09	-0.44	0.86
		(0.04)	(0.03)	(0.03)	(0.03)	(0.06)	(0.07)
	I3	0.60	0.43	0.22	-0.14	-0.45	1.05
		(0.04)	(0.03)	(0.03)	(0.03)	(0.06)	(0.07)
	I4	0.55	0.41	0.23	-0.12	-0.39	0.94
		(0.04)	(0.03)	(0.04)	(0.04)	(0.07)	(0.08)
	High RIOR	0.69	0.36	0.29	-0.02	-0.18	0.86
		(0.04)	(0.04)	(0.04)	(0.05)	(0.08)	(0.08)
	I1–I5	-0.24	-0.13	-0.14	-0.05	-0.19	-0.05
		(0.05)	(0.05)	(0.05)	(0.05)	(0.09)	(0.09)
β_{mom}	I1 (Low RIOR)	-0.02	-0.12	-0.09	-0.26	-0.54	0.52
		(0.03)	(0.03)	(0.03)	(0.04)	(0.07)	(0.07)
	I2	0.00	0.00	-0.09	-0.18	-0.47	0.48
		(0.03)	(0.02)	(0.02)	(0.02)	(0.05)	(0.06)
	I3	0.08	0.06	-0.02	-0.19	-0.49	0.56
		(0.03)	(0.03)	(0.03)	(0.02)	(0.05)	(0.06)
	I4	0.08	0.07	-0.06	-0.24	-0.42	0.49
		(0.03)	(0.03)	(0.03)	(0.03)	(0.06)	(0.06)
	I5 (High RIOR)	0.08	-0.02	-0.04	-0.15	-0.26	0.34
		(0.03)	(0.03)	(0.03)	(0.03)	(0.06)	(0.06)
	I1 - I5	-0.10	-0.10	-0.05	-0.11	-0.28	0.18
		(0.04)	(0.04)	(0.04)	(0.04)	(0.07)	(0.07)

Table 14: **Four Factor Alphas of 25 Portfolios sorted on Duration and Residual Institutional Ownership**

This table reports pricing errors (α) for the four factor model for 25 portfolios sorted on duration (Dur) and residual institutional ownership (RIOR) with OLS standard errors in parentheses. At the end of June each year t from 1981 to 2010 all common stocks listed on NYSE, AMEX and NASDAQ are sorted into quintiles based on duration for all firms with fiscal years ending in calendar year t-1. These quintiles are then intersected with an independent sort on residual institutional ownership as of December t-1. Returns are equally weighted and delisting returns included. If a firm is delisted for cause (delisting code between 400 and 591) and has a missing delisting return, I assume a delisting return of -30% following Shumway (1997). Market is the value weighted return on all NYSE, AMEX, and NASDAQ stocks minus the one-month Treasury bill rate, SMB is the average return on three small portfolios minus the average return on three big portfolios, HML is the average return on two value portfolios minus the average return on two growth portfolios and Mom is the average return on two high prior return portfolios minus the average return on two low prior return portfolios. Duration is the equity duration measure of Dechow et al. (2004). RIOR is the residual in a cross sectional regression of the fraction of shares held by institutions on size. Institutional ownership information is obtained from the Thomson Reuters 13F database. Financial statement data comes from Compustat. For missing Compustat book equity values, I use the Moody's book equity information collected by Davis et al. (2000). Only stocks above the 20th percentile are included.

		Low Dur	D2	D3	D4	High Dur	D1–D5
$\alpha_{4Factor}$	Low RIOR	0.25	0.18	0.02	-0.12	-0.72	0.97
		(0.12)	(0.12)	(0.10)	(0.14)	(0.25)	(0.24)
	I2	0.23	0.15	0.11	0.13	-0.33	0.56
		(0.11)	(0.09)	(0.08)	(0.09)	(0.18)	(0.21)
	I3	0.11	0.02	0.16	0.22	0.00	0.11
		(0.11)	(0.09)	(0.09)	(0.09)	(0.18)	(0.21)
	I4	0.10	0.09	0.13	-0.02	-0.01	0.10
		(0.11)	(0.10)	(0.10)	(0.10)	(0.21)	(0.24)
	High RIOR	0.08	0.16	0.06	0.04	0.15	-0.07
		(0.12)	(0.11)	(0.11)	(0.13)	(0.22)	(0.24)
	I1–I5	0.17	0.02	-0.04	-0.16	-0.87	1.04
		(0.14)	(0.14)	(0.13)	(0.15)	(0.25)	(0.26)

Table 15: **Fama & French Alphas of 25 Portfolios sorted on Duration and Residual Institutional Ownership Conditional on Investor Sentiment**

This table reports monthly benchmark adjusted mean excess returns following periods of high and low investor sentiment in Panel A as well as sentiment betas in Panel B for 25 portfolios sorted on duration (Dur) and residual institutional ownership (RIOR) with OLS standard errors in parentheses. At the end of June each year t from 1981 to 2010 all common stocks listed on NYSE, AMEX and NASDAQ are sorted into quintiles based on duration for all firms with fiscal years ending in calendar year t-1. These quintiles are then intersected with an independent sort on residual institutional ownership as of December t-1. Returns are equally weighted and delisting returns included. If a firm is delisted for cause (delisting code between 400 and 591) and has a missing delisting return, I assume a delisting return of -30% following Shumway (1997). High and low sentiment periods are defined by the mean level of the sentiment index of Baker and Wurgler (2006). Sentiment betas are the time series factor loadings of the benchmark adjusted mean excess returns on a constant and changes in the sentiment index. Duration is the equity duration measure of Dechow et al. (2004). RIOR is the residual in a cross sectional regression of the fraction of shares held by institutions on size. Institutional ownership information is obtained from the Thomson Reuters 13F database. Financial statement data comes from Compustat. For missing Compustat book equity values, I use the Moody's book equity information collected by Davis et al. (2000). Only stocks above the 20th percentile are included.

		Low Dur	D2	D3	D4	High Dur	D1–D5
				Panel A. Sentiment Alphas			
$\alpha_{HighSent}$	Low RIOR	0.17	0.00	-0.10	-0.83	-2.35	2.51
		(0.20)	(0.19)	(0.16)	(0.24)	(0.43)	(0.42)
	I2	0.01	0.08	-0.01	-0.36	-1.63	1.63
		(0.18)	(0.15)	(0.13)	(0.15)	(0.32)	(0.36)
	I3	0.15	0.13	0.17	-0.02	-1.24	1.38
		(0.18)	(0.15)	(0.15)	(0.15)	(0.33)	(0.38)
	I4	0.21	0.18	0.04	-0.49	-1.02	1.23
		(0.18)	(0.16)	(0.16)	(0.18)	(0.36)	(0.41)
	Low RIOR	0.08	0.15	0.05	-0.36	-0.59	0.68
		(0.20)	(0.18)	(0.18)	(0.21)	(0.36)	(0.40)
	I1–I5	0.08	-0.15	-0.15	-0.47	-1.75	1.84
		(0.23)	(0.23)	(0.21)	(0.24)	(0.41)	(0.42)
$\alpha_{LowSent}$	Low RIOR	0.27	0.10	-0.02	-0.16	-0.72	0.99
		(0.15)	(0.15)	(0.12)	(0.18)	(0.32)	(0.32)
	I2	0.36	0.17	0.04	0.10	-0.42	0.78
		(0.14)	(0.11)	(0.10)	(0.12)	(0.24)	(0.27)
	I3	0.23	0.05	0.12	0.03	-0.13	0.35
		(0.13)	(0.11)	(0.11)	(0.11)	(0.25)	(0.29)
	I4	0.16	0.17	0.06	-0.19	-0.14	0.30
		(0.14)	(0.12)	(0.12)	(0.13)	(0.27)	(0.31)
	Low RIOR	0.19	0.10	-0.02	0.05	0.15	0.04
		(0.15)	(0.13)	(0.13)	(0.16)	(0.27)	(0.30)
	I1–I5	0.08	0.00	0.01	-0.20	-0.87	0.95
		(0.18)	(0.18)	(0.16)	(0.18)	(0.31)	(0.32)

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Table 15: **Continued from Previous Page**

		Low Dur	D2	D3	D4	High Dur	D1–D5
		Panel B. Sentiment Betas					
β_{Sent}	Low RIOR	-0.06	0.21	-0.01	0.45	1.01	-1.07
		(0.12)	(0.12)	(0.10)	(0.14)	(0.26)	(0.25)
	I2	0.10	-0.13	-0.09	0.08	0.65	-0.55
		(0.11)	(0.09)	(0.08)	(0.09)	(0.19)	(0.22)
	I3	-0.16	-0.38	-0.23	0.15	0.58	-0.74
		(0.11)	(0.09)	(0.09)	(0.09)	(0.20)	(0.23)
	I4	-0.25	-0.21	-0.23	0.21	0.45	-0.69
		(0.11)	(0.09)	(0.10)	(0.11)	(0.22)	(0.25)
	High RIOR	-0.08	-0.22	-0.12	0.09	0.45	-0.53
		(0.12)	(0.11)	(0.11)	(0.13)	(0.22)	(0.24)
	I1–I5	0.02	0.42	0.11	0.36	0.56	-0.54
		(0.14)	(0.14)	(0.13)	(0.15)	(0.25)	(0.26)

Table 16: **Fama - French Alphas of 9 Portfolios sorted on Duration and Residual Institutional Ownership (conditional on size)**

This table reports reports pricing errors (α) for the Fama & French three factor model for 9 portfolios sorted on duration (Dur) and residual institutional ownership (RIOR) with OLS standard errors in parentheses, separately for small stocks in Panel I and large stocks in Panel II. At the end of June each year t from 1981 to 2010 all common stocks listed on NYSE, AMEX and NASDAQ are first sorted into two baskets based on size and within each bin sorted into tertiles based on duration (Dur) for all firms with fiscal years ending in calendar year t-1. These tertiles are then intersected with an independent sort on residual institutional ownership as of December t-1. Returns are equally weighted and delisting returns included. If a firm is delisted for cause (delisting code between 400 and 591) and has a missing delisting return, I assume a delisting return of -30% following Shumway (1997). Market is the value weighted return on all NYSE, AMEX, and NASDAQ stocks minus the one-month Treasury bill rate, SMB is the average return on three small portfolios minus the average return on three big portfolios and HML is the average return on two value portfolios minus the average return on two growth portfolios. Duration is the equity duration measure of Dechow et al. (2004). RIOR is the residual in a cross sectional regression of the fraction of shares held by institutions on size. Institutional ownership information is obtained from the Thomson Reuters 13F database. Financial statement data comes from Compustat. For missing Compustat book equity values, I use the Moody's book equity information collected by Davis et al. (2000).

		Low Dur	D2	High Dur	D1–D3	Low Dur	D2	High Dur	D1–D3
		Panel I. Small Stocks				**Panel II. Large Stocks**			
$\alpha_{F\&F}$	Low RIOR	1.00	0.30	-0.73	1.73	0.27	0.03	-0.89	1.17
		(0.20)	(0.21)	(0.31)	(0.24)	(0.10)	(0.06)	(0.15)	(0.18)
	I2	0.47	0.13	-0.02	0.49	0.04	0.03	-0.34	0.38
		(0.15)	(0.16)	(0.29)	(0.23)	(0.08)	(0.08)	(0.12)	(0.15)
	High RIOR	0.59	0.42	0.22	0.37	0.07	0.03	-0.41	0.48
		(0.16)	(0.15)	(0.30)	(0.24)	(0.10)	(0.09)	(0.14)	(0.18)
	I1–I3	0.41	-0.12	-0.94	1.36	0.21	0.00	-0.48	0.69
		(0.16)	(0.16)	(0.23)	(0.25)	(0.12)	(0.09)	(0.16)	(0.17)

Table 17: **Fama - French Alphas of 9 Portfolios sorted on Duration and Residual Institutional Ownership (conditional on book-to-market)**

This table reports reports pricing errors (α) for the Fama & French three factor model for 9 portfolios sorted on duration (Dur) and residual institutional ownership (RIOR) with OLS standard errors in parentheses, separately for value stocks in Panel I and growth stocks in Panel II. At the end of June each year t from 1981 to 2010 all common stocks listed on NYSE, AMEX and NASDAQ are first sorted into two baskets based on book-to-market and within each bin sorted into tertiles based on duration (Dur) for all firms with fiscal years ending in calendar year t-1. These tertiles are then intersected with an independent sort on residual institutional ownership as of December t-1. Returns are equally weighted and delisting returns included. If a firm is delisted for cause (delisting code between 400 and 591) and has a missing delisting return, I assume a delisting return of -30% following Shumway (1997). Market is the value weighted return on all NYSE, AMEX, and NASDAQ stocks minus the one-month Treasury bill rate, SMB is the average return on three small portfolios minus the average return on three big portfolios and HML is the average return on two value portfolios minus the average return on two growth portfolios. Duration is the equity duration measure of Dechow et al. (2004). RIOR is the residual in a cross sectional regression of the fraction of shares held by institutions on size. Institutional ownership information is obtained from the Thomson Reuters 13F database. Financial statement data comes from Compustat. For missing Compustat book equity values, I use the Moody's book equity information collected by Davis et al. (2000).

		Low Dur	D2	High Dur	D1–D3	Low Dur	D2	High Dur	D1–D3
		Panel I. Value Stocks				**Panel II. Growth Stocks**			
$\alpha_{F\&F}$	Low RIOR	0.26	0.08	-1.14	1.40	0.09	-0.12	-0.98	1.06
		(0.09)	(0.11)	(0.36)	(0.35)	(0.28)	(0.09)	(0.19)	(0.31)
	I2	0.13	0.16	-0.36	0.49	0.28	0.04	-0.36	0.64
		(0.08)	(0.09)	(0.29)	(0.30)	(0.19)	(0.07)	(0.13)	(0.23)
	High RIOR	0.20	0.05	-0.12	0.32	-0.43	-0.01	-0.31	-0.12
		(0.10)	(0.11)	(0.37)	(0.37)	(0.26)	(0.09)	(0.14)	(0.30)
	I1–I3	0.05	0.03	-1.02	1.08	0.52	-0.12	-0.67	1.19
		(0.10)	(0.12)	(0.44)	(0.44)	(0.37)	(0.10)	(0.16)	(0.39)

Table 18: **Fama - French Alphas of 25 Portfolios sorted on Book-to-Market and Residual Institutional Ownership**

This table reports reports pricing errors (α) for the Fama & French three factor model for 25 portfolios sorted on on book-to-market (BEME) and residual institutional ownership (RIOR) with OLS standard errors in parentheses. At the end of June each year t from 1981 to 2010 all common stocks listed on NYSE, AMEX and NASDAQ are sorted into quintiles based on book-to-market for all firms with fiscal years ending in calendar year t-1. These quintiles are then intersected with an independent sort on residual institutional ownership as of December t-1. Returns are equally weighted and delisting returns included. If a firm is delisted for cause (delisting code between 400 and 591) and has a missing delisting return, I assume a delisting return of -30% following Shumway (1997). Market is the value weighted return on all NYSE, AMEX, and NASDAQ stocks minus the one-month Treasury bill rate, SMB is the average return on three small portfolios minus the average return on three big portfolios and HML is the average return on two value portfolios minus the average return on two growth portfolios. RIOR is the residual in a cross sectional regression of the fraction of shares held by institutions on size. Institutional ownership information is obtained from the Thomson Reuters 13F database. Financial statement data comes from Compustat. For missing Compustat book equity values, I use the Moody's book equity information collected by Davis et al. (2000). Only stocks above the 20th percentile are included.

		Low BEME	B2	B3	B4	High BEME	B1–B5
$\alpha_{F\&F}$	Low IOR	-1.13	-0.47	-0.09	-0.03	-0.05	-1.08
		(0.22)	(0.17)	(0.12)	(0.13)	(0.15)	(0.20)
	I2	-0.59	-0.11	0.02	0.08	0.12	-0.71
		(0.14)	(0.10)	(0.09)	(0.09)	(0.15)	(0.19)
	I3	-0.44	-0.01	0.16	0.14	0.10	-0.55
		(0.13)	(0.09)	(0.09)	(0.09)	(0.12)	(0.18)
	I4	-0.41	-0.20	-0.10	0.26	0.18	-0.59
		(0.14)	(0.11)	(0.09)	(0.10)	(0.12)	(0.19)
	High IOR	-0.26	-0.01	0.19	0.05	0.13	-0.39
		(0.19)	(0.12)	(0.12)	(0.10)	(0.13)	(0.23)
	I1–I5	-0.86	-0.46	-0.29	-0.07	-0.17	-0.69
		(0.24)	(0.18)	(0.15)	(0.14)	(0.18)	(0.25)

Table 19: **Fama - French Alphas of 9 Portfolios sorted on Book-to-Market and Residual Institutional Ownership (conditional on Duration)**

This table reports reports pricing errors (α) for the Fama & French three factor model for 9 portfolios sorted on book-to-market (BEME) and residual institutional ownership (RIOR) with OLS standard errors in parentheses, separately for low duration stocks in Panel I and high duration stocks in Panel II. At the end of June each year t from 1981 to 2010 all common stocks listed on NYSE, AMEX and NASDAQ are first sorted into two baskets based on duration and within each bin sorted into tertiles based on book-to-market for all firms with fiscal years ending in calendar year t-1. These tertiles are then intersected with an independent sort on residual institutional ownership as of December t-1. Returns are equally weighted and delisting returns included. If a firm is delisted for cause (delisting code between 400 and 591) and has a missing delisting return, I assume a delisting return of -30% following Shumway (1997). Market is the value weighted return on all NYSE, AMEX, and NASDAQ stocks minus the one-month Treasury bill rate, SMB is the average return on three small portfolios minus the average return on three big portfolios and HML is the average return on two value portfolios minus the average return on two growth portfolios. Duration is the equity duration measure of Dechow et al. (2004). RIOR is the residual in a cross sectional regression of the fraction of shares held by institutions on size. Institutional ownership information is obtained from the Thomson Reuters 13F database. Financial statement data comes from Compustat. For missing Compustat book equity values, I use the Moody's book equity information collected by Davis et al. (2000). Only stocks above the 20th percentile are included.

		Low BEME	B2	High BEME	B1–B3	Low BEME	B2	High BEME	B1–B3
		Panel I. Short Dur				**Panel II. High Dur**			
$\alpha_{F\&F}$	Low RIOR	-0.59	0.16	0.23	-0.82	-0.86	-0.43	-1.12	0.26
		(0.29)	(0.07)	(0.10)	(0.29)	(0.18)	(0.14)	(0.38)	(0.34)
	I2	-0.32	0.21	0.12	-0.44	-0.31	-0.02	-0.44	0.14
		(0.22)	(0.07)	(0.09)	(0.24)	(0.11)	(0.09)	(0.29)	(0.28)
	High RIOR	-0.76	0.06	0.19	-0.95	-0.25	0.03	-0.34	0.08
		(0.33)	(0.08)	(0.10)	(0.33)	(0.12)	(0.12)	(0.33)	(0.32)
	I1–I3	0.17	0.10	0.04	0.13	-0.61	-0.46	-0.78	0.17
		(0.40)	(0.08)	(0.11)	(0.40)	(0.15)	(0.14)	(0.42)	(0.43)