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The insensitivity of investment to interest rates: Evidence from a survey of CFOs

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Abstract

A fundamental tenet of investment theory and the traditional theory of monetary policy transmission is that investment expenditures by businesses are negatively affected by interest rates. Yet, a large body of empirical research offer mixed evidence, at best, for a substantial interest-rate effect on investment. In this paper, we examine the sensitivity of investment plans to interest rates using a set of special questions asked of CFOs in the Global Business Outlook Survey conducted in the third quarter of 2012. Among the more than 500 responses to the special questions, we find that most firms claim to be quite insensitive to decreases in interest rates, and only mildly more responsive to interest rate increases. Most CFOs cited ample cash or the low level of interest rates, as explanations for their own insensitivity. We also find that sensitivity to interest rate changes tends to be lower among firms that do not report being concerned about working capital management as well as those that do not expect to borrow over the coming year. Perhaps more surprisingly, we find that investment is also less interest sensitive among firms expecting greater revenue growth. These findings seem to be corroborated by a cursory meta-analysis of average hurdle rates drawn from firm-level surveys at different times over the past 30 years, which exhibit no apparent relation to market interest rates.

JEL codes: E22, E52, G31
Keywords: Investment, interest rates, hurdle rates

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A fundamental tenet of investment theory and the traditional theory of monetary policy transmission is that investment expenditures by businesses are negatively affected by interest rates. Yet, a large body of empirical research offer mixed evidence, at best, for a substantial interest-rate effect on investment. In this paper, we examine the sensitivity of investment plans to interest rates using a set of special questions asked of CFOs in the Global Business Outlook Survey conducted in the third quarter of 2012. Among the more than 500 responses to the special questions, we find that most firms claim to be quite insensitive to decreases in interest rates, and only mildly more responsive to interest rate increases. Most CFOs cited ample cash or the low level of interest rates, as explanations for their own insensitivity. We also find that sensitivity to interest rate changes tends to be lower among firms that do not report being concerned about working capital management as well as those that do not expect to borrow over the coming year. Perhaps more surprisingly, we find that investment is also less interest sensitive among firms expecting greater revenue growth. These findings seem to be corroborated by a cursory meta-analysis of average hurdle rates drawn from firm-level surveys at different times over the past 30 years, which exhibit no apparent relation to market interest rates.

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1. Introduction

A fundamental tenet of investment theory and the traditional view of monetary policy transmission is that a rise in interest rates has a sizable negative effect on capital expenditures by businesses. In particular, the market interest rate is considered to be a key building block in the firm's user cost of capital, which, combined with the resulting stream of expected cash flows, constitute the primary determinants of whether and how much to invest. Yet, a large body of empirical research offer mixed evidence, at best, for a substantial interest-rate effect on investment.[1]

Much of that research is focused on measuring the elasticity of investment with respect to the all-in user cost of capital, from which one can back out the implied interest-rate elasticity. In the earlier studies, the effects of changes in the user cost of capital on investment estimated from time-series data tend to be surprisingly small in the short- to medium-term (Chirinko, 1993). More recent time series studies that focus on estimating the long-run elasticity of investment to the all-in user cost tend to find larger user-cost effects, which are more in line with standard theory (Caballero, 1994; Schaller, 2006).

Regardless of horizon, though, interest rate elasticities backed out from most empirical studies are predicated on the restrictions imposed by the user cost formula. Indeed, the few attempts to separately estimate elasticities for each component of user cost generally find no negative effect associated with the interest rate component of user cost, and relatively sizable effects from the other user cost components (Tevlin and Whelan, 2003; Schaller, 2007). Simultaneity bias from unobservable shifts in investment demand are widely presumed to be the culprit behind the lack of a negative interest rate coefficient, but an alternative explanation could be that the required rate of return used for investment decisions is not closely connected to recent interest rates, whereas other components of user cost are more accurately measured. [2]

[1] See Caballero (1999) for an overview of the literature.
[2] A very recent exception is Kothari, Lewellen, and Warner (2012), who estimate reduced-form aggregate investment regressions as a function of interest rates.

Studies using microeconomic data, particularly when combined with natural experiments, generally find larger user-cost effects than aggregate studies. Here again though, empirical tests mostly focus on estimating implied interest-rate effects under the constraints assumed within the user cost formula; so results could be driven by the non-interest rate components. Indeed, Cummins, Hassett, and Hubbard (1994), one of the most commonly cited microeconomic studies, find that all-in user cost elasticity estimates are largely unaffected if the firm-level measures of required return employed in the user-cost formula are replaced with a fixed 4% real required rate of return.[3]

Our study offers a very different approach to measuring the interest-rate sensitivity of investment. It avoids conventional identification biases by using data from a survey of corporate executives, which asks directly how their companies' investment plans are likely to be influenced by changes in interest rates, holding other factors constant. The data come from the quarterly Duke University/CFO Magazine Business Global Outlook survey of financial executives, a web-based survey completed by around 600 to 900 U.S. companies each quarter. Our analysis focuses on the responses from CFOs of U.S. firms in nonfinancial industries who provided answers to two special questions that were included in the September 2012 survey.

The key survey questions ask the respondents to assume that "demand and cost conditions faced by your firm and industry remain the same" and then answer the following: "By how much would your borrowing costs have to decrease to cause you to initiate, accelerate, or increase investment projects in the next year?" After responding, the executives were asked the opposite question, "by how much would your borrowing costs have to increase to cause you to delay or stop investment projects." They were given six response choices (in addition to the option to responding "not applicable"). These choices were: 0.5 percentage point, 1 percentage point, 2 percentage points, 3 percentage points, more than 3 percentage points, or "likely would not change investment

[3] Gilchrist and Zakrajsek (2007) estimate separate component elasticities and find large cross-sectional investment sensitivity to the idiosyncratic component of interest rates, or spreads over market rates. However, to the extent they are unable to control for cash flow news that affects firm-level spreads, this approach is vulnerable to producing upward-biased elasticities, the opposite of time series studies.

plans in response to an interest rate increase." If the latter response is chosen, the respondent was prompted with an open-ended question: "Why not?"

To provide further context for interpreting those responses and to analyze factors that influence the firm's reported interest-rate sensitivity, we construct indicators of the firm's financial condition and its outlook based on the regular quarterly survey questions that ask about the firm's expectations for growth and about issues of greatest management concern. Another important piece of information came from a special question that asks "Do you plan to borrow to fund at least part of your investment in the next year". The survey also provides information on some basic firm characteristics such as broad industry and firm size.

Our findings can be summarized as follows. The vast majority of CFOs indicate that their investment plans are quite insensitive to potential *decreases* in their borrowing costs. Only 8% of firms would increase investment if borrowing costs declined 100 basis points, and an additional 8% would respond to a decrease of 100 to 200 basis points. Strikingly, 68% did not expect *any* decline in interest rates would induce more investment. In addition, we find that firms expect to be somewhat more sensitive to an *increase* in interest rates. Still, only 16% of firms would reduce investment in response to a 100 basis point increase, and another 15% would respond to an increase of 100 to 200 basis points.

A few factors help to explain the cross-sectional variation in reported investment sensitivity to interest rates. One of the strongest factors, particularly with regard to increases in interest rates, is whether a firm has plans to borrow to finance some of their investment plans in the year ahead. Those without plans to borrow were much less likely to anticipate cutting back in response to an increase or required a larger increase to induce a cutback.

A factor that influenced the propensity to respond to both borrowing cost increases and decreases was whether the firm considered working capital management to be a top

concern (about 25% of firms). A third and perhaps more surprising factor is a firm's expectations for revenue growth over the coming year. In particular, firms with higher growth expectations were found to be less sensitive to changes in interest rates. On the other hand, investment sensitivity to interest rates did not appear to be related to firm characteristics such as firm size, whether it is publicly or privately owned, or its industry classification. Finally, we attempted to test for an uncertainty effect (related to the option value of waiting) but our proxy for uncertainty did not have a significant negative effect on interest-rate sensitivity.

As noted above, firms that expected their investment plans to be unresponsive to any conceivable decrease (or increase) in borrowing cost were given the space to provide a reason, and most offered one. The most commonly cited reason for insensitivity was the firm's ample cash reserves or cash flow. Two other popular reasons were: (i) interest rates are already low (absolutely, or compared to firm's rate of return); and (ii) the firm's investment was based largely on product demand or long-term plans rather than on current interest rates. Only about 10% of firms providing a reason for not responding to a decrease cited a lack of profitable opportunities, and only a handful offered high uncertainty as a reason.

Twelve months after survey respondents were questioned on their likely responses to prospective changes in interest rates, actual longer-term interest rates were, in the event, about 100 basis points higher. The September 2013 Global Business Outlook thus asked CFOs how their firms reacted to these developments and the responses broadly confirmed the limited sensitivity indicated in our analysis of the predicted reactions in the original survey.

Finally, as part of our effort to expand upon the interpretation of our findings, we also provide survey-based evidence on how firm's self-reported hurdle rates for new investment have evolved during the past 30-years' slide in market interest rates. The corroborating evidence on firm's hurdle rates is gathered from the Duke/CFO Magazine survey in selected recent quarters, as well as several one-time surveys by academics, in

which U.S. companies have been reported their hurdle rates,. The data indicate that hurdle rates remain surprisingly high of late and, in the aggregate, apparently quite insensitive to interest rates over time.

The rest of this paper is organized as follows. Section 2 summarizes the special questions on the interest rate sensitivity of investment plans in the Global Business Outlook survey. Section 3 describes sample selection and firm characteristics of respondents by their reported sensitivity to interest rate changes. Section 4 presents our empirical methodology and main results. Section 5 discusses the implications of our findings using complementary evidence from previous studies on hurdle rates and Section 6 concludes.

2. Data

2.1. The CFO Survey

The Duke CFO Magazine Global Business Outlook (or Duke/CFO) survey, conducted quarterly by Duke University and the CFO magazine since 1996, polls financial executives of firms with sales ranging from less than $25 million to more than $10 billion, from a wide spectrum of industries.[4] Each quarter, e-mail invitations to complete the web-based survey are sent to thousands of firms. In recent years, around 800 to 900 companies have completed the survey each quarter.

The measure of CFO sentiment constructed from the survey and published by Duke CFO Magazine tracks fairly closely the sentiment gauge that is constructed from the Global Business Outlook Survey conducted by the Federal Reserve Bank of Philadelphia [construct comparison chart]. Special questions from the Duke/CFO survey have been used to study a wide range of topics in corporate finance, including capital structure (Graham and Harvey, 2001), payout policies (Brav et al., 2005), liquidity management in

[4] General information about the survey can be consulted at http://www.cfosurvey.org.

periods of stress (Campello et al., 2011), and the effects of financial crises on nonfinancial firms (Campello, Graham, and Harvey, 2010).

2.2. Special questions on the sensitivity of investment to interest rate changes

The CFO survey conducted in September 2012 included, for the first time, questions asking respondents how sensitive their investment plans are likely to be in response to potential increases or decreases in the interest rates they faced. Our analysis focuses on the survey responses from about 550 private sector CFOs at U.S. nonfinancial firms, thereby excluding responses from non-for-profit and government entities as well as financial firms. To gauge the sensitivity of investment plans to changes in interest rates, all survey respondents were asked the following question:

> "We'd like to better understand the extent to which borrowing costs affect your investment plans. Assuming demand and cost conditions faced by your firm and industry remain the same, please answer the following: By how much would your borrowing costs have to decrease to cause you to initiate, accelerate, or increase investment projects in the next year?"

Responses were structured in multiple choice format; in addition to "Not applicable," there were six possible responses: (1) "0.5 percentage points," (2) "1 percentage point," (3) "2 percentage points," (4) "3 percentage points," (5) "More than 3 percentage points," or (6) "Likely would not change investment plans in response to an interest rate increase." If the sixth option was chosen, the respondent was prompted with an open-ended question: "Why not?"

2.3. Univariate results on interest rate sensitivity

Column 1 of Table 1 shows the distribution of responses to the hypothetical decreases in interest rates. A large majority of respondents reported that their investment plans would be quite insensitive to decreases in interest rates. Among the 541 completed responses to this question, only 8% of firms indicated that they would react to a decrease in borrowing costs of 1 percentage point or less; an additional 8% would respond to a 2

percentage point decrease in borrowing costs; and another 16% would respond to a decrease of 3 percentage points or more, whereas 68% of respondents would likely not change their investment plans in response to a decrease in borrowing costs. Finally, as noted at the bottom of the table, 139 of the respondents chose "not applicable".[5]

[Insert Table 1 about here]

Following the question on interest rate decreases, survey respondents were also asked in the same multiple-choice format about a hypothetical increase in their borrowing costs: "By how much would your borrowing costs have to increase to cause you to delay or stop investment projects?" The responses to this second question (in column 2) indicate somewhat more sensitivity to interest rate increases than decreases, but the size of the increases most would bear before cutting back investment tended to be quite large. Among the 534 firms that answered this special question, 16% would react to an increase in borrowing costs of 1 percentage point or less; another 16% would react to a 2 percentage point increase. Another 31% would only react to an increase of 3 percentage points or more, while 37% responded they would likely not change their investment plans in response to an increase in borrowing costs.

3. Characteristics of sample respondents

For analyzing firm characteristics that might explain cross-sectional differences in the sensitivity to interest rates, we restrict attention to the subsample of 428 firms that provided (non-N.A.) responses to both interest rate sensitivity questions and that completed all the other survey questions used to construct our key explanatory variables. The distributions of the responses to the interest rate sensitivity questions in this subsample are very similar to those shown for the full sample of responses in Table 1.

[5] Only 10 respondents provided no response to the question whatsoever.

The standard survey includes questions that identify some basic firm characteristics, including firm size (by revenues and number of employees), ownership (public or privately owned), and broad industry sector. In addition, each quarterly survey contains a set of questions asking respondents to provide quantitative responses on their expectations for a variety of financial performance metrics for their firm over the coming 12 months. Two survey metrics are ultimately used in our analysis, expected revenue growth, the metric which had the highest response rate, with the vast majority of firms providing responses, and capital spending growth, for which the response frequency is about 15% lower.

Our primary gauge of firm size comes from a question asking firms to categorize their annual revenue within one of seven buckets: (1) less than $25 million, (2) $25 million to $99 million, (3) $100 million to $499 million, (4), $500 million to $999 million, (5) $1 billion to $4.9 billion, (6) $5 billion to $9.9 billion, (7) more than $10 billion. A similar question asks firms to report their number of employees within similarly broad ranges, but responses are provided a little less frequently than to the revenue question.

Figure 1 shows the distribution of firms by number of employees (Panel A) and by current revenue (Panel B). These two measures of size provide similar pictures of the distribution of respondents in our sample. In particular, both distributions are skewed towards smaller firms, and around one-third of respondents are in the bottom category of size either in terms of the number of employees or sales revenue. Even so, the sample also contains a non-negligible fraction of very large firms.

[Insert Figure 1 about here]

Figure 2 plots the distribution of firms in our sample by expected revenue growth (Panel A) and by expected capital expenditure growth (Panel B). At the time of the survey, a significant portion of firms in our sample expected modest growth in revenues over the next 12 months. About one-third of firms in our sample reported that they expected sales to increase between 0 and 6% over the next year. Even so, almost 15% of

firms in our sample expected very strong revenue growth (20% or more). The distribution of expected growth in capital expenditures was similar, but slightly more concentrated around zero growth than the distribution of expected revenue growth.

[Insert Figure 2 about here]

The survey question that is perhaps most obviously related to the focus of our analysis is question 8: "Do you plan to borrow to finance some of your investment plans next year." Assuming no capital market imperfections, the interest rate is a component of the opportunity cost of an investment for all firms, and so interest rates should influence all firms' investment decisions on the margin, and not just those that expect to borrow. Alternatively, to the extent that capital market imperfections create substantial wedges, such as in the "pecking order" theory of financing, then changes in interest rates could be less decision-relevant to the subset of firms that do not plan to finance marginal investment with debt. We construct a dummy indicator equal to 1 for those firms that do plan to borrow and zero for firms that indicated they have no plan to borrow or that the question about borrowing is not applicable. As shown in the first column of Table 2, 49% of our sample firms indicate plans to borrow.

Finally, we construct a pair of variables from the responses to a regular survey question that asks firms to indicate their top three company-specific concerns they face, and prompts them with 13 standard response options as well as the opportunity to indicate other non-listed concerns. The responses a firm chooses to this question might be indicative of characteristics that are likely to influence firm investment plans. The two most commonly chosen of the standard response choices offered are concern with "ability to maintain margins" and "cost of health care," flagged by about 60% and 40% of sample respondents, respectively. In our analysis, we focus on two of the other fairly commonly flagged responses, one that indicates uncertainty is a major concern and one that indicates that access to financing is a major concern.

The choice of top concerns that most clearly indicates the importance of uncertainty is the concern about "ability to forecast results," flagged by 32% of sample firms. Thus, we construct a dummy indicator for uncertainty, equal to 1 for all those observations where the respondent chose "ability to forecast results" as a top three concern. Theories of investment that focus on the option value of waiting (e.g., Abel and Eberly, 1996; Dixit and Pindyck, 1994) suggest that, all else the same, firms facing relatively high uncertainty are likely to be relatively insensitive to changes in user-cost parameters, including the interest rate.

The other presumably highly germane concern among those listed is concern about "working capital management", which was flagged by 26% of the sample firms. If working capital management is a top concern, this would seem to indicate that the respondent firm is more sensitive to financial market conditions, perhaps because it does not have access to ample internally-generated funds. Thus, one might expect the investment (as well as operational) plans of firms that flag "working capital concerns" to be more sensitive to potential changes in the cost of borrowing.[6]

Panel A in Table 2 summarizes the characteristics of firms that responded to the special question about the sensitivity of their investment plans to interest rate increases. Column 1 shows statistics for the full sample used in the regression model estimation. As indicated earlier, 26% have working capital concerns, 32% have concerns about uncertainty, and 49% plan to borrow. In addition, 78% of respondents are privately held, 58% expect robust revenue growth (above 5%) over the next year, while 57% are relatively small with revenues less than $100 million. Manufacturing firms account for a third of the sample, with services (18%) and retail (14%) being the second and third most represented industry groups. Finally, indicated at the bottom of the table, 15% of our sample firms did not provide a response to the inquiry about their expected growth in

[6] The other response option that indicates the importance of the financial conditions the firm faces, is a concern about "balance sheet weakness," which is flagged by about 15% of the respondents and which we do not find to have any effect on interest rate sensitivity.

capital expenditures. Some of the regression analysis excludes those observations in an effort to impose additional quality control on the survey data.

[Insert Table 2 about here]

Panel A in Table 2 also splits the sample of respondents according to their sensitivity to interest rate increases. When compared with firms that would not change their plans in response to any increase in interest rates (column 3), firms that would respond to an increase (column 2) are more likely to consider working capital management to be a top concern. In addition, firms that would respond to an interest rate increase are much more likely to report plans to borrow to finance some of their investment. Finally, perhaps surprisingly, firms that would respond to an increase are less likely to be anticipating robust (5% or more) revenue growth, compared to those that would not change their plans in response to an increase. To the contrary, under the presumption that firms with slower-growing revenues have fewer profitable growth prospects, we might have expected these firms to be less sensitive to interest rates than faster-growing firms.

The last column in Table 2 shows the characteristics of the observations that were omitted from our study because the firm chose to respond "not applicable" to the question on interest rate increases. It is not entirely clear how one should interpret the choosing of "not applicable (NA)." It is tempting to infer that choosing NA is tantamount to responding that a change in borrowing cost is not relevant and thus would not affect the firm or its investment decisions. Of course, assuming such an interpretation is clearly speculative, so we have excluded such observations from our main analysis. Still, it is somewhat instructive to compare the characteristics of the firms responding NA to our primary sample firms. Although the non-respondents are similar in many dimensions to the sample of respondents, the firms that responded NA were much less likely to report plans to borrow, and they were a lot more likely to leave blank (NA) their response for expected 12-month growth in capital spending. Finally, they were somewhat less likely to report robust revenue growth, and tended to be smaller in size when compared with our regression sample.

Our findings are very similar when we compare the subsample of firms that would change their plans in response to interest rate *decreases* and the subsample that would not change plans in response to a decrease (Table 2, Panel B). In particular, firms that are responsive to interest rate decreases (column 2) are more likely to consider working capital management as a top concern and also tend to expect weaker revenue growth compared to firms that are not responsive to rate decreases (column 3). In contrast, there does not appear to be any difference in the propensity to have borrowing plans.

4. Regression Analysis

4.1. Estimation Methodology

As the responses to the special questions reported in Table 1 clearly indicate, a significant portion of firms reported that they would not adjust their investment plans in response to any of the hypothetical changes in interest rates. This raises the methodological question of whether these respondents should be treated as an entirely different category ("completely insensitive") from those that indicated a threshold interest rate change that would induce them to adjust capital expenditures. This interpretation calls for a qualitative response regression model (e.g., a probit). Alternatively, we could treat firms that would not change their investment plans as very insensitive, but still falling along the interest-rate sensitivity continuum. In this case, we could assume they would respond but only to a large change in rates that was inconceivable in the context of the survey question. Of course, that magnitude is also unobservable to the econometrician. This second interpretation would call for a censored response model (i.e., a tobit). We employ both approaches in this paper.

In the qualitative response approach, we define $React\ to\ increase$ as a dummy variable that is equal to one if the firm answered that it would delay or stop investment projects in response to an increase in interest rates of 0.5 percentage point, 1 percentage point, 2 percentage points, 3 percentage points, or more than 3 percentage points. On the

other hand, the dummy variable was set to zero if the firm reported that it would likely not change its investment plans in response to an interest rate increase. We analogously define the dummy variable $React\ to\ decrease$ based on the special question about the adjustment of investment plans in response to interest rate decreases.

We then model the probability of a firm reporting that it would react to a rate increase using a probit regression:

$$Prob(React\ to\ increase_i = 1) = F(\beta' X_i), \text{ and}$$

$$\beta' X_i = \alpha_{ind} + \beta_1 Working\ capital_i + \beta_2 Uncertainty_i + \beta_3 Plan\ to\ borrow_i + \beta_4 Revenue\ Growth_i + \beta_5 Size_i + \beta_6 Private_i\ , \qquad (1)$$

where i indexes firms, F is the standard normal cumulative distribution, and α_{ind} represents industry dummies (retail, mining, transportation, technology/telecommunications, services, health, and other industries, with manufacturing as the omitted industry). The dummy variables $Working\ capital$ and $Uncertainty$ are equal to one for firms reporting, respectively, that working capital and uncertainty are one of their top three business concerns, and zero otherwise. $Plan\ to\ Borrow$ is also an indicator variable, constructed from responses to the question: "Do you plan to borrow to fund at least part of your investment plans next year?" $Revenue\ Growth$ is the firm's expected revenue growth over the next 12 months.[7] $Size$ is an index based on annual revenues ranging from 1 (less than $25 million) to 7 (more than $10 billion), and $Private$ is a dummy variable for privately held firms. We also separately estimate equation (1) with the dependent variable $React\ to\ decrease$, the dummy variable that identifies whether or not firms would not change investment plans in response to an interest rate decrease.

In the second approach to modeling the interest rate sensitivity of investment plans, the dependent variable is the degree of interest rate sensitivity; specifically, it is the

[7] We winsorize $Revenue\ Growth$ at the 10th and 90th percentiles in all regressions. Results are qualitatively similar using other winsorization thresholds.

(minimum) interest rate change that would induce the respondent firm to alter its investment. The clear advantage of this approach is that we exploit more of the information in the responses by measuring differences in sensitivity along a continuum. The disadvantage is that it requires us to impute a more subtle interpretation to the respondent's choice of "would likely not react".

In particular, in the second approach to modeling the response to the question about an increase in borrowing costs, we estimate the following tobit specification:

$$Threshold\ rate\ increase_i = \max\{3.1,\ \delta' X_i + u_i\}\,, \qquad (2)$$

$Threshold\ rate\ increase$ is equal to the numerical response, either 0.5, 1, 2, or 3 percentage points, when one of these responses are chosen. On the other hand, the response is assumed to be censored, or unobserved, when the true threshold is above 3 percentage points. In particular, we assume that the unobserved threshold is above 3.1 percentage points[8] both for firms that chose "More than 3 percentage points" and those that choose "Likely would not change plans" in response to the question about a prospective increase in borrowing costs. The vector of explanatory variables is the same as in equation (1), and u is an independent and identically distributed normal disturbance. Finally, we separately estimate a similar equation with censored dependent variable, $Threshold\ rate\ decrease$, constructed in an analogous fashion from responses to the question about a prospective decrease in borrowing costs.

4.2. Qualitative response results: Interest-rate sensitive versus not sensitive

We begin by reviewing the results for the probit specification, in which firms either react or do not react to interest rate changes. The results from estimating the probit model in equation (1) for the probability that a firm would react to an *increase* in rates are summarized in Table 3. The table reports estimated marginal effects for a firm with average characteristics. In the initial specification, column 1, we include only the key explanatory variables. In column 2 we add all the other control variables in vector X:

[8] Our results are robust to right-censoring the dependent variable at 3.5 percentage points instead.

industry fixed effects, the size index, and the dummy for privately held firms. In column 3 we exclude sample firms that expected revenue to contract more than 5%, as these firms that seem much less likely to have many investment opportunities to begin with. The sample in column 4 is further restricted by excluding those firms that, when asked about their expected growth in capital expenditures over the next 12 months, left it blank, rather than choosing a quantitative response (as instructed for questions that are "not applicable"). Firms that provide a forecast for growth in capital expenditures would seem to be better positioned to respond to a question about how interest rates would affect their investment plans.

[Insert Table 3 about here]

Consistent with the univariate statistics reported in Table 2, the statistics reported in the first and third rows indicate that firms that report working capital concerns, and those that plan to borrow, are more likely to reduce capital expenditures in response to an interest rate increase. Based on the estimated marginal effects in column (2), an average firm reporting working capital concerns is 14 percentage points more likely to indicate it would reduce capital expenditures in response to some interest rate increase. Similarly, a firm that plans to borrow is 28 percentage points more likely to respond to some interest rate increase. These results are robust when considering different sets of controls (columns 1 and 2) or different samples (columns 3 and 4). Thus, despite the generally low level of sensitivity to interest rate changes by most firms in the survey, firms that actually perceive debt as a marginal source of funding are more likely to respond to interest rate movements.

Perhaps more interesting is the significant effect of expected near-term growth prospects, as represented by *Revenue Growth.* Firms expecting higher revenue growth--those that presumably have greater investment opportunities--are less likely to respond to interest rate increases. Moreover, in specification (3), where we exclude those firms expecting revenue to decline by 5% or more—those firms that are less likely to be contemplating substantial capital expenditures—the estimated marginal effect is larger in

magnitude. Firms with a 10% higher expected revenue growth rate are 11 percentage points less likely to respond to an interest rate increase. One plausible interpretation of this finding is that firms with stronger growth opportunities are only considering investments whose expected returns are well above the margin where changes in interest rates are relevant for investment plans.

Indeed, it appears that all the influential variables appear to have larger effects in specification (3), and the pseudo-R^2 increases as well, suggesting that our model fits better for firms that are more likely to be contemplating substantial investment in the first place. In a similar vein, the model appears to fit even a bit better in column 4, where we omit firms that did not report an expected growth rate for capital expenditures (as if it the question was not applicable). Thus, the model fits better on those observations where firms appear to be in a better position to contemplate the potential effect of interest rates on investment plans. We similarly analyze the sensitivity of firms to interest rate decreases, and the results from these probit regressions are reported in Table 4.

[Insert Table 4 about here]

Similar to our findings for the sensitivity to interest rate increases, we also find that firms concerned about working capital management are more likely to respond to interest rate decreases. In addition, firms expecting more robust growth in sales are less likely to react to rate decreases. Interestingly, in contrast with the findings in Table 3, we do not find that those firms planning to borrow (to at least partly fund their investment) to be any more sensitive than firms not planning to borrow. Thinking in terms of discretized decisions, this asymmetry seems sensible: if firms are already planning to borrow, then an increase in rates could push the investment plan "out of the money;" but a decrease in rates might not alter their calculus. Indeed, it might be even more likely to change the decision of some firms that are not planning to borrow. Finally, as in Table 3, we find our results tend to be stronger when we exclude firms expecting revenue declines and firms that did not report an expected growth rate for investment.

4.3. Determinants of the degree of investment sensitivity to interest rates

In this section we treat the firms that indicated they would not alter their investment plans to changes in interest rates as having a high unobservable threshold below which they are insensitive. . Given their unobservable (censored) threshold, as well as that for those firms explicitly indicating they would respond to a change greater than 3 percent, we estimate a tobit model on the size of the interest rate change that would induce a response. As with the probit regressions, we first consider the reaction to interest rate increases.

The results from estimating equation (2) on the minimum rate increase that would cause firms to adjust their investment plans are summarized in Table 5. The regression in column 1 excludes industry fixed effects, the size index, and the dummy for privately held firms. In column 2 we include all the control variables. In column 3 we restrict the sample to firms that expected revenue growth greater than −5%. The sample in column 4 is further restricted to firms that reported an expected growth rate (of any sign) for capital expenditures. Finally, the sample in column 5 excludes those firms that indicated they would not react to any increase in interest rate (i.e., unresponsive firms).

[Insert Table 5 about here]

Consistent with the results from the probit regressions, we find that firms reporting having working capital concerns tend to respond to smaller increases in interest rates, suggesting greater rate-sensitivity of investment plans. In addition, we find that firms planning to borrow at least part of their investment funds also adjust their investment plans in response to relatively smaller changes in rates. Finally, we find that firms expecting relatively greater revenue growth—and thus presumably more robust investment opportunities—are less sensitive to interest rate increases in the sense that they tend to require larger changes in rates to adjust their investment plans. As in the probit regressions, excluding firms that expect revenue declines (column 3) and those that do not provide an expected growth rate for capital expenditures (column 4) tends to boost

a bit the magnitude of the estimated coefficients and improve model fit. As a final robustness check, in column 5 we drop observations for which firms answered that they would "likely not change plans" in response to an increase in borrowing costs. The in this case are attenuated somewhat and the pseudo-R^2 is lower. Reflecting the fall-off in sample size, statistical significance is also somewhat weaker; nonetheless, in a qualitative sense, the results are quite similar to the previous specifications.

We reproduce the analogous regression specification to estimate the sensitivity to interest rate decreases, that is, we estimate the minimum decrease in interest rates that would cause firms to initiate, increase, or accelerate their investment plans. In the first four specifications shown in Table 6, we find that the coefficients associated with working capital concerns are again negative and statistically significant, indicating that firms reporting concerns about working capital management are more responsive to interest rate decreases. However, some of the results in Table 6 are a bit different from those in the probit regressions. In particular, unlike the probit specification for interest rate decreases, the coefficients on *Plan to Borrow* are significant in some of the specifications here, suggesting that firms with plans to borrow tend to require a smaller interest rate decrease to react.

[Insert Table 6 about here]

On the other hand, the positive coefficients on expected revenue growth suggest that faster growing firms again tend to require larger interest rate changes before they react, but this coefficient is never statistically significant in these regressions. One new effect uncovered in this specification is that firms having uncertainty concerns require larger interest rate declines to induce an increase in investment, a result that is consistent with the option value theory of investing. Finally, in the specification in column (5), we again drop observations in which the firm indicated it would "likely not change plans" in response to a decrease in borrowing costs. This restriction removes two-thirds of the remaining sample, and the results suggest that, across this group of firms, uncertainty concerns is the only characteristic that significantly affects sensitivity.

5. Interpretation and Implications

5.1 Reasons given for investment insensitivity

Respondents who indicated their firms would not change investment plans as a result of a decrease (or increase) in borrowing costs were prompted with the question, "why not?" and most offered a reason. While responses were not guided by any structure (beyond a blank line to fill in), we found that the majority of them fell into a handful of fairly well-delineated themes. The most commonly cited rationale offered for insensitivity to prospective interest rate changes centered on the idea that debt was not a marginal source of finance. Most of the responses in this category invoked the firm's ability to finance desired investments internally, owing to the presence of ample cash reserves or sufficient cash flow from ongoing operations (Table 7). Also included in this category is a handful of cases where the respondent said either that their firm does not use debt or that they had already locked in financing. Overall, this category of response was offered by about half the firms that would likely not respond to an increase in borrowing costs and a third of firms that would not respond to a decrease.

[Insert Table 7 about here]

The two other relatively common reasons were: (i) interest rates are already low, absolutely or compared to firm's rate of return (more common in the case of interest rate decreases); or (ii) the firm's investment is based largely on product demand or a long-term plan, rather than on current interest rates. The fourth and final common reason, invoked by about 10% of firms providing one, was a lack of profitable opportunities. Surprisingly, only 3% cited high uncertainty as the reason for not responding to a decrease, while only 2% cited lack of access to credit. Of course, lack of access could be an underrepresented reason if most firms lacking access to credit were prone to choose "not applicable" in response to the primary questions on interest rates changes. Overall, these findings suggest that, for many firms in September 2012, the level of interest rates

was not an important determinant of investment plans largely because debt was not viewed as a marginal source of funding or because firms' own hurdle rates for investment far exceed, or have little relation to, interest rates at the their recent low levels.

5.2 Some evidence on investment hurdle rates

If the connection between prevailing interest rates and the hurdle rates firms use to determine investment choices is critical to interpreting our results, then it would be instructive to examine the available survey evidence on hurdle rates and how they have changed over time. Over the past 30 years, a handful of surveys focusing on firms' capital budgeting practices have included questions asking respondents for their current investment hurdle rates—the expected rates of return they require for dedicating capital to new projects. On a couple of occasions, the Duke CFO Business Outlook Survey has itself included a question asking for firms' hurdle rates, one instance being the survey in the second quarter of 2012, just prior to the survey studied in this paper.

Using all 328 completed responses from that survey, we find that the average respondent reported a hurdle rate of 14.1%, while the median value was 13.4%. On the face of it, this seems quite high relative to the average BBB-rated corporate bond yield at that time, which was close to 4%. To compare Global Business Outlook survey results with previous survey studies, we calculate and plot the results for the subsample of 150 respondents that are nonfinancial corporations with sales in excess of $100 million. In this subsample, both the mean and median hurdle rates are even a bit higher, at 15%.

Just as interesting as the level of hurdle rates in 2012, and perhaps more relevant to the question at hand, is how little hurdle rates appear to have changed over time, even long periods of time. Figure 3 plots average corporate hurdle rates drawn from five different surveys conducted between 1985 and 2011, alongside a plot of the BBB 10-year corporate bond yield and the 10-year Treasury yield over this period. The two most recent snapshots prior to 2012 also came from the Global Business Outlook survey, which in the first quarter of 2011 included a question asking firms for their current hurdle

rates and how much they had changed from their hurdle rates in 2007. The other three snapshots each came from one-off surveys conducted to provide the inputs to academic studies.

[Insert Figure 3 about here]

The four post-2000 data points suggest that the average corporate hurdle rate has been quite stable for at least ten years, showing no evidence of a downward shift in concert with the general decline in interest rates over this period. Indeed, in the 2003 survey study, more than half of the respondents claimed that they had not changed their hurdle rate in the three years leading up to the survey, suggesting the recent prevailing level extends back at least to 2000. The results from two earlier surveys indicate that the average hurdle rate was about 2% higher in the 1980s and early 1990s. Even so, the difference pales in comparison to the 8 percentage point drop in interest rates between mid-1985 and 2012; moreover, the median and modal responses appear to be unchanged or close to unchanged over the entire period. The fact that the mode has been a constant 15% throughout the entire period suggests that hurdle rates are determined using rough rules of thumb, rather than fine-tuned calculations, an interpretation that would account for the lack of sensitivity to interest rates reported by vast majority of the firms in our study.

One final bit of insight on the factors that affect interest rate sensitivity among firms in the September CFO survey might come from examining the cross-sectional variation in hurdle rates reported by firms in the second quarter 2012 CFO survey (a quarter prior to our study). In particular, recall the finding that firms expecting higher revenue growth tend to report lower sensitivity to prospective interest rate changes. We conjectured that this could be because the expected return on the marginal investments of higher growth firms tends to be much higher than current interest rates (and the returns on marginal investments by lower-growth firms). Using the hurdle rate data from this survey, we could examine whether higher growth firms tend to have higher hurdle rates, which would be consistent with this conjecture. If so, this would also suggest that

understanding the large gap between the average hurdle rate and current interest rates could shed light on the generally low degree of interest sensitivity expressed by the average firm.

As a simple test of this idea, we divide the 268 nonfinancial firms that provided a numerical response to the question asking for their hurdle rate in the earlier 2012 survey into quintiles according to their expected 12-month revenue growth. These quintile ranges are: (i) below 1%, (ii) 1% to 5%, (iii) 5% to 8%, (iv) 8% to 15%, and (v) 15% or higher. Moving from lowest to highest revenue growth quintile, we find the following group median hurdle rates: 12%, 12%, 14.5%, 15%, and 18.5%. Group means progress in a similar monotonic fashion and, by either measure, the median or mean hurdle rate for the highest growth quintile is significantly higher than that for the lowest growth quintile. This is consistent with our conjecture that investment by higher-growth firms is relatively insensitive to interest rates because their hurdle rates are far above and perhaps largely unaffected by interest rates.

5.3 Reported sensitivity to actual interest rate increase

By August 2013, twelve months after Global Business Outlook surveyed firms on their sensitivity to hypothetical interest rate changes, long-term interest rates had in fact risen substantially; notably, yields on 10-year Treasury bonds and investment-grade bonds were about 100 basis points higher. Fortuitously, the Global Business Outlook survey for the third quarter of 2013 once again included questions about interest-rate sensitivity, including a retrospective question:

> "Over the past quarter, interest rates have increased by 1%. What effect have higher rates had to this point on your capital spending [also hiring, debt financing]?"

Among the 396 usable responses to this question, 9 CFOs indicated their capital spending was "reduced significantly" and 28 indicated it was "reduced somewhat". Thus, in total, 9.3% of respondents claimed they had reduced capital spending in response, closely in line with the 10% of respondents from the 2012 survey who

predicted their firm would reduce investment plans in response to a 100 basis point increase. Also consistent with our previous findings, those firms that reporting reduced capital spending owing to the interest rate increase also reported relatively low growth prospects on average. Their median expected 12-month revenue growth was –0.5%, compared to a median of 7.0% among firms that did not report a cut in capital spending due to the interest rate increase.

Following the question about effects of the recent rise in interest rates, the 2013 survey asked forward-looking questions about interest rate increases, the first being:

> "If benchmark long-term interest rates increase 1% [more] by the end of 2013, will this affect your capital spending?"

For the 91% of the sample respondents that had not indicated reducing capital spending as a result of the recent 1% increase in interest rates, their responses to the forward-looking question in principle should indicate whether a *total* increase in interest rates (by year end) of 2% would induce a cutback in their capital spending. Within this group, only 15 respondents, about 3.7% of the overall sample, indicated they would likely reduce capital spending as a result. This suggests even less sensitivity to a 200 basis point increase than the results from the original survey. Responses to this later survey thus appear to support our inferences from the original survey.

6. Conclusions

This paper takes a survey approach to study the interest rate sensitivity of investment, a central question in investment theory, as well as the transmission of monetary policy. In contrast to previous work in this area, which has mostly relied on observed ex-post investment outcomes at the firm or aggregate levels, our approach allows us to focus on firms' planned (ex-ante) policies.

Using a special set of questions on the reaction of firms to hypothetical increases and decreases in interest rates asked of respondents to the Global Business Outlook survey conducted in the second quarter of 2012, we find that most firms did not see themselves

as likely to increase investment if interest rates decreased. Firms expected to be somewhat more sensitive to interest rate increases than decreases, but for the most part the interest rate increases required to elicit adjustments to investment plans are generally quite large.

The investment plans of firms that do not expect to borrow over the coming year or for firms that do not report that working capital management as one of their top business concerns tend to be less sensitive to interest rate changes than the average sample firm. More surprisingly, we find that firms that expect stronger growth in revenue—presumably firms with brighter investment opportunities—also tend to be less sensitive to interest rates. We interpret this finding as suggesting that faster growing firms face marginal investment returns that substantially exceed the cost of borrowing. Separately, we provide evidence from other business surveys conducted over the past few decades which indicates that, in contrast to steeply declining interest rates, average hurdle rates have remained elevated and quite steady over that period. This seems to corroborate our main finding that investment plans tend to be quite insensitive to interest rates.

Of course, there are many caveats to our study. Perhaps most importantly, the key survey questions have been asked only once, in September 2012, and—despite the bit of corroborating evidence from the year-later survey—we do not know the extent to which inferences can be extrapolated to other periods. Moreover, while our analysis is less vulnerable to the usual identification problems faced by analysis of ex-post investment behavior, survey responses to hypotheticals should be interpreted with caution. Finally, the Duke CFO survey results do not necessarily rule out a sizable aggregate investment response if the minority of firms that do respond to interest rate changes tend to alter investment by large amounts. Still, the findings from the special questions in the Duke CFO survey about the interest rate sensitivity of investment, together with the evidence on consistently elevated investment hurdle rates in several prior studies, arguably provide some support for the view that investment is not as tightly linked to interest rates as traditional theory would suggest.

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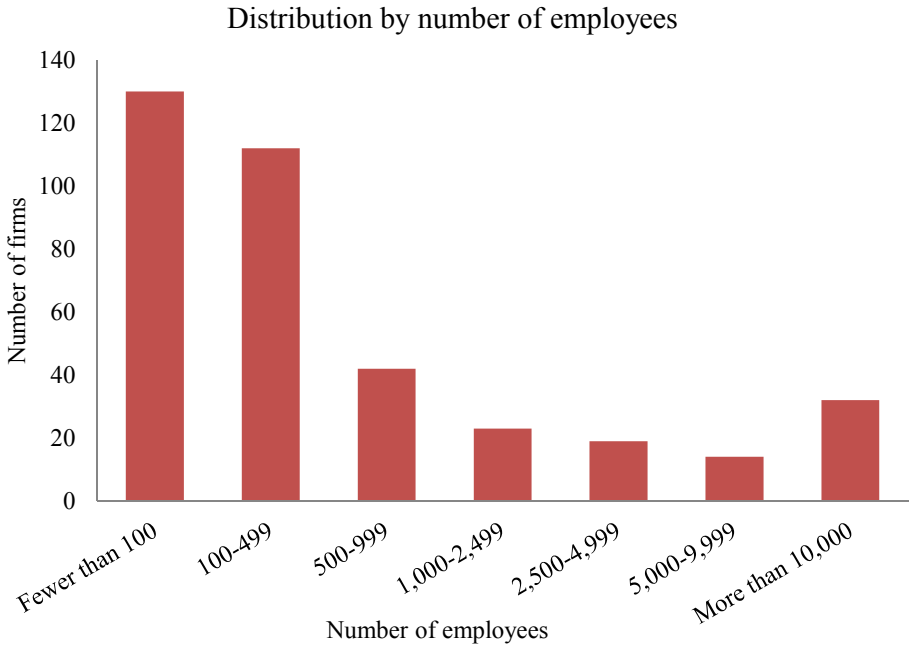
Panel A



Panel B

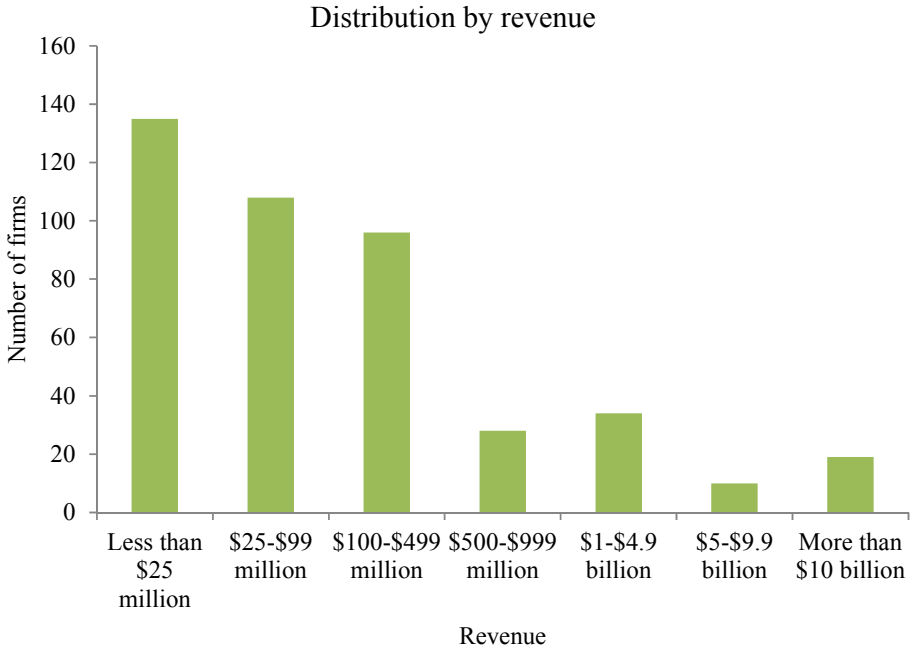


Figure 1. The figure plots the distribution of respondents to the Duke CFO survey in the third quarter of 2012 that compose the sample of firms in Table 2 by number of employees (Panel A) and by revenue (Panel B).

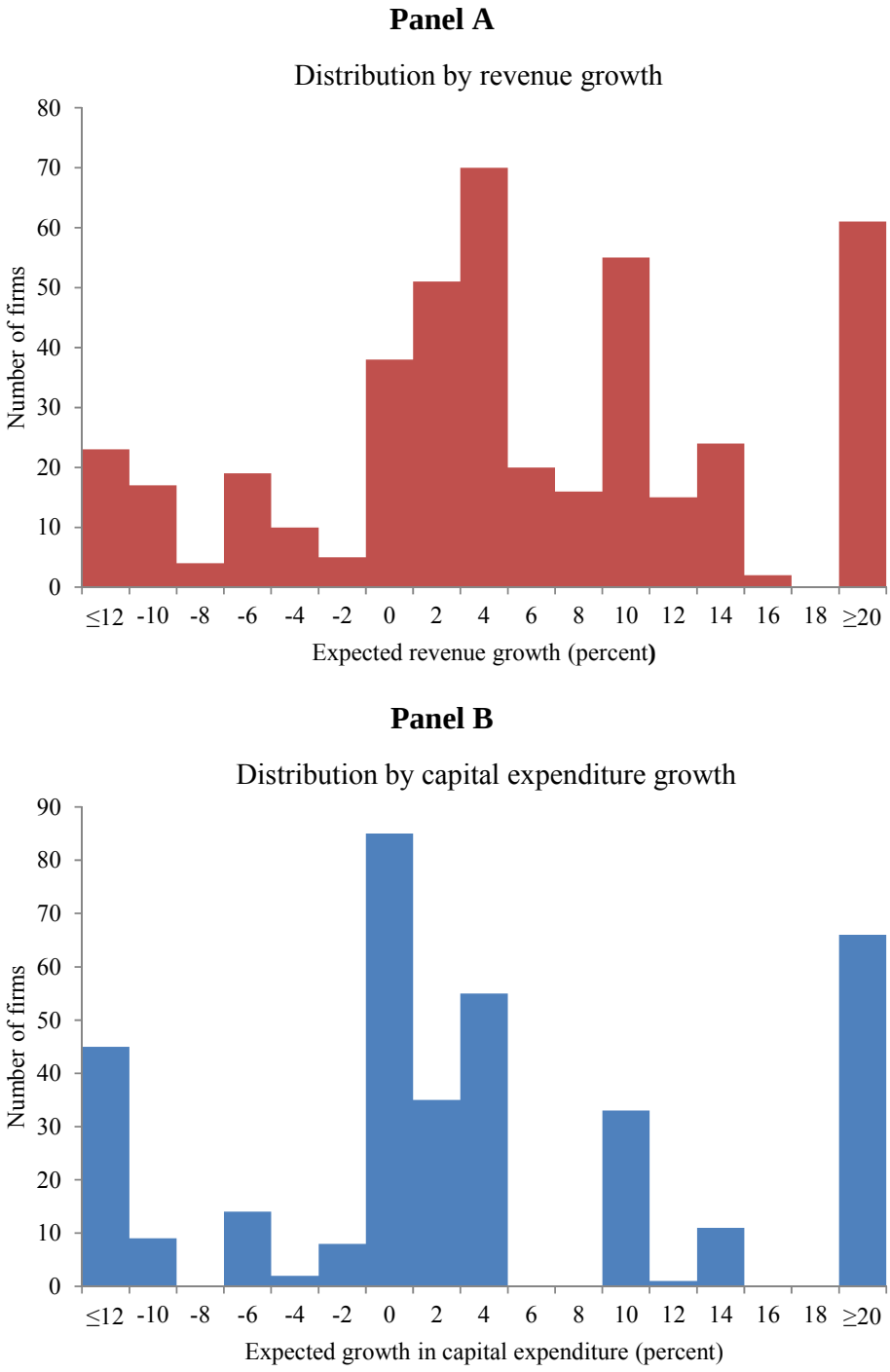
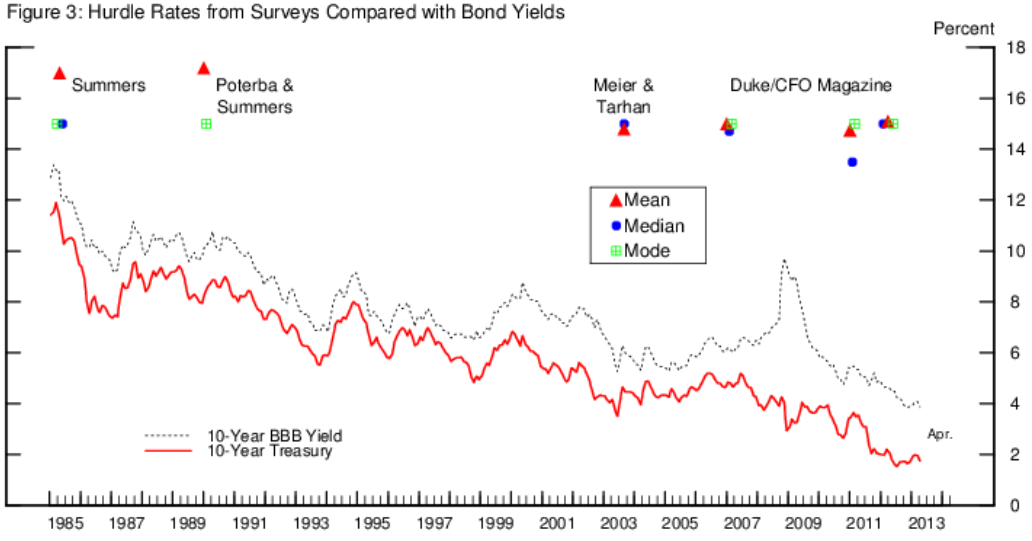


Figure 2. The figure plots the distribution of respondents to the Duke CFO survey in the third quarter of 2012 that compose the sample of firms in Table 2 by expected revenue growth (Panel A) and expected growth in capital expenditures (Panel B).

Figure 3: Hurdle Rates from Surveys Compared with Bond Yields



Source: Duke CFO Magazine Global Business Outlook; Meier and Tarhan (2007), "Corporate Investment Decisions Practices and Hurdle Rate Premium Puzzle"; Poterba and Summers (1995), "A CEO Survey of U.S. Companies' Time Horizons and Hurdle Rates", Summers (1987), "Investment Incentives and the Discounting of Depreciation Allowances"

Note: BBB yield estimated from curve fit to Merrill Lynch bond yields. Treasury yields from smoothed yield curve estimated from off-the-run securities.

Table 1. Interest Rate Sensitivity of Investment Plans

This table summarizes responses in the 2012:Q3 Duke/CFO Magazine Global Business Outlook Survey to special questions about the sensitivity of investment plans to changes in interest rates. Column 1 summarizes responses to the question: "By how much would your borrowing costs have to decrease to cause you to initiate, accelerate, or increase investment projects next year?" Column 2 summarizes responses to the question: "By how much would your borrowing costs have to increase to cause you to delay or stop investment projects next year?" Percentages are reported with respect to the total number of firms that answered the question with an answer different from "Not applicable."

Change in borrowing costs that would prompt a change in investment plans	(1) In response to a decrease in interest rates	(2) In response to an increase in interest rates
	Number (pct.)	Number (pct.)
0.5 percentage point	17 (3%)	30 (6%)
1 percentage point	27 (5%)	52 (10%)
2 percentage points	43 (8%)	85 (16%)
3 percentage points	27 (5%)	61 (11%)
More than 3 percentage points	60 (11%)	108 (20%)
Likely would not change plans	367 (68%)	198 (37%)
Total	541 (100%)	534 (100%)
Memo: "Not applicable" answers	139	146

Table 2. Sample Characteristics

This table reports the characteristics of firms that responded to the special questions about the sensitivity of investment plans to interest rate changes in the 2012:Q3 Duke/CFO Survey. Panel A (Panel B) reports the characteristics of firms that responded the question: "By how much would your borrowing costs have to increase (decrease) to cause you to delay or stop (initiate, accelerate, or increase) investment projects next year?" In both panels, column (2) summarizes the characteristics of firms that would change their investment plans in response to an interest rate change; column (3) summarizes the characteristics of firms that would likely not change investment plans in response to the interest rate change; and column (4) reports characteristics of firms that answered "Not applicable" to the special question. Working capital concerns and uncertainty concerns are indicator variables that equal one for firms that report, respectively, that working capital concerns and uncertainty was one of their top three concerns. Plan to borrow is an indicator variable constructed from responses to the question: "Do you plan to borrow to fund at least part of your investment plans next year?" Private firm is an indicator variable for privately held firms. Manufacturing, services, and retail are industry dummies. The remaining industries include mining, transportation, technology/telecommunications, health, and other industries (as reported in the survey). Percentages are computed as a fraction of the total number of firms with data on all characteristics for the same column.

Panel A: Split by responsiveness to interest rate increases

Firm characteristic	(1) Full sample (428 firms)	(2) Would respond to rate increase (261 firms)	(3) Would not "change plans" (167 firms)	(4) Memo: Answered "not applicable" to question on rate increases (146 firms)
Working capital concerns	26%	30%	21%	26%
Uncertainty concerns	32%	30%	34%	34%
Plan to borrow	49%	59%	34%	13%
Privately held	78%	77%	80%	82%
Expected revenue growth ≥ 5%	58%	54%	63%	39%
Revenue < $100 million	57%	56%	58%	77%
Manufacturing	32%	33%	31%	27%
Services	18%	17%	19%	27%
Retail	14%	12%	16%	18%
Industries other than manuf., services, and retail	36%	38%	34%	28%
Expected capex growth = N.A.	15%	17%	13%	42%

Table 2. Sensitivity to Interest Rate Changes and Firm Characteristics (continued)

Panel B: Split by responsiveness to interest rate decreases

Firm characteristic	(1) Full sample (428 firms)	(2) Would respond to rate decrease (130 firms)	(3) Would not "change plans" (298 firms)	(4) Memo: answered "not applicable" to question on rate increase (139 firms)
Working capital concerns	26%	40%	20%	26%
Uncertainty concerns	32%	29%	33%	30%
Plan to borrow	49%	50%	49%	18%
Privately held	78%	74%	80%	81%
Expected revenue growth ≥ 5%	58%	43%	64%	37%
Revenue < $100 million	57%	58%	56%	73%
Manufacturing	32%	28%	34%	27%
Services	18%	22%	16%	25%
Retail	14%	8%	16%	21%
Industries other than manuf., services, and retail	6%	10%	4%	5%
Expected capex growth = N.A.	15%	22%	13%	43%

Table 3. Regressions of the Probability of Responding to an Interest Rate Increase

This table reports the estimated marginal effects of probit regressions in which the dependent variable is an indicator for respondents to the 2012:Q3 Duke/CFO Survey that reported that they would react to an interest rate increase. Working capital concerns and uncertainty concerns are indicator variables that equal one for firms that report, respectively, that working capital concerns and uncertainty was one of their top three concerns. Expected revenue growth (over the next 12 months) is winsorized at the 10th and 90th percentiles. Plan to borrow is an indicator variable constructed from responses to the question: "Do you plan to borrow to fund at least part of your investment plans next year?" Firm size is an index based on current annual revenues ranging from 1 (less than $25 million) to 7 (more than $10 billion). Private firm is an indicator variable for privately held firms. Retail, mining, transportation, technology/communications, services, health, and other industries are industry dummies. The sample in column (3) is restricted to firms that expected revenue growth greater than −5% and the sample in column (4) is further restricted to firms that reported an expected growth rate for capital expenditures. *** indicates statistical significance at the 1% level, ** at the 5% level, and * at the 10% level.

	(1)	(2)	(3)	(4)
Working capital concerns	0.114**	0.139***	0.181***	0.212***
	[0.052]	[0.053]	[0.057]	[0.061]
Uncertainty concerns	-0.029	-0.034	-0.062	-0.094
	[0.052]	[0.053]	[0.058]	[0.063]
Plan to borrow	0.258***	0.283***	0.320***	0.336***
	[0.046]	[0.048]	[0.053]	[0.057]
Expected revenue growth	-0.007**	-0.007**	-0.011**	-0.009**
	[0.003]	[0.003]	[0.004]	[0.005]
Firm size		0.028	0.015	0.032
		[0.018]	[0.019]	[0.021]
Private firm		-0.051	-0.072	-0.049
		[0.067]	[0.070]	[0.077]
Retail		-0.097	-0.113	-0.053
		[0.081]	[0.088]	[0.093]
Mining		0.09	0.168	0.226**
		[0.120]	[0.121]	[0.112]
Transportation		-0.061	-0.109	-0.118
		[0.103]	[0.111]	[0.124]
Technology/communications		-0.106	-0.174*	-0.122
		[0.099]	[0.106]	[0.118]
Services		0.067	0.07	0.085
		[0.072]	[0.079]	[0.085]
Health		0.052	0.05	0.105
		[0.110]	[0.126]	[0.136]
Other industries		0.074	0.11	0.124
		[0.083]	[0.089]	[0.093]
Observations	428	428	365	314
Pseudo R^2	0.065	0.0844	0.112	0.128

Table 4. Regressions of the Probability of Responding to an Interest Rate Decrease

This table reports the estimated marginal effects of probit regressions in which the dependent variable is an indicator for respondents to the Duke/CFO Survey that reported that they would react to an interest rate decrease. All explanatory variables are defined as in Table 6. The sample in column (3) is restricted to firms that expected revenue growth greater than −5% and the sample in column (4) is further restricted to firms that reported an expected growth rate for capital expenditures. *** indicates statistical significance at the 1% level, ** at the 5% level, and * at the 10% level.

	(1)	(2)	(3)	(4)
Working capital concerns	0.245***	0.276***	0.288***	0.299***
	[0.054]	[0.057]	[0.061]	[0.067]
Uncertainty concerns	-0.022	-0.028	-0.026	-0.022
	[0.048]	[0.048]	[0.050]	[0.053]
Plan to borrow	0.028	0.064	0.065	0.053
	[0.045]	[0.048]	[0.051]	[0.054]
Expected revenue growth	-0.009***	-0.009***	-0.011***	-0.012***
	[0.003]	[0.003]	[0.004]	[0.004]
Firm size		-0.001	-0.014	-0.004
		[0.016]	[0.017]	[0.018]
Private firm		-0.118*	-0.128*	-0.09
		[0.067]	[0.069]	[0.072]
Retail		-0.111*	-0.113*	-0.11
		[0.066]	[0.067]	[0.070]
Mining		0.061	0.16	0.197
		[0.129]	[0.147]	[0.154]
Transportation		0.105	0.083	0.094
		[0.102]	[0.107]	[0.120]
Technology/communications		0.063	0.048	0.05
		[0.095]	[0.099]	[0.108]
Services		0.186**	0.188**	0.218**
		[0.077]	[0.085]	[0.092]
Health		0.220*	0.213	0.250*
		[0.116]	[0.132]	[0.148]
Other industries		0.088	0.106	0.085
		[0.087]	[0.094]	[0.098]
Observations	428	428	365	314
Pseudo R^2	0.0597	0.0978	0.103	0.112

Table 5. Regressions of the Increase in Interest Rates that Would Prompt a Reaction

This table reports the estimated coefficients of tobit regressions in which the dependent variable is the interest rate increase that would cause respondents to the Duke/CFO Survey to delay or stop investment projects in the next year. The dependent variable is right censored at 3.1 percentage points. All explanatory variables are defined as in Table 6. The sample in column (3) is restricted to firms that expected revenue growth greater than −5%, the sample in column (4) is further restricted to firms that reported an expected growth rate for capital expenditures, and the sample in column (5) further excludes firms that would not react to any increase in interest rates. *** indicates statistical significance at the 1% level, ** at the 5% level, and * at the 10% level.

	(1)	(2)	(3)	(4)	(5)
Working capital concerns	-0.671***	-0.719***	-0.781***	-0.860***	-0.498**
	[0.195]	[0.198]	[0.212]	[0.230]	[0.193]
Uncertainty concerns	0.002	0.01	0.135	0.182	-0.011
	[0.188]	[0.184]	[0.199]	[0.214]	[0.185]
Plan to borrow	-0.655***	-0.788***	-0.919***	-0.961***	-0.370*
	[0.178]	[0.184]	[0.202]	[0.220]	[0.191]
Expected revenue growth	0.041***	0.041***	0.046***	0.042***	0.031**
	[0.010]	[0.010]	[0.015]	[0.016]	[0.014]
Firm size		-0.003	0.005	-0.007	0.044
		[0.060]	[0.064]	[0.069]	[0.057]
Private firm		0.321	0.383	0.429	0.319
		[0.236]	[0.246]	[0.266]	[0.225]
Retail		-0.212	-0.216	-0.428	-0.481*
		[0.276]	[0.290]	[0.307]	[0.271]
Mining		-1.141***	-1.334***	-1.510***	-1.141***
		[0.427]	[0.457]	[0.469]	[0.408]
Transportation		0.044	0.493	0.603	0.252
		[0.365]	[0.407]	[0.474]	[0.362]
Technology/communications		-0.513	-0.257	-0.467	-0.851**
		[0.335]	[0.363]	[0.392]	[0.365]
Services		-0.497*	-0.555*	-0.704**	-0.529*
		[0.266]	[0.291]	[0.312]	[0.270]
Health		-0.558	-0.307	-0.616	-0.245
		[0.379]	[0.436]	[0.473]	[0.389]
Other industries		-0.403	-0.401	-0.355	-0.296
		[0.300]	[0.318]	[0.338]	[0.277]
Constant	3.721***	3.826***	3.705***	3.848***	2.720***
	[0.168]	[0.369]	[0.396]	[0.424]	[0.355]
Observations	428	428	365	314	220
Censored Observations	255	255	226	194	81
Pseudo R^2	0.0364	0.0501	0.0621	0.0741	0.045

Table 6. Regressions of the Decrease in Interest Rates that Would Prompt a Reaction

This table reports the estimated coefficients of tobit regressions in which the dependent variable is the interest rate decrease that would cause respondents to the Duke/CFO Survey to initiate, accelerate or increase investment projects in the next year. The dependent variable is right censored at 3.1 percentage points. All explanatory variables are defined as in Table 6. The sample in column (3) is restricted to firms that expected revenue growth greater than −5%, the sample in column (4) is further restricted to firms that reported an expected growth rate for capital expenditures, and the sample in column (5) further excludes firms that would not react to any increase in interest rates. *** indicates statistical significance at the 1% level, ** at the 5% level, and * at the 10% level.

	(1)	(2)	(3)	(4)	(5)
Working capital concerns	-1.163***	-1.263***	-1.486***	-1.569***	-0.095
	[0.327]	[0.337]	[0.376]	[0.411]	[0.291]
Uncertainty concerns	0.552*	0.562*	0.670*	0.693*	0.749**
	[0.330]	[0.323]	[0.360]	[0.386]	[0.288]
Plan to borrow	-0.384	-0.656**	-0.672*	-0.434	-0.326
	[0.298]	[0.309]	[0.346]	[0.374]	[0.277]
Expected revenue growth	0.027	0.021	0.041	0.034	-0.01
	[0.017]	[0.017]	[0.025]	[0.027]	[0.020]
Firm size		-0.037	-0.051	-0.12	-0.158*
		[0.101]	[0.109]	[0.120]	[0.088]
Private firm		0.656*	0.675	0.329	0.142
		[0.386]	[0.413]	[0.449]	[0.325]
Retail		0.452	0.652	0.977	-0.059
		[0.516]	[0.570]	[0.638]	[0.503]
Mining		-0.213	-0.489	-0.492	0.057
		[0.794]	[0.852]	[0.852]	[0.639]
Transportation		0.004	-0.098	0.179	0.297
		[0.606]	[0.642]	[0.723]	[0.507]
Technology/communications		-0.375	-0.363	-0.288	-0.071
		[0.570]	[0.624]	[0.679]	[0.519]
Services		-1.053**	-1.005**	-0.918*	-0.027
		[0.442]	[0.500]	[0.523]	[0.389]
Health		-1.285**	-1.504**	-1.295*	-0.644
		[0.579]	[0.662]	[0.725]	[0.483]
Other industries		-0.333	-0.583	-0.341	-0.453
		[0.506]	[0.544]	[0.581]	[0.429]
Constant	5.156***	5.205***	5.135***	5.473***	2.872***
	[0.350]	[0.646]	[0.712]	[0.782]	[0.540]
Observations	428	428	365	314	104
Censored Observations	343	343	294	257	33
Pseudo R^2	0.0313	0.0566	0.0705	0.073	0.0526

Table 7. Reasons for Insensitivity to Interest Rate Changes

Column 1 reports the reasons offered by respondents to the 2012:Q3 Duke/CFO Survey for choosing the answer "It's likely we would not change investment plans in response to an interest rate decrease" to the question "By how much would your borrowing costs have to decrease to cause you to initiate, accelerate, or increase investment projects next year?" Responses are reported as a percent of the number of firms that reported a reason for their insensitivity to interest rate decreases. Similarly, column 2 reports the reasons offered for choosing no interest rate sensitivity to the corresponding question about interest rates increases.

Category of reason offered	(1) Decrease in interest rates	(2) Increase in interest rates
Financing related		
Interest rate already very low / Return on investment much higher than interest rate	27%	11%
Ample funding from cash flow or stock / Debt is not the marginal source of finance	32%	49%
Too much debt / Weak balance sheet	4%	1%
Lacking access to credit	2%	2%
Non-financing related		
Investment based on product demand / Based on long-term plan, not current rates	17%	17%
Lack profit opportunities given demand / All desired projects funded	10%	11%
High uncertainty	3%	1%
Firm is not capital intensive / Other	5%	7%
Number of firms offering reasons	286	141
Number of firms not offering reasons	81	57

Table 8. Reasons for Insensitivity to Interest Rate Changes by Expected Revenue Growth Categories

Panel A reports the reasons offered by respondents to the 2012:Q3 Duke/CFO Survey for choosing the answer "It's likely we would not change investment plans in response to an interest rate decrease" to the question "By how much would your borrowing costs have to decrease to cause you to initiate, accelerate, or increase investment projects next year?" Reponses are split by expected revenue growth categories (no greater than 1%, greater than 1% but no greater than 5%, and greater than 5%). Similarly, Panel B reports the reasons for choosing no changes in investment plans in response to an interest rate increase by expected revenue growth categories. Percentages are computed over the number of firms that reported a reason for insensitivity in the subsample of the column.

Panel A: Reasons for insensitivity to interest rate decreases

Category of reason offered	Expected revenue growth ≤ 1%	Expected revenue growth between 1% and 5%	Expected revenue growth > 5%
Interest rate already very low / Return on investment much higher that interest rate	32%	28%	23%
Ample funding from cash flow or stock / Debt is not the marginal source of finance	32%	30%	33%
Investment based on product demand / Based on long-term plan, not current rates	12%	15%	19%
Other reasons	24%	27%	25%
Number of firms offering reasons	68	61	119

Table 8. Reasons for Insensitivity to Interest Rate Changes by Expected Revenue Growth Categories (continued)

Panel B: Reasons for insensitivity to interest rate increases

Category of reason offered	Expected revenue growth ≤ 1%	Expected revenue growth between 1% and 5%	Expected revenue growth > 5%
Interest rate already very low / Return on investment much higher that interest rate	21%	8%	10%
Ample funding from cash flow or stock / Debt is not the marginal source of finance	56%	46%	45%
Investment based on product demand / Based on long-term plan, not current rates	9%	19%	18%
Other reasons	14%	27%	27%
Number of firms offering reasons	34	26	60