Equity Factors and Firms' 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 measures of expected returns from financial markets. While the perceived cost of capital reflects traditional factors such as the market, size, and value factors, it is unrelated to most 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 the factors are reflected with the wrong sign. As to investment-based factors, we find that 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 substantial 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 finance literature often endows firms with perfect information about their cost of capital. But the cost of capital is a complicated construct that depends crucially on the return 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 cause anomalous investment behavior by firms, lead to misallocation of capital in the economy, and lead to 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 challenge is that we do not directly observe measures of firms' perceived cost of capital from publicly available archival data. In this study, we rely on hand collected data on from Gormsen and Huber (2022) to analyze how firms' perceived cost of capital relates to the equity risk factors used to describe expected returns in the asset pricing literature. The dataset is constructed from corporate conference calls and contains firms' perceived cost of debt, equity, and overall cost of capital, as well as data on the discount rates used by firms in capital budgetting decisions. The dataset has the advantage that firm-level data can be merged with detailed measures of firm-level factor exposures and other measures of firm-level cost of capital used in the finance literature.

Using these data, we document that firms' perceived cost of capital deviates substantially from what standard models in finance would predict. We do find evidence 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 cost of capital with the wrong sign. Moreover, standard 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. Firms' perceptions about their cost of capital thus differ substantially from what standard measures used in finance would imply. This result poses a challenge for the production-based asset pricing framework (Cochrane 1991), which which builds on the idea that firms have perfect information about their cost of capital and that researcheres 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 these data available online such that the measures can be used to guide future research.[1]

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 captured by the factor model of Equation 2, we should expect the perceived cost of equity to line up strongly 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

[1]We produce a publicly available, deanonymized dataset 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".

managers may be unaware of the existence of these factors in the first place, potentially 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 line 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 empirical drivers

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. Firms are financed with 70% equity, and the debt and equity are ultimately related to the same underlying asset risk. We therefore expect equity factors to play a similar role studying the impact on the perceived cost of capital instead of the perceived cost of equity. Consistent with this expectation, we find that the perceived cost of capital reflect CAPM betas, size, and book-to-market ratios with similar magnitude and significance as it reflects 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 the factor data assembled by Jensen et al. (forthcoming) to study the impact of 146 risk factors on the perceived

[2]Managers may 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.

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 percent of the factors are significantly reflected in firms' 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 that is reflected in the perceived cost of capital with a reasonable consistency is the value factors. Of the 16 value factors we study, 81% are reflected with the same sign as in the financial markets, and the effect is significant for as much as 38% of the factors. The opposite is the case for factors based on investment. For the investment-based factors, more than two thirds 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 suggests that there are substantial wedges between the perceived cost of capital and that implied by standard measures of expected returns. The weak relation could potentially arise because many factors do not predict long-run expected returns, on which the cost of capital is based, but instead only predicts short-run returns (see e.g. Keloharju et al. 2019). Momentum, for instance, predicts returns to firms over the next few months, but it does not predict long-run returns, and we therefore shouldn't expect momentum to be reflected in the perceived cost of capital.[3]

To address the issue of long-run versus short-run expected returns, we first use estimates of long-run expected returns for different risk factors from van Binsbergen et al. (2023). Using these data, we compare the the perceived cost of capital to long-run expected returns for 30 anomalies. The results are stronger than the previous results on short-run expected returns, with the majority of factors now being reflected with the correct sign. Moreover, the magnitude of the implied factor premia in the perceived cost of capital are significantly related to the magnitude of the long-run factor premia. There are, however, large wedges between the perceived cost of capital and the long-run factor premia. The wedges are large in magnitude and vary by more

[3]By long run, we mean a horizon that is similar to the firms assets. See Chen and Kaniel (2021) for further discussion of these points.

than the perceived cost of capital itself varies.

Previous research has often used measures of the “implied cost of capital" to measure firm-level 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 construct measures of expected returns. The implied cost of capital is likely not as good an estimate of the true financial cost of capital as factors exposures are, but it is possible that the implied cost of capital is closer to firms' perceived cost of capital. However, we find at best a weak relation between the implied and perceived cost of capital. Firms with 1 percentage point higher implied cost of capital have around 3 basis points higher perceived cost of capital. Within-firm variation is similar in magnitude. These finding imply large wedges between the measures traditionally used to capture firms' cost of capital and firms' 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.

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. 2015) 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 high expected returns, and cost of equity, are going to 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 capital 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.

One objection to the above conclusions could be that firms' expectations about their stock returns are incorporated in the discount rates, rather than the 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, or hurdle rates. Our data allows us to also test this hypothesis. In short, we find that looking at discount rates strengthens the above conclusions, as discount rates are positively related to investment rates as well. We emphasize that this 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 unconditionally, something the data does not support.[4].

Given the discrepancy between the perceived cost of capital and traditional measures of the cost of capital used in the literature, we end the paper by constructing a new measure 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.

The results from this multifactor analysis confirms the previous analysis. We use a Lasso procedure to shrink the high number of potential risk factors into a parsimonious model with 10 characteristics. CAPM betas, size, and leverage have strong explanatory power, while new predictors such age and a negative year trend also influence the perceived cost of capital. The Lasso procedure also picks risk factors related to repurchase and issuing activity of the firm, although the economic impact of these factors is modest. For discount rates, we find that market power, financial constraints, and various measures of volatility predict discount rates. In addition, factors related to investment play a role, consistent with the important role of discount rates in determining corporate investment (firms with higher investment have lower discount rates).

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.

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

Related literature

There exists little evidence on how firms' perceived cost of capital relates to that implied by traditional measures of expected returns. This is in contrast to the large body of work that studies how prices in financial markets affect firms' cash flow expectations (Bond et al. 2012). Previous work has addressed the relation between perceived cost of capital relates to that implied by traditional measures of expected returns through surveys that ask firms about which factors models they use to estimate their cost of capital. The surveys suggest that firms often apply the capital asset pricing model (CAPM), but leave open which additional models may play a role (Graham 2022). Even if firms explicitly applied only the CAPM, they may implicitly incorporate other factors of expected returns by adding discretionary wedges to their perceived cost of capital "as if" they were using complex models.

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 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.

2 Data

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

2.1 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 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.[5]

2.2 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

[5]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.

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).

2.3 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.

3 Modigliani-Miller and the Role of Leverage

We start the analysis motivated by Modigliani and Miller's (MM) seminal research on capital structure. 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. However, if there are tax benefits to debt, 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 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.

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.

We next 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.

4 Perceived Cost of Capital and Equity Risk Factors

We next explore how the perceived cost of capital relates to firm-level risk. A large literature in asset pricing shows that equity risk factors affect expected returns in stock and bond markets. Conceptually, expected returns determine firms' costs of equity and capital. It is therefore natural to analyze whether firms' perception of these costs also vary with equity factors.

4.1 The Fama and French Factors

The traditional Fama and French factors primarily explain equity and not bond markets (Fama and French 1993), so we start by studying the relation between equity factors and the perceived cost of equity. However, since firms are mostly financed with equity, exposure to equity factors should also influence the overall cost of capital. We therefore subsequently analyze whether equity factors predict the perceived cost of capital.

4.1.1 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:

$$r_{i,t}^{\text{equity}} = \lambda_0 + \sum_k \lambda^k X_{i,t}^k, \tag{3}$$

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.

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, 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.

The regressions in Table 4 consider basic equity factors. The asset pricing literature offers a range of other factors that may influence the perceived cost of equity. Given the limited number of observations of the cost of equity, we will explore the role of other factors in the upcoming section on the perceived cost of capital, for which we have ten times as many observations.

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

We study the relation between the perceived cost of capital and equity factors using specifications based on Equation 3. We include leverage in the regressions throughout to control for the effect leverage has on the cost of capital through the tax shield (see 3).

In Table 8, 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 in Table 4, which is expected as the total assets are less exposed to the CAPM beta than equity on its own. 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

French (1992) 3-factor model. Size has a negative coefficient, consistent with its effect on the equity market returns, and is statistically significant. As with the CAPM beta, the slope is slightly smaller than that in Table 4, 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. The result may be driven by the fact that value firms have cheaper cost of debt than growth firms. Indeed, in a separate analysis, we find that in a regression of the perceived cost of debt on the book-to-market ratio, controlling for leverage, the coefficient is -0.6, suggesting that value firms have lower cost of debt.

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.

4.2 The Full Set of Equity Risk Factors

The asset pricing literature has uncovered hundreds of equity factors that explain expected stock returns. We explore which of these factors are related to firms' perceived cost of capital.

For each equity factor k, we run:

$$r_{i,t}^{\text{cost of capital}} = \lambda_0 + \lambda^{\text{beta}} X_{i,t}^{\text{beta}} + \lambda^{\text{size}} X_{i,t}^{\text{size}} + \lambda^{\text{leverage}} X_{i,t}^{\text{leverage}} + \lambda^k X_{i,t}^k + \varepsilon_{i,t}^k, \quad (4)$$

which means that we control for the CAPM beta, size, and leverage in all regressions, because of their predictive power in the above regressions, but otherwise only include one additional factor. We do not include all factors in one regression because many factors do not predict equity returns in multivariate analyses, but only relative to a few benchmark equity factors.

Figure 3 plots λ^k for k different regressions (we refer to the online version of this figure for better readability). Unlike in the previous regressions, we sign all factors here such that a higher factor is associated with a higher expected return in equity markets, relative to the CAPM beta. As a result, a λ should be positive if firms' perceived cost of capital reflects the return premium observed in equity markets. The figure shows that this is far from the case. In fact, most factors have the wrong sign, in that the estimated λ is negative.

A few additional 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 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 8. In contrast, the sign should have been negative according to Fama and French (2015).

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.

In Figure 11, we plot only the statistically significant under a false discovery rate of 5 percent. Only ten factors are significant with the expected (positive) sign. This finding suggests that out of all the factors in the factor zoo, most of them are not incorporated into 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. The significant factors are again related to profitability (Altman's Z-score, turnover, return on operating assets). In addition, factors based on the intangibility of firm assets are significant, including the seasonality of returns, cash flow volatility, cash-to-asset ratio, and the share of tangible assets (see Jensen et al. forthcoming for precise definitions of these factors).

5 Cost of Capital Wedges

5.1 Wedges with Respect to Long-Run Factor Premia

5.2 Wedges with Respect to the “ Implied Cost of Capital

A large literature in accounting and finance rely measures of the implied cost of capital. These measures

6 Discount Rates, Equity Risk Factors, and Price Wedges

It is not clear that discount rates exhibit the same factor exposure as the perceived cost of capital. On the one hand, firms seem to use the CAPM to allocate capital (Krüger et al. 2015, Cho and Salarkia 2020, Hommel et al. 2023) and the perceived cost of capital is associated with discount rates across firms, countries, and time (Gormsen and Huber 2022). On the other hand, firms introduce large "discount rate wedges" between the perceived cost of capital and discount rates, driven by market power, constraints, and idiosyncratic volatility (Jagannathan et al. 2016, 2017, Sharpe and Suarez 2021, Gormsen and Huber 2022). The wedges may undo the relation between factor exposure associated with the perceived cost of capital and discount rates.

So far, our analysis has focused on how firms set their perceived costs of equity and capital. In this section, we ask whether equity factors also predict the discount rates, which firms use in their investment decisions and which enter firms' net present value calculations.

6.1 Firms' Discount Rates and Equity Factors

It is ex ante not clear whether equity factors that influence the perceived cost of capital also predict firms' discount rates. On the one hand, Gormsen and Huber (2022) show that the perceived cost of capital is associated with discount rates, both in the cross section as well as dynamically over time within firm, implying that equity factors predicting the perceived cost of capital also predict discount rates. However, there also exist large "discount rate wedges" between the perceived cost of capital and discount rates, which depend on firms' idiosyncratic risk, constraints, and market power (Jagannathan et al. 2016, 2017, Sharpe and Suarez 2021, Gormsen and Huber 2022). The average discount rate of 16.1 percent, relative to the average perceived cost of capital of 8.5 percent, reveals that discount rate wedges are large. These wedges may render the association between equity factors and discount rates quantitatively weak or undo it altogether.

We test the relation between discount rates and the perceived cost of capital in Table 9, always condition on country and year fixed effects. 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 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. This may happen through associations between discount rate wedges and risk, financial constraints, and market power, all of which are correlated with size. 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) 5-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.

7 Implications for Production-Based Asset Pricing

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

8.1 Predicting the Perceived Cost of Capital

We use the empirical associations between the perceived cost of capital and equity factors documented so far to create a large, new, publicly available dataset of predicted values of the perceived cost of capital. We are able to conduct the prediction exercise because we have combined the relatively large dataset on perceived cost of capital from conference calls with an extensive dataset of the factor zoo.

We predict the values using the estimates generated by Lasso and the factor data for all firms in the factor zoo dataset. Figure 6 reveals the selected variables, as discussed above. The final dataset contains 15,911 firms with a total of 119,717 predicted annual observations of the perceived cost of capital.

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 10, 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.

8.2 Predicting Discount Rates

8.3 Multivariate Analysis of the Factor Zoo

We next conduct a multivariate analysis of the factor zoo. 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 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 4.1.2: 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. Altman's Z-score is not included among the selected factors, despite its strong predictive power in the univariate regressions.

We create predicted values of firms' discount rates, following the procedure using Lasso established in Section 8.1 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 invest less, ceteris paribus. 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.

9 Conclusion

Firms' cost of capital plays a key role in standard finance and macroeconomics. In traditional theories, expected returns in asset markets determine how firms perceive their cost of capital. As a result, changes in expected returns have large effects on firm behavior and real outcomes. An implication of traditional theories is that the factors that predict firms' expected equity returns are also reflected in firms' perceived costs of equity and capital.

In this paper, we present new evidence on how firms set their perceived costs of equity and capital. We find that along certain dimension, the perceived cost of capital behaves as traditional finance theory would predict. The perceived cost of capital decreases in leverage, increases in market beta, and decreases in size.

However, most factors that predict expected stock returns are not reflected in the perceived cost of capital. When considering the full set of risk factors from the asset pricing literature, less than 10 percent are associated with significant risk premia with the correct sign. More than half of the factors have the wrong sign on the implied risk premium. These findings suggests that there are large wedges between the perceived cost of capital and the cost of capital implied by standard risk factors.

We produce a parsimonious model of the perceived cost of capital by using a Lasso procedure to select a few salient risk factors and firm characteristics. The model suggests that CAPM beta, size, leverage, age, and a year trend are particularly informative for determining a firm's perceived cost of capital. Equity factor exposure is also reflected in firms' discount rates, with the CAPM beta and size playing strong roles among the traditional factors. Among the "factor zoo," the strongest predictors of discount rates are market power, financial constraints, volatility, and investment.

Applying the insights, we generate a new dataset containing predicted values of the perceived cost of capital and discount rates. 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

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.

Panel A: Perceived cost of capital

	(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

Panel B: Perceived cost of debt and equity

	(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

Table 3
Fama-French (1993) factors and the perceived cost of equity

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)
Small market size		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

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

Table 4
Fama-French (2015) factors and the perceived cost of capital

This table reports results of regressions of firm-level perceived cost of capital 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 measured in cross-sectional percentiles ranging from 0 to 1. The sample is 2002 to 2021. Standard errors are clustered by firm.

	(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)
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)
Smaller market size			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)
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

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

Table 5
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. The resulting factor premia λ^i thus measures the difference in perceived cost of capital between the firms' with the highest and lowest exposure to the given factor. 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

Table 6
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 the risk premia λ_k using both the perceived cost of capital and financial markets,

$$r_{i,t}^{\text{cost of capital}} = \lambda_0 + \lambda_{\text{beta}}^{\text{perceived}} X_{\text{beta},t} + \lambda_{\text{i}}^{\text{perceived}} X_{i,t} + \text{controls}_{i,t} + \varepsilon_{i,t}$$
$$r_{i,t}^{\text{long-run stock returns}} = \lambda_0 + \lambda_{\text{beta}}^{\text{financial}} X_{\text{beta},t} + \lambda_{\text{i}}^{\text{financial}} X_{i,t} + \varepsilon_{i,t}$$

The controls in the regressions for perceived cost of capital are the firm-level levarage and leverage squared, as in equation (4). Factor premia for long-run stock returns are estimated based on the data from van Binsbergen et al. (2023). Exposure to equity factors is measured by the characteristic of the underlying factor, such as size and book-to-market. 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 26 risk factors.

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

Table 7

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

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 double-clustered by firm and year

	(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)
Market size			-11.2***
			(1.99)
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
Cluster	Firm/year	Firm/year	Firm/year
Within R^2	0.049	0.051	0.13

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

Table 7
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

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.

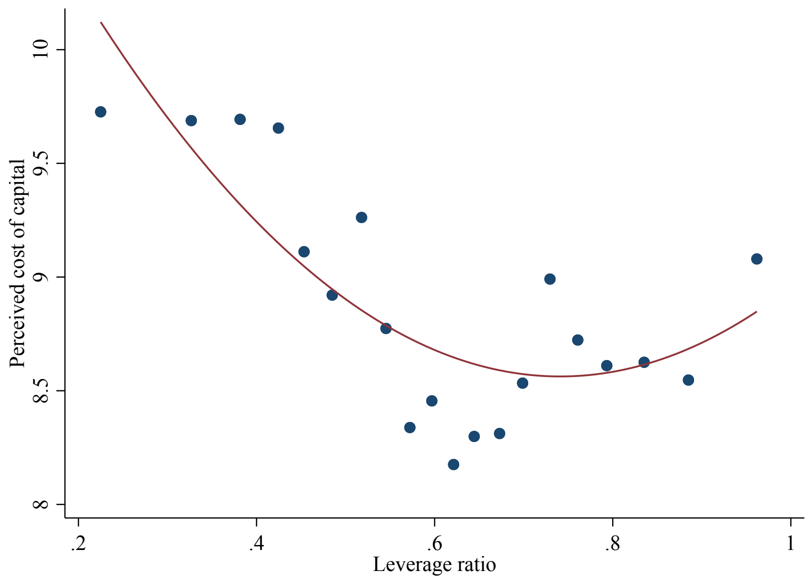


Figure 2
CAPM and the perceived cost of capital

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.

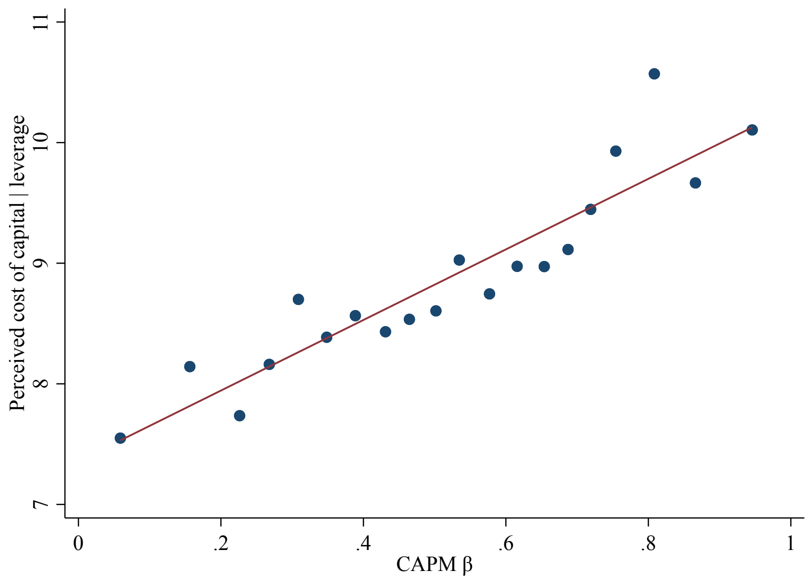


Figure 3
The factor zoo and the perceived cost of capital: univariate analysis

Please refer to the online version of this figure for better readability.
This figure plots slope coefficients from a series of regressions of the perceived cost of capital on firm characteristics. Each regressions includes the CAPM beta, size, and leverage of the firm 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.

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 the risk premia λ_k using both the perceived cost of capital and financial markets,

$$r_{i,t}^{\text{cost of capital}} = \lambda_0 + \lambda_{\text{beta}}^{\text{perceived}} X_{\text{beta},t} + \lambda_{\text{i}}^{\text{perceived}} X_{i,t} + \text{controls}_{i,t} + \varepsilon_{i,t}$$
$$r_{i,t}^{\text{long-run stock returns}} = \lambda_0 + \lambda_{\text{beta}}^{\text{financial}} X_{\text{beta},t} + \lambda_{\text{i}}^{\text{financial}} X_{i,t} + \varepsilon_{i,t}$$

The controls in the regressions for perceived cost of capital are the firm-level levarage and leverage squared, as in equation (4). Factor premia for long-run stock returns are estimated based on the data from van Binsbergen et al. (2023). Exposure to equity factors is measured by the characteristic of the underlying factor, such as size and book-to-market. 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.

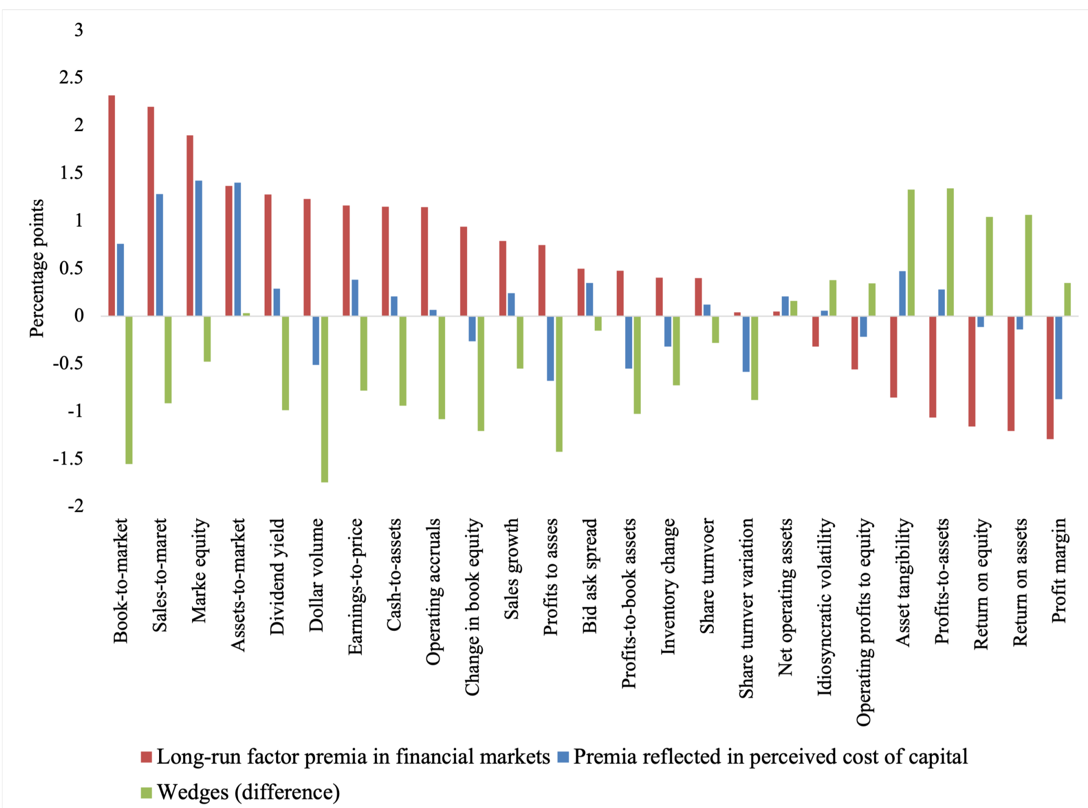


Figure 5
Wedges between implied and perceived cost of capital

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.

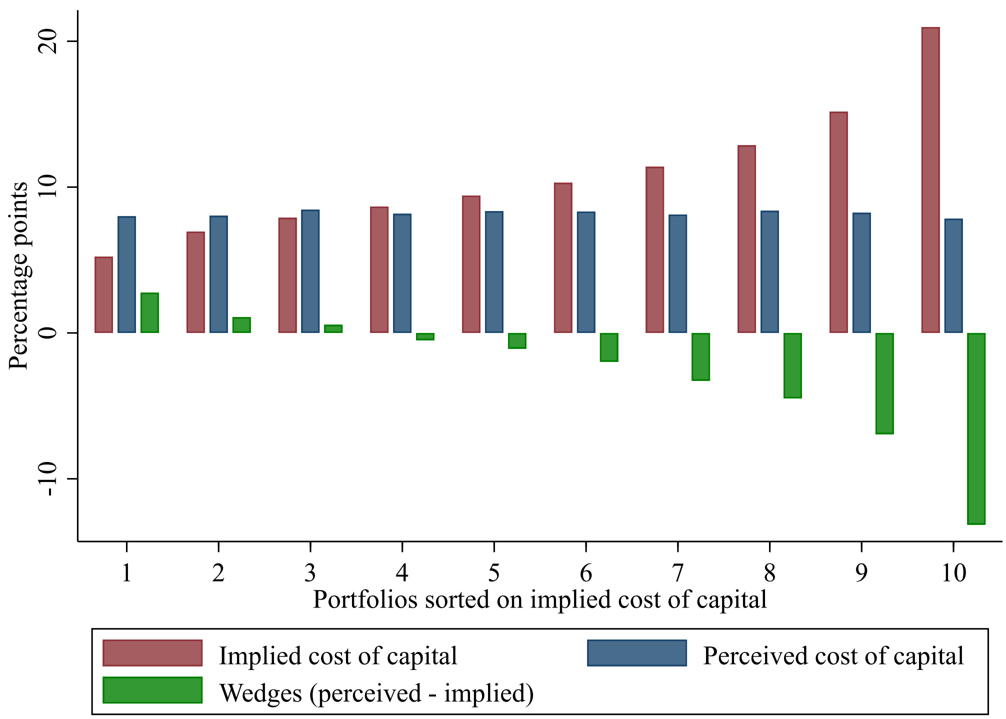


Figure 6
Equity factors and the perceived cost of capital: multivariate analysis

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.

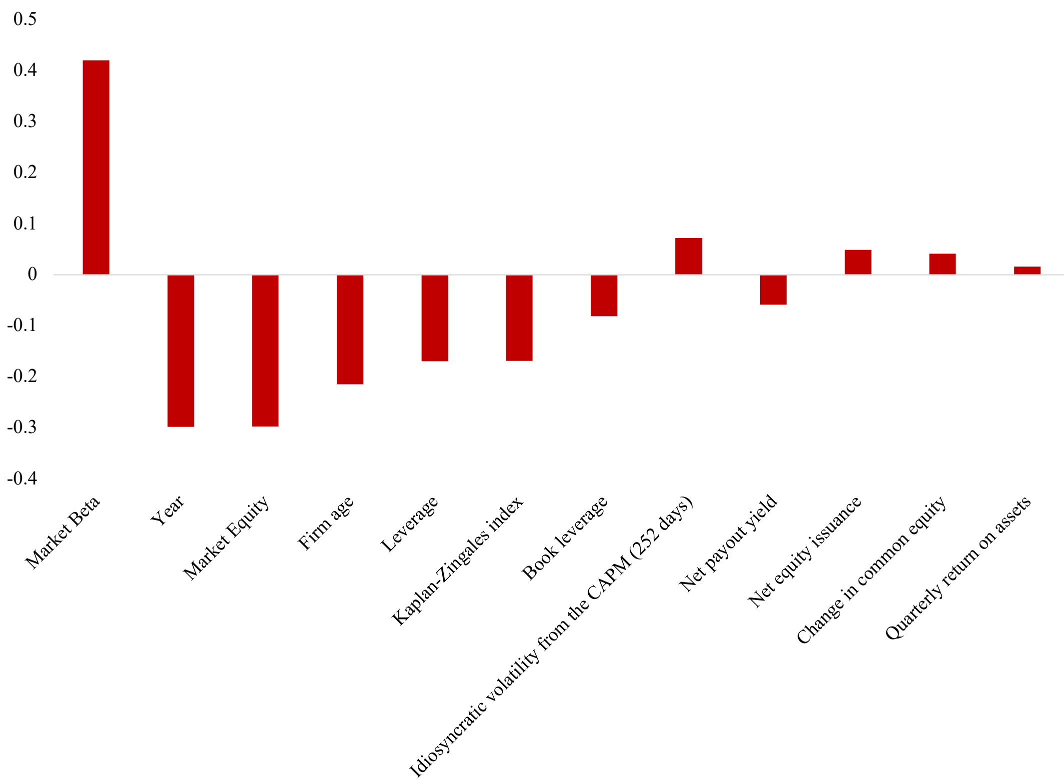
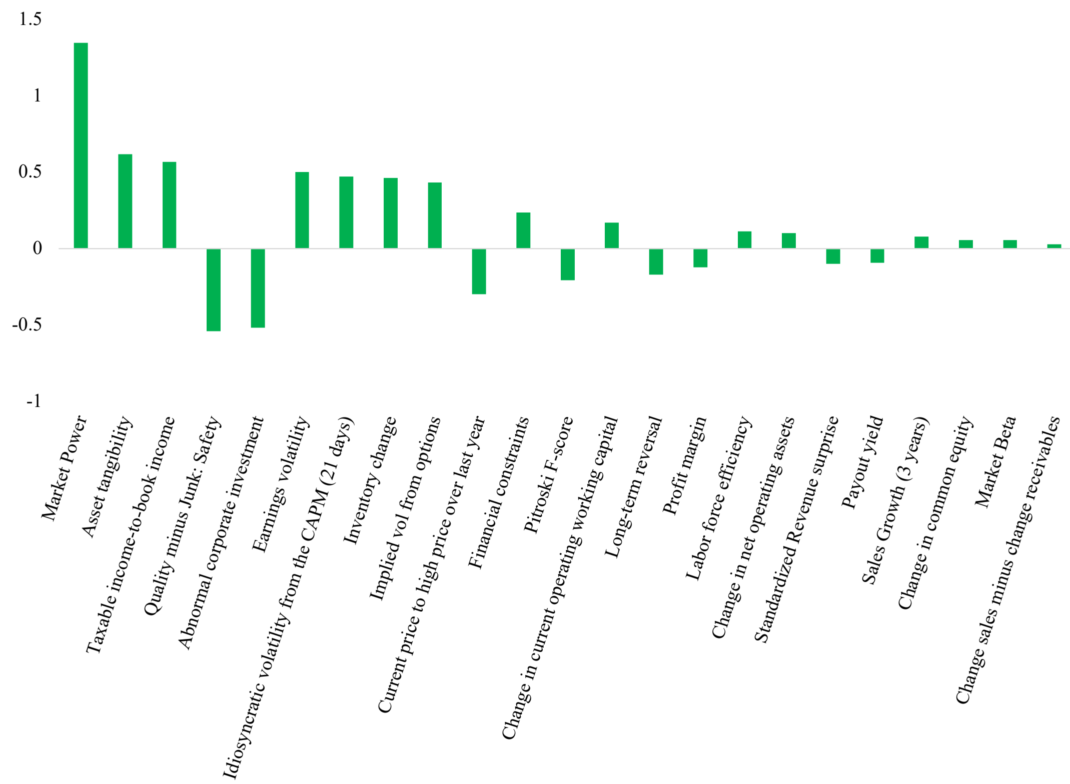


Figure 7
Equity factors and firms' discount rates: multivariate analysis

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.



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

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.

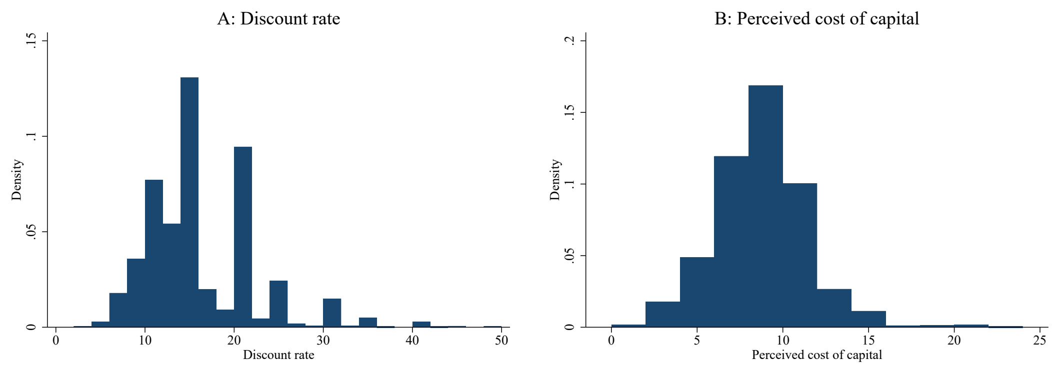


Figure A2
Leverage and the perceived cost of capital

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.

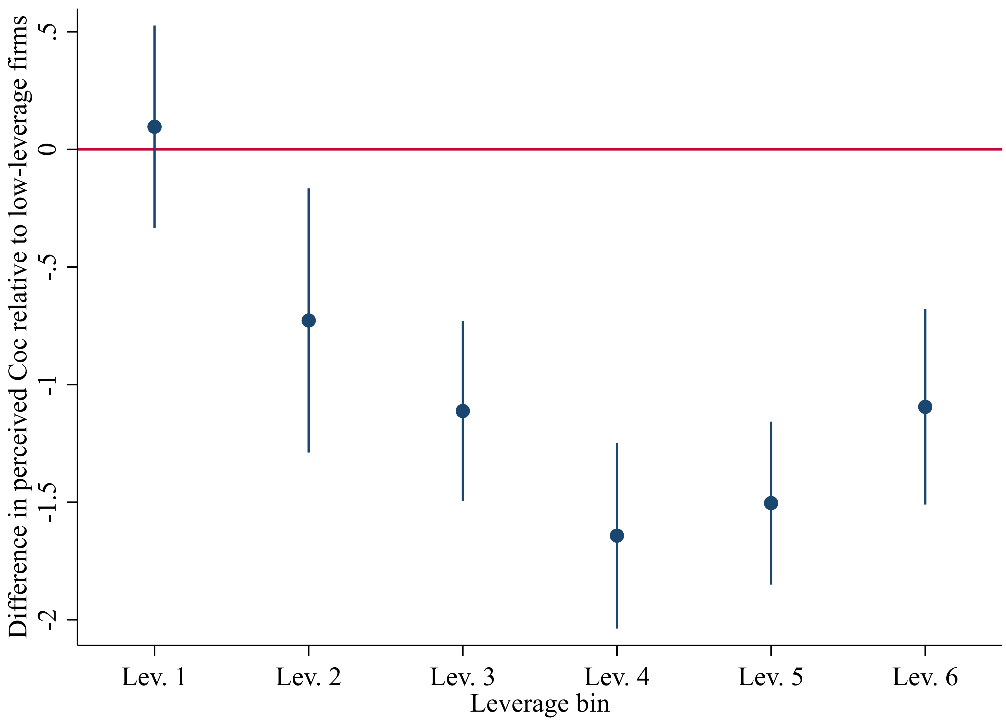


Figure A3
The 5-factor model and the perceived cost of capital

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.

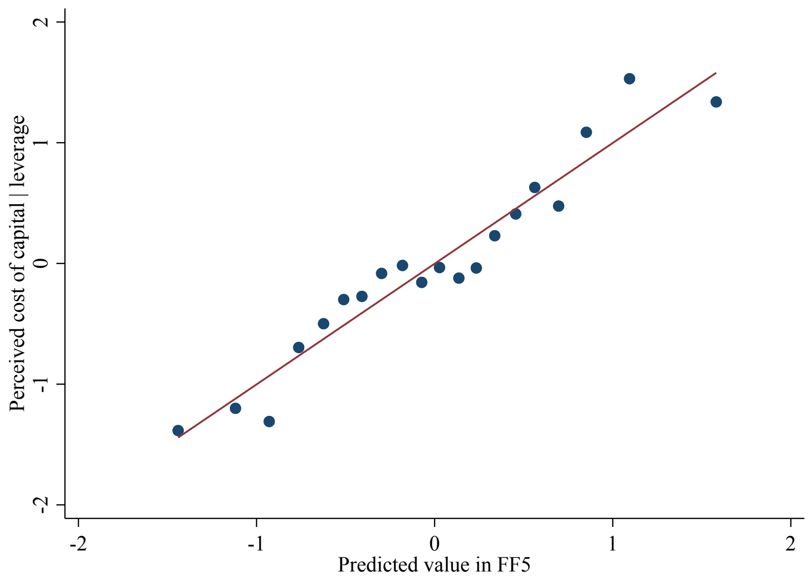


Figure A4
The factor zoo and the perceived cost of capital: significant factors in univariate analysis

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, size, 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.

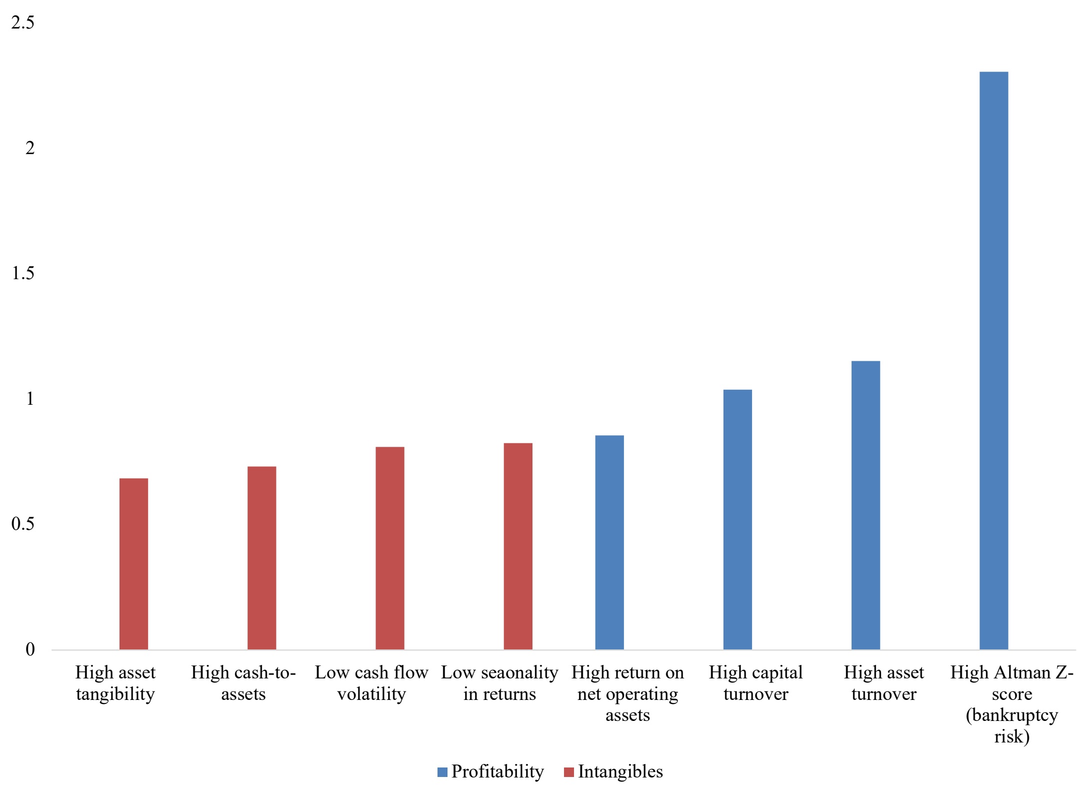


Figure A5
The 5-factor model and discount rates

This figure shows a binned scatter plot of discount rates for different bins of predicted values in the Fama and French (2015) 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.

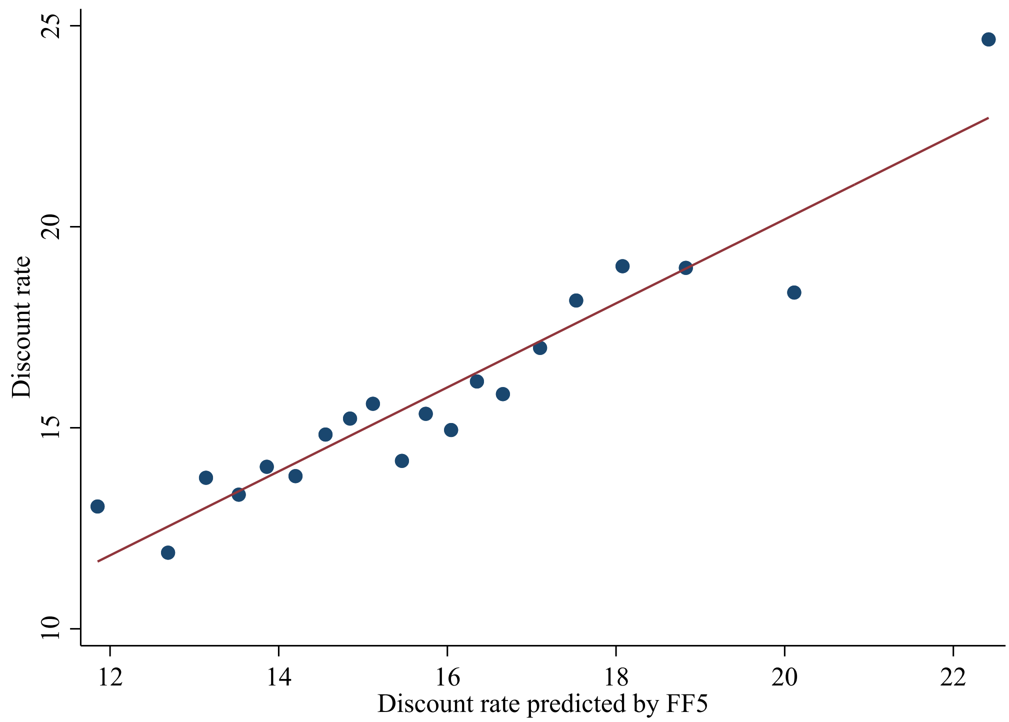


Table 5
Factor risk premia in firms' perceived cost of capital

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
Profitability-based factor		**Intangible-based factors**	
Profit margin	-0.62	Liquidity of book assets	-1.27
Taxable income-to-book income	-0.24	Kaplan-Zingales index	-0.88
Change in quarterly return on equity	-0.19	Labor force efficiency	-0.65
Operating profits-to-lagged book assets	-0.12	Change sales minus change SG&A	-0.57
Operating profits-to-book assets	-0.11	Year 1-lagged return, nonannual	-0.41
Cash-based operating profits-to-book assets	-0.08	Liquidity of market assets	-0.40
Cash-based operating profits-to-lagged book assets	-0.06	Change sales minus change Inventory	-0.35
Pitroski F-score	-0.05	Earnings persistence	-0.22
Change in quarterly return on assets	-0.03	Hiring rate	-0.21
Operating profits-to-lagged book equity	0.06	Years 2-5 lagged returns, nonannual	-0.19
Operating profits-to-book equity	0.09	Years 11-15 lagged returns, nonannual	-0.19
Ohlson O-score	0.10	Firm age	-0.17
Sales growth (1 quarter)	0.26	Year 1-lagged return, annual	-0.08
Quarterly return on equity	0.27	Years 6-10 lagged returns, annual	-0.04
Book leverage	0.35	Change gross margin minus change sales	-0.02
Quarterly return on assets	0.53	Years 16-20 lagged returns, nonannual	0.06
Market size	0.55	Years 2-5 lagged returns, annual	0.06
Gross profits-to-lagged assets	0.56	Earnings variability	0.29
Gross profits-to-assets	0.59	Change sales minus change receivables	0.29
Return on net operating assets	0.86**	Earnings volatility	0.30
Capital turnover	1.04**	R&D-to-sales	0.33
Assets turnover	1.15**	Years 11-15 lagged returns, annual	0.50
Altman Z-score	2.31**	Years 16-20 lagged returns, annual	0.53
		R&D-to-market	0.54
Momentum-based factors		Asset tangibility	0.68**
Price momentum t-12 to t-1	-0.30	R&D capital-to-book assets	0.71
Number of consecutive quarters with earnings increases	-0.29	Cash-to-assets	0.73**
Residual momentum t-6 to t-1	-0.28	Cash flow volatility	0.81**
Price momentum t-6 to t-1	-0.26	Years 6-10 lagged returns, nonannual	0.82**
Standardized Revenue surprise	-0.23		
Residual momentum t-12 to t-1	-0.12		
Current price to high price over last year	0.00		
Standardized earnings surprise	0.08		
Tax expense surprise	0.31		

continues...

Table 5
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		**Value-based factors**	
Net equity issuance	-0.85	Net payout yield	-0.97
Equity net payout	-0.58	Payout yield	-0.77
Change in current operating assets	-0.57	Operating cash flow-to-market	-0.38
Abnormal corporate investment	-0.52	Free cash flow-to-price	-0.24
Change in net operating assets	-0.51	Long-term reversal	-0.22
Change in common equity	-0.46	Assets-to-market	-0.17
Percent total accruals	-0.46	Book-to-market enterprise value	-0.13
Change in current operating liabilities	-0.45	Dividend yield	-0.12
Growth in book debt (3 years)	-0.35	Book-to-market equity	-0.03
Total accruals	-0.29	Sales Growth (3 years)	0.13
CAPEX growth (3 years)	-0.28	Equity duration	0.18
CAPEX growth (1 year)	-0.27	Intrinsic value-to-market	0.20
Change in net noncurrent operating assets	-0.26	Ebitda-to-market enterprise value	0.27
CAPEX growth (2 years)	-0.26	Earnings-to-price	0.40
Change in long-term investments	-0.25	Sales Growth (1 year)	0.47
Change PPE and Inventory	-0.25	Sales-to-market	0.52
Inventory change	-0.24		
Change in current operating working capital	-0.20	**Factors based on trading frictions**	
Inventory growth	-0.17	Price per share	-0.60
Percent operating accruals	-0.16	Coefficient of variation for share turnover	-0.39
Net total issuance	-0.14	Coefficient of variation for dollar trading volume	-0.31
Change in long-term net operating assets	-0.12	Number of zero trades (12 m)	-0.05
Operating accruals	-0.07	Number of zero trades (1 m)	-0.03
Change in noncurrent operating liabilities	-0.06	Share turnover	-0.03
Asset Growth	-0.04	Number of zero trades (6 m)	-0.03
Change in noncurrent operating assets	-0.01	Coskewness	-0.02
Change in short-term investments	0.12	Idiosyncratic skewness from the CAPM	0.03
Net debt issuance	0.13	Total skewness	0.08
Net stock issues	0.29	Idiosyncratic volatility from the CAPM (252 days)	0.09
Change in net financial assets	0.39	Idiosyncratic skewness from the q-factor model	0.10
Change in financial liabilities	0.41	Idiosyncratic skewness from the FF 3-factor model	0.15
Net operating assets	0.48	Short-term reversal	0.17
Change in operating cash flow to assets	-0.04	The high-low bid-ask spread	0.20
Quality minus Junk: Profitability	0.00	Idiosyncratic volatility from the q-factor model	0.22
Quality minus Junk: Growth	0.05	Return volatility	0.23
Highest 5 days of return	0.26	Idiosyncratic volatility from the CAPM (21 days)	0.28
Highest 5 days of return scaled by volatility	0.29	Maximum daily return	0.32
Return on equity	0.34	Idiosyncratic volatility from the FF 3-factor model	0.34
Quality minus Junk: Composite	0.37	Amihud Measure	0.44
Mispricing factor: Performance	0.53	Market Equity	0.55
		Dollar trading volume	0.60