Essays on Applications of Textual Analysis in Macro Finance

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Abstract

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This dissertation is a study of fundamental questions in macro-finance using modern tools from textual analysis. These questions include how financial constraints affect firm investment and financing decisions when they are not presently binding, and whether stock returns are predictable based on concerns revealed in conversations between firms and investors.

The first chapter examines whether financial covenants are an important consideration for firm decisions when they are not presently in violation. A key empirical challenge is measuring the risk of future covenant violations, which is not directly observed. I propose a novel measure of concerns about future violations by distinguishing between discussions of covenants in earnings calls that relate to the future as opposed to the past or present. As validation, I show that the measure predicts future violations and covaries intuitively with earnings, leverage, and default risk. Importantly, I find that concerns about covenants are significantly associated with reductions in investment as well as debt and equity financing activities. These responses persist even after controlling for standard measures of investment opportunities and are economically large relative to the effects of actual violations.

The second chapter empirically analyzes two explanations for how covenants concerns relate to a firm's investment decisions. One explanation is that covenant concerns coincide with a deterioration in expected profitability, which dampens firms' incentives to invest. A second explanation is that firms become concerned when they expect violations to be more costly, which indicates future difficulties with funding investments. To shed light on the relevance of these two explanations, I examine empirical patterns in analyst expectations of future earnings, loan amendments in SEC filings, and the stock returns of firms that mention covenant concerns. The evidence suggest that both explanations are relevant mechanisms driving the correlation between covenant concerns and firm activity. However, I find that the second channel is more economically significant, suggesting that covenant concerns are informative about the degree to which firms are constrained by financial

covenants.

In the third chapter, I investigate how covenant concerns relate to firm policies in a standard model of investments with financial frictions. In the model, the theoretical object that most naturally links to covenant concerns is the expected shadow cost of the borrowing constraint. As in the data, the shadow cost of the borrowing constraint covaries negatively with earnings as well as firm investment and financing activity. Through an analysis of impulse response functions, I show how the empirical correlations between covenant concerns and firm policy arise in the model. One channel is through negative productivity shocks, which raises covenant concerns and leads to a fall in investment, debt, and equity issuance. The second channel is through higher leverage, holding fixed productivity. In the model, firm with higher debt levels are more concerned about covenants when hit by a negative productivity shock, and also choose less investment, debt issuance, and equity issuance. In this chapter, I also discuss several shortcomings of the model and suggest avenues for modifications.

The final chapter investigates a new question: are stock returns predictable based on the extent to which firms are concerned about the macroeconomy? We document that firms that pay more attention to the macroeconomy earn lower average returns relative to firms that pay less attention to the macroeconomy. Differences in returns are economically significant and are not explained by traditional asset pricing factors, such as market beta, size, value, and idiosyncratic volatility. To explain the negative macroeconomic attention premium, we propose a model of attention allocation that links analyst attention to fundamental shocks affecting firm cash flows. In the model, attention to the macroeconomy is increasing in the share of earning news explained by the macroeconomic component. Firms with a greater share of cash flow news explained by the macroeconomic component face lower cash flow risk, hence earn lower expected returns.

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Chapter 1: Anticipating binding constraints: an analysis of financial covenants

1.1 Introduction

A fundamental question in macro-finance is how financial constraints affect firm investment and financing decisions. Recent research has shed light on the types of financial constraints affecting large non-financial firms in the United States, highlighting financial covenants as one of the most prevalent forms of corporate borrowing constraints (Lian and Ma (2021)). These covenants limit borrowers' actions based on financial ratios, with the most common being a restriction on total debt exceeding a multiple of earnings. This raises an important question: how relevant are financial covenants for firm investment and financing decisions?

In theory, financial constraints affect firm decisions not only when they are binding but also when they are expected to bind in the future. Previous research on the effects of financial covenants has primarily focused on covenant violations and finds that violations leads to significant reductions in investments, net debt issuance, equity payout, acquisitions, and employment.[1] However, the effects of expected covenant violations in the future have not been widely explored. Leaving out the effects of anticipated covenant violations may lead to an underestimation of the overall impact of financial covenants on firms' investment and financing decisions.

This chapter aims to examine the relationship between concerns about future covenant violations and firm investment and financing activity. To measure these concerns, I distinguish between

[1] Violations occur when firms fail to comply with the restrictions specified in the covenants. In this chapter, I equate covenant violations to constraints binding. Prior work on covenant violations include Chava and Roberts (2008), Roberts and Sufi (2009), Nini, Smith, and Sufi (2012), Falato and Liang (2016), Chava, Nanda, and Xiao (2017), Ferreira, Ferreira, and Mariano (2018), Chava, Wang, and Zou (2019), and Becher, Griffin, and Nini (2021). While cov-lite loans are not a focus of this study, the literature finds that cov-lite borrowers are still subjected to the discipline of financial covenants. (Becker and Ivashina (2016), Berlin, Nini, and Yu (2020), and Brauning, Ivashina, and Ozdagli (2021)).

discussions of covenants in earnings call transcripts that relate to the future versus those that relate to the past or present. I employ an algorithm that parses the text for sentences about covenants and identifies whether each of these sentences is forward-looking or not. The resulting measure of covenant concerns is a binary variable that indicates whether the firm's earnings call for a particular quarter contains any forward-looking sentence related to covenants. Using this measure, I shed light on the extent to which firms are concerned about future covenant violations and the potential implications of these concerns.

The algorithm to determine whether a sentence is forward-looking proceeds in two steps. First, it identifies the tense of the sentence based on its grammatical structure, a task that relies on established tools in natural language processing. Second, the algorithm searches for the presence of forward-looking keywords in the sentence. This second step is necessary since the majority of forward-looking sentences are expressed in the present tense. The algorithm categorizes a sentence as forward-looking if it is in the present tense and contains a forward-looking keyword, or if it is in the future tense.

As input to the algorithm, I develop a novel dictionary of forward-looking keywords extracted from safe harbor disclosures in SEC filings. These disclosures often contain examples of words or phrases that companies use to signal forward-looking statements. Companies have an incentive to be explicit about such statements because they can be held liable for making claims that do not materialize. Keywords such as "expect," "anticipate," or "believe" serve as linguistic cues that signal to investors that a statement is forward-looking and should not be taken as historical fact. I implement a text-search algorithm to extract these keywords from the safe-harbor disclosures.

To validate that the measure correctly identifies concerns of future covenant violations, I examine the dynamics of covenant concerns around actual violation events. The share of forward-looking covenant discussions peaks in the quarter prior to violation, rather than at violation. This finding supports the interpretation of forward-looking covenant discussions as related to concerns about the future, rather than past or present. Importantly, it also indicates that firms are able to anticipate violations to some extent before they occur. Consistent with this result, I find that covenant concerns is associated with a five percent increase increase in the probability of violation next quarter. The magnitude of the coefficient is large compared to the average probability of violation of three percent and is robust to controlling for operating earnings, covenant slack, and their second-order terms.

An examination of covenant discussions across firms and over time reveals several notable findings. First, during the financial crisis of 2008-09, the discussion of covenants with financial implications among firms increased more than threefold, in contrast to a relatively muted response in covenant violations. Second, covenant concerns vary inversely with earnings at the firm level. This result is intuitive as covenant violations are more likely to occur following a deterioration of earnings. Additionally, there is a significant heterogeneity in covenant concerns across firms, even when earnings are taken into account. In particular, firms are more concerned about covenants when they are financially constrained, as proxied by having high leverage, low cash holdings, low net worth, or low Altman z-scores. Since covenants are commonly defined based on measures of financial constraints, firms are closer to violation when these variables deteriorate.

Next, I investigate how investments and financing activities change when firms are concerned about future covenant violations. Using an event study framework, I find significant reductions in investment and financing responses in the quarters following mentions of covenant concerns. These changes coincide with a deterioration in firms' investment opportunities but persist even after investment opportunities begins to recover. To explore the role of poor investment opportunities in explaining these changes, I match each concerned firm with a group of unconcerned firms with similar Tobin's Q, cash flow, and sales growth one quarter before and when covenant concerns are mentioned. Capital expenditures of both groups show similar trends in the quarters leading up to when concerns are mentioned, but diverge significantly in the subsequent quarters. Similar patterns are also found in long-term debt growth and equity payouts in the quarters after mention, even among firms that do not subsequently violate their covenants. These results indicate that covenant concerns are associated with a greater reduction in investment and financing responses than can be explained by investment opportunities at the time concerns are mentioned.

In a panel regression specification, I find that covenant concerns are associated with a significant decline of 20.9 basis points in capital expenditures over four quarters after they are mentioned, which is equivalent to a 17 percent reduction relative to the average capital expenditure in the sample. Notably, this magnitude of change in capital expenditures associated with covenant concerns is larger than the change associated with actual covenant violations. In addition, covenant concerns are also associated with substantial reductions in the firm's asset base, long-term net debt issuance, and equity payouts. Specifically, assets decrease by 5.1 log percentage points, long-term net debt issuance drops by 44.2 basis points, and equity payouts fall by 15.8 log percentage points in the four quarters after covenant concerns are mentioned. These changes are comparable to the effects of actual covenant violations.

The results are robust to a variety of alternative specifications. For instance, the magnitude and significance of the effects do not change when controlling for operating earnings or covenant slack and their second-order terms. Additionally, the estimates remain robust when controlling for changes in default risk as proxied by the Altman z-score or observed rating downgrade, as well as text-based measures of call sentiment and risk (Hassan et al. (2019)). Furthermore, the relationship between covenant concerns and firm outcomes persists regardless of how firms discuss these concerns. Even when firms discuss these concerns with a positive tone, the association with firm investment and financing policy remains significant. Overall, this chapter provides evidence that the expectations of future binding borrowing constraints, specifically financial covenants, are associated with substantial changes in firm investment and financing decisions.

Related literature. This chapter contributes to several strands of literature. The first relates to studies on the implications of covenant violations. The literature provides ample evidence that covenant violations have economically meaningful effects on a wide range of firm outcomes, including but not limited to investments, net debt issuance, equity payouts, CEO turnover, employment, and acquisitions (Chava and Roberts (2008), Roberts and Sufi (2009), Nini, Smith, and Sufi (2012), Falato and Liang (2016), Chava, Nanda, and Xiao (2017), Ferreira, Ferreira, and Mariano (2018), Chava, Wang, and Zou (2019), and Becher, Griffin, and Nini (2021)). Several studies also emphasize the importance of lenders in affecting the outcome of violations (Demiroglu and James (2010), Murfin (2012), Bradley and Roberts (2015), Acharya et al. (2021), and Chodorow-Reich and Falato (2021)). The contribution of this chapter is to document evidence that firms cut investments and financing activities not only at violation but also when they are concerned about potential future violations. In turn, this supports the idea that the expectation of covenants violations also matter for firm outcomes.[2]

More broadly, this chapter relates to a recent literature that investigates the borrowing constraints of large US non-financial corporations. Lian and Ma (2021) document that sixty percent of large US non-financial firms have financial covenants written in their debt contracts. Drechsel (2018) and Greenwald (2019) study the macroeconomic implications of financial covenants. Closely related to this chapter, Adler (2020) finds that lower covenant slack is associated with lower investments and total debt growth. While covenant slack is conceptually linked to covenant concerns, the correlation between the two variables is low in the data (correlation = -0.1). An important reason is because covenant slack is defined based on past cash flow realizations, whereas covenant concerns also reflect the expected path of cash flows. The two measures can differ substantially when past cash flows are a poor proxy for future cash flows. Importantly, I find that the relationship between firm responses and covenant concerns are robust to controlling for covenant slack and its squared value.

Third, this chapter contributes to a literature that measures financial constraints using textual data.[3] Kaplan and Zingales (1997) is a seminal work that measures financial constraints by reading the SEC 10-K filings of 49 low dividend-paying firms. Hoberg and Maksimovic (2014) employs an algorithm to identify financially constrained firms from the universe of SEC 10-K filings, and find that constrained firms cut their investments and issuance policies to a larger extent following

[2]This result is consistent with the predictions of dynamic models of investments. See for example Gamba and Triantis (2012) and Bolton, Chen, and Wang (2013).

[3]Antweiler and Frank (2004), Tetlock (2007), and Loughran and McDonald (2011) are early applications of textual analysis in finance. See Gentzkow, Kelly, and Taddy (2019) and Loughran and McDonald (2020) for a recent survey of textual analysis in finance. In particular, a growing literature uses modern techniques in computational linguistics to analyze information in corporate disclosures. See Abis (2020), Glasserman et al. (2020), Calomiris, Mamaysky, and Yang (2020), and Cao et al. (2021) for recent examples.

unexpected negative shocks compared to unconstrained firms. Buehlmaier and Whited (2018) estimates a text-based classifier on their measure and find that more constrained firms earn higher stock returns. Bodnaruk, Loughran, and McDonald (2015) find that more frequent use of constrained words predict higher probability of dividend omissions and underfunded pensions and lower probability of dividend increases and equity recycling. Previous research studies financial constraints in general and does not look at the effects of future binding constraints. This chapter focuses on the role of financial covenants and highlights the importance of concerns about future binding constraints on firm decisions.

I also contribute to a recent literature that constructs text-based measures of unobserved variables of interests from corporate earnings calls. Hassan et al. (2019), Hassan et al. (2020b), and Hassan et al. (2020a) construct firm-level measures of political, Brexit, Covid-19 risks and find that they predict investment, hiring, stock returns, as well as other firm-level activities. Hassan et al. (2021b) identify the sources and transmission of country risk and find that the measure explains cross-country patterns in capital flows, currency premia, and real activity. Mamaysky, Shen, and Wu (2022) extract credit–relevant information from earnings call transcripts and show that the information forecasts future changes in credit spreads. The unscripted interactions between firm managers and market participants ensures that the most pertinent issues affecting the firms financial and operating performances are discussed. This chapter differs in its focus on distinguishing between references to the future, as opposed to the past or present, from textual data. In this sense, this chapter relates to Caldara and Iacoviello (2022) who separately measures the effects of threats and realizations of geopolitical adverse events.

The chapter proceeds as follows. Section 1.2 details how I measure concerns about future covenant violations and discusses the results of the validation exercises. Section 1.3 documents key stylized facts about when firms are concerned about future covenant violations. Section 1.4 examines the relationship between covenant concerns and firm responses. Finally, Section 1.5 concludes.

1.2 Data and measurement

1.2.1 Data and sample selection

The primary data is the earnings call transcripts transcribed and published by FactSet from 2002Q1 to 2020Q1. The sample consists of 418 thousand calls of 12,781 unique firms with matched CUSIP identifiers. Earnings calls are typically held once per quarter and serve as a medium for firms to discuss their most recent earnings results and disclose material information to market participants. The typical earnings calls consists of a management discussion section in which senior managers (CEOs and CFOs) discuss the company's most recent financial results and a question and answer section in which management fields questions from market participants.

I merge this data with information on covenant violations reported in SEC 10-K and 10-Q filings as well as firm-quarter level income and balance sheet information from Compustat. Information on covenant violations comes from Becher, Griffin, and Nini (2021), who extend the covenant violation data set in Nini, Smith, and Sufi (2012).[4] In particular, the algorithm searches for the joint occurrence of the word "covenant" and the following five phrases in the surrounding seven lines from the initial hit: "waiv", "viol", "in default", "modif", and "not in compliance". I use a similar algorithm to extend the dataset of covenant violations to 2020.

Subsequent analyses focus on a sample of firm-quarter observations of firms incorporated in the United States, excluding utilities (SIC 4900-4999) and financials (SIC 6000-6999), from quarters 2002Q1 to 2020Q1 constructed from the intersection of three datasets: (1) earnings call transcript from Factset, (2) income and balance sheet information from Compustat, and (3) covenant violations data from SEC 10-K and 10-Q filings. I winsorize all continuous variables at the 1 and 99 percent levels. The merged sample consists of 138,111 firm-quarter observations from 5,249 permanent Compustat firm identifiers (gvkey).

I also consider a restricted sample of firm-quarter observations with data on financial covenants from LPC DealScan. LPC DealScan database records information on private syndicated debt con-

[4] I thank Thomas Griffin for generously sharing the dataset of covenant violations.

tracts, where syndicated means a group of lenders jointly lending to a single borrower (Berlin, Nini, and Yu (2020)). Financial covenant information is available for 12 percent of debt contracts originated or amended between 2000 and 2020. The restricted sample consists of 59,403 firm-quarter observations with 2,415 firms.

1.2.2 Measuring concern about future covenant violations

The variable of interest is a measure of when firms anticipate future covenant violations. To provide some intuition for the measurement exercise, consider the following four sentences extracted from earnings calls that relates to covenants.

> "During the first quarter we exceeded accumulative limit of $61 million for the add back of these cutover-related costs for covenant purposes."
>
> "Our financial covenants are conservative."
>
> "We will proactively work with our bank groups to seek a waiver."
>
> "It now appears that we are at risk of violating our interest coverage covenant."

The first sentence describes events in the past, as illustrated by the past tense form of the root verb "exceeded". To disentangle concern about future violations from discussions of realized violations, it is important to exclude these discussions as they likely describe past covenant violations. The second sentence describes events in the present, as illustrated by the present tense form of the root verb "are". These discussions may not represent concern about future violations if they are simply reporting of existing terms of financial contracts. The last two sentences are examples of discussions about events that may occur in the future, which are the focus of subsequent analyses. The forward-looking nature of the third sentence is captured by the use of the auxiliary modal verb "will".[5] The forward-looking component of the fourth sentence is less obvious as the sentence does not contain a modal verb. However, the use of the phrase "at risk" provides a strong indicator that the discussion is related to the future.

[5] Modal verbs are verbs that are used with other verbs to express ideas such as possibility, necessity, and permission (Merriam-Webster).

The construction of forward-looking measure of covenant mentions proceeds as follows. First, I extract all sub-sentences[6] in earnings calls with variants of the word "covenant", and assign an indicator $1\{``covenant"\} = 1$ for these subsentences and 0 for other sentences. For each subsentence containing mentions of covenants, I construct an indicator $1\{forward\}$ to denote whether the sentence is forward-looking. If the subsentence is in past tense, then the indicator assignment is $1\{forward\} = 0$. If the subsentence is in present tense, then I examine whether a forward-looking keyword is present in the text. If forward-looking keyword is present, then the indicator assignment is $1\{forward\} = 1$, otherwise it is 0. If the subsentence is in the future tense, the indicator assignment is $1\{forward\} = 1$. For subsentences with ambiguous tenses, I assign $1\{forward\} = 1$ if it contains a forward-looking keyword.

Finally, I aggregate these subsentence into a call-level indicator of forward-looking covenant mentions that takes a value of one if the call contains any subsentence with covenant mentions and is labeled as forward-looking. Formally, define $\mathcal{S}_{it}$ to be the set of all subsentences in call of firm i related to fiscal quarter t. The forward-looking covenant mention $CovFuture_{it}$ is given by

$$CovFuture_{it} = \max_{s \in \mathcal{S}} \left(1\{``covenant"\} \times 1\{forward\} \right)$$

Detecting tenses

The procedure for identifying the tense of a subsentence relies on well-developed infrastructure in the natural language processing literature. Specifically, I deploy spaCy's dependency parsing algorithm to process the grammatical structure of a sentence (Honnibal and Johnson (2015)). In dependency parsing, the grammatical structure of a sentence is expressed a directed graph with words as vertices and the relationships between any two words as arcs. To construct the directed graph for a given sentence, the dependency parsing algorithm relies on an "oracle", which is a classifier trained by supervised machine learning to predict the appropriate action to take given a

[6] As spoken sentences are complex with multiple statements joined by conjunctions, I focus on subsentences by further splitting each sentence based on indicators such as "but", "so" and punctuations such as ",", ";". See Cieslak and Vissing-Jorgensen (2020) for a similar treatment of sentences in FOMC minutes and transcripts. Appendix A.3.1 provides further details of steps taken to preprocess the text.

particular configuration of the parse (Jurafsky and Martin (2000)).

For the purpose of identifying the tense of the sentence, a key output of the dependency parse is the root node of a sentence. A sentence is in the past tense if the root node is a past tense verb, or if not a past tense verb, has an auxiliary verb that is in the past tense. Consider again the example sentence provided at the beginning of the section, "During the first quarter we *exceeded* accumulative limit...for covenant purposes." For this sentence, the former case applies as the root verb "exceeded" is in the past tense, hence the sentence as a whole is past tense. The latter case is applicable for verbs that are in the past continuous tense, such as "was exceeding", or past perfect continuous tense, such as "had been exceeding".

A sentence is in the present tense if the root node is a present tense verb and if any auxiliary verb is not in the past tense or modal form. The example sentence, "Our financial covenants *are* conservative." satisfies the definition as the root verb "are" is in the present tense and the sentence does not contain an auxiliary verb. On the other hand, the example sentence "We *will* proactively work with our bank groups to seek a waiver." does not satisfy the criteria as the auxiliary verb "will" is modal, which signals that the sentence is in the future tense.

Identifying future tenses in English is less direct as the future is usually expressed using the present tense (Huddleston and Pullum (2002)). Rather, a primary way to indicate the future is to use modal verbs such as "will", "shall", or "might". I categorize a sentence as a future tense sentence if the root node is a present tense verb and if any auxiliary verb is modal. However, as the fourth example sentence in the beginning of the section illustrates, this strategy leaves out a large number of sentences that describes the future but does not explicitly contain modal auxiliary verbs. For that purpose, I turn to detecting for the usage of forward-looking keywords in the sentence.

Detecting forward-looking keywords

To construct a dictionary of forward-looking keywords, I rely on example keywords provided by firms in their safe harbor disclosures for signaling that a statement is forward-looking. Consider the following safe harbor disclaimer in the 2020-Q1 10-Q filings of Apple Inc., where example keywords are words or phrases that appear in quotation marks:

> This section and other parts of this Quarterly Report on Form 10-Q contain forward-looking statements, within the meaning of the Private Securities Litigation Reform Act of 1995, that involve risks and uncertainties. Forward-looking statements provide current expectations of future events based on certain assumptions and include any statement that does not directly relate to any historical or current fact. Forward-looking statements can also be identified by words such as "future," "anticipates," "believes," "estimates," "expects," "intends," "plans," "predicts," "will," "would," "could," "can," "may," and similar terms.

Firms tend to be careful about forward-looking statements to avoid liability in situations where the statements do not subsequently materialize. The Private Securities Litigation Reform Act of 1995 provides a safe-harbor clause that affords protection in such instances, so long as statements made are not misleading and are accompanied by meaningful cautionary statements. (Horwich (2009)) Statements made in the present tense that are accompanied by appropriate linguistic cues can be considered forward looking: "[t]he use of linguistic cues like "we expect" or "we believe," when combined with an explanatory description of the company's intention to thereby designate a statement as forward-looking, generally should be sufficient to put the reader on notice that the company is making a forward-looking statement." (*Slayton vs American Express Co*, as cited in Rosen and Carey (2016))

Building on this insight, I apply an algorithm that extracts safe-harbor disclosures from all SEC 10-K and 10-Q filings from 2002Q1 to 2021Q4. From the universe of 10-K and 10-Q filings, I identify 57 thousand filings with safe-harbor disclosures that provide examples of forward-looking keywords. The algorithm then identifies portions of the disclosures that provide examples of forward-looking words. After hand-removing false positives, typos, and ambiguous keywords, the text search procedure yields 119 unique forward-looking keywords or phrases.

Table 1.1 lists the root words of the 30 most commonly occurring forward-looking words in safe-harbor statements. The set of forward-looking keywords is intuitive. It includes words such

Table 1.1: Most common forward-looking words or phrases extracted from safe-harbor disclosures in 10-K and 10-Q filings.

Word/Phrase	Count	Word/Phrase	Count	Word/Phrase	Count
expect	84545	could	30922	contempl	3161
believ	75291	potenti	19267	will like result	2444
estim	73095	predict	18485	hope	1945
intend	71885	would	17951	possibl	1803
anticip	71480	seek	16125	forese	1665
plan	62660	might	6426	guidanc	1637
will	46940	goal	6151	aim	1513
project	43365	futur	4808	probabl	1246
may	42233	like	4647	opportun	1233
should	41302	outlook	4502	pursu	812

Notes. "Count" is number of disclosures a given phrase is used as an example. Appendix A.3.3 provides the full list of forward-looking keywords.

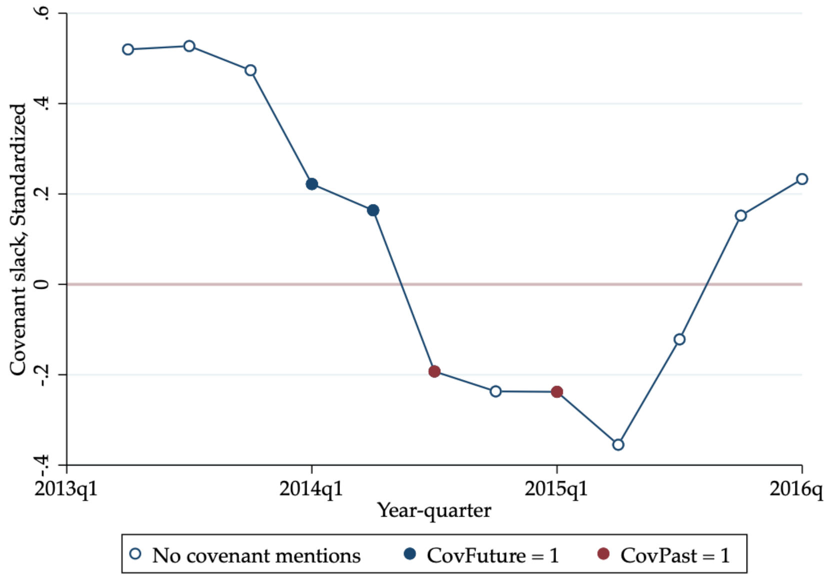
as "expect", "believ", "anticip", which convey a sense of anticipation about future events, as well as hedging terms such as "probabl", "hope", and "might", which convey a sense of uncertainty that comes with forecasting the future. A closely related word list is the Loughran and McDonald (2011) dictionary of uncertainty keywords. I find that the word list constructed from safe-harbor disclosures include informative terms not contained in the 2018 release of the Loughran-McDonald dictionary, such as "expect", "foresee", and "intend".

1.2.3 Validation

In this section, I verify that the text-based measure $CovFuture$ describes forward-looking concern about covenants. I begin with a case study of American Vanguard Corp, a large producer of agricultural chemical products listed in the NYSE. The company violated its maximum debt-to-earnings covenant in 2013Q3 but returned to compliance in 2015Q4.

Figure 1.1 plots the evolution of the firms debt-to-earnings covenant slack, the standardized difference between the maximum debt-to-earnings threshold specified in the financial covenant and the firms actual debt-to-earnings ratio, from 2013Q1 to 2016Q1. Positive values indicate compliance with the financial covenant and negative values indicate violation of the covenant. The

Figure 1.1: Case study of covenant violation event by American Vanguard Corp.



Notes. Covenant slack is the difference between covenant threshold in DealScan and financial ratio, normalized by standard deviation of financial ratio. Negative values indicate violation. Blue dots show calls in which covenant mentions are forward-looking, red dots show calls in which covenant mentions are backward-looking, white dot shows calls with no covenant mentions.

filled dots indicate year-quarters in which the firm mentions covenants. The blue dots are covenant mentions that are forward-looking, and the red dots are covenant mentions that are non-forward looking.

The figure shows forward-looking mentions of covenants begin two quarters prior to violation, as the firm faces a greater risk of violating its covenants following the precipitous decline in covenant slack. The content of the discussions suggest that the two events are directly linked. In the 2014Q1 earnings call, the CEO provides reassurances that its lenders are "supportive of the company" and that it will "decide...if [it] need[s] to make any minor short-term adjustments to key covenants...". The statement is forward-looking given the use of the phrase "short-term" and suggests that management is actively thinking about the consequences of violating its covenants.

Covenant mentions one quarter prior to violation similarly reflects forward-looking concern about covenants. In the 2014Q2 earnings call, the firm states "we believe that in addition to our anticipated cash flow from operations and having worked out some loosening of our key covenants for a few quarters[,] we have the necessary liquidity to work our way through this tough period..." The discussion is labeled as forward-looking given the presence of the word "believe".[7] Moreover, the discussion suggests that heightened concern is also accompanied by tangible action. In this instance, the firm renegotiates a loosening of covenants in anticipation of greater liquidity needs in the future.

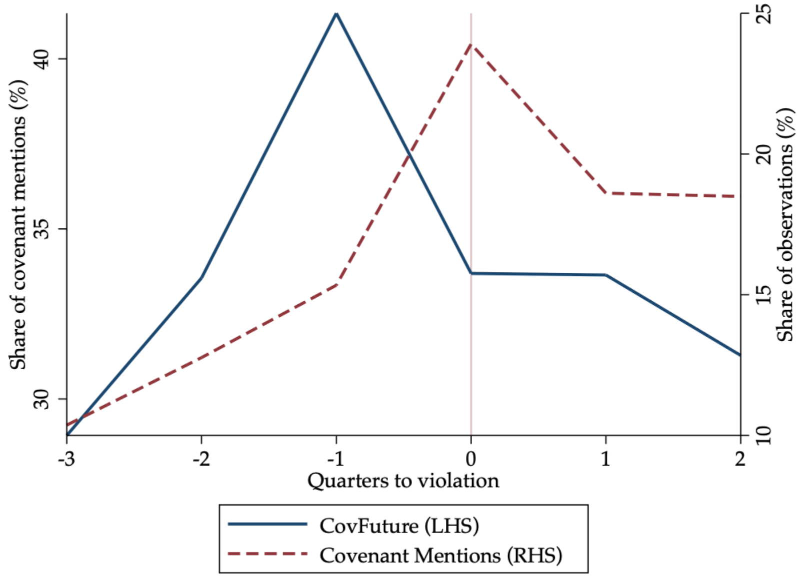
In contrast to forward-looking covenant mentions, non-forward looking covenant mentions occur after the firm violates its covenants. In its 2014Q3 earnings call, the company reminds participants that "[they] obtained covenant release from our vendor group during the third quarter to ensure that [they] had adequate borrowing capacity in light of covenants based on 12 month trailing EBITDA." The sentence is labeled as non-forward looking given that the main verb "obtained" is in past tense form. The company does not mention covenants in 2014Q4, but in 2015Q1 again discusses the terms of the covenant amendment: "[the] covenant changes were a movement up on our leverage ratio from 3.25 to 3.5 for the next three quarters... The sentence is labeled as non-forward looking given the use of the past tense verb "were".

Figure 1.2 plots covenant mentions in the quarters around violations reported in SEC filings. The dashed red line (right axis) reports the share of calls in each quarter with any discussions of covenants. The solid blue line (left axis) reports the share of covenant discussions in each quarter that are forward-looking. To provide a clean analysis of covenant discussions pre- versus post-violation, I restrict the sample to violation events with no prior violations reported in the past three quarters.

The figure shows two notable findings. First, covenant mentions in general peak in the quarter that covenants are violated, rising from 10 percent three quarters prior to violation to 24 percent in the quarter of violation. This finding suggests that covenant mentions in earnings call are not boilerplate disclosures, but rather reflect situations in which covenants become significant enough to be mentioned in discussions of the firm's earnings performance.

[7]The use of past participles "anticipated" and "worked out" does not imply that the sentence is in the past tense. Rather, the tense of the sentence is determined by the tense of the main verb. As the main verb "believe" is both in the present tense and forward-looking, the overall sentence is labeled as forward-looking.

Figure 1.2: Covenant mentions around violations reported in SEC filings.



Notes. Sample restricted to events with no violations in the preceding 3 quarters ($N = 1,167$). Left axis shows share of covenant mentions that is forward looking, right axis shows share of observations with any covenant mentions.

Second, Figure 1.2 reveals that the share of forward-looking covenant mentions peaks in the quarter prior to violation, rather than at violation.[8] This finding supports the idea that the measure captures information that relates to the future as opposed to the past or present. Importantly, this shows that firms anticipate future violations to some extent before they occur and discuss these concerns in their earnings calls.

Discussion of violations. The preceding analysis shows that around a fourth of violations are associated with covenant discussions in earnings calls. Appendix Table A.3 shows that covenant violations that are mentioned in earnings calls are associated with larger reduction to long-term debt growth, higher probability of the borrower receiving an increase in interest rates on loans, a reduction in the borrowing amount, and a credit rating downgrade. This result lends support to the idea that violations discussed in earnings calls are those that are more consequential to borrowers.

Besides financial covenants, borrowers may also be subjected to affirmative covenants, such as those that require timely submission of financial information, and negative covenants, such as

[8] Appendix Table A.2 formalizes this finding in a regression specification.

those that restrict payment of dividends or capital expenditures (Nini, Smith, and Sufi (2012)). To investigate whether there are differences in the types of violations discussed in earnings calls, I collect information on violations from a random sample of 360 violation events with matched SEC filings and earnings call transcripts. Appendix Table A.4 reports the share of violations that relates to financial covenants and the share of violations that are relates only to non-financial covenants. The analysis shows that the majority of violations are associated with financial covenants, more so violations that are discussed in earnings calls. In particular, 82.5 percent of violations pertain to a financial covenant in the unconditional sample, and 92.6 percent of violations discussed in earnings calls relate to financial covenants.

Covenant concerns predict future violation

I investigate whether covenant concerns are informative about future violations, over and above information contained in other predictors of future violations. In particular, I estimate the regression specification

$$Violation_{it} = \beta_0 + \beta_2 CovFuture_{it-1} + \alpha_i + \delta_t + \epsilon_{it} \tag{1.1}$$

where $Violation_{it}$ is an indicator for whether firm i violates a covenant in quarter t, $CovFuture_{it-1}$ is an indicator for whether firm i has a forward-looking covenant mention in quarter $t-1$, α_i and δ_t are respectively firm and time fixed effects. The coefficient of interest is β_1, the change in the probability of violating a covenant in quarter t, conditional on covenant concerns expressed in quarter $t-1$. All specifications control for lagged violation status.

The specification controls for two key predictors of future violations: operating earnings and covenant slack. Operating earnings (EBITDA) is an important predictor about future covenant violations because most financial covenants are defined to be a function of EBITDA (Lian and Ma (2021)). Prior work also finds that covenant slack, defined as the difference between the covenant threshold and the firms actual financial ratio, is an important empirical proxy for future violations (Murfin (2012) and Demerjian and Owens (2016)). I include second order terms to allow for a

Table 1.2: Predicting future covenant violations.

	(1) Violation	(2) Violation	(3) Violation	(4) Violation, Dealscan	(5) Violation, Dealscan
CovFuture (t-1)	4.98***	4.90***	4.23***	4.30***	4.80***
	(6.64)	(6.56)	(4.85)	(5.90)	(6.34)
Violation (t-1)	0.35***	0.35***	0.32***		
	(15.50)	(15.42)	(12.35)		
Violation, DealScan (t-1)				0.67***	0.64***
				(83.96)	(79.03)
Earnings (t-1)		-0.11***		-1.37***	
		(-6.85)		(-14.96)	
Sq. Earnings (t-1)		-0.05***		-2.67***	
		(-6.39)		(-8.62)	
Covenant Slack (t-1)			-2.23***		-15.10***
			(-6.29)		(-16.14)
Sq. Covenant Slack (t-1)			0.02		-2.81***
			(0.07)		(-3.74)
Unconditional avg.	3.04	3.04	3.04	35.64	35.64
% Δ relative to avg.	163.93	161.25	139.16	12.06	13.47
Firm & Time FE	✓	✓	✓	✓	✓
R-squared	0.32	0.32	0.31	0.74	0.74
Nobs	129185	129185	57062	57133	57133

Notes. Columns 1-3 report estimates from regression predicting SEC reported violations. Columns 4-5 report estimates from regression predicting DealScan implied violations. Due to data constraints, regressions on covenant slack and DealScan implied violations only cover firms with information reported in DealScan. Standard errors are two-way clustered by firm and year-quarter. T-statistics are reported in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

non-linear relationship between violation status and these variables.

Table 1.2 show that $CovFuture$ predicts a significant increase in the probability of violation next quarter. Column 1 shows that $CovFuture$ predicts a 4.98 percent ($s.e. = 0.75$) increase in the probability of SEC-reported violation in the next quarter. Relative to the average violation probability of 3.04 percent, covenant concerns are associated with a 1.6 time increase in the probability of violation. Columns 2 and 3 show that $CovFuture$ remains informative about future violations, over and above information in operating earnings, covenant slack, and their squared values. Columns 4 and 5 repeat the analysis with DealScan-implied violations as the dependent variable. In Column 4, $CovFuture$ is associated with an increase in the probability of violation by 4.3 percent ($s.e.$ = 0.72). This translates to an increase in the probability of DealScan-implied violation by 12.1 percent relative to an average of 35.6 percent. Column 5 shows that this estimate is similarly robust to controlling for covenant slack and its squared term.

1.3 Stylized facts about covenant violation risk

1.3.1 Aggregate covenant mentions, concerns, and violations

Previous empirical work on covenants finds that violations did not increase significantly during the 2008-09 financial crisis (Griffin, Nini, and Smith (2018)). Appendix Figure A.1 shows that violations imputed from covenant thresholds in DealScan also show a modest increase during the 2008-09 financial crisis. One possible interpretation of this finding is that covenants were not a more binding constraint despite the substantial decline in earnings during the crisis.

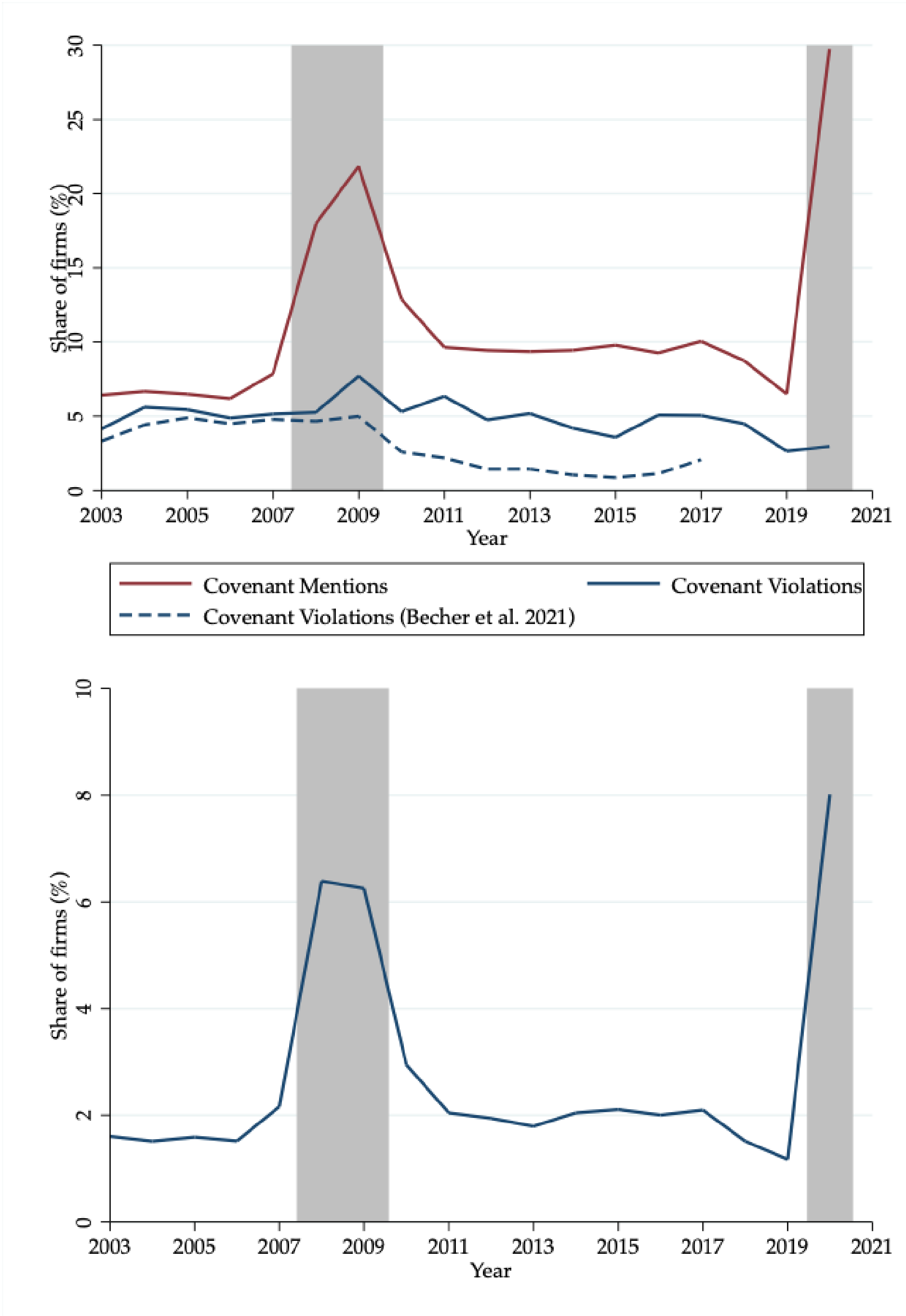
Examining mentions of covenants in earnings calls reveals a different story. The top panel of Figure 1.3 shows that during the financial crisis, the frequency of covenant discussions (red line) sharply increased from 7.3 percent in 2007 to 22.9 percent in 2009.[9] In contrast, the frequency of covenant violations (blue line) only slightly increased from 5.2 percent in 2007 to 7.6 percent in 2009, indicating that most of these discussions were made by firms that remained compliant with their covenants. The same spike in covenant concerns occurred during the 2020 Covid recession.[10]

This finding is significant given recent evidence on the role of covenants in explaining investment and employment during recessions (Falato and Liang (2016), Acharya et al. (2021), and

[9] I focus on annual frequency to reduce measurement noise due to differences in reporting quality between quarterly 10-Q and annual 10-K SEC filings, consistent with the treatment in past literature (Nini, Smith, and Sufi (2012), Griffin, Nini, and Smith (2018), and Becher, Griffin, and Nini (2021)). The sample consists of Compustat firms, excluding utilites and financials, with financial covenants based on information in DealScan, covenant violations data from SEC filings, and earnings call transcripts in FactSet. Restricting the sample to firms with active financial covenants in DealScan addresses the concern that aggregate trends are driven by changes in the share of firms with covenants.

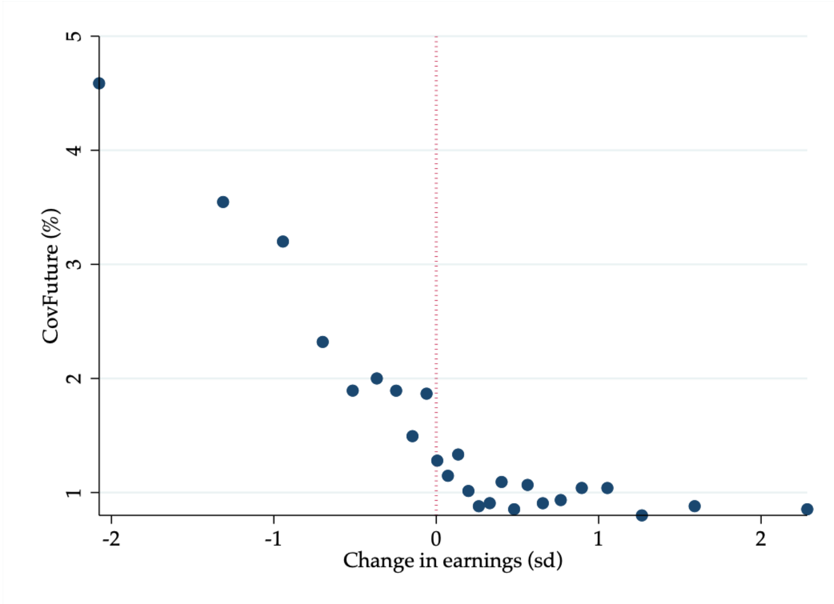
[10] The figure shows a discrepancy in covenant violations from Becher, Griffin, and Nini (2021) and covenant violations parsed from SEC filings. Since the former is corrected for measurement error through detailed reading of SEC filings, the difference likely captures mis-measured violations in the latter. In subsequent analysis, I use covenant violations from Becher, Griffin, and Nini (2021) as the default measure but extend their sample using violation information parsed from SEC filings.

Figure 1.3: Covenant violations, mentions, and concerns over time.



Notes. Top panel computes share of firms reporting covenant violations in SEC filings and any covenant mentions in earnings calls in the full sample. For covenant violation data, dashed line uses covenant violation data from Becher, Griffin, and Nini (2021) that ends in 2017Q2, whereas solid line uses covenant violation data parsed from SEC filings. Full sample consists of Compustat firms, excluding utilities and financials, with covenant information in DealScan and earnings call transcripts, from 2003Q1 to 2020Q1. Bottom panel computes share of firms with mentions of covenant concerns ($CovFuture = 1$) in a given quarter. Shaded bars denote year-quarters with NBER recession months.

Figure 1.4: Binned scatter plot of covenant concerns and change in earnings.



Notes. Change in earnings is the year-over-year difference in earnings, normalized by firm-level standard deviation of difference in earnings.

Chodorow-Reich and Falato (2021)). While previous research has focused on how covenants affect firm decisions when they are violated, this finding suggest that covenants matter to a broader set of firms, including those not currently in violation. In fact, the share of firms concerned about covenants in their earnings calls is three times as large as the share of firms in violation (22.9 percent versus 7.6 percent).

The bottom panel of Figure 1.3 shows a similar spike in forward-looking covenant concerns during the financial crisis, rising from 2.2 percent in 2007 to 6.5 percent in 2009. Together, these findings provide further evidence that firms are concerned about covenants even when they are not in violation, and that covenants are a significant concern during financial crises, including the 2008-09 financial crisis and the 2020 Covid recession.

1.3.2 Covenant concerns and firm performance

The inverse relationship between covenant concerns and earnings extends to the firm-level. Figure 1.4 plots the relationship between covenant concerns and changes in earnings, measured as the difference in earnings from four quarters prior and normalized by firm-specific standard deviation in earnings. The figure shows that concerns about covenants rise when earnings fall, but vary little when earnings rise. This finding that concerns about covenants coincide with deterioration in firm profitability is intuitive as these are precisely periods when firms expect to violate their covenants (Nini, Smith, and Sufi (2012)).[11] I also find significant heterogeneity in covenant concerns, even after controlling for earnings. Specifically, I find that firms are more likely to express concerns about covenants when they are financially constrained, even after accounting for similar declines in earnings. As Figure 1.5 shows, covenant concerns are more sensitive to decreases in earnings when leverage is high or when cash holdings, net worth, and the Altman z-score are low. Since covenants are defined based on measures of financial constraints such as leverage and net worth, a decline in these measures increases the likelihood of covenant violation. Moreover, these measures are also correlated with a higher risk of default, making lenders more likely to impose severe penalties on borrowers who violate their covenants. Given the higher probability and cost of covenant violation, firms are more concerned about the risk of breaching their covenants when they are financially constrained. Appendix Table A.5 presents a formal regression analysis of these results.

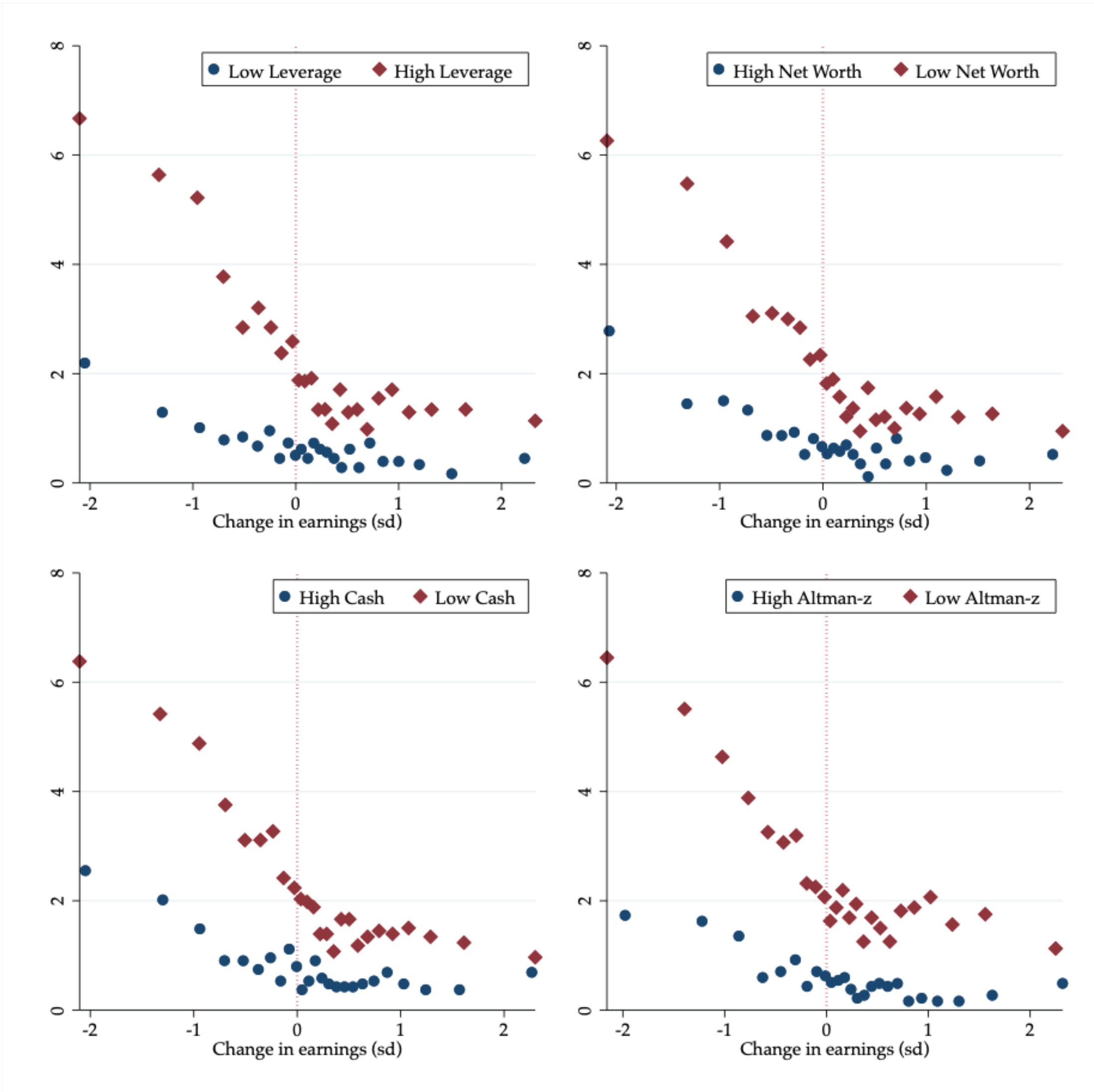
1.3.3 Cross-sectional variation in covenant concerns and violations

Table 1.3 examines additional descriptive statistics of covenant concerns and violations in the cross-section of firms. Notably, covenant concerns are discussed in earnings calls across all industries, with the highest frequency in the energy industry and the lowest frequency in the healthcare industry. Interestingly, the frequency of covenant concerns increases monotonically with the size of the firm, as measured by book assets, whereas no such pattern is observed for covenant violations.[12] This finding is consistent with prior research indicating that smaller firms tend to rely

[11] Appendix Table A.5 formalizes the findings in a regression specification. In particular, I find that the estimates are robust to controlling for violation status, firm and time fixed effects. In unreported analysis, I find the estimates qualitatively similar after dropping observations in violation in the current and past quarter.

[12] The relationship is not mechanically due to larger firms having better earnings call coverage than smaller firms. Specifically Appendix Table A.6 shows that the relationship between covenant concerns and size is robust to controlling for analyst coverage, call length, and number of quarters observed.

Figure 1.5: Cross-sectional variation in covenant concerns and change in earnings.



Notes. High (low) leverage, net worth, cash, and Altman-z are defined relative to the median value within two-digit SIC industry and time at the beginning of the quarter. Change in earnings is the year-over-year difference in earnings, normalized by firm-level standard deviation of difference in earnings.

Table 1.3: Cross-sectional summary statistics for covenant concerns and violations.

	Any Concern	Any Violation	Difference
All firms	0.21	0.26	-0.04
A. By industry			
Energy	0.39	0.32	0.07
Chemicals	0.36	0.24	0.11
Manufacturing	0.34	0.34	-0.00
Telecom	0.33	0.29	0.04
Durables	0.31	0.40	-0.09
Retail	0.26	0.25	0.01
Non-Durables	0.23	0.29	-0.06
Business-Equipment	0.11	0.22	-0.11
Health	0.08	0.17	-0.09
B. By book asset quintile			
1 (small)	0.02	0.06	-0.05
2	0.07	0.23	-0.16
3	0.11	0.25	-0.14
4	0.27	0.30	-0.03
5 (large)	0.35	0.27	0.08
C. By S&P credit rating			
Investment Grade	0.14	0.11	0.03
High Yield	0.44	0.36	0.09
No rating	0.19	0.25	-0.06

Notes. "Any Concern" shows share of firms (as fraction of one) with at least one mention of covenant concerns across all observed quarters in the sample, "Any Violation" shows share of firms (as fraction of one) with at least one violation, "Difference" shows the difference between the two shares. Industry refers to the Fama-French 12 industry classification, excluding firms that are classified as utilities, financials, and others. Book asset quintiles are constructed by sorting firms into five quintile bins each quarter based on their book asset value at the start of the quarter.

more on asset-based lending than cash-flow based lending, which is where covenants are more commonly used (Lian and Ma (2021)). Since covenants primarily apply to cash-flow based lending, smaller firms are less likely to be concerned about violating their covenants.

Furthermore, the analysis shows that firms with high yield credit ratings are more likely to be concerned about covenants and more likely to violate them compared to investment grade firms or unrated firms. This finding supports the idea that firms facing higher default risk are more likely to be concerned about violating their covenants, given the greater probability of severe penalties and potential default.

1.4 Implications of covenant concerns for firm investment and financing

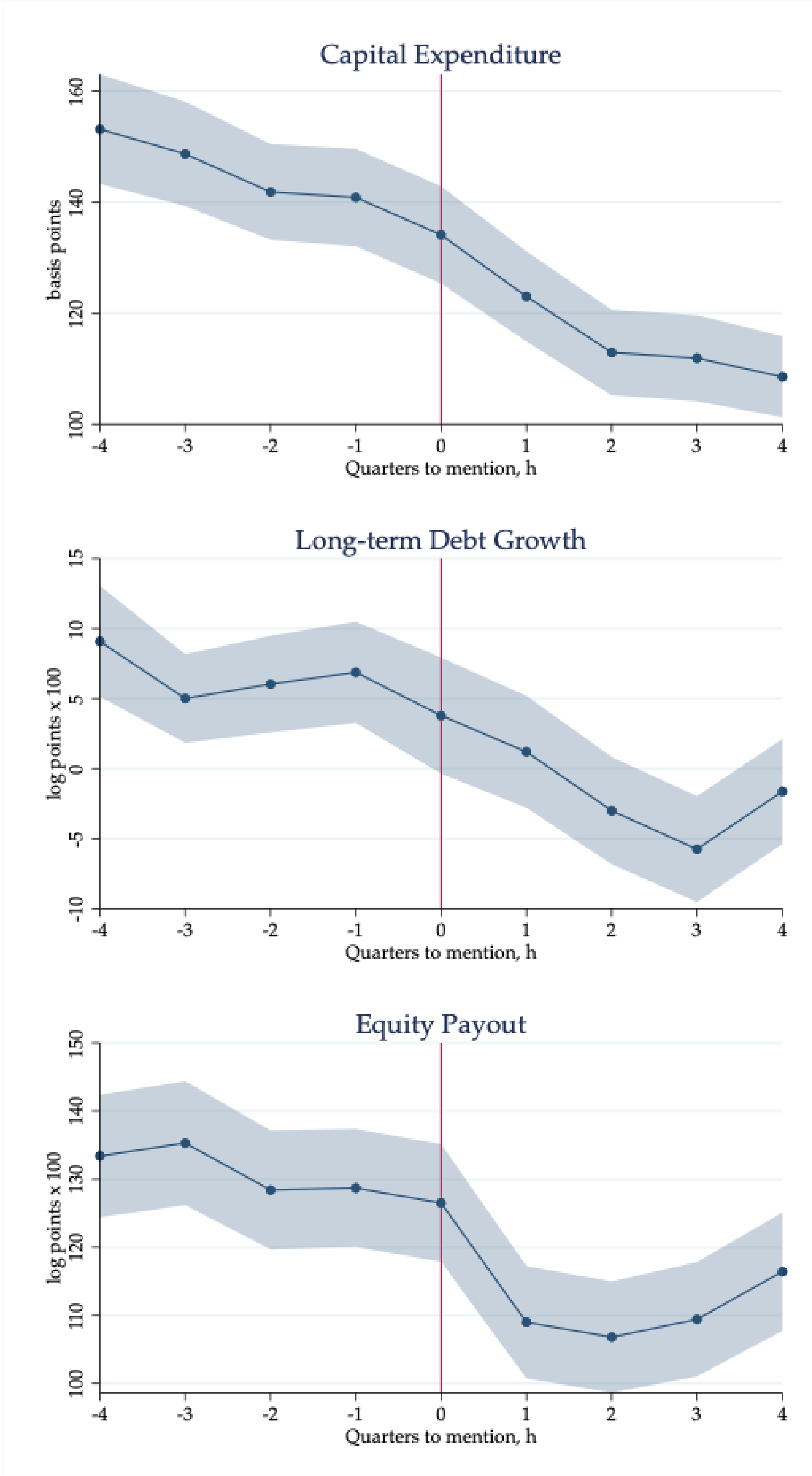
1.4.1 Event study around covenant concerns

To investigate the relationship between concerns about future covenant violations and investment and financing activity, I examine the dynamics of investment and financing activities in the quarters following firms' mention of covenant concerns. This event study is limited to events where there were no covenant violations in the quarter concerns were mentioned or in the previous four quarters and where no concerns were mentioned in any of the previous four quarters.

The top panel of Figure 1.6 shows the average trends in capital expenditures. While there is a downward trend in the four quarters before mention, there is an accelerated decline in the quarters after the mention of covenant concerns. The middle and bottom panels in Figure 1.6 display changes to debt and equity financing activities. Long-term debt growth starts to decline in the quarter when concerns are mentioned, whereas equity payouts sharply fall in the subsequent quarter.

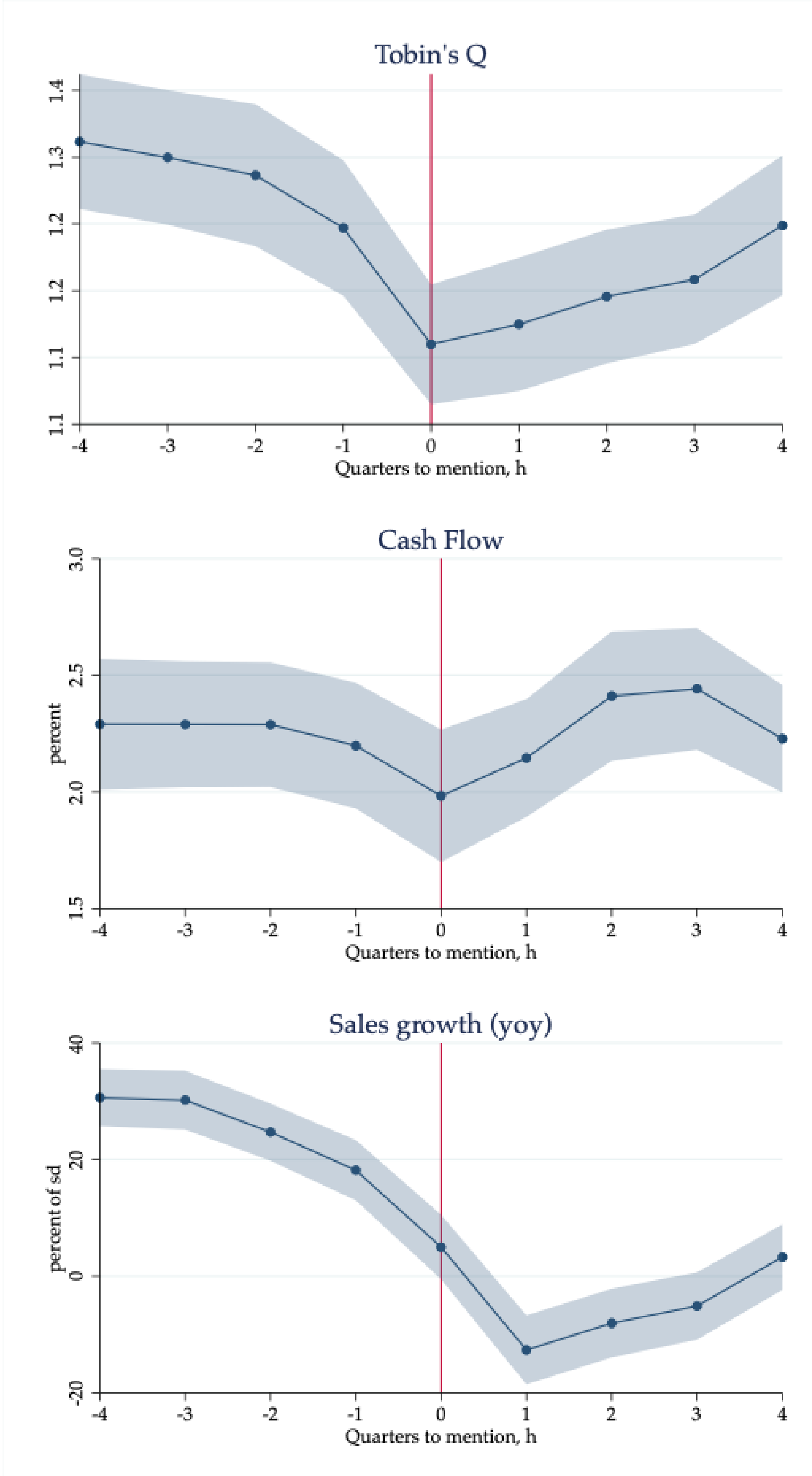
Figure 1.7 presents the dynamics of three metrics of investment opportunities: Tobin's Q, operating cash flows, and year-on-year sales growth. All three variables decline over the four quarters leading up to when concerns are mentioned. These trends suggest that covenant concerns coincide with a period of deteriorating investment opportunities. Tobin's Q and operating cash flows reach their lowest point in the quarter when covenant concerns are mentioned, but both recover in the

Figure 1.6: Investment and financing responses around covenant concerns.



Notes. Blue lines show the average responses. Shaded area denotes 95 percent confidence interval of the sample mean. Event study windows restricted to windows where no covenant concerns expressed in four quarters prior to event and no covenant violations occur in four quarters prior to and including quarter of event. ($N = 1,355$)

Figure 1.7: Measures of investment opportunities around covenant concerns.



Notes. Blue lines show the average responses. Shaded area denotes 95 percent confidence interval of the sample mean. Event study windows restricted to windows where no covenant concerns expressed in four quarters prior to event and no covenant violations occur in four quarters prior to and including quarter of event. ($N = 1,355$)

subsequent quarters. Sales growth continues to decline one quarter after concerns are mentioned but also recovers subsequently. The post-event recovery in investment opportunities suggests that poor investment opportunities may not fully account for the persistent post-event decline in firm investment and financing activities. I examine this hypothesis further in the following analysis.

Covenant concerns and investment opportunities

To better understand the relationship between firm responses to covenant concerns and changes in investment opportunities, I construct a comparison set of events that have similar trends in key measures of investment opportunities leading up to the event but with no mentions of covenant concerns. To do so, I match each firm-quarter observation where covenant concerns are mentioned with up to four firm-quarter observations where no covenant concerns are mentioned, based on their similarities along key measures of investment opportunities as defined by the Mahalanobis distance metric. The three key measures of investment opportunities are Tobins Q, operating cash flows, and sales growth, which are included because they are widely recognized proxies of Q in standard investment regressions. Sales growth is included to capture information about investment opportunities from changes in firm performance. Matching is done using both the contemporaneous and one-quarter lagged values of these variables. As before, the comparison group is restricted to observations where no covenant concerns are mentioned in any of the four quarters prior to the event and no violations occur in any of the four quarters prior to or including the event.

Table 1.4 provides a summary of the distribution of covariates for observations with and without mentions of covenant concerns, as well as the results of the matching analysis. Panel A presents covariates related to investment opportunities, which are used in the matching analysis. The results show that firms with covenant concerns have lower Tobin's Q and sales growth but higher operating cash flows compared to the full sample of observations with no mentions of covenant concerns. However, the matched group of unconcerned observations is more similar to the concerned observations in terms of these three measures. In addition, Appendix $A.2$ demonstrates parallel pre-trends in the matched variables, including the quarters not used in the matching pro-

Table 1.4: Summary statistics for matched event study sample.

	CovFuture Mentions		Matched Non-mentions		All Non-mentions	
	Mean	SD	Mean	SD	Mean	SD
A. Matched variables						
Tobin Q (t)	1.15	.81	1.18	.75	1.95	1.55
Cash Flow (t, %)	1.98	5.3	2.16	3.87	1.28	7.23
Sales Growth (t, %)	4.97	102.52	6.36	97.7	38.38	91.56
Tobin Q (t-1)	1.24	.92	1.25	.84	1.96	1.55
Cash Flow (t-1, %)	2.19	5	2.39	3.97	1.28	7.27
Sales Growth (t-1, %)	18.16	95.12	20.79	90.63	38.89	90.52
B. Non-matched variables						
Log(Assets) (t-1)	7.12	1.44	7.07	1.67	6.54	1.87
Leverage(t-1,%)	41.13	29.07	24.9	21.37	22.76	28.07
Tangible Net Worth (t-1, %)	6.62	40.72	25.64	33.54	28.74	48.49
Cash Holdings (t-1, %)	8.65	13.27	15.6	18.35	23.87	24.84
Altman-z (t-1)	1.32	2.54	2.47	3.47	4.06	6.24
N	1355		5420		121060	

Notes. "CovFuture Mentions" describe statistics of concerned firms in the quarter concerns are mentioned. "Matched Non-mentions" describe statistics of comparison firms with matched Tobin's Q, cash flow, and sales growth in the quarter prior to and when concerns are mentioned. "All Non-mentions" are statistics for all unconcerned firms in the sample. Sample restricted to concerns where no violations occur in quarters up to and including mention, and no covenant concerns expressed prior to mention.

cess.

Panel B highlights differences in the distribution of other covariates not used in the matching analysis. Specifically, firms with covenant concerns have higher leverage, lower tangible net worth, lower cash holdings, and lower Altman z-scores. As discussed in Section 1.3, these differences suggest that covenant concerns are associated with tighter financial constraints. Since financial covenants are defined based on not only the firms' earnings but also measures of financial constraints, these differences imply that firms concerned about covenants are closer to violating their covenants than their comparison group.

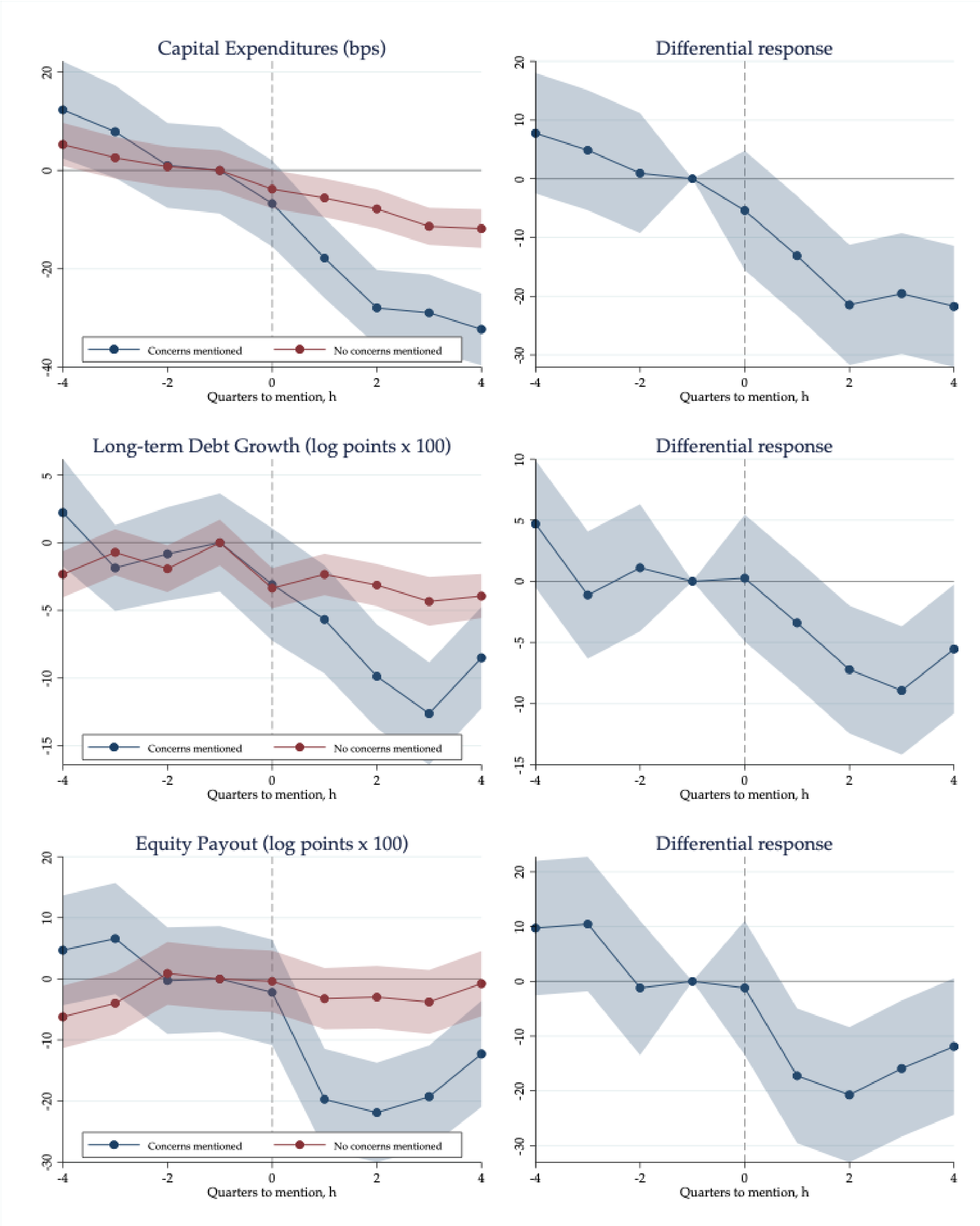
To quantify the difference in firm outcomes when covenant concerns relative to their matched comparison group, I estimate the following difference-in-differences specification

$$Y_{it} = \sum_{\tau=-4,\tau\neq-1}^{4} \beta_\tau 1\{h_{it}^{concerned} = \tau\} + \sum_{\tau=-4,\tau\neq-1}^{4} \delta_\tau 1\{h_{it}^{All} = \tau\} + \alpha_g + \alpha_{g\times concerned} + \epsilon_{it} \qquad (1.2)$$

where $1\{h_{it}^{concerned} = \tau\}$ are lead-lag indicators of quarter τ relative to the event for concerned firms, $1\{h_{it}^{All} = \tau\}$ are lead-lag indicators of quarter τ relative to the event for all firms in the sample. The group fixed effects α_g allow for differences in responses across groups of concerned firms and their matched counterparts in the baseline quarter $h = -1$, and the group-concerned fixed effects $\alpha_{g\times concerned}$ allow for group-specific time-invariant differences between concerned firms and their matched counterparts in quarter $h = -1$.

The top left panel in Figure 1.8 displays the average dynamics of capital expenditures for firms with and without covenant concerns. The blue line represents firms with covenant concerns, while the red line represents firms without. We observe that both groups experience a similar downward trend in capital expenditures in the four quarters prior to mention. However, after concerns are mentioned, firms with covenant concerns exhibit a larger decline in capital expenditures compared to their matched comparison group with similar profitability in the quarter of mention. This finding suggests that factors beyond poor investment opportunities, as proxied by Tobin's Q, operating cash flow, and sales growth, contribute to the decline in capital expenditures following covenant

Figure 1.8: Investment and financing responses around covenant concerns, relative to matched comparison group.



Notes. Left panel shows raw means, normalized to 0 in period -1. Blue line is average response when covenant concerns are mentioned. Red line is average response of matched events where concerns are not mentioned. Right panel shows differential response given by coefficient estimates from OLS specification (1.2). Shaded area denotes 95 percent confidence interval, which are based on non-clustered standard errors.

concerns. The top right panel in Figure 1.8 shows that this difference in response grows to 21.7 basis points (s.e.=5.3) four quarters after concerns are mentioned. This corresponds to an 18.1 percent decline relative to the average capital expenditure of 119.9 basis points in the unconditional sample.

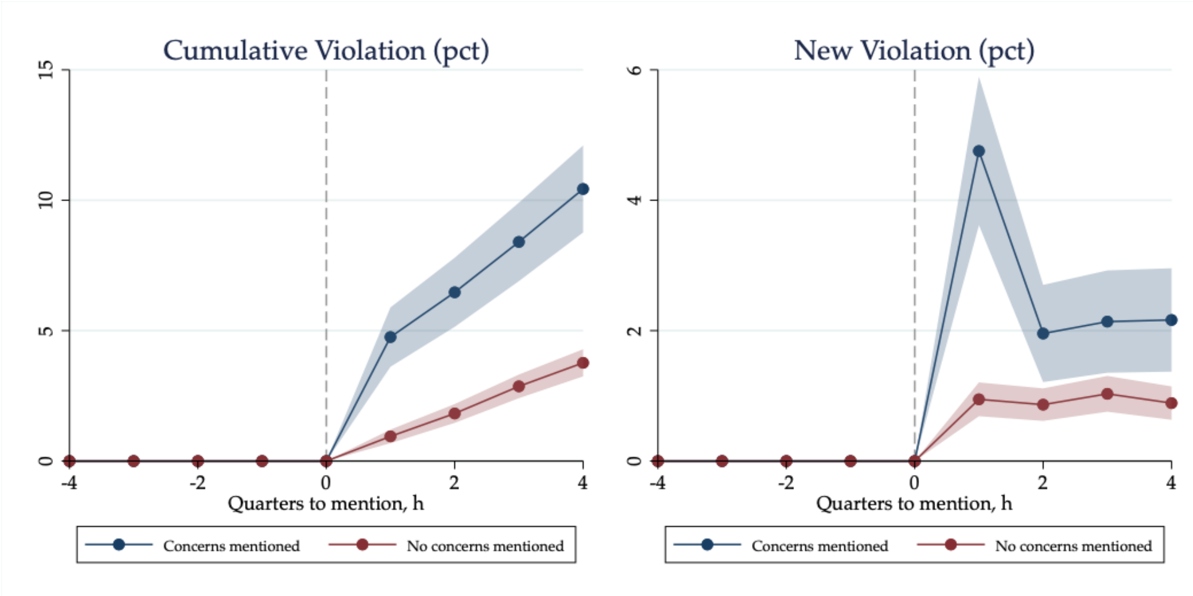
The lower two panels in Figure 1.8 further demonstrate a larger post-event decline in long-term debt growth and equity payout for firms with covenant concerns compared to their comparison group. The difference in long-term debt growth becomes significant two quarters after mention, whereas the difference in equity payouts becomes significant one quarter after mention. Three quarters after mention, the difference in long-term debt growth is 8.9 log percentage points (s.e.=2.7), which is more than twice the average unconditional long-term debt growth of 3.8 log percentage points. Similarly, two quarters after mention, the difference in equity payout is 20.7 log percentage points (s.e.=6.3), equivalent to a 16.4 percent decline relative to the average unconditional equity payout of 126.3 log percentage points. Taken together, these findings suggest that the post-event decline in firm investment and financing activities cannot be fully explained by differences in investment opportunities trends leading up to mention of covenant concerns.

Covenant concerns and ex-post violations

Figure 1.9 shows that firms that mention covenant concerns are more likely to violate their covenants in the quarters following mention than firms that do not mention concerns. The left panel displays the frequency of post-event covenant violations, revealing that 5% of concerned firms are in violation one quarter after mention, compared to only 1.4 percent of firms in the comparison group. Four quarters after mention, the gap widens further, with 10.4 percent of concerned firms experiencing at least one violation, while only 4.5 percent of the comparison group do so. The average time to the first violation after mention is 2.13 quarters, conditional on at least one violation occurring in the four quarters after mention.

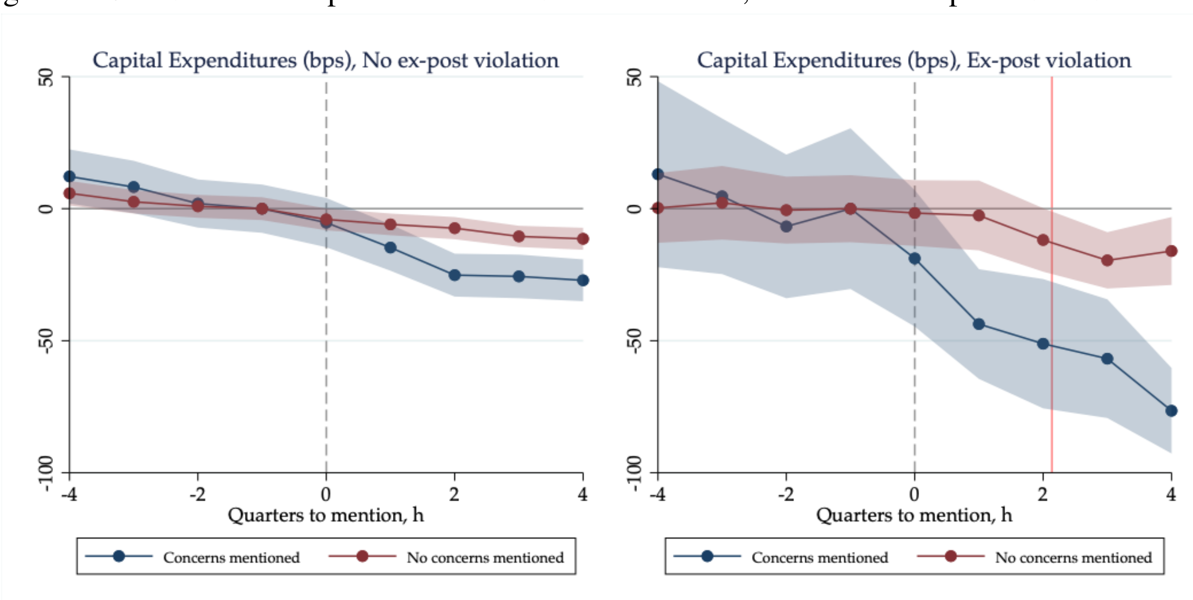
One question that arises is whether subsequent covenant violations explain the differences in capital expenditures and financing. Figure 1.10 indicates that this is not the case. The left panel

Figure 1.9: Probability of violation around covenant concerns.



Notes. Cumulative violation is the probability of any violation in the current and previous quarters following mention. New violation is the probability of a violation in the current quarter, conditional on no violation in the previous quarters following mention. Shaded area denotes 95 percent confidence interval, which are based on non-clustered standard errors.

Figure 1.10: Investment response around covenant concerns, conditional on post-event violations.



Notes. Red line is average response of control firms matched by Tobin's Q, cash flow, and sales growth in periods 0 and -1. Red vertical line in the right panels are the average quarter of first violation for firms that mention covenant concerns (2.1 quarters after mention). Shaded area denotes 95 percent confidence interval, which are based on non-clustered standard errors.

illustrates the average dynamics of capital expenditures among firms that mention covenants but do not subsequently violate them in the four quarters after mention. Even in this group, there is a significant difference in the post-event decline in capital expenditures compared to the comparison group. Four quarters after concerns are mentioned, capital expenditures of firms that mentioned concerns are 18.2 bps lower (s.e.=5.3 bps) than the comparison group. The right panel of Figure 1.10 shows that covenant concerns associated with subsequent violations are linked to even larger declines in capital expenditures. Conditional on a subsequent violation occurring, capital expenditures fall by 59.6 bps (s.e.=13.2 bps) relative to the comparison group four quarters after mention. Similar patterns are observed for long-term debt growth and equity payouts, as shown in Appendix Figure A.3.

1.4.2 Panel regression evidence

In this section, I use a regression framework to examine the robustness of the relationship between covenant concerns and firm outcomes to the inclusion of additional controls. Following the approach of Nini, Smith, and Sufi (2012), I investigate four-quarter changes in post-event firm outcomes using the regression equation:

$$Y_{it+4} - Y_{it-1} = \beta_0 + \beta_1 CovFuture_{it} + \Gamma X_{it} + \alpha_i + \delta_t + \epsilon_{it} \tag{1.3}$$

The dependent variable is the change in firm outcome from the beginning of quarter t to the end of quarter $t+4$. $CovFuture_{it}$ is an indicator for whether covenant concerns are mentioned in quarter t, and X_{it} includes a set of time-varying controls in quarters t and $t-1$. The baseline controls include Tobin's Q, operating cash flow, and sales growth in quarter t to proxy for investment opportunities, as well as the level of the dependent variable Y_{it} at the beginning of quarter t to account for reversion to the mean. To isolate the effect of covenant concerns outside of the states in which covenant violations bind, I limit the sample to observations with no violations reported in quarter t or any of the four quarters preceding quarter t. To account for correlation across firms

Table 1.5: Covenant concerns and changes in investment activity.

	Δ Capital Expenditures					Δ Log(Asset)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
CovFuture	-20.85***	-18.58***	-19.22***	-19.77***	-19.33***	-5.12***	-4.52***	-4.77***	-5.23***	-4.94***
	(-5.41)	(-4.85)	(-5.01)	(-5.12)	(-5.04)	(-5.05)	(-3.67)	(-4.19)	(-4.38)	(-4.15)
Tobin's Q	10.64***	22.84***	11.06***	11.71***	11.74***	5.73***	5.03***	5.32***	5.34***	5.92***
	(14.47)	(10.89)	(13.23)	(12.29)	(13.89)	(18.75)	(9.20)	(16.63)	(14.76)	(19.31)
Cash Flow	0.39***	0.53***	0.06	0.53***	0.52***	0.08	0.17***	-0.02	0.25***	0.25***
	(4.27)	(3.28)	(0.54)	(4.80)	(4.71)	(1.30)	(2.69)	(-0.40)	(4.87)	(4.82)
Sales Growth	4.14***	2.83***	2.98***	4.33***	4.00***	4.40***	3.86***	3.02***	4.13***	3.88***
	(5.82)	(3.08)	(4.17)	(5.59)	(5.15)	(18.89)	(13.41)	(12.51)	(16.80)	(15.39)
Covenant Slack		14.20***					3.81***			
		(4.43)					(4.14)			
Sq. Covenant Slack		0.00					1.27*			
		(0.00)					(1.68)			
Earnings			1.93***					1.35***		
			(6.55)					(12.60)		
Sq. Earnings			0.02***					0.02***		
			(3.55)					(9.07)		
Altman z-score				0.07					0.29***	
				(0.32)					(3.40)	
Rating Downgrade				-14.81***					4.47***	
				(-4.36)					(2.81)	
LM Sentiment					0.52***					0.27***
					(3.96)					(8.32)
HHLT Risk					1.88*					1.16***
					(1.75)					(4.10)
Firm & Time FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lag dependent variable	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
R^2	0.51	0.52	0.51	0.51	0.51	0.42	0.44	0.43	0.42	0.42
N	100898	46063	83267	83267	83267	101914	46664	83803	83803	83803

Notes. Dependent variables are changes from quarter t to quarter $t+4$. Coefficient estimates of the lag dependent variable, which are included as controls, are omitted. Sample restricted to observations with no violations reported in the current and past four quarters. Due to data constraints, regressions on covenant slack and its squared only cover firms with covenant information reported in DealScan. Standard errors double-clustered by firm and quarter. t-statistics are reported in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Table 1.6: Covenant concerns and changes in financing activity.

	Δ Long-Term Net Debt Issuance					Δ Equity Payout				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
CovFuture	-44.22***	-34.75**	-36.13***	-37.23***	-36.48***	-15.76***	-13.67***	-17.62***	-18.05***	-17.60***
	(-3.53)	(-2.34)	(-2.73)	(-2.82)	(-2.75)	(-5.05)	(-3.16)	(-4.92)	(-5.12)	(-5.03)
Tobin's Q	9.09***	30.94***	9.60***	8.57***	10.81***	3.96***	7.32***	3.17***	1.84	4.02***
	(5.19)	(5.47)	(4.71)	(3.37)	(5.37)	(4.79)	(2.91)	(3.10)	(1.64)	(3.92)
Cash Flow	-4.34***	-9.56***	-6.11***	-4.83***	-4.82***	0.78***	0.74***	0.45***	0.92***	0.94***
	(-7.37)	(-6.23)	(-7.30)	(-6.40)	(-6.36)	(8.07)	(3.29)	(3.58)	(7.38)	(7.48)
Sales Growth	4.34**	0.07	0.59	3.77*	2.96	7.81***	8.33***	6.18***	7.92***	7.37***
	(2.19)	(0.02)	(0.26)	(1.71)	(1.32)	(9.93)	(7.70)	(7.14)	(8.93)	(8.17)
Covenant Slack		79.86***					36.93***			
		(7.04)					(8.47)			
Sq. Covenant Slack		13.15					4.46			
		(1.44)					(1.43)			
Earnings			4.39***					2.26***		
			(4.71)					(9.00)		
Sq. Earnings			-0.00					0.03***		
			(-0.28)					(5.02)		
Altman z-score				1.15**					1.10***	
				(2.11)					(4.79)	
Rating Downgrade				-21.52					-30.96***	
				(-1.28)					(-3.40)	
LM Sentiment					0.94**					0.71***
					(2.49)					(4.20)
HHLT Risk					-3.37					0.19
					(-0.94)					(0.17)
Firm & Time FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lag dependent variable	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
R^2	0.53	0.56	0.52	0.52	0.52	0.42	0.45	0.43	0.43	0.42
N	99787	45471	82248	82248	82248	97904	44662	80113	80113	80113

Notes. Dependent variables are changes from quarter t to quarter $t+4$. Coefficient estimates of the lag dependent variable, which are included as controls, are omitted. Sample restricted to observations with no violations reported in the current and past four quarters. Due to data constraints, regressions on covenant slack and its squared only cover firms with covenant information reported in DealScan. Standard errors double-clustered by firm and quarter. t-statistics are reported in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

and over time, I apply double-clustered standard errors following Cameron, Gelbach, and Miller (2011).[13]

To test whether covenant concerns provide additional information about firm outcomes over and above other predictors of future covenant violations, I include additional control variables in the model. These include covenant slack and operating earnings, as well as their squared values, Altman z-score, an indicator for credit rating downgrade, and text-based measures of call sentiment and risk.

It is important to control for covenant slack, which is defined as the standardized difference between a firm's financial covenant threshold and its actual financial ratio, since it is a key measure of borrowing capacity. Prior work finds that a fall in covenant slack predicts higher probability of covenant violations (Murfin (2012)) and is associated with changes in firm investment and financing policies (Adler (2020)). However, in the data the correlation between covenant slack and covenant concerns is low (correlation of -0.1).This may be because covenant slack is based on past cash flow realizations, whereas covenant concerns also reflect the future path of cash flows. Both measures can differ substantially when past earnings are a poor proxy for future cash flows, for instance, when earnings are more volatile or less persistent.

Operating earnings are an important measure of a firm's borrowing capacity as financial covenants are often based on earnings, and operating earnings have been shown to predict changes in firm outcomes (Lian and Ma (2021)). Altman z-score and credit rating downgrade indicators are used as proxies for changes in default risk. Additionally, text-based measures of call sentiment and risk capture the first and second moments of firm performance contained in earnings calls. These measures are constructed using keywords from Loughran and McDonald (2011) and Hassan et al. (2019) and are obtained from the website `https://www.firmlevelrisk.com`.

The findings in Table 1.5 indicate that covenant concerns have a significant negative effect on firm investment policies. Specifically, the baseline specification (Column 1) shows that capital expenditures fall by 20.9 basis points (s.e.=3.9) over four quarters following mentions of covenant

[13] The fixed effects estimation and double clustered standard errors are implemented using the reghdfe package from Correia (2014).

concerns, which is equivalent to a 17.4 percent decline relative to average capital expenditure (119.9 basis points) in the unconditional sample. This result is robust to controlling for covenant slack and operating earnings as well as their squared terms (Columns 2 and 3). Moreover, controlling for default risk measures, including the Altman z-score and credit rating downgrade, as well as the firm's overall sentiment or general risk level, does not affect the robustness of the estimates (Columns 4 and 5). Columns 6 through 10 show that covenant concerns also predict a significant decline in log assets in the four quarters after covenant concerns are mentioned, and these estimates are also robust to the inclusion of additional controls.

Table 1.6 provides further evidence of the sensitivity of firm policies to covenant concerns. The results indicate that covenant concerns are associated with significant reductions in both debt and equity financing activities. For instance, in Column 1, covenant concerns are associated with a 44.2 basis point (s.e.=12.5) decline in long-term net debt issuance, which is equivalent to a 95 percent decline relative to the average net debt issuance (46.5 basis points) in the unconditional sample. In Column 6, covenant concerns are associated with a 15.8 log percentage point (s.e.=3.1) decline in log equity payouts, which is equivalent to a 12.5 percent decline relative to the average equity payout (126.3 log percentage point) in the unconditional sample. These results are robust to controlling for covenant slack, operating earnings, changes in default risk, as well as firm-level sentiment and risk. Overall, the findings in this section provide strong evidence that covenant concerns are an important driver of firm policies, affecting both investment and financing decisions.

Robustness checks. Appendix Tables A.8 and A.9 provide additional robustness tests to evaluate the effectiveness of the measure to alternative specifications. The first test examines whether the sentiment in which covenants are discussed matters. Columns 1 and 6 of the respective tables interact the measure of covenant concerns with an indicator for whether the tone of the discussion is positive or negative. The results indicate that regardless of the sentiment in which covenants are discussed, the measure of covenant concerns predicts changes in firm outcomes, and the estimates in these cases are not significantly different at the 10 percent level. This finding suggests that firms' forward-looking mentions of covenants reflect greater prospects of violating covenants, even if they describe these situations positively.

The second test examines whether the effects of covenant concerns on firm outcomes differ depending on whether these concerns are mentioned in more than one sentence in the earnings call. Columns 2 and 7 in the tables estimate a specification that interacts covenant concerns with an indicator for whether these concerns are discussed in more than one sentence in a given earnings call. The results show no significant difference in the estimates at the 10 percent level. Since the majority of calls that mention covenant concerns do so only once, variation in the intensive margin does not provide additional information about the extent to which firms are concerned about covenant violation risk.

The third test examines whether the effects of covenant concerns vary depending on whether concerns are mentioned in the scripted management discussion and analysis (MDA) section of the call or the questions and answers (QA) section of the call. Columns 3 and 8 show that both types of mentions significantly predict changes in firm outcomes, with no differences in the estimated coefficients. The majority of covenant concerns are mentioned in the MDA section of the call, indicating that information about covenants is disclosed voluntarily by firms in most cases.

The fourth test examines whether firm response to covenant concerns is primarily a recession phenomenon, given a previous stylized fact that covenant concerns spike during recession periods. Columns 4 and 9 interact covenant concerns with an indicator for whether the concerns are mentioned during a quarter with an NBER recession month. Both estimates are highly significant, suggesting that the association between covenant concerns and firm outcomes also holds in normal times. While the estimates of covenant concerns are larger when mentioned during recessions compared to normal times, the difference is not statistically significant except for equity payouts.

The final test examines whether covenant concerns mentioned in SEC filings also predict significant changes in firm outcomes. The measure is obtained by running the text-search algorithm described in Section 1.2.2 on the text of each firm's MDA section of their SEC filings. Columns 5 and 10 show that covenant concerns measured from SEC filings predict a smaller change in firm outcomes compared to covenant concerns measured from earnings call transcripts, suggesting that the former measure is a noisier proxy of firm-level concerns about covenant violation risk.

1.4.3 Economic magnitude

Building on Roberts and Sufi (2009), I assess the economic magnitude of the response of covenant concerns by comparing the marginal effects of covenant concerns to the marginal effects of covenant violations as well as changes in borrowing capacity, as measured by the firms leverage, earnings, and covenant slack. Leverage and earnings are standardized by subtracting their respective firm-specific average and normalizing by their respective firm-specific standard deviation.

To estimate the marginal effect of each variable of interest, I use the regression specification in (2.16) but with the variable substituted for $CovFuture_{it}$. All specifications control for Tobin's Q, cash flow, sales growth, and the lagged dependent variable. To ensure the robustness of the results, the sample is restricted to observations with no reported violations in the current and past four quarters, except when estimating the marginal effect of covenant violations. In that case, the sample is restricted to no violations in the past four quarters.

The marginal effects of covenant concerns, along with other variables of interest on firm investment and financing policy, are reported in Table 1.7. For comparison, the coefficients on $CovFuture$, which are identical to those reported in Columns 1 and 6 of Tables 1.5 and 1.6, are also included.

In Row 2 Column 1, we see that covenant concerns have a larger impact on capital expenditures than covenant violations. Specifically, in the sample, covenant violations are associated with a 7.1 basis point decline (s.e.=2.72) in capital expenditures over the subsequent four quarters. This decline is equivalent to a 5.9 percent reduction relative to the average capital expenditure of 119.9 basis points. This estimate is in line with those found in a previous study by Nini, Smith, and Sufi (2012), which reports a decline in capital expenditures between 5.1 percent and 8.4 percent relative to an average (annualized) capital expenditure of 590 basis points.

Moving on to Row 2 Column 3, we see that covenant violations are associated with a 27.7 basis point decline (s.e.=14.3) in long-term net debt issuance, which is equivalent to a 59.6 percent

Table 1.7: Economic magnitude of covenant concerns.

	(1) Δ CapEx	(2) Δ Log(Asset)	(3) Δ NDI	(4) Δ EquityPay
CovFuture	-20.85***	-5.12***	-44.22***	-15.76***
	(-5.41)	(-5.05)	(-3.53)	(-5.05)
Violation	-7.06**	-4.38***	-27.69*	-11.78***
	(-2.59)	(-4.88)	(-1.93)	(-3.79)
Violation(Mentioned)	-13.10**	-10.02***	-69.02***	-23.24***
	(-2.26)	(-5.94)	(-2.78)	(-4.49)
Leverage	-6.69***	-0.99***	-39.83***	-13.57***
	(-8.76)	(-3.79)	(-16.47)	(-14.60)
Earnings	6.18***	3.80***	16.34***	8.85***
	(8.97)	(15.04)	(7.23)	(10.95)
Covenant Slack	14.46***	3.23***	73.85***	34.74***
	(4.77)	(3.61)	(7.27)	(8.25)

Notes. This table compares the marginal effect of covenant concerns on firm outcomes to the marginal effect of covenant violations and other variables of interest. Each element in the table represents the marginal effect of the variable (row) on the firm outcome (column). The marginal effect is the estimated coefficient from regression specification 2.16, but with the respective variable (row) substituted for $CovFuture$. In the table, leverage and earnings are standardized by subtracting the firms average and dividing by the firms standard deviation. Standard errors double-clustered by firm and quarter. t-statistics are reported in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

reduction relative to the average net debt issuance of 46.5 basis points. This finding is slightly smaller than the estimated reduction in net debt issuance reported in Nini, Smith, and Sufi (2012), which ranges from 61.3 percent to 109.7 percent relative to the average (annualized) net debt issuance of 3.1 percent.

Finally, in Column 4, it is revealed that equity payouts decrease by 11.8 log percentage points (s.e.=3.1) in the four quarters following a covenant violation, which is equivalent to a 9.3 percent reduction relative to the average equity payout of 126.3 log percentage points. Comparatively, the study by Nini, Smith, and Sufi (2012) found a decline in equity payout ranging from 3.12 percent to 6.33 percent relative to the sample average equity payout of 127.9 log percentage points.

Covenant concerns appear to have a greater impact on firm investment and financing activity than covenant violations. This may be because covenant violations include both significant and insignificant violations, whereas covenant concerns primarily reflect the borrower's concern about significant violations. Consistent with this idea, Section 1.2.3 shows that earnings call discussions of covenant violations lead to more consequential changes in loan terms. In Row 3 of Table 1.7, we observe that the impact of discussed violations on various measures of firm activity is more pronounced than that of all violations combined. Although covenant concerns still have a substantial effect on investment activity compared to discussed violations, the effects on asset-based and financial activity are less significant than those of discussed violations.

The next two rows shows that the impact of covenant concerns is larger in magnitude to changes in within-firm leverage and earnings. Specifically, Column 1 of the third row shows that a one-standard deviation increase in within-firm leverage leads to a 6.7 basis point (s.e.=0.8) reduction in capital expenditures over the subsequent four quarters. Thus, the decrease in capital expenditures associated with covenant concerns is comparable to the effect of a three-standard deviation increase in within-firm leverage. Similarly, Row 5 Column 1 reveals that the marginal effect of covenant concerns on capital expenditures is similar in size to a three-standard deviation decrease in within-firm earnings. Row 5 Column 3 indicates that covenant concerns have a substantial effect on long-term net debt issuance compared to changes in within-firm earnings. Specifically, the coefficient estimates suggest that the effect of covenant concerns on long-term net debt issuance is 2.4 times the effect of a one-standard deviation decline in within-firm earnings.

Finally, the last row indicates that a one-standard deviation decrease in covenant slack results in a 14.5 basis point (s.e.=3.0) decline in capital expenditures, which is slightly smaller but comparable to the effect of covenant concerns on capital expenditures. To summarize, these results indicate that the economic significance of covenant concerns is comparable to that of covenant violations and changes in other measures of borrowing capacity.

1.5 Conclusion

Understanding how financial constraints affect firms' investment and financing decisions is a critical question in macro-finance. Recent research finds that financial covenants are among the most prevalent borrowing constraints imposed on non-financial US firms. However, measuring the impact of covenants on firms' investment and financing decisions when they are expected to be violated in the future poses a significant challenge. Neglecting to account for expected covenant violations can lead to an understatement of the total effects of covenants on firm decisions.

To address this gap, this chapter employs a novel measure of firms' concerns about future covenant violations using textual analysis of earnings call transcripts. To construct the measure of covenant concerns, I employ an algorithm that parses for sentences in the text about covenants and determines whether each of these sentences are forward-looking or not. This measure captures the extent to which firms anticipate future covenant violations, as discussions about covenants often increase several quarters before violations occur. Moreover, covenant concerns predict a significant increase in the likelihood of covenant violations in the following quarter, even after controlling for other predictors such as covenant slack.

The findings show that concerns about future covenant violations are associated with a substantial reduction in investment, debt, and equity financing. I find that the magnitude of the reduction in investment and financing activities is more substantial than a comparison group of firms with similar investment opportunities but no mention of covenant concerns. Moreover, estimates from a panel regression specification indicate that the information captured by covenant concerns is not subsumed by other predictors of covenant violations, such as covenant slack, earnings, changes in default risk, as well as firm-level sentiment and risk.

In summary, this chapter provides empirical evidence that expectations of future binding borrowing constraints, specifically financial covenants, are associated with economically meaningful changes in firm investment and financing policy, as predicted by theoretical models. The study highlights the importance of considering expected covenant violations when analyzing the impact of financial constraints on firms' decisions.

Chapter 2: An empirical analysis of potential mechanisms

2.1 Introduction

Chapter 1 studies the extent to which firms are concerned about future covenant violations and investigates the effects of these concerns on firm investment and financing policy. A key finding is that covenant concerns are associated with significant reductions in investment and financing activities, even when no violations occur. The decline in investment associated with covenant concerns is sizable relative to actual violations, and is not explained by standard measures of investment opportunities. In this chapter, I shed light on the underlying mechanisms that explain the negative correlation between covenant concerns and firm investment and financing activity.

I investigate two potential explanations for why covenant concerns may lead to a decline in investments. One possibility is that covenant concerns signal periods of expected deterioration in firm profitability. As firms face a shortfall in cash flows, they are more likely to discuss the adequacy of their liquidity and capital resources, including their ability to comply with financial covenants. If lower expected profitability is correlated with a lower marginal value of capital, then firms may have a weakened incentive to invest.

Another explanation is that covenant concerns arise when firms expect that covenant violations will have a significant impact on their operations. Roberts and Sufi (2009) find that lenders respond to violations by reducing a firm's credit facility, increasing the interest spread, or demanding additional collateral. Firms that expect to face more costly violations are more likely to be concerned about covenants. Such firms may also reduce their investment activity as they consider the difficulties of funding their investment plans if they violate their covenants.

To investigate the role of expected profitability, I examine whether covenant concerns are associated with changes in expected sales and earnings, using data on analyst forecasts from I/B/E/S.

The findings reveal that covenant concerns are linked with a downward revision in both sales and earnings in the month of the call. However, the magnitude of the decline is small. Despite controlling for changes in expected sales growth, the relationship between covenant concerns and changes in investments remains significant and large. These findings suggest that while firms that mention covenant concerns experience a decline in expected profitability, differences in expected profitability do not fully explain why covenant concerns are predictive of subsequent changes in investment activity.

Next, I explore whether covenant concerns are related to more severe covenant violations by analyzing loan amendments extracted from SEC filings. The results reveal that firms that mention concerns about covenants are twice as likely to experience a costly loan amendment in the event of a violation. Notably, these differences persist even after controlling for variations in sales growth, Tobin's Q, and cash flows at the time of mentioning covenant concerns. These findings suggest that firms mentioning covenant concerns are at a higher risk of experiencing severe covenant violations.

Further examination of the cross-sectional variation in the effects of covenant concerns on firm investment and financing activity reveals that the effects of covenant concerns are significant when leverage is high, and when cash holdings, Altman z-score, or net worth are low, but not significant otherwise. These are precisely the circumstances under which loan amendments are more likely to occur. Taken together, these results suggest that covenant concerns capture periods in which firms expect more severe consequences to covenant violations and are hence associated with significant changes in investment and financing activity.

The final set of results investigates whether covenant concerns predict subsequent changes in stock returns. Previous research, both theoretical and empirical, suggests that financial constraints have a significant effect on firms' stock returns. Financially constrained firms are unable to smooth their dividend stream in the presence of aggregate shocks, making them riskier (Livdan, Sapriza, and Zhang (2009)). As a result, more financially constrained firms expect to earn higher stock returns relative to unconstrained firms. Previous empirical studies have found that sorting firms based on general indices of financial constraints results in more financially constrained firms earning higher stock returns (Whited and Wu (2006) and Buehlmaier and Whited (2018)). However, the effect of covenant violations on subsequent stock returns has been inconclusive (Nini, Smith, and Sufi (2012)).

In this chapter, I uncover two key findings. First, I observe that covenant concerns are associated with higher subsequent stock returns, but only when earnings are below expectations. This result is contradictory to the expected profitability channel, as lower expected profitability is typically associated with lower subsequent returns. Second, I find that the returns of a portfolio composed of stocks of firms that mention covenant concerns with poor earnings covary significantly with various proxies of financial constraint risk. These results lend further support to the interpretation of covenant concerns as a measure of financial constraints.

The remaining sections of the chapter proceeds as follows. Section 2.2 outlines the two potential explanations through the lens of an investment model with borrowing constraints. Section 2.3 evaluates the relationship between covenant concerns and expected profitability. Section 2.4 studies the relationship between covenant concerns and costly loan amendments. Section 2.5 turns to the relationship between covenant concerns and stock returns. Finally, Section 2.6 concludes.

2.2 Conceptual framework

To fix ideas, I examine how covenant concerns shape the firm's investment decisions through the lens of a model. In the model, firms choose dividends D_t, debt B_t, capital K_t, and labor L_t at the beginning of period t to maximize

$$\max E_t\Big[\sum_{j=0}\beta^j D_{t+j}\Big] \tag{2.1}$$

subject to

$$\Psi(D_t) = \Pi_t + B_t - RB_{t-1} \tag{2.2}$$

$$\Pi_t = A_t K_t^{\alpha} L_t^{1-\alpha} - wL_t - \Phi(I_t, K_t) \tag{2.3}$$

$$\Phi(I_t, K_t) = I_t + \frac{\phi}{2}\Big(\frac{I_t}{K_t} - \delta\Big)^2 K_t \tag{2.4}$$

$$K_t = (1-\delta)K_{t-1} + I_{t-1} \tag{2.5}$$

$$B_t \leq \kappa \Pi_t \tag{2.6}$$

where Π_t is the firm's earnings, given the productivity process A_t, gross borrowing rate R, and wage rate L. $\Psi(D_t)$ is a dividend adjustment cost function, which can take the form of a quadratic adjustment cost function as in Jermann and Quadrini (2012). Building on Lian and Ma (2021), a key source of financial friction is that the firm's borrowing is limited to be a fraction of its earnings Π_t, given by (2.6). I interpret a costly violation to be equivalent to the borrowing constraint binding, so that $B_t = \kappa \Pi_t$.

Define the Lagrange multipliers for the budget constraint (2.2) as λ_t, the capital accumulation equation (2.5) as $\lambda_t q_t$, and the borrowing constraint (2.6) as $\lambda_t \mu_t$. The firm's optimality conditions are given by

$$w = (1-\alpha) A_t K_t^{\alpha} L_t^{-\alpha} \tag{2.7}$$

$$\lambda_t = \Psi_{D,t}^{-1} \tag{2.8}$$

$$\Phi_{I,t} \lambda_t (1 + \kappa \mu_t) = \beta E_t[\lambda_{t+1} q_{t+1}] \tag{2.9}$$

$$\lambda_t q_t = \lambda_t (1 + \kappa \mu_t)\Big(\alpha A_t K_t^{\alpha-1} L_t^{1-\alpha} - \Phi_{K.t}\Big) + \beta(1-\delta) E_t[\lambda_{t+1} q_{t+1}] \tag{2.10}$$

$$\lambda_t (1 - \mu_t) = \beta R E_t \lambda_{t+1} \tag{2.11}$$

where $\Psi_{D,t}$ is the first order derivative of $\Psi(D_t)$ with respect to D_t, $\Phi_{I,t}$ and $\Phi_{K,t}$ are the first order derivative of $\Phi(I_t, K_t)$ with respect to I_t and K_t, respectively.

In the model, the theoretical object that most naturally links to covenant concerns is the Lagrange multiplier on the borrowing constraint μ_{t+j}. Recall that $\mu_{t+j} > 0$ when a covenant violation occurs in period $t + j$, and is zero otherwise. Given that the empirical analysis in Section 1.4.1 show that covenant concerns have the strongest predictive power for violations in the next quarter, we can define covenant concerns as $E_t \mu_{t+1}$.

Given constant returns-to-scale of the production function and capital adjustment cost function, the optimality conditions implies that the optimal investment can be expressed as[1]

$$\frac{I_t}{K_t} = \left(\delta - \frac{1}{\phi}\right) + \frac{\beta}{\phi} E_t \Big[\sum_{j=0} \beta^j \frac{\lambda_{t+1+j}}{\lambda_t} \frac{1 + \kappa \mu_{t+1+j}}{1 + \kappa \mu_t} \frac{\Pi_{t+1+j}}{K_{t+1}} \Big] \tag{2.12}$$

In words, the firm's investment choice in period t I_t/K_t is a function of the firm's market-to-book value of capital, where the market value of capital is defined as the present discounted value of future profits. This result is a reprise of the insight from neoclassical investment theory. Importantly, we see that the market-to-book value of capital depends on expected future earnings Π_{t+1+j} as well as the firm's internal discount rate, given by $\beta^j \frac{\lambda_{t+1+j}}{\lambda_t} \frac{1+\kappa\mu_{t+1+j}}{1+\kappa\mu_t}$. These can be thought of the two channels driving the correlation between covenant concerns and investment.

The first channel in which covenant concerns affect investments is through expected future profits. Investments fall when the expectation of future profits Π_{t+J} for $J > 0$ fall. Hence, covenant concerns predicts a decline in investments if it is associated with a decline in expectation of future profits. While investments depend on expected future profits even in the absence of financial constraints, i.e. when $\Psi_{D,t} = 1$ and $\mu_t = 0$ for all t, it does not rule out a role for covenant concerns in explaining variation in investments. In the model with financial constraints, expected future profits is also affected by the firm's constraints on external funding.

The second channel in which covenant concerns affect investments is through the discount rate term, given by $\beta^J \frac{\lambda_{t+J}}{\lambda_t} \frac{1+\kappa\mu_{t+J}}{1+\kappa\mu_t}$ for $J > 0$. An expected violation in period $t + J$, that is $\mu_{t+J} > 0$, affects the discount rate term in two ways. First, it indirectly affects the discount rate by distorting the firm's ability to smooth dividends inter-temporally, which influences $\frac{\lambda_{t+J}}{\lambda_t}$. Second, it directly

[1] See Appendix B.3 for a mathematical derivation.

affects the discount rate through the term $\frac{1+\kappa\mu_{t+J}}{1+\kappa\mu_t}$, which arises because firms internalize the benefits of investments in relaxing its borrowing capacity.

To see how expected violations affect the firm's ability to smooth dividends inter-temporally, iterate forward the debt Euler equation (2.11) to get

$$\lambda_t = \beta^J R^J \underbrace{\left(\frac{1}{1-\mu_t}\right)}_{\text{actual violations}} E_t\Big[\prod_{j=1}^{J-1} \underbrace{\left(\frac{1}{1-\mu_{t+j}}\right)}_{\text{expected violations}} \lambda_{t+J}\Big] \tag{2.13}$$

Equation (2.13) implies that the optimizing firm equalizes the present value of marginal utility consumption across periods, in this case between period t and period $t+J$. The right hand side shows that the present value is affected not just by the Lagrange multiplier of the borrowing constraint in period t, μ_t, but also the sequence of Lagrange multipliers up to $J-1$ periods ahead. In other words, the firm's expected marginal utility depends not only on the borrowing constraint binding today, but also the expectation of the constraint binding in future periods.

To summarize, the theoretical model shows two channels through which covenant concerns shape firm investment policy. First, covenant concerns coincide with lower investment if it is associated with lower expected profitability. Second, covenant concerns coincide with lower investment if it is associated with an expected costly violation in the future. The rest of the chapter investigates the relevance of these two channels by examining additional empirical patterns from the data.

2.3 Covenant concerns and expected profitability

In this section, I examine the association between covenant concerns and changes in expected profitability using data on analyst forecasts of sales and earnings per share from I/B/E/S. To construct a dataset of expected profitability, I start by computing the consensus forecast for each firm's fiscal quarter at the end of every month leading up to the announcement date of the fiscal quarter's results. The consensus forecast is computed as the median forecast at the end of each month among analysts who have issued a forecast for the next five fiscal quarters (I/B/E/S FPI codes $= 6, 7, 8, 9, N$). To ensure the most recent forecast is used for each fiscal quarter, I take each analyst's most up-to-date forecast.

To calculate the change in forecast for a given fiscal quarter, I subtract the consensus forecast for that fiscal quarter at the end of the month from the consensus forecast of the same fiscal quarter in the previous month. Next, to measure changes in expected sales and earnings growth, I sum the change in forecast of sales and earnings per share for the next four fiscal quarters, respectively, and normalize these sums by dividing them by realized sales per share in the past four quarters. Forecasts of earnings per share is also normalized by realized sales per share to ensure that observations where realized earnings are negative are not dropped.

The sample is limited to firm-quarters with at least one forecast of sales or earnings per share for each of the next four quarters in the month before and during the earnings call. The resulting panel comprises 46,194 firm-quarter observations with valid forecasts of earnings and sales growth, which are winsorized at the 5 percent level. Appendix Table B.1 show that firms with valid forecasts tend to be larger, have higher cash flows, and less likely to violate their covenants than firms that have missing forecasts.

To investigate whether covenant concerns predict changes in expected firm performance, I estimate the following regression specification

$$F_{it}\left[\Delta Sales_{i,1,4}\right] - F_{it-}\left[\Delta Sales_{i,1,4}\right] = \beta_0 + \beta_1 CovFuture_{it} + \Gamma X_{it} + \alpha_i + \delta_t + \epsilon_t \qquad (2.14)$$

where $\Delta Sales_{i,1,4}$ the forecast of sales growth for the next four fiscal quarters, t index the month of the call, and $t-$ index the month prior to the call.[2] Controls X_{it} include measures of investment opportunities, Tobin's Q, cash flow, and realized sales growth. I also control for expected sales

[2]For instance, consider a call of a firm related to fiscal quarter 2010Q1 held on April 15, 2010. $F_{it}[\Delta Sales_{i,1,4}]$ is the forecast of sales growth over fiscal quarters 2010Q2 to 2011Q1 as of April 30, 2010, whereas $F_{it-}[\Delta Sales_{i,1,4}]$ is the forecast of sales growth over fiscal quarters 2010Q2 to 2011Q1 as of March 31, 2010.

growth based on forecasts in the month prior to the call. To rule out changes due reported violations, the sample is restricted to firm-quarters where no violations are reported in the current and past four quarters.

Table 2.1 presents the coefficient estimates from equation (2.14). In the top panel, I find that covenant concerns are associated with a downward revision in expected sales growth over the next four quarters. Specifically, in the baseline specification (Column 1), covenant concerns are linked to a 0.44 percent decline ($s.e.$ = 0.12) in expected sales growth. This decline is equivalent to a 5.1 percent decrease relative to the average expected sales growth of 8.65 percent before the earnings call. The bottom panel shows that covenant concerns are similarly associated with a downward revision in expected earnings growth over the next four quarters. The results indicate that covenant concerns are related to a 0.26 basis point decline ($s.e.$ = 0.09) in expected earnings over past sales, which is equivalent to a 2 percent decline relative to the average expected earnings over past sales. I find that these estimates remain robust in Columns 2 through 5, where additional controls such as covenant slack, operating earnings, Altman z-score, credit rating downgrade, and the call's sentiment and risk are included. The overall findings suggest that covenant concerns lead to a deterioration in expected profitability, although the decline in magnitude is relatively small.

Next, I probe whether the relationship between covenant concerns and firm outcomes hold after controlling for information in expected earnings growth. Specifically, I estimate the regression specification given by (2.16) in Chapter 1, except for additional controls for expected earnings growth. The specification is restated below for convenience

$$Y_{it+4} - Y_{it-1} = \beta_0 + \beta_1 CovFuture_{it} + \Gamma X_{it} + \alpha_i + \delta_t + \epsilon_{it}$$

where the dependent variable is the change in firm is outcome from beginning of quarter t to end of quarter t+4, $CovFuture_{it}$ is the measure of covenant concerns, X_{it} are the set of controls in periods t and $t-1$, and α_i and δ_t are firm and time fixed effects. In addition to controls for investment opportunities, I also control for changes in expected earnings growth in the month around a call,

Table 2.1: Covenant concerns and changes in expected sales and earnings growth.

	Change in Expected Sales Growth (pct)				
	(1)	(2)	(3)	(4)	(5)
CovFuture (t)	-0.43***	-0.38***	-0.42***	-0.42***	-0.39***
	(-3.60)	(-2.96)	(-3.59)	(-3.59)	(-3.32)
Sales Surprise (t)	1.42***	1.39***	1.42***	1.42***	1.41***
	(32.85)	(29.62)	(32.84)	(32.85)	(32.87)
Expected Sales Growth ($t-$)	-0.03***	-0.03***	-0.03***	-0.03***	-0.03***
	(-8.81)	(-7.15)	(-8.79)	(-8.80)	(-8.99)
Firm FE	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	✓	✓
R^2	0.32	0.35	0.32	0.32	0.32
N	39732	20376	39732	39732	39732
	Change in Expected Earnings Growth (bps)				
	(1)	(2)	(3)	(4)	(5)
CovFuture (t)	-0.25***	-0.19**	-0.25***	-0.25***	-0.22**
	(-2.83)	(-2.52)	(-2.82)	(-2.83)	(-2.35)
Earnings Surprise (t)	0.54***	0.44***	0.51***	0.54***	0.53***
	(21.52)	(15.29)	(20.75)	(21.54)	(21.58)
Expected Earnings Growth ($t-$)	-0.02***	-0.03***	-0.03***	-0.02***	-0.02***
	(-8.09)	(-6.85)	(-9.27)	(-8.10)	(-8.42)
Firm FE	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	✓	✓
R^2	0.27	0.28	0.28	0.27	0.28
N	43523	23734	43523	43523	43523

Notes. This table examines whether covenant concerns are associated with changes in expected sales and earnings growth over the next four quarters. The columns report specifications with similar controls as in Tables 1.5 and 1.6. Due to data constraints, regressions on covenant slack and its squared (Column 2) only cover firms with covenant information reported in DealScan. Sample excludes observations where violation reported in the current and past four quarters. Standard errors double-clustered by firm and quarter. t-statistics are reported in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Table 2.2: Covenant concerns and changes in investment activity, controlling for expected earnings growth.

	Δ Capital Expenditures					
	(1)	(2)	(3)	(4)	(5)	(6)
CovFuture (t)	-14.99***	-13.04**	-13.04***	-12.96**	-12.82**	-12.59**
	(-2.99)	(-2.62)	(-3.14)	(-2.61)	(-2.58)	(-2.54)
Change in Expected Earn Growth		1.85***	3.55***	1.76***	1.86***	1.79***
		(6.07)	(5.79)	(5.79)	(6.08)	(5.96)
Earnings Surprise (t)		1.03	1.08	0.43	1.01	0.96
		(1.47)	(1.21)	(0.58)	(1.45)	(1.37)
Expected Earnings Growth ($t-$)		0.87***	1.49***	0.77***	0.87***	0.85***
		(5.55)	(5.56)	(5.02)	(5.57)	(5.48)
Firm & Time FE	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
R^2	0.51	0.51	0.52	0.51	0.51	0.51
N	43120	43120	26661	43120	43120	43120

	Δ Log(Assets)					
	(1)	(2)	(3)	(4)	(5)	(6)
CovFuture (t)	-3.46***	-2.47**	-2.63**	-2.50**	-2.54**	-2.31**
	(-2.96)	(-2.22)	(-2.38)	(-2.27)	(-2.27)	(-2.08)
Change in Expected Earn Growth		0.74***	0.91***	0.66***	0.74***	0.72***
		(10.07)	(7.68)	(9.03)	(10.05)	(9.86)
Earnings Surprise (t)		0.67***	0.49***	0.18	0.67***	0.64***
		(3.75)	(2.72)	(0.97)	(3.76)	(3.61)
Expected Earnings Growth ($t-$)		0.48***	0.67***	0.38***	0.48***	0.48***
		(14.17)	(10.47)	(11.54)	(14.23)	(14.06)
Firm & Time FE	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
R^2	0.44	0.46	0.46	0.47	0.46	0.46
N	42929	42929	26788	42929	42929	42929

Notes. Dependent variables are changes from quarter t to quarter $t + 4$. "Change in Expected Earn Growth" is the difference in expected earnings per share over the next four quarters at the end of the month of a call relative to the beginning of the month, divided by realized sales per share in the current and past three quarters. Column 1 is the specification with just baseline controls for Tobin's Q, operating cash flow and sales growth. Column 2 includes additional controls for expectations reported in the table. Columns 3 to 6 include additional controls similar to those reported in Columns 2 to 5 in Tables 1.5 and 1.6. Due to data constraints, regressions on covenant slack and its squared (Column 2) only cover firms with covenant information reported in DealScan. Sample excludes observations where violation reported in the current and past four quarters. Standard errors double-clustered by firm and quarter. t-statistics are reported in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Table 2.3: Covenant concerns and changes in financing activity, controlling for expected earnings growth.

	Δ Long-Term Net Debt Issuance					
	(1)	(2)	(3)	(4)	(5)	(6)
CovFuture (t)	-15.46	-12.50	-12.65	-12.37	-12.31	-10.65
	(-0.76)	(-0.62)	(-0.54)	(-0.61)	(-0.61)	(-0.53)
Change in Expected Earn Growth		1.68	4.87**	1.45	1.68	1.34
		(1.27)	(2.04)	(1.12)	(1.28)	(1.00)
Earnings Surprise (t)		1.27	2.36	-0.15	1.29	1.00
		(0.37)	(0.66)	(-0.04)	(0.38)	(0.29)
Expected Earnings Growth ($t-$)		1.67***	1.98***	1.41***	1.64***	1.63***
		(4.59)	(3.10)	(3.80)	(4.42)	(4.44)
Firm & Time FE	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
R^2	0.53	0.53	0.57	0.53	0.53	0.53
N	42460	42460	26208	42460	42460	42460

	Δ Equity Payout					
	(1)	(2)	(3)	(4)	(5)	(6)
CovFuture (t)	-16.91***	-14.76**	-10.97*	-14.72**	-14.46**	-14.04**
	(-3.00)	(-2.57)	(-1.89)	(-2.58)	(-2.54)	(-2.47)
Change in Expected Earn Growth		0.86***	1.55***	0.65**	0.87***	0.73**
		(2.91)	(3.09)	(2.17)	(2.97)	(2.48)
Earnings Surprise (t)		2.91***	2.40**	1.62*	2.94***	2.80***
		(3.60)	(2.50)	(1.97)	(3.63)	(3.49)
Expected Earnings Growth ($t-$)		1.13***	1.37***	0.90***	1.07***	1.12***
		(8.24)	(6.15)	(6.27)	(7.75)	(8.11)
Firm & Time FE	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
R^2	0.45	0.46	0.48	0.46	0.46	0.46
N	40428	40428	25366	40428	40428	40428

Notes. Dependent variables are changes from quarter t to quarter $t + 4$. "Change in Expected Earn Growth" is the difference in expected earnings per share over the next four quarters at the end of the month of a call relative to the beginning of the month, divided by realized sales per share in the current and past three quarters. Column 1 is the specification with just baseline controls for Tobin's Q, operating cash flow and sales growth. Column 2 includes additional controls for expectations reported in the table. Columns 3 to 6 include additional controls similar to those reported in Columns 2 to 5 in Tables 1.5 and 1.6. Due to data constraints, regressions on covenant slack and its squared (Column 2) only cover firms with covenant information reported in DealScan. Sample excludes observations where violation reported in the current and past four quarters. Standard errors double-clustered by firm and quarter. t-statistics are reported in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

expected earnings growth in the month prior to the call, and earnings surprise. The sample is restricted only to observations with information on expected earnings growth over the next four quarters, as well as no covenant violations reported in the current and past four quarters.

Table 2.2 presents the coefficient estimates for covenant concerns as well as additional controls from forecasting data. In unreported analysis, I find that the estimates remain qualitatively similar when controlling for changes in expected sales growth. The results show that changes in expected earnings growth are significant predictors of changes in capital expenditures and log assets, which is consistent with the notion that investments are influenced by expectations of future profits. The coefficient estimates on covenant concerns slightly diminish but remain significant and substantial relative to the specification without controls for expectations (Column 1).

Table 2.3 displays the estimates for changes in long-term net debt issuance and changes in equity payouts. The results indicate that covenant concerns continue to predict subsequent reductions in equity payouts, even after controlling for expected earnings growth. However, covenant concerns no longer predict changes in long-term net debt issuance. In Column 1, the coefficient estimate for covenant concerns is not significant for the sample of firms with sales forecast data, even when no additional controls are included. This suggests that differences in sample composition partly account for the variations in coefficient estimates relative to the baseline specification.

To summarize, the findings in this section show that covenant concerns are associated with a downward revision in expected sales and profitability. However, the magnitude of the change is small and the relationship between covenant concerns and firm investment remains large and significant even after controlling for information in expected earnings growth.

2.4 Covenant concerns and costly covenant violations

In this section, I investigate whether covenant concerns are associated with more severe consequences. I measure the severity of covenant violations based on changes in loan terms reported in SEC filings, building on previous work by Roberts and Sufi (2009).[3] To construct my measure of

[3]Roberts and Sufi (2009) identifies loan amendments for a random sample of 500 firms. Recently, Griffin, Nini, and Smith (2018) and Acharya et al. (2021) have also proposed methods to identify loan amendments from SEC filings

Table 2.4: Loan amendments in SEC filings and changes in loan terms in DealScan.

	Δ Loan Rate (log pp)		Δ Deal Amount (log pp)	
	(1)	(2)	(3)	(4)
1{Increase Loan Rate}	2.41***	2.13***		1.31
	(3.91)	(3.42)		(0.99)
1{Reduce Credit Facility}		1.36***	-3.12***	-3.25***
		(3.06)	(-3.39)	(-3.50)
Firm & Time FE	✓	✓	✓	✓
R^2	0.15	0.15	0.13	0.13
N	74944	74944	75356	75356

Notes. This table examines the economic content of the text-based measure of loan amendments parsed from SEC filings. Δ Loan Rate is the log difference in loan interest spread over LIBOR from quarter t to quarter $t + 4$, whereas Δ Deal Amount is the log difference in deal amount from quarter t to quarter $t + 4$. Both variables are expressed in units of log percentage points, and are computed using loan information from DealScan. The variables 1{Increase Loan Rate} and 1{Reduce Credit Facility} are text-based indicators for whether a loan amendment that increases the loan spread or decrease the credit facility are reported in SEC filings in quarter t to quarter $t + 4$. t-statistics reported in parentheses are based on non-clustered standard errors. * p<0.10, ** p<0.05, *** p<0.01.

loan amendments, I collect the text of the management, discussion, and analysis (MDA) section of SEC filings and parse for sentences containing keywords indicating an amendment has taken place. To ensure that only relevant information is included, I remove hypothetical statements, sentences that do not refer to a loan agreement amendment, and those that occurred more than six months prior to the current filing date. Then, I extract the relevant sentences discussing amendments and the subsequent three sentences following each of these sentences. From these sentences, I search for mentions of an increase in the loan interest rate or a reduction in the credit facility. Appendix A.4 provides additional details of the text-search algorithm.

Table 2.4 reports the correlation between each text-based indicator of loan amendment and actual changes in loan rates and amounts reported in DealScan. Column 1 show that amendments increasing loan interest rates are significantly associated with increases in loan interest rates in DealScan. Similarly, Column 3 shows that amendments reducing credit facility are associated with significant decreases in the the loan amounts in DealScan. These results validate that the measure of loan amendments parsed from SEC filings are informative about actual changes in loan

for samples of firms with covenant information.

terms.

Next, I examine whether mentions of covenant concerns explain differences in the probability of a costly loan amendment in the quarters of and following a covenant violation. The analysis focuses on the sample of 1, 242 violation events not preceded by a violation in the previous quarter. Specifically, I estimate the following regression specification

$$Amendment_{it} = \beta_0 + \beta_1 CovFuture_{it-1} + \Gamma X_{it-1} + \alpha_i + \delta_t + \epsilon_{it} \tag{2.15}$$

where $Amendment_{it}$ is an indicator for whether firm i reports a costly loan amendment in quarter of violation t or any of next four quarters. The coefficient of interest is β_1, which is the difference in probability of a costly violation when the violation predicted by covenant concerns. The hypothesis that covenant concerns are associated with more costly covenant violations predicts that $\beta_1 < 0$. The vector of controls X_{it-1} account for differences in the firm's investment opportunities at the time concerns are mentioned, and includes Tobin's Q, sales growth, and operating cash flow in the quarter prior to violation.

Table 2.5 reports the coefficient estimates for β_1. Column 1 shows that covenant violations preceded by covenant concerns are more likely to result in an increase in loan interest rates. The estimated coefficient of 13.71 percent ($s.e. = 4.97$) is more than twice the unconditional average of 7.1 percent. Columns 2 and 3 hold fixed the firm's covenant slack and earnings in the quarter covenants are mentioned. We see that the coefficient estimates on covenant concerns remain stable and significant in those two cases. Columns 4 to 6 paints a similar picture for amendments that decrease the loan facility. In the baseline specification (Column 4), covenant concerns are associated with a 9.88 percent ($s.e. = 5.38$) increase in the probability of observing an amendment that decreases the loan facility. To summarize, the results show that firms that mention covenants are more likely to face more severe consequences to violating covenants than firms that do not mention these concerns.

In theory, creditors are more likely to take action on borrowers when there is a greater likeli-

Table 2.5: Covenant concerns and loan amendments at violation.

	1{Increase Loan Rate}			1{Reduce Credit Facility}		
	(1)	(2)	(3)	(4)	(5)	(6)
CovFuture (t-1)	13.71***	15.03**	13.50***	9.88*	14.30**	9.88*
	(2.76)	(2.45)	(2.72)	(1.84)	(2.07)	(1.82)
Covenant Slack (t-1)		2.49			8.87	
		(0.45)			(0.81)	
Sq. Covenant Slack (t-1)		-5.55*			4.48	
		(-1.69)			(0.63)	
Earnings (t-1)			-0.27			-0.06
			(-0.57)			(-0.16)
Sq. Earnings (t-1)			0.01			-0.01
			(0.80)			(-0.60)
Unconditional avg.	7.14	7.14	7.14	10.06	10.06	10.06
% Δ relative to avg.	192.06	210.60	189.04	98.21	142.14	98.20
Firm & Time FE	✓	✓	✓	✓	✓	✓
R-squared	0.59	0.66	0.59	0.63	0.67	0.63
Nobs	1142	535	1142	1142	535	1142

Notes. This table examines whether covenant concerns predict differences in the probability of a costly loan amendment in the quarter of violation or any of the following four quarters. 1{Increase Loan Rate} indicates a reported amendment that increases the loan interest rates. 1{Reduce Credit Facility} indicates a reported amendment that reduces the credit facility. The sample is restricted to violation events not preceded by a violation in the previous quarter. t-statistics reported in parentheses are double-clustered by firm and time. * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

hood that borrowers will default on their obligations. If covenant concerns capture differences in expected costs of violation, then we should see the effect of covenant concerns on firm outcomes to be stronger when default risk is higher. To test this hypothesis, I estimate the following regression specification

$$Y_{it+4} - Y_{it-1} = \beta_0 + \beta_1 CovFuture_{it} \times Z_{it-1} + \beta_2 CovFuture_{it} \times (1 - Z_{it-1}) \quad (2.16)$$
$$+ \Gamma_0 X_{it} \times Z_{it-1} + \Gamma_1 X_{it} \times (1 - Z_{it-1}) + \alpha_i + \delta_t + \epsilon_{it}$$

where $Y_{it+4} - Y_{it-1}$ is the change in firm outcome from the end of quarter $t-1$ to the end of quarter $t+4$, Z_{it-1} is an indicator based on proxies of default risk in quarter $t-1$. I focus on four ex-ante measures of default risk: leverage, cash holdings, Altman z-score, and net worth. In each of these cases, Z_{it-1} that takes a value of one if the firm's value of default risk is larger than the median value across firms in a given quarter. The coefficients of interest are β_1 and β_2, which are the relationship between covenant concerns and changes in firm outcomes conditional on proxies of default risk. The controls X_{it-1} include Tobin's Q, operating cash flow, and sales growth in the quarter covenant concerns are mentioned.

Tables 2.6 reports the estimates for β_1 and β_2 with changes in capital expenditure and changes in log assets as the dependent variable, respectively. The table also reports the difference in coefficients $\beta_1 - \beta_2$ along with their t-statistics. We see that covenant concerns significantly predicts changes in investment only when leverage is high or when cash holdings, Altman z-score or net worth is low. These are precisely firms that expect a greater probability of lender intervention since their risk of default is higher. Table 2.7 also shows that the effects of covenant concerns on changes in long-term net debt issuance and equity payouts is significant when default risk is high.

To conclude, this section provides evidence that covenant concerns are associated with more costly loan amendments in the quarters of and after violation. Moreover, the effects of covenant concerns are unique to firms that face higher default risk, which is precisely when lenders are more likely to take action on borrowers through loan amendments. Taken together, the findings suggest

Table 2.6: Covenant concerns and changes in investment activities, conditional on default risk.

	Δ Capital Expenditures				Δ Log(Asset)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CovFuture(t) x Low Leverage (t-1)	-5.59				-1.59			
	(-0.77)				(-0.73)			
CovFuture(t) x High Leverage (t-1)	-22.92***				-6.02***			
	(-5.37)				(-4.76)			
CovFuture(t) x Low Cash (t-1)		-22.30***				-5.79***		
		(-4.95)				(-4.65)		
CovFuture(t) x High Cash (t-1)		-9.95				-4.41*		
		(-1.50)				(-1.90)		
CovFuture(t) x Low Altman-z (t-1)			-22.49***				-5.20***	
			(-4.96)				(-3.98)	
CovFuture(t) x High Altman-z (t-1)			-6.31				-2.33	
			(-0.77)				(-1.37)	
CovFuture(t) x Low NetWorth (t-1)				-24.54***				-5.88***
				(-5.33)				(-4.21)
CovFuture(t) x High NetWorth (t-1)				-7.95				-3.71**
				(-1.14)				(-2.50)
Difference	-17.34	12.34	16.17	16.59	-4.44	1.38	2.87	2.17
	(-2.29)	(1.65)	(1.74)	(2.07)	(-1.85)	(.55)	(1.35)	(1.14)
Controls	✓	✓	✓	✓	✓	✓	✓	✓
Firm & Time FE	✓	✓	✓	✓	✓	✓	✓	✓
R^2	0.51	0.51	0.51	0.51	0.40	0.40	0.41	0.40
N	93259	93259	93259	93259	94162	94162	94162	94162

Notes. This table examines cross-sectional variation in the correlation between covenant concerns and investment activities. Dependent variables are changes from quarter t to quarter $t+4$. Controls include Tobin's Q, cash flow, sales growth in quarter t and the dependent variable in quarter $t-1$. "Difference" is the difference in the estimates reported in each column. Sample restricted to observations with no violations reported in the current and past four quarters. Due to data constraints, regressions on covenant slack and its squared only cover firms with covenant information reported in DealScan. Standard errors double-clustered by firm and quarter. t-statistics are reported in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Table 2.7: Covenant concerns and changes in financing activities, conditional on default risk.

	Δ Long-Term Net Debt Issuance				Δ Equity Payout			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CovFuture(t) x Low Leverage (t-1)	-12.79				-11.29*			
	(-0.45)				(-1.69)			
CovFuture(t) x High Leverage (t-1)	-46.40***				-18.38***			
	(-3.27)				(-5.46)			
CovFuture(t) x Low Cash (t-1)		-43.53***				-17.00***		
		(-3.21)				(-4.69)		
CovFuture(t) x High Cash (t-1)		-31.95				-17.52***		
		(-1.20)				(-3.07)		
CovFuture(t) x Low Altman-z (t-1)			-58.68***				-19.65***	
			(-4.55)				(-6.44)	
CovFuture(t) x High Altman-z (t-1)			46.60				-3.74	
			(1.41)				(-0.41)	
CovFuture(t) x Low NetWorth (t-1)				-50.64***				-21.57***
				(-3.35)				(-5.66)
CovFuture(t) x High NetWorth (t-1)				-16.30				-4.89
				(-0.77)				(-1.12)
Difference	-33.61	11.58	105.27	34.34	-7.1	-.53	15.91	16.68
	(-1.04)	(.4)	(3.01)	(1.3)	(-1.04)	(-.08)	(1.74)	(3.11)
Controls	✓	✓	✓	✓	✓	✓	✓	✓
Firm & Time FE	✓	✓	✓	✓	✓	✓	✓	✓
R^2	0.53	0.53	0.53	0.53	0.42	0.42	0.43	0.42
N	92224	92224	92224	92224	90315	90315	90315	90315

Notes. This table examines cross-sectional variation in the correlation between covenant concerns and financing activities. Dependent variables are changes from quarter t to quarter $t+4$. Controls include Tobin's Q, cash flow, sales growth in quarter t and the dependent variable in quarter $t-1$. "Difference" is the difference in the estimates reported in each column. Sample restricted to observations with no violations reported in the current and past four quarters. Due to data constraints, regressions on covenant slack and its squared only cover firms with covenant information reported in DealScan. Standard errors double-clustered by firm and quarter. t-statistics are reported in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

that covenant concerns are informative about when covenants are a relevant source of financial constraint on firm investment and financing activity.

2.5 Covenant concerns and stock returns

Previous research, both theoretical and empirical, suggests that financially constrained firms tend to earn higher average stock returns. The findings from the previous section suggest that covenant concerns serve as a proxy for financially constrained situations. Therefore, it is reasonable to expect that covenant concerns will be associated with positive subsequent returns. This section aims to investigate this hypothesis.

2.5.1 Post-event stock returns

I begin by investigating the dynamics of stock returns in the months following covenant concerns. To provide a comparison group, I match calls that mentions covenant concerns with four other calls that do not mention any such concerns. The matching is based on key characteristics that are known to predict the cross-section of stock returns, including size (log market capitalization), value (log book-to-market value of equity), momentum (past 12-month stock returns), and earnings surprise. Previous studies have established that these factors are strong predictors of stock returns (Fama and French (1993) and Daniel and Titman (1997)) and are therefore suitable for this study. In addition, earnings surprise is also an important factor in predicting stock returns around earnings releases, which coincide with the timing of conference calls (Bernard and Thomas (1989) and Livnat and Mendenhall (2006)). The matched sample includes 5,623 calls, of which 1,179 calls are associated with mentions of covenant concerns.

To account for differences in risk exposures across firms, each firms stock returns are residualized with respect to expected returns predicted by the Fama-French five factor model. Specifically, each stocks abnormal returns is computed as

$$
\begin{aligned}
AR_{it} \equiv R_{it} - R_{ft} \\
- \Big(\alpha_i + \beta_{i1}(R_{mt} - R_{ft}) + \beta_{i2}SMB_t + \beta_{i3}HML_t + \beta_{i4}RMW_t + \beta_{i5}CMA_t\Big)
\end{aligned} \tag{2.17}
$$

where R_{it} is the monthly return of stock i at year-month t, R_{ft} is the monthly risk free rate, R_{mt} is the market return, and SMB_t, HML_t, RMW_t, and CMA_t are the factor returns from Fama and French (2015), which are obtained from the website of Kenneth French. I estimate (2.17) using monthly returns 25 to 5 months prior to each call, requiring at least 15 observations of monthly returns.[4]

Figure 2.1 plots the cumulative stock returns in the months before and after a call, conditional on earnings surprise. The blue line shows average cumulative returns for calls where covenant concerns are mentioned, whereas the red line shows the average cumulative returns for calls from the comparison group with no covenant mentions. When earnings are below expectation (left panel), calls with covenant concerns are associated with lower returns in the month of call relative to its comparison group, but higher returns in the subsequent months. The difference in returns between calls in which covenant concerns are mentioned and its comparison group is more muted when earnings are at or above expectations.

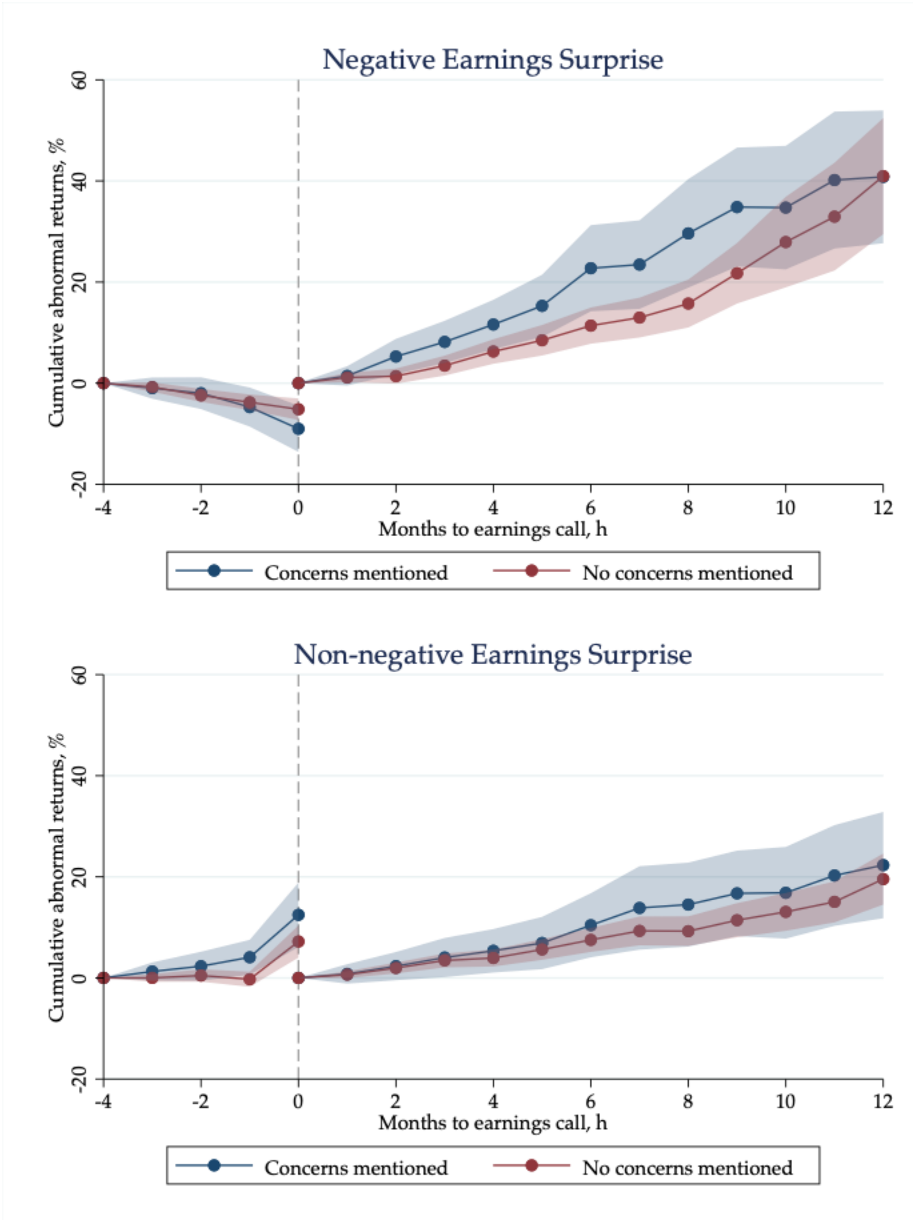
To quantify the difference in stock returns, I estimate the following regression specification

$$
CAR_{i,t+1\rightarrow t+h} = \alpha + \beta CovFuture_{it} + \Gamma X_{it} + \alpha_g + \epsilon_{it+h} \tag{2.18}
$$

where $CAR_{i,t+1\rightarrow t+h}$ is the cumulative abnormal return from holding firm i's stock from one month to h months after a call in year-month t, $CovFuture_{it}$ is an indicator for whether covenant concerns are mentioned by firm i in year-month t, and α_g is the group fixed effects that allows for differences in average cumulative abnormal returns across groups. The vector of controls X_{it} include earnings surprise, log capitalization, log book-to-market, and past 12 month returns. These

[4]Stock returns are also adjusted for delisting events following Shumway (1997).

Figure 2.1: Stock returns around covenant concerns, conditional on earnings surprise.



Notes. Left panel shows calls in which earnings surprise is non-negative, whereas right panel shows calls in which earnings surprise is negative. Pre-event returns are cumulated from the end of 4 months prior to the month of call until the end of the call month. Post-event returns are cumulated from the end of the month of call until the end of 12 months after the call. Blue line plots average cumulative returns of calls in which covenant concerns are mentioned. Red line plots average cumulative returns of calls with no mention of covenant concerns, after matching on earnings surprise, log market capitalization, log book-to-market, and past 12 month stock returns. Of the 1,179 calls with covenant concerns and stock returns, 647 are calls with positive earnings surprise and 532 are calls with negative earnings surprise. Shaded area denotes 95 percent confidence interval, which assumes no cross-sectional correlation in returns.

Table 2.8: Covenant concerns and post-call monthly stock returns.

	(1) AR (0)	(2) CAR (1,3)	(3) CAR (1,6)	(4) CAR (1,12)
A. Unconditional sample				
CovFuture	-2.25***	1.43	6.36*	3.28
	(-2.73)	(1.04)	(1.76)	(0.51)
R^2	0.3	0.3	0.3	0.3
N	4903	4903	4903	4903
B. Negative earnings surprise sample				
CovFuture	-3.84**	3.66**	12.65**	6.85
	(-2.31)	(1.99)	(2.04)	(0.67)
R^2	0.3	0.3	0.3	0.3
N	1967	1967	1967	1967
C. Non-negative earnings surprise sample				
CovFuture	-1.13	-0.14	1.91	0.75
	(-0.76)	(-0.08)	(0.60)	(0.12)
R^2	0.3	0.3	0.3	0.3
N	2818	2818	2818	2818

Notes. This table examines whether covenant concerns predict post-call monthly returns. Sample includes calls that mention covenant concerns and their comparison group, after matching on earnings surprise, log market capitalization, log book-to-market, and past 12 month stock returns. Sample excludes calls where covenant violations are reported in the fiscal quarter of call and preceding fiscal quarter. Regression specification additionally controls for earnings surprise, log market capitalization, log book-to-market, and past 12 month stock returns. Standard errors clustered by date. t-statistics are reported in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

controls account for differences in characteristics that remain after matching process, but the results are quantitatively similar even without these controls. Standard errors are clustered by date to account for cross-sectional correlation in returns.

Table 2.8 reports the coefficient estimates using abnormal returns in the month of call, and cumulative abnormal returns over 3, 6, and 12 month holding periods. When earnings is below expectations, covenant concerns are associated with 3.84 percent ($s.e.$ = 1.66) lower returns in the month concerns are mentioned. In contrast, covenant concerns does not significantly predict stock returns in the month of calls when earnings surprise is non-negative.

Consistent with the graphical analysis, we see positive cumulative abnormal returns in the months following mentions of covenant concerns when earnings is below expectations, but muted response in stock returns when earnings is at or above expectations. Over a 3 month holding period (Column 2), calls with covenant concerns have cumulative returns that are 3.66 percent ($s.e.$ = 1.84 percent) higher than calls with no covenant concerns. Columns 3 shows that covenant concerns also predict higher returns for a 6 month holding period, with covenant concerns associated with 12.65 percent ($s.e.$ = 6.20) higher returns than calls with no covenant concerns. In contrast, when earnings are at or above expectations, covenant concerns do not significantly predict abnormal returns across all holding periods.

How do actual covenant violations affect stock returns? In prior work, Nini, Smith, and Sufi (2012) finds that covenant violators earn positive abnormal returns after violations are reported. However, positive abnormal returns are accrued with some delay, starting only 12 months after violations are reported. I extend their analysis to investigate whether there is also state dependence the relationship between actual covenant violations and stock returns. Appendix Table B.3 examines stock returns following covenant violations, conditional on the sign of earnings surprise. After matching covenant violators to non-violators with similar characteristics[5], I find that covenant violations are associated with 14.03 percent ($s.e.$ = 6.96 percent) increase in cumulative abnormal returns only when earnings are below expectations. Moreover, the positive cumulative abnormal returns are accrued only for a holding period of 12 months but not for shorter horizons.

2.5.2 Covenant concerns and financial constraint risk

Are the positive abnormal returns accrued in the months following covenant violations explained by financial constraint risk? To shed light this question, I examine whether the stock returns of firms that mention covenant concerns covary with proxies of financial constraint risk.

I construct the portfolio of covenant concerned stocks by buying stocks at the beginning of the month following calls that mention covenant concerns and holding these stocks for N months.

[5] As in the analysis of covenant concerns, I match covenant violators to non-violators based on their earnings surprise, log market capitalization, log book-to-market, and past 12 month stock returns.

To be consistent with the previous analysis, stocks included in the portfolio are restricted to those facing a negative earnings surprise in the fiscal quarter associated with covenant concerns. I also ensure that no covenant violations reported in the same fiscal quarter as well as the previous fiscal quarter. The portfolio excess are computed as an equally-weighted average of the constituent monthly stock returns minus the monthly risk free rate, where weights are given by the stocks lagged market capitalization. I focus on portfolio returns with a holding period of $N = 6$.

The financial constraint risk factor is proxied by returns of mimicking portfolios constructed from three alternative measures of financial constraints. These financial constraint measures are the Kaplan-Zingales (KZ) index (Kaplan and Zingales (1997) and Lamont, Polk, and Saa-Requejo (2001)), the Whited-Wu (WW) index (Whited and Wu (2006)), and the Hoberg-Maksimovic (HM) index (Hoberg and Maksimovic (2014) and Buehlmaier and Whited (2018)). All are available at the firm-year frequency, and higher values of the measure indicate firms that are more financially constrained. In addition to the general HM index, Hoberg and Maksimovic (2014) also propose a debt-focused financial constrained index (HM-Debt), which places emphasis on the use of debt as a source of liquidity.

Table 2.9 reports the coefficient estimates of regressing the returns of the portfolio of covenant concerned stocks on the factor returns. Column 1 show that the portfolio of covenant concerned stocks earn an average raw return of 2.69 percent ($s.e. = 0.80$ percent) per month. This result indicates that stocks of firms concerned about covenants move in tandem with other firms that are also concerned about covenants, generating positive returns. The remaining columns explore whether the observed positive returns can be explained by established asset pricing factors.

Columns 2-6 report the coefficients from regression the portfolio returns on the Fama-French five factors as well as a proxy for financial constraint risk. Across all specifications, the returns of the covenant portfolio covaries significantly with the market factor and size (SMB) factor. The coefficient on the market factor (Rm-Rf) is greater than one, which is intuitive since stocks that are concerned about covenants are more levered than the average CRSP stock. The significance of the size (SMB) factor is also consistent with prior research that links the size effect to financial

Table 2.9: Calendar-time portfolio returns and financial constraint risk.

	(1)	(2)	(3)	(4)	(5)	(6)
Constant	1.41**	1.43**	1.46***	1.53***	1.19**	1.11*
	(2.58)	(2.53)	(2.62)	(2.79)	(2.09)	(1.97)
KZ FC			0.65***			
			(2.67)			
WW FC				-0.35***		
				(-3.72)		
HM FC					1.49***	
					(3.35)	
HM-Debt FC						1.30***
						(3.27)
Rm-Rf	1.47***	1.48***	1.35***	1.36***	1.44***	1.34***
	(10.55)	(10.20)	(8.94)	(9.59)	(8.75)	(7.66)
SMB	1.33***	1.32***	1.27***	1.29***	1.10***	1.33***
	(5.38)	(5.14)	(5.03)	(5.22)	(4.17)	(5.13)
HML	0.19	0.13	-0.04	-0.25	0.95***	0.27
	(0.89)	(0.55)	(-0.14)	(-0.99)	(3.66)	(0.90)
CMA		0.20	0.24	0.00	-0.13	-0.13
		(0.47)	(0.58)	(0.01)	(-0.28)	(-0.30)
RMW		-0.08	-0.17	-0.48	0.88**	-0.24
		(-0.21)	(-0.47)	(-1.36)	(2.18)	(-0.57)
Adjusted R^2	0.55	0.55	0.56	0.60	0.62	0.62
N	205	205	205	193	164	164

Notes. This table reports the coefficient estimates of regressing the returns of the portfolio of covenant concerned stocks on the factor returns. The financial constraint (FC) factors are KZ FC, WW FC, HM FC, HM-Debt FC. Rm-Rf, SMB, HML, CMA, and RMW are the Fama-French five factors. Constant refers to the monthly risk-adjusted returns of stocks that mention covenant concerns. Due to data constraints, regressions on the HM, HM-Equity, and HM-D FC factors only cover the period from November 2003 to June 2017. All other regressions use the full sample period from November 2003 to June 2021. t-statistics are reported in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

constraints (Whited and Wu (2006)).

Notably, the regression results demonstrate that the returns of stocks concerned about covenants are highly related to measures of financial constraint risk (Columns 3-6). Including the financial constraint risk factor increases the models' adjusted R-squared by between 1 percent (Column 3) and 8 percent (Column 5). These findings support the hypothesis that the excess returns observed in the months following covenant concerns are partly explained by the stocks' higher exposure to financial constraint risk.[6]

In summary, the findings suggest two key observations regarding the impact of covenant risk on stock returns. First, the results indicate that news concerning financial covenants are only relevant to subsequent stock returns when earnings are below, but not at or above, expectations. Additionally, the positive abnormal returns associated with covenant risk concerns tend to occur for less than a year after they are mentioned. Second, the returns of a portfolio of firms with covenant concerns that experience poor earnings show a significant association with proxies of financial constraint risk. This supports the idea that covenant concerns serve as an indicator of financial constraint risk.

2.6 Conclusion

This chapter examines potential explanations for why covenant concerns predict a decline in investment and financing activity. One explanation is that covenant concerns coincide with periods when firms expect a further deterioration in their profitability, while a second is that firms become concerned about covenants when they expect violations to have a significant impact on their operations.

To shed light on the relevance of these two explanations, I examine empirical patterns in analyst expectations of future firm earnings, loan amendments reported in SEC filings, and the stock returns of firms that mention covenant concerns. The evidence suggest that both explanations are

[6] An alternative explanation for the positive excess returns observed following covenant concerns is that they signal positive news about the future earnings of firms. However, the evidence presented in Section 2.3 contradicts this hypothesis. Specifically, the section demonstrates that covenant concerns are instead linked with a decline in expected future earnings.

relevant mechanisms driving the correlation between covenant concerns and firm investment and financing policy. However, I find that the second channel is likely more economically significant.

Specifically, I find that, while covenant concerns are associated with downward revisions in expected future sales and earnings, the magnitude is small and the effects of covenant concerns on investments remain large and significant even after controlling for information in analyst expectations. Conversely, I find that covenant concerns predict a large increase in the probability of loan amendments at violation, and that the effects of covenant concerns is unique to firms that face higher default risk. This is precisely when lenders are more likely to intervene when firms violate their covenants.

Consistent with the idea that firms that are more financially constrained earn higher stock returns, I document that firms that mention covenant concerns accrue positive abnormal returns in the months after the call but only temporarily and when earnings are below expectations. Additionally, I find that the returns of a portfolio constructed from stocks of firms that mention covenant concerns with poor earnings covary significantly with various proxies of financial constraint risk. Taken together, the findings in this chapter support the interpretation that covenant concerns are informative about the degree to which firms are constrained by financial covenants.

Chapter 3: Covenant concerns in a dynamic structural model

3.1 Introduction

The previous two chapters examine the empirical implications of concerns about financial covenants on firm investment and financing policies. Chapter 1 establishes that covenant concerns associated with significant reductions in firm investment and financing activity, even when firms are not in violation of their covenants. The chapter also documents that covenant concerns are more likely to be mentioned when earnings fall and when leverage is high. Chapter 2 probes two potential explanations for the documented correlations through additional patterns in the data. In particular, changes in analyst forecasts of earnings around mentions of covenant concerns suggest that these concerns are associated with lower expected profitability. Subsequent costly loan amendments also suggest that covenant concerns are associated with higher expected cost of future violations. In this chapter, I investigate how covenant concerns relate to firm investment and financing policies in a structural model.

The model considered is a dynamic partial equilibrium model that features risk averse firms subject to financial covenants in the form of an earnings-based borrowing constraint. In the model, firms choose to invest, borrow, and issue dividend, with the restriction that borrowing must not exceed a multiple of their earnings. The only source of risk is fluctuations in the firm's productivity. Analyzing the role of covenant concerns first requires a definition of covenant concerns in the model. The theoretical object that most naturally relates to covenant concerns in the model is the expected value of the shadow cost of the borrowing constraint. Since covenant concerns is a binary variable in the data, I define covenant concerns in the model as an indicator for whether the expected shadow cost exceeds a threshold, which is calibrated to match the share of observations with covenant concerns in the data.

While the model is relatively parsimonious, it does well in replicating key moments in the data. The model matches the share of firms that are in violation, average leverage, and the first and second moments of investment rates, which is unsurprising given that these moments targeted in the calibration of parameters. However, the model also does well in predicting average debt-to-earnings, Tobin's Q, and average earnings yield in the data, which are not targeted in the calibration exercise. Importantly, the model predicts that covenant concerns varies inversely with changes in earnings and are associated with subsequent reductions in firm investment and financing activities, which are two key empirical correlations documented in Chapter 1. The good fit of the model along these dimensions suggest that the model is informative about underlying drivers of how covenant concerns relate to firm policies.

Nevertheless, there is scope for modifying the assumptions since the model does not perform well along several key dimensions. First, the model under-predicts the magnitude of the correlation between covenant concerns and investment and financing activity. Once controls for investment opportunities are included, the model-implied correlation between covenant concerns and changes in firm investment and financing activity diminishes significantly, whereas the empirical correlation remains large and significant. Second, the model predicts that covenant concerns is negatively correlated with leverage and positively correlated with Tobin's Q, which is counterfactual to the data. These two inconsistencies suggest that it may be important to incorporate heterogeneous cost of violation in the model. The intuition is that lenders are expected to take action on less creditworthy borrowers, that is firms with high leverage and poor investment opportunities. These firms are naturally more concerned about covenants given the higher cost to violation.

Having assessed the model fit, I analyze the underlying drivers of the correlation between covenant concerns and firm policy. The impulse responses of firm policy to productivity shocks suggest two plausible explanations for the correlation between covenant concerns and firm policy in the model. The first explanation is that covenant concerns coincide with periods when firms experiences a negative productivity shock, which also predicts a fall in investments and equity payouts. Interestingly, the model predicts that debt issuance first rises on impact but then declines in the periods following the shock. The second explanation is that covenant concerns are associated with high debt levels. Conditional on a negative productivity shock, firms higher debt levels choose lower investments, debt issuance, and equity payouts relative to firms with low debt levels.

In the final set of results, I run a counterfactual experiment to examine how the presence of financial covenants distort firm investment and financing policies. Firms in the counterfactual model do not face a financial covenant but are subjected to an identical path of productivity shocks as firms in the baseline model. Besides the covenant threshold parameters, all other parameters in the counterfactual model are identical to those in the baseline model. While firms in the counterfactual model do not face financial covenants, the adopted parametrization means that are nonetheless constrained by the maximum allowed debt level on the grid. In this sense, one can interpret the counterfactual firms as subjected to a looser borrowing constraint that does not vary with earnings.

The counterfactual analysis reveals three key findings. First, firms with financial covenants maintain a higher level of capital but a lower level of leverage relative to firms without financial covenants. The intuition is that firms with financial covenants have an additional incentive to accumulate capital since additional capital relaxes their borrowing constraint. These firms have lower leverage because their debt levels are constrained by a tighter borrowing constraint. Second, I show that holding fixed capital and debt at the baseline model's median, firms with financial covenants adopt a more conservative investment and financing policy across all levels of productivity. The difference in optimal investment and debt issuance can be seen even when the constraint is not presently binding. Third, firms with financial covenants cut their investment and financing activity by more than firms without covenants around violation events, even though both firms face an identical path of productivity. Importantly, differences in firm responses are observed not only at violation, but also several periods before the violation event. To summarize, these three findings show that financial covenants distort firm investment and financing activity not only in states where violation occurs, but also in states where no violation occurs.

Related literature. This chapter builds on a rich literature in corporate finance studying the implications of financial covenants. Early work on covenants highlights their role in mitigating agency frictions by allocating control rights in a state contingent manner (Aghion and Bolton (1992) and Dewatripont and Tirole (1994)). The literature on bank monitoring also show that covenants serve as tripwires that improve flexibility and efficiency in lending when monitoring is costly (Berlin and Mester (1992), Rajan and Winton (1995), and Park (2000)). More recently, covenants are shown to play a role in signaling private information about the borrower's prospects to lenders (Garleanu and Zwiebel (2009)). This body of research focuses on analyzing the implications of covenants in a stylized setting. This chapter models covenants as exogenous borrowing constraints, but analyzes its implications in a dynamic optimization framework.

Relatedly, this chapter ties into a recent literature that studies covenants in dynamic corporate finance models. Gamba and Triantis (2012) show that financial covenants mitigates another source of agency friction, in which borrowers dilute the claims of existing borrowers by issuing additional debt. Xiang (2019) studies the role of covenants in addressing debt dilution in a model that endogenizes the ex-post consequences of covenant violations. In the macro-finance literature, Drechsel (2018), Greenwald (2019), and Adler (2020) study the real implications of financial covenants. Broadly related, prior research in open macroeconomics also study the implications of earnings-based borrowing constraints, which is how financial covenants are modeled in this chapter (Bianchi (2011) and Schmitt-Grohe and Uribe (2021)). Closely related to Adler (2020), the model in this chapter assumes risk averse firms in a dynamic partial equilibrium setting but fixes the covenant thresholds as a constant. Additionally, the findings in this chapter are consistent with those from Gamba and Triantis (2012)), who show that covenant violations distort firm policies not only at violation but also in states away from violation. This chapter uses the model to study the empirical patterns documented in Chapter 1, which are new in the literature. Moreover, the analysis of impulse response functions also contribute additional insights into how covenant violation risk correlate with changes in firm investment and financing policies.

The remainder of the chapter proceeds as follows. Section 3.2 outlines the model and its parametrization. Section 3.3 takes the model to data and also examines the underlying mechanisms driving key empirical correlations. Section 3.4 studies how the presence of financial covenants distort firm outcomes through a counterfactual analysis. Finally, Section 3.5 concludes.

3.2 Model

Firms have access to production technology $y_t = z_t k_t^{\alpha}$, where z_t is a productivity shock, k_t is the entrepreneurs capital stock. Capital used in production in period t is pre-determined at time $t-1$. Entrepreneurs own their capital, which evolves according to the capital accumulation equation $k_{t+1} = i_t + (1-\delta)k_t$, where i_t is the firm's investment in period t and δ is the depreciation rate of capital. Installing capital is costly and incurs quadratic adjustment cost $\frac{\psi}{2}\frac{(k_{t+1}-k_t)^2}{k_t}$.

Firms borrow and lend through one-period risk-free debt d_{t+1}. Positive values of d_{t+1} represents net borrowing, and negative values of d_{t+1} represents net lending. Building on Lian and Ma (2021), I model financial covenants as a limit on total debt as a multiple of earnings, given by

$$\frac{d_{t+1}}{R} \leq \kappa y_t$$

where R is the gross interest rate on loans and κ is the covenant threshold. There is no default in this model, so the gross interest rate is equal to the risk free rate. Lian and Ma (2021) discusses why financial covenants are reasonably modeled as an earnings-based borrowing constraint. In particular, financial covenants apply to total borrowing of the firm, are typically defined as a function of EBITDA (earnings before interest, taxes, depreciation, and amortization), and are monitored for compliance on a quarterly basis. As the only input of production is capital and firms own the capital stock, earnings equal output y_t. In the model, a violation occurs when $\frac{d_{t+1}}{R} = \kappa y_t$.

The firm's problem can be described recursively. In particular, let $V(z_t, k_t, d_t)$ be the expected utility of a firm that starts a period with productivity shock z_t, capital stock k_t, and debt d_t. The firm chooses dividend issuance c_t, next periods capital k_{t+1} and debt d_{t+1} to maximize their expected utility

$$V(z_t, k_t, d_t) = \max_{c_t, k_{t+1}, d_{t+1}} \frac{c_t^{1-\gamma}}{1-\gamma} + \beta E\left[V(z_{t+1}, k_{t+1}, d_{t+1})\middle| z_t\right] \tag{3.1}$$

subject to

$$c_t = y_t - d_t + \frac{d_{t+1}}{R} - i_t - \frac{\psi}{2}\frac{(k_{t+1} - k_t)^2}{k_t} \tag{3.2}$$

$$i_t = k_{t+1} - (1 - \delta)k_t \tag{3.3}$$

$$y_t = z_t k_t^{\alpha} \tag{3.4}$$

$$\frac{d_{t+1}}{R} \leq \kappa y_t \tag{3.5}$$

Productivity follows a log AR(1) process given by

$$\log z_t = \rho_z \log z_{t-1} + \sigma_z \epsilon_t \tag{3.6}$$

where $\epsilon_t \sim N(0, 1)$ are innovations in productivity.

3.2.1 Optimality conditions

Let λ_t be the Lagrange multiplier on the budget constraint (3.2) and $\lambda_t \mu_t$ the Lagrange multiplier on the earnings-based borrowing constraint (3.5). These Lagrange multipliers represent the additional value in utils of relaxing the budget constraint and earnings-based constraint, respectively, by one unit. Given the firm's maximization problem, the optimal allocations $\{c_t, d_{t+1}, k_{t+1}\}_{t=0}^{\infty}$ and Lagrange multipliers $\{\lambda_t, \mu_t\}_{t=0}^{\infty}$ satisfy

$$\lambda_t = c_t^{-\gamma} \tag{3.7}$$

$$\lambda_t(1 - \mu_t) = \beta R E[\lambda_{t+1}] \tag{3.8}$$

$$\lambda_t(1 + \Psi_{1,t}) = \beta E\Big[\lambda_{t+1}\Big(\alpha z_{t+1} k_{t+1}^{\alpha-1}(1 + \mu_{t+1}\kappa) + 1 - \delta - \Psi_{2,t+1}\Big)\Big] \tag{3.9}$$

$$c_t = y_t + (1 - \delta)k_t - d_t + \frac{d_{t+1}}{R} - k_{t+1} - \Psi(k_{t+1}, k_t) \tag{3.10}$$

$$\mu_t\Big(\kappa y_t - \frac{d_{t+1}}{R}\Big) = 0; \mu_t \geq 0; \kappa y_t \geq \frac{d_{t+1}}{R} \tag{3.11}$$

given stochastic productivity process $\{z_t\}_{t=0}^{\infty}$. $\Psi_{1,t}$ and $\Psi_{2,t}$ are, respectively, the first derivatives of the adjustment cost function $\Psi(k_{t+1}, k_t) \equiv \frac{\psi}{2}\frac{(k_{t+1}-(1-\delta)k_t)^2}{k_t}$ with respect to k_{t+1} and k_t.

3.2.2 Deterministic steady state

Before proceeding with the numerical analysis, I first characterize the deterministic steady state of the model. This step is pins down the debt and capital grid, since the average positions of debt and capital in the stochastic steady state approximately coincides with the deterministic steady state values (Uribe and Schmitt-Grohé (2017)).

Letting variables without time subscripts denote constants, the deterministic steady state is given by

$$\lambda = c^{-\gamma} \tag{3.12}$$

$$\mu = 1 - \beta R \tag{3.13}$$

$$k = \left(\frac{\alpha(1+\kappa\mu)}{\beta^{-1} - 1 + \delta}\right)^{\frac{1}{1-\alpha}} \tag{3.14}$$

$$d = \kappa k^{\alpha} R \tag{3.15}$$

$$c = k^{\alpha} - \delta k - \frac{r}{R} d \tag{3.16}$$

There are two key takeaways from the characterization above. First, we see from condition (3.13) that the borrowing constraint binds in the deterministic steady state, that is $\mu > 0$. This follows since we require that $\beta R < 1$ to induce stationarity in the model. Second, condition (3.14) shows that the steady state level of capital is influenced by borrowing constraint, given the term $\kappa\mu$. This term is not present when the borrowing constraint does not depend on earnings or next period's capital. Intuitively, firms with an earnings-based borrowing constraint have an incentive to increase capital holdings since this relaxes their borrowing constraint. Consistent with this idea, Section 3.4 shows that the distribution of capital in the baseline model is to the right of the distribution of capital in a counterfactual model without the earnings-based constraint.

3.2.3 Discussion of assumptions

The model outlined above assumes that firms have a preference for smoothing dividends over time, which is governed by the parameter γ. One interpretation of the consumption smoothing motive is that it captures a preference for smoothing dividends over time (Lintner (1956)). Graham (2022) confirms this idea in a recent survey of CFOs, reporting that 77 percent of dividend paying firms consider maintaining historical levels of dividends a very important or top priority for the firm.

In Chapter 2, the firm's problem is expressed as a firms maximizing the present discounted value of dividends. Firms are also subjected to a constraint on dividend issuance, which can take the form of a non-negative dividend constraint or quadratic adjustment cost function as in Jermann and Quadrini (2012). The dividend constraint captures the pecuniary costs of repurchasing shares or issuing new equity. From a technical perspective, the dividend constraint is necessary for the borrowing constraint to be effective since firms can overcome the borrowing constraint by issuing negative dividends if the latter is not costly in the model.

While the qualitative implications are similar across both classes of models, I assume the specification outlined above since it allows the shadow cost of the borrowing constraint to be characterized as a function of dividend issuance c_t, which is an observed variable in the model. In the model of firms maximizing the present discounted value of dividends, the shadow cost of the borrowing constraint is not conveniently expressed as a function of observed variables in the model. While it is possible to characterize the shadow cost from the Euler equations through numerical solution methods, I leave the task for future research.

3.2.4 Parametrization

While the objective of the numerical analysis is to study the qualitative predictions of the model, it is useful to calibrate the model to capture key moments in the data. The model has nine parameters that needs to be assigned values. The first set of parameters $(\alpha, \gamma, R, \rho_z, \sigma_z)$ is chosen based on standard values from the literature, whereas the second set of parameters $(\delta, \psi, \beta, \kappa)$ is chosen to match key moments of the data.

Table 3.1: Quarterly calibration of the baseline model.

Description	Parameter	Value	Notes
Production technology	α	0.6956	Cooper and Ejarque (2001)
Risk aversion coefficient	γ	2	Standard calibration
Productivity persistence	ρ_z	0.8874	Gomes (2001)
Productivity std. dev.	σ_ϵ	0.0882	Gomes (2001)
Interest rate	R	$1.015^{1/4}$	Calibrate to real interest rate in DealScan
Depreciation rate	δ	0.012	Target steady state avg. investment rate
Capital adjustment cost	ψ	4	Target steady state std. dev. investment rate
Subjective discount factor	β	0.991	Target steady state share constrained & avg. debt/asset
Debt-to-earnings covenant	κ	3×4	Calibrate to median max. debt-to-earnings threshold in DealScan

Table 3.1 lists the parameter values adopted in the baseline model, which is calibrated to a quarterly frequency. The returns to scale parameter α is set to 0.6956 following Cooper and Ejarque (2001). The productivity parameters ρ_z and σ_z are set to 0.8874 and 0.0882, respectively, following Gomes (2001) after converting the annual values to their quarterly equivalents. The coefficient of risk aversion γ is set to 2, a conventional value in the macro literature. To calibrate the interest rate on debt R, I compute the real interest rate of loans in DealScan, following Greenwald (2019). This is set equal to 1.5 (0.37) percent per year (quarter).

The remaining parameters are disciplined by targeting key empirical moments from the literature. The parameters δ and ψ are calibrated by targeting moments related to the firms investment policy based on firms in my sample. In particular, I set the depreciation rate δ to match the average annualized investment-to-capital ratio of 113 basis points per quarter in the data, and the capital adjustment cost ψ to 4 to match the standard deviation of investment-to-capital ratio of 154 basis points per quarter.

The parameters β and κ are calibrated to target moments related to the firms debt financing policy. In particular, the subjective discount factor β is calibrated by targeting the share of covenant violations reported in SEC filings of 3.2 percent and the average book leverage (debt-to-asset) of 30.4 percent. The calibrated value of β is 0.991, which implies that $\beta R = 0.9947$. This means that firm's subjective discount factor is 53 basis points below the market discount rate. The maximum debt-to-earnings threshold κ is set based on the median debt-to-earnings covenant in DealScan, which is equal to $3(12)$ times the (annual) quarterly earnings y_t.

The model is solved by value function iteration over discretized state space. In particular, I discretize the state space with 30 equally spaced points for $\log z$ from -0.6046 to 0.6046, and 60 equally spaced points for capital k and debt d, respectively. The transition probability for $\log z$ is computed using the simulation algorithm in Schmitt-Grohé and Uribe (2014). The grid for capital k is $[0.5 \times k_{nss}, 2.25 \times k_{nss}]$, where k_{nss} is the deterministic steady state of capital stock. The grid for debt d is set to $[0.1 \times d_{nss}, 1.5 \times d_{nss}]$, where d_{nss} is the deterministic steady state value of debt. In the baseline calibration of the model, all grid points on the capital grid are visited with positive probability whereas all but the first seven grid points on the debt grid are visited.

Having solved for the policy functions, I simulate the model for 1 million periods and drop the first 100 thousand observations as burn-in. To make the simulated data comparable to the empirical data for subsequent analysis, I create a panel of 2500 firms each with 72 quarters of observations from the simulated data. The panel is constructed by dividing the last 430 thousand simulated observations into 2500 groups so that each group consists of 172 observations. For each group, I then drop the first 100 observations as burn-in so that the first observation of a given group is not correlated with the last observation of the previous group.

Appendix Figure C.1 shows the distribution of debt, capital and, debt to income computed using model simulations. The average value of capital is slightly higher than its deterministic steady state value, whereas the average value of debt is lower than its deterministic steady state value. Debt-to-earnings is concentrated near the borrowing constraint, but the borrowing constraint is not always binding. This feature of the model arises from two opposing forces in equilibrium. On one hand, firms desire to accumulate debt since the firm's subjective discount factor β is less than the market discount factor $1/R$, so that $\beta R < 1$. On the other hand, firms also have a precautionary savings motive that pushes debt holdings away from the upper debt limit. Both forces counterbalance in equilibrium to yield a stationary debt distribution.

Model fit

Table 3.2: Empirical and theoretical moments targeted in calibration.

Moments	Variable	Model	Data
Avg. share constrained (pct)	$1\{d'/Ry = \kappa\}$	3.49	3.24
Avg. debt-to-asset (pct)	d/k	26.14	30.35
Avg. investment rate (bps)	i/k	121.23	113.46
Std. dev. investment rate (bps)	i/k	126.84	153.84

Notes. "Model" refers to theoretical moments computed from simulated data. "Data" refers to empirical moments estimated using the sample of Compustat firms, excluding financials and utilities, with information of covenant concerns from earnings call transcripts, covenant violations from SEC filings, and debt-to-earnings covenants as reported in DealScan.

Table 3.2 compares the four targeted empirical moments and the corresponding stochastic steady-state moments computed from the model simulation. Overall, I find that the model provides a relatively close match of the four targeted moments. The average share of constrained firms in the model is 3.5 percent, which is close to the average share of firm-quarter observations with covenant violations of 3.2 percent in my sample. The average debt-to-asset ratio of firms in the model is 26.1 percent, which is lower but close to the average of 30.3 percent among firm-quarter observations in my sample. Average investment-to-capital of 121.2 basis points in the model replicates well the empirical moment, while the standard deviation of investment-to-capital in the model of 126.8 basis points is lower but still a close match to the data.

Some discussion of the share of observations in violations is warranted. The share of observations with covenant violations is lower than those documented in Nini, Smith, and Sufi (2012), using a sample of firms in Compustat with covenant violations data from 1997 to 2008. Specifically, they find that 6.9 percent of firm-quarter observations are in violation of covenants, which is more than double the share of observations in my sample. This is explained in part by an improvement in the ability of lenders to identify distressed borrowers, which reduces the number of inconsequential violations (Griffin, Nini, and Smith (2018)). Other sources of covenant violations report a larger share of violations. In particular, Chodorow-Reich and Falato (2021) documents that between 24 to 34 percent of loans are in violation between 2006 to 2009, and Chava and Roberts (2008) reports that between 13 and 15 percent of firm-quarter observations are in violation of the net worth and current ratio covenants in DealScan using a sample from 1994 and 2005. The reason violations reported in SEC filings are lower than those reported in other sources is because regulation only requires firms to report violations that are not resolved by the end of the quarter (Sufi (2009)). In this sense, the model is calibrated to match violations that are consequential enough to be reported in quarterly SEC filings.

3.3 Mapping model to data

This section evaluates the quantitative predictions of the model, starting with a definition of covenant concerns in the model and a discussion of how concerns correlate with other key variables. The section then examines the extent to which the model predictions are consistent with two key empirical correlations documented in Chapter 1. Specifically, I evaluate whether covenant concerns vary inversely with earnings and whether concerns predict a decline in firm investment and financing activity in the model. Finally, the section inspects the underlying mechanisms driving the observed correlations through an analysis of impulse responses to productivity shocks.

3.3.1 Defining covenant concerns

In the model, the theoretical object that most naturally links to covenant concerns is the expected value of the shadow cost of the borrowing constraint $E_t(\mu_{t+j})$ for $j > 0$. I focus on the expectation of the shadow cost of the borrowing constraint in the next period $E_t\mu_{t+1}$, since the empirical analysis in Section 1.4 shows that covenant concerns have the strongest predictive power for violations in the next quarter.

In the data, covenant concerns is a binary variable that indicates whether the firm discusses forward-looking concerns about covenants in a given quarter. Since the expected value of the shadow cost is a continuous variable, I define covenant concerns in the model as $CovFuture \equiv 1\{E_t\mu_{t+1} > c\}$ where the threshold c is set to match the average share of observations with covenant concerns in the data. Given that covenant concerns occur in 3.04 percent of observations in the data, c is calibrate to 0.0353.

Table 3.3: Comparison of additional empirical and theoretical moments.

	Model			Data		
	$\hat{\mu}_X$	$\hat{\sigma}_X$	$\hat{\rho}_{X,CF}$	$\hat{\mu}_X$	$\hat{\sigma}_X$	$\hat{\rho}_{X,CF}$
CovFuture(pct)	3.05	17.21	100.00	3.04	17.17	100.00
Violation(pct)	3.49	18.35	50.89	3.24	17.71	8.07
Capital Expenditure (bps)	121.23	126.84	-16.80	133.46	153.84	-1.20
Net Debt Issuance (bps)	-8.29	105.29	-10.15	57.88	497.17	-1.53
Equity Payout (bps)	755.30	24.25	-14.12	167.63	177.98	-6.83
Covenant Slack (sd)	1.99	1.00	-29.68	0.08	0.41	-12.23
Debt-to-Earnings	9.38	1.32	29.68	10.21	12.71	8.72
Tobin's Q	1.98	0.23	4.59	1.51	1.04	-8.57
Cash Flow (pct)	2.85	0.53	-21.56	3.15	3.72	-3.01
Sales Growth (sd)	0.00	1.00	-17.33	0.37	0.94	-8.94
Log(Asset)	11.75	0.24	-8.83	7.29	1.31	-1.14
Leverage(pct)	26.14	2.69	-4.25	30.35	24.75	10.87

Notes. Empirical moments are computed using the sample of Compustat firms, excluding non-financials and utilities, with covenant concerns data from earnings call transcripts, covenant violations from SEC filings, and covenant thresholds from DealScan. $\hat{\mu}_X$ refers to the sample mean, $\hat{\sigma}_X$ refers to the sample standard deviation, and $\hat{\rho}_{X,CF}$ refers to the Pearson correlation coefficient with $CovFuture$. Model moments are computed from a balanced panel of 2,500 firms with 72 observations constructed from simulated data. In the model, $CovFuture \equiv 1\{E_t\mu_{t+1} > c\}$, where c is the expected shadow value of the borrowing constraint, and is set so that the average share of observations with covenant concerns matches the average in the empirical data. Model is calibrated to match share of observation in violations, average leverage, average and standard deviation of capital expenditures. See Appendix Table C.1 for the definition of variables in the model and Appendix Table A.2.2 for the definition of variables in the data.

Table 3.3 compares the first and second moments of key variables in the model as well as their correlation with covenant concerns to their empirical counterparts. The sample used to estimate the empirical moments consists of Compustat firms with covenant concerns data from earnings call transcripts, covenant violations data from SEC filings, as well as debt-to-earnings covenants in DealScan. Since this imposes additional sample restrictions, the estimated moments may differ from those reported in the first chapter.

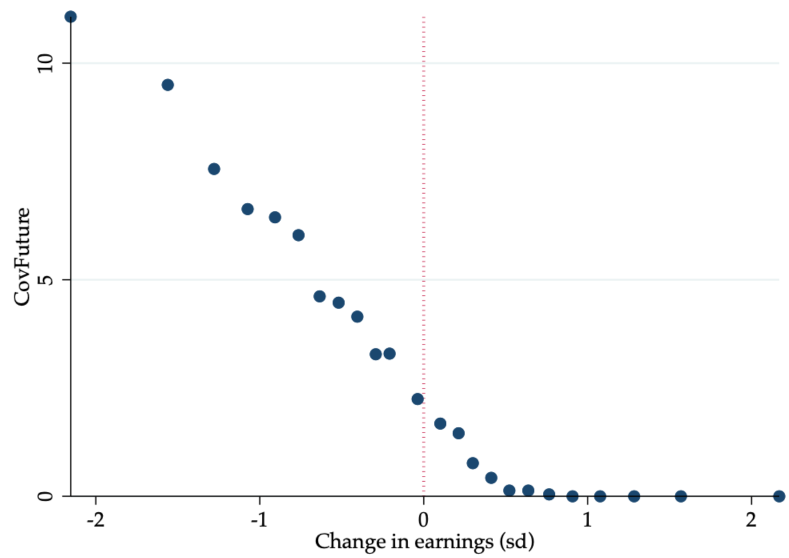
We see that the model does well in replicating average debt-to-earnings, Tobin's Q, and earnings-to-capital in the data. These are moments that are not targeted in the calibration exercise. Furthermore, the model also qualitatively matches the correlation between covenant concerns and firm investment and financing policies, as well as the correlation between covenant concerns and covenant slack, debt-to-earnings, cash flow, sales growth, and log assets. Nonetheless, we see that the model under-predicts the magnitude of the correlation between covenant concerns and firm investment and financing policies, and over-predicts the magnitude of the correlation between covenant concerns and cash flow and sales growth. Furthermore, covenant concerns is also positively correlated with Tobin's Q and negatively correlated with leverage in the model, which is counterfactual to the data. A plausible explanation for these discrepancies is that the model does not incorporate heterogeneous costs of covenant violations. In reality, firms that that violate covenants may also face a reduction in their credit facility or an increase in their loan interest rates (Roberts and Sufi (2009)). Firms that expect to face more costly violations are naturally more concerned about their covenants. Since lenders are expected to take action on less creditworthy borrowers, firms concerned about covenants are also more likely to have lower investment opportunities and higher leverage (Demiroglu and James (2010)).

3.3.2 Correlations of covenant concerns with earnings and firm policies

Figure 3.1 shows a bin-scatter plot of covenant concerns against changes in earnings using model simulated data. The model predicts a negative relationship between covenant concerns and changes in earnings. We also see that the relationship is asymmetric, whereby covenant concerns increases when earnings fall but does not vary when earnings rise. These findings are consistent with the empirical patterns documented in Chapter 1, providing further validation that covenant concerns empirically measures the degree to which financial covenants are a binding borrowing constraint on firm decisions.[1]

[1] While the model replicates the negative relationship between covenant concerns and earnings, it performs poorly against the data along other dimensions. In undocumented analysis, I find that covenant concerns vary with earnings

Figure 3.1: Covenant concerns and change in the earnings in the model.



Notes. Covenant concerns is defined as $CovFuture \equiv 1\{E_t\mu_{t+1} > c\}$, where $E_t\mu_{t+1}$ is the expected shadow value of the borrowing constraint, and c is set so that the average share of observations with covenant concerns matches the average in the empirical data. Change in earnings is computed as the difference in earnings from four quarters ago, normalized by firm-level standard deviation in the change in earnings.

Next, I probe whether covenant concerns predict changes in investment and financing activity in the model. Specifically, I estimate the regression specification (2.16) from Chapter 1, which I restate below for convenience

$$Y_{it+4} - Y_{it-1} = \beta_0 + \beta_1 CovFuture_{it} + \Gamma X_{it} + \alpha_i + \delta_t + \epsilon_{it}$$

where the dependent variable is the change in firm is outcome from beginning of quarter t to end of quarter $t + 4$, $CovFuture_{it}$ is the measure of covenant concerns defined above, X_{it} are a set of time-varying controls in periods t and $t - 1$, and α_i and δ_t are firm and time fixed effects.

Tables 3.4 and 3.5 compare the coefficient estimates using data from model simulation as well as from the sample of Compustat firms with debt-to-earnings covenants in DealScan. Columns 1 and 3 report the estimates from the specification that does not control for investment opportuni-

only when debt-to-earnings is above the firm's average but not below. In the data, covenant concerns also vary inversely with earnings, albeit with lower sensitivity, when debt-to-earnings is below average.

Table 3.4: Covenant concerns and changes in investment activity in the model.

	Δ Capital Expenditures			
	Model		Data	
CovFuture	-34.20***	-0.17	-21.58***	-18.47***
	(-9.88)	(-0.05)	(-5.77)	(-4.96)
Tobin's Q		412.56***		22.80***
		(77.38)		(9.82)
Cash Flow		26.85***		0.48***
		(27.81)		(2.66)
Sales Growth		0.78*		1.77**
		(1.83)		(2.14)
R^2	0.43	0.47	0.52	0.53
N	139309	139309	35356	35356
	Δ Log(Assets)			
	Model		Data	
CovFuture	-3.98***	-1.03***	-5.89***	-4.48***
	(-42.56)	(-14.04)	(-4.65)	(-3.67)
Tobin's Q		-25.15***		5.32***
		(-48.50)		(9.11)
Cash Flow		5.75***		0.24***
		(164.65)		(3.19)
Sales Growth		0.13***		3.61***
		(13.99)		(14.62)
R^2	0.20	0.52	0.42	0.45
N	139309	139309	35909	35909
Firm & Time FE	✓	✓	✓	✓
Controls	✓	✓	✓	✓

Notes. Dependent variable is the change in firm outcome from period $t-1$ to period $t+4$. Capital expenditures is expressed in basis points whereas log assets in log percentage points. All specifications additional controls for the lagged dependent variable, which is not shown in the table. "Model" refers to coefficients estimated using model simulated data, whereas "Data" refers to coefficients estimated using the sample of Compustat firms, excluding non-financials and utilities, with covenant concerns data from earnings call transcripts, covenant violations from SEC filings, and debt-to-earnings covenants in DealScan. See Appendix Table C.1 for the definition of variables in the model and Appendix Table A.2.2 for the definition of variables in the data. * p<0.10, ** p<0.05, *** p<0.01.

Table 3.5: Covenant concerns and changes in financing activity in the model.

	Δ Net Debt Issuance			
	Model		Data	
CovFuture	-9.36***	-1.39	-37.10**	-37.33**
	(-3.20)	(-0.48)	(-2.36)	(-2.38)
Tobin's Q		276.09***		35.27***
		(60.10)		(5.95)
Cash Flow		-15.95***		-9.58***
		(-20.48)		(-4.85)
Sales Growth		4.17***		-1.64
		(11.23)		(-0.50)
R^2	0.48	0.49	0.56	0.56
N	139309	139309	34864	34864
	Δ Equity Payout			
	Model		Data	
CovFuture	-4.18***	-1.59***	-16.43***	-13.51***
	(-9.41)	(-3.66)	(-3.88)	(-3.24)
Tobin's Q		-54.36***		8.75***
		(-75.88)		(3.46)
Cash Flow		8.52***		0.59**
		(70.48)		(2.58)
Sales Growth		0.38***		6.79***
		(7.00)		(6.14)
R^2	0.45	0.48	0.46	0.47
N	139309	139309	34899	34899
Firm & Time FE	✓	✓	✓	✓
Lagged dependent variable	✓	✓	✓	✓

Notes. Dependent variable is the change in firm outcome from period $t-1$ to period $t+4$. Net debt issuance is expressed in basis points whereas equity payout is in log percentage points. All specifications additional controls for the lagged dependent variable, which is not shown in the table. "Model" refers to coefficients estimated using model simulated data, whereas "Data" refers to coefficients estimated using the sample of Compustat firms, excluding non-financials and utilities, with covenant concerns data from earnings call transcripts, covenant violations from SEC filings, and debt-to-earnings covenants in DealScan. See Appendix Table C.1 for the definition of variables in the model and Appendix Table A.2.2 for the definition of variables in the data. * p<0.10, ** p<0.05, *** p<0.01.

ties. Consistent with the data, covenant concerns in the model coincide with a reduction in capital expenditures, log assets, net debt issuance, and equity payouts. The magnitude of decline in investment activity associated with covenant concerns in the model is comparable to those from the data. However, the magnitude of decline in financing activity is significantly smaller compared to the data.

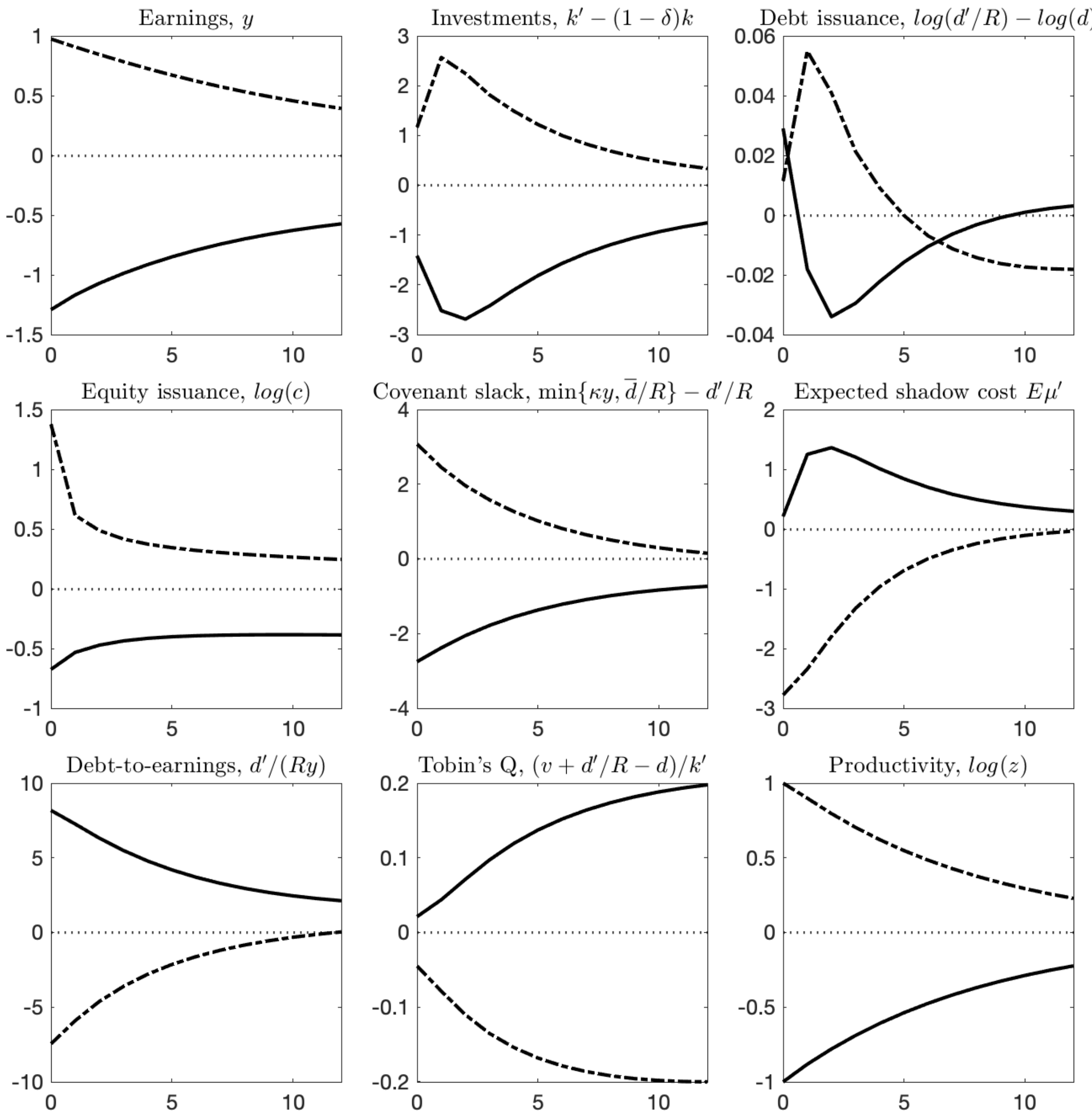
Columns 2 and 4 additionally controls for Tobin's Q, cash flow, and sales growth, which are common empirical proxies of investment opportunities. While the relationship between covenant concerns and firm activity remains large and significant in the data, the additional controls significantly diminishes the coefficient estimates on covenant concerns in the model. This finding suggests that, in the model, the correlation between covenant concerns and changes in firm activities arises from differences in investment opportunities. On the other hand, the correlation in the data also reflects variation in the expected cost of violations, which is discussed in Chapter 2 but is not a feature of the model.

3.3.3 Inspecting drivers of the covenant concerns

What explains the correlation between covenant concerns and firm policies in the model? Since productivity shocks are the only source of uncertainty, it is useful to examine how covenant concerns and firm policies individually respond to an exogenous shock to productivity.

Figure 3.2 plots the impulse responses to an unexpected one standard deviation change in productivity. The solid line plots the responses following a negative productivity shock, whereas the dashed line plots the responses following a positive productivity shock. Following a negative shock to productivity, investments, and equity issuance falls. Debt issuance first rises on impact, but subsequently deteriorates. We also see that the expected shadow cost of the borrowing constraint rises as the firm's covenant slack falls with earnings. These patterns illustrate how differences in productivity shocks explain the correlation between covenant concerns and firm policy. In particular, covenant concerns coincide with a decline in productivity, which is also when the firm's investment and financing activity falls. The decline in earnings following a negative productivity shock also

Figure 3.2: Impulses response to a one-standard deviation shock to productivity log z.



Notes. Solid (dashed) lines show responses following a one standard deviation negative (positive) productivity shock. The impulse responses are expressed in percentage deviation from the steady state average.

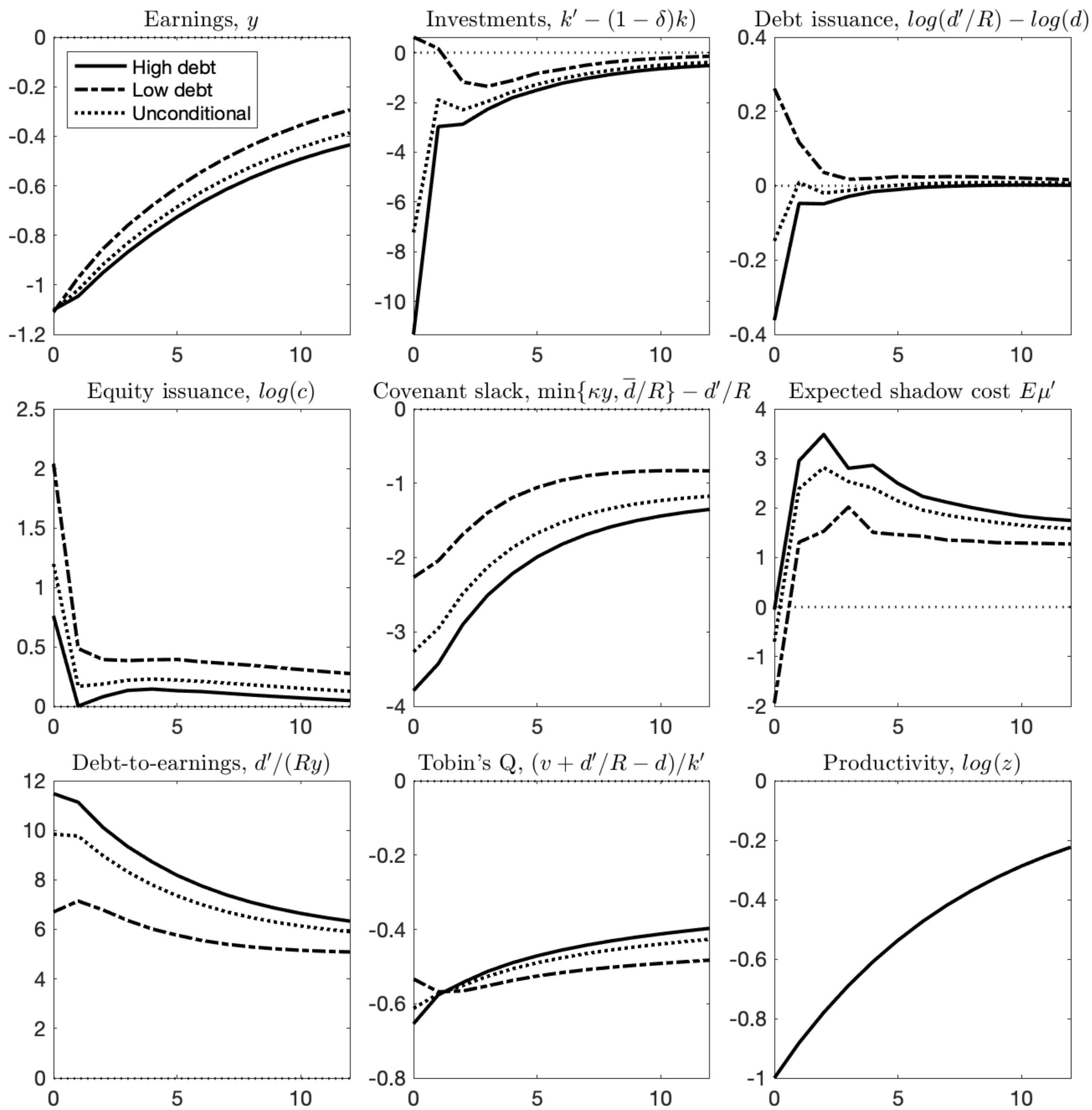
explains why covenant concerns covary negatively with earnings.

There are several notable non-linearities in the responses. In absolute terms, the change in investments conditional on a negative shock ($|i/E_{-1}i - 1| = 1.41$) is 22 percent larger to the change conditional on a positive shock ($|i/E_{-1}i - 1| = 1.16$). In contrast, the change in dividend issuance conditional on a negative shock ($|log(c) - E(log(c))| = 0.68$) is 50.7 percent smaller than change following on a positive shock ($|log(c) - E(log(c))| = 1.38$). These findings are consistent with firms mitigating a large decline in dividends in the bad states when the marginal utility is high. One way to cushion the fall in dividends is to reduce investments. Interestingly, debt issuance rises on impact both following a negative and positive productivity shock. The increase in debt issuance following a negative productivity shock arises from firms' desire to finance a temporary short fall in earnings since they expect productivity to mean revert. The increase in debt issuance following a positive productivity shocks suggest that this channel is dominated by firms' higher demand for external funds due to the increase in desired investment when productivity improves.

How do differences in debt levels explain the correlation between covenant concerns and firm outcomes? Figure 3.3 shows the impulse responses when debt is high (solid line), when debt is low (dashed line), and unconditional on debt levels (dotted line). To make the responses comparable, I fix the level of capital in period 0 to be within three grid points around the median value in the unconditional distribution of capital, but find the results to be qualitatively similar when capital is set to the grid point closest to the median value. Since the restriction on capital reduces the number of valid states from $3,600$ states to 180 states, the impulse response shown is considerably noisier. In contrast to the unconditional responses, a negative productivity shock is associated with a decline in debt issuance on impact and an increase in equity issuance conditional on capital.

The figure shows that that differences in debt levels also explains the correlation between covenant concerns and firm outcomes. In particular, higher covenant concerns, due to higher debt in the period of the shock, is associated with a larger decline in investments, debt issuance and a smaller increase in equity issuance. Why does equity issuance rise when productivity falls? A plausible explanation is that the inter-temporal smoothing motive is dominant in this setting. Since

Figure 3.3: Impulses response to a one-standard deviation shock to productivity $\log z$, conditional on level of debt d.



Notes. Capital stock is set to within three grid points around the median value in the unconditional distribution of capital k. Solid (dashed) lines show responses when debt d in period 0 is above (below) the average value of debt conditional on capital and productivity. Dotted lines show the responses unconditional on debt. The impulse responses are expressed in percentage deviation from the steady state average.

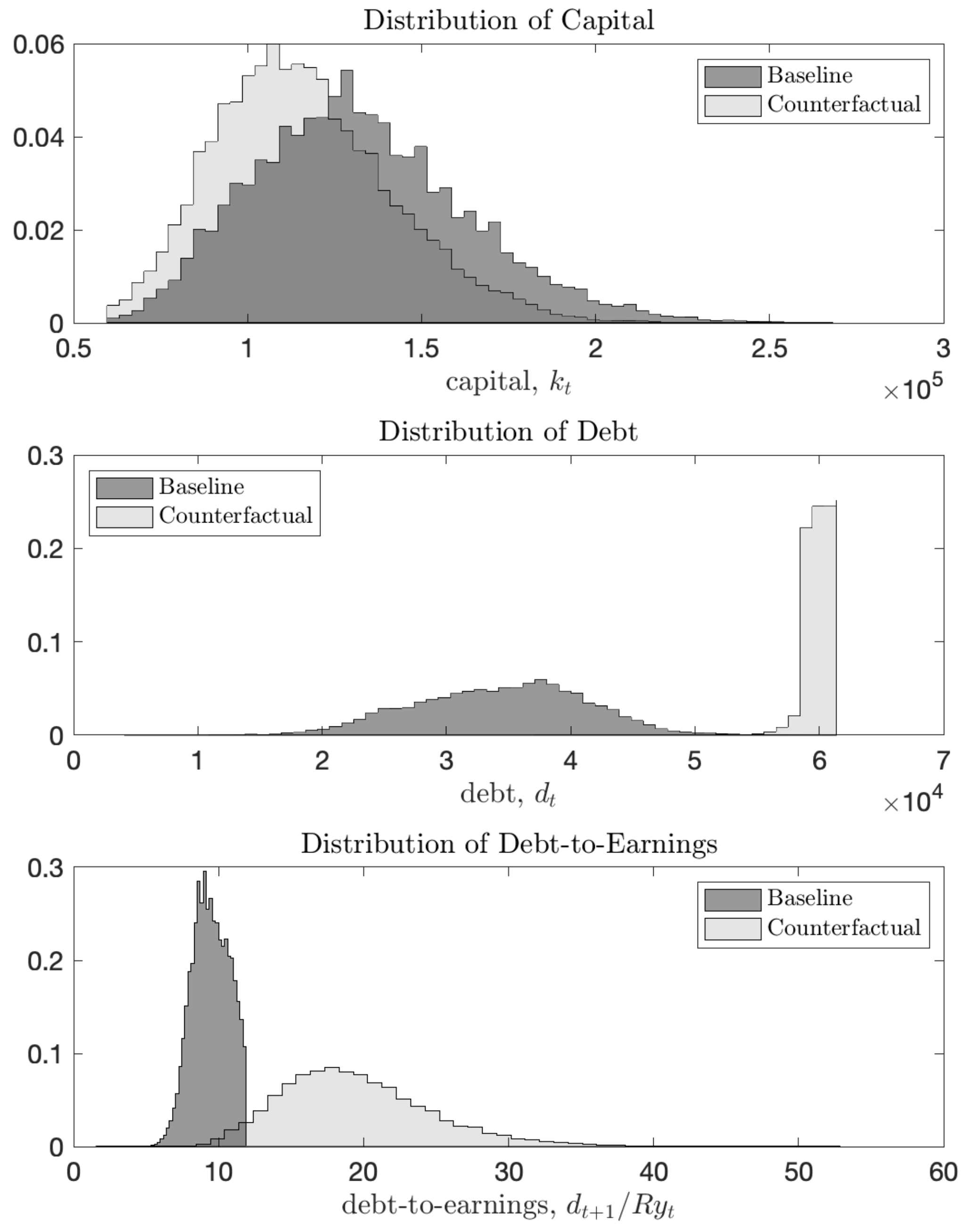
the productivity process is mean reverting, firms expect productivity to subsequently rise following a negative productivity shock. Higher expected productivity, in turn, incentivizes firms to increase investments today as well as issue more dividends. While this motive is present for all points in the state space, they are counterbalanced by higher investment demand when productivity is expected to rise, which leads to lower dividend issuance. Finally, we see that higher covenant concerns, due to higher debt, are associated with lower covenant slack, higher debt-to-earnings, and lower Tobin's Q, which are consistent with the data.

To summarize, the impulse responses shed light on two explanations for why covenant concerns are associated with lower investments, borrowing, and equity issuance. The first explanation is that covenant concerns coincide with periods when firms experience poor realizations of productivity shocks. Poor productivity shocks also lead to lower investments, debt issuance, and equity payouts. The second explanation is that covenant concerns coincides with periods in which firms have high debt levels when facing a negative productivity shock. Firms with high debt levels are more likely to be concerned about covenants when productivity falls. They also choose lower levels of investment, debt and equity issuance compared to firms with low debt levels.

3.4 Implications of financial covenants on firm policy

How do the presence of financial covenants affect firm investment and financing policy? To probe this question, I consider a counterfactual model of firms with no earnings-based constraint, but face an identical path of productivity shocks as the baseline firm. Specifically, the covenant threshold parameter is set to $\kappa = \infty$, but all other parameters are identical to the baseline calibration. Debt and capital grids are identical to the baseline model. Since the maximum allowed debt is below the natural borrowing limit, firms in the counterfactual model are constrained by the upper debt limit. In this sense, one can interpret firms in the counterfactual model as subject to a more relaxed borrowing constraint that does not vary with earnings.

Figure 3.4: Distribution of debt, capital, and debt-to-earnings in the baseline and counterfactual models.



Notes. The dark shaded histogram denotes the baseline model where $\kappa = 3 \times 4$, the light shaded histogram denotes the counterfactual model with $\kappa = \infty$. All other parameters are identical across the two models.

3.4.1 Steady state distribution of debt and capital

Figure 3.4 compares the steady state distribution of debt, capital, and debt-to-earnings between the baseline model with $\kappa = 3 \times 4$ and the counterfactual model with $\kappa = \infty$. There are two key takeaways. First, the distribution of capital in the baseline model is located to the right of the counterfactual model. This implies that financial covenants in the form of earnings-based constraints generates higher levels of capital in equilibrium. Second, the distribution of debt-to-earnings in the baseline model is located to the left of the counterfactual model. This implies that the presence of financial covenants implies a lower level of debt-to-earnings as well as leverage, which is not shown, in equilibrium.

The intuition for why financial covenants imply a higher level of capital can be seen from the deterministic steady state value of capital. In particular, the steady state value of capital for the baseline model and counterfactual model is given by

$$k_{baseline} = \left(\frac{\alpha(1+\kappa\mu)}{\beta^{-1} - 1 + \delta}\right)^{\frac{1}{1-\alpha}}$$
$$k_{counterfactual} = \left(\frac{\alpha}{\beta^{-1} - 1 + \delta}\right)^{\frac{1}{1-\alpha}}$$

We see that the steady state value of capital is higher when the borrowing constraint binds due to the presence of the term $\kappa\mu$ in the numerator. This term is not present in the counterfactual model given the borrowing constraint does not depend on capital. Since the deterministic steady state capital is similar to the average value of capital in the stochastic steady state up to a first order approximation, the presence of financial covenants in the form of an earnings-based borrowing constraint implies a higher average value of capital in steady state. Finally, firms in the counterfactual model are more highly levered because their borrowing constraint is more relaxed. Given that the subjective discount factor is lower than the market discount rate, a more relaxed borrowing constraint allows firms to accumulate more debt in the counterfactual model.

3.4.2 Investment and debt policy functions

Having discussed how financial covenants affect the distribution of debt and capital, I turn to their implications for investment and financing policy. Figure 3.5 shows the optimal choice of investment and debt issuance for a given level of productivity in the baseline and counterfactual model. Since optimal policy also depends on the level of debt and capital, I fix capital and debt to their 50th percentile values in the baseline model.

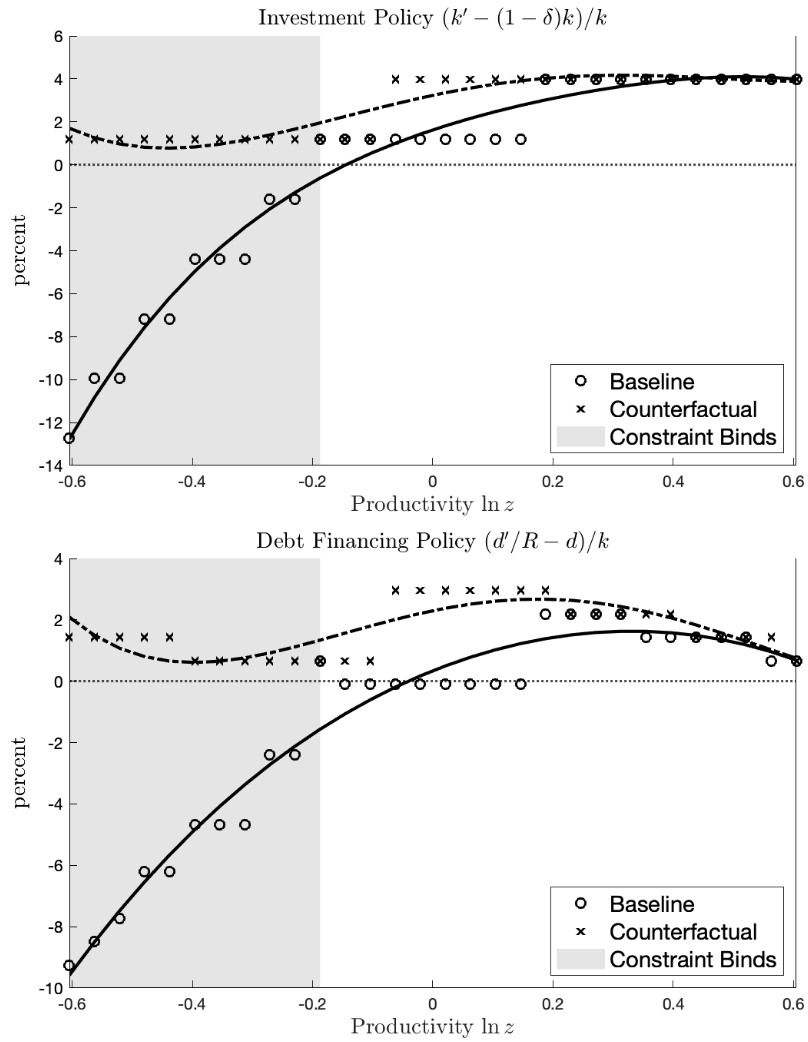
The figure shows that, holding fixed capital and debt, firms facing financial covenants choose to invest and borrow less than firms in the counterfactual model across all levels of productivity. We also see that the wedges between the optimal policies in the baseline and counterfactual models are larger for lower levels of productivity. The wedges are present even in states when the constraint is not binding, which is shown by the non-shaded regions of the state space. This finding is key to the analysis since it shows that financial covenants also distort firm investment and borrowing policies at points where the firm is not in violation of their covenants. This finding is consistent with the findings from Gamba and Triantis (2012) in the context of a dynamic corporate finance model with default risk.

It is important to note that this finding does not contradict the previous finding that financial covenants lead to higher levels of steady state capital. The policy functions shown do not compare firms that are at their steady state since firms in the counterfactual model are not at their median value of leverage. In Appendix Figure C.5, I compare the policy functions fixing debt and capital at the median values of the respective models. Here, I find that optimal investment of the baseline firms is higher than counterfactual firm's when productivity is high and remains below the counterfactual firm when productivity is low. In other words, the presence of financial covenants also raises firms' incentives to accumulate more capital when productivity is high.

3.4.3 Equilibrium response around violations

How do violations of covenants affect the equilibrium responses of firms? To investigate this question, I examine the responses of firms in the baseline model around a covenant violation and

Figure 3.5: Investment and debt issuance policies as a function of log productivity.



Notes. Baseline refers to the model in which $\kappa = 3\times4$, Counterfactual refers to the model in which $\kappa = \infty$. "Constraint Binds" refers to states in which in the baseline model. All other parameters are identical. Both capital and debt are set to the median values of their respective distributions in baseline model. Lines shown are a fourth-order polynomial fitted over the points denoting the respective model's optimal policies.

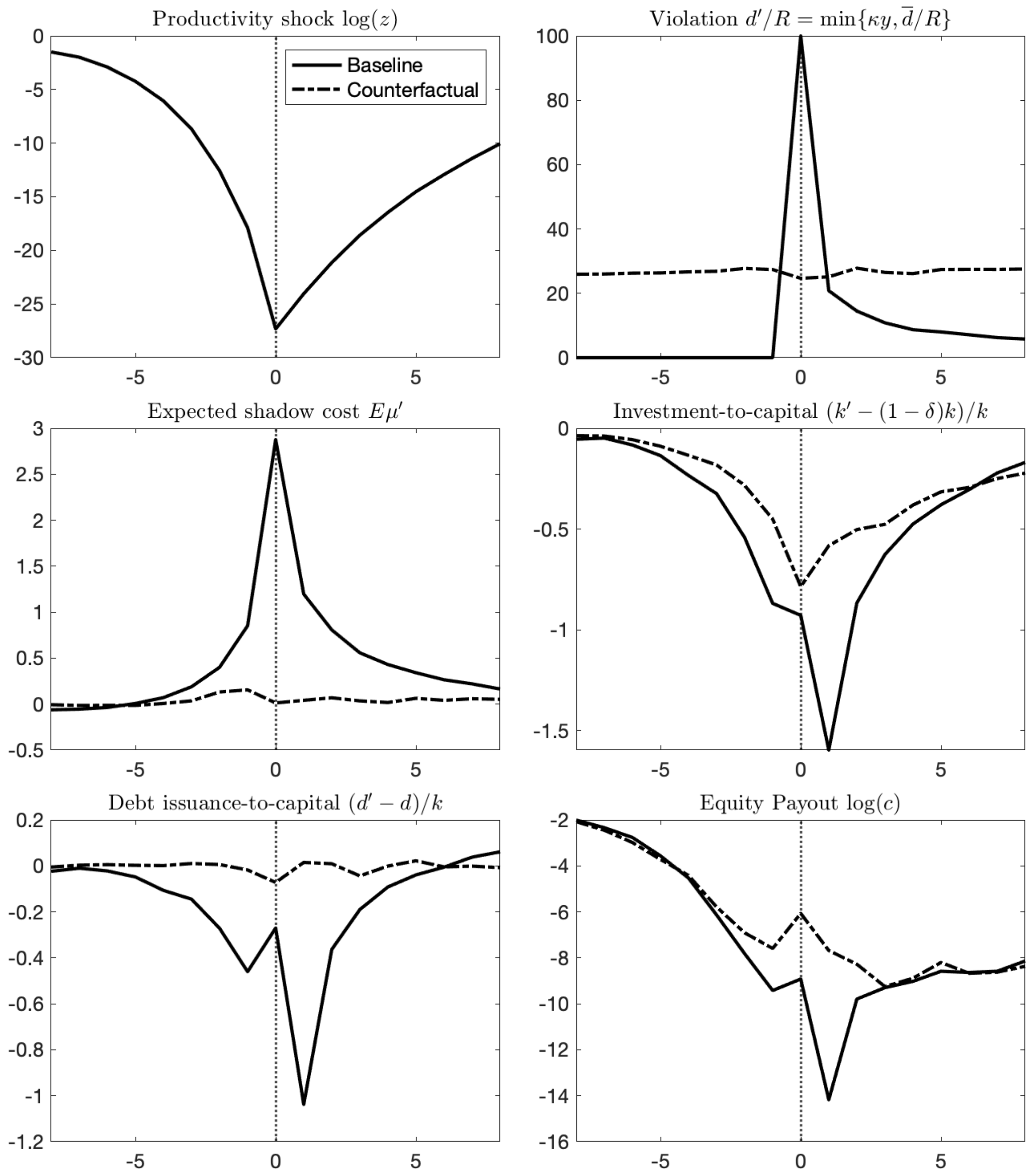
compare them with those in the counterfactual model, holding fixed the sequence of shocks. In the baseline model, a covenant violation is defined as an event in which the borrowing constraint binds with equality, that is $d'/R = \kappa y$. In the counterfactual model, a binding borrowing constraint refers to events in which debt is at the upper limit of the debt grid, that is $d' = \overline{d}$.

To construct the event study window, I extract all observations in the baseline model in which the borrowing constraint binds as well as the eight quarters before and after the violation event. I further restrict the sample to events not preceded by another violation in the previous eight periods, which leaves 17,463 violation events out of 1 million observations. Since the counterfactual model is simulated using the same sequence of productivity shocks, extracting observations along the same points in the simulation yields observations with identical productivity shocks as the baseline model. Finally, I average the responses across all event study windows for each model simulation. All variables are expressed as percentage deviation from their unconditional average.

Figure 3.6 plots the equilibrium dynamics in the eight quarter window around covenant violation events for the firm with earnings-based borrowing constraint as the solid line and the counterfactual firm as the dashed line. The top row illustrates the sample restrictions discussed above. In the left panel, we see that the sequence productivity shocks is identical in both the baseline and counterfactual model. In the right panel, we see that no violations occur in the eight periods prior to period 0 for the baseline model. There are two notable observations. First, covenant violations in the baseline model occurs after a sequence of negative productivity shocks. Given that the productivity process is mean reverting, the firm in both models are negatively surprised leading up to the violation event. Second, there is no variation in the probability of violation in the counterfactual model even though productivity declines. This is because there is a significant mass of observations bunched at the upper debt limit with no room for additional increases in debt. The firm does not choose to de-cumulate debt since they expect productivity to mean-revert.

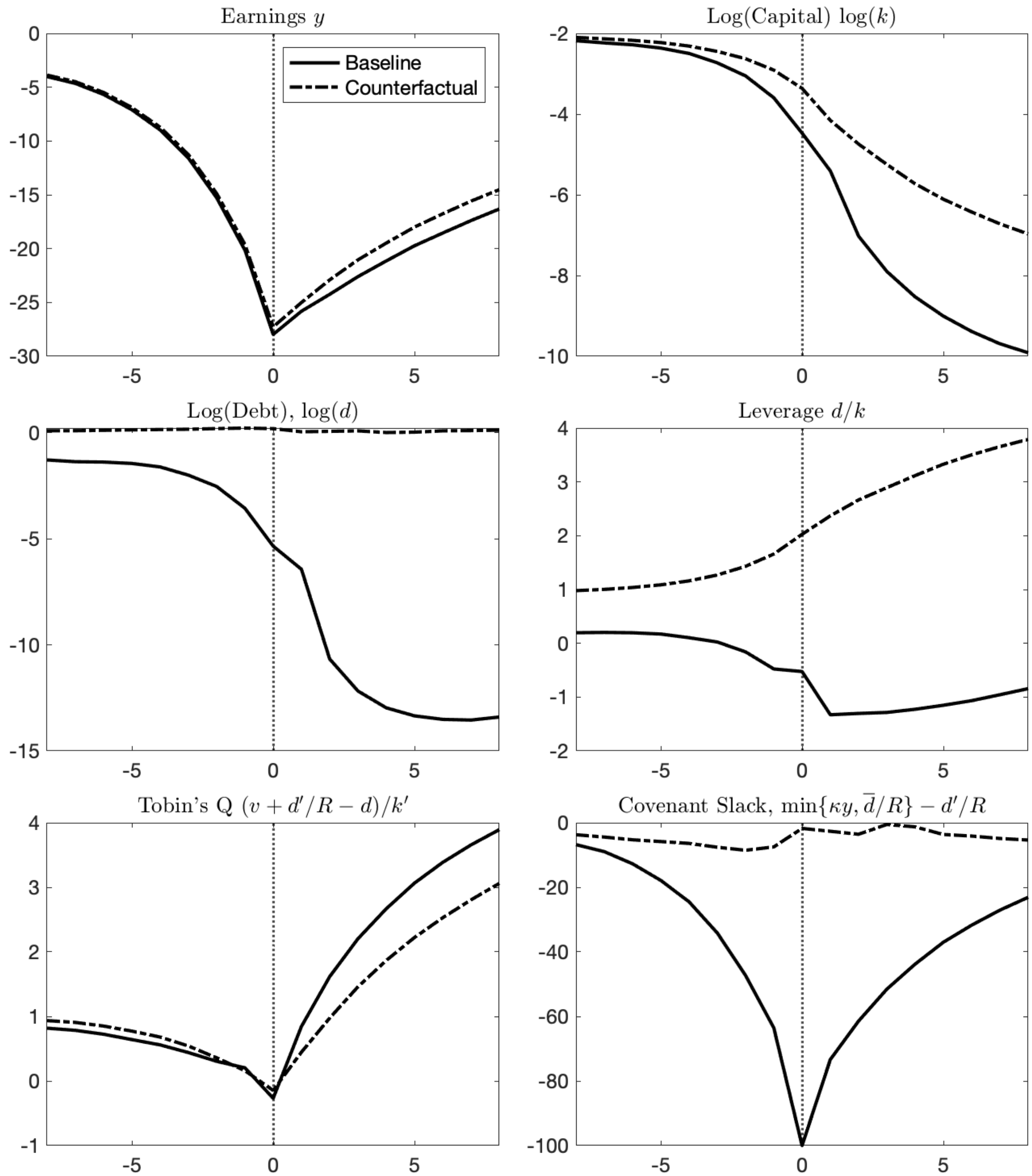
The lower two rows examine differences in investment, debt, and equity financing policies around violation events. The figures also show the expected shadow cost of the borrowing constraint, which describes the expected value of relaxing the borrowing constraint in the next period.

Figure 3.6: Equilibrium responses around covenant violation events (1 of 2)



Notes. The solid (dashed) line shows the average response in the baseline (counterfactual) model. Event study windows are constructed by extracting observations in the baseline model in which the borrowing constraint binds, as well as the preceding and following eight quarters. Similar points along the simulation are also collected for the counterfactual model, which uses the same sequence of productivity shocks. All variables are expressed in percentage deviation from the stochastic steady state average.

Figure 3.7: Equilibrium responses around covenant violation events (2 of 2)



Notes. The solid (dashed) line shows the average response in the baseline (counterfactual) model. Event study windows are constructed by extracting observations in the baseline model in which the borrowing constraint binds, as well as the preceding and following eight quarters. Similar points along the simulation are also collected for the counterfactual model, which uses the same sequence of productivity shocks. All variables are expressed in percentage deviation from the stochastic steady state average.

We see that investment and financing activity fall by more in the baseline model compared to the counterfactual model, even though the sequence of productivity is the same across both models. Importantly, the divergence begins several periods before the violation event, even though no violations occur during that time. We see that the divergence coincides with a rise in the expected shadow cost of the borrowing constraint, which implies that firms place an increasing value on loosening their borrowing constraints.

Figure 3.7 completes the picture by showing the dynamics of other key variables in the model. Firms in the baseline model enter the event study window with similar levels of capital but less leverage. As productivity continues to decline leading up to the violation events, baseline firms de-lever but their actions are not sufficient to avoid the violation from occurring. An important reason is because firms expect productivity to mean revert, hence do not de-cumulate debt faster in expectation of lower future productivity. Firms in the baseline model exit violation with lower leverage given the general decline in debt, but with higher in Tobin's Q given higher levels of productivity.

To summarize, the findings show violation of covenants are associated with a lower equilibrium investment and financing responses relative to the counterfactual model, even in periods prior to a violation event. In other words, financial covenants distort firm investment and financing policies even at points where the borrowing constraint does not bind.

3.5 Conclusion

This chapter studies how covenant concerns correlate with firm investment and financing policy in a structural model. The model is a dynamic partial equilibrium model in which firms are risk averse and subjected to an occasionally binding earnings constraint. While relatively parsimonious, the model qualitatively explains key moments in the data, including the correlation between covenant concerns and firm investment and financing policy.

Analyzing the impulse responses to productivity shocks sheds light on two explanations for the correlation between covenant concerns and firm policies. First, covenant concerns coincide with negative productivity shocks, which also results in lower investment and equity payouts in the model. The model also predicts that debt issuance subsequently declines following a negative productivity shock, although debt issuance is higher on impact. A second explanation is that covenant concerns coincide with higher debt levels. Conditional on a negative productivity shock, firms with higher debt levels choose less investments, debt issuance, and equity payouts relative to firms with low debt levels.

Through a counterfactual analysis, this chapter also demonstrates that financial covenants distort firm policies and equilibrium responses in general, not only when firms are in violation. In particular, I find that firms with financial covenants hold more capital than firms without covenants, but are less levered. Holding fixed debt and capital, firms with financial covenants adopt more conservative investment and debt financing policies at all levels of productivity. Finally, firms with covenants cut their investment and financing activities by more than firms without covenants around covenant violation events.

The model analyzed in this chapter does not incorporate heterogeneous cost of violation. However, the empirical patterns documented in Chapter 2 suggests that differences in violation costs are also important in explaining covenant concerns in the data. Extending the model to incorporate these features may allow the model to better match other empirical patterns in the data. Microfounding differences in violation costs would also shed light on the role of lenders in affecting firm responses to financial covenants. Given recent empirical work documenting the role of financial covenants in transmitting financial shocks to the economy (Chodorow-Reich and Falato (2021)), this is a promising avenue for future research.

Chapter 4: Macroeconomic attention and expected returns[1]

4.1 Introduction

This chapter investigates whether attention to the macroeconomy is a source of risk that is priced in the cross section of expected returns. We find that firms with higher macroeconomic attention subsequently earn returns that are lower on average than firms that pay less attention to the macroeconomy. Sorting stocks into portfolios based on their degree of attentiveness to the macroeconomy, we document that stocks in the top decile (most attention) have returns that are on average 1.02 percent per month (11.6 percent per year) lower than stocks in the bottom decile (least attention). A portfolio that longs the top decile portfolio and shorts the bottom decile portfolio earns an absolute annualized Sharpe ratio of 1.34, which is sizeable relative to the market portfolio's Sharpe ratio over the same sample period.

If macroeconomic attention proxies for a stock's exposure to aggregate risk, then the excess returns of macroeconomic attention sorted portfolios should be fully explained by the portfolios' market betas. We find that the excess return of the portfolios persists even after controlling for market betas, as well as other factors and firm characteristics known to predict the cross section of asset returns, including the stock's log market capitalization, book-to-market ratio, exposure to aggregate volatility and idiosyncratic volatility. In each of these cases, we find that returns of portfolios decrease as the average macroeconomic attention of stocks in the portfolios increase. Our findings are also robust to measuring the effects of macroeconomic attention on returns at the individual stock level. Hence, an explanation that relies solely on exposure to aggregate risk does not fully account for the negative macroeconomic attention premium we observe.

Measuring firm-level macroeconomic attention is challenging given that we do not directly

[1] Joint with Eugene Larsen-Hallock.

observe what firm managers pay attention to. Recent empirical work draws on survey responses of firm managers and finds rich heterogeneity in the degree to which managers are paying attention to macroeconomic conditions (Kumar et al. (2015) and Coibion, Gorodnichenko, and Kumar (2018)). We contribute to this literature by proposing an alternative measure based on the attention CEOs and CFOs allocate to discussing macroeconomic conditions in earnings calls. To identify macroeconomic-related discussions in calls, we train a neural-network classifier on a library of labeled Reuters news articles published in the same period as the calls, and then use the classifier to label sentences in earnings calls transcripts as either macroeconomic- or firm-related.

To explain the negative macroeconomic premium, we first link our measure of macroeconomic attention to firm fundamentals through a model of analysts whose objective is to accurately forecast future earnings, which in turn is affected by unobserved macroeconomic and firm-specific shocks.[2] Information about these shocks is conveyed through the content of the call, which is naturally limited by the length of the call and the finite attention span of analysts listening in on the call. Prior literature offers evidence of such limitations, including underreaction of prices to earnings announcements made on Fridays as opposed to other weekdays (Dellavigna and Pollet (2009)) and lower consumption of earnings calls on days where more firms hold calls (Heinrichs, Park, and Soltes (2018)). The model predicts that attention to the macroeconomy is increasing in the share of earnings news explained by the macroeconomic component.

Using the return decomposition framework of Campbell (1991), we then show that firms with a greater share of cash flow news explained by the macroeconomic component is associated lower cash flow risk, hence lower risk premium. The reason is that these stocks contribute less undiversified cash flow risk to the investor's portfolio, hence earn lower expected returns. As the price of risk on cash flow news is different from that of discount rate news (Campbell and Vuolteenaho (2004)), market betas do not fully explain heterogeneity in cash flow risk. At the level of portfolio

[2]The model builds on a rich literature that studies the implications of rational inattention, in particular Maćkowiak and Wiederholt (2009). See Maćkowiak and Wiederholt (2009), Maćkowiak, Moench, and Wiederholt (2009), and Mackowiak, Matejka, and Wiederholt (2018)for models of attention allocation in a linear Gaussian quadratic framework, Nieuwerburgh and Veldkamp (2009), Nieuwerburgh and Veldkamp (2010), and Kacperczyk, Nieuwerburgh, and Veldkamp (2016) for models of attention allocation in a noisy rational expectations equilibrium framework.

returns, we find evidence that stocks with higher macroeconomic attention have lower cash flow betas. This finding is consistent with the explanation that different levels of macroeconomic attention we observe reflects different exposures to aggregate cash flow risk, and supports a rational explanation for the macroeconomic attention premia.

Related literature. Our analysis is an application of neural network models, which has gained prominence in natural language application in recent years.[3] Complex prediction problems such as parts-of-speech tags, question answering, and machine translation leverage sophisticated networks with convolutional and recurrent structures. While these structures allow for a richer representation of meaning to be extracted from the text data, we find that the nonlinearity of neural network models provides significant accuracy gains for our classification tasks without the need to introduce more complexity into our prediction model. As such, we focus on the simplest of neural network models for our application.

Closely related to our work, Flynn and Sastry (2020) measures macroeconomic attention in firm disclosure data. Our findings complement theirs in that we find that our measure of macroeconomic attention is strongly countercyclical. However, our analysis differs in several regards. First, we apply a supervised machine learning method for parsing the content of earnings calls related to the macroeconomy, which is more suitable to our application given our interest in predicting returns. Second, their analysis focuses on the implications of attention allocation for the volatility of output growth, whereas our analysis focuses on the effects of attention allocation for the cross section of stock returns.

Our work also contributes to a growing literature in macroeconomics using earnings call transcripts.[4] Hassan et al. (2019) constructs a novel measure of political risk from the text of earnings calls and finds that their measure strongly predicts investment, hiring, lobbying and political donation activities of firms in a manner highly indicative of political risk. Hassan et al. (2021a) constructs a measure of country-level risk using earnings calls transcripts. They find that increased

[3]See Goldberg (2015) for a survey of application of neural network models in textual analysis.

[4]Gentzkow, Kelly, and Taddy (2019) provides a recent and comprehensive survey of the methods in textual analysis with emphasis on its application to economics and finance, Li (2010) and Loughran and McDonald (2016) provide comprehensive surveys of the use of textual analysis in the accounting literature.

perceptions of country riskiness is associated with capital outflows and fall in asset prices within that country, which provides novel insight into cross-border contagion through firm-level exposures to country specific risks.

Finally, our work contributes to a long tradition in finance studies characteristics that predict expected returns in the cross-section of stocks.[5] We add to this literature by documenting a characteristic that has economically meaningful and robust effects on stock returns, particularly in the recent sample period. Furthermore, we draw on the contributions of Campbell and Mei (1993), Vuolteenaho (2002), Campbell and Vuolteenaho (2004), and Campbell, Polk, and Vuolteenaho (2009) to explain the macroeconomic attention risk premium that we observe in the data.

The rest of the chapter proceeds as follows. Section 4.2 describes our methodology for measuring macroeconomic attention, and Section 4.3 reports our empirical results on the effects of macroeconomic attention on stock returns. In Section 4.4, provide our explanation for the negative macroeconomic attention that we observe in the data in Section . Finally, Section 4.5 concludes.

4.2 Measuring firm-level macroeconomic attention

4.2.1 Data

Earnings call transcripts

Our laboratory is the set of transcripts of earnings conference calls held by publicly listed firms in the United States from 2002Q1 to 2020Q2, transcribed and published by FactSet. Our subsequent analysis focuses on calls of US public listed firms, excluding firms in the financial and utilities sectors, which take place between 2005Q1 and 2019Q4.[6]

Earnings calls are typically held once per quarter, and serve as a medium for firms to discuss their most recent earnings results and disclose material information to market participants.

[5] See Lewellen (2015), McLean and Pontiff (2016), Chen and Zimmermann (2020), and Feng, Giglio, and Xiu (2020) for detailed surveys of cross-sectional predictors of asset returns.

[6] We drop calls in 2020 given that we have access to data only until May 2020, and drop calls before 2005 due to poor coverage of publicly listed US firms. See Figure D.1 in the Appendix for share of public listed US firms with matched earnings calls over time.

Earnings calls typically consist of a management discussion section where senior management discusses the company's most recent financial results and a questions and answers section where they field questions from a selected group of analysts.

Heinrichs, Park, and Soltes (2018) documents that earnings call participants are primarily buy-side investors, and that participants are approximately equally split between common stock holders and non-holders. They find that buy-side non-holders are significantly more likely to invest in the firm's shares in the quarter following its earnings calls, after controlling for the firm's earnings performance and other firm and call characteristics. Their evidence lends support that conference calls contain material information that influence the investment decisions of market participants, complementing prior evidence that calls materially affect stock returns, both through the content of the discussions as well as in the use of vocal cues (Matsumoto, Pronk, and Roelofsen (2011)).

Training data

As training data, we use a collection of Reuters news articles that we label as either related to the macroeconomy or firm-specific news. We gather our library of Retuers news articles by systematically collecting the top-ranked Google Search results Reuters news every week from January 2004 to May 2020. Our search query is

$$
\begin{aligned}
\text{query} = &\text{“site: reuters.com”} \\
&+ \text{“economy”or “[company name]”} \\
&+ \text{“after: [start date]”} + \text{“before: [end date]”}
\end{aligned}
$$

where [company name] is a placeholder for the name of companies from the S&P1500. This search query algorithm allows us to collect both news articles relevant to economic conditions, as well as articles related to company-specific news.

We then proceed to systematically label our news articles using topic codes in the metadata of the articles collected, which are assigned by Reuters for search engine optimization[7] Specifically, we classify an article as "Macro" news if it has keywords "United States" and "Economy" but not "Company News". Conversely, an article is classified as "Firm" news if it has keywords "United States" and "Company News" but not "Economy". This ensures we obtain non-overlapping training libraries for macro and firm-specific words. Our final sample consists of 44,835 Reuters news articles, with 12.7 percent of articles labeled as related to the macroeconomy.

4.2.2 Preprocessing and feature selection

Prior to estimation, we preprocess the text of both Reuters news articles and earnings calls transcripts similarly with the purpose of reducing the vocabulary to a set of meaningful terms informative about underlying content of interest. The preprocessing procedure that we adopt is commonly applied in the literature on textual analysis (Gentzkow, Kelly, and Taddy (2019)), and involves removing stop words such as "the", "a", "an", which convey little meaning in our application, and stemming words down to their root using the Porter stemmer algorithm (Porter (1980)).

We divide the news articles and call transcripts into a collection of sentences, which in turn consists of a collection of words. Formally, denote the vocabulary $\mathcal{V}$ as the unique set of words w in the training data, and a document $d_{s,i,t}$ as a $|\mathcal{V}| \times 1$ vector of counts for each word in the vocabulary, indexed by the sentence s from the earnings call held by firm i in quarter t. Denote corpus $\mathcal{D} = \cup_{s,i,t} d_{s,i,t}$ as a collection of documents across sentences s, firms i, and quarter t. Our corpus has a bag-of-words representation, which is an $|\mathcal{D}| \times |\mathcal{V}|$ matrix of word counts. While this characterization of the text ignores the rich complexity conveyed by the grammatical structure and co-occurrence of words in each document, it is shown to be an effective representation of text data in many economics and finance applications (Gentzkow, Kelly, and Taddy (2019)).

To construct the vocabulary list, we compile the set of individual words or unigrams from the text, as well as bi- and trigrams, such as "capit expenditur" and "foreign currenc exchang", which we construct by the patterns-of-speech algorithm adopted in Hansen, McMahon, and Prat (2018).

[7] See Reuters metadata guide (`https://liaison.reuters.com/tools/metadata-guide`) for a complete list of topic codes.

We retain bigrams that occur at least 100 times in the corpus and trigrams that occur at least 50 times.

To further reduce the weights of common and rare words in subsequent analysis, we assign a document-specific measure of importance to each word in a given document known as the term frequency-inverse document frequency (tf-idf) score. Formally, for word v in document d_{sit}, define the term frequency-inverse document frequency (tf-idf) score $w_{d,v}$ as

$$w_{d,v} = f_{d,w} \times \log\left(\frac{1}{b_{d,w}}\right)$$

where $f_{d,v}$ is the fraction of times word w occurs in document d, and $b_{d,v}$ is the fraction of documents word v appears across the entire corpus $\mathcal{D}$. A document d is thus represented as a $|\mathcal{V}| \times 1$ vector of tf-idf scores $w_d = [w_{d,1}, ..., w_{d,|\mathcal{V}|}]'$, and the document-term matrix is the $|\mathcal{D}| \times |\mathcal{V}|$ matrix of tf-idf scores, where $w = [w'_1, ..., w'_{|\mathcal{D}|}]'$. To further reduce the dimensions of our data, we restrict the set of vocabulary terms to top 5000 terms by average tf-idf score across documents in the training sample.

4.2.3 Classification problem

We are interested in mapping the representation of the text w to the outcome variable of interest. For our analysis, this outcome variable is the attention to the macroeconomy in earnings calls of firm i in quarter t. In our library of Reuters news article sentences, this variable takes on a binary value of 0 or 1, where 1 indicates a sentence from an article labeled as “Macro” and 0 otherwise. Our set of earnings call transcripts, however, do not have such naturally assigned labels. As such, we are interested in estimating a function that allows us to predict the label m_d of the document from from its tf-idf score T_d. Formally, for each document d, we want to estimate the function

$$m_d = h(w_{d,1}, ..., w_{d,|\mathcal{V}|})$$

where $h(\cdot)$ is a function that maps the tf-idf score w_d to the probability that document d has label 1, $m_d \in [0, 1]$. As an application in supervised machine learning, we train the parameters of the function $h(\cdot)$ on our training data for which we have labels assigned (Reuters news articles), and then use the trained function to predict labels on data for which we do not have labels (earnings call transcripts).

Our preferred approach is to approximate the function $h(\cdot)$ using an artificial neural-network. Artificial neural networks (ANN) encompass a large class of machine learning models with widespread applications in many fields, and is one of the preferred approaches for complex prediction problems such as computer vision, natural language processing, and speech recognition (Hastie, Tibshirani, and Friedman (2009)). This is largely due to the model's ability to approximate any continuous function arbitrarily well for a large enough number of hidden features.Hornik, Stinchcombe, and White (1989)

Formally, the ANN model is given by

$$m_d = h(w_{d,1}, ..., w_{d,|\mathcal{V}|}) \approx \theta_0 + \sum_{n=1}^{N} \theta_n \sigma\Big(\beta_{0,n} + \beta_n' w_d\Big) \tag{4.1}$$

where the first layer consists of N linear models with parameters $(\beta_{0,n}, \beta_0)$, and the second layer is a linear combination of the N models with parameters (θ_0, θ_n), after applying a suitable non-linear transformation to each model. There are many possible non-linear transformations commonly applied in estimating the ANN. Given that the outcome variable is $\{0, 1\}$, choosing the sigmoid function $\sigma(x) = 1/(1+e^{-x})$, which restricts the output space to be $[0, 1]$, is appropriate. Multilayer ANN generalize the above structure by allowing for multiple layers of hidden units, where each layer consists of a linear combination of the previous layer's hidden units after applying a nonlinear transformation. The specification shown is a single hidden-layer ANN.

4.2.4 Inference

For the single-layer artificial neural network, the model parameters consists of $N(|\mathcal{V}|+1)$ first-layer weights $\{\beta_{0,n}, \beta_{n,w}; n = 1, ..., N, w = 1, ..., |\mathcal{V}|\}$ and $(N+1)$ output-layer weights $\{\theta_0, \theta_n; n = 1, ..., N\}$. As an application of supervised learning, we train the parameters of the model $\Theta = \{\theta_0, \theta_n, \beta_{0,n}, \beta_{n,w}\}$ on our library of Reuters news articles. Formally, the parameters are estimated by minimizing the cross-entropy loss function

$$\min J(\Theta) = \frac{1}{|\mathcal{D}|}\sum_{d=1}^{|\mathcal{D}|}\mathcal{L}(\hat{m}_d, m_d)$$

$$\mathcal{L}(\hat{m}_d, m_d) = -m_d \log(\hat{m}_d) - (1 - m_d)\log(1 - \hat{m}_d) \tag{4.2}$$

where $\hat{m}_d$ denotes the prediction of document d's label from the neural net model (we drop the subindices of documents (s, i, t) for notational convenience). The generic approach to minimizing $J(\Theta)$ is by gradient descent, which involves computing the predicted values $\hat{m}_d$ using the forward propagation equation (4.1), computing the local gradients of each parameter given the lost function (4.2), and then updating each parameter by the size of the computed gradients subject to a learning rate adjustment. This process is done iteratively until the parameter estimates converge as the gradients tend to zero with each update. In general, computing the gradients using all training examples $|\mathcal{D}|$ is computationally expensive, and a common solution is to employ stochastic gradient descent in which the gradient of parameters are updated using a random subset of the training data. The stochastic nature of the descent requires that the step size of the updates shrinks to zero as the gradient approaches zero so that the noise from random sampling does not dominate the directional signal of the gradient. A critical tuning parameter that governs the step size is the learning rate, and we adopt the Adam algorithm proposed by Kingma and Ba (2014) to adaptively control the learning rate.

Fitting a neural-net model also involves choosing the number of hidden layers and number of hidden features per layer. A common approach is to estimate the optimal number of units and layers by cross-validation. This approach evaluates the fit of the model on a validation dataset not used to estimate the model parameters, and chooses the number of units and layers that yields the best fit. Our preferred specification based on a five-fold cross validation procedure is a single hidden-layer neural-net with $N = 64$.

Having obtained a prediction of the macroeconomic relevance of each sentence, we construct a measure of attention to the macroeconomy for firm i in quarter t as the share of sentences that are macroeconomic-relevant. Formally, define C_{it} to be the set of sentences d in earnings call for firm i in quarter t. The macroeconomic attention of firm i in quarter t is given by

$$MacroAttn_{it} = \frac{1}{|C_{it}|} \sum_{d \in C_{it}} 1\{m_d \geq c\}$$

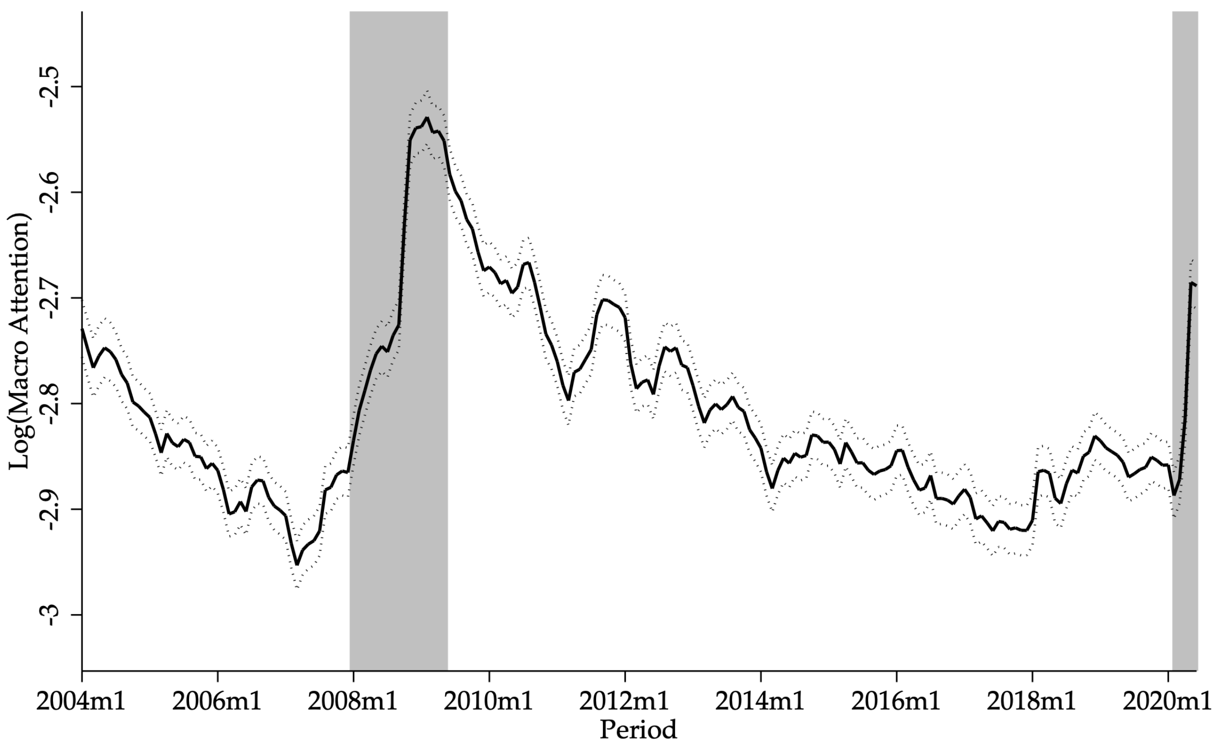
where c is a threshold to be specified. In our baseline specification, we choose $c = 0.5$, but find that our results remain robust to variation in this threshold. As a validation exercise, we report the top-20 terms that occur in the earnings call transcripts labeled as "Macro" as well as "non-Macro" in Appendix Table D.2. We find interpretable differences in the terms found in earnings call transcript sentences labeled as "Macro" and "non-Macro", which suggest that our algorithm works as intended.

4.2.5 Discussion

Figure 4.1 plots the cross-sectional average log macroeconomic attention each month over the sample period for which we have earnings calls transcripts – from January 2004 to May 2020.[8] The average attention to the macroeconomy is strongly countercyclical; The two peaks in the attention index occurs in April 2009 and May 2020, which coincides with the Great Financial Recession and the Covid-19 pandemic-induced recession. The countercyclical discussion of macroeconomic conditions is consistent with the notion of attention in models of rational attention allocation. In particular, heightened aggregate uncertainty during recessions draw more attention away

[8] To construct monthly observations for each firm, the quarterly macroeconomic estimates are carried forward from the month the call was held until the month before next call is observed.

Figure 4.1: Attention to the macroeconomy over time.



Notes. The sample period is from January 2004 to May 2020. Dotted lines show the 95 percent confidence interval of the estimated average. Shaded bar denotes NBER recession months.

from firm-specific conditions to macroeconomic conditions (Maćkowiak and Wiederholt (2009); Kacperczyk, Nieuwerburgh, and Veldkamp (2016)).

Another plausible explanation for the observed countercyclical nature of macroeconomic discussions is that firms managers may be more inclined to blame the economy when they perform poorly relative to expectations. Recent empirical work finds evidence that managers engage in strategic disclosures that are influenced by earnings performance, for example by limiting information in the presence of unfavorable condition (Chen, Matsumoto, and Rajgopal (2011)) or disproportionately calling on analysts with positive views of the firm (Cohen and Malloy (2016)). We explore the robustness of the relationship between macroeconomic uncertainty and attention in the following regression specification

$$log(MacroAttn)_{ic} = \alpha_i + \beta_1 log(MacroUnc)_c + \beta_2 SUE_{ic} + \delta X_{ic} + \epsilon_{ic} \tag{4.3}$$

where $log(MacroAttn)_{ic}$ is log macro attention of firm i in call c, $log(MacroUnc)_c$ is the log macroeconomic uncertainty in the month call c was held, SUE_{ic} is firm i's earnings in the fiscal quarter associated with call c relative to market expectations, X_{ic} are firm-specific characteristics in the fiscal quarter associated with call c, and α_i controls for firm fixed effects. To proxy for uncertainty about macroeconomic shocks, we use the 12-month ahead total macro uncertainty index (JLN Uncertainty) of Jurado, Ludvigson, and Ng (2015). As controls, we include firm specific controls including the log market capitalization (Size), debt-to-asset ratio (Leverage), log book-to-market equity ratio (Book-to-market), and number of analysts issuing forecasts (NumAnalyst). We also control for the length of the call using the number of sentences, and the dictionary-based sentiment measure of the call constructed from the Loughran and McDonald (2011) sentiment dictionary.

If our text-based measure of macroeconomic attention is related to overall uncertainty about macroeconomic conditions, we expect $\beta_1 > 0$ after controlling for other potential explanations. In words, an increase in macroeconomic uncertainty corresponds to more time allocated to discussing

Table 4.1: Macroeconomic attention, uncertainty, and earnings performance.

	log(MacroAttn)
log(MacroUnc)	0.986***
	(32.93)
Earnings Surprise	0.000132
	(0.04)
Controls	Yes
Firm FE	Yes
R-squared	0.439
Nobs	84260

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Notes. This table reports the regression estimates of macroeconomic attention on macroeconomic uncertainty, earnings surprise, time-varying firm controls, and firm fixed effects at the firm-quarter level. Controls include the firm size, leverage, book-to-market ratio, analyst coverage, and excess returns over the fiscal quarter, and number of sentences in the call. The sample period is from 2005Q1 to 2019Q4.

macroeconomic conditions, controlling for firm-specific characteristics. Furthermore, finding $\beta_2 < 0$ would be evidence suggestive that firms which underperform market expectations are more likely to blame the economy.

Table 4.1 reports the coefficient estimates of the regression specification (4.3). We find that our measure of macroeconomic discussions covary positively with macroeconomic uncertainty ($\beta_1 > 0$), even after controlling for the firm's operating performance, time-varying characteristics and firm fixed effects. This result provides suggestive evidence that discussions of macroeconomic conditions are higher during periods of higher macroeconomic uncertainty. We do not find evidence that firms are more likely to discuss macroeconomic conditions when earnings underperform relative to analyst expectations ($\beta_2 = 0$).

4.3 Macroeconomic attention and expected returns

In this section, we examine whether our measure of macroeconomic attention predicts the cross-section of stock returns. Our analysis is based on two well-established methodologies for testing predictors of the cross section of expected returns: (1) examining the excess returns of portfolios sorted on the basis of macroeconomic attention, and (2) a regression of returns on firm characteristics in the spirit of Fama and MacBeth (1973).[9]

To improve our predictor's signal-to-noise ratio, we fit a predictive model of macroeconomic attention using past values of macroeconomic attention, and use the out-of-sample predicted value of macroeconomic attention as our preferred measure of the characteristic in a given quarter. Formally, for firm i and quarter $t \in \{1, ..., T\}$, we estimate a linear predictive model given by $log(MacroAttn)_{i,t} = \alpha_i + \sum_{j=1}^{4} \beta_j log(MacroAttn)_{i,t-j} + \varepsilon_{i,t}$, where α_i are firm fixed effects, using only data up to quarter T. Having estimated the model parameters, we then predict the out-of-sample value of macroeconomic attention in quarter $T + 1$, $log(\widehat{MacroAttn})_{i,T+1}$. We repeat this procedure on a rolling basis to generate predicted values of macroeconomic attention for each firm over the sample period.

Prior empirical studies have found a large number of cross-sectional factors that have explanatory power for the cross-section of returns (Lewellen (2015), McLean and Pontiff (2016), Feng, Giglio, and Xiu (2020), and Chen and Zimmermann (2020)), and the challenge lies in showing that our characteristic provides incremental information about the cross section of returns. We control for well-known factors and characteristics known to predict returns, including exposure to the market factor (beta), log market capitalization (size), book-to-market ratio (BM), as well as aggregate volatility and idiosyncratic volatility betas from Ang et al. (2006). We also examine whether returns of portfolios sorted on the basis of macroeconomic attention can be explained by the market model, Cahart four-factor model, Fama-French three- and five-factor models (Fama and MacBeth (1973)). As an additional robustness exercise, we include additional controls by considering the 15 characteristics found by Lewellen (2015) to be important predictors of returns. Table 4.2 reports the contemporaneous correlation of our measure of macroeconomic attention with these characteristics, which we control for in subsequent analysis.

[9]To reduce the effects of outlier observations in subsequent analysis, we restrict our sample to firm-month observations with stock prices greater than 5 and less than 1000, ordinary common shares incorporated inside the US (CRSP share codes 10 and 11).

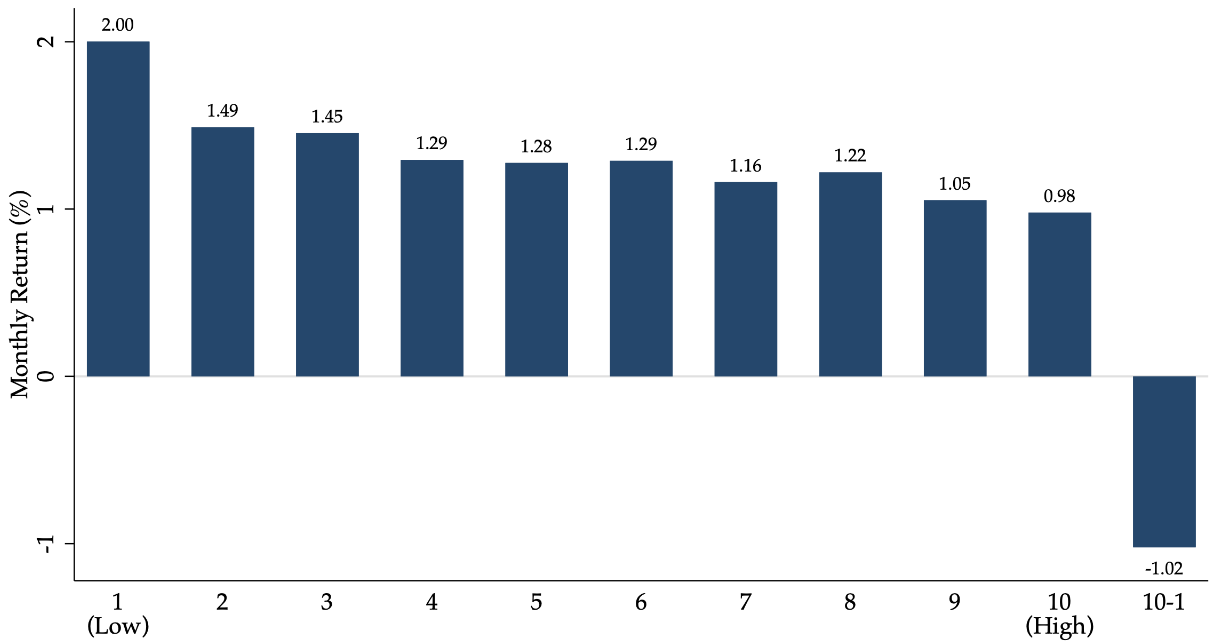
Table 4.2: Correlation between macroeconomic attention and other predictors of stock returns.

	Macro Attention	
$\beta(MKT)$	0.003	(0.091)
$\beta(SMB)$	-0.070	(0.000)
$\beta(HML)$	0.060	(0.000)
$\beta(VIX)$	0.006	(0.001)
Size	0.191	(0.000)
Book-to-market	0.086	(0.000)
Lagged returns (12 mths)	-0.052	(0.000)
Idio vol	-0.191	(0.000)
Issuances (36 mths)	-0.210	(0.000)
Accruals	-0.132	(0.000)
Return on asset	0.291	(0.000)
Dividend yield	-0.096	(0.000)
Asset growth	-0.180	(0.000)
Lagged returns (36 mths)	-0.070	(0.000)
Issuances (12 mths)	-0.181	(0.000)
Turnover	-0.083	(0.000)
Net debt-to-Price	0.132	(0.000)
Sale-to-Price	0.110	(0.000)

p-values in parentheses

Notes. See Appendix Table D.3 for variable definitions.

Figure 4.2: Average monthly returns of macroeconomic attention sorted portfolios.



Notes. Stocks are sorted into ten equally-weighted portfolios using NYSE breakpoints based on the out-of-sample predicted macroeconomic attention in month , and then compute returns for month . "10-1" refers to a portfolio with a long position in portfolio 10 (high attention) and a short position in portfolio 1 (low attention). The sample period is from January 2005 to December 2019.

4.3.1 Portfolio analysis

We sort stocks into ten portfolios based on the firm's macroeconomic attention at the beginning of each month, and compute portfolio return as an equally weighted average of monthly returns of stocks within each portfolio. Portfolio sorts, as opposed to regression of individual stock returns on characteristics, mitigate idiosyncratic noise in returns and provide stable estimates of risk prices, particularly in the presence of time-varying loadings of characteristics (Feng, Giglio, and Xiu (2020)).

Figure 4.2 plots the average monthly returns of each decile portfolios sorted on macroeconomic attention in excess of the risk free rate. The last column shows the excess returns of a cash-neutral portfolio that takes a long position in Portfolio 10 and a short position in Portfolio 1. Going from the bottom decile (lowest macroeconomic attention) to the top decile (highest macroeconomic attention), average returns declines from 2.00% per month to 0.98% per month. The long-short portfolio generates a return of -1.02% (-11.6%) per month (annum).

Table 4.3 reports the statistical significance of the average excess returns and alphas of the macroeconomic attention sorted portfolios. We examine whether the excess returns of the macroeconomic attention sorted portfolios are predicted by the factors of several asset pricing models from the literature. Across each of the model we consider, we find that the alphas of the long short portfolio remains negative and significant at the 1 percent level. This suggest that macroeconomic attention likely captures common variation in returns that is not fully explained by standard asset pricing models.

As an exercise in robustness, we control for the pricing effects of characteristics known to predict the cross section of returns. We consider four well-known characteristics from the literature: sensitivity to the market factor (beta), log market capitalization (size), book-to-market ratio (BM), sensitivity to aggregate volatility (Agg Vol) and idiosyncratic volatility of returns (Ang et al. (2006)). To control for the effects of these characteristics, we construct double sorted portfolios where we first sort stocks into five portfolios based on the control characteristic using NYSE breakpoints, and then for each characteristic sorted portfolio, we further divide stocks into deciles based on macroeconomic attention using NYSE breakpoints. Finally, we take the simple average of returns of portfolios in similar macroeconomic attention deciles.

Table 4.4 reports the alphas for the double sorted portfolios along the macroeconomic attention decile, with respect to the Fama-French three factor model. Across characteristics we control for, we find that alphas consistently declines going from the lowest attention to the highest attention portfolio. Long-short portfolio constructed from the double sorted portfolios generates negative alpha that is significant at the 1 percent level.

4.3.2 Fama and MacBeth (1973) linear regressions

The Fama and MacBeth (1973) regressions for the firm i at end-of-month t takes the form of

$$r_{it} = c + \gamma log(\widehat{MacroAttn})_{it} + \lambda'_{\beta}\beta_{i,t} + \lambda'_{z}z_{i,t} + \epsilon_{it} \tag{4.4}$$

Table 4.3: Average excess returns and alphas in monthly percentages for equal-weighted decile macroeconomic attention portfolios.

	AvgRet		CAPM		FF-3		Carhart-4		FF-5		FF-3 + FVIX	
	α	t	α	t	α	t	α	t	α	t	α	t
1	2.00***	(4.42)	1.11***	(5.13)	1.20***	(10.63)	1.61***	(6.42)	1.33***	(12.09)	1.19***	(10.65)
2	1.49***	(3.44)	0.61***	(3.33)	0.71***	(7.59)	0.92***	(4.08)	0.74***	(7.74)	0.70***	(8.04)
3	1.45***	(3.23)	0.58***	(3.48)	0.68***	(5.83)	0.87***	(3.26)	0.70***	(6.02)	0.68***	(6.28)
4	1.29***	(2.98)	0.42**	(2.38)	0.55***	(4.55)	0.88***	(3.13)	0.53***	(4.48)	0.55***	(4.63)
5	1.28***	(2.98)	0.38**	(2.19)	0.50***	(4.45)	0.76***	(3.69)	0.48***	(4.27)	0.50***	(4.48)
6	1.29***	(3.05)	0.41***	(2.66)	0.53***	(6.27)	0.79***	(6.25)	0.48***	(6.11)	0.53***	(6.30)
7	1.16***	(2.79)	0.29*	(1.73)	0.42***	(3.76)	0.69***	(2.89)	0.32***	(3.40)	0.42***	(3.74)
8	1.22***	(2.85)	0.34**	(2.16)	0.47***	(4.45)	0.60***	(2.86)	0.39***	(4.12)	0.47***	(4.49)
9	1.05**	(2.44)	0.15	(0.96)	0.29***	(2.71)	0.47**	(2.54)	0.23**	(2.02)	0.29***	(2.69)
10	0.98**	(2.23)	0.07	(0.47)	0.23*	(1.92)	0.37**	(2.21)	0.16	(1.42)	0.23*	(1.92)
10-1	-1.02***	(-6.15)	-1.04***	(-5.69)	-0.97***	(-6.74)	-1.09***	(-5.05)	-1.17***	(-8.29)	-0.96***	(-6.57)

Notes. Stocks are sorted into equal-weighted decile every month based predicted value of macroeconomic attention from (**??**), where Portfolio 1 are stocks with the lowest attention and Portfolio 10 are stocks with the highest attention. “10-1” refers to the difference in monthly returns between Portfolio 10 and Portfolio 1. “AvgRet” refers to average portfolio returns in excess of the risk free rate, “CAPM” is the alpha (intercept) of regressing average portfolio excess return on the market factor, “FF-3” is the alpha from the Fama and French (1993) 3-factor model, "Carhart-4" is alpha from the Carhart (1997) 4-factor model, "FF-5" is alpha from the Fama and French (2015) 5-factor model, and "FF-3+FVIX" is alpha from the Fama-French 3-factor model and VIX factor from Ang et al. (2006). Within each column, subcolumn refer to the estimated alpha and is the associated t-statistics, which incorporate Newey-West correction with four lags. The sample period is from January 2005 to December 2019. * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Table 4.4: Alphas for double sorted equally-weighted portfolios on a control characteristic and macroeconomic attention.

	Beta		Size		BM		Agg Vol		Idio Vol	
	α	t	α	t	α	t	α	t	α	t
1	0.81***	(8.24)	0.58***	(6.83)	0.78***	(8.15)	0.83***	(8.91)	0.73***	(8.57)
2	0.72***	(7.30)	0.55***	(6.75)	0.63***	(6.52)	0.68***	(7.76)	0.60***	(6.87)
3	0.59***	(5.39)	0.52***	(4.54)	0.60***	(5.47)	0.69***	(5.44)	0.57***	(5.31)
4	0.52***	(5.06)	0.35***	(4.01)	0.43***	(4.05)	0.45***	(4.74)	0.45***	(5.46)
5	0.42***	(3.92)	0.41***	(4.10)	0.50***	(4.07)	0.44***	(4.62)	0.42***	(4.63)
6	0.43***	(4.24)	0.30***	(3.46)	0.45***	(4.69)	0.42***	(4.04)	0.43***	(4.69)
7	0.44***	(4.28)	0.40***	(4.99)	0.39***	(4.36)	0.50***	(4.46)	0.42***	(4.54)
8	0.33***	(2.88)	0.28***	(2.76)	0.35***	(2.83)	0.34***	(2.79)	0.34***	(3.07)
9	0.41***	(4.05)	0.33***	(3.41)	0.39***	(4.13)	0.37***	(3.92)	0.36***	(3.79)
10	0.30**	(2.41)	0.22**	(1.98)	0.27**	(2.16)	0.30**	(2.39)	0.30**	(2.51)
10-1	-0.51***	(-3.89)	-0.35***	(-2.64)	-0.52***	(-4.14)	-0.53***	(-3.97)	-0.43***	(-3.28)

Notes. To construct the double-sorted portfolios, stocks are first sorted into two portfolios based on their value of a given control characteristic each month. For each characteristic portfolio, stocks are then sorted into ten portfolios based on their value of macroeconomic attention. The rows report the alphas of portfolios in similar macroeconomic attention deciles with respect to Fama and French (1993) three factor model. Each column is the characteristic that is controlled for. Beta is exposure to the market factor, Size is log market capitalization, BM is the log book-to-market ratio, Agg Vol is exposure to innovations in the VIX index, and Idio Vol is the idiosyncratic volatility with respect to the market factor model. Within each column, subcolumn refer to the estimated alpha and is the associated t-statistics, which incorporate Newey-West correction with four lags. The sample period is from January 2004 to May 2020. * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

where r_{it} is the stock's excess return from month $t-1$ to month t, $log(\widehat{MacroAttn})_{it}$ is the predicted value of macroeconomic attention for month t, $\beta_{i,t}$ is a vector of factor loadings over the month t, and $z_{i,t}$ the vector of firm charactersitics available prior to month t. The regression coefficient of interest is γ, which is the price of a one-unit exposure to macroeconomic attention risk. We test whether this coefficient is significantly different from zero, which would sugges that macroeconomic attention provides incremental information for predicting returns, over and above the information in the characteristics we control for. In the Fama-MacBeth approach, this linear model is first estimated each month across firms, followed by a second stage test of whether the time series of γ estimated is significantly different from zero. The advantage of Fama and MacBeth (1973) regressions in comparison to portfolio sorts is that they allow for controls for multiple factor loadings and characteristics.

Our vector of contemporaneous factor loadings β_{it} are the loadings from the Fama and French (1993) model using the value-weighted market excess returns (MKT) , size (SMB), and value (HML) factors in addition to the loadings on the aggregate volatility ΔVIX factor (Ang et al. 2006). In addition to the factor loadings, we also include a vector of firm characteristics z_{it} known at the beginning of month t. These include log market capitalization (size), book-to-market ratios, cumulative returns from the past 12 to 2 months (lagged returns), and the stock's idiosyncratic volatility (idio vol).

Table 4.5 reports the coefficient estimates of the Fama and MacBeth (1973) regressions. Across all specifications, we find that higher macroeconomic attention in the past month predicts lower returns. The Newey-West heteroskedastic and autocorrelation robust t-statistic indicates that the slope is significant at the 1 percent level across all specifications. In Column (9), jointly controlling for the stock's loadings on relevant factor loadings and firm characteristics, we find a slope coefficient of -0.301 on macroeconomic attention. This translates to a -0.39% (-4.6%) per month (annum) decrease in average return moving from the bottom decile to the top decile of macroeconomic attention ($-0.301 \times (-2.18 - (-3.49)) = -0.39\%$).

As a robustness check, we include additional return predictors studied in Lewellen (2015).

Table 4.5: Fama and MacBeth (1973) regressions on individual stock monthly returns.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
MacroAttn	-0.676***	-0.610***	-0.650***	-0.671***	-0.572***	-0.816***	-0.803***	-0.616***	-0.302***
	(-5.01)	(-4.94)	(-5.04)	(-5.11)	(-4.36)	(-6.31)	(-5.51)	(-4.96)	(-2.82)
$\beta(MKT)$	-0.346*								-0.325*
	(-1.79)								(-1.82)
$\beta(SMB)$		0.0497							-0.107
		(0.83)							(-1.28)
$\beta(HML)$			0.151*						0.214**
			(1.84)						(2.24)
$\beta(VIX)$				9.470					49.62*
				(0.30)					(1.72)
Size					-0.376***				-0.131***
					(-6.61)				(-3.41)
Book-to-market						0.114			-0.120
						(1.01)			(-1.62)
Lagged returns (12 mths)							-0.0931		0.420*
							(-0.32)		(1.97)
Idio vol								44.78***	7.930*
								(4.61)	(1.69)
Observations	312680	312660	312783	312926	313191	301129	310379	312839	274268
R^2	0.0181	0.0153	0.0167	0.0122	0.0123	0.0115	0.0136	0.0138	0.0755

t statistics in parentheses

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

Notes. For each month, we regress individual stock returns in excess of the one-month Treasury bill rate on a constant, predicted macroeconomic attention for month, and a set of factor exposures and characteristics as control, and then compute the average across coefficients estimated for each characteristic. R^2 reports the average cross-sectional R^2's. The sample period is from January 2005 to December 2019. t-statistics incorporate Newey-West correction with four lags.

Similar to Asness, Frazzini, and Pedersen (2019), we perform a simple rank transformation of the characteristics to ensure we have sufficient observations when all control variables are included. Specifically for characteristic c_{it} of firm i in month t, we compute the cross-sectional rank as $f(c_{i,t}) = rank(c_{i,t})/(N_t + 1)$ where $N_t \equiv \max_i c_{i,t}$. We set the value of missing observations to 0, which is equivalent to setting the value of missing observations to the cross-sectional mean of the characteristic each period. This approach has the advantage of retaining information conveyed through the cross-sectional distribution of the characteristic, at the same time reducing the effects of outlier observations. Table 4.6 reports the coefficient estimates using this approach. The coefficient estimates on macroeconomic attention remains negative and significant at the 1 percent level.

4.4 Conceptual framework

In the previous section, we find that firms with higher macroeconomic attention is associated with lower returns that are both economically and statistically meaningful. If our measure of macroeconomic attention is a proxy for a firm's exposure to cash flow risk, then we expect returns of the macroeconomic attention-sorted portfolios to be fully explained by its market beta. However, we find that the abnormal returns of the portfolios to persist even after controlling for exposure to market risk as well as other characteristics and factors known to predict returns. In this section, we develop a risk-based explanation to account for the abnormal returns associated with macroeconomic attention. Through the lens of a model of optimal attention allocation, we show that optimal attention to the macroeconomy varies with a firm's exposure to aggregate and idiosyncratic cash flow risk. We then use the returns decomposition framework of Campbell (1991) to explain how firms with greater macroeconomic attention earn lower returns.

4.4.1 Modeling attention allocation

We build on Maćkowiak and Wiederholt (2009) and outline a model where analysts learn about an aggregate and firm-specific shock with the objective of minimizing forecast errors on future

Table 4.6: Fama and MacBeth (1973) regressions on individual stock monthly returns with additional return predictors.

	(1)		(2)	
MacroAttn	-0.17***	(-4.53)	-0.13***	(-4.45)
$\beta(MKT)$	-0.11	(-1.10)	-0.12	(-1.33)
$\beta(SMB)$	-0.18*	(-2.55)	-0.19**	(-2.81)
$\beta(HML)$	0.13	(1.53)	0.10	(1.26)
$\beta(VIX)$	-0.05	(-0.73)	-0.05	(-0.79)
Size	-0.44***	(-7.93)	-0.48***	(-8.30)
Book-to-market	-0.10	(-1.96)	-0.22***	(-4.17)
Lagged returns (12 mths)	0.04	(0.68)	0.03	(0.64)
Idio vol	0.26***	(4.30)	0.19***	(4.11)
Issuances (36 mths)			-0.02	(-0.65)
Accruals			0.14***	(4.72)
Return on asset			-0.29***	(-5.28)
Asset growth			-0.08**	(-3.22)
Lagged returns (12 mths)			0.08*	(2.11)
Issuances (12 mths)			-0.02	(-0.56)
Turnover			0.08	(1.52)
Sale-to-price			0.09	(1.78)
Net debt-to-price			0.07	(1.79)
Dividend yield			-0.04	(-1.05)
Observations	318152		318152	
R^2	0.0582		0.0779	

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes. For each month, we regress individual stock returns in excess of the one-month Treasury bill rate on a constant, predicted macroeconomic attention for month, and a set of factor exposures and characteristics as control, and then compute the average across coefficients estimated for each characteristic. R^2 reports the average cross-sectional R^2's. The sample period is from January 2005 to December 2019. t-statistics incorporate Newey-West correction with four lags.

dividends. Information about these shocks is conveyed through the content of the call, which is naturally limited by the length of the call and the finite attention span of analysts listening in on the call. Prior literature offers evidence of such limitations, including underreaction of prices to earnings announcements made on Fridays as opposed to other weekdays (Dellavigna and Pollet (2009)) and lower consumption of earnings calls on days where more firms hold calls (Heinrichs, Park, and Soltes (2018)).

We consider an analyst covering firm i who receives payoffs $-(d_{it+1} - \hat{d}_{it+1})^2$ at the end of period t, where $\hat{d}_{it+1}$ is the forecast of dividends in period $t+1$, d_{it+1}. Dividends are revealed at the end of each period, hence d_{it} is observed when the analyst forecasts d_{it+1}. We assume that firm i's dividend growth follows the process

$$\Delta d_{i,t+1} = z_{it} + u_{it+1} \tag{4.5}$$

$$u_{it+1} = \eta_{t+1} + \nu_{it+1}$$

where z_{it} are predictors of the firm's dividend growth in $t+1$ known at time t, and the unexpected component u_{it+1} is the sum of an aggregate component $\eta_{t+1} \sim N(0, \sigma_\eta^2)$ and an idiosyncratic component $\nu_{i,t+1} \sim N(0, \varphi_i \sigma_\nu^2)$. Here, φ_i is a parameter that scales the firm-specific component of dividend growth for firm i. In period t, the analyst attends firm i's earnings call and receives signals s_{it} given by

$$s_{it}^{\eta} = \eta_{t+1} + \epsilon_{it}^{\eta}$$

$$s_{it}^{\nu} = \nu_{i,t+1} + \epsilon_{it}^{\nu}$$

where signal noises are distributed as $\epsilon_{it}^{\eta} \sim N(0, \sigma_{\epsilon,\eta}^2)$ and $\epsilon_{it}^{\nu} \sim N(0, \sigma_{\epsilon,\nu}^2)$, which are mutually independent with each other and with η_{t+1} and $\nu_{i,t+1}$ for all i and t. There is an active discussion in the literature on whether attention to different sources of shocks are reasonably modeled as separate activities (see Afrouzi (2019) and Miao and Su (2019)). We adopt this assumption simply because we are able to identify discussions of macroeconomy separately from firm-specific conditions in earnings calls.

The analyst for firm i to choose which signal to pay more attention to, subject to a limitation on the information that the analyst is able to learn from earnings calls. This could either arise from limitations in the analyst's information processing capacity or a limitation on the firm manager's ability to convey precise information about the firm's future cash flows. Formally, the analyst's problem is to choose signal noise precision $(\sigma^2_{\epsilon,\eta}, \sigma^2_{\epsilon,\nu})$ to minimize forecast error on the firm's dividends. Since dividends are revealed at the end of each period, we can rewrite the analyst's payoffs as $-(\Delta d_{it+1} - \Delta\hat{d}_{it+1})^2$. We assume that the analyst have priors that are identical to the actual data generating process. That is, her priors over unobserved shocks η_{t+1} and $\nu_{i,t+1}$ are given by $\eta_{t+1} \sim N(0, \sigma^2_\eta)$ and $\nu_{i,t+1} \sim N(0, \varphi_i \sigma^2_\nu)$. As a Bayesian, the optimal update of earnings expectations, given the specified prior and signal structure is given by

$$\Delta\hat{d}_{it+1} = z_{it} + \frac{\sigma^2_\eta}{\sigma^2_\eta + \sigma^2_{\epsilon,\eta}} s^\eta_{it} + \frac{\varphi_i \sigma^2_\nu}{\varphi_i \sigma^2_\nu + \sigma^2_{\epsilon,\nu}} s^\nu_{it}$$

As standard in the rational inattention literature, we assume a mutual information constraint on information processing capacity. Specifically, the analyst solves the optimization problem

$$\max_{\sigma^2_{\epsilon,\eta}, \sigma^2_{\epsilon,\nu}} -E_t\left[(\Delta d_{it+1} - \Delta\hat{d}_{it+1})^2\right]$$

subject to information processing constraint

$$\underbrace{\frac{1}{2}\log_2\left(1 + \frac{\sigma^2_\eta}{\sigma^2_{\epsilon,\eta}}\right)}_{\kappa_\eta} + \underbrace{\frac{1}{2}\log_2\left(1 + \frac{\varphi_i \sigma^2_\nu}{\sigma^2_{\epsilon,\nu}}\right)}_{\kappa_\nu} \leq \kappa$$

The analyst's problem is similar to the setup in Section IV of Maćkowiak and Wiederholt

(2009), and the unique solution to the analyst's attention problem is given by

$$\kappa_{\eta,i} = \begin{cases} \kappa & \text{if } x_i \geq 2^{2\kappa} \\ \frac{1}{2}\kappa + \frac{1}{4}\log_2(x_i) & \text{if } x_i \in [2^{-2\kappa}, 2^{2\kappa}] \\ 0 & \text{if } x_i \leq 2^{-2\kappa} \end{cases}$$

where $x_i = \sigma_\eta^2/(\varphi_i \sigma_\nu^2)$.

Definition 1 *The analyst's attention to macroeconomic condition in the earnings call of firm i, $MacroAttn_i$, is the share of information about the aggregate component of cash flows relative to total information about cash flows*

$$MacroAttn_i \equiv \frac{\kappa_{\eta,i}}{\kappa} = \frac{1}{2} + \frac{1}{4\kappa}\log_2\left(\frac{\sigma_\eta^2}{\varphi_i \sigma_\nu^2}\right) \tag{4.6}$$

4.4.2 Return decomposition

Denote $r_{i,t}$ to be the log market return of asset i in time t, and $d_{i,t}$ is the dividends of firms in period t. Using the Campbell (1991) return decomposition, we can characterize the unexpected log return on stock i, $r_{i,t+1} - E_t r_{i,t+1}$ as two components, revisions in expected future dividends $N_{i,t+1}^{CF}$ and revisions in discount rates $N_{i,t+1}^{DR}$

$$r_{i,t+1} - E_t r_{i,t+1} = N_{i,t+1}^{CF} - N_{i,t+1}^{DR}$$

where $N_{i,t+1}^{CF} = (E_{t+1} - E_t)\sum_{j=0}^{\infty} \rho^j d_{i,t+1+j}$ and $N_{i,t+1}^{DR} = (E_{t+1} - E_t)\sum_{j=1}^{\infty} \rho^j r_{i,t+1+j}$.

Using the definition of dividends $d_{i,t}$ from 4.5 and given the assumption that analysts do not receive signals about dividends beyond the next period $t+1$ from earnings calls, cash flow news is given by

$$N_{CF,t+1}^{i} \equiv (E_{t+1} - E_t)\sum_{j=0}^{\infty} \rho^j d_{i,t+1+j} = \eta_{t+1} + \nu_{i,t+1}$$

where $\eta_{t+1} \sim N(0, \sigma_\eta^2)$ and $\nu_{i,t+1} \sim N(0, \varphi_i \sigma_\nu^2)$. We further assume that each firm's discount rate news is uncorrelated with the cash flow news, and is uncorrelated across firms, formally $N^{DR}_{i,t+1} \sim_i N\left(0, \sigma^2_\omega\right)$.

Definition 2 *The diversified cash flow risk of firm i, D_i, is the share of variance of cash flow news attributed to the aggregate component*

$$D_i = \frac{\sigma^2_\eta}{\sigma^2_\eta + \varphi_i \sigma^2_\nu} \tag{4.7}$$

The higher the share of cash flow risk that is diversified, the lower the exposure of an investor who holds asset i to its idiosyncratic cash flow risk. Under optimal attention allocation as described in Section 4.4.1, stocks with a greater share of diversified cash flow risk is associated with higher attention to the macroeconomy.

Corollary 3 *Attention to macroeconomic conditions is higher for firms with greater diversified cash flows, D_i.*

Proof. *See Appendix D.1.*

Consider a market portfolio constructed as an equal-weighted portfolio consisting of all assets in the economy with returns $r_{m,t+1} = 1/M \sum_{i=1}^{M} r_{i,t+1}$.[10] The unexpected log return on the market portfolio can be similarly written as $r_{m,t+1} - E_t r_{m,t+1} = N^{CF}_{m,t+1} - N^{DR}_{m,t+1}$. The cash flow news component of the market portfolio is given by $N^{CF}_{m,t+1} = \frac{1}{M} \sum_{i=1}^{M} N^{CF}_{i,t+1}$and the discount rate component is $N^{DR}_{m,t+1} = \frac{1}{M} \sum_{i=1}^{M} N^{DR}_{i,t+1} \sim N\left(0, \frac{1}{M}\sigma^2_\omega\right)$. Given a representative investor with Epstein-Zin preferences and who holds the market portfolio Campbell and Vuolteenaho (2004), the risk premium for any stock i is given by

$$rp_{i,t} = \gamma Cov(r_{i,t+1} - E_t r_{i,t+1}, N^{CF}_{m,t+1}) + Cov(r_{i,t+1} - E_t r_{i,t+1}, -N^{DR}_{m,t+1}) \tag{4.8}$$

where γ is risk aversion coefficient. As the diversified cash flow risk D_i increases (φ_i decreases), the risk premium of stock i decreases.

[10]Under the assumption that the size of a stock is uncorrelated to its idiosyncratic variance, this is equivalent to a value-weighted portfolio of all assets.

Corollary 4 *The risk premium on asset i's returns is decreasing in the share of diversified cash flow risk.*

Proof. *See Appendix D.1.*

Following Campbell and Vuolteenaho (2004), we define cash flows and discount rate betas of asset i as

$$\beta_{i,m}^{DR} = \frac{Cov(r_{i,t+1} - E_t r_{i,t+1}, -N_{M,t+1}^{DR})}{Var(r_{M,t+1})} \tag{4.9}$$
$$\beta_{i,m}^{CF} = \frac{Cov(r_{i,t+1} - E_t r_{i,t+1}, N_{M,t+1}^{CF})}{Var(r_{M,t+1})}$$

whcih sums up to the total market beta $\beta_{i,m} = \beta_{i,m}^{CF} + \beta_{i,m}^{DR}$. Using this definitions, we rewrite the risk premium of asset i in (4.8) as

$$rp_i = \gamma \sigma_m^2 \beta_{i,m}^{CF} + \sigma_m^2 \beta_{i,m}^{DR} \tag{4.10}$$

The insight from Campbell and Vuolteenaho (2004) is that the price of risk on the cash flow beta $\beta_{i,m}^{CF}$ is γ times greater that the price of risk on the discount rate beta $\beta_{i,m}^{DR}$, where γ is the risk aversion coefficient that is greater than 1. Hence, the composition of the market betas matter. Consider two assets A and B with identical market betas $\beta_{i,m}$. If asset A has higher cash flow beta $\beta_{i,m}^{CF}$ than asset B, asset A will earn a higher risk premia than asset B, which will not be explained by a single-factor market beta model. Hence, Campbell and Vuolteenaho (2004) terms cash flow beta $\beta_{i,m}^{CF}$ as the bad beta and discount rate beta $\beta_{i,m}^{DR}$ as the good beta, given that the latter has a lower price of risk.

Given our assumption about the data generating process for cash flow news, we have the following testable implication.

Proposition 5 *Stocks with higher diversification factor have lower cash flow betas, and no systematic difference in discount rate betas. The risk premium unaccounted for the stock's market beta (the CAPM alpha) is decreasing in the stock's cash flow beta.*

Proof. *See Appendix D.1.*

4.4.3 Measuring cash flow betas

In this section, we empirically evaluate the testable implication of the model outlined above, namely that the stocks with larger macroeconomic attention have lower cash flow risk due to a lower share of firm-specific risk. The estimation strategy closely follows Vuolteenaho (2002), Campbell and Vuolteenaho (2004), and Campbell, Polk, and Vuolteenaho (2009). The data generating process follows a first-order VAR model

$$z_{t+1} = a + \Gamma z_t + u_{t+1} \tag{4.11}$$

where z_{t+1} is an $m \times 1$ state vector with return r_{t+1} as the first element, a and Γ are respectively a $m \times 1$ vector and $m \times m$ matrix of VAR parameters to be estimated, and u_{t+1} is an $m \times 1$ vector of shocks with variance-covariance Σ. We specify the remaining state variables in the VAR specification shortly below. Given the above specification, the $t+1$ cash flow and discount rate news are given by

$$N_{t+1}^{DR} = \lambda' u_{t+1}$$
$$N_{t+1}^{CF} = (e1' + \lambda') u_{t+1}$$

where $e1$ is a vector whose first element equals unity and the remaining elements are zero, and $\lambda' \equiv e1' \rho \Gamma (I - \rho \Gamma)^{-1}$. In words λ captures the effect of each individual VAR shock on the discount-rate expectations, which increases in the value of coefficient in Γ as well as its persistence $(I - \rho\Gamma)^{-1}$. Following Campbell, Polk, and Vuolteenaho (2010), we estimate separate VARs for aggregate news and firm-specific news and set $\rho = 0.95$. This approach is consistent with the empirical literature documenting different sources of risk driving returns in the aggregate and cross-section. We estimate both VARs using annual data over the sample period from 1928 to 2019, and treat the parameters (a, Γ, Σ) as constant across the sample period. As such, the parameters

Table 4.7: Variance decomposition of market, firm, and portfolio-level unexpected annual returns.

	var(DR)	var(CF)	-2cov(DR,CF)
Market return	59	16	25
Firm market-adjusted return	1	88	10
Portfolio market-adjusted return	0	96	4

Notes. Firm returns are market-adjusted by subtracting the market return from individual firm returns, and portfolio returns are the simple average of firm market-adjusted returns of stocks within each portfolio. Returns are decomposed into discount rate news (DR) and cash flow news (CF) using the panel VAR specified in 4.11 estimated using annual returns from 1928 to 2019. Variance decomposition is reported for the sample period from 2005 to 2019 for which we observe macroeconomic attention data.

are estimated by separate equation-by-equation pooled regression.

The aggregate VAR consists of four state variables ($m = 4$): the log market return, the term yield spread, log smoothed price-earnings ratio, and the small-stock value spread. The firm-level VAR consists of three state variables ($m = 3$): the log return (r_i) on a firm's common stock equity, log book-to-market ratio of unlevered equity, and the long term profitability. All variables in the firm-level VAR are cross-sectionally demeaned by subtracting the value-weighted market return in the case of firm-returns and average value of each variable each year for the other state variables.

From the cash flow and discount rate news components of individual stock returns, we proceed to estimating the constructing the cash flow and news series of the macroeconomic attention portfolios. Portfolios are constructed by sorting stocks into deciles based on the average value of their macroeconomic attention each year. We first compute the portfolio level market-adjusted news series by taking a simple average of the respective news components of individual firms within each portfolio. Given that we only have macroeconomic attention data over the sample period for which we observe a firm's earnings calls, we have 15 annual observations of news for each portfolio over the sample period from 2005 to 2019.[11] In subsequent analysis, we report robust standard errors constructed from 1000 bootstrap samples of the observations.

Variance decomposition

Table 5 reports the share of variance explained by cash flow and discount rate news, as well as two times the covariance between the two news components. For the market portfolio consisting of a value-weighted portfolio of all stocks, we find that 59% of total return variation is attributed to discount rate news, 16% to cash flow news, and the remaining 25% to the covariance component. This result is consistent with the findings in the prior literature such as Campbell (1991). The middle row reports the decomposition for firm-level market adjusted returns. In our sample period from 2005 to 2019, we find that cash flow news explains 88% of firm-level market-adjusted returns, with a much smaller share attributed to discount rate news. This result again is consistent with the findings of Vuolteenaho (2002).

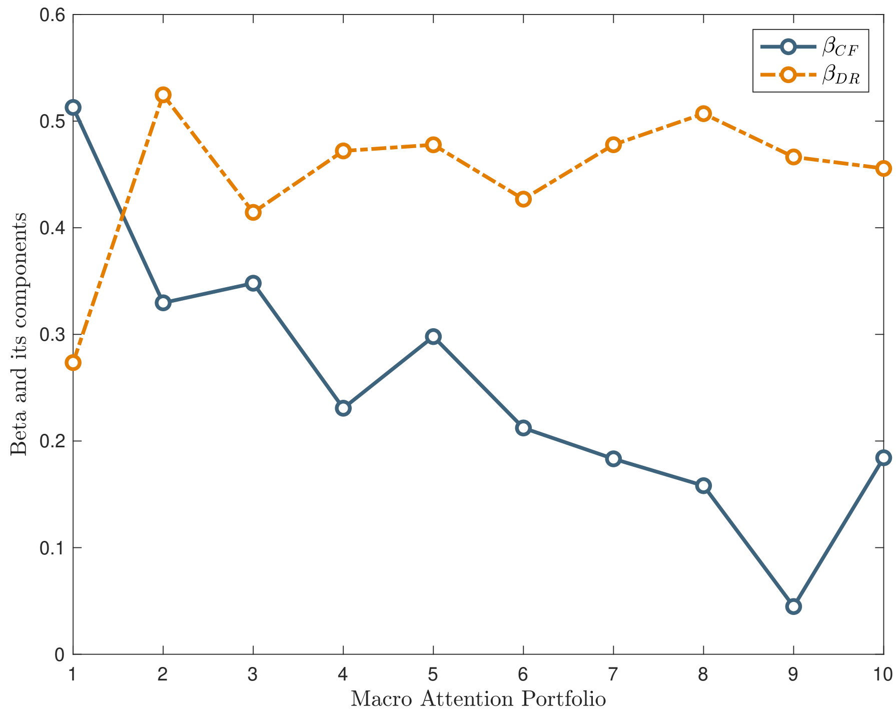
In the last row, we show the decomposition for portfolio-level market adjusted returns. Interestingly, we find that cash flow news explains a much larger share of returns relative to firm-level market adjusted returns, accounting for 96% of total return variation. We interpret this result as consistent with the explanation that our anomaly returns is largely due to cash flow shocks, rather than shocks to investor behavior that affects prices but does not affect the earnings of firms. This result is also consistent with the findings from Lochstoer and Tetlock (2020), who show that cash flow news account for most of the variation in returns across key anomaly portfolios including value, size, profitability, investment, and momentum.

Portfolio betas and its components

Our theoretical framework suggests that stocks with higher macroeconomic attention are better diversified stocks, hence expose investors to lower firm-specific cash flow risk. As described in the previous section, portfolios with higher macroeconomic attention should have lower betas with respect to cash flow news. In this subsection, we examine the prediction by computing the betas of the portfolios using the news series estimated from the VAR model. The betas are constructed as

[11] The VAR model from which the news components are estimated have parameters estimated on a longer sample of annual data from 1929 to 2019.

Figure 4.3: Cash flow and discount rate betas of macroeconomic attention portfolios.



Notes. Betas are constructed as in (4.9) by regressing the unexpected returns of each portfolio on the cash flow news and discount rate news of the market portfolio. The sample period is from January 2005 to December 2019.

in (4.9), by regressing the respective portfolio's news components on a constant and the cash flow and discount rate news components of the market portfolio.

Figure 4.3 shows the cash flow and discount rate betas for each portfolio. Portfolio 1 are stocks in the lowest decile of macroeconomic attention each year, whereas Portfolio 10 are stocks in the highest decile. The key takeaway from the figure is that, as our theoretical framework would suggest, the cash flow betas of portfolios declines as macroeconomic attention increases, whereas we do not observe systematic patterns in discount rate betas in our sample.[12] Overall, our results provide some evidence that is consistent with our explanation (Prediction 1) that the risk premia of our macroeconomic attention portfolio captures varying exposures to the macroeconomic and idiosyncratic components of cash flow risk.

[12]Table D.4 in the Appendix provides the beta components estimates with relevant t-statistics. While we observe a systematic sorting of cash flow betas consistent with the prediction of our model, the difference across portfolios is not statistically significant. This is likely due to limited sample availability given that betas of each portfolio are computed only from 15 annual observations.

4.5 Conclusion

The idea that economic agents choose what to pay attention to has important implications for a variety of economic phenomena. In this chapter, we focus on implications of macroeconomic attention on the cross section of stock returns. We quantify the amount of attention to the macroeconomy at the firm-level from the text of earnings calls transcripts, and find that this measure strongly predicts returns of stocks in the cross section. In particular, we find that firms associated with higher attention to the macroeconomy earn on average lower returns than those associated with lower attention to the macroeconomy.

We provide a risk-based explanation for the negative risk premia that we observe. In a model where analysts allocate attention optimally to learn about macroeconomic and firm-specific cash flow news, attention to the macroeconomy is increasing in the share of cash flow news variation explained by macroeconomic risk. All else equal, firms with higher macroeconomic attention exposes investors to less firm-specific fundamental risk. As such, investors demand higher premia for stocks with lower macroeconomic attention. We find empirical support that portfolios of stocks with higher macroeconomic attention have lower cash flow risk, hence justifying their lower expected returns.

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Appendix A: Appendix to Chapter 1

A.1 Additional figures and tables

Table A.1: Summary statistics of full sample and conditional on forward-looking covenant concern $CovFuture$.

	All			CovFuture=1		
	Nobs	Mean	Std. dev.	Nobs	Mean	Std. dev.
CovMention(pct)	138111	7.02	25.54	2395	100.00	0.00
CovFuture(pct)	138111	1.73	13.05	2395	100.00	0.00
Capital Expenditure (bps)	136149	119.92	147.48	2355	123.25	156.90
Change in Log(Asset) (log pp)	136973	2.30	16.30	2389	-1.92	12.93
Long-Term Debt Growth (log pp)	136557	3.84	65.66	2379	-1.63	81.55
Net Debt Issuance (bps)	135380	46.45	439.27	2342	26.77	471.66
Equity Payout (log pp)	133895	126.30	171.94	2359	93.77	141.23
Tobin's Q	130912	1.88	1.52	2210	1.06	0.71
Cash Flow (pct)	137430	1.31	7.07	2379	2.09	4.73
Sales Growth (pct)	135291	35.16	93.12	2333	-10.75	106.33
Log(Asset)	137100	6.54	1.85	2392	6.95	1.44
Leverage(pct)	137684	24.44	28.94	2389	44.89	31.81
Tangible Net Worth (pct)	137752	26.71	49.19	2388	4.12	41.78
Cash Holdings (pct)	137966	22.37	24.06	2394	7.69	11.13
Altman z-score	120943	3.72	5.99	1965	0.89	2.07
Earnings(pct)	133866	1.13	8.77	2331	1.65	4.87
Has Rating (pct)	138111	25.46	43.56	2395	38.79	48.74
High Yield Rating (pct)	35624	61.98	48.55	950	88.11	32.39
LM Sentiment	117795	8.33	5.15	2103	5.94	5.65
HHLT Risk	117795	0.58	0.50	2103	0.60	0.49
Violation(pct)	138111	3.04	17.17	2395	12.65	33.25
Violation, DealScan (pct)	60101	35.64	47.89	1578	66.35	47.27
Covenant Slack (sd)	60101	0.01	0.36	1578	-0.21	0.40

Table A.2: Event study of covenant mentions around violations.

	(1) CovMention	(2) CovFuture
Horizon=-2	0.014	0.002
	(1.31)	(0.03)
Horizon=-1	0.039***	0.100**
	(3.41)	(2.02)
Horizon=0	0.116***	0.019
	(8.63)	(0.45)
Horizon=1	0.083***	0.022
	(6.29)	(0.61)
Horizon=2	0.056***	-0.034
	(4.37)	(-0.77)
Constant	0.118***	0.315***
	(15.38)	(10.62)
Firm & Time FE	✓	✓
R-squared	0.43	0.45
Nobs	9204	1336

Notes. This table examines the statistical significance of changes in covenant mentions and covenant concerns around violation events. The base horizon is three quarters prior to violation ($Horizon = -3$), with estimates are given by the constant term. Column 1 shows the change in probability of any covenant mention in each horizon, relative to the base horizon. Column 2 shows the change in probability of covenant concerns conditional on any covenant mentions. Standard errors clustered by firm and time. t-statistics are reported in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Table A.3: Covenant mentions and the consequences of covenant violations.

	(1) Capital Expenditure	(2) Long-term Debt Growth	(3) Equity Payout	(4) 1{Increase Loan Rate}	(5) 1{Reduce Loan Amount}	(6) 1{Rating Downgrade}
CovMention	-12.72*	-12.20***	-0.17**	4.72**	8.97***	5.97***
	(-1.80)	(-4.10)	(-2.39)	(2.44)	(2.91)	(4.75)
Covenant slack	28.71**	5.80	0.70***	-4.30**	-2.67	-2.89**
	(2.40)	(0.37)	(4.25)	(-2.60)	(-1.14)	(-2.44)
Sq. covenant slack	17.36**	9.13	0.48***	0.34	1.44	-0.60
	(2.43)	(0.63)	(3.93)	(0.24)	(0.80)	(-0.48)
Earnings	1.90	0.52	0.05***	0.13	-0.17	0.05
	(1.58)	(0.94)	(3.02)	(0.72)	(-0.99)	(0.46)
Sq. earnings	17.53***	-3.11	0.17**	2.31**	-1.68	-0.65
	(3.47)	(-1.01)	(2.35)	(2.40)	(-1.44)	(-1.12)
Industry & Time FE	✓	✓	✓	✓	✓	✓
R-squared	0.39	0.052	0.30	0.14	0.15	0.14
Nobs	1894	1932	1910	1510	1510	1941

Notes. This table examines cross-sectional variation in the consequences of covenant violations. 1Increase Loan Rate is an indicator for a loan amendment that increases interest rates in the SEC filing in the quarter of violation. 1Reduce Loan Amount is an indicator for a loan amendment that decreases borrowing amount in the quarter of violation. CovMention is an indicator for whether covenants are discussed in the quarter of violation. Sample restricted to firm-quarter observations in which violation is reported in SEC filings. Standard errors are two-way clustered by industry and year-quarter. t-statistics are reported in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Table A.4: Types of violations reported in SEC filings.

	Percent of violation
A. Unconditional sample	
Number of violations	360
Financial covenant	82.5
Non-financial covenant only	10.6
Dividend restriction	7.9
Capx restriction	15.8
Reporting requirement	50
Others	26.3
Unclear	6.9
B. Conditional on covenant mention	
Share of violations	26.4
Financial covenant	92.6
Non-financial covenant only	5.3
Dividend restriction	20
Capx restriction	0
Reporting requirement	80
Others	0
Unclear	2.1

Notes. This table examines the types of violations reported by firms in their SEC filings. The sample is constructed using 360 randomly sampled violation events with matched SEC filings and earnings call transcripts. All values are in percentage points, except for "Number of violations". Values for "Dividend restrictions", "Capx restrictions", "Reporting requirement", and "Others" are reported as a share of all non-financial covenant violations. Sample "conditional on covenant mentions" refer to violation events with associated discussions of covenants in earnings call transcripts. "Unclear" refers to cases where the types of violations cannot be inferred from SEC filings.

Table A.5: Covenant concerns and changes in earnings.

	(1) CovFuture	(2) CovFuture	(3) CovFuture	(4) CovFuture	(5) CovFuture
Δ EBITDA	-0.08	-0.06	0.02	0.05	-0.07
	(-1.03)	(-0.88)	(0.20)	(0.57)	(-0.70)
1{Δ EBITDA<0}=1 × Δ EBITDA	-1.13***	-0.32	-0.66**	-0.68***	-0.60***
	(-4.28)	(-1.45)	(-2.14)	(-3.02)	(-2.70)
1{Δ EBITDA<0}=1 × Leverage=1 × Δ EBITDA		-1.42***			
		(-3.92)			
1{Δ EBITDA<0}=1 × NetWorth=1 × Δ EBITDA			-0.99***		
			(-2.93)		
1{Δ EBITDA<0}=1 × Cash=1 × Δ EBITDA				-0.79**	
				(-2.20)	
1{Δ EBITDA<0}=1 × Altmanz=1 × Δ EBITDA					-1.36***
					(-2.95)
Violation controls	✓	✓	✓	✓	✓
Firm & Time FE	✓	✓	✓	✓	✓
R-squared	0.027	0.034	0.031	0.032	0.034
Nobs	93465	92536	90371	93383	61583

Notes. This table examines the statistical significance of the correlation between covenant concerns and earnings. Leverage (net worth, cash, and Altmanz) is an indicator that takes a value of one if it is above (below) the median value within two-digit SIC industry and time at the beginning of the quarter. $\Delta Earnings$ is the year-over-year difference in earnings, normalized by firm-level standard deviation of earnings. $1\{\Delta Earnings < 0\}$ is an indicator for negative change in earnings. Column 2 violation controls include violation and its interactions with $1\{\Delta Earnings < 0\}$. Column 4 violation controls include violation and its interactions with and $1\{\Delta Earnings < 0\}$ and indicators of financial constraints. Standard errors double clustered by two-digit SIC industry and time. t-statistics are reported in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Table A.6: Covenant mentions and call coverage

	(1) Any Concern	(2) Any Violation
log(Asset)	3.24***	-1.32
	(6.03)	(-1.55)
Analyst coverage	-1.93***	-1.53***
	(-7.83)	(-11.17)
Num. quarters observed	0.53***	0.50***
	(9.48)	(10.49)
Call length	12.55***	2.10
	(3.43)	(1.06)
Industry FE	✓	✓
R-squared	0.2	0.1
Nobs	4381	4381

Notes. This table examines the relationship between covenant mentions and call coverage. Any concern is an indicator that equals one if a firm mentions covenant concerns in any quarter in the sample. Any violation is an indicator that equals one if a firm violations covenants in any quarter in the sample. Industry classification based on 2-digit SIC classification code. Standard errors clustered by industry. t-statistics are reported in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Table A.7: Covenant mentions, violations, and covenant tightness.

	(1) Any Concern	(2) Any Violation
Covenant tightness	-19.68***	-14.03**
	(-4.57)	(-2.67)
Num. covenants	3.60**	4.11**
	(2.61)	(2.56)
Industry FE	✓	✓
R-squared	0.07	0.06
Nobs	1979	1979

Notes. This table examines the relationship between covenant mentions and violations with covenant tightness. Any concern is an indicator that equals one if a firm mentions covenant concerns in any quarter in the sample. Any violation is an indicator that equals one if a firm violations covenants in any quarter in the sample. Covenant tightness is the smallest difference between financial covenant threshold and the corresponding financial ratio at loan origination. Num. covenants is the average number of financial covenants reported in DealScan. Industry classification based on 2-digit SIC classification code. Standard errors clustered by industry. t-stat in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Table A.8: Robustness – covenant concerns and changes in investment activities.

	Δ Capital Expenditures					Δ Log(Asset)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
CovFuture x CovSent > 0	-18.18***					-5.05***				
	(-3.32)					(-3.92)				
CovFuture x CovSent ≤ 0	-21.84***					-5.15***				
	(-4.97)					(-4.03)				
CovFuture x NMentions= 1		-19.46***					-5.02***			
		(-4.59)					(-5.22)			
CovFuture x NMentions≥ 1		-27.93***					-5.64**			
		(-4.41)					(-2.32)			
CovFuture (MDA)			-21.08***					-5.34***		
			(-5.11)					(-4.84)		
CovFuture (QA)			-17.47***					-4.71***		
			(-3.69)					(-2.86)		
CovFuture x Recession				-24.76***					-24.76***	
				(-5.71)					(-5.71)	
CovFuture x (1-Recession)				-19.26***					-19.26***	
				(-3.79)					(-3.79)	
CovFuture (EarnCalls)					-18.79***					-18.79***
					(-4.34)					(-4.34)
CovFuture (SEC)					-6.88***					-6.88***
					(-3.67)					(-3.67)
Difference	3.66	8.47	-3.61	-5.51	-11.92	.09	.62	-.64	-5.51	-11.92
	(.6)	(1.19)	(-.75)	(-.84)	(-2.45)	(.05)	(.27)	(-.38)	(-.84)	(-2.45)
Firm & Time FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lag dependent variable	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
R^2	0.51	0.51	0.51	0.51	0.51	0.42	0.42	0.42	0.51	0.51
N	100898	100898	100898	100898	77461	101914	101914	101914	100898	77461

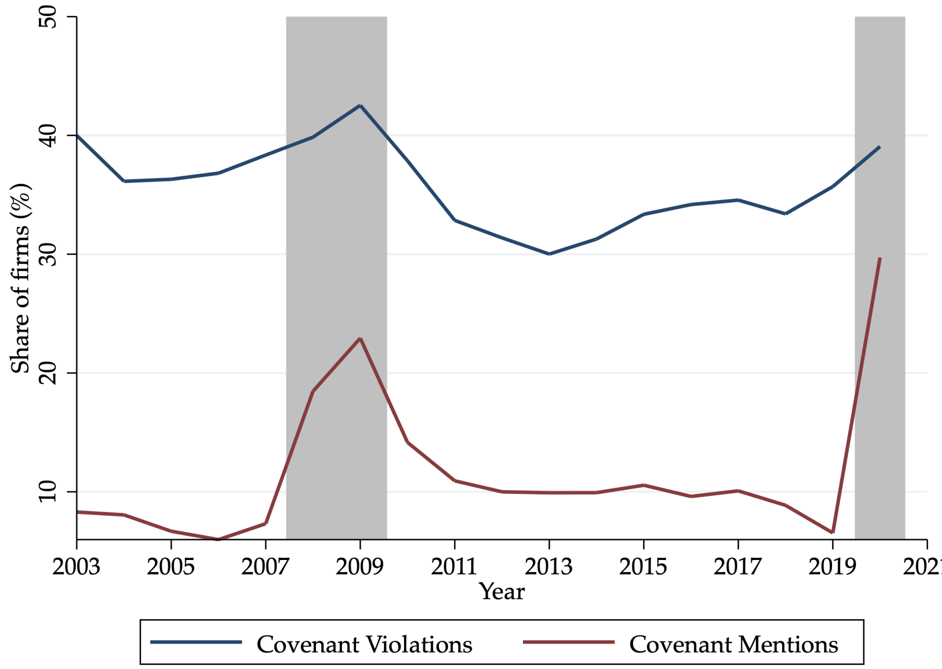
Notes. This table examines robustness of the relationship between covenant concerns and changes in investment activity from the beginning of quarter t to the end of quarter $t + 4$. Coefficient estimates of the lag dependent variable, which are included as controls, are omitted. Sample is restricted to firm-quarter observations with no violations reported in the current and past four quarters. Due to data constraints, regressions on covenant slack and its squared only cover firms with covenant information reported in DealScan. Standard errors double-clustered by firm and quarter. t-statistics are reported in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Table A.9: Robustness – covenant concerns and changes in financing activities.

	Δ Long-Term Net Debt Issuance					Δ Equity Payout				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
CovFuture x CovSent > 0	-54.21**					-14.09***				
	(-2.14)					(-2.91)				
CovFuture x CovSent ≤ 0	-40.51***					-16.38***				
	(-2.95)					(-4.16)				
CovFuture x NMentions= 1		-42.25***					-13.42***			
		(-3.21)					(-3.97)			
CovFuture x NMentions≥ 1		-54.40**					-27.47***			
		(-2.19)					(-4.19)			
CovFuture (MDA)			-47.52***					-16.17***		
			(-2.94)					(-4.12)		
CovFuture (QA)			-35.47*					-13.38***		
			(-1.83)					(-3.08)		
CovFuture x Recession				-43.68**					-26.33***	
				(-2.39)					(-3.94)	
CovFuture x (1-Recession)				-44.43***					-11.54***	
				(-2.71)					(-3.86)	
CovFuture (EarnCalls)					-38.30***					-15.82***
					(-2.67)					(-4.53)
CovFuture (SEC)					-10.60					-5.05**
					(-1.59)					(-2.42)
Difference	-13.71	12.14	-12.06	.75	-27.71	2.28	14.04	-2.79	-14.79	-10.77
	(-.49)	(.47)	(-.44)	(.02)	(-1.82)	(.36)	(1.95)	(-.5)	(-2.03)	(-2.67)
Firm & Time FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lag dependent variable	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
R^2	0.53	0.53	0.53	0.53	0.53	0.42	0.42	0.42	0.42	0.43
N	99787	99787	99787	99787	76726	97904	97904	97904	97904	75482

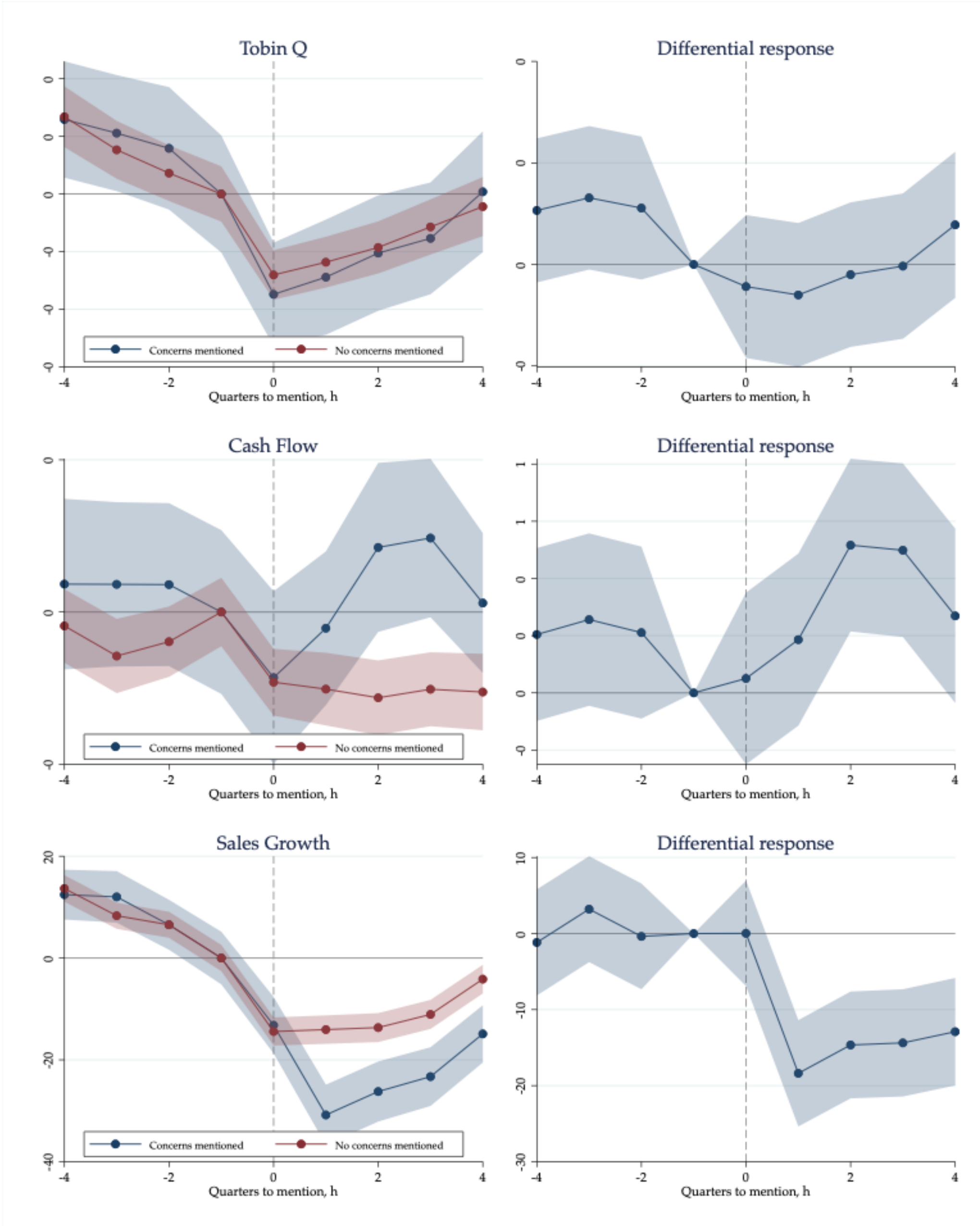
Notes. This table examines robustness of the relationship between covenant concerns and changes in financing activity from the beginning of quarter t to the end of quarter $t+4$. Coefficient estimates of the lag dependent variable, which are included as controls, are omitted. Sample is restricted to firm-quarter observations with no violations reported in the current and past four quarters. Due to data constraints, regressions on covenant slack and its squared only cover firms with covenant information reported in DealScan. Standard errors double-clustered by firm and quarter. t-statistics are reported in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Figure A.1: Covenant mentions and violations from DealScan over time.



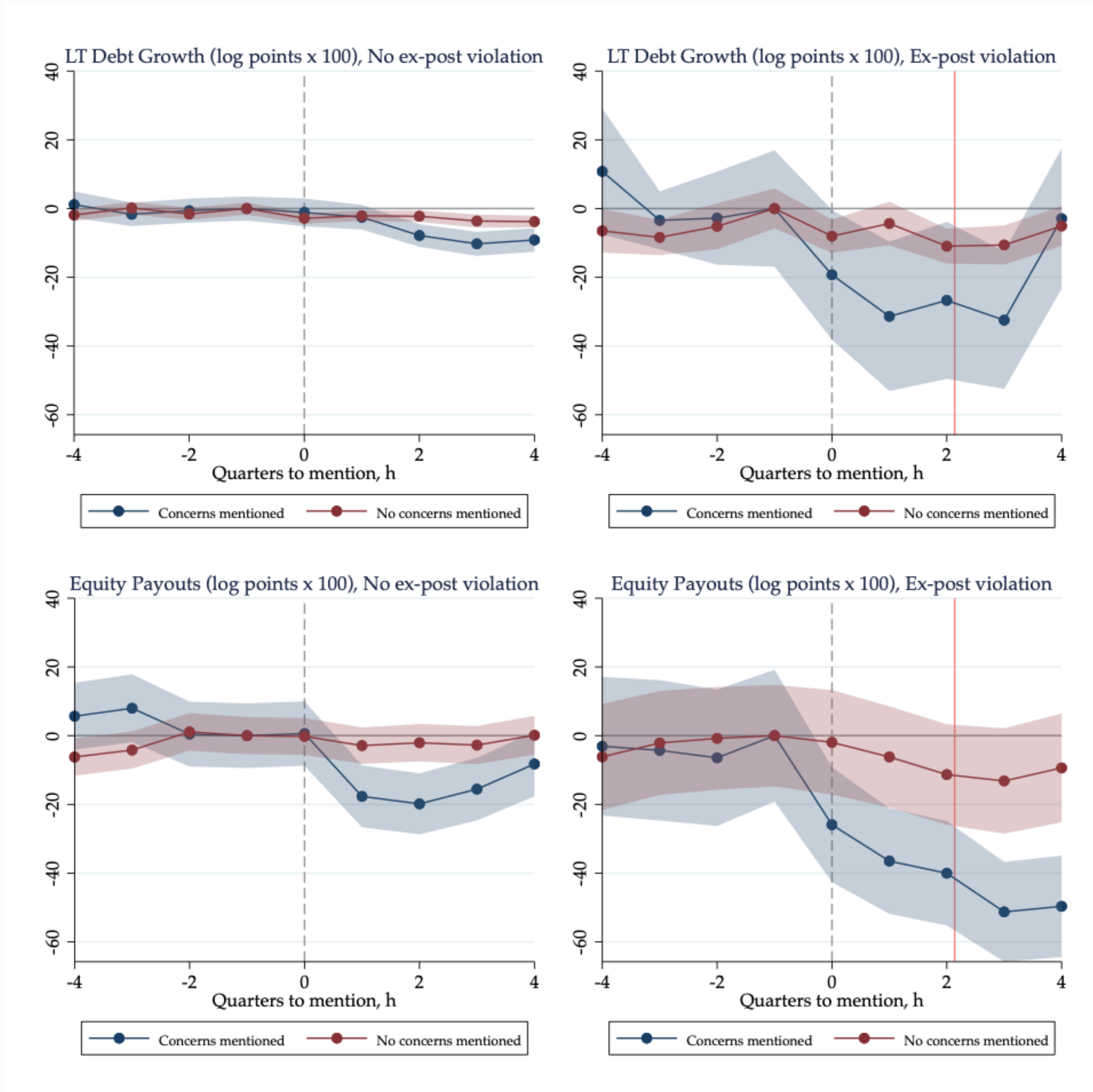
Notes. Share of firms with violation from DealScan and any covenant mentions in earnings calls in the full sample. Full sample consists of Compustat firms, excluding utilities and financials, with covenant information in DealScan and earnings call transcripts, from 2003Q1 to 2020Q1. Shaded bars denote year-quarters with NBER recession months.

Figure A.2: Measures of investment opportunities around covenant concerns, relative to the matched comparison group.



Notes. This table examines how measures of investment opportunities change around covenant concerns, relative to the matched comparison group. Left panel shows raw means, normalized to 0 in period -1. Blue line is average response when covenant concerns are mentioned. Red line is average response of matched events where concerns are not mentioned. Right panel shows differential response given by coefficient estimates from OLS specification (1.2). Shaded area denotes 95 percent confidence interval, which are based on non-clustered standard errors.

Figure A.3: Financing responses around covenant concerns, , conditional on post-event violations.



Notes. Red line is average response of control firms matched by Tobin's Q, cash flow, and sales growth in periods 0 and -1. Red vertical line in the right panels are the average quarter of first violation for firms that mention covenant concerns (2.1 quarters after mention). Shaded area denotes 95 percent confidence interval, which are based on non-clustered standard errors.

A.2 Data

A.2.1 Financial covenants

I obtain data on debt covenants from Thomson Reuters LPC DealScan database. The database records information on private syndicated debt contracts at the point of origination, where syndicated means a group of lenders jointly lending to a single borrower (Berlin, Nini, and Yu (2020)). These contracts, known as deals in the database, typically bundles different types of tranches, such as revolvers or lines of credits and term loans. Coverage in DealScan is available from 1981 onwards, with more than individual 101 thousand deals involving US-based borrowers. Chava and Roberts (2008) find that DealScan covers 50-75 percent of all commercial loans issued in the United States.

Information on financial covenants comes from the variable "all_covenants_financial", which provides a textual description of the types of financial covenants as well as their respective thresholds. The covenant information provided is common across tranches within a deal package. I use this text-based variable, instead of the information provided in the individual covenant variables provided by Dealscan as I found many missing entries in the individual covenant variables even though information is provided in "all_covenants_financial". I apply a simple text search algorithm to extract information on the type of covenants and the threshold that applies.

Next, I construct a firm-quarter panel of covenant thresholds from DealScan. To this end, I define a covenant threshold as active from the date the tranche becomes active ("tranche_active_date"). A covenant threshold no longer is relevant when the tranche matures or if the tranche is amended, i.e. a new "tranche_active_date" is recorded before the previous "tranche_maturity_date". I obtain the Compustat GVKEY ID of each borrower from the Roberts Dealscan-Compustat linking database (Chava and Roberts (2008)). This allows me to know which covenant threshold applies in a given firm and year-quarter. If a firm has multiple covenant thresholds that apply in a given quarter, I keep the tightest threshold.

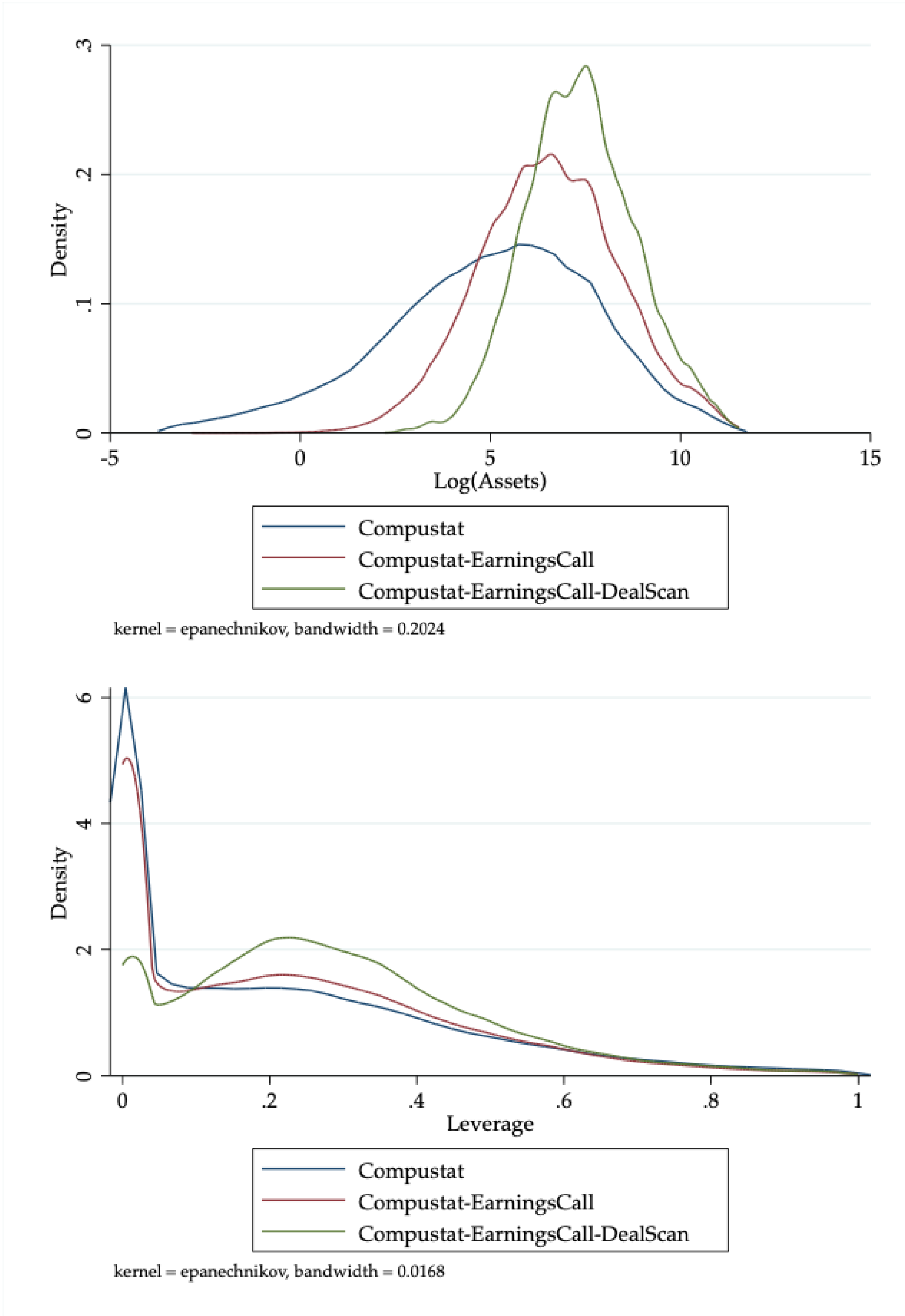
Table A.10: Prevalence of financial covenants in Dealscan.

Covenant Type	No. Obs	p25	p50	p75	Mean
Max. Debt to EBITDA	118788	2.5	3	3.9	3.34
Min. Interest Coverage	94024	2.5	3	3.5	2.98
Min. Fixed Charge Coverage	73679	1.15	1.3	1.6	1.5
Min. Tangible Net Worth	37438	45	275	1500	4367
Max. Leverage ratio	36738	0.5	0.6	0.65	0.8
Min. Net Worth	31247	87	257	800	3373
Max. Senior Debt to EBITDA	23527	2	2.5	3.1	2.81
Min. Current Ratio	22148	1	1	1.2	1.37
Min. Debt Service Coverage	17691	1.2	1.3	1.75	1.56
Max. Debt to Tangible Net Worth	17320	1	1.5	2.25	2.3
Max. Debt to Equity	5407	1	1.5	2.23	3.74
Min. Cash Interest Coverage	3267	1.5	2.25	3	2.43
Max. Loan to Value ratio	1673	0.5	0.65	0.75	6.11

Notes. "No. Obs" is the number of firm-quarter observations in which a covenant type applies. "p25", "p50", "p75", "Mean" are, respectively, the 25th, 50th, 75th percentiles, and average covenant threshold. See text for constructing firm-quarter panel of covenant thresholds from Dealscan information. Sample consists of borrowers with Compustat GVKEY ID available in the Roberts Dealscan-Compustat linking database (Chava and Roberts (2008)) and financial covenant information in the variable "all$_{c}ovenants_{f}inancial$"$inDealscanfrom2002Q1to2020Q1$.

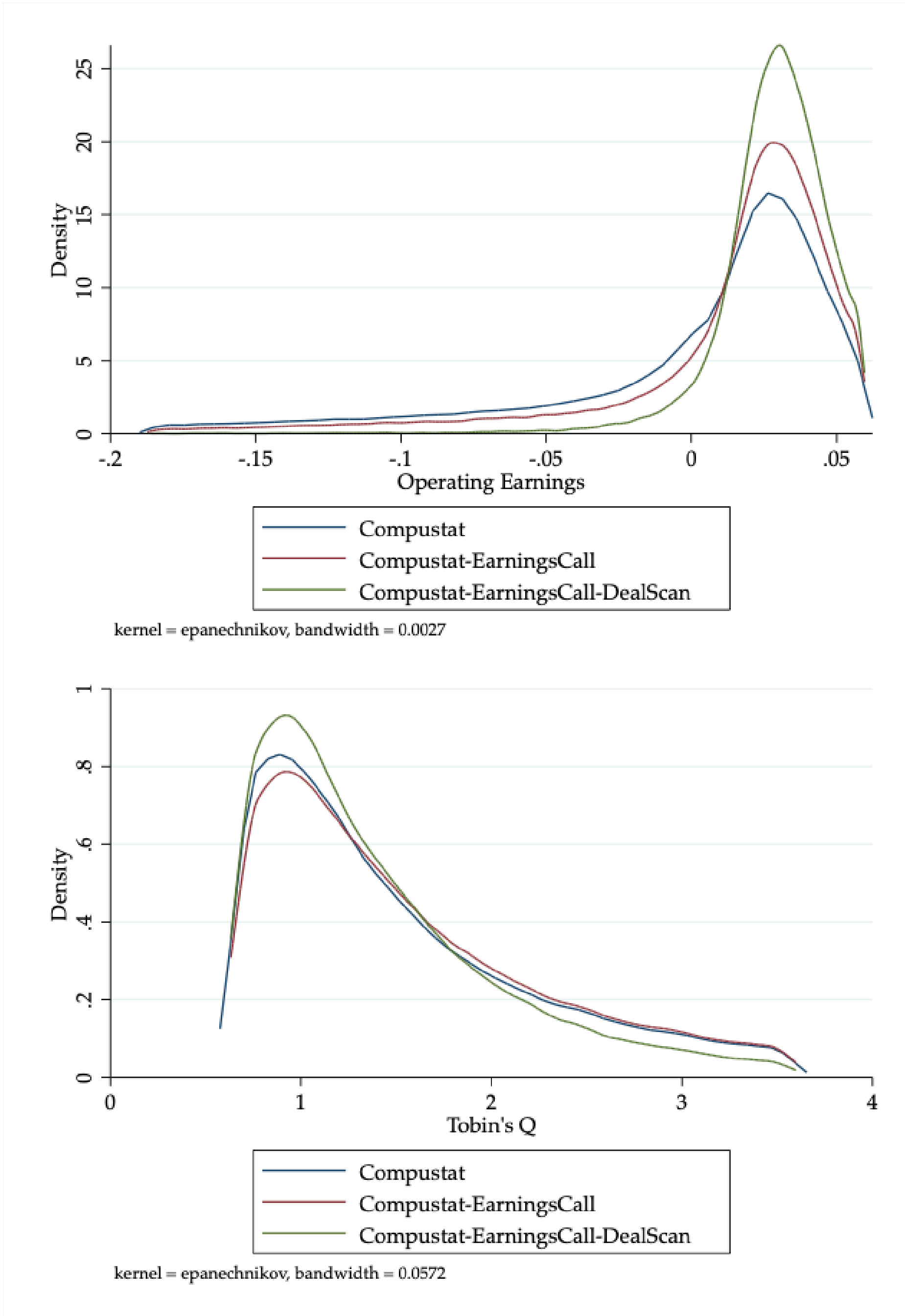
Table A.10 shows the prevalence of different types of financial covenants in DealScan. As documented in prior literature, most financial covenants are related to operating earnings or EBITDA (earnings before interest, taxes, depreciation, and amortization) (Drechsel (2018), Lian and Ma (2021), and Adler (2020)). These covenants are restrictions on total debt at the firm level, not just for a particular loan contract. The remaining set of financial covenants, such as the minimum net worth and maximum leverage ratio covenants, are based on book values of the firms assets and liabilities. I obtain accounting variables from Compustat to compute financial ratios corresponding to each of the financial covenants, using the definitions of financial ratios provided in Demerjian and Owens (2016).

Figure A.4: Distribution of assets and leverage by sample.



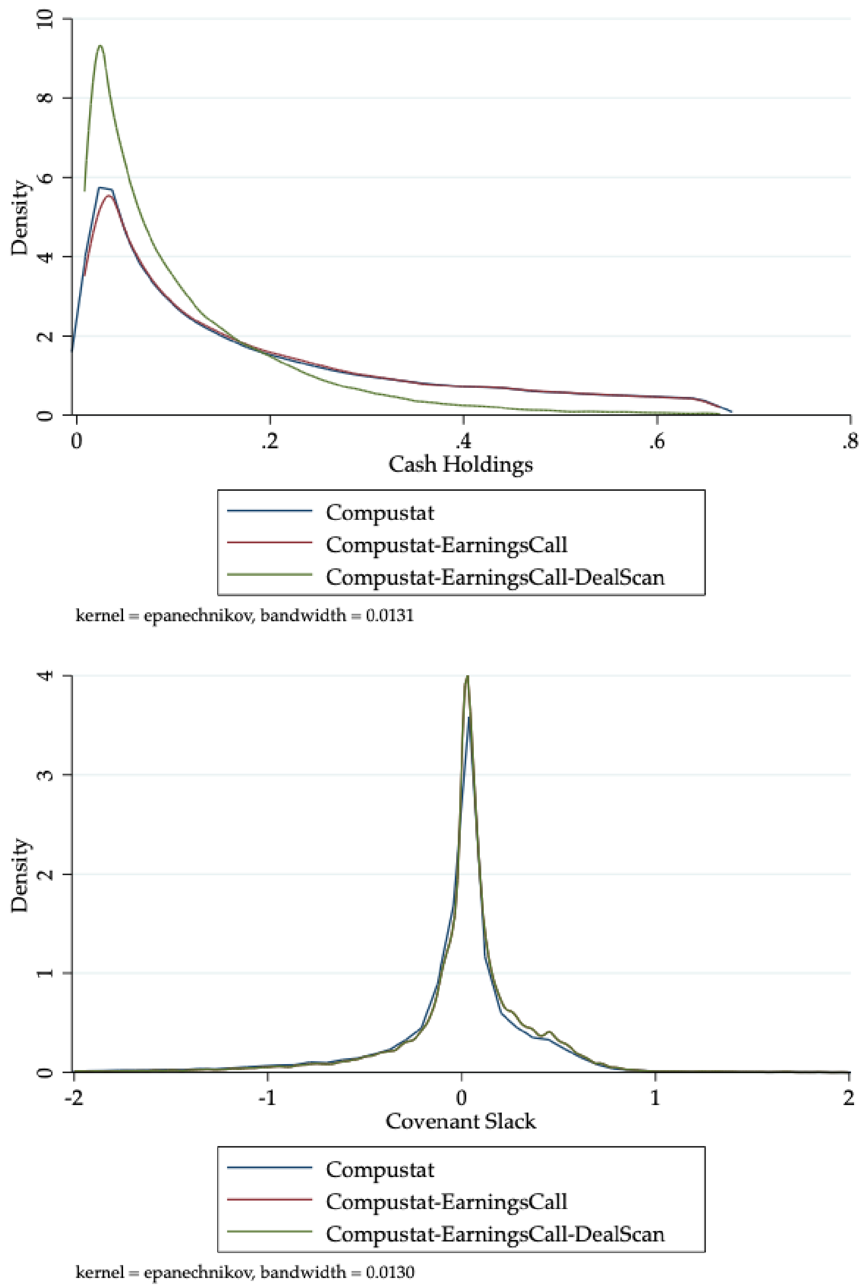
Notes. Compustat refers to firm-quarter observations in Compustat with matched SEC filings, excluding utilities (SIC 4900-4999) and financials (SIC 6000-6999), from 2002Q1 to 2020Q1. Compustat-EarningsCall refers to firm-quarter observations in the Compustat sample with earnings call transcripts. Compustat-EarningsCall-DealScan refers to firm-quarter observations in Compustat-EarningsCall sample with financial covenant information in DealScan.

Figure A.5: Distribution of earnings and Tobin's Q by sample.



Notes. Compustat refers to firm-quarter observations in Compustat with matched SEC filings, excluding utilities (SIC 4900-4999) and financials (SIC 6000-6999), from 2002Q1 to 2020Q1. Compustat-EarningsCall refers to firm-quarter observations in the Compustat sample with earnings call transcripts. Compustat-EarningsCall-DealScan refers to firm-quarter observations in Compustat-EarningsCall sample with financial covenant information in DealScan.

Figure A.6: Distribution of cash and covenant slack by sample.



Notes. Compustat refers to firm-quarter observations in Compustat with matched SEC filings, excluding utilities (SIC 4900-4999) and financials (SIC 6000-6999), from 2002Q1 to 2020Q1. Compustat-EarningsCall refers to firm-quarter observations in the Compustat sample with earnings call transcripts. Compustat-EarningsCall-DealScan refers to firm-quarter observations in Compustat-EarningsCall sample with financial covenant information in DealScan

A.2.2 Variable definitions

Variable	Compustat formula and notes	Source
Altman-z	3.3*(oibdpq/atq) + saleq/atq + 1.4*req/atq + 1.2*((actq-lctq)/atq) + 0.6*mcap/ltq	Compustat
Capital expenditure	capxq / l1.atq where capxq = capxy - l1.capxy if fqtr!=1 and capxq = capxy if fqtr==1	Compustat
Cash holdings	cheq / atq	Compustat
Covenant slack	Difference between accounting ratio and threshold in covenants, normalized by standard deviation of accounting ratio. If multiple covenants present, take whichever is tighter (more negative).	Compustat, Dealscan
CovFuture	Text-based measure of covenant concerns. See text for definition.	
Current ratio	actq/lctq	Compustat
Depreciation	dpq / l1.atq	Compustat
Earnings (EBITDA)	oibdpq / l1.atq	Compustat
Earnings growth	(oibdpq - l4.oibdpq) / oibdpq_sd where oibdpq_sd is the firm specific standard deviation of (oibdpq - l4.oibdpq)	Compustat
Equity Payouts	log(1+prstkcq+dvq) where prstkcq = prstkcy - l1.prstkcy if fqtr!=1 and prstkcq = prstkcy if fqtr==1, similar treatment for dvq	Compustat
HHLT Risk	Text-based measure of risk constructed using keywords from Hassan et al. (2019). Firm-quarter level data obtained from the website `https://www.firmlevelrisk.com`.	
Interest expense	xintq / l1.atq	Compustat
Leverage	(dlttq + dlcq) / atq	Compustat
Long-term debt growth	log(1+dlttq) - log(1+l1.dlttq)	Compustat

Variable	Compustat formula and notes	Source
Long-term net debt issuance	(dltisq-dltrq) / l1.atq where dltisq = dltisy - l1.dltisy if fqtr!=1 and dltisq = dltisy if fqtr==1, similar treatment for dltrq	
LM Sentiment	Text-based measure of sentiment constructed using keywords from Loughran and McDonald (2011). Firm-quarter level data obtained from the website `https://www.firmlevelrisk.com`.	
Max. Debt-to-EBITDA	(dlttq + dlcq) / ann_oibdpq where ann_oibdpq = oibdpq + l1.oibdpq + l2.oibdpq + l3.oibdpq	Compustat
Min. interest coverage	ann_oibdpq / ann_xintq where ann_xintq = xintq + l1.xintq + l2.xintq + l3.xintq and intpnq = intpny - l.intpny if fqtr!=1 and intpnq=intpny if fqtr==1	Compustat
Net worth	(atq - ltq) / atq	Compustat
Operating cash flow	(oancfq + xintq) / l1.atq where oancfq = oancfy - l1.oancfy if fqtr!=1 and oancfq = oancfy if fqtr==1	Compustat
PPE	ppentq / atq	Compustat
Rating	S&P credit rating obtained from Capital IQ. Ratings between AAA and BBB- are labeled as investment grade, the remainder are labeled as high yield. Missing data is labeled as no ratings.	Capital IQ
Sales growth	(saleq - l4.saleq) / saleq_sd where saleq_sd is the firm specific standard deviation of (saleq - l4.saleq)	Compustat
Size / Log(assets)	log(atq)	Compustat
Tangible net worth	(atq - ltq - intanq) / atq	Compustat
Tobin's Q	(dlttq + dlcq + mcap) / atq where mcap = prc * shrout / 1000	Compustat, CRSP
Violation	Covenant violation reported in SEC filings. See text for definition.	
Violation, DealScan	Covenant violations computed using covenant slack imputed from DealScan. Violation is an indicator for whether covenant slack falls below zero.	Compustat, DealScan

A.3 Textual analysis of earning call transcripts

A.3.1 Preprocessing

I begin by extracting discussions of firm participants in earnings call transcripts. I include both prepared remarks in the management discussion and analysis section as well as unprepared remarks by management in the question and answer section. I exclude the first 15 sentences in each call to remove the boilerplate statements made before beginning discussions of operating and financial results. As the measurement strategy relies on identifying forward-looking keywords typically found in these boilerplate discussions, their removal is necessary to ensure that the measure constructed reflects economically meaningful content.

As spoken sentences are often complex with multiple statements joined by conjunctions, I use SpaCys sentence tokenizer algorithm to split the text of each call into subsentences by detecting for the presence of the following indicators:

",", ".", "!", "?", ";", "or", "after", "because", "but", "so", "when", "where", "while", "although", "however", "though", "whereas" "so that", "despite"

Next, I apply a simple cleaning algorithm to each sentence.

- Remove any words that occur in brackets or squared brackets.
- Remove months (“January”, “February”, etc), irrelevant mentions of covenants (“covenant skills” and “customer covenant”).
- Remove capitalization, punction, and numbers.

Finally, I stem words to their roots using the Porter stemming algorithm (Porter, 1980). For instance, words such as “earnings” are stemmed to “earn” and “risks” are stemmed to “risk”. The purpose is to reduce the number of variations in words that convey the same meaning.

A.3.2 Tense detection

I use SpaCys dependency parser to learn the grammatical structure of each subsentence. The relevant output of the dependency parser is each words part-of-speech tag and the dependency relation with the head node. A part-of-speech (POS) tag identifies the grammatical category (e.g. noun, verb, adverb) of each word. The part-of-speech tags follow the Universal Dependency scheme (source: https://universaldependencies.org/u/pos/), which is commonly used in natural language processing applications. The dependency relation identifies the dependency relation between each word. Importantly, this identifies the root word of a subsentence and auxiliary words. The root word of a sentence is the word in which all other words directly or indirectly depend. Auxiliary words are functional words associated with verbal predicates that express tense, mood, aspect, or voice. (Universal Dependencies, n.d.)

A subsentence is labeled past tense if the following criteria is satisfied:

- The root word has POS tag: VBD (verb, past tense) or VBN (verb, past participle), or;
- Any child of the root word that is an auxiliary word (AUX or AUXPASS) has POS tag: VBD or VBN.

A subsentence is labeled as present tense if the following criteria is satisfied:

- The root word has POS tag: VB (verb, base form), VBG (verb, gerund or present participle), VBP (verb, non-3rd person singular present), VBZ (verb, 3rd person singular present), and;
- Any child of the root word that is an auxiliary word (AUX or AUXPASS) does not have POS tag: VBD, VBN, or MD (modal).

A subsentence is labeled as future tense if the following criteria is satisfied:

- The root word has POS tag: VB (verb, base form), VBG (verb, gerund or present participle), VBP (verb, non-3rd person singular present), VBZ (verb, 3rd person singular present), and;
- Any child of the root word that is an auxiliary word (AUX or AUXPASS) has POS tag: MD.

A.3.3 Forward-looking keywords

Table A.11: Forward-looking keywords from safe-harbor disclosures (1 of 4)

Word/Phrase (Stemmed)	**Count**	**Variants**
expect	84545	expect, expects, expected, expectations, expectation, expecting
believ	75291	believe, believes, believer
estim	73095	estimate, estimates, estimated
intend	71885	intend, intends, intended
anticip	71480	anticipate, anticipates, anticipated, anticipating
plan	62660	plan, plans, planned, planning
will	46940	will
project	43365	project, projects, projection, projected, projections, projecting
may	42233	may
should	41302	should
could	30922	could
potenti	19267	potential, potentially
predict	18485	predict, predicts, predictions, predicted, predicting, predictable
would	17951	would
seek	16125	seek, seeks, seeking
might	6426	might
goal	6151	goal, goals
futur	4808	future
like	4647	likely
outlook	4502	outlook
contempl	3161	contemplate, contemplates, contemplated
will like result	2444	will likely result
hope	1945	hope, hopes, hopeful, hopefully
possibl	1803	possible, possibly, possibility
forese	1665	foresee, foresees, foreseeable
guidanc	1637	guidance
aim	1513	aim, aims, aimed, aiming

Notes. Keywords and key phrases are stemmed to their roots using the NLTK librarys Porter Stemmer algorithm. "Count" is the number of safe-harbor disclosures in which the keyword or key phrase is given as an example of words that indicate a statement as forward-looking. "Variants" is the variant of the stemmed word that appears in the safe harbor disclosure.

Table A.12: Forward-looking keywords from safe-harbor disclosures (2 of 4)

Word/Phrase (Stemmed)	**Count**	**Variants**
probabl	1246	probably, probable, probability
opportun	1233	opportunity, opportunities
pursu	812	pursue, pursues, pursuing
consid	713	consider, considers
can have	649	can have
shall	623	shall
appear	570	appear, appears
indic	570	indicate, indicates, indicator, indicative, indication
schedul	558	scheduled, schedule
propos	551	propose, proposed, proposes
see	501	see, sees
suggest	399	suggest, suggests
think	371	think, thinks
prospect	363	prospects, prospective, prospect
is like	358	is likely
trend	323	trend, trends
pro forma	290	pro forma
feel	260	feel, feels
confid	234	confident, confidence
preliminari	227	preliminary
endeavor	214	endeavor, endeavors
look forward	177	looking forward, look forward, looks forward
depend	150	depend, depends
view	107	view, views
prioriti	98	priorities, priority
drive	97	drive, driving
tent	95	tentative
look ahead	94	looking ahead
upsid	90	upside
belief	89	belief, beliefs
could be	87	could be
envis	85	envision, envisions
risk	81	risk

Notes. Keywords and key phrases are stemmed to their roots using the NLTK librarys Porter Stemmer algorithm. "Count" is the number of safe-harbor disclosures in which the keyword or key phrase is given as an example of words that indicate a statement as forward-looking. "Variants" is the variant of the stemmed word that appears in the safe harbor disclosure.

Table A.13: Forward-looking keywords from safe-harbor disclosures (3 of 4)

Word/Phrase (Stemmed)	**Count**	**Variants**
pipelin	76	pipeline
is like to	75	is likely to
explor	74	explore, exploring
pend	68	pending
seek to	55	seek to, seeks to
are like	54	are likely
do not expect	51	do not expect
will like	51	will likely
may not	51	may not
do not anticip	51	do not anticipate
may be	48	may be
presum	48	presume
look forward to	43	look forward to
on pace	37	on pace
will like be	36	will likely be
may impact	34	may impact
improv	33	improve
expect to	31	expects to, expect to
move toward	24	moving toward
would be	23	would be
like will result	21	likely will result
express confid	15	expressed confidence
may continu	15	may continue
remain confid	15	remain confident
may result	14	may result
forse	13	forsees
shortterm	13	shortterm
can be	12	can be
uncertainti	11	uncertainty, uncertainties
call for	11	calls for
with a view to	11	with a view to
schedul to	10	scheduled to

Notes. Keywords and key phrases are stemmed to their roots using the NLTK librarys Porter Stemmer algorithm. "Count" is the number of safe-harbor disclosures in which the keyword or key phrase is given as an example of words that indicate a statement as forward-looking. "Variants" is the variant of the stemmed word that appears in the safe harbor disclosure.

Table A.14: Forward-looking keywords from safe-harbor disclosures (4 of 4)

Word/Phrase (Stemmed)	**Count**	**Variants**
go to	9	going to
work toward	8	work toward, working toward
go forward	7	going forward
unknown	6	unknown
unanticip	6	unanticipated
appear to	6	appear to
abl to remain	6	able to remain
estim will	6	estimate will
likelihood	6	likelihood
like to	6	likely to
on target	6	on target
up to	5	up to
could depend	5	could depends
well posit to	5	well positioned to
tailwind	5	tailwind
headwind	5	headwind
longterm	4	longterm
may depend	3	may depend
short term	3	short term
not expect	3	not expected
may affect	3	may affect
hypothes	3	hypothesize
uncertain	2	uncertain
could potenti	1	could potentially
ought	1	ought
may becom	1	may become
full year guidanc	1	full year guidance

Notes. Keywords and key phrases are stemmed to their roots using the NLTK librarys Porter Stemmer algorithm. "Count" is the number of safe-harbor disclosures in which the keyword or key phrase is given as an example of words that indicate a statement as forward-looking. "Variants" is the variant of the stemmed word that appears in the safe harbor disclosure.

A.3.4 Sentence examples

Table A.15: Sentence excerpts with mentions of covenant concerns (1 of 7)

Quarters to violation	Text excerpt
-4	1) "We **believe** that we are currently compliance with all material covenants of our mortgages and revolving credit facility." (Alerislife Inc, Mar 1, 2006) 2) "This coupled with the reduce level of capital spending that I mentioned in the use of free cash flow repay debt **should** results and coverage under covenants actually **improving** beginning in the first quarter of 2009." (Hercules Offshore Inc, Oct 29, 2008) 3) "...as you can **see** we had significant cushion in both of these covenants and looking ahead..." (United Rentals Inc, Oct 29, 2008) 4) "...it **would** not impact compliance with our debt covenants as it **would** be a non-cash expense." (Amn Healthcare Services Inc, Feb 26, 2009) 5) "In addition we **expect** that the Company **will** remain in compliance with the financial covenants..." (Key Energy Services Inc, Feb 26, 2009) 6) "We believe that the reduction in debt – reduction in indebtedness combined with the improvement in debt-to-total capitalization and debt-to-EBITDA covenant better position American Dental Partners refinance our revolving credit facility in term loan..." (American Dental Partners Inc, Jul 28, 2009) 7) "Youll note that we have continued to **improve** on our covenant ratios." (Pharmerica Corp, Feb 5, 2010) 8) "...we **will** proactively reach out to our lenders to discuss our performance relative to our covenants and we **will** determine the appropriate course of action." (Federal Signal Corp, Nov 3, 2010) 9) "...we dont **see** significant pressure on that covenant as we model out the **future**." (Tivity Health Inc, Oct 24, 2011) 10) "We **intend** to initially allocate the free cash flow to leverage reduction and we **expect** covenant leverage of approximately 4.5 times by year end 2016 and that assumes no net proceeds from the incentive auction." (Nexstar Media Group, May 3, 2016)

Notes. Quarters to violation refer to the fiscal quarter relative to violation event. Bold words are keywords that identifies a subsentence as forward looking. The text is selected among Compustat firms with maximum Debt-to-EBITDA or minimum interest coverage financial covenants in LPC DealScan, excluding firms in financial and utilities industries.

Table A.16: Sentence excerpts with mentions of covenant concerns (2 of 7).

Quarters to violation	Text excerpt
-3	1) "We **believe** that we are totally in compliance with all material covenants of our mortgages and revolving credit facility." (Alerislife Inc, May 10, 2006) 2) "...the less obvious **potential** remedies weve already commenced discussions with our agent bank on our options for gaining additional flexibility under the covenants during this cyclical downturn." (Hercules Offshore Inc, Feb 10, 2009) 3) "...we **believe** our lenders **will** work with us to negotiate some relief on covenants if market conditions persist." (Pioneer Energy Services Corp, May 7, 2009) 4) "...at some point in the **future** we **might** chip those covenants and speculate thats what the banks response **would** be..." (Bronco Drilling Co, May 8, 2009) 5) "Therefore we do not **believe** that we have covenant issues related to the consolidation of receivables." (Cabelas Inc, July 30, 2009) 6) "As such we remain very comfortable that we **will** stay in compliance with our covenants even if 2010 proves to be another year of declining EBITDA leaving us with ample excess to liquidity **should** we need it." (Starwood Hotels & Resort world, Jul 23, 2009) 7) "We are **reviewing** our options for replacing this credit facility primarily due to certain covenant limitations." (Englobal Corp, Nov 9, 2009) 8) "But we dont have a concern about an issue with that covenant and the payment rate is in line with our **expectations**." (Conns Inc, Mar 27, 2014) 9) "...we **plan** to use cash to pay down debt as we move back under the bank covenant constraint of 3-to-1 debt to EBITDA ratio." (Essendant Inc, Apr 21, 2016) 10) "We **intend** to initially allocate free cash flow to leverage reduction and **expect** covenant leverage of approximately 4.5 times by year end 2016 and that assumes no net proceeds from the spectrum auction." (Nexstar Media Group, Aug 9, 2016)

Notes. Quarters to violation refer to the fiscal quarter relative to violation event. Bold words are keywords that identifies a subsentence as forward looking. The text is selected among Compustat firms with maximum Debt-to-EBITDA or minimum interest coverage financial covenants in LPC DealScan, excluding firms in financial and utilities industries.

Table A.17: Sentence excerpts with mentions of covenant concerns (3 of 7).

Quarters to violation	Text excerpt
-2	1) “...there is a reasonable **likelihood** we **will** not be in compliance with covenant and revolving credit agreement as we exit the fourth quarter.” (Brunswick Corp, Oct 23, 2008) 2) “...we **believe** that our liquidity position is strong and we currently have sufficient **headwind** on our three financial covenants.” (Newpark Resources, Feb 20, 2009) 3) “...we are currently **pursuing** other changes to the financial covenants underlying the credit facility to provide us with ongoing financial flexibility in response of the current economic environment.” (Flow International Corp, Mar 12, 2009) 4) “...we determine that we **will** need more cushion under these covenants and have better visibility as to what we **would** need...” (Hercules Offshore Inc, Apr 28, 2009) 5) “...we **believe** that we **will** continue to maintain compliance with such financial covenants.” (Calumet Specialty Products, Nov 4, 2009) 6) “We are taking actions to maintain compliance including entering discussions with the lenders in our ABL and ABS facilities regarding **potential** amendment of the covenants and are **reviewing** options to reduce the outstanding balance of debt on our balance sheet including the ability to sell and lease back owned real estate...” (Conns Inc, Nov 25, 2009) 7) “We do not **believe** that we **will** violate any covenants under the line of credit...” (ITT Educational Services Inc, Jan 24, 2013) 8) “...we **anticipate** our covenants **will** be [tight] on a go forward basis.” (Amedisys Inc, Mar 12, 2014) 9) “....if we need to make any minor **short-term** adjustments to key covenants as we work through this trading period.” (American Vanguard Corp, May 1, 2014) 10) “So I **think** the concern about covenants today in the downturn is **considerably** less than any concerns we **would** have then.” (Asbury Automotive Group Inc, Feb 4, 2016)

Notes. Quarters to violation refer to the fiscal quarter relative to violation event. Bold words are keywords that identifies a subsentence as forward looking. The text is selected among Compustat firms with maximum Debt-to-EBITDA or minimum interest coverage financial covenants in LPC DealScan, excluding firms in financial and utilities industries.

Table A.18: Sentence excerpts with mentions of covenant concerns (4 of 7).

Quarters to violation	Text excerpt
-1	1) "We **believe** that we are currently in compliance with all material covenants of our mortgages and revolving credit facility." (Alerislife Inc, Nov 9, 2006) 2) "We **will** be working with our lenders to obtain a modification of covenants for **future** periods." (Ruby Tuesday Inc, Jan 9, 2008) 3) "...we **would** ask for a waiver from our long-standing bank group regarding compliance with these financial covenants for a specific period of time." (Steel Dynamics Inc, Apr 23, 2009) 4) "...we **feel** we **will** remain in compliance with our debt covenants for the remainder of 2009." (Arc Document Solutions Inc, May 7, 2009) 5) "...we **might** stand against the two financial covenants contained in our credit agreement." (Hercules Offshore Inc, Jul 23, 2009) 6) "We do **anticipate** continued pressure on our leverage covenant in 2010 due to lower margins and throughput in our Midstream Business." (Eagle Rock Energy Partnrs LP, Nov 5, 2009) 7) "...we **believe** we have sufficient cushion in our covenants to satisfy our debt covenant test." (Education Management Corp, Nov 1, 2012) 8) "This **guidance would suggest** that we **will** be running close to our leverage covenant of 4.0 at the end of the year." (Ranger Oil Corporation, Feb 26, 2015) 9) "...we **believe** that in addition to our **anticipated** cash flow from operations and having worked out some loosening of our key covenants for a few quarters." (American Vanguard Corp, Jul 31, 2014) 10) "Our current internal financial forecast **indicates** that we **will** not remain in compliance with this interest coverage covenant as early as the end of the first quarter of our fiscal 2017..." (Tidewater Inc, May 26, 2016)

Notes. Quarters to violation refer to the fiscal quarter relative to violation event. Bold words are keywords that identifies a subsentence as forward looking. The text is selected among Compustat firms with maximum Debt-to-EBITDA or minimum interest coverage financial covenants in LPC DealScan, excluding firms in financial and utilities industries.

Table A.19: Sentence excerpts with mentions of covenant concerns (5 of 7).

Quarters to violation	Text excerpt
0	1) "The banks **agreed** to exclude the majority of the one-time cost attributable to the strike in Cedar Rapids and relaxed previously established thresholds for this covenant ratio. " (Penford Corp, Dec 16, 2004) 2) "...this forbearance agreement **is designed** to provide time for our management team along with the banks to evaluate the structure in terms of this facility and to address our ability to satisfy certain financial covenants." (Ultralife Corp, Aug 2, 2007) 3) "...we **did not** meet two of the financial ratio covenants required by $75million unsecured revolving credit facility." (Tandy Brands Accessories Inc, Nov 13, 2007) 4) "...**removed** all the maintenance covenants that caused so..." (Axiall Corp, Feb 18, 2010) 5) "...we **were** not incompliance with the consolidated leverage covenant in our credit agreement." (Kids Brands Inc, Aug 14, 2012) 6) "Net interest coverage **was** 2.85 times compared to a covenants requirement of 1.85." (West Corp, Jan 31, 2013) 7) "...we **obtained** covenant release from our vendor group during the third quarter to ensure that we had adequate borrowing capacity in light of covenants based on 12 month trailing EBITDA." (American Vanguard Corp, Oct 30, 2014) 8) "Crestwood also **amended** certain terms of our revolving credit facility such as increasing the total leverage ratio covenant from 5.0 times to 5.5 times and adding a senior secure level ratio of 3.75 times." (Crestwood Equity partners LP, Nov 3, 2015) 9) "...our credit agreement **has been** simplified to only have one leverage covenant." (Nexstar Media Group, Aug 8, 2017) 10) "...we **amended** our revolving credit facility to obtain a waiver of financial leverage covenants for four quarters through the first quarter of 2021." (Hyatt Hotels Corp, May 7, 2020)

Notes. Quarters to violation refer to the fiscal quarter relative to violation event. Bold words are keywords that identifies a subsentence as forward looking. The text is selected among Compustat firms with maximum Debt-to-EBITDA or minimum interest coverage financial covenants in LPC DealScan, excluding firms in financial and utilities industries.

Table A.20: Sentence excerpts with mentions of covenant concerns (6 of 7).

Quarters to violation	Text excerpt
1	1) "We **extended** the majority of our facilities to six years revised some of the covenants and reduced the recorded annual principal payments from 16 million to 2 million." (Pantry Inc, Jan 26, 2006) 2) "...we **had** conversations with many of our banks regarding our need for an amendment of the covenant package in our credit facility." (Avis Budget Group Inc, Nov 7, 2008) 3) "...the Company significantly **exceeded** its debt covenant requirements which resulted in are moving down two pricing levels on our interest cost to 200 basis points over LIBOR." (Craft Brew Alliance Inc, Mar 31, 2010) 4) "...we **worked** closely with our bank syndicate to revise our credit agreement to provide additional flexibility in our loan covenants." (1-800-flowers.com, Aug 19, 2010) 5) "The company **paid** down nearly $17 million in debt during the quarter and achieve a net leverage ratio of 3.35 times which is significantly below our leverage covenant of 3.50." (Lodgenet Interactive Corp, Feb 25, 2011) 6) "...**increased** the companys flexibility with respect to certain financial covenants." (Alliance Healthcare Services Inc, Nov 9, 2011) 87) "We **extended** the 4.5 times beverage covenant through the end of 2013..." (Ranger Oil Corporation, Nov 1, 2012) 8) "...we **received** unanimous support from our lenders to address our debt covenants for the quarterly reporting periods in 2013." (Cleveland Cliffs Inc, Apr 25, 2013) 9) "Our debt covenants **were** reinstated at the fourth quarter and we are in full compliance." (Pilgrims Pride Corp, Feb 15, 2013) 10) "...we **finished** the year with a net debt-to-EBITDA ratio of 2.9 times based on our bank covenant definition." (Acco Brands Corp, Feb 11, 2015)

Notes. Quarters to violation refer to the fiscal quarter relative to violation event. Bold words are keywords that identifies a subsentence as forward looking. The text is selected among Compustat firms with maximum Debt-to-EBITDA or minimum interest coverage financial covenants in LPC DealScan, excluding firms in financial and utilities industries.

Table A.21: Sentence excerpts with mentions of covenant concerns (7 of 7).

Quarters to violation	Text excerpt
2	1) "...**relaxed** the number of the restrictive covenants including those relating to debt incurrence..." (Guitar Center Inc, Jan 29, 2004) 2) "We **did** meet our covenants under the agreement for the quarter." (PRGX Global Inc, Jul 28, 2005) 3) "...we **maintained** our debt covenant compliance throughout the year and ended 2009 with a total debt covenant ratio of 3.1 times which was well below the required level under our credit agreement of 3.75 times." (Barnes Group Inc, Feb 18, 2010) 4) "We **had limited** scope for investment due to our obligations to meet our debt covenants." (Brocade Communications Sys, Sep 15, 2010) 5) "...we **reduced** our debt and the effect of this was to eliminate all of our maintenance covenants that were part of the term loan." (Dana Inc, Feb 23, 2011) 6) "We also **made** various modifications to financial covenants under the facilities that provide PAA and PNG with increased flexibility." (Plains All American Pipeline, Nov 3, 2011) 7) "...this amendment **provided** Alliance with greater flexibility under our financial maintenance covenants." (Alliance Healthcare Services, Mar 15, 2012) 8) "We **ended** the quarter with significant cushion in our credit statistics with our leverage ratio as defined in our Credit Agreement at 3.1 times consolidated EBITDA compared to our covenant maximum of 6 times." (NPC Restaurant Holdings LLC, Mar 10, 2014) 9) "...we successfully **removed** the limiting restricted cash covenant allowing us to redeploy the additional capital into the business." (AV Homes Inc, Feb 24, 2017) 10) "...**eliminated** almost all financial covenants and generally provides the company with more financial flexibility." (Seaworld Entertainment Inc, Nov 5, 2018)

Notes. Quarters to violation refer to the fiscal quarter relative to violation event. Bold words are keywords that identifies a subsentence as forward looking. The text is selected among Compustat firms with maximum Debt-to-EBITDA or minimum interest coverage financial covenants in LPC DealScan, excluding firms in financial and utilities industries.

A.4 Textual analysis of SEC filings

A.4.1 Overview

I identify instances of covenant violations and loan amendments using each firms 10-K and 10-Q SEC filings. As discussed in Beneish and Press (1993) and Sufi (2009), firms are required by SEC regulation to report covenant violations that are unresolved in the most recent SEC filings. This makes SEC filings the ideal setting to extract information about covenant violations. However, firms are not required to disclose information on loan amendments, hence any information extracted from SEC filings are those made by firms on a voluntary basis.

The procedure for identifying covenant violations builds on the text-search algorithm in Nini, Smith, and Sufi (2012). Building on the initial algorithm, Adler (2020) extends the database on covenant violations to 2015, whereas Becher, Griffin, and Nini (2021) extends the database on covenant violations to 2017. I modify the algorithm to extend the database further to 2020. While the adapted algorithm I propose is able to reduce false positive identifications, it does not fully eliminate all false positive identifications. Since Becher, Griffin, and Nini (2021) removes false positive identifications through detailed reading of text snippets around covenant violations, I use their measure as the default measure but supplement missing information with those from the measure I constructed.

The procedure for identifying loan amendments similarly rely on a text-search algorithm. In previous research, Roberts and Sufi (2009) identifies loan amendments from SEC filings through a detailed reading of 500 randomly selected transcripts. More recently, Griffin, Nini, and Smith (2018) extends the database of loan amendments reported in SEC filings to firms with covenant information in SEC filings.

A.4.2 Data collection and pre-processing

The text of SEC filings is obtained directly from the SEC EDGAR website, which contains all filings for the universe of publicly listed firms in the United States. The raw text files directly downloaded from the website are not XML formatted, so it is often difficult to identify separate sections in the text without extensive cleaning. To this end, I employ the proprietary API from SEC-API to extract relevant text from SEC filings directly from the SEC EDGAR website.

I only use the Management, Discussion, and Analysis (MDA) section of each firms SEC filings. These are Item 7 in 10-K filings and Item 1 Part 2 in 10-Q filings. This approach is consistent with past research, in particular Kaplan and Zingales (1997) and Hoberg and Maksimovic (2014), that uses this portion of the filings to identify when firms are financially constrained. In undocumented analysis, I find that parsing for covenant violations and loan amendments using the entire SEC filings yields significantly more false positives. This is because SEC filings often contain attached exhibits of loan agreements that discuss conditions of covenant violations and amendments, which do not reflect actual violations or amendment events.

The pre-processing of the text is standard. They include:

- Remove formatting, such as line break symbols "\n", and character symbols, such as "&#1" or "rsquo".
- Remove capitalization, punctuation, and extra spacing. I retain full stops, which is used to split the text into sentences. I also retain numerical characters, since this is subsequently used to identify dates.
- Remove irrelevant text, such as page number, "table of contents", and section headers.

Once the text is cleaned, it is then split into sentences. Since grammatical information is not used to identify covenant violations and loan amendments, I do not split the sentences further into subsentences. Additionally, I do not stem the text since this yields a larger number of false positive identifications when parsing various types of loan amendments.

A.4.3 Identifying covenant violations

The procedure for identifying covenant violations builds on the text-search algorithm proposed in Nini, Smith, and Sufi (2012), but with several modifications. The purpose is to reduce the number of false positive identifications while minimizing the time required for a detailed reading of the text excerpts.

I begin by searching for sentences that contains the word “covenant”. I then separately search for sentences that contains the following violation keywords (stars denote wildcards):

> *waiv*, viol*, in default, modif*, not in compliance, forbear*, out of compliance, did not comply, unable to comply, failed to comply, did not meet, unable to meet, failed to meet, did not satisfy, unable to satisfy, failed to satisfy*

To remove likely false positive identifications, I search for sentences that contains the following:

- Negation of violation terms, e.g. “not in violation”. I remove these sentences by searching for the presence of negating terms that occur 10 characters before any violation term. The negating keywords are: “no”, “not”, “don*”, “won*”, “none”, “wouldn*”, “without”, “didn*”.

- Hypothetical statements, which are sentences that include the presence of forward-looking keywords. The keywords are similar to those used in the construction of the measure of covenant concerns. I do not filter for the tense of the sentence since this step is computationally costly.

- References to old dates, which implies that the violation or amendment did not occur in the fiscal quarter of filing. I remove dates that are 6 months prior to the filing date. Year only references are assumed as occurring on July 1 of the given year. If there are multiple date references in a given sentence, I consider the sentence as referring to an old violation or amendment if more than half of the dates are more than 6 months prior to the filing date.

Finally, I consider the sentence as referring to a covenant violation if a sentence containing a violation keyword occurs in the same sentence as those with the word “covenant” or any of the latter’s subsequent three sentences.

A.4.4 Identifying loan amendments

The text-search algorithm to identify loan amendments builds on Acharya et al. (2021). I outline an algorithm below that extends their framework to include more keywords that are relevant to identifying loan amendments. Specifically, I begin by searching for sentences that jointly contains keywords that imply amendments (stars denote wildcards):

> *amend*, modif*, renegotiate, forbearance, waiv*, in default, viol*, not in compliance*

as well as keywords that refer to loan agreements:

> *covenant, line of credit, lines of credit, credit line, credit facility, loan facility, revolving facility, credit agreement, loan agreement, financing agreement, revolving credit, revolver, term loan*

As before, I remove false positive identifications by searching for sentences that contain hypothetical statements or references to old dates. Next, I extract these sentences as well as the three subsequent sentences.

To identify loan amendments that are costly to firms, I search for amendments that imply any of the following changes: an increase in the interest rate, a reduction in the borrowing amount, an adjustment of the loan maturity, and a requirement of additional collateral.

These changes are identified by searching for the joint occurrence of "directional" keywords and "loan term" keywords. Specifically, I require that "directional" keywords occurring 30 characters before "loan term" keywords, or "loan term" keywords occurring 30 characters before "directional" keywords but separated by a past tense term, e.g. "was", "were". I also require that no punctuations occur between the "directional" keyword and "loan term" keywords.

The directional keywords are:

- "increase" keywords: *increase, raise, upward*
- "decrease" keywords: *decrease, reduce, lower, downward*

- “adjust” keywords: *adjust, change, update, decrease, lower, reduce, shorten*

- “require” keywords: *require, pledge, add, provide, deposit*

The loan term keywords are:

- “interest rate” keywords: *interest rate, rate, yield, spread, margin, borrowing cost, pricing grid, commitment fee, rate increment, libor increment*

- “credit availability” keywords: *amount, size, commitment, capacity, limit, sublimit, committed, line of credit, lines of credit, lines of credit, credit line, revolving credit, revolver, loan facility, credit facility, revolving facility, borrowing base, maximum available, credit availability, available credit*

- “maturity” keywords: *matur**

- “collateral” keywords: *collateral**

Finally, I consider a sentence as referring to a costly loan amendment if a sentence referring costly changes occur in the same sentence as the sentence referring to loan amendments, or any of the latter’s subsequent three sentences.

Appendix B: Appendix to Chapter 2

B.1 Summary Statistics

Table B.1: Summary statistics conditional on availability of analyst forecasts.

	Has All Forecast			Missing Forecast		
	Nobs	Mean	SD	Nobs	Mean	SD
Chg in F(SalesGrowth) (%)	45643	-0.37	2.82	10648	-0.80	3.82
Chg in F(EarnGrowth) (bps)	45643	-0.43	1.76	15177	-1.07	2.90
F(SalesGrowth) (%)	45643	8.66	8.06	10643	12.99	10.76
F(EarnGrowth) (bps)	45643	13.02	14.32	15175	13.24	18.43
CovFuture (%)	45643	1.32	11.44	92468	1.93	13.77
Violation(%)	45643	1.63	12.66	92468	3.73	18.96
Tobin's Q	45449	1.84	1.31	85463	1.89	1.61
Cash Flow (%)	45599	3.15	3.73	91831	0.39	8.08
Annualized Sales Growth (%)	43917	7.78	14.70	75721	9.62	24.70
Log(Asset)	45116	7.44	1.51	91984	6.09	1.84
Leverage(%)	45588	24.33	22.43	92096	24.49	31.67
Tang Net Worth (%)	45639	23.36	33.29	92113	28.37	55.33
Cash Holdings (%)	45643	16.10	16.57	92323	25.46	26.46
Altman z-score	42706	3.71	4.45	78237	3.72	6.68
Has Rating (%)	45643	34.29	47.47	92468	21.09	40.79
High Yield Rating (%)	15802	52.63	49.93	19822	69.41	46.07

Notes. This table reports the summary statistics for the sample of firms from Compustat, excluding financials and utilities, with covenant violations data from SEC filings, and earnings call transcripts in FactSet. "Has All Forecast" refers to observations with analyst forecasts of sales and earnings per share for the next four quarters. "Missing Forecast" refers to observations with at least one missing forecast. See Appendix A.2.2 for variable definitions.

B.2 Robustness checks

Table B.2: Robustness – Covenant concerns and post-call monthly returns.

	(1) AR (0)	(2) CAR (1,3)	(3) CAR (1,6)	(4) CAR (1,12)
A. Unconditional sample				
CovFuture	0.15	1.15	6.90***	11.76**
	(0.19)	(1.03)	(2.70)	(2.07)
Firm FE	✓	✓	✓	✓
Time FE	✓	✓	✓	✓
R^2	0.2	0.2	0.2	0.05
N	75843	75843	75843	75843
B. Negative earnings surprise sample				
CovFuture	-1.13	2.57	9.37**	8.06
	(-0.84)	(1.45)	(2.39)	(1.19)
Firm FE	✓	✓	✓	✓
Time FE	✓	✓	✓	✓
R^2	0.3	0.3	0.4	0.5
N	21375	21375	21375	21375
C. Non-negative earnings surprise sample				
CovFuture	1.24	0.14	3.77	12.18
	(1.17)	(0.10)	(1.25)	(1.42)
Firm FE	✓	✓	✓	✓
Time FE	✓	✓	✓	✓
R^2	0.2	0.2	0.2	0.07
N	53046	53046	53046	53046

Notes. This table examines whether covenant concerns predict post-call monthly returns. Sample includes all calls with data on reported violations from SEC filings and earnings surprise from IBES. Controls include earnings surprise, log market capitalization, log book-to-market, and past 12 month stock returns. Sample excludes calls where covenant violations are reported in the fiscal quarter of call and preceding fiscal quarter. Standard errors are clustered by call-date. t-statistics are reported in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Table B.3: Covenant violations and post-event stock returns.

	(1) AR (0)	(2) CAR (1,3)	(3) CAR (1,6)	(4) CAR (1,12)
A. Unconditional sample				
CovFuture	1.03	0.28	1.98	6.29
	(1.53)	(0.31)	(1.04)	(1.50)
R^2	0.3	0.3	0.3	0.3
N	7162	7162	7162	7162
B. Negative earnings surprise sample				
CovFuture	1.83*	0.73	3.11	14.03**
	(1.81)	(0.55)	(1.01)	(2.02)
R^2	0.3	0.3	0.3	0.3
N	3417	3417	3417	3417
C. Non-negative earnings surprise sample				
CovFuture	0.17	-0.03	1.20	-0.22
	(0.19)	(-0.02)	(0.54)	(-0.05)
R^2	0.3	0.3	0.3	0.3
N	3376	3376	3376	3376

Notes. This table examines whether covenant violations predict monthly returns following announcements of violations in SEC filings. Sample includes quarterly observations of covenant violators and their comparison group, after matching on earnings surprise, log market capitalization, log book-to-market, and past 12 month stock returns. Regression specification additionally controls for earnings surprise, log market capitalization, log book-to-market, and past 12 month stock returns. Standard errors clustered by date. t-statistics are reported in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

B.3 Derivation of equation (2.12)

The firm's problem is as described by equations (2.1) to (2.6) in the main text. The optimality conditions are given by equations (2.7) to (2.11), which I restate below for convenience

$$w = (1-\alpha)A_t K_t^{\alpha} L_t^{-\alpha} \tag{B.1}$$

$$\lambda_t = \Psi_{D,t}^{-1} \tag{B.2}$$

$$\Phi_{I,t}\lambda_t(1+\kappa\mu_t) = \beta E_t[\lambda_{t+1}q_{t+1}] \tag{B.3}$$

$$\lambda_t q_t = \lambda_t(1+\kappa\mu_t)\Big(\alpha A_t K_t^{\alpha-1} L_t^{1-\alpha} - \Phi_{K.t}\Big) + \beta(1-\delta)E_t[\lambda_{t+1}q_{t+1}] \tag{B.4}$$

$$\lambda_t(1-\mu_t) = \beta R E_t \lambda_{t+1} \tag{B.5}$$

The first-order derivatives of the investment adjustment cost function are given by

$$\Phi_{I,t} = 1 - \phi\Big(\frac{I_t}{K_t} - \delta\Big) \tag{B.6}$$

$$\Phi_{K,t} = \frac{\phi}{2}\Big(\frac{I_t}{K_t} - \delta\Big)^2 - \phi\Big(\frac{I_t}{K_t} - \delta\Big)\frac{I_t}{K_t} \tag{B.7}$$

To link investments to marginal q, substitute (B.6) into (B.3) to get

$$\frac{I_t}{K_t} = \Big(\delta - \frac{1}{\phi}\Big) + \frac{\beta}{\phi}\frac{1}{\lambda_t(1+\kappa\mu_t)}E_t\Big[\lambda_{t+1}q_{t+1}\Big] \tag{B.8}$$

To link investment rate to Tobin's Q, multiply both sides of (B.4) by K_t

$$\lambda_t q_t K_t = \lambda_t(1+\kappa\mu_t)\Big(\alpha A_t K_t^{\alpha} L_t^{1-\alpha} - \Phi_{K.t}K_t\Big) + \beta(1-\delta)E_t[\lambda_{t+1}q_{t+1}]K_t$$

Given $K_t = (K_{t+1} - I_t)/(1-\delta)$ and (B.3), we have

$$\lambda_t q_t K_t = \lambda_t(1+\kappa\mu_t)\Big(\alpha A_t K_t^{\alpha} L_t^{1-\alpha} - \Phi_{K.t}K_t - \Phi_{I,t}I_t\Big) + \beta E_t[\lambda_{t+1}q_{t+1}K_{t+1}]$$

Constant returns-to-scale of the production function and adjustment cost imply that

$$\Pi_t = \alpha A_t K_t^{\alpha} L_t^{1-\alpha}$$

and

$$\Phi(I_t K_t) = \Phi_{K.t} K_t + \Phi_{I,t} I_t$$

Hence, we have

$$\lambda_t q_t K_t = \lambda_t (1 + \kappa\mu_t)\Pi_t + \beta E_t[\lambda_{t+1} q_{t+1} K_{t+1}]$$

Iterate this equation forward and apply the transversality condition yields

$$\lambda_t q_t = \frac{E_t\Big[\sum_{j=0} \beta^j \lambda_{t+j}(1 + \kappa\mu_{t+j})\Pi_{t+j}\Big]}{K_t}$$

which implies

$$E_t[\lambda_{t+1} q_{t+1}] = \frac{E_t\Big[\sum_{j=0} \beta^j \lambda_{t+1+j}(1 + \kappa\mu_{t+1+j})\Pi_{t+1+j}\Big]}{K_{t+1}}$$

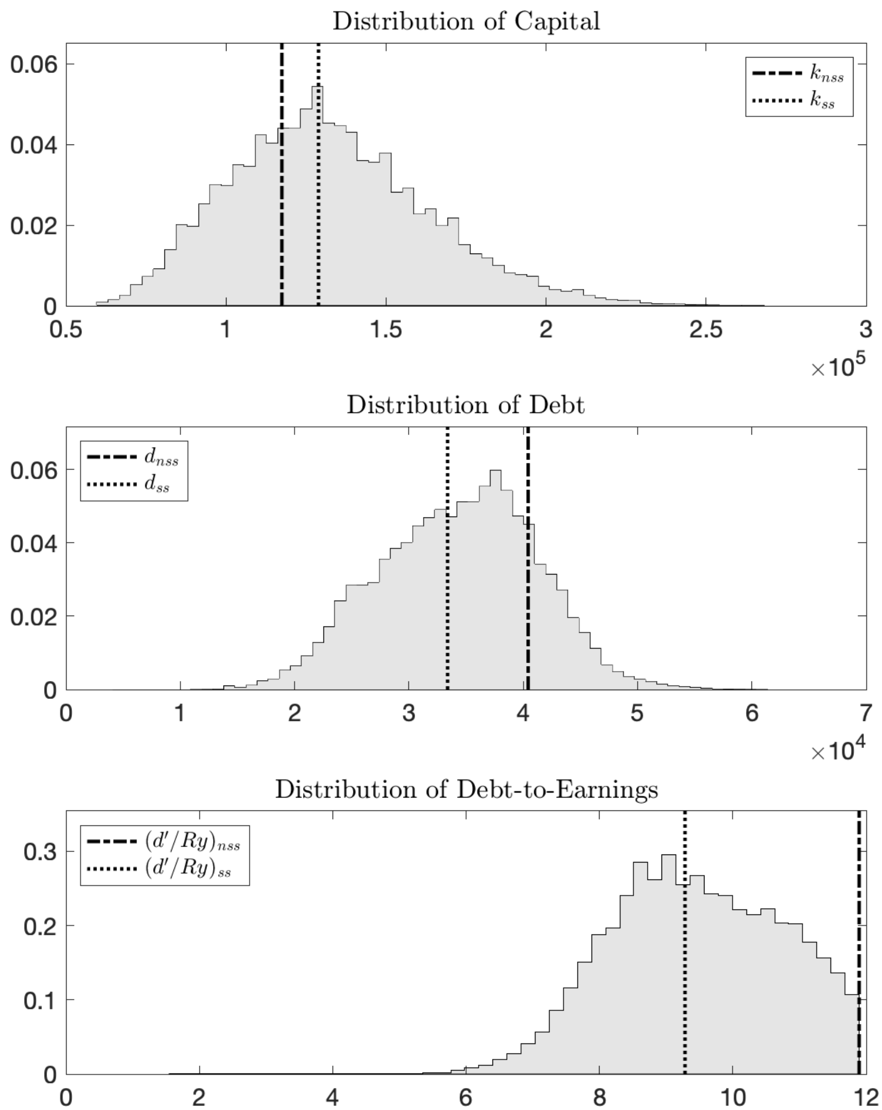
Substitute this result into (B.8) yields

$$\frac{I_t}{K_t} = \left(\delta - \frac{1}{\phi}\right) + \frac{\beta}{\phi} E_t\Big[\sum_{j=0} \beta^j \frac{\lambda_{t+1+j}}{\lambda_t} \frac{1 + \kappa\mu_{t+1+j}}{1 + \kappa\mu_t} \frac{\Pi_{t+1+j}}{K_{t+1}}\Big] \tag{B.9}$$

Appendix C: Appendix to Chapter 3

C.1 Deterministic and stochastic state state distributions of capital and debt

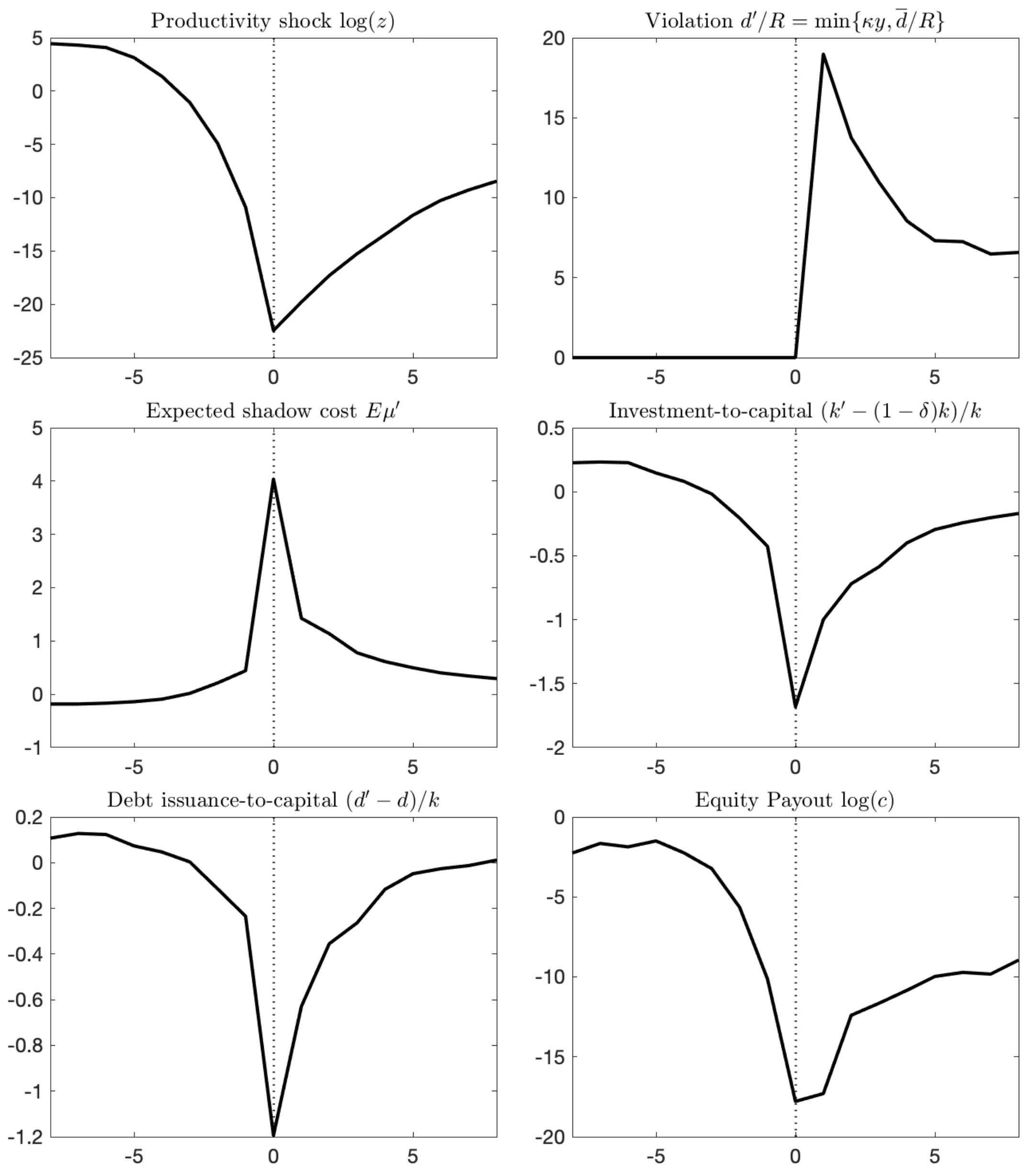
Figure C.1: Distribution of debt, capital, and debt-to-earnings in the baseline model.



Notes. The dashed-dotted line is the deterministic steady state value of each variable, whereas the dotted line is the average value of the variable in the stochastic steady state.

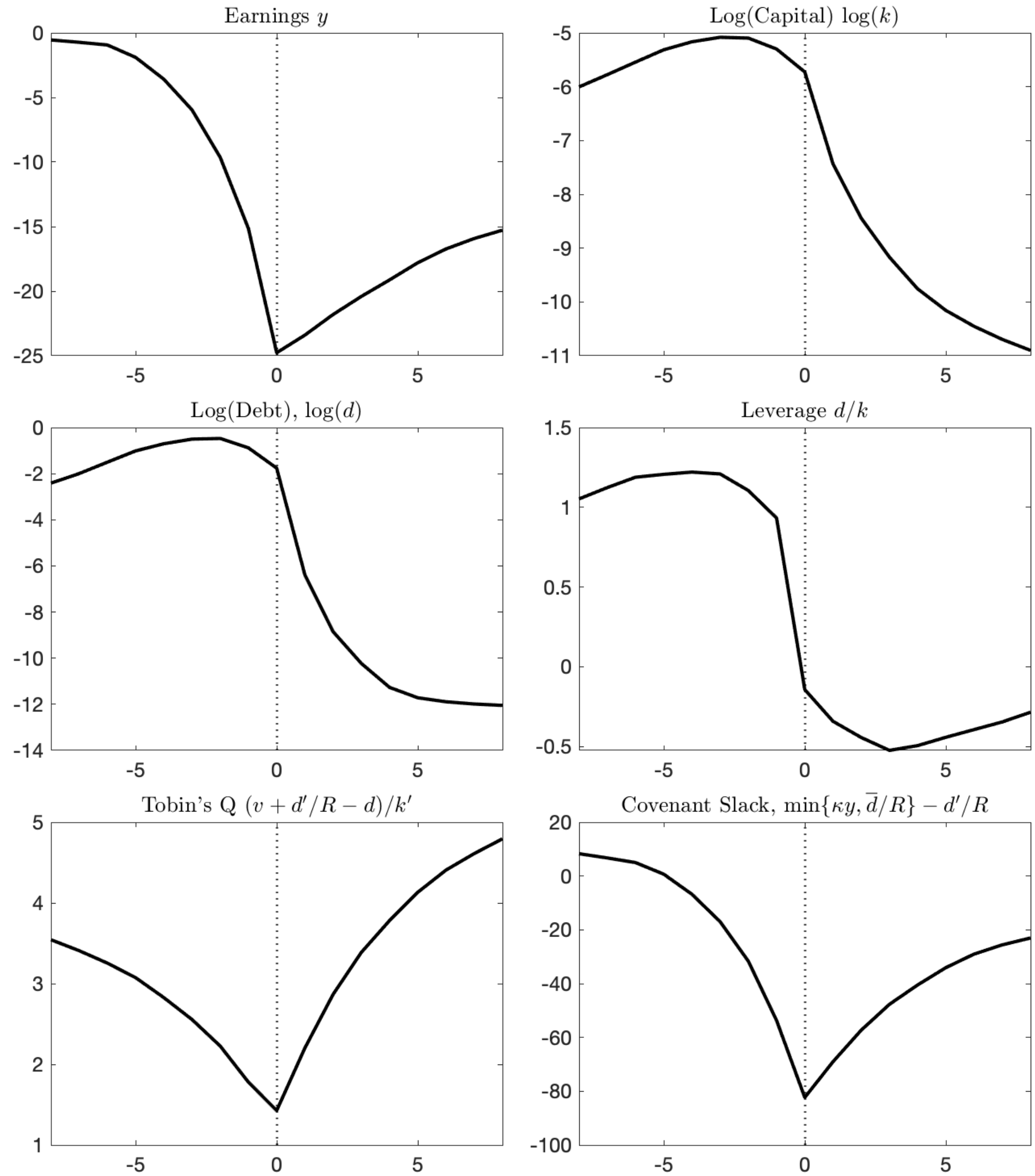
C.2 Event study around covenant concerns

Figure C.2: Equilibrium responses around covenant concerns (1 of 2)



Notes. Event study windows are constructed by extracting observations in the baseline model with covenant concerns, as well as the preceding and following eight quarters. Covenant concerns is defined as $CovFuture \equiv 1\{E_t \mu_{t+1} > c\}$, where $E_t \mu_{t+1}$ is the expected shadow value of the borrowing constraint, and c is set so that the average share of observations with covenant concerns matches the average in the empirical data. All variables are expressed in percentage deviation from the stochastic steady state average.

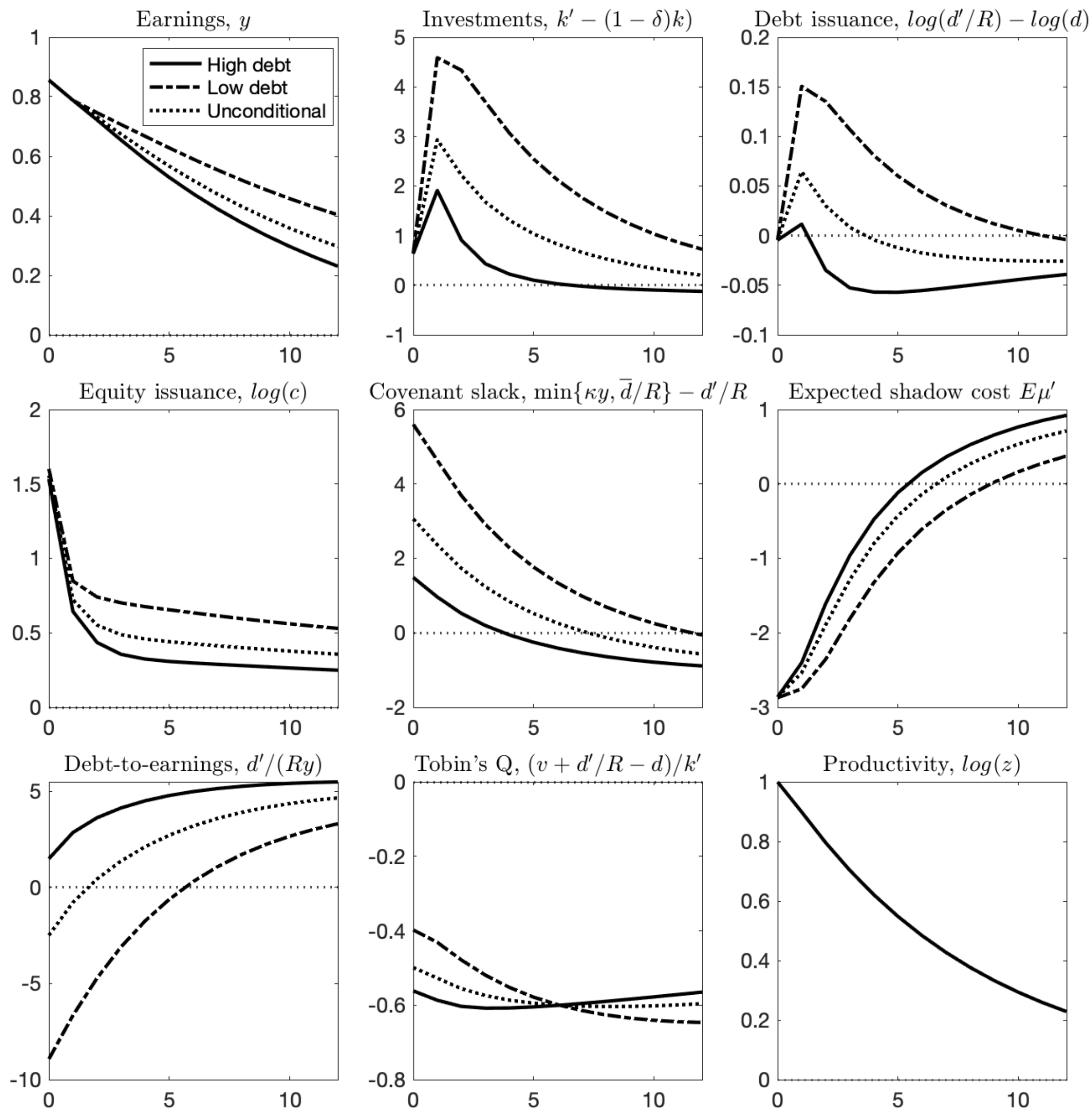
Figure C.3: Equilibrium responses around covenant concerns (2 of 2)



Notes. Event study windows are constructed by extracting observations in the baseline model with covenant concerns, as well as the preceding and following eight quarters. Covenant concerns is defined as $CovFuture \equiv 1\{E_t \mu_{t+1} > c\}$, where $E_t \mu_{t+1}$ is the expected shadow value of the borrowing constraint, and c is set so that the average share of observations with covenant concerns matches the average in the empirical data. All variables are expressed in percentage deviation from the stochastic steady state average.

C.3 Impulse responses to positive productivity shocks

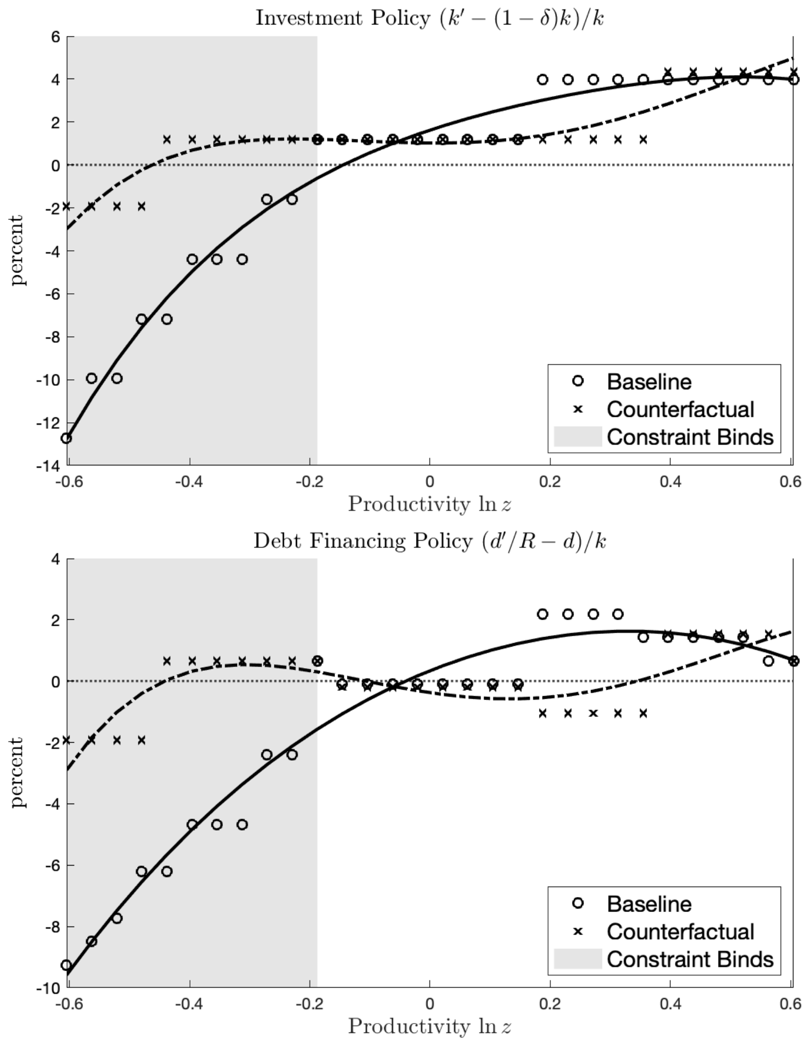
Figure C.4: Impulses response to a one-standard deviation positive shock to productivity $\log z$, conditional on level of debt d.



Notes. Capital stock is set to within three grid points around the median value in the unconditional distribution of capital k. Solid (dashed) line shows response when debt d in period 0 is above (below) the average value of debt conditional on capital and productivity. Dotted line shows the response unconditional on debt. The impulse responses are expressed in percentage deviation from the steady state average.

C.4 Baseline and counterfactual policy functions

Figure C.5: Investment and debt issuance policies in the baseline and counterfactual model, for median values capital and debt.



Notes. This figure compares the investment and debt issuance policy functions when capital and debt are held at each model's steady state median. Baseline refers to the model in which $\kappa = 3 \times 4$, Counterfactual refers to the model in which $\kappa = \infty$. "Constraint Binds" refers to states in which in the baseline model. All other parameters are identical. Lines shown are a fourth-order polynomial fitted over the points denoting the respective model's optimal policies.

C.5 Variable definitions in the model

Table C.1: Variable definitions in the model.

Variable	Definitions
Capital Expenditures	$(k' - (1-\delta)k)/k$
Cash Flow / Earnings	$y/k; y \equiv zk^{\alpha}$
Covenant Slack	$\min\{\kappa y, \overline{d}/R\} - d'/R$
CovFuture	$1\{E\mu' > c\}$
Debt-to-Earnings	$d'/(Ry)$
Dividend Issuance	$c = y + (1-\delta)k + d'/R - k' - d' - \psi(k'-k)^2/k$
Equity Value	$v_E = c + \beta E v_E$
Log Asset	$log(k)$
(Log) Equity Payout	$log(c)$
Leverage	d/k
Marginal Utility of Dividend Issuance	$\lambda = c^{-\gamma}$
Net Debt Issuance	$(d'/R - d)/k$
Shadow Cost of Borrowing Constraint	$\mu = 1 - \beta R E \lambda'/\lambda$
Tobin's Q	$(v_E + d'/R - d)/k'$
Violation	$1\{d'/R = \min\{\kappa y, \overline{d}/R\}\}$

Appendix D: Appendix to Chapter 4

D.1 Proofs

Corollary 3. *Attention to macroeconomic conditions is higher for firms with greater diversified cash flows, D_i.*

Proof. Substitute the definition of the diversification factor D_i from (4.7) into (4.6), we have

$$MacroAttn_i = \frac{1}{2} + \frac{1}{4\kappa} \log_2 \left(\frac{D_i}{1 - D_i} \right)$$

Differentiating with respect to D_i and given that $D_i \in [0, 1]$, we see that macroeconomic attention is increasing in D_i.

□

Corollary 4. *The risk premium on asset i's returns is decreasing in the share of diversified cash flow risk.*

Proof. Rewrite the unexpected log return of asset i as $r_{it+1} - E_t r_{i,t+1} = N^{CF}_{i,t+1} - N^{DR}_{i,t+1}$. We then can write the first term in (4.8) as

$$\begin{aligned} Cov(r_{i,t+1} - E_t r_{i,t+1}, N^{CF}_{m,t+1}) &= Cov(N^{CF}_{i,t+1}, N^{CF}_{m,t+1}) - Cov(N^{DR}_{i,t+1}, N^{CF}_{m,t+1}) \\ &= Cov(\eta_{t+1} + \nu_{it+1}, \eta_{t+1} + \frac{1}{M} \sum_i \nu_{it+1}) - Cov(N^{DR}_{i,t+1}, \frac{1}{M} \sum_i N^{CF}_{i,t+1}) \\ &= \sigma^2_\eta + \frac{1}{M} \varphi_i \sigma^2_\nu \end{aligned}$$

where the second equality follows from definitions of the news terms $N^{CF}_{i,t+1}$ and $N^{CF}_{m,t+1}$ and the third equality follows from our assumption of independence of cash flow and discount rate news.

The second term in (4.8) can likewise be written as

$$Cov(r_{i,t+1} - E_t r_{i,t+1}, -N_{m,t+1}^{DR}) = Cov(-N_{i,t+1}^{DR}, -\frac{1}{M}\sum_i N_{i,t+1}^{DR}) = \frac{1}{M}\sigma_\omega^2$$

Combining the terms we have

$$rp_{i,t} = \gamma\left(\sigma_\eta^2 + \frac{1}{M}\varphi_i\sigma_\nu^2\right) + \frac{1}{M}\sigma_\omega^2$$

By chain rule, the effect on risk premium is given by

$$\frac{\partial rp_{i,t}}{\partial D_i} = \frac{\partial rp_{it}}{\partial \varphi_i}\frac{\partial \varphi_i}{\partial D_i} = -\frac{\gamma}{M}\frac{(\sigma_\eta^2 + \varphi_i\sigma_\nu^2)^2}{\sigma_\eta^2} < 0$$

□

Prediction 5. *Stocks with higher diversification factor have lower cash flow betas, and no systematic difference in discount rate betas. The risk premium unaccounted for the stock's market beta (the CAPM alpha) is decreasing in the stock's cash flow beta.*

Proof. By chain rule and the definition of the betas, we have

$$\frac{\partial \beta_{i,m}^{CF}}{\partial D_i} = \frac{1}{Var(r_{M,t+1})}\frac{\partial Cov(r_{i,t+1} - E_t r_{i,t+1}, N_{M,t+1}^{CF})}{\partial \varphi_i}\frac{\partial \varphi_i}{\partial D_i} = -\frac{1}{\sigma_M^2}\frac{\gamma}{M}\frac{(\sigma_\eta^2 + \varphi_i\sigma_\nu^2)^2}{\sigma_\eta^2} < 0$$
$$\frac{\partial \beta_{i,m}^{DR}}{\partial D_i} = \frac{1}{Var(r_{M,t+1})}\frac{\partial Cov(r_{i,t+1} - E_t r_{i,t+1}, -N_{M,t+1}^{DR})}{\partial \varphi_i}\frac{\partial \varphi_i}{\partial D_i} = 0$$

Substitute the identity $\beta_{i,m} = \beta_{i,m}^{CF} + \beta_{i,m}^{DR}$ into (4.10) yields

$$rp_i = \sigma_m^2(\gamma - 1)\beta_{i,m}^{CF} + \beta\sigma_m^2$$

It follows that the component of risk premium unexplained by the market beta (CAPM alpha) is given by

$$\alpha^{CAPM} \equiv rp_i - \beta_{i,m}\sigma_m^2 = \sigma_m^2(\gamma - 1)\beta_{i,m}^{CF}$$

Given that $\beta_{i,m}^{CF}$ is decreasing in a stock's diversification factor D_i, it follows that α^{CAPM} is decreasing in D_i as well.

□

D.2 Additional tables and figures

Table D.1: Summary statistics of return predictors from 2005Q1 to 2019Q4.

	Mean	Std dev	AR(1)	P10	P90	Sharpe ratio
Macro Attention	-2.80	0.52	0.46	-3.49	-2.18	1.34
$\beta(MKT)$	1.01	0.85	0.12	0.04	2.03	0.23
$\beta(SMB)$	0.72	1.28	0.09	-0.72	2.35	0.05
$\beta(HML)$	0.08	1.55	0.11	-1.69	1.86	0.51
$\beta(VIX)$	-0.00	0.01	-0.01	-0.01	0.01	0.14
Size	14.08	1.55	0.88	12.16	16.23	1.62
Book-to-market	-0.90	0.74	0.86	-1.90	-0.02	0.45
Lagged returns (12 mths)	0.14	0.35	0.72	-0.29	0.57	0.17
Idio vol	0.02	0.01	0.43	0.01	0.03	1.27
Issuances (36 mths)	0.06	0.20	0.89	-0.11	0.28	0.65
Accruals	0.06	0.07	0.83	-0.01	0.14	1.29
Return on asset	0.11	0.14	0.91	0.00	0.24	1.30
Dividend yield	0.02	0.01	0.86	0.01	0.04	0.38
Asset growth	-2.20	1.30	0.80	-3.87	-0.54	0.13
Lagged returns (36 mths)	0.35	0.49	0.81	-0.25	0.99	0.23
Issuances (12 mths)	0.02	0.09	0.77	-0.04	0.09	0.59
Turnover	2.07	1.42	0.92	0.67	3.96	0.25
Net debt-to-Price	0.16	0.48	0.84	-0.23	0.64	0.08
Sale-to-Price	1.12	1.29	0.84	0.18	2.55	0.77

Notes. The table reports the average (Mean), standard deviation (Std dev), AR(1) coefficient of firm-level observations (AR(1)), 10th percentile (P10), 90th percentile (P90), and Sharpe ratio of long-short portfolio constructed from decile sorts on characteristics using monthly observations for each variable. See Table D.3 in the Appendix for variable definitions.

Table D.2: Macroeconomic and firm-specific terms occurring in earnings call transcripts.

Macro terms	Non-macro terms
economi	compani
inflat	acquisit
budget	ebitda
hous	technolog
central	brand
recess	store
slow	patient
pace	platform
foreign exchang	launch
euro	execut
gdp	facil
export	network
moder	sharehold
uncertainti	client
exchang rate	strateg
germani	excit
read	dividend
labor	digit
steadi	capabl
crisi	equiti

Notes. The table reports the top 20 vocabulary terms occurring in earnings call transcripts labeled as “Macro” (Left) and “Non-Macro” (Right). Terms are first stemmed to root (Porter (1980)) and common stopwords are removed, and then ranked by the average TF-IDF score across all earnings calls transcripts. Terms that occur in both sets of labeled call transcripts are excluded.

Table D.3: Definition of predictors of stock returns.

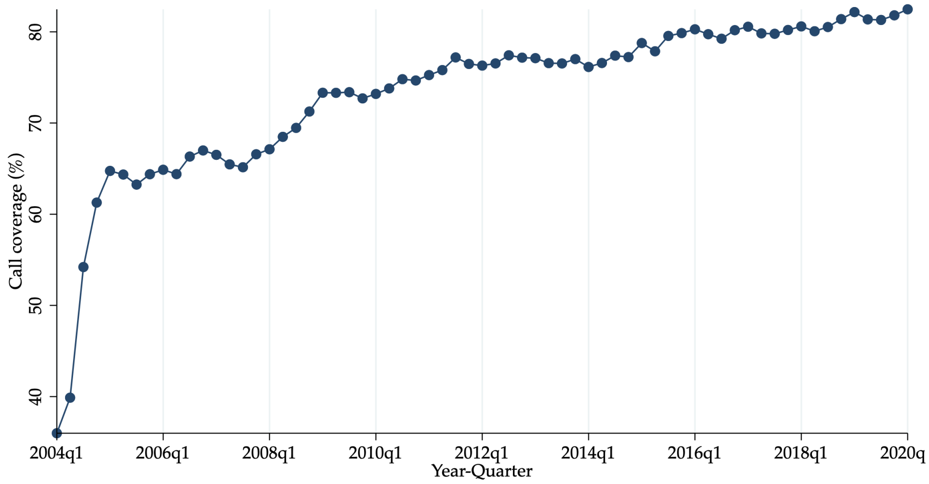
Name	Description	Year	Authors
beta(MKT)	Market factor beta	1973	Fama and MacBeth
beta(SMB)	Small-minus-big factor beta	1993	Fama and French
beta(HML)	High-minus-low factor beta	1993	Fama and French
beta(VIX)	Aggregate volatility factor beta	2006	Ang and Hodrick and Xing and Zhang
Size	Log market capitalization	1981	Banz
Book-to-market	Log book-to-market ratio	1980	Stattman
Lagged returns (12 mths)	Stock returns from mo -12 to mo -1	1985	De Bondt and Thaler
Idio vol	Volatility of residuals from regressing daily returns on market factor in past mo	2006	Ang and Hodrick and Xing and Zhang
Issuances (36 mths)	Log growth in split-adjusted shares outstanding from mo -36 to -1	2006	Daniel and Titman
Accruals	Change in non-cash net working capital in prior fiscal year	1996	Sloan
Return on asset	Income before extraordinary items divided by average total assets in prior fiscal year	2008	Soliman
Asset growth	Log growth in total assets in the prior fiscal year	2004	Titman and Wei and Xie
Lagged returns (36 mths)	Log stock returns from mo -36 to mo -13	1985	De Bondt and Thaler
Issuances (12 mths)	Log growth in split-adjusted shares outstanding from mo -12 to -1	2006	Daniel and Titman
Turnover	Average monthly turnover (shares traded div shares outstanding) from mo -12 to mo -1	2000	Lee and Swaminathan
Sale-to-price	Sales in the prior fiscal year divided by market value at the end of the prior mo	1994	Lakonishok and Shleifer and Vishny
Net debt-to-price	Short-term plus long-term debt net of cash divided by market value at the end of the prior mo	2007	Penman and Richardson and Tuna
Dividend yield	Dividends per share over the prior 12 mo divided by price at end of the prior mo	1982	Litzenberger and Ramaswamy

Table D.4: Decomposing portfolio returns into cash flow and discount rate news.

	(1) CFi-CFm		(2) CFi-DRm		(3) DRi-CFm		(4) DRi-DRm		(5) Ri-CFm		(6) Ri-DRm	
	β	t	β	t	β	t	β	t	β	t	β	t
1	1.84	(4.2)	-0.52	(-4.1)	-1.12	(-1.9)	0.72	(141.7)	0.72	(1.1)	0.20	(1.6)
2	1.61	(3.9)	-0.36	(-3.2)	-1.15	(-1.9)	0.74	(175.1)	0.46	(0.6)	0.38	(3.4)
3	1.63	(5.0)	-0.43	(-4.4)	-1.14	(-2.0)	0.73	(117.0)	0.49	(0.8)	0.30	(3.1)
4	1.47	(4.6)	-0.39	(-4.4)	-1.15	(-2.0)	0.73	(107.6)	0.32	(0.5)	0.34	(4.0)
5	1.57	(5.5)	-0.39	(-4.4)	-1.15	(-2.0)	0.74	(161.0)	0.42	(0.7)	0.34	(3.9)
6	1.44	(4.3)	-0.42	(-3.4)	-1.14	(-1.9)	0.73	(161.7)	0.30	(0.5)	0.31	(2.5)
7	1.42	(5.5)	-0.39	(-4.7)	-1.16	(-2.0)	0.74	(115.8)	0.26	(0.5)	0.34	(4.3)
8	1.40	(5.4)	-0.37	(-4.7)	-1.18	(-2.0)	0.74	(116.7)	0.22	(0.4)	0.36	(4.7)
9	1.26	(4.5)	-0.40	(-4.4)	-1.19	(-2.1)	0.74	(98.1)	0.06	(0.1)	0.34	(3.7)
10	1.43	(4.0)	-0.40	(-3.9)	-1.17	(-2.0)	0.73	(96.1)	0.26	(0.5)	0.33	(3.1)
10-1	-0.41	(-0.7)	0.12	(0.7)	-0.05	(-0.1)	0.01	(1.2)	-0.46	(-0.5)	0.13	(0.8)

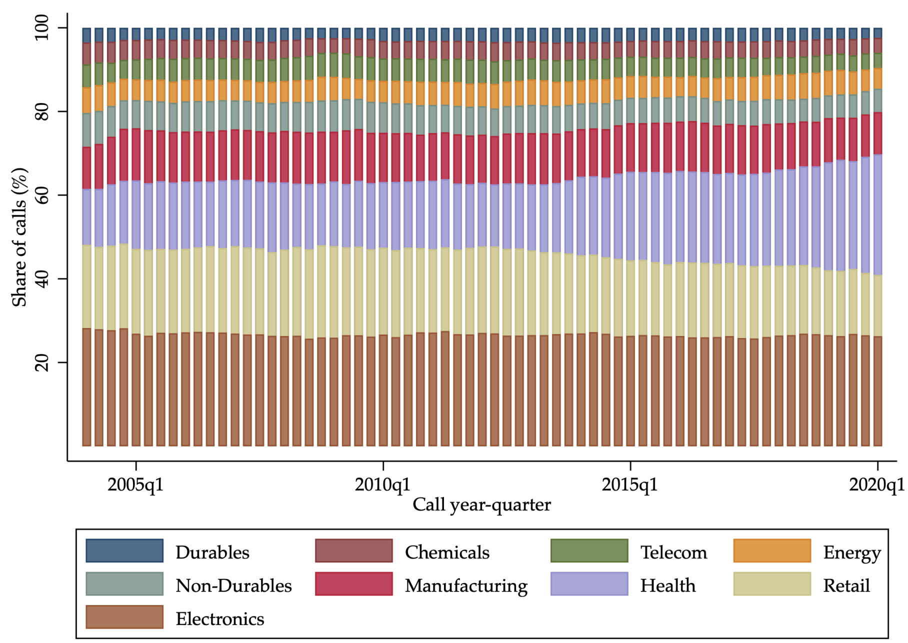
Notes. The table reports the estimates of regressing portfolio cash flow (CFi) and discount rate (DRi) news on the market portfolio's cash flow (CFm) and discount rate (DRm) news. Ri refers to the portfolio unexpected return, computed as the difference in cash flow and discount rate news. Rows refer to portfolios sorted on the basis of predicted macroeconomic attention, with 1 as the lowest attention portfolio and 10 the highest. "10-1" refers to the difference of the beta of Portfolio 10 relative to Portfolio 1. Within each column, refers to the estimated betas, and refers to the corresponding t-statistic computed from bootstrap standard errors. The sample period is from 2005 to 2019.

Figure D.1: Call coverage from 2004Q1 to 2020Q1.



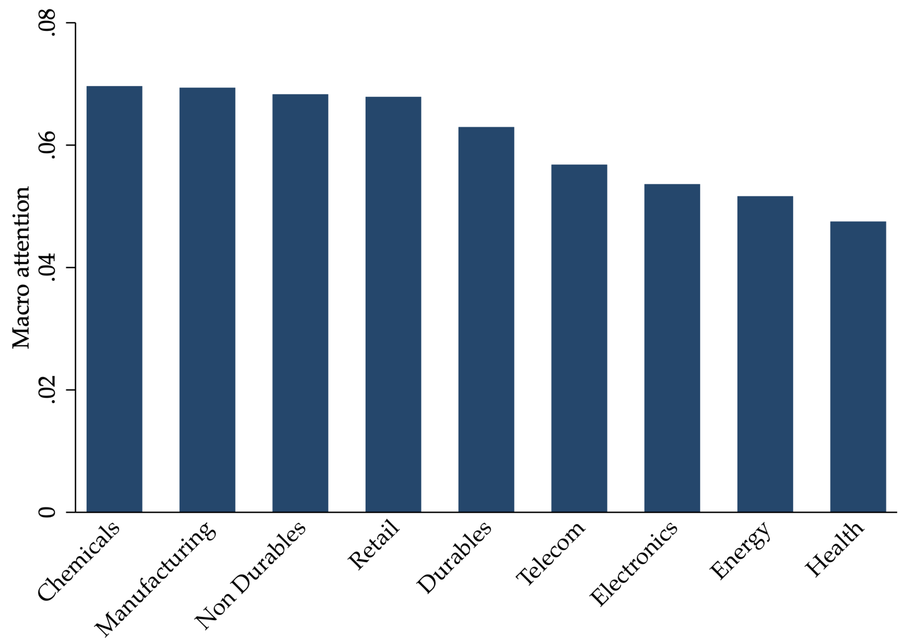
Notes. Call coverage is the percentage of unique CUSIPs with monthly stock returns data from CRSP and matched earnings call transcripts from Factset.

Figure D.2: Composition of calls by industry from 2004Q1 to 2020Q1.



Notes. Industry classification based on Fama and French 12 industry portfolios, excluding firms in the utilities (SIC 4900-4999) and financial (SIC 6000-6999) sectors.

Figure D.3: Average macroeconomic attention by industry.



Notes. Industry classification based on Fama and French 12 industry portfolios, excluding firms in the utilities (SIC 4900-4999) and financial (SIC 6000-6999) sectors.

D.3 VAR estimation

The estimation strategy closely follows Vuolteenaho (2002), Campbell and Vuolteenaho (2004), and Campbell, Polk, and Vuolteenaho (2009). The data generating process follows a first-order VAR model

$$z_{t+1} = a + \Gamma z_t + u_{t+1}$$

where z_{t+1} is an $m \times 1$ state vector with return r_{t+1} as the first element, a and Γ are respectively a $m \times 1$ vector and $m \times m$ matrix of VAR parameters to be estimated, and u_{t+1} is an $m \times 1$ vector of shocks with variance-covariance Σ. We specify the remaining state variables in the VAR specification shortly below. Following Campbell, Polk, and Vuolteenaho (2010), we estimate separate VARs for aggregate news and firm-specific news and set $\rho = 0.95$. This approach is consistent with the empirical literature documenting different sources of risk driving returns in the aggregate and cross-section. We estimate both VARs using annual data over the sample period from 1928 to 2019, and treat the parameters (a, Γ, Σ) as constant across the sample period. As such, the parameters are estimated by separate equation-by-equation pooled regression.

The aggregate VAR consists of four state variables $(m = 4)$. The first is the log market return r_M defined as the value-weighted average log return of all common equity from the end of June in year $t - 1$ to end of June in year t. The second state variable is the term yield spread (TY), which is the difference between the ten-year Treasury bond log yield in June of year t and the 90-day secondary market Treasury bill log yield in June of year t, using data from the Global Financial database. The third variable is the log smoothed price-earnings ratio (PE) in June of year t taken from Professor Shiller's website, and the last variable is the small-stock value spread (VS) defined as the difference between the log book-to-market (BM) ratio of the small high BM portfolio and the log BM ratio of the small low BM portfolio in June of year t, which comes from Professor French's website.

The firm-level VAR consists of three state variables $(m = 3)$. The first state variable is the log return (r_i) on a firm's common stock equity from the end of June in year $t - 1$ to the end of June in year t. Following Vuolteenaho (2002), we use unlevered returns by defining a stock as consisting of 90% firm's common stock and 10% Treasury bill. The second variable is the log book-to-market ratio of unlevered equity, BM, which is defined as $BM = \log(0.9BE + 0.1ME) - \log ME$, where BE is the book equity at the end of calendar year $t - 1$ and ME is the market equity at the end of May of year t. The third variable is the long term profitability ROE, defied as the training average of earnings divided by the trailing five-year average of $(0.9BE + 0.1ME)$. Following Campbell et al. (2010), earnings X_t is defined from the identity $X_t = [(1 + r_i)ME_{t-1} - D_t]/ME_t \times BE_t - BE_{t-1} + D_t$. We use this rather than recorded earnings given that the quantity is measured with less precision in the early sample period. All variables in the firm-level VAR are cross-sectionally demeaned by subtracting the value-weighted market return in the case of firm-returns and average value of each variable each year for the other state variables.