The Cross-Section of the Perceived Cost of Capital*

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Abstract

We document large wedges between firms' perceived cost of capital and the cost of capital implied by expected returns in financial markets. While the perceived cost of capital reflects traditional determinants such as leverage ratio and exposure to the market, size, and value factors, it is unrelated to most other risk factors studied in asset pricing. Less than 10% of all factors in the factor zoo are significantly reflected in the perceived cost of capital and more than half of factors are reflected with the wrong sign. The biggest challenge is for investment-based factors, as firms with higher investment rates have higher perceived cost of capital, which is inconsistent with the Investment-CAPM and challenges the production-based asset pricing paradigm. We also document large wedges between firms' perceived cost of capital and measures of the "implied cost of capital" used in the literature.

Keywords: Cost of capital, factor models, discount rates
JEL classification: G1, G10, G12, G31, G32, G40

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1 Introduction

The literature often endows firms with perfect information about their cost of capital. But the cost of capital is a complicated construct that depends on the returns that investors expect to earn from holding a given firm's bonds and stocks. These expected returns are unobserved and notoriously difficult to estimate. It is therefore likely that different agents have different perceptions about what a given firm's cost of capital is. In particular, it is plausible that firms' perceptions about their own cost of capital deviate substantially from what measures of expected returns used in the finance literature imply. Such deviations can lead to anomalous investment behavior by firms, misallocation of capital, and a failure of the production-based asset pricing paradigm.

There exists little evidence on how firms' perceived cost of capital relates to that implied by traditional measures of expected returns. One reason is that we do not observe firms' perceived cost of capital in publicly available archival data. To overcome this issue, we use hand-collected data from Gormsen and Huber (2022) on firms' perceived cost of debt, equity, and overall capital. The dataset is constructed from corporate conference calls and has the advantage that firm-level data for 2,500 firms can be merged with detailed measures of firm-level factor exposures and other measures of firm-level cost of capital used in the literature.

Using these data, we document that firms' perceived cost of capital deviates substantially from what standard models predict. We do find that the commonly used market, size, and value factors are reflected in firms' perceived cost of capital, which is consistent with standard models that predict a strong relation between these factors and firms' expected returns. But when considering more sophisticated measures of expected returns and the cost of capital, we find large wedges between these measures and firms' perceived cost of capital. More than half of the risk factors that are supposed to explain expected stock returns are reflected in the perceived cost of capital with the wrong sign. Moreover, measures of the "implied cost of capital", such as those studied in Easton and Monahan (2005), are largely orthogonal to firms' perceived cost of capital. Taken together, firms' perceptions about their cost of capital thus differ substantially from what standard measures used in finance would imply. These results pose a challenge for the production-based asset pricing framework (Cochrane 1991), which builds on the idea that firms have perfect information about their cost of capital (more generally, perfect information about the stochastic discount factor)

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and that researchers therefore can infer expected stock returns from the behavior of firms. Given the discrepancy between standard measure of the cost of capital and the perceived cost of capital, we produce a simple empirical model, and associated data, for firms' perceived cost of capital. We make data based on this model readily available online such that the measures can be used to guide future research.[1]

Framework

Conceptually, a firm's true cost of capital (WACC) is a function of firm leverage (ω), the tax rate (τ), the cost of debt (r^{debt}), and the cost of equity (r^{equity}):

$$\text{WACC} = \omega \times (1 - \tau) \times r^{\text{debt}} + (1 - \omega) \times r^{\text{equity}}. \tag{1}$$

The cost of equity equals the expected return on equity in asset markets. The asset pricing literature often models expected returns using factor models. In these models, expected returns are determined by exposure to one or several equity factors (X^k) that command factor-specific risk premia λ^k:

$$r^{\text{equity}} = \lambda_0 + \sum_k \lambda^k X^k. \tag{2}$$

If prices are efficient and managers are fully informed about the expected returns described by the factor model of Equation 2, we should expect the perceived cost of equity to line up with the model. Either managers explicitly apply the model or, alternatively, managers determine their cost of equity "as if" they were estimating a factor model, for example by applying the dividend discount model or other methods to recover the expected returns produced by Equation 2.

However, there are reasons to believe that the perceived cost of capital does not strongly reflect firms' exposure to risk factors. For one, implementing factor models involves substantial model and statistical uncertainty, which may cause managers to shy away from explicitly using such models (Fama and French 1997, Pástor and Stambaugh 1999, Martin and Nagel 2022). Moreover, managers may think that certain risk factors do not reflect investors' true required returns (Stein 1996, Jensen 2022) or managers may be unaware of the existence of these factors in the first place, potentially

[1]We share deanonymized data containing predicted values of the perceived cost of capital and discount rates. The data are available for download at costofcapital.org under "firm-level data".

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due to behavioral biases (Greenwood and Shleifer 2014, Giglio et al. 2021, Bordalo et al. 2020, Engelberg et al. 2020, Boutros et al. 2020).[2]

Ultimately, whether firms' perceived cost of capital lines up with firms' expected stock returns is an empirical question. We address this question head on using data on firms' perceived cost of capital from Gormsen and Huber (2022), which contain the perceived costs of capital, debt, and equity, as well as discount rates, for more than 2,500 of the world's largest firms. We merge these data with firm-level factor exposures and other characteristics used to measure expected returns in the literature to study the drivers of firms' perceptions.

Perceived Factor Premia and Factor Wedges

We start by analyzing the relation between firms' perceived cost of equity and exposure to the most prominent equity factors. We find that the perceived cost of equity is positively related to firms' CAPM betas and book-to-market ratios and negatively related to firm size. The signs of the coefficients are consistent with how these characteristics relate to expected stock returns (Fama and French 1993). The economic magnitude of the beta and size coefficients is similar to each other and economically large: when going from the smallest to the largest firm in the cross section, the perceived cost of equity increases by more than 3 percentage points. The coefficient on book-to-market is more modest and statistically insignificant.

While most equity risk factors are designed to explain expected stock returns, and thus the cost of equity, they are likely to be important for the overall cost of capital as well (the average firm is financed with 70% equity). We therefore expect equity factors to play a similar role for the perceived cost of capital as for the perceived cost of equity. Consistent with this expectation, we find that the perceived cost of capital reflects CAPM betas, size, and book-to-market ratios with largely similar magnitude and significance as the perceived cost of equity.

We next expand the analysis to a much broader set of risk factors. The asset pricing literature has proposed a large number of factor exposures that may determine expected equity returns, the so-called "factor zoo." We use factor data assembled by

[2]Managers may also believe that a subset of factors does not predict long-run expected returns very strongly (Cohen et al. 2003, Keloharju et al. 2019, Cho and Polk 2019). In most cases, firms should still incorporate the factors, although to a much smaller extent than when considering short-run returns.

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Jensen et al. (forthcoming) to study the impact of 146 risk factors on the perceived cost of capital. Using this large set of risk factors, we find that most factors studied in the asset pricing literature are not reflected in the perceived cost of capital. Less than 10% of factors are significantly reflected in the perceived cost of capital and more than half the factors are reflected with the wrong sign, in the sense that the implied risk premium for the perceived cost of capital has the opposite sign of the risk premium observed in expected stock returns.

The only category of risk factors reflected in the perceived cost of capital with reasonable consistency are the value factors. Of the 16 value factors we study, 81% are reflected with the same sign as in financial markets, and the effect is significant for as much as 38% of these factors. The opposite is the case for factors based on investment. More than two thirds of investment-based factors have the wrong sign and none of the factors are statistically significant. This inconsistency between the investment-based factors and the perceived cost of capital is a key point of the paper, which we shall return to shortly.

Taken together, the above analysis points to substantial wedges between the perceived cost of capital and the cost of capital implied by standard measures of expected returns. We quantify the size of these wedges by comparing the implied factor premia estimated in the perceived cost of capital with factor premia from financial markets. As measures of the latter, we use the estimates of long-run factor premia from van Binsbergen et al. (2023). We find that the factor premia extracted from the perceived cost of capital are positively related to those factor premia from financial markets. The relation between the two is, however, far from one-to-one, giving rise to large factor wedges. The cross-sectional variation in the factor wedges is larger than the variation in the perceived factor premia themselves.

Previous research has often used the "implied cost of capital" to measure firms' cost of capital (see, e.g., Gebhardt et al. 2001, Easton and Monahan 2005). Rather than relying on equity factor exposure, these measures combine forecasts of future earnings with current prices to measure expected returns. While this implied cost of capital does not have the same theoretical foundation as the equity factors, it is possible that the implied cost of capital is closer to firms' perceived cost of capital. However, we find a weak relation between the implied and perceived cost of capital. Firms whose implied cost of capital is 1 percentage point higher have a perceived cost of capital that is around 3 basis points higher. Within-firm variation is of a similar

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magnitude. These findings imply large wedges between the implied cost of capital and the perceived cost of capital. For instance, for the 10% of firms with the highest implied cost of capital, the wedge between the implied and perceived cost of capital is more than 10 percentage points.

Implications and Extensions

The results represent a serious challenge for the production-based asset pricing framework (Cochrane 1991, 1995, Zhang 2005) and the Investment CAPM (Hou et al. 2015a) in particular. The idea behind the Investment CAPM is that firms have perfect information about their cost of equity (i.e., their expected stock returns) and that their investment decisions are based on this cost of equity. In particular, firms that have higher cost of equity require a higher return on investments and therefore invest less, everything else equal. The model thereby rationalizes the strong negative relation between expected stock returns and firm investment that is observed empirically. However, our findings are inconsistent with this mechanism. Firms with high investment rates perceive their cost of equity to be higher, not lower, which rejects the basic premise of the model. More generally, the fact that firms' perceived cost of capital deviates substantially from standard measures of expected stock returns suggests that one cannot easily rely on firm behavior to make inference about expected stock returns or the properties of the stochastic discount factor, as otherwise argued by production-based asset pricing models (Cochrane, 1991).

One objection to the above conclusions about the Investment CAPM could be that firms incorporate expectations about their stock returns into their discount rates, rather than their perceived cost of capital. While there is no clear reason to expect such behavior, it is in principle possible that firms use a very basic textbook measure of the cost of capital and then incorporate beliefs about expected stock returns into their discount rates. Our data allows us to test this hypothesis. In short, we find that discount rates are also positively related to investment rates, meaning looking at discount rates does not improve the prospects of the Investment CAPM. We emphasize that this result is a statement about the unconditional correlation. Once considering within-firm variation in discount rates, or including more controls, investment is indeed negatively related to discount rates, as one would expect. However, the Investment CAPM relies on a strongly negative relation between discount rates and investment

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unconditionally, an assumption the data does not support.[3]

Given the discrepancy between the perceived cost of capital and traditional measures of the cost of capital used in the literature, we conclude the paper by constructing new firm-level measures of the perceived cost of capital and discount rates. We fit the perceived cost of capital and discount rates to a multifactor model of firm characteristics using machine learning techniques. Based on this model, we produce a publicly available dataset of predicted values in a large firm-year panel running from 2002 to 2021. We confirm the accuracy of the predicted data by comparing the predicted values to observations of the perceived cost of capital and discount rates from the Duke CFO Survey of Graham and Harvey (2001). We find a coefficient close to one when regressing the survey data on our predicted values, underscoring that the predicted values predict the perceived cost of capital out-of-sample. For discount rates, the out-of-sample R^2 is around 20% while it is a 5% for the perceived cost of capital.

Related Literature

To our knowledge, this is the first paper to quantitatively study cross-sectional variation in the perceived cost of capital.[4] Previous research on the properties of the perceived cost of capital has focused mostly on qualitative survey evidence. In particular, Graham and Harvey (2001) ask managers which methods they use to estimate their cost of capital. This approach has shed important light on mechanisms, but leaves open the quantitative relation between stock returns and the cost of capital. In particular, respondents report to use multiple methods at the same time and do not explain exactly how they implement these methods – or whether they also consider additional methods – making it unclear how strongly different factors influence the cost of capital.[5] In addition, the surveys cannot speak to the impact of expected

[3] More precisely, it requires a negative relation ones controlling for ROE (Hou et al., 2015a).

[4] Previous work by Poterba and Summers (1995) and Jagannathan et al. (2016) does study the quantitative properties of hurdle rates. Poterba and Summers (1995) find no relation between hurdle and CAPM betas while Jagannathan et al. (2016) find a sizeable relation.

[5] For instance, managers' report using different techniques at the same time. Since these methods are of different quantitative importance and since some are complementary, it is unclear what the final result is. For instance, if managers use the Capital Asset Pricing Model (the CAPM) but think the security market line is essentially flat, the effect on the cost of capital is trivial. In addition, some managers report that they do not use the value factor to estimate the cost of capital, but at the same time they report that they use valuation ratios to back out the cost of capital, which for practical purposes is similar to using the value factor, as both methods make value firms report a higher cost of capital. It is also unclear how managers implement different methods, such as multi-factor models,

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stock returns that comes from managers acting "as if" – that is, managers potentially incorporate expected stock returns implicitly even if they do not report to use the "high-minus-low" factor when asked in surveys.[6]

Our results are consistent with the evidence from past survey evidence. According to the seminal Duke CFO Survey, 80 percent of large firms apply the CAPM to estimate their cost of equity but 70 percent additionally use multi-factor models and 40 percent use historical returns (Graham and Harvey 2001; Graham 2022). Other surveys confirm that the CAPM is popular (Jacobs and Shivdasani 2012, Mukhlynina and Nyborg 2016, Jagannathan et al. 2016). Gormsen and Huber (2022) find that CAPM betas are reflected in the perceived cost of capital, but that a large fraction of the cross-sectional variation in the perceived cost of capital remains unexplained by standard CAPM-based estimates.

The results on the relation between firms' perceived cost of capital to pricing in financial markets is relevant for a broad range of research in finance and economics. In particular, the evidence on this relation helps us evaluate the argument that expected stock returns influence the cost of equity and discount rates used by managers and thereby influence corporate investment (Cochrane, 1991, 1996). This idea is widespread in the literature and is used to explain capital mis-allocation (van Binsbergen and Opp, 2019, David et al., 2022), cyclical variation in unemployment (Hall, 2017), business cycle fluctuations (Bloom, 2014 page 165-166, Cochrane, 2017), and the cross-section of stock returns (Gomes et al., 2003, Carlson et al., 2004, Cooper et al., 2008, Hou et al., 2015b, Betermier et al., 2019). These research areas assume, or imply, a perfect relation between pricing in financial markets, a premise our paper challenges.

The paper also contributes to a large literature on how pricing in secondary markets influence the real economy (see Bond et al. (2012) and citations therein). We of this research focuses on how firms learn about cash flows from financial markets. In particular, Bond et al. emphasize three channels through which pricing in secondary markets can influence real activities, namely that managers learn from stock prices, managers seek to maximize stock prices, and managers might, for behavioral reasons, use stock prices as an anchor in decision maker. Chen et al. (2006) provides evidence consistent with managers learning from stock prices and incorporating this information

and it is unclear if they even use them correctly.

[6]More recently, Cho and Salarkia (2020) studies which factor model managers use to estimate the cost of equity based on a revealed-preference approach, finding evidence that managers incorporate market betas in their hurdle rates.

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in their investment decisions. We emphasize a new channel, namely that firms can also learn about the their cost of capital from financial markets.

2 Framework and Roadmap

The cost of capital of firm i at time t is defined as the weighted average cost of debt and equity,

$$r_{i,t}^{\text{capital}} = \omega_{i,t} \times (1-\tau) \times r_{i,t}^{\text{debt}} + (1-\omega_{i,t}) \times r_{i,t}^{\text{equity}}, \tag{3}$$

with the notation as defined in the intro. The cost of debt and equity is the expected return on firms debt and equity in financial markets. The literature often models the cost of equity using a factor model,

$$r_{i,t}^{\text{equity}} = \lambda_0 + \sum_k \lambda_k X_{i,t}^k, \tag{4}$$

with terms again defined in the introduction. Inserting equation 4 into 3, we get

$$r_{i,t}^{\text{capital}} = \omega_{i,t} \times (1-\tau) \times r_{i,t}^{\text{debt}} + (1-\omega_{i,t}) \times \left(\lambda_0 + \sum_k \lambda_k X_{i,t}^k \right). \tag{5}$$

Part of the goal of this paper is to explore the quantative properties of firms perceived cost of capital, motivated by the above equation. A second goal of the paper is to estimate wedges between firms' perceptions of their cost of capital and the cost of capital estimated in financial markets. We are interested in two types of wedges. The first wedge is the wedge between the factor premia reflected in financial markets and those reflected in the percevied cost of capital. We define factor wedges as

$$\delta_k^\lambda = \lambda_k^{\text{perceived}} - \lambda_k^{\text{financial}}, \tag{6}$$

where $\lambda_k^{\text{perceived}}$ and $\lambda_k^{\text{financial}}$ are the factor premia estimated in the perceived cost of capital and financial markets, respectively. The perceived factor premia $\lambda_k^{\text{perceived}}$ can be extracted using data on firms perceived cost of equity or capital. We can estimate the premia directly from equation (4) by using data on the perceived cost of equity. Alternatively, we can estimate the premia from (5) by using data on the perceived

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cost of capital. When estimating the factor risk premia using the perceived cost of capital, we need to be careful to account for the impact of capital structure and the cost of debt.

The second wedge we are interested in is the firm-level wedge between the perceived and financial cost of capital. We define firm-level wedges as

$$\delta^r_{i,t} = r^{\text{capital,perceived}}_{i,t} - r^{\text{capital,financial}}_{i,t}, \tag{7}$$

where $r^{\text{capital,perceived}}_{i,t}$ and $r^{\text{capital,financial}}_{i,t}$ are the perceived cost of capital and the cost of capital estimated in financial markets.

To estimate the properties of the perceived cost of capital and the wedges δ^λ_k and $\delta^r_{i,t}$, the paper proceeds as follows. In Section 3 we explain how we obtain data on firms' perceived cost of capital and equity factors. In Section 4 we explore the role of leverage in the cost of capital. In Section 5 we explore whether $\lambda^{\text{perceived}}_k$ has the same sign as $\lambda^{\text{financial}}_k$ for a range of risk factors. In 6 we estimate δ^λ_k and $\delta^r_{i,t}$. Sections 7 to 9 discusses implications and extensions.

3 Data

We combine data on firm-level perceived cost of capital and discount rates with firm-level asset prices and exposure to risk factors.

3.1 Data on the Perceived Cost of Capital and Discount Rates

Two challenges make it difficult to study how equity factors influence firms' perceived cost of capital. First, firms do not typically report a perceived cost of capital in official financial reports. Second, data from surveys are mostly anonymized and cannot easily be matched to firm characteristics, asset prices, and factor exposure. We overcome these challenges by relying on deanonymized data from corporate conference calls, described in detail and provided by Gormsen and Huber (2022). We briefly summarize these data here.

Listed firms hold quarterly conference calls with analysts and investors where they occasionally disclose the firm's internal estimate of their cost of capital. By manually reading through 74,000 relevant paragraphs, Gormsen and Huber (2022) collected all instances where firms state the "cost of capital," the "weighted average cost of

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capital," or the "WACC" for the firm as a whole. The data do not include instances where firms discuss hypothetical values (e.g., "imagine a cost of capital of x percent"), where outsiders posit a cost of capital or ask suggestive question (e.g., "am I correctly assuming that your cost of capital is x percent?"), or where managers discuss rates associated with specific debt issuances (e.g., "the yield associated with the new bond issuance is x percent.") The data cover the period January 2002 to September 2021 and all firms available on the Thomson One database. Firms almost always discuss the unlevered, after-tax cost of capital and discount rates. Gormsen and Huber (2022) convert the few levered or pre-tax values into unlevered, after-tax values.

In addition to the perceived cost of capital, the dataset also includes firms' perceived cost of debt, perceived cost of equity, and the discount rates used by firms to assess the net present value of new investment projects. To identify discount rates, Gormsen and Huber (2022) rely on explicit manager statements about the minimum required IRR that they want to earn on new investment projects. Conference calls are high-stakes interactions where managers are questioned extensively by analysts and investors, often with reference to past decisions and numbers, suggesting that managers have incentives to report truthful numbers. Indeed, within-firm changes in discount rates predict within-firm changes in future investment rates, implying that the values provided by managers are accurate.[7]

3.2 Merging Asset Prices and Equity Factors

We link firm names from the conference call data to a Compustat identifier using manual matching of firm names. In turn, we can merge asset prices from the Center for Research in Security Prices and Compustat. We also add 153 equity factors, grouped under thirteen themes, by Jensen et al. (forthcoming).

The data from conference calls contain roughly 2,500 firm-quarter observations on perceived cost of capital and 2,400 observations on discount rates. Not all observations also appear in the equity factors dataset by Jensen et al. (forthcoming). The merge leaves 1,784 firm-quarter observations on perceived cost of capital (for 802 distinct firms) and 1,737 observations on discount rates (for 771 distinct firms).

[7]See the Appendix B of Gormsen and Huber (2022) for details. Other rates (such as realized and expected IRR) and ratios (such as required, realized, and expected ROA, ROIC, ROE) were separately recorded during the data collection to ensure that the concept of a discount rate was clearly differentiated.

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3.3 Summary Statistics

The mean perceived cost of capital is 8.5 percent, with substantial variation ranging from 4.1 at the 5th percentile to 12 percent at the 95th percentile, as shown in Table 1. The mean average discount rate is 16.1 percent.

Firms in the sample are larger than the average firm in the Compustat universe of listed firms, as the market value of the average firm in the sample lies at the 84th percentile relative to firms in the same year and country in the Compustat population. The average firm in the sample is slightly more profitable and levered compared to its year-country peer group (66th and 67th average percentile, respectively). Book-to-market ratio, investment rate, asset tangibility, and the CAPM beta are relatively close to the 50th percentile. Firms appearing in the sample at least once cover over 40 percent of total market value in advanced economies. The sample includes many well-known firms, such as AT&T, Bank of America, Disney, Exxon, Home Depot, Intel, JPMorgan Chase, Mastercard, Nestle, Novartis, UnitedHealth, and Visa.

4 Modigliani-Miller and the Role of Leverage

Before studying the relation between the percevied cost of capital and measures of risk and ultimately expected returns, we start by exploring the relation between the perceived cost of capital and firm leverage. This analysis is motivated by Modigliani and Miller's (MM) seminal research on capital structure, according to which the cost of capital depends not only on the risiness of the asssets in place but also by tax benefits of debt.[8] In particular, if there are tax benefits to debt, MM predicts that the cost of capital decreases when leverage increases.

Figure 1 shows a binned scatter plot of the perceived cost of capital and leverage. Leverage is measured in cross-sectional percentiles, relative to firms in the same year and country in the Compustat population, throughout the paper to reduce the influence of outliers on regression coefficients. The figure shows a negative relation between the perceived cost of capital and leverage for firms up to the 80th percentile of leverage. The relation is consistent with a tax benefit to debt but could also arise if firms with riskier assets are less levered. For firms above the 80th percentile of

[8] According to MM, the cost of capital does not depend on leverage in the absence of taxes. If a firm funds itself with more debt, which is generally cheaper than equity, the costs of debt and equity both increase such that the overall cost of capital is unchanged.

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leverage , the figure suggests a flat or even positive relation between leverage and the perceived cost of capital, rendering the figure U-shaped over the entire distribution. Table 2 shows the regression counterparts to Figure 1. The table again reveals a negative and convex relation between the perceived cost of capital and leverage. R^2 is around 5 percent.[9]

We also explore how the perceived cost of equity and debt relate to leverage. Table 2 shows that perceived cost of equity is not significantly related to leverage. This finding is at odds with standard theory, as higher leverage should, ceteris paribus, make equity riskier. The result could arise if firms with high leverage hold safer assets. The next two columns of Table 2 show that the perceived cost of debt is strongly positively related to leverage, consistent with the basic MM prediction.

Overall, the relation between leverage and the perceived costs of capital and debt are consistent with the basic MM prediction, while the weak relation between leverage and cost of equity is not. We keep these relations in mind throughout the rest of the analysis.

5 Perceived Cost of Capital and Equity Risk Factors

In this section, we explore how the perceived cost of capital relates to firm-level exposure to risk factor. A large literature in asset pricing shows that equity risk factors affect expected returns in stock markets. These expected returns should, conceptually, determine firms' costs of equity and capital. It is therefore natural to analyze whether firms' perception of these costs also vary with equity factors.

5.1 The Fama and French Factors

We begin the analysis by studying how the perceived cost of equity and capital relates to exposure to risk factors in the Fama and French 3-factor model. We first consider the perceived cost of equity on its own before turning to the perceived cost of capital.

[9]Figure 9 plots estimates on fixed effects for firms in six quantile bins of leverage, relative to baseline of firms in the lowest leverage bin (leverage ratio roughly below 19 percent). The perceived cost of capital for firms in the lowest plotted bin (ratio between 19 and 32 percent) is not different from firms in the baseline bin. However, all firms in bins with higher leverage (above 32 percent) have lower perceived cost of capital than to the baseline. Firms in the fourth bin (between 57 and 71 percent) have the lowest perceived cost of capital, whereas it is slightly higher in the top two bins (above 71 percent), in line with a convex relation.

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5.1.1 The Fama and French Factors and The Perceived Cost of Equity

In Table 4, we regress the perceived cost of equity on characteristics that proxy for exposure to equity factors:

$$r_{i,t}^{\text{equity}} = \lambda_0 + \sum_k \lambda^k X_{i,t}^k, \tag{8}$$

where $r_{i,t}^{\text{equity}}$ is the perceived cost of equity of firm i at time t, $X_{i,t}^k$ is the characteristic associated with the k$^{\text{th}}$ factor, and λ^k is the parameter estimate for the k$^{\text{th}}$ factor. We follow the literature in measuring characteristics in cross-sectional percentiles to minimize the effect of outliers.

The leftmost column considers the CAPM model, that is, the CAPM beta (co-movement between firm i's stock return and the market portfolio) is the only included factor. The slope coefficient is 3.46 and highly significant. The estimate implies that the firm with the highest beta in the cross section has a perceived cost of equity that is 3.46 percent higher than the firm with the lowest beta. The R^2 is 0.4, but a large fraction of the variation is captured by country and year fixed effects. This can be seen by the more modest within R^2 of 0.16. In sum, the CAPM beta has a statistically and economically significant impact on the perceived cost of equity, but a large fraction of the cross-sectional variation remains unexplained. This result is consistent with previous research (Jagannathan et al. 2016, Gormsen and Huber 2022).

Column 2 to 4 explore the role of market, size, and book-to-market factors. Fama and French (1993) show that firms that are smaller and have lower valuation ratios have higher expected stock returns. Consistent with this notion, we find that size, measured by market value, is negatively related to the perceived cost of equity and the book-to-market ratio is positively related to the perceived cost of equity. The economic magnitude of the size effect is similar to the effect of the CAPM beta and statistically significant at the 10 percent level. The effect of the book-to-market ratio is smaller than that of size and the CAPM beta and statistically insignificant. The within R^2 increases slightly relative the CAPM to 0.19.

Column 5 augments the regressions with firm-level leverage. The theory of MM predicts that firm's cost of equity rises with leverage, as leverage increases equity holders' exposure to the underlying riskiness of the firm's equity. However, if the included equity factors already capture all relevant risks for the firm's cost of equity,

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then leverage should not have any additional explanatory power. For instance, if the CAPM was the true model explaining all firm risk, then higher leverage would affect the cost of equity only through the CAPM beta and an additional leverage term would be insignificant. We find that the coefficient on leverage is relatively small and statistically insignificant, suggesting that leverage does not explain firm's perceived cost of equity beyond the CAPM beta, size, and book-to-market factors.

5.1.2 The Fama and French Factors and The Perceived Cost of Capital

We next study the relation between the perceived cost of capital and the Fama and French factors. We do so based on the specification in equation (8). Equation (8) shows that, assuming a constant leverage ratio, we can estimate $\lambda_k \times (1 - \omega_i)$ by regressing the perceived cost of capital on factor exposure $X^k_{i,t}$. Alternatively we could regress the perceived cost of capital on $X^k_{i,t} \times (1 - \omega_i)$ and extract λ_k. We follow the first strategy, but we show in the Appendix that the alternative strategy leads to largely similar estimates of λ.

Throughout the regressions, we control for leverage to avoid an omitted variable bias. As shown in Section 4, higher leverage is associated with lower cost of capital (through the tax shield), so the estimated premia for factors that are positively related to leverage would be biased downwards if we do not control for leverage. As our measure of leverage is measured in cross-sectional percentiles, and because the relation between leverage and the perceived cost of capital uncovered in Section 4 is convex, we include the squared leverage term as well. We do not control for the cost of debt as the equity factors are generally orthogonal to the cost of debt (Fama and French 1993).

In second panel of Table 4, we regress the perceived cost of capital on equity factors and country and year fixed effects. In column (1), the coefficient on the CAPM beta is 2.95 and significant. The within R^2 is 0.13. The coefficient is slightly smaller than that for the cost of equity in the top panel, which is expected as the estimate reflects the product of the perceived factor premium and $(1 - \omega_i)$. The coefficient on the CAPM beta is stable when we control for leverage. Figure 2 shows a binned scatter plot of the perceived cost of capital, conditional on leverage, and the CAPM beta. The variation in the average perceived cost of capital is relatively large, ranging from 7.5 to 10 percent going from the smallest to the largest CAPM beta in the data.

In column (3), we add the size and book-to-market factors from the Fama and

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French (1992) 3-factor model. Smaller firms have higher perceived cost of capital, consistent with its effect on the equity market returns, and the effect statistically significant. As with the CAPM beta, the slope is slightly smaller than that for the cost of equity, but it is still economically significant: going from the smallest to largest firm decreases the perceived cost of capital by 2.12 percentage points. For the book-to-market factor, we find a slightly negative slope. This is the opposite sign of the association between the book-to-market factor and the cost of equity.

In column (4), we further augment the regressions with the profit and investment factors of the Fama and French (2015) 5-factor model. The profit factor, which predicts higher equity returns, is not significantly related to the cost of capital and the coefficient has the opposite sign. The investment factor negatively predicts equity returns—firms with higher investment rates should have lower cost of equity—but, in contrast, we find that firms with higher investment rates have higher perceived cost of capital. Figure 10 displays a binned scatter plot of the perceived cost of capital, conditional on leverage, and the cost of capital predicted using the 5-factor model. The range in the average perceived cost of capital is relatively large, roughly 3 percentage points, going from the smallest to the largest predicted value in the data.

Taken together, the findings confirm that the CAPM beta and size are related to the perceived costs of equity and capital. The CAPM model and, to some extent, the Fama and French (1993) 3-factor model explain the perceived cost of equity and capital, although the book-to-market ratio is not strongly related to the perceived cost of capital. However, we find no evidence that firms incorporate the 5-factor model, as profit are unrelated to the perceived cost of capital and investment has the wrong sign.

5.2 The Full Set of Equity Risk Factors

We next turns to a broader set of equity risk factors. The asset pricing literature has uncovered hundreds of equity factors that explain expected stock returns. These risk factors captures different dimensions of expected stock returns. To We explore which of these factors are related to firms' perceived cost of capital.

For each equity factor k, we extract factor premia from slope coefficients in the

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below regression

$$r_{i,t}^{\text{cost of capital}} = b_0 + b_1 X_{i,t}^{\text{beta}} + b_2 X_{i,t}^{\text{lev}} + b_3 X_{i,t}^{\text{lev squared}} + b_4 X_{i,t}^{k} + \varepsilon_{i,t}^{k}, \tag{9}$$

where, as before, $r_{i,t}^{\text{cost of capital}}$ is the perceived cost of equity of firm i at time t, $X_{i,t}^{k}$ is the characteristic associated with the k$^{\text{th}}$ factor, and λ^k is the parameter estimate for the k$^{\text{th}}$ factor. The specification thus studies each risk factor k seperately, controlling for the CAPM beta, leverage, and leverage squared. We control for CAPM beta because the equity risk factors we study are associated with positive CAPM alpha, not necessarily positive expected returns. We continue to control for leverage to account for the mechanical effect of leverage on cost of capital documented in Section 4. We consider the risk factors in isolation, except for the above controls, as these risk factors have been shown to work in univariate specifications.

To get a broad overview of the results on the many risk factors, we first categorize these factors into groups and study average properties across groups. We classify the risk factors based on the method in Jensen et al. (forthcoming), which results in seven broad groups of equity factors. These groups are based the well-known major drivers of equity returns, namely value, profitability, investment, trading frictions, intangibles, momentum, and a final category called “new", which captures are larger range of factors.

Table 5 reports results averaged across different groups of risk factors. The first column reports the average factor premia in the group. We sign all factors here such that a higher factor should be associated with a higher CAPM alpha, which means we expect the factor premia to be positive on average. For the value factors, the average risk premia is around 0.4 percentage points. This is well below the premia estimated for beta and size in Table 4. It is nonetheless economically significant, and it is substantially larger than the average risk premia in any of the other categories, most of which are either close to zero or negative.

The next columns shows the percentage of the factors in a given group that has the correct sign. We see that for factors based on value and trading frictions, a reasonable fraction of the factors have premia with the correct sign (81% and 71%). None of the other groups produce factors that consistently have the correct sign.

The last column shows the percentage of the factors in a given group that has a statistically significant correct sign. That is, for each factor, we test whether the factor

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is equal to zero against the one-sided alternative that it has the same sign as observed in financial markets (i.e. it is positive). To give the factors the best possible change, we consider the factor positive if they have a p-value below 5% in the one-sided tests and we use standard OLS errors. We correct for the numbers of factors tested within a group using the Benjamini and Hochberg (1995) method for setting a false discovery rate at 5% (this, again, is lenient relative to, for instance, a Bonferroni adjustment).

Despite the arguably lenient method for assessing significance, we find that most groups do not have many significant factors. Only a handful of factors are significant in the trading friction, intangible, and profitability groups. For investment, new, and momentum, none of the factors are significant with the correct sign. Only for value do we observe a meaning degree of significance, as 38% of the value factors are significant.

The last row of Table 5 reports a summary of all factors. Overall, the average factor premium across the 146 factors tested is zero and less than 50% of the factors have the correct sign. Moreover, only 9% of the factors have factor premia with the correct sign that are statistically significant. Overall, these results leads us to conclude that the majority of risk factors studied in the asset pricing literature are not reflected in firms' perceived cost of capital. This finding is consistent with (Engelberg et al. 2020, Jensen 2022), who finds that most equity factors do not show up in investors' expected or required returns.

We also note that many of the investment factors have the wrong sign. This result represents a serious challenge for the Investment CAPM and production-based asset pricing more generally, as discussed in the upcoming Section 7.

We also reports results on individual factor premia in Figure 3 and in Table A1 in the Appendix. Figure 3 λ^k for the K different factors (we refer to the online version of this figure for better readability). Again, we sign all factors here such that a higher factor should be associated with a higher CAPM alpha. Given that we control for market betas in the regressions in (2), We therefore expect that that $\lambda_k's$ estimated in equation (9) be be positive. As shown in Table 5, this is far from the case. In fact, most factors have the wrong sign, in that the estimated λ is negative.

A couple of observations stand out from Figure 3. First, factors based on profitability generally have the largest and most positive λs. While profitability, measured according to Fama and French (2015), does not predict returns well (operating profits to lagged book equity), other profitability characteristics are related to the perceived cost of capital, such as turnover and return on operating assets. Second, factors based

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on trading frictions and risks also tend to have positive λs. Third, factors based on investment and momentum tend to show up with the wrong sign in the perceived cost of capital, consistent with the result that investment has a positive impact on the perceived cost of capital in Table 4. In contrast, the sign should have been negative according to Fama and French (2015).

Figure 11 zooms in on the significant factors. Even though value is the strongest group of factors on average, we find significant factors in other groups as well. For instance, the factor with the largest λ is Altman's Z-score, a measure of how close a firm is to bankruptcy. A higher Z-score implies that a firm is further from bankruptcy. In financial markets, a higher Z-score is associated with a higher expected stock return, a fact often referred to as distress puzzle. We similarly find that a higher Z-score is associated with a higher perceived cost of capital. This finding may be relevant for our understanding of which economic mechanisms cause the distress puzzle.

6 Cost of Capital Wedges

The previous section documents that most equity factors are reflected in the perceived cost of capital with opposite sign of how they are reflected in financial markets. This finding implies substantial wedges between perceived cost of capital and the cost of capital implied by financial markets. In this section, we more formally quantify these wedges. We first compare the perceived cost of capital to long-run factor premia in financial markets, which leads to estimates of the factor wedges δ_k^λ. We next compare the perceived cost of capital to the "implied cost of capital" from the accounting literature, which leads to estimates of the firm-level wedges, $\delta_{i,t}^r$.

6.1 Factor Wedges

To estimate factor wedges,

$$\delta_k^\lambda = \lambda_k^{\text{perceived}} - \lambda_k^{\text{financial}},$$

we need estimates of long-run factor premia in financial markets, $\lambda_k^{\text{financial}}$. Most of the research on the cross-section of expected stock returns focuses on short-run expected returns. The factor premia documented by Fama and French (1993) and many subsequent papers are for one-month or one-year expected returns on a given

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firm. For instance, Fama and French (1993) shows that value firms have high CAPM alpha over the next year, but the paper is silent on the longer-run expected returns of value firm

A recent literature discusses how long-run expected stock returns may differ substantially from short-run expected returns (see, e.g., Cohen et al. 2009, Cho and Polk 2019, Keloharju et al. 2019, van Binsbergen et al. 2023, Chen and Kaniel 2021). This literature documents that many of the patterns that characterizes the cross-section of expected short-run returns dissappears when considering long-run expected returns. A natural example of this difference is the momentum factors, which predict returns to firms over a few months but naturally do not predict long-run expected returns.

We use data from van Binsbergen et al. (2023) to estimate $\lambda_{\text{k}}^{\text{financial}}$. The authors estimate long-run CAPM alpha for a set of popular firm characteristics, 24 of which we merge to our factor data set (which comes from Jensen et al. forthcoming).[10] For each of these factors, $\lambda_{\text{k}}^{\text{financial}}$ as the difference in annual CAPM alpha between the firms in the top and bottom decile of the given characteristic. These estimates are thus akin to factor premia obtained from the following regression:

$$r_{i,t}^{\text{long-run stock returns}} = \lambda_0 + \lambda_{\text{beta}}^{\text{financial}} X_{\text{beta},t} + \lambda_{\text{k}}^{\text{financial}} X_{i,t} + \varepsilon_{i,t}$$

where $X_{i,t}$ as measured in cross-sectional percentiles ranging from 0 to 1 (i.e., our main measure throughout the paper).

We compare these estimates of long-run expected returns to the factor premia recovered from equation (9). To compare these to estimates of the cost of equity, we need to account for the fact that equity only accounts for some of the cost of capital. To do so, we assume that exposure to risk premia only influence the perceived cost of equity (not debt) and that leverage ratios are constant at 0.3 for all firms. Under these assumptions, we can extract the implied long-run equity risk premia, $\lambda_{\text{k}}^{\text{perceived}}$, by dividing the slope coefficients extracted from equation (9) by 0.7 (the percentage equity financing).

Since $\lambda_{\text{k}}^{\text{perceived}}$ and $\lambda_{\text{k}}^{\text{financial}}$ both capture the long-run expected returns for a given factor, they should move one-for-one. Table 6 test this hypothesis by running the

[10]We can merge 28 factors, but we exclude factors based momentum, short-term reversal, and MAX. These factors are based on highly transient characteristics and should therefore not predict long-run expected returns. Including the characteristics does not change the results of the analysis.

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following regression across the factor premia,

$$\lambda_{\mathrm{k}}^{\text{perceived}} = a + b \times \lambda_{\mathrm{k}}^{\text{financial}} + \varepsilon_k.$$

The table shows that the perceived and financial premia are positively related, but the slope is well below 1. The low slope suggests that there are substantial wedges between the $\lambda^{\text{perceived}}$ and $\lambda^{\text{financial}}$. The standard errors are corrected for heteroscedasticity but not for the fact that $\lambda_{\mathrm{k}}^{\text{financial}}$ is a generated regressor. As such, we can reject the null of no predictability but we technically cannot make inference about whether the slope coefficient is equal to one. That said, the confidence interval is far from 1 with the current choice for standard errors.

Figure 4 compares $\lambda_{\mathrm{k}}^{\text{perceived}}$ and $\lambda_{\mathrm{k}}^{\text{financial}}$ for each of the factors individually. The figure plots the estimated risk premia next to each other along with the factor-specific wedges δ_k^{λ}. All factors are signed such that a higher factor exposure is associated with a higher short-run CAPM alpha. The figure shows that factors based on value and size have sizeable estimates of both $\lambda_{\mathrm{k}}^{\text{perceived}}$ and $\lambda_{\mathrm{k}}^{\text{financial}}$. For factors based on market equity, assets-to-market, and book-to-market, for instance, the estimated factor premia are around 1 to 2 percentage points per year.

However, for most of the other factors, we observe modest values of $\lambda_{\mathrm{k}}^{\text{perceived}}$ and therefore large factor-specific wedges. For instance, firms with low liquidity (dollar volume) have a relatively high long-run expected stock returns but they do not have a relatively high perceived cost of capital. Similarly, firms with high asset tangibility have high perceived cost of capital but low long-run expected stock returns, again generating wedges between the two estimates.

We note that the factor wedges are larger in magnitude than the perceived factor premia themselves. The average absolute wedge is around 1 percentage point and the cross-sectional standard deviation of the wedges is also around 1 percentage point. In contrast, the average perceived factor premium is only around 0.67 percentage points (in absolute terms) and the standard deviation is 0.87 percentage points.

Taken together, the analysis in this section suggests that factor premia in the perceived cost of capital are related to estimates of long-run factor premia from financial markets, but that there are large wedges between the two. In the subsequent section, we use firm-level measures of implied cost of capital that is also based on financial markets data but differs in nature from the risk-factor approach taken in

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this section.

6.2 Firm-level Wedges with Respect to the "Implied Cost of Capital"

To estimate firm-level wedges, we need estimates of firm-level cost of equity in financial markets. To this end, we follow a large literature in accounting and finance that estimates the implied cost of capital. Rather than using exposure to equity risk factors as a measure of long-run expected returns – and thus cost of equity – this literature uses present value accounting to back out expected long-run returns. In particular, by combining measures of expected future cash flows with current prices, one can calculate the implied discount rate for a given firm, and thereby the implied cost of equity. Seminal references to this approach include Gebhardt et al. (2001), Botosan and Plumlee (2002), and Mohanram (2003).

Easton and Monahan (2005) reviews a set of the proposed measures of the implied cost of capital, finding that these are generally not strong predictors of expected future stock returns. It is, however, possible that these measures are strong predictors of the perceived cost of capital. In particular, if firms' use valuation ratios and present value accounting in estimating their perceived cost of capital, it is possible that they end up with estimates that are close to the measures of the implied cost of capital used in the literature.

To assess the relation between the perceived and implied cost of capital and the implied cost of capital, we first run simple firm-level panel regressions. Table 7 shows the results of regressions of the firm-level perceived cost of capital on the implied cost of capital. Here the implied cost of capital is calculated using the price-earnings growth model in Easton and Monahan (2005) but the results are similar when using alternative measures.

The table shows that the two measures of the cost of capital are close to uncorrelated. When excluding firm-fixed effects, the slope coefficients are around 0.035, which means that an increase in the implied cost of capital of 1 percentage points leads to an increase in the perceived cost of capital of only 0.035 percentage points. The correlation is close to 0 as seen by the R^2 value in the first column. When including firm-fixed effects, the results are slightly better, with slopes increasing to around 0.075 and becoming statistically significant. This result suggests that measures of the implied

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cost of capital are better for capturing within-firm variation than across firm variation in firms' perceived cost of capital. However, the slope coefficients are small for both measures, suggesting substantial wedges between the perceived and implied cost of capital. These wedges capture the firm-level wedges $\delta^r_{i,t}$.

To illustrate the magnitude of these wedges, we sort firms into 10 portfolios based on the implied cost of capital for a given firm in a given quarter. We then average the implied and perceived cost of capital across firms in these portfolios. Figure 5 shows the averages along with wedges, which are defined as the difference between the average perceived cost of capital of firms in the portfolio and the average implied cost of capital of the firms in the portfolio.

The implied cost of capital increases from around 5% per year to 20% per year when going from the portfolio with the lowest to the highest implied cost of capital. The perceived cost of capital is, however, essentially the same for all portfolios. As a result, we observe large wedges across the 10 portfolios. For the portfolio with the highest implied cost of capital, we find discount rate wedges above 10% on average.

The large firm-level wedges in the above analysis limitations as to which analyses the "implied cost of capital" is suitable for. For instance, the results suggest that one cannot use the implied cost of capital to test how economic shocks influence firms' perceived cost of capital and thereby real outcomes. We introduce a new measure of the perceived cost of capital towards the end of the paper that can be used in applied work going forward.

7 Implications for Production-Based Asset Pricing

The results above suggests that firms' expectations about their cost of equity deviate substantially from what standard measures of expected stock returns used in the literature imply. This deviation represents a challenge for the production-based asset pricing paradigm. In this section, we describe the challenge and formalize our main points in the context of the Investment-CAPM by Hou et al. (2015a).

Production-based asset pricing models build on the idea that firms have perfect information about the stochastic discount factor. Since firms incorporate this information in their investment decisions, firms' investment choices reflect the riskiness of their investments. In particular, firms that make relative riskier investments will require a higher return on their investments. By looking at firms' investment behavior,

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researchers can infer what return firms are requiring on new investment and thereby what firms' believe their cost of capital is. If one imposes enough structure on the investment problem, one can recover key parameters of the stochastic discount factor and data generating process this way (Cochrane, 1991).

Our analysis, however, suggests that firms' do have perfect knowledge about their cost of capital. In particular, firms' expectations about their cost of capital does not line up with the equity factors that the asset pricing literature believes to be driving the stochastic discount factor. As such, the results limit the extent to which we can hope to recover the properties of the stochastic discount factor from firms' investment behavior.

We formalize this critique in the context of the Investment CAPM proposed by Hou et al. (2015a). Hou et al. base their investment CAPM on a simple one-period investment model where firms' optimally choose investment based expected stock returns and expected profits. To simplify their ideas, the authors assume that adjustment costs are quadratic in investment rates and that capital depreciates fully over one period. In this setting, the optimal investment rate for a fully equity financed firm is given by

$$1 + \frac{I_t}{K_t} = \frac{E_t[X_{t+1}]}{E_t[r_{t+1}]} \times \frac{1}{a} \tag{10}$$

where I_t is investment at time t, K_t is capital at time t, $E_t[r_{t+1}]$ is the expected stock returns for the firm at time t for the period between t and $t+1$, $E_t[X_{t+1}]$ is the expected profit at time t for the period between t and $t+1$, and a is a parameter governing the adjustment costs.

Based on equation (10), Hou et al. argue that firms that invest more should have lower expected stock returns, once controlling for the profitability of the firm. Following this argument, they construct investment and profit factors and show that firms with low investment indeed have high expected stock returns (when keeping profitability fixed) and that firms with high profitability have high expected stock returns (when keeping investment fixed). The authors argue that these relation arise exactly because a firm with high profitability would only have a low investment rates if the had a high cost of capital (i.e. high expected returns).

We present evidence that this premise of the model does not hold in our data. We first test whether firms with lower investment rates have higher cost of capital

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in simply univariate regressions. As shown in column 1 of Table 8, we find that this is not the case: firms with low investment rates have low, not high preceived cost of capital. In the next column, we control for profitability by including fixed effects for how profitable firms are (we include 10 fixed effects based on the profitability-bin of individual firm in the relevant quarter). This control slightly strengthens the conclusions: low investment firms now have even lower perceived cost of capital and the effect becomes statistically significant. Controlling for a larger host of factors in column 3 does not change the results.

In the above results, we use the exact specifications of Hou et al. (2015a) for investment and profit characteristics. That is, we use asset expansion as the measure of investment and return on equity as the measure of profits. These are the characteristics that Hou et al. (2015a) base their factors upon, and therefore the relevant characteristics for testing the Investment CAPM. However, we note that most investment factors have the wrong sign. As shown in Table 5, 72% of the investment actors have the wrong sign and none of the factors that have the correct sign are significant. The exact factors and their sign can be seen in Figure 3 and Table A1 in the Appendix.

Overall, the results suggests that firms with relative low investment rates have a low, not high, perceived cost of capital. This finding goes against the basic premise of the Investment CAPM.

8 Discount Rates and Equity Factors

Most firms' do not directly use their cost of capital as their discount rate in their investment decisions but rather use discount rates that are well above the cost of capital. Gormsen and Huber (2022) show that these discount rate wedges are large on average, varies over time and across firms, and strongly predicts firm-level investment. These observation raises two questions for our analysis.

8.1 Testing the Investment CAPM using Discount Rates

Given the presence discount rate wedges, one objection to the above conclusions about the Investment CAPM could be that firms incorporate expectations about their stock returns into their discount rates, rather than their perceived cost of capital. While

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there is no clear reason to expect such behavior, it is in principle possible that firms use a very basic textbook measure of the cost of capital and then incorporate beliefs about expected stock returns into their discount rates.

Our data allows us to test this hypothesis, as they contain detailed information on firm-level discount rates. Using these discount rates, we repeat the tests of the Investment CAPM using discount rates as the outcome variable. We present the results in Table 10. We again find that firms with low investment rates use lower, not higher discount rates. The effect is statistically significant in three of our specifications. This findings again leads to a rejection of the basic premise of the Investment CAPM.

It is important to emphasize that this result relates to the unconditional correlation across firms between investment rates and discount rates. Once including firm-fixed effects, one finds a strongly negative relation between discount rates and investment, as basic theory predicts. Moreover, in Section 9.2, we show that investment rates are negatively to discount rates once controlling for a larger set of factors that are significant in explaining variation in discount rates. However, when testing the Investment CAPM, the relevant test is whether investment rates are negatively related to the perceived cost of capital and discount rates when controlling for profitability alone.

8.2 Discount Rates in the Fama and French Model

The fact that discount rates differ from the perceived cost of capital raises an additional question for our analysis, namely whether the relations between the Fama and French factors and the perceived cost of capital also arise when looking at discount rates. To answer this question, we test the relation between discount rates and the perceived cost of capital in Table 9. The coefficient on the CAPM beta is economically and statistically significant. Moving from the firm with the smallest to the largest CAPM beta leads to a 5 percentage point increase in the discount rate. The positive sign is consistent with the relation between the CAPM beta and expected equity returns. The within R^2 in the univariate regression of column (1) is around 5 percent. There is no significant association between the discount rate and leverage in column (2), suggesting that discount rate wedges weaken the impact of leverage on discount rates, relative to the impact on the perceived cost of capital.

In column (3), size is significantly and negatively related discount rates, mirroring

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the earlier result that size negatively predicts the perceived cost of capital. The coefficient on size is partially driven by the perceived cost of capital, but the large size suggests that size also influences discount rate wedges. The book-to-market factor also significantly predicts discount rates. The coefficient is negative, while we earlier found that the book-to-market factor is positively related to expected equity returns and unrelated to the perceived cost of capital. This result implies that discount rate wedges substantially affect the role of the book-to-market factor, switching its sign relative to its impact on expected equity returns. The within R^2 in column (3) is around 13 percent, implying that equity factors explain a non-negligible share of discount rate variation.

Taken together, the results of Table 9 suggest that equity factors have substantial predictive power for discount rates. We confirm this finding in Figure 12 by showing a binned scatter plot of discount rates against discount rates predicted using the Fama and French (2015) 3-factor model. The average discount rate varies by roughly 12 percentage points moving from the smallest to the largest predicted value in the data, again showing that equity factors can explain variation in observed discount rates.

9 Predicting Perceived Cost of Capital and Discount Rates Out-of-Sample

The previous analysis suggests that there a large wedges between firms' perceieved cost of capital and the measures researchers usually use for measuring the cost of capital. To help facilitate research that requires measures of firms' perceived cost of capital going forward, we construct predicted measures of this cost of capital based on a simple multifactor model. The final dataset contains 15,911 firms with a total of 119,717 predicted annual observations of the perceived cost of capital and can be downloaded online at costofcapital.org.

9.1 Predicting the Perceived Cost of Capital

To construct a firm-level perceived cost of capital, we first conduct a multivariate analysis of which equity factors are reflected in the perceived cost of capital. Given the large number of factors, we use a Lasso for model selection. We feed in the variables of the factor zoo, country fixed effects, and a year trend, which can capture the time

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variation in the perceived cost of capital documented in Gormsen and Huber (2022).

The Lasso procedure selects twelve characteristics. Figure 6 shows the slope coefficients (λ) for the selected factors. We no longer sign the factors to positively predict returns, as we did in Figure 3, but instead use the natural definitions of each factor. The results largely confirm the analysis in Section 5.1.2: firms with high beta, low size, and low leverage have high predicted cost of capital. We also confirm the finding in Gormsen and Huber (2022), namely that the perceived cost of capital decreases over time. A new factor that has substantial predictive power for the perceived cost of capital is firm age, as older firms have lower perceived cost of capital.

Based on this multifactor model, we construct a dataset of predicted value for the perceieved cost of capital for 15,911 firms. We verify the new dataset by comparing the predicted values to a different dataset, the Duke CFO data collected by Graham and Harvey (2001). There are 335 observations that can be linked to register data and thus our factor zoo data. We regress the Duke CFO value for the perceived cost of capital on the value from our new predicted dataset. In Table 11, we find that the coefficient, weighting by firm size, is 0.87, significantly different from zero, and not significantly different to 1. So, we cannot reject that observations in the two datasets move one-to-one. This shows that the new predicted data have predictive power for data collected using a completely different, survey method.

9.2 Predicting Discount Rates

We similarly create predicted values of firms' discount rates, following the procedure using Lasso established in Section 9 for predicted values of the perceived cost of capital. We feed in the variables of the factor zoo, country fixed effects, and discount rate predictors documented in Gormsen and Huber (2022): a year trend, option-implied volatility, financial frictions (index by Hadlock and Pierce 2010), and market power (measured using the accounting method of Baqaee and Farhi 2020).

Lasso selects the predictors shown in Figure 7. Market power, financial constraints, and measures of volatility predict discount rates strongly, in line with the findings in Gormsen and Huber (2022) that they predict discount rate wedges. We also find that abnormal investment is negatively related to discount rates. This result is expected, as firms with higher discount rates should invest less, once accounting for the relevant

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set of controls. Many of the selected variables are related to volatility and uncertainty, and they are all signed such that higher volatility leads to higher discount rates. Summing across the relevant variables (QMJ safety, earnings volatility, idiosyncratic volatility, implied volatility from options) implies a large impact of risk on hurdle rates.

We confirm the predictive power of the new dataset, again using the Duke CFO data. We regress the values of the discount rate from the Duke CFO data on our new predicted values. The coefficient is 1.11 when weighting by size. The finding underscores the predictive power of the new dataset.

10 Conclusion

The cost of capital plays a key role in traditional analyses in finance and macroeconomics. In stylized models, the cost of capital determines the return firms' require on new investment and thereby their investment rates. In theory, the cost of capital should be based on the expected returns set in financial markets. For this reason, a large literature in asset pricing and macroeconomics argues that expected stock returns have important implications for investment in (Brainard and Tobin, 1968, Cochrane, 1991, 2017), business cycle fluctuations (Bloom, 2009), cyclical variation in unemployment (Hall, 2017), and capital misallocation (van Binsbergen and Opp, 2019, David et al., 2022). Policy makers are also aware of this potential link between expected stock returns and corporate investment. Members of the FOMC board, for instance, express direct concern that a drop in stock prices would lead to a higher cost of capital for corporations and thereby to a decrease in real activity (Cieslak and Vissing-Jorgensen, 2021).

This traditional view is based on models where firms are endowed with perfect knowledge about their cost of capital. However, the cost of capital is a complicated construct that depends crucially on the expected return on firms bonds and stocks. As these expected returns are difficult to estimate, it is possible that firms' perceptions about their cost of capital deviates substantial from a rational expectations benchmark.

In this paper, we provide some of the first cross-sectional analysis on firms perceptions about their cost of capital. We document that firms perceptions about their cost of capital indeed deviates substantial from what traditional measures of expected returns in financial markets would imply. This finding challenges the classical view

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outlined above. Moreover, these wedges may be important for understanding firms investment decisions and have implications for capital missallocation. We consider these promising directions for future research.

The results presented in this paper represent at particular challenge for the Investment CAPM. According to the Investment CAPM, we can recover expected stock returns from the behavior of firms. The model argues that if firms have high profiability yet invest at a low rate, it must be because firms think they have a high cost of capital. Empirically, such firms do have high expected stock returns, but we find that they have low perceived cost of capital. This finding suggests that the observed relation between investment, profits, and expected stock returns is not reflecting managers' expectations about their firm' stock returns, which is the basic premise of the Investment CAPM.

Despite the presence of cost-of-capital wedges, we note that firms' perceived cost of capital does indeed reflect some of the prominent factors. The cost of capital, for instance, reflects standard risk factors such as the market beta, size, and – to some extent – value, consistent with the Fama and French (1993) model. It also reflect firms' leverage ratios, consistent with the theories of Modigliani and Miller (1958) the revolve around tax-benefits of debt.

Our results emphasize the need for a better understanding of the link between financial markets, the perceived cost of capital, and corporate investment. To facilitate research on this topic, we construct a new publicly available dataset of predicted values of the perceived cost of capital and discount rates at the firm-year level. The new dataset is substantially larger than previous datasets, covers some of the world's largest firms, and accurately predicts out-of-sample variation in the Duke CFO Survey.

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Table 1
Summary Statistics

This table reports summary statistics at the level of firm-quarter observations. We report firm-quarter observations where at least one of the perceived cost of capital, debt, equity, and discount rate are observed in the conference call data. The remaining variables are from the factor zoo data. Variables in "percentile ranks" report the percentile rank of firms in the data, relative to the universe of firms in Compustat in the same year and country of listing. Mean values of variables in percentile rank around 50 imply that firms in the sample are close to the mean in the country-year peer group.

	N	Mean	p5	p95
Perceived cost of capital	1784	8.5	4.2	12.0
Perceived cost of debt	2630	4.2	1.6	7.0
Perceived cost of equity	209	9.8	5.5	13.5
Discount rate	1737	16.1	8.0	30.0
Market value (percentile rank)	5931	83.5	48.8	99.3
Profits / assets (percentile rank)	5541	65.5	23.9	96.5
Leverage ratio (percentile rank)	5920	66.7	29.5	95.4
Book-to-market ratio (percentile rank)	5756	49.1	9.5	90.0
Investment rate (percentile rank)	5910	51.8	13.7	90.3
Asset tangibility (percentile rank)	4681	42.6	3.1	89.1
Market beta (percentile rank)	5555	50.6	9.7	93.1

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Table 2
Leverage and the Perceived Cost of Capital

This table reports results of regressions of firm-level perceived cost of capital, debt, and equity on firm-level measure of leverage. Perceived cost of capital, debt, and equity is in percent and leverage is in cross-sectional percentiles ranging from 0 to 1. The sample is 2002 to 2021. Standard errors are clustered by firm. Statistical significance is denoted by *** p<0.01, ** p<0.05, * p<0.1.

	(1)	(2)	(3)
	Perceived cost of capital		
Leverage ratio	-1.67***	-10.9***	0.74
	(0.45)	(2.06)	(7.92)
Leverage ratio^2		7.82***	-14.3
		(1.75)	(15.2)
Leverage ratio^3			12.7
			(8.79)
Observations	1,441	1,441	1,441
R-squared	0.162	0.190	0.194
FE	Country/year	Country/year	Country/year
Within R^2	0.025	0.058	0.062

	(1)	(2)	(3)	(4)
	Perceived cost of equity		Perceived cost of debt	
Leverage ratio	0.77	-10.7	2.05***	-2.77
	(1.52)	(6.66)	(0.30)	(1.61)
Leverage ratio^2		9.15*		3.72***
		(5.03)		(1.24)
Observations	147	147	2,493	2,493
R-squared	0.219	0.242	0.505	0.513
FE	Country/year	Country/year	Country/year	Country/year
Within R^2	0.0037	0.033	0.063	0.077

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Table 3
Fama-French Factors and the the Perceived Cost of Capital

This table reports results of regressions of firm-level perceived cost of equity on measures of firm-level exposure to equity factors. Exposure to equity factors is measured by the characteristic of the underlying factor, such as size and book-to-market. Perceived cost of capital is in percent and characteristics are in cross-sectional percentiles ranging from 0 to 1. The sample is 2002 to 2021. Standard errors are double-clustered by firm and year.

	(1)	(2)	(3)	(4)	(5)
	Perceived cost of equity				
Market beta	3.48***	3.50***	3.33***	3.32***	3.21***
	(0.73)	(0.74)	(0.78)	(0.80)	(0.87)
Lower market capitalization		3.15*		3.32*	3.47*
		(1.66)		(1.73)	(1.75)
Higher book-to-market			0.67	0.85	0.55
			(1.34)	(1.44)	(1.57)
Leverage ratio					-1.73
					(4.86)
Leverage ratio^2					1.91
					(3.68)
Observations	145	145	143	143	143
R-squared	0.379	0.397	0.374	0.395	0.398
FE	Country/year	Country/year	Country/year	Country/year	Country/year
Within R^2	0.16	0.19	0.16	0.19	0.20

	(1)	(2)	(3)	(4)
	Perceived cost of capital			
Market beta	2.95***	2.96***	2.78***	2.86***
	(0.38)	(0.36)	(0.31)	(0.32)
Lower market capitalization			2.12**	2.29***
			(0.77)	(0.78)
Higher book-to-market			-0.016	-0.079
			(0.38)	(0.43)
Higher profit				-0.11
				(0.52)
Lower investment				-0.59**
				(0.25)
Leverage ratio		-8.68***	-7.84***	-8.28***
		(1.88)	(1.70)	(2.05)
Leverage ratio^2		5.48***	4.75***	4.89**
		(1.61)	(1.53)	(1.82)
Observations	1,368	1,368	1,342	1,267
R-squared	0.263	0.317	0.332	0.348
FE	Country/year	Country/year	Country/year	Country/year
Within R^2	0.13	0.20	0.21	0.24

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Table 4
Summary of Factor Regressions

This table reports average results for factor regressions across different groups of risk factors. For each factor in our sample, we project the perceived cost of capital onto the given firm's market beta, leverage, leverage squared, and the firm's characteristic for the factor in question. All firm characteristics are measures in cross-sectional percentiles ranging from 0 to 1 and the cost of capital is measured in percentage points. All factors are signed such that higher exposure is associated with higher CAPM alpha in financial markets. The factors are grouped into categories as in Jensen et al. (forthcoming). For each group of factors, we report the average factor premium (λ^i), the number of factors belonging to the category, the percent of factors for which λ^i has the same sign as that observed in financial markets, and the percent of factors that are significant against the one-sided alternative of having a different sign than the one observed in financial markets. A factor is significant if it has a $p-$value above 5% after doing a Benjamini and Hochberg (1995)-correction for number of factors tested in the given category. The sample is 2002 to 2021.

Factor category	Average λ^i	# of factors	% Correct sign	% Significant
Value	0.42	16	0.81	0.38
Trading frictions	0.21	24	0.71	0.17
Intangibles	0.02	29	0.52	0.07
Profitability	-0.03	22	0.32	0.14
Investment	-0.19	32	0.28	0.00
New	-0.29	14	0.14	0.00
Momentum	-0.30	9	0.22	0.00
All	-0.01	146	0.45	0.09

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Table 5
Perceived versus Financial Factor Premia

This table compares factor premia estimated in the perceived cost of capital with factor premia estimated based on long-run stock returns. For each risk factor k we estimate factor premia in both the perceived cost of capital ($\lambda_{\text{k}}^{\text{perceived}}$) and financial markets ($\lambda_{\text{k}}^{\text{financial}}$). Factor premia for the perceived cost of capital are estimated as explained in the text. Factor premia in financial markets are estimated based on the data from van Binsbergen et al. (2023). Factor premia are measured in percentage points difference of firms' in the top and bottom of the cross-sectional distribution of the given characteristic. The null of similar risk premia is $a = 0$ and $b = 1$ in the below regression. The sample covers 24 risk factors.

Dependent variable	$a + b \times \lambda_k^{\text{Financial}} + \varepsilon$						R^2
$\lambda_k^{\text{perceived}}$	=	-0.06 (0.08)	+	0.30 $\times\lambda_k^{\text{financial}}$ (0.09)	+	ε_i	0.27

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Table 6
Implied versus Perceived Cost of Capital

This table reports results of regressions of firm-level perceived cost of capital the implied cost of capital. The implied cost of capital is calculated based on the price-earning growth model in Easton and Monahan (2005). Both perceived and implied cost of capital are in percent. The sample is 2002 to 2021. Standard errors are clustered by firm.

	(1)	(2)	(3)	(4)	(5)
	Perceived cost of capital				
Implied cost of capital	0.033	0.040	0.032	0.078**	0.076**
	(0.028)	(0.032)	(0.030)	(0.033)	(0.035)
Observations	940	940	940	731	731
R-squared	0.003	0.023	0.156	0.816	0.832
FE	None	Country	Country/year	Firm	Firm/year
Within R^2	0.0029	0.0038	0.0027	0.032	0.028

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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Table 7
Testing the Investment CAPM Using the Perceived Cost of Capital

This table reports results of panel regressions of firm-level perceived cost of capital on firm-level investment ratios and firm-level profitability. Both variables are measured as in Fama and French (2015) and signed such that both variables should be associated with a higher expected return according to the Investment CAPM. The characteristics are in cross-sectional percentiles ranging from 0 to 1. The sample is 2002 to 2021. Standard errors are clustered by firm.

	(1)	(2)	(3)
	Perceived cost of capital		
Lower investment rates	-0.43	-0.63**	-0.46*
	(0.32)	(0.32)	(0.27)
Market beta			2.69***
			(0.33)
Leverage ratio			-0.077***
			(0.017)
Leverage ratio^2			0.00047***
			(0.00015)
Low market capitalization			2.14***
			(0.75)
Higher book-to-market			0.11
			(0.43)
Observations	1,519	1,483	1,409
R-squared	0.153	0.182	0.344
FE	Country/Year	Country/Year/Profit bins	Country/Year/Profit bins
Within R^2	0.0022	0.0048	0.20

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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Table 8
Equity Factors and Firm's Discount Rates

This table reports results of panel regressions of firm-level discount rates on measures of firm-level exposure to equity factors. Exposure to equity factors is measured by the characteristic of the underlying factor, such as size and book-to-market. Discount rates are in percent and characteristics are in cross-sectional percentiles ranging from 0 to 1. The sample is 2002 to 2021. Standard errors are clustered by firm.

	(1)	(2)	(3)
		Discount rate	
Market beta	5.23***	5.52***	4.59***
	(1.17)	(1.23)	(1.09)
Leverage ratio		-1.58	-13.6
		(2.08)	(8.65)
Leverage ratio^2			10.0
			(6.50)
Lower market capitalization			11.2***
			(1.99)
Higher book-to-market			-3.92***
			(1.35)
Observations	1,617	1,617	1,554
R-squared	0.173	0.175	0.242
FE	Country/year	Country/year	Country/year
Within R^2	0.049	0.051	0.13

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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Table 9
Testing the Investment CAPM Using Discount Rates

This table reports results of panel regressions of firm-level discount rates on firm-level investment ratios and firm-level profitability. Both variables are measured as in Fama and French (2015) and signed such that both variables should be associated with a higher expected return according to the Investment CAPM. The characteristics are in cross-sectional percentiles ranging from 0 to 1. The sample is 2002 to 2021. Standard errors are clustered by firm.

	(1)	(2)	(3)
		Discount rates	
Lower investment rates	-1.20	-3.54***	-3.06***
	(1.21)	(1.19)	(1.09)
Market beta			4.18***
			(1.00)
Leverage ratio			-0.11
			(0.084)
Leverage ratio^2			0.00070
			(0.00065)
Low market capitalization			9.80***
			(1.93)
Higher book-to-market			-4.29**
			(1.72)
Observations	1,802	1,733	1,625
R-squared	0.017	0.193	0.277
FE	Countr/Year	Countr/Year/Profit bins	Countr/Year/Profit bins
Within R^2	0.0019	0.019	0.12

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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Table 10
Predicting Capital Budgeting Rates in Duke-CFO Data

This table reports results of regressions of perceived cost of capital and discount rates from the Duke CFO Survey on predicted values from the Lasso estimation.

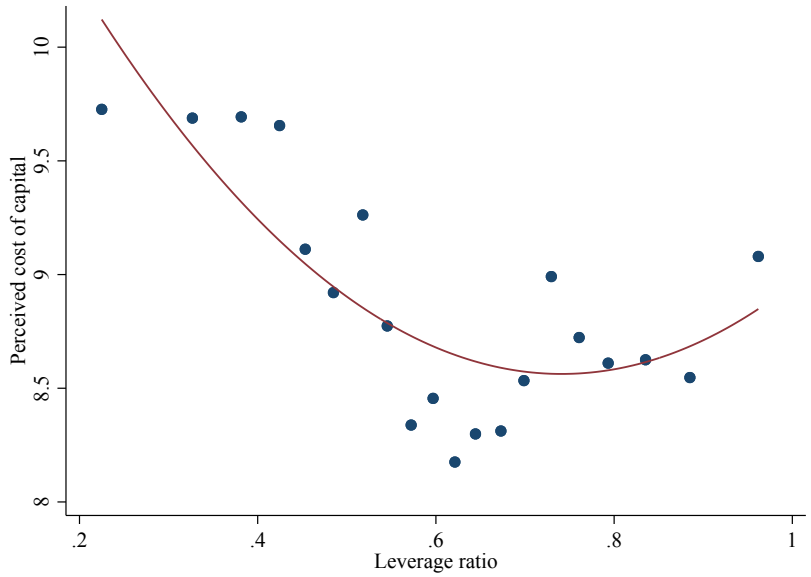
	(1)	(2)	(3)	(4)
	Perceived cost of capital		Discount rate	
Predicted cost of capital (Lasso)	0.74***	0.87***		
	(0.21)	(0.25)		
Predicted discount rate (Lasso)			1.12***	1.11***
			(0.41)	(0.40)
Observations	335	335	61	61
R-squared	0.047	0.055	0.197	0.193
Weight	None	Size	None	Size
Within R^2	0.047	0.055	0.20	0.19

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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Figure 1
Leverage and the perceived cost of capital

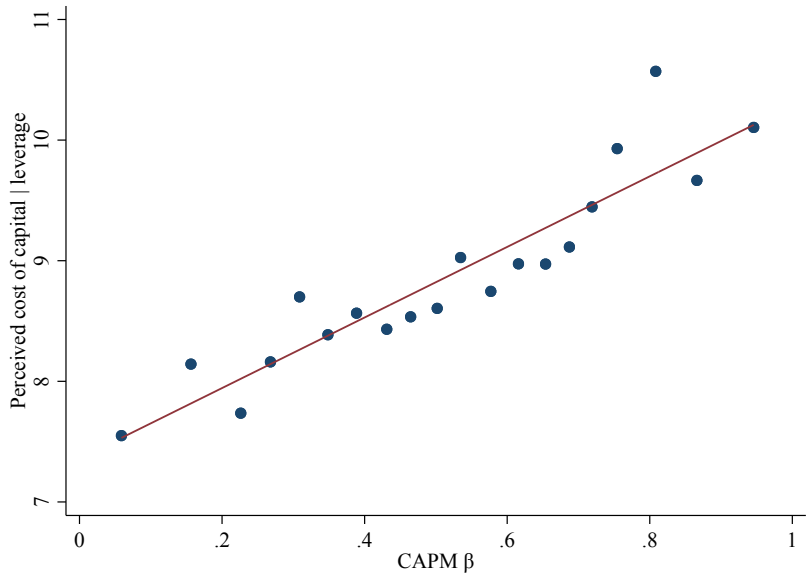
This figure shows a binned scatterplot of the mean perceived cost of capital for different leverage bins, absorbing year and country fixed effects. Perceived cost of capital is in percent and leverage is measured in cross-sectional percentiles ranging from 0 to 1. The sample is 2002 to 2021.



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Figure 2
CAPM and the perceived cost of capital

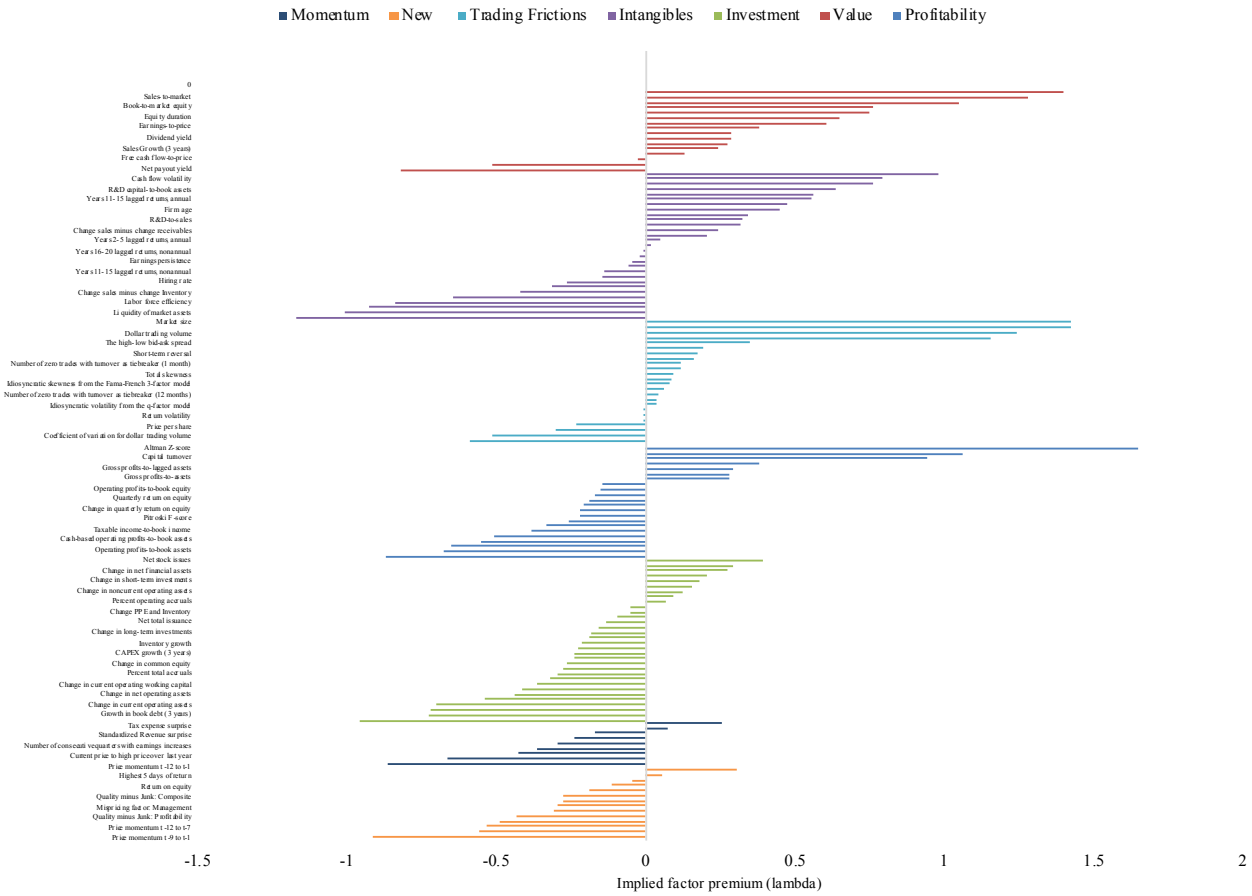
This figure shows a binned scatterplot of the perceived cost of capital for the CAPM beta bins, absorbing year and country fixed effects. Perceived cost of capital is in percent and the CAPM beta is in cross-sectional percentiles ranging from 0 to 1. The sample is 2002 to 2021.



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Figure 3
The factor zoo and the perceived cost of capital: univariate analysis

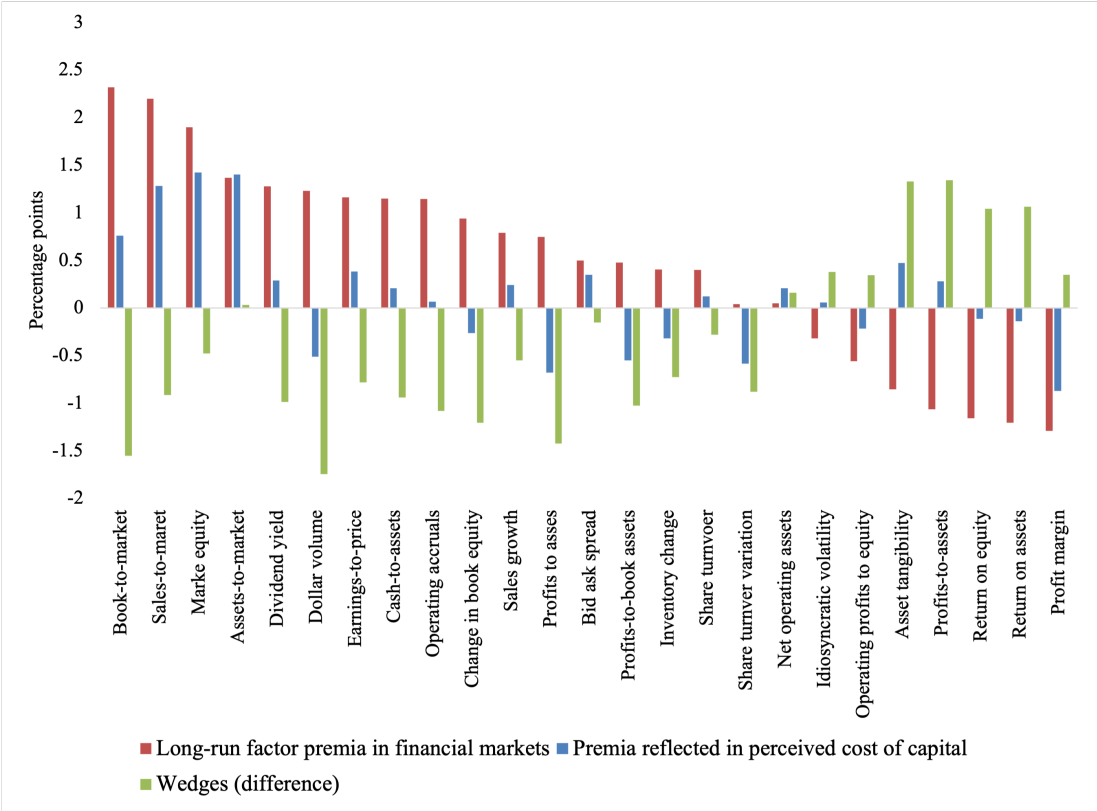
Please refer to the online version of this figure for better readability.
This figure plots factor premia extracted from a series of regressions of the perceived cost of capital on firm characteristics. Each regressions includes the CAPM beta, leverage, leverage squared, as well as the single characteristic in question. All characteristics are signed such that a higher value predicts a higher CAPM alpha in equity markets.



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Figure 4
Factor premia in the perceived cost of capital versus long-run premia from financial markets

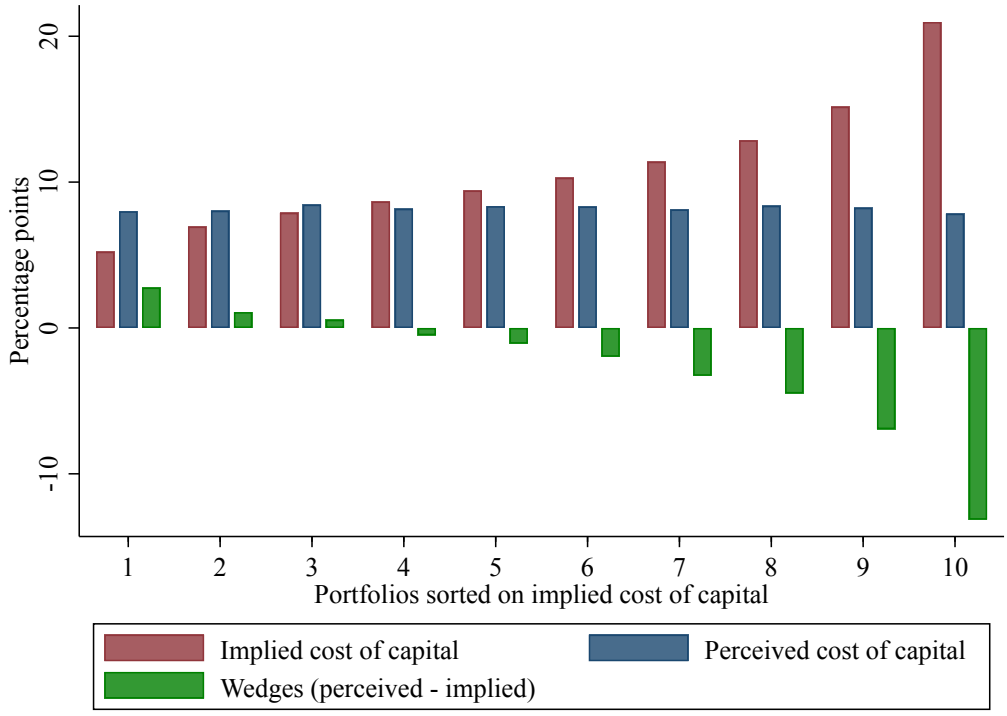
This figure compares factor premia estimated in the perceived cost of capital with factor premia estimated based on long-run stock returns. For each risk factor k we estimate factor premia in both the perceived cost of capital ($\lambda_k^{\text{perceived}}$) and financial markets ($\lambda_k^{\text{financial}}$). Factor premia for the perceived cost of capital are estimated as explained in the text. Factor premia in financial markets are estimated based on the data from van Binsbergen et al. (2023). Factor premia are measured in percentage points difference of firms' in the top and bottom of the cross-sectional distribution of the given characteristic. All characteristics are signed such that a higher characteristic is associated with higher short-run CAPM alpha. Factor premia are measured in percentage points difference of firms' in the top and bottom of the cross-sectional distribution of the given characteristic.



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Figure 5
Wedges between implied and perceived cost of capital

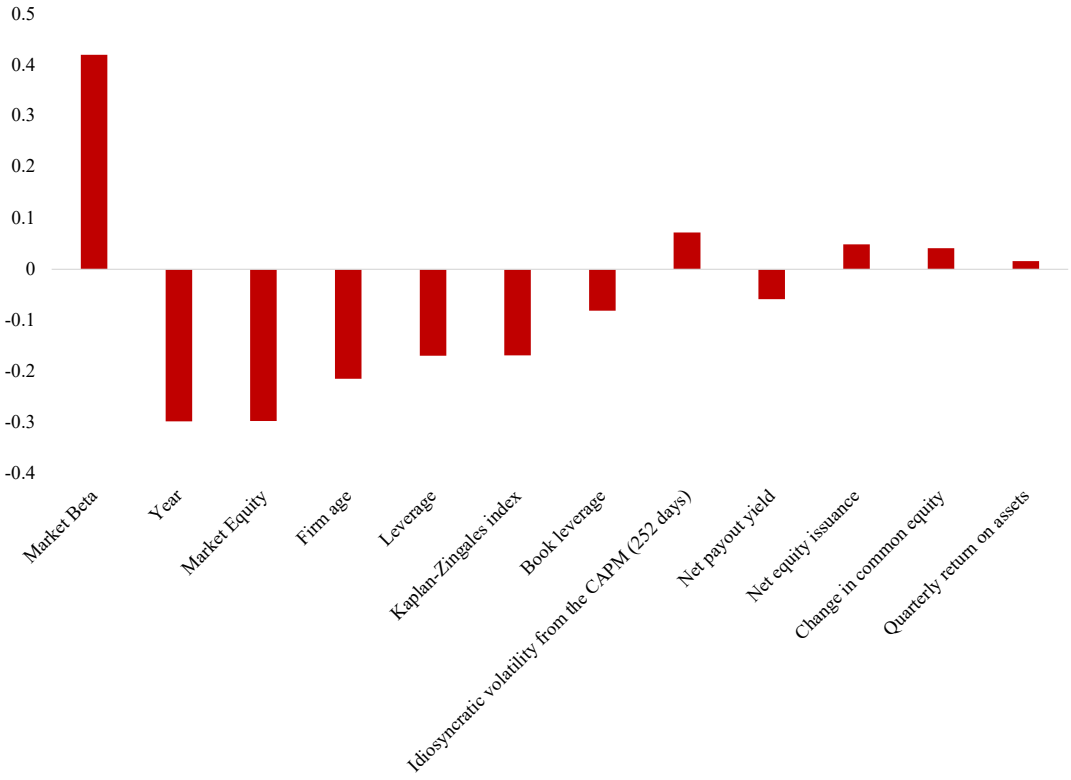
This figure plots the implied cost of capital, the perceived cost of capital, and the difference between the two for 10 portfolios of firms sorted on firms' implied cost of capital. The implied cost of capital is calculated based on the price-earning growth model in Easton and Monahan (2005). The portfolios are equal-weighted. Wedges are defined as the difference between the average perceived cost of capital of firms in the portfolios and the average implied cost of capital of firms in the portfolio.



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Figure 6
Equity factors and the perceived cost of capital: multivariate analysis

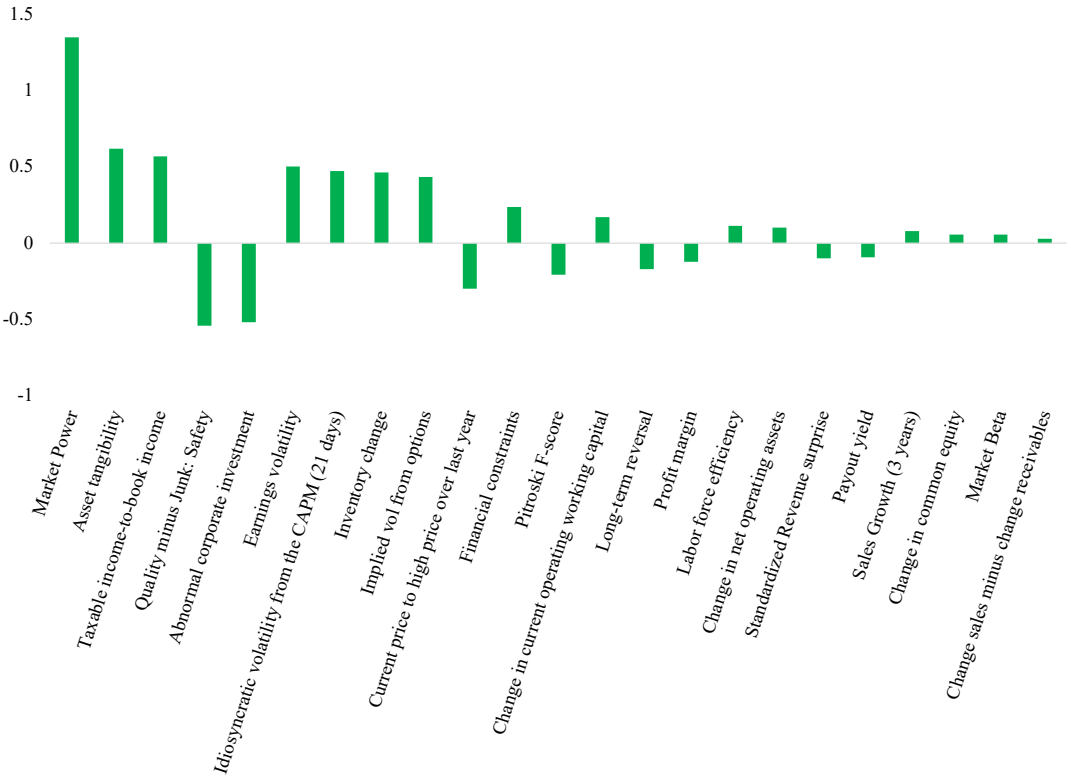
This figure plots slope coefficients from a regression of the perceived cost of capital on a series of firm-level characteristics. The characteristics are selected using Lasso. Each characteristic is measured in cross-sectional percentiles ranging from 0 to 1, except for the year variable, which is measured in actual years.



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Figure 7
Equity factors and firms' discount rates: multivariate analysis

This figure slope coefficients from a regression of discount rates on a series of firm-level characteristics. The characteristics are selected using Lasso. Each characteristic is measured in cross-sectional percentiles ranging from 0 to 1, except for the year variable, which is measured in actual years.



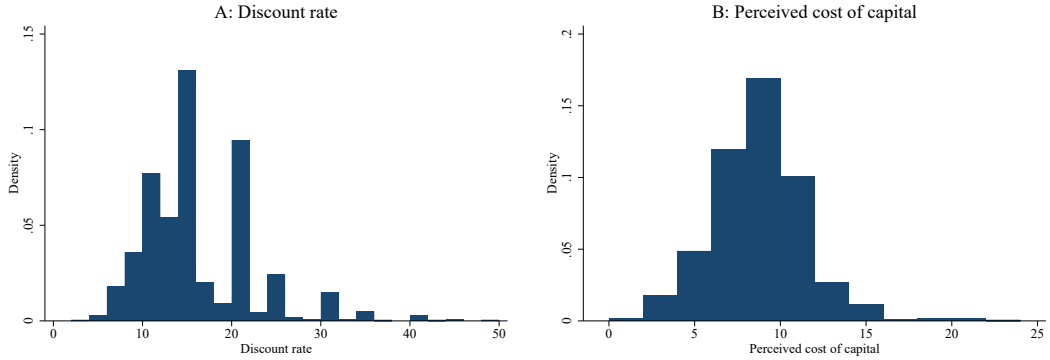
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Online Appendix to
"Equity Factors and Firms' Perceived Cost of Capital"

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Figure A1
Histograms of Discount Rates and the Perceived Cost of Capital

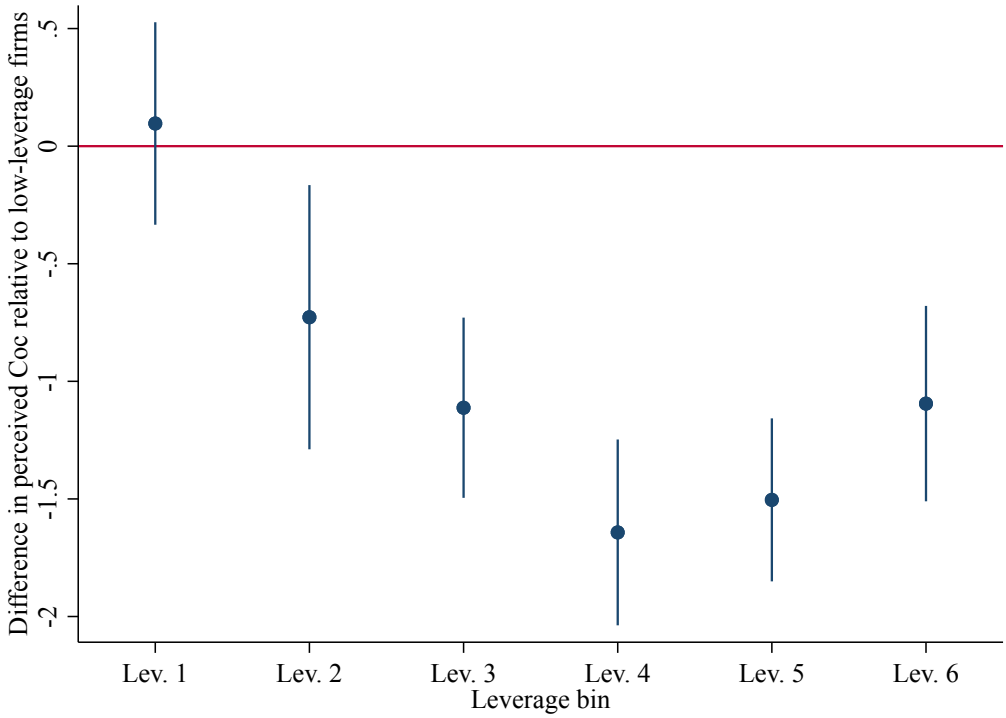
This figure plots histograms of discount rates and the perceived cost of capital. The sample is 2002 to 2021.



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Figure A2
Leverage and the perceived cost of capital

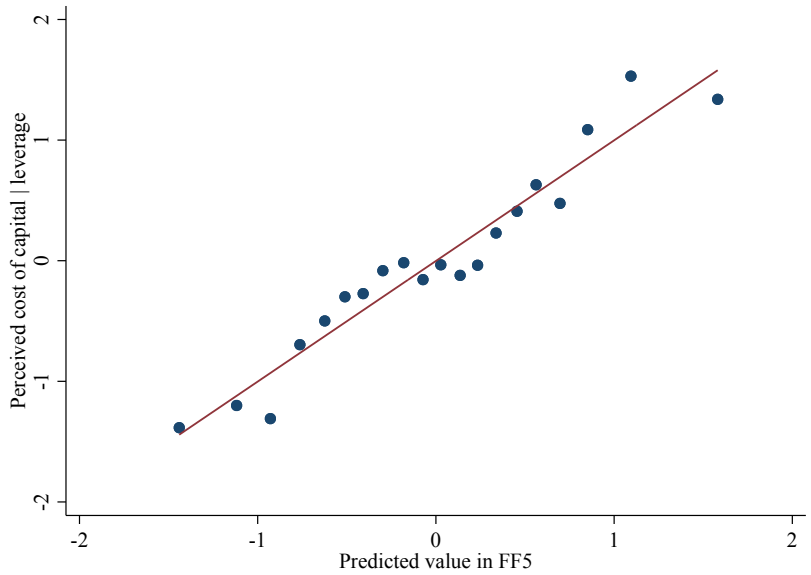
This figure shows the coefficient estimates for different leverage bins in a regression of the perceived cost of capital on leverage groups, absorbing year and country fixed effects. Perceived cost of capital is in percent. The figure shows one standard errors bars.



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Figure A3
The 5-factor model and the perceived cost of capital

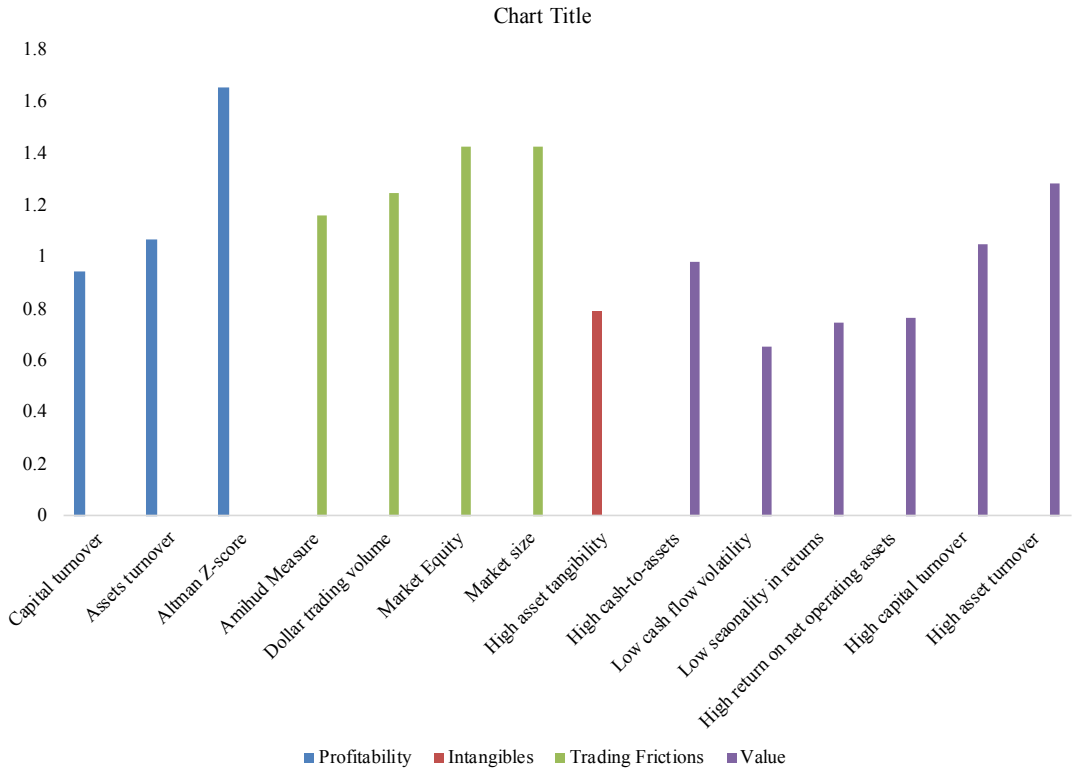
This figure shows a binned scatterplot of the perceived cost of capital for different bins of predicted values in the Fama and French (2015) 5-factor model. The figure absorbs year and country fixed effects and controls for leverage. Perceived cost of capital and the predicted values are in percent. The sample is 2002 to 2021.



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Figure A4
The factor zoo and the perceived cost of capital: significant factors in univariate analysis

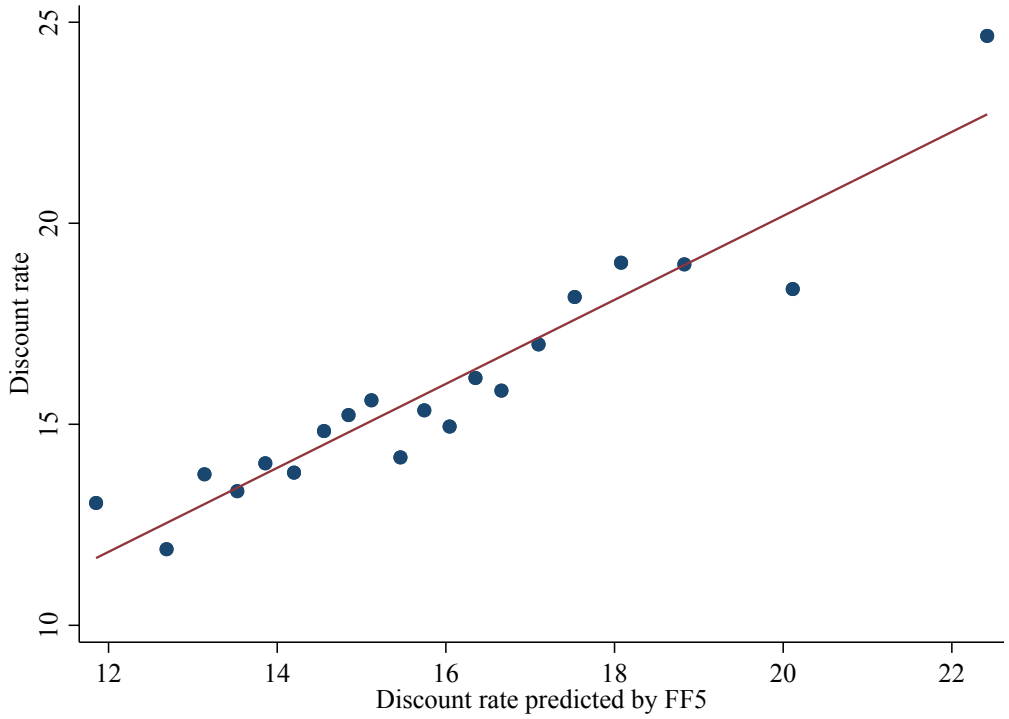
This figure plots slope coefficients from a series of regressions of the perceived cost of capital on firm characteristics. Each regressions includes the CAPM beta and leverage of the firm as well as the single characteristic in question. All characteristics are signed such that a higher value predicts higher CAPM alpha. We include only factors that are significant for a false discovery rate of 5 percent.



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Figure A5
The 3-factor model and discount rates

This figure shows a binned scatter plot of discount rates for different bins of predicted values in the Fama and French (1993) 5-factor model. The figure absorbs year and country fixed effects. Discount rates and predicted values are in percent. The sample is 2002 to 2021.



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Table A1
Factor risk premia in firms' perceived cost of capital

This table plots slope coefficients from a series of regressions of the perceived cost of capital on firm characteristics. Each regressions includes the CAPM beta, leverage of the firm, and the single characteristic in question. All characteristics are signed such that a higher value predicts a higher CAPM alpha in equity markets. The perceived cost of capital is in percentage points and characteristics are measured in cross-sectional percentiles ranging from 0 to 1. Sample is 2002 to 2021.

Name	Slope	Name	Slope
Value-based factor		**Intangible-based factors**	
Assets-to-market	1.40	Asset tangibility	0.47
Book-to-market enterprise value	1.05	Cash flow volatility	0.79
Book-to-market equity	0.76	Cash-to-assets	0.21
Dividend yield	0.29	Change gross margin minus change sales	-0.15
Earnings-to-price	0.38	Change sales minus change inventory	-0.42
Ebitda-to-market enterprise value	0.75	Change sales minus change receivables	0.25
Equity duration	0.65	Change sales minus change SG&A	-0.31
Free cash flow-to-price	-0.03	Earnings persistence	-0.04
Intrinsic value-to-market	0.27	Earnings variability	0.34
Long-term reversal	0.29	Earnings volatility	-0.02
Net payout yield	-0.82	Firm age	0.45
Operating cash flow-to-market	0.13	Hiring rate	-0.26
Payout yield	-0.52	Kaplan-Zingales index	-0.65
Sales Growth (1 year)	0.60	Labor force efficiency	-0.84
Sales Growth (3 years)	0.24	Liquidity of book assets	-1.17
Sales-to-market	1.28	Liquidity of market assets	-1.01
		R&D capital-to-book assets	0.64
Momentum-based factor		R&D-to-market	0.76
Current price to high price over last year	-0.43	R&D-to-sales	0.32
# of quarters with earnings increases	-0.30	Year 1-lagged return, annual	-0.06
Price momentum t-12 to t-1	-0.87	Year 1-lagged return, nonannual	-0.92
Price momentum t-6 to t-1	-0.66	Years 11-15 lagged returns, annual	0.55
Residual momentum t-12 to t-1	-0.24	Years 11-15 lagged returns, nonannual	-0.14
Residual momentum t-6 to t-1	-0.36	Years 16-20 lagged returns, annual	0.56
Standardized earnings surprise	0.07	Years 16-20 lagged returns, nonannual	-0.01
Standardized Revenue surprise	-0.17	Years 2-5 lagged returns, annual	0.05
Tax expense surprise	0.26	Years 2-5 lagged returns, nonannual	0.32
		Years 6-10 lagged returns, annual	0.02
		Years 6-10 lagged returns, nonannual	0.98

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Table A1
Factor risk premia in firms' perceived cost of capital (continued)

This table plots slope coefficients from a series of regressions of the perceived cost of capital on firm characteristics. Each regressions includes the CAPM beta, leverage of the firm, and the single characteristic in question. All characteristics are signed such that a higher value predicts a higher CAPM alpha in equity markets. The perceived cost of capital is in percentage points and characteristics are measured in cross-sectional percentiles ranging from 0 to 1. Sample is 2002 to 2021. Statistical significance at the 5% level is denoted with **.

Name	Slope	Name	Slope
Investment-based factors		**Profitability-based factors**	
Abnormal corporate investment	-0.54	Total skewness	0.09
Asset Growth	-0.16	Altman Z-score	1.65
CAPEX growth (1 year)	-0.24	Assets turnover	1.06
CAPEX growth (2 years)	-0.23	Book leverage	-0.17
CAPEX growth (3 years)	-0.24	Capital turnover	0.94
Change in common equity	-0.27	Cash-based operating profits-to-book assets	-0.55
Change in current operating assets	-0.70	Cash-based operating profits-to-lagged book assets	-0.51
Change in current operating liabilities	-0.41	Change in quarterly return on assets	-0.21
Change in current operating working capital	-0.37	Change in quarterly return on equity	-0.22
Change in financial liabilities	0.29	Gross profits-to-assets	0.28
Change in long-term investments	-0.18	Gross profits-to-lagged assets	0.30
Change in long-term net operating assets	0.09	Ohlson O-score	-0.33
Change in net financial assets	0.28	Operating profits-to-book assets	-0.68
Change in net noncurrent operating assets	-0.05	Operating profits-to-book equity	-0.15
Change in net operating assets	-0.44	Operating profits-to-lagged book assets	-0.65
Change in noncurrent operating assets	0.12	Operating profits-to-lagged book equity	-0.22
Change in noncurrent operating liabilities	-0.09	Pitroski F-score	-0.25
Change in short-term investments	0.18	Profit margin	-0.87
Change PPE and Inventory	-0.05	Quarterly return on assets	-0.14
Equity net payout	-0.72	Quarterly return on equity	-0.19
Growth in book debt (3 years)	-0.73	Return on net operating assets	0.38
Inventory change	-0.32	Sales growth (1 quarter)	0.28
Inventory growth	-0.21	Taxable income-to-book income	-0.38
Net debt issuance	0.16		
Net equity issuance	-0.96		
Net operating assets	0.21		
Net stock issues	0.39		
Net total issuance	-0.13		
Operating accruals	-0.19		
Percent operating accruals	0.07		
Percent total accruals	-0.30		
Total accruals	-0.28		

continues...

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Table A1
Factor risk premia in firms' perceived cost of capital (continued)

This table plots slope coefficients from a series of regressions of the perceived cost of capital on firm characteristics. Each regressions includes the CAPM beta, leverage of the firm, and the single characteristic in question. All characteristics are signed such that a higher value predicts a higher CAPM alpha in equity markets. The perceived cost of capital is in percentage points and characteristics are measured in cross-sectional percentiles ranging from 0 to 1. Sample is 2002 to 2021. Statistical significance at the 5% level is denoted with **.

Name	Slope	Name	Slope
Factors based on trading frictions		**"New" risk factors**	
Amihud Measure	1.16	Change in operating cash flow to assets	-0.19
Coefficient of variation for dollar trading volume	-0.51	Highest 5 days of return	0.05
Coefficient of variation for share turnover	-0.59	Highest 5 days of return scaled by volatility	0.30
Coskewness	0.00	Market correlation	-0.05
Dollar trading volume	1.24	Mispricing factor: Management	-0.30
Idiosyncratic skewness from the CAPM	-0.01	Mispricing factor: Performance	-0.56
Idiosyncratic skewness from the FF3 model	0.08	Operating cash flow to assets	-0.49
Idiosyncratic skewness from the q-factor model	0.04	Price momentum t-12 to t-7	-0.53
Idiosyncratic volatility from the CAPM (21 days)	0.06	Price momentum t-3 to t-1	-0.31
Idiosyncratic volatility from the CAPM (252 days)	-0.30	Price momentum t-9 to t-1	-0.91
Idiosyncratic volatility from the FF 3 model	0.19	Quality minus Junk: Composite	-0.28
Idiosyncratic volatility from the q-factor model	0.04	Quality minus Junk: Growth	-0.28
Market Equity	1.42	Quality minus Junk: Profitability	-0.43
Market size	1.42	Return on equity	-0.12
Maximum daily return	0.16		
Number of zero trades (1 m)	0.12		
Number of zero trades (12 m)	0.04		
Number of zero trades (6 m)	0.09		
Price per share	-0.23		
Return volatility	-0.01		
Share turnover	0.12		
Short-term reversal	0.17		
The high-low bid-ask spread	0.35		

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