Anticipating binding constraints: an analysis of financial covenants

Ken Teoh*

November 3, 2022

Job Market Paper

Latest Draft Here

Abstract

This paper studies the extent to which public nonfinancial firms in the United States are concerned about future covenant violations. Applying textual analysis to earnings call transcripts, I construct a novel measure of covenant concerns by distinguishing between discussions of covenants that relate to the future as opposed to the past or present. Covenant concerns rise significantly during recessions, covary asymmetrically with earnings growth, and predict a higher risk of violating covenants in the next quarter. Firms that are concerned about future violations significantly reduce their investments, debt issuance, and equity payouts. The reduction in investments associated with concerns about future violations is twice as large as the reduction due to actual violations.

*Department of Economics, Columbia University. email: ht2467@columbia.edu. I am grateful to my advisors Stephanie Schmitt-Grohé, Jesse Schreger, and Martín Uribe for their invaluable guidance and support. I have also benefited from discussions with Simona Abis, Elena Afanasyeva, Levent Altinoglu, Jose Berrospide, Matt Darst, Martsella Davitaya, Bora Durdu, Matthieu Gomez, Émilien Gouin-Bonenfant, Harrison Hong, Anni Isojärvi, Jennifer La'O, Eugene Larsen-Hallock, Harry Mamaysky, Shruti Mishra, Noémie Pinardon-Touati, José Scheinkman, Chaehee Shin, David Rappoport, Tim Schmidt-Eisenlohr, Skander Van den Heuvel, Sergio Villalvazo, Mengxue Wang, Shang-Jin Wei, Xiao Xu, Molin Zhong, as well as seminar participants at Columbia University and the Federal Reserve Board. I thank Thomas Griffin for sharing data, and acknowledge the generous financial support of Columbia University's Program for Economic Research.

1 Introduction

A fundamental question in macro-finance is how financial constraints affect firm investment and financing decisions. To answer this question, researchers often rely on general measures of financial constraints, such as size, age, and leverage, to accommodate the various types of financial constraints that could apply. Recent work provides further clarity on the types of financial constraints that actually apply to large nonfinancial firms in the United States (Lian and Ma (2021)). Specifically, one of the most prevalent forms of financial constraints in corporate borrowing are financial covenants. These covenants restrict borrower actions based on their financial ratios, the most common of which specify that total debt cannot exceed a multiple of earnings. A natural question is: how important are financial covenants for firm investment and financing decisions?

In theory, financial constraints affect firm decisions not only when they bind, but also when they are expected to bind in the future.[1] For financial covenants specifically, the existing empirical literature focuses on the effects of covenants when they bind. In particular, prior work finds that covenant violations lead to significant reductions in investments, net debt issuance, equity payout, acquisitions, and employment.[2] In contrast, the effects of covenants when they are expected to bind in the future are less well understood empirically. Leaving out the effects of expected covenant violations risks understating the total effects of covenants on firm investment and financing decisions.

In this paper, I shed light on the extent to which firms are concerned about future covenant violations and investigate the real effects of these concerns. I measure concerns about future covenant violations by distinguishing between discussions of covenants in earnings call transcripts that relate to the future as opposed to the past or present. In particular, 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. The measure of covenant concerns is a binary variable that indicates whether the earnings call for the given firm and quarter contains any covenant-related sentence that is forward-looking.

The procedure for determining whether a sentence is forward-looking proceeds in two steps. First, I identify the tense of a sentence from its grammatical structure, a step that

[1] See for example Mendoza and Smith (2006); Mendoza (2010); Bianchi (2011); Bolton, Chen, and Wang (2013); Jeanne and Korinek (2020); Schmitt-Grohe and Uribe (2021).

[2] Violations occur when firms fail to comply with the restrictions specified in the covenants. In this paper, I equate covenant violations to covenants 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); 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); Brauning, Ivashina, and Ozdagli (2021)).

relies on well-developed tools in natural language processing. Second, I search for the usage of forward-looking keywords in the sentence. The second step is necessary as the vast majority of forward-looking sentences are expressed in the present tense. The algorithm then categorizes a sentence as forward-looking if it is in the present tense and contains a forward-looking keyword or simply if it is in the future tense.

As input to the algorithm, I develop a novel dictionary of forward-looking keywords from safe harbor disclosures in SEC filings. Many of these disclosures include examples of words or phrases that firms use to identify forward-looking statements. A key reason why firms have incentives to be explicit about making such statements is that they can be held liable for making claims that do not materialize. The use of linguistic cues such as "expect", "anticipate" or "believe" signal to investors that a statement is forward-looking, hence 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. I find that discussions of covenants increase in the quarters prior to violation, which suggests that firms are able to anticipate violations to some extent before they occur. Importantly, I find that the share of forward-looking covenant discussions peaks in the quarter prior to violation, rather than at violation. This supports the interpretation of forward-looking covenant discussions as related to concerns about future covenant violations, rather than discussions about past realized violations.

An examination of covenant discussions across firms and over time reveals several notable findings. First, discussion of covenants among firms with financial covenants increased by more than three fold during the 2008-09 financial crisis, rising from 7.9 percent in 2007 to 22.9 percent in 2009. This contrasts with a more muted response in covenant violations, which rose from 5.2 percent in 2007 to 7.6 percent in 2009. Second, covenant concerns covary asymmetrically with earnings growth, varying little when earnings growth is positive but rising significantly with negative earnings growth. Third, covenant concerns are associated with a higher probability of violation in the next quarter. This result is robust to controlling for other predictors, and suggests that anticipatory responses do not fully mitigate covenant violations.

Next, I investigate how investments and financing activities change when concerned about future covenant violations. Using an event study framework, I find a significant decline in investment, net debt issuance, and equity payouts after firms express concerns about future violations. Four quarters after mention, investment is cumulatively 32 basis points or 21 percent of a standard deviation lower relative to the quarter prior to mention. Net debt

issuance falls from an average of 81 basis points in the four quarters prior to close to zero two quarters after, which is equivalent to a 17 percent of a standard deviation decline. Equity payouts fall by 14 basis points, or 11 percent of a standard deviation. The findings are robust to dropping events in which violations are realized in the four quarters after mention. While the observed changes in investment and financing activities may be driven by a deterioration of realized and expected cash flows, I find an opposite trend in the data. In particular, operating earnings and market-to-book ratios improve in the quarters following concerns about future covenant violations, just as firms cut back on investment, net debt issuance, and equity payouts.

To further isolate the impact of covenant concerns, I estimate a panel regression with controls and firm and time fixed effects. The regression confirms that that covenant concerns are associated with significant reductions in investment, net debt issuance, and equity payouts. Furthermore, I find that the effects due to the expectation of future violations are larger than the effects of actual violations. Specifically for investments, the decline of 35 basis points over the two quarters on and after mention is twice as large as the 17 basis point decline in investment over the two quarters on and after violation. I also find that the decline in net debt issuance and equity payouts associated with covenant concerns are comparable to the decline assoicated with covenant violations. Taken together, the results suggest that covenants matter for firm decisions, not only in violation but also when they are expected to be violated.

The results are robust to a variety of alternative specifications. In particular, by controlling for nonlinear proxies of cash flows and expected cash flows, I show that the effects are not explained by differences in incentives to invest. Second, by controlling for a quadratic function of covenant slack, I show that the effects are not fully explained by different severity of violations or the information content in covenant slack. I also find the results robust to interacting violation status with covenant concerns, which confirms that the effects are not driven by different penalties at violation.

Finally, I evaluate the empirical findings relative to predictions of a standard model of investment with an earnings-based borrowing constraint. The model features risk averse entrepreneurs who face an earnings-based borrowing constraint, where borrowing is restricted to be a function of realized earnings each period. The only source of risk is fluctuations in the entrepreneur's productivity. While the structure of the model is relative parsimonious, it closely matches the frequency of covenant violations observed in the data, leverage as well as the first and second moments related to investments. Consistent with the data, model simulations show that covenant concerns rise with increasing sensitivity when earnings growth fall, and are negatively associated with investment, debt issuance, and equity payouts.

Related literature. This paper 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 et al. (2012); Falato and Liang (2016); Chava et al. (2017); Ferreira et al. (2018); Chava et al. (2019); Becher et al. (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, Almeida, Ippolito, and Orive (2021); Chodorow-Reich and Falato (2021)).The contribution of this paper is to document evidence that firms begin to cut investments and net debt issuance prior to violating covenants. In turn, this supports to the idea that the expectation of covenants violations also matter for firm outcomes.

More broadly, this paper relates to a recent literature that investigates the borrowing constraints of large US non-financial corporations. Lian and Ma (2021) documents that sixty percent o 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 paper, Adler (2020) investigates the precautionary effects of financial covenants. He finds that reduced covenant slack leads to a decline in 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 future path of cash flows. Both measures can differ substantially when past cash flows are a poor proxy for future cash flows. Moreover, I find that the relationship between firm responses and covenant concerns are robust to controlling for covenant slack.

Third, this paper contributes to a rich literature that measures financial constraints using textual data.[3] Kaplan and Zingales (1997) is an early 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 that measures financial constraints using the universe of SEC 10-K filings and find that more constrained firms lower their investments and issuance policies to a larger extent following unexpected negative shocks. Buehlmaier and

[3]Antweiler and Frank (2004); Tetlock (2007); Loughran and McDonald (2011) are early applications of textual analysis in finance. See Gentzkow, Kelly, and Taddy (2019); 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, Krstovski, Laliberte, and Mamaysky (2020); Calomiris, Mamaysky, and Yang (2020); Cao, Jiang, Wang, and Yang (2021) for recent examples.

Whited (2018) estimates a text-based classifier on their measure and find that more constrained firms earn higher stock returns, particularly firms that are constrained in debt markets. 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 focuses on the effects of financial constraints in general, without differentiating between when the constraint binds and when it is expected to bind. This paper 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, Hollander, van Lent, and Tahoun (2019, 2020a); Hassan, van Lent, Hollander, and Tahoun (2020b); Hassan, Schwedeler, Schreger, and Tahoun (2021) construct measures of firm-level risk relevant to political, Brexit, Covid-19 risks and find that they predict investment, hiring, stock returns, as well as other firm-level activities. The unscripted interactions between firm managers and market participants ensures that the most pertinent issues affecting the firm's financial and operating performances are discussed. This paper 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 paper relates to Caldara and Iacoviello (2022) who separately measures the effects of threats and realizations of geopolitical adverse events.

The paper proceeds as follows. Section 2 details how I measure concerns about future covenant violations and discusses the results of the validation exercises. Section 3 documents key stylized facts about when firms are concerned about future covenant violations. Section 4 examines the relationship between covenant concerns and firm responses. Section 5 discusses the model and its predictions. Finally, Section 6 concludes.

2 Data and measurement

This section details how I construct a measure of covenant concerns from the text of earnings call transcripts.

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 et al. (2021), who extend the covenant violation data set in Nini et al. (2012) using a similar text-search algorithm.[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 an adapted algorithm to extend their data further from the years 2015 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 86,694 firm-quarter observations from 4,088 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 contracts, where syndicated means a group of lenders jointly lending to a single borrower (Berlin et al. (2020)). Financial covenant information is available for 12 percent of debt contracts originated or amended between 2000 and 2020. The restricted sample consists of 44,108 firm-quarter observations with 2,057 firms.

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 measuring 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."

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

"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.

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

$$CovFuture_{it} = \max_{s \in \mathcal{S}} \Big(1\{\text{“}covenant''\} \times 1\{forward\} \Big)$$

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

[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 C.1 provides further details of steps taken to preprocess the text.

As a placebo exercise, I construct a backward-looking covenant mention indicator $CovPast_{it}$ that takes a value of one if the call does not contain forward-looking covenant mentions but contains covenant mentions in the past tense. By construction, $CovFuture_{it}$ and $CovPast_{it}$ indicate mutually exclusive events.

2.2.1 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 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

explictly contain modal auxiliary verbs. For that purpose, I turn to detecting for the usage of forward-looking keywords in the sentence.

2.2.2 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 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

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

Table 1: 30 most common forward-looking words or phrases extracted from safe-harbor disclosures in 10-K and 10-Q filings. "Count" is number of disclosures a given phrase is used as an example. Appendix C.3 provides the full list of forward-looking keywords.

words such 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".

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 plots the evolution of the firm's debt-to-earnings covenant slack, the standardized difference between the maximum debt-to-earnings threshold specified in the financial covenant and the firm's 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 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

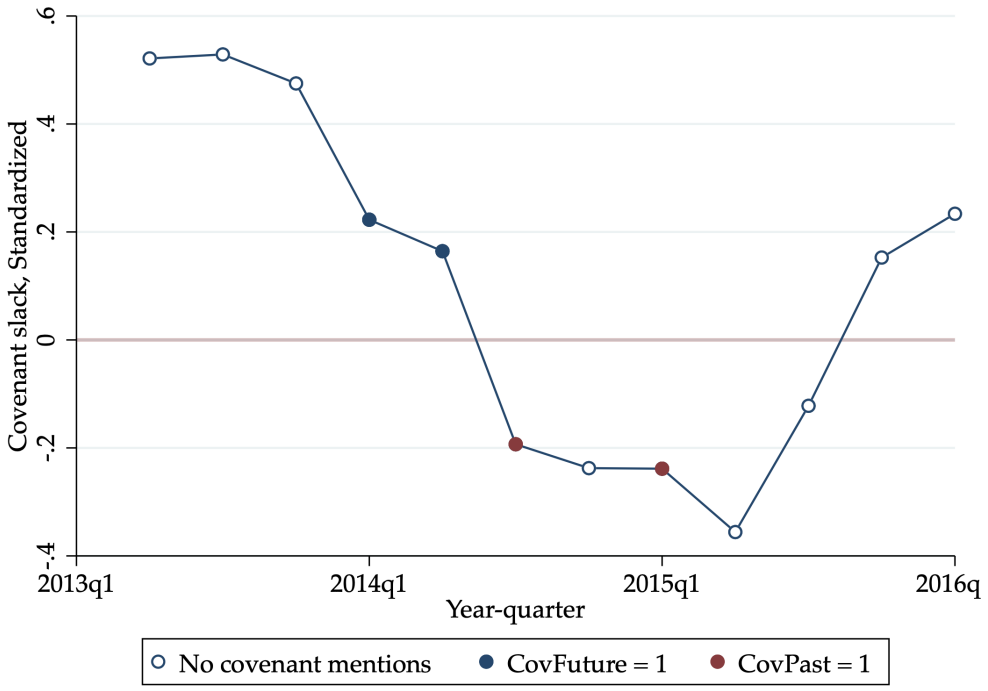


Figure 1: Case study of covenant violation event by American Vanguard Corp. Covenant slack is the difference between covenant threshold in DealScan and financial ratio, normalized by standard deviation of financial ratio. Negative values indicate violation. Blue dots show calls in which covenant mentions are forward-looking ($CovFuture = 1$), red dots show calls in which covenant mentions are backward-looking ($CovPast = 1$), white dot shows calls with no covenant mentions.

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".

I find that this pattern holds broadly across covenant violations events. Figure 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.

Figure 2 documents two notable patterns. First, firms are more likely to mention covenants in their earnings call as they draw closer to violation. The increase in the probabil-

[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.

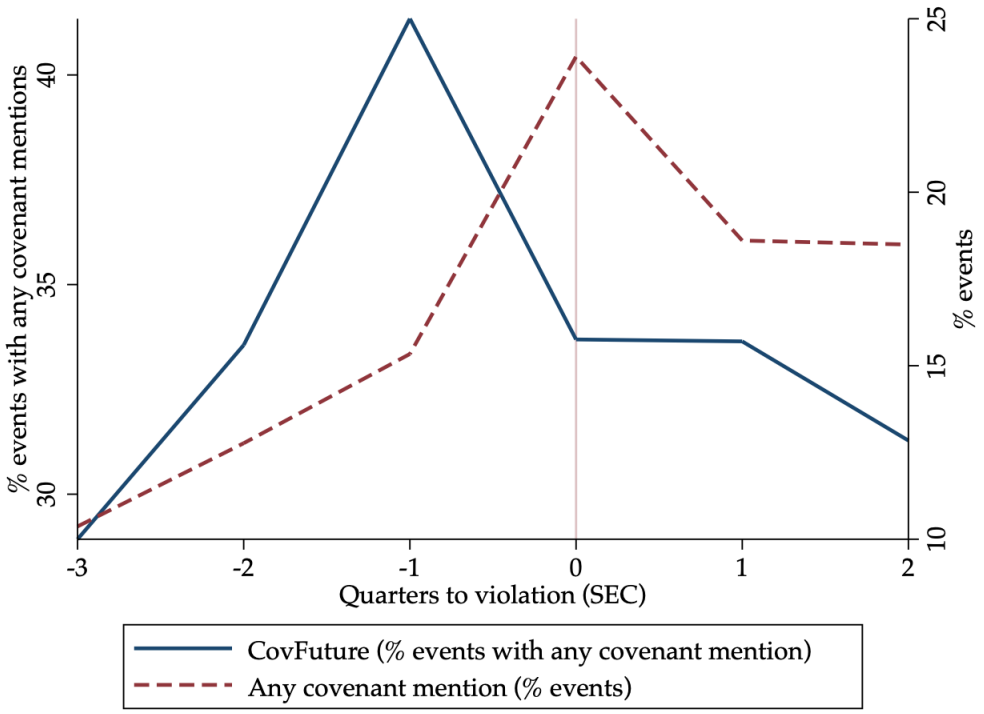


Figure 2: Covenant mentions around violations reported in SEC filings. Sample restricted to events with no violations in the preceding 3 quarters ($NViol = 1,167$). Left axis shows share of covenant mentions that is forward looking, right axis shows share of observations with any covenant mentions.

ity of covenant mentions is significant, rising from 10 percent three quarters prior to violation to almost 25 percent at violation. This suggests that covenant mentions in earnings calls are informative about the probability of covenant violations, rather than boilerplate disclosures of financial results. Second, covenant mentions are more likely to be forward-looking in the quarter prior to a covenant violation relative to the quarters on and after the violation event. This finding support the idea that $CovFuture$ measures concern about future covenant violations.

Appendix Table A.3 confirms the statistical significance of the findings in a regression specification. In particular, I regress covenant mentions and $CovFuture$ conditional on covenant mentions on a set of indicators for the quarters around violation, including firm fixed effects to allow for different baseline mentions across firms and different trends over time. Consistent with the graphical analysis, I find that covenant mentions spikes in the quarter of violation, increasing by 7.7 percent relative to the quarter prior to violation. Conditional on covenant mentions, $CovFuture$ is 10 percent higher in the quarter prior to violation relative a baseline of 31.5 percent three quarters prior to violation.

3 When are firms concerned about covenants?

3.1 Covenant concerns rise when earnings fall, both at the macro and micro level

A notable fact from existing literature is that covenant violations did not rise substantially during the 2008-09 financial crisis. Extending the measure of covenant violations from Nini et al. (2012) to 2015, Griffin, Nini, and Smith (2018) find only a marginal increase in covenant violations during 2008-09. Appendix Figure A.1 shows that violations imputed from covenant thresholds in DealScan also show a modest increase during the 2008-09 financial crisis. A plausible intepretation of this finding is that covenants did not become a more binding constraint despite the large decline in cash flows during the financial crisis.

A different picture emerges when examining mentions of covenants in earnings calls. The top panel in Figure 3 compares the annual frequency of covenant discussions in earnings calls and the frequency of covenant violations from 2003 to 2020.[8] The figure shows a sharp increase in covenant mentions (red line) during the 2008-09 financial crisis, rising from 7.3 percent in 2007 to 22.9 percent in 2009, in contrast to the muted response in covenant violations (blue line) over the same sample period, rising from 5.2 percent in 2007 to 7.6 percent in 2009.

This result is notable in light of recent evidence on the role of covenants in explaining investment and employment during the recession (Falato and Liang (2016); Acharya et al. (2021); Chodorow-Reich and Falato (2021)). While the literature focuses on how covenants affect firm decisions when covenants are violated, the finding suggest that covenants also matter to a broader set of firms including those not presently in violation of covenants. Specifically, 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). In the next section, I document that the magnitude of response associated with greater concern about covenants is also comparable to the response associated with covenant violations.

One concern is that greater discussions of covenants during recessions reflect changes in how firms discuss covenant violations during recessions. For instance, firms may be more inclined to discuss covenant violations that are resolved to reassure investors that they are

[8] 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 et al. (2012); Griffin et al. (2018); Becher et al. (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.

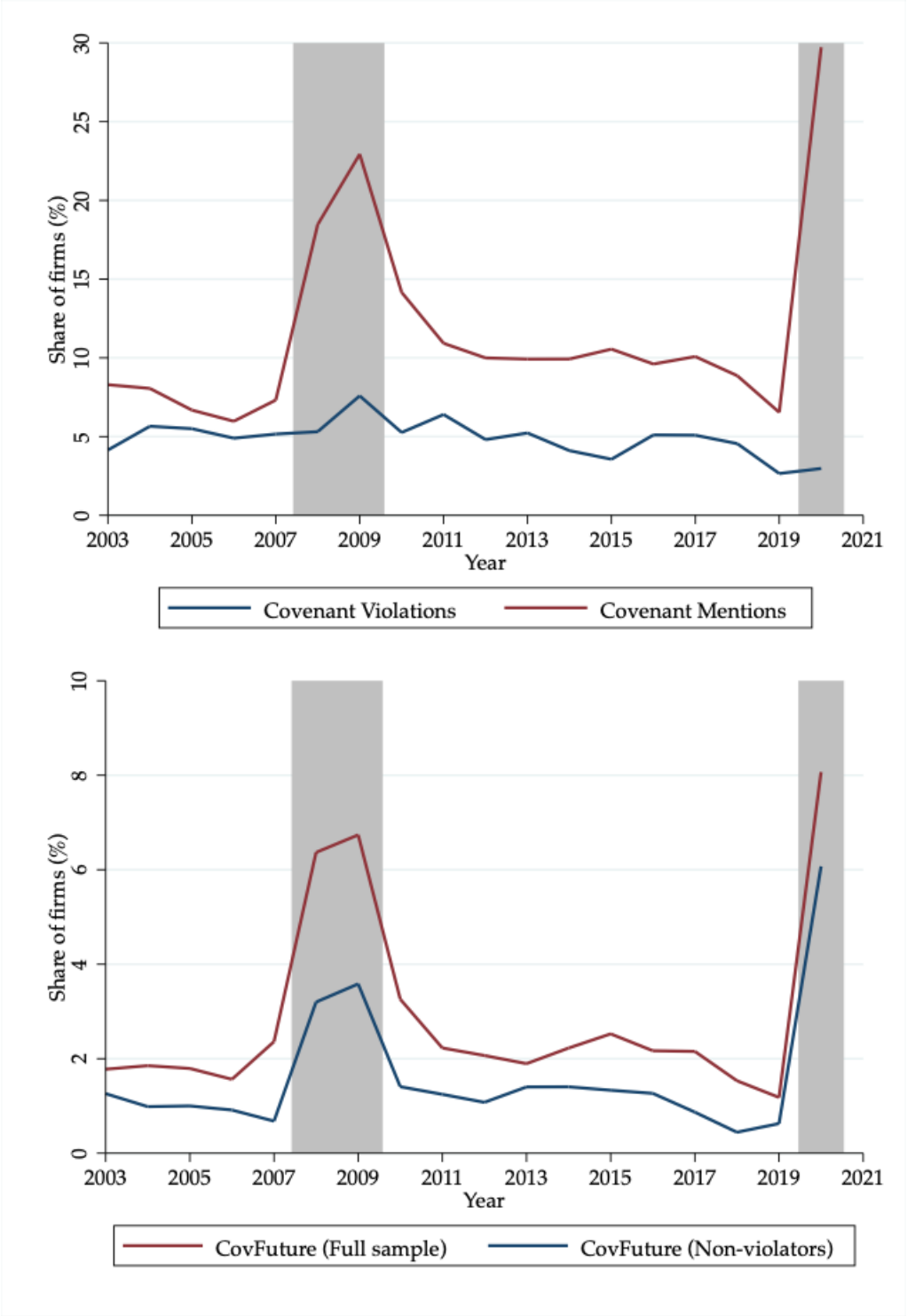


Figure 3: Annual frequency of covenant violations, covenant mentions, and *CovFuture* from 2003 to 2020. Top panel computes share of firms reporting covenant violations in SEC filings and any covenant mentions in earnings calls in the full sample. Full sample consists of Compustat firms, excluding utilities and financials, with covenant information in DealScan and earnings call transcripts, from 2003Q1 to 2020Q1. Bottom panel computes share of firms reporting *CovFuture* in the full sample and in the sample of non-violators. Non-violator sample consists of those not in violation based on information in Dealscan and SEC filings. Shaded bars denote year-quarters with NBER recession months.

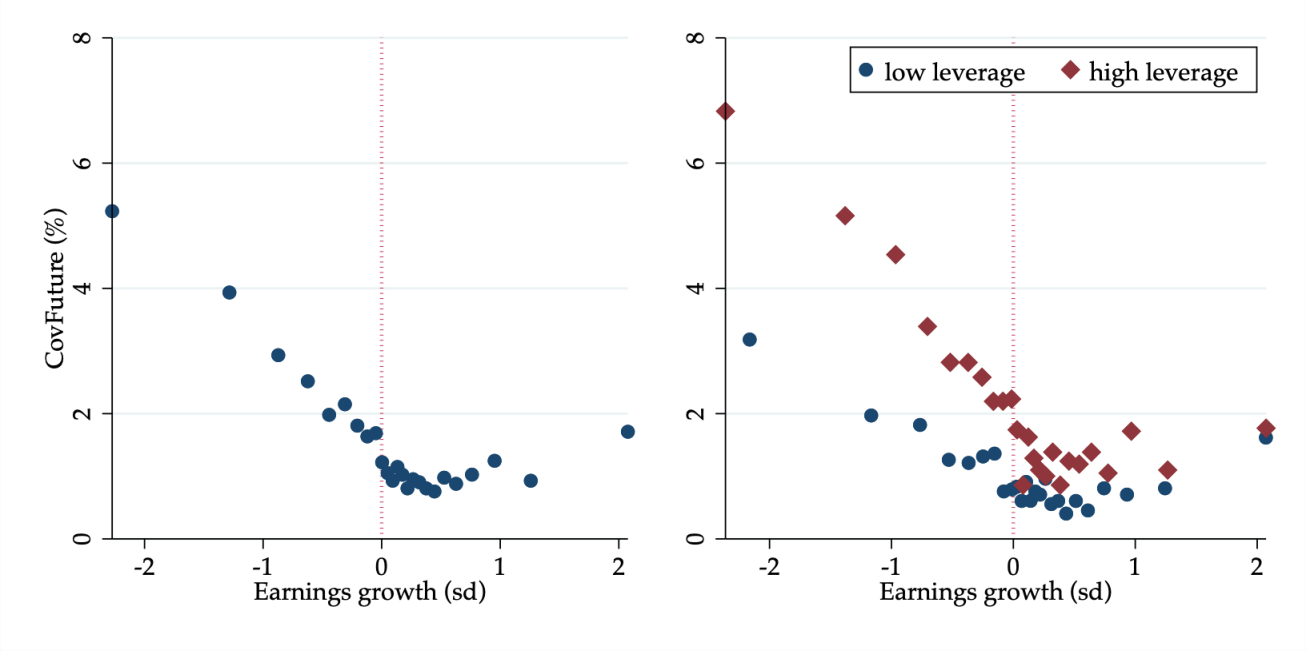


Figure 4: Probability of forward-looking covenant mentions $CovFuture = 1$, earnings growth, and book leverage (net debt/asset). Permanent component of leverage removed by subtracting firm average. Low (high) leverage refers to leverage below (above) 50th percentile. Earnings growth is the year-over-year difference in earnings, normalized by firm-level standard deviation of earnings.

not exposed to adverse shocks in the financial sector. These types of violations do not show up in SEC filings as firms are only required to report unresolved violations at the end of each quarter (Nini et al. (2012)). In this case, covenant discussions reflect discussions of past resolved violations, rather than concern about future violations.

To address the concern that discussions reflect past resolved violations, I examine forward-looking discussions of covenants $CovFuture$. As described in the previous section, this measure parses for discussions of covenants that relate to future as opposed to past events, hence are more likely to capture concern about future covenant violations. Additionally, I evaluate a restricted sample of firms that are not in violation of covenants based on reporting in SEC filings as well as imputed violations in DealScan. This conservative treatment mitigates concern that discussions capture discussions of resolved violations. The bottom panel in Figure 3 reports the frequency of $CovFuture$ both in the full sample (red line) as well as in the restricted sample of non-violators (blue line). Consistent with the baseline result, I find that concern about future covenant violations rise significantly during the two recession periods. Taken together, the results strongly suggest that covenants are more relevant to firms during recessions, even among firms not presently in violation.

I find that the relationship between covenant concerns and earnings also holds at the

firm level. The left panel of Figure 4 shows a binscatter plot of covenant concerns against earnings growth, which is computed as the difference between earnings in a given quarter from earnings four quarters prior scaled by the firm's standard deviation of earnings. The figure shows a strong asymmetry in the relationship between the two variables. When earnings growth is positive, there is little variation in covenant concerns. However, when earnings growth is negative, covenant concerns rises significantly as earnings growth fall.

The right panel of Figure 4 splits the sample into whether leverage is above or below median. To remove permanent differences across firms, I group the sample based on leverage demeaned using the firm's average leverage over the sample. While the asymmetric relationship holds both when leverage is low and when leverage is high, it is stronger when leverage is higher.

Appendix Table A.1 formalizes the findings in a regression specification. In particular, I find that the estimates are robust to controlling for current and lagged 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.

3.2 Covenant concerns predict future violations

Next, I analyze whether $CovFuture$ is informative about future violations in a regression framework. The regression analysis is useful for two reasons. First, by including additional controls, the analysis probes whether $CovFuture$ contains information about future violations not already contained in other predictors. Second, the analysis sheds light on the extent to which anticipatory responses, if any, mitigates the probability of future violations.

Formally, I estimate the following regression specification

$$Viol_{it+1} = \beta_0 + \beta_1 CovFuture_{it} + \sum_{j=0,1} \gamma_j' X_{it-j} + \alpha_i + \delta_t + \epsilon_{it+1}$$

where $Viol_{it}$ is an indicator for whether firm i violates a covenant in quarter t, $CovFuture_{it}$ is an indicator for whether firm i has a forward-looking covenant mention in quarter t, X_{it} are a vector of controls, α_i and δ_t are respectively firm and time fixed effects. The coefficient of interest is β_1, the difference in the probability of violating a covenant in quarter $t+1$, conditional on anticipating a covenant violation in quarter t.

I control for key predictors of future violations. One such predictor is the firm's current violation status, as violations are persistent events a violation in the current quarter is likely informative about whether a violation will occur in the next quarter. Another important predictor of future covenant violations that prior literature finds informative is covenant slack (Murfin (2012); Demerjian and Owens (2016)). To account for both level and change

Table 2: Predicting future covenant violations. Controls: violation status, covenant slack, covenant slack squared, operating earnings, size, acquisition, cash holdings, tobin's q, book leverage, S&P credit rating. Columns 1 and 2 report results with Dealscan violation sample. Columns 3 and 4 report results with SEC violation sample. Standard errors are two-way clustered by firm and year-quarter.

	(1) F.Viol (SEC)	(2) F.Viol (SEC)	(3) F.Viol (SEC)	(4) F.Viol	(5) F.Viol
CovFuture	4.555***	4.182***	3.982***	4.887***	2.869***
	(6.25)	(5.97)	(5.38)	(5.33)	(3.15)
Earnings		-0.120***	-0.132**		-0.901***
		(-4.41)	(-2.46)		(-6.96)
Covenant slack			-0.661		-16.032***
			(-1.07)		(-9.11)
Sq. covenant slack			-0.221		-6.015***
			(-0.49)		(-4.99)
Incl. Dealscan			✓	✓	✓
Add. Controls		✓	✓		✓
Firm & Time FE	✓	✓	✓	✓	✓
R-squared	0.32	0.33	0.33	0.73	0.74
Nobs	84260	84260	41978	41826	41826

effects, I include both beginning and end of quarter t violation status and covenant slack as controls.

Other controls include proxies for financial health and determinants of investment demand. In particular, violations tend to occur following a deterioration of cash flows (Nini et al. (2012)), as such a firm's current financial performance is likely a strong predictor of whether it violates its covenants in the next quarter. Proxies for financial performance include operating earnings and its squared, an indicator for earnings growth below the 25th percentile, and an indicator for ratings downgrade. A firm's incentive to invest also affects its need for external financing. To proxy for investment demand, I control for tobin's q and lagged cash holding. To account for both level and growth effects, I control for both the beginning and end of quarter t value of each of these variables. Additionally, I control for levels of log total debt, log equity payouts, log assets, log cash holdings, and credit ratings at the beginning of the quarter t.

Table 2 reports the estimates. Columns 1 to 3 are regressions with violations in SEC filings as the dependent variable, whereas Columns 4 and 5 are regressions with violations implied from DealScan as the dependent variable. Across all specifications, I find that $CovFuture$ is robust predictor of covenant violation one period ahead. Moreover, the mag-

nitude of the change in probability of violation is economically sigificant. In the baseline specification that just controls for current and lagged violation status (Columns 1 and 4), $CovFuture$ implies a 4.4 percent increase in the probability of violating covenants in the next quarter, in light of an average probability of violation in SEC filings of 4.6 percent and an average probability of violation in DealScan of 42 percent.

4 How do firms respond when they anticipate covenant violations?

4.1 Event study of covenant mentions

How do firms respond when they become concerned about future violations? I begin the investigation with an event study of firm responses around $CovFuture$. To isolate the response to a new forward-looking mention of covenants, I drop event study windows where a forward-looking covenant mention occurs in any of the four quarters prior to the event, or a covenant violation occurs in any of the four quarters prior to as well as including the quarter of the event. I focus on three margins of adjustments: capital expenditures, net debt issuance, and equity payouts. Given that prior literature finds a significant effects of covenant violations on these variables (Chava and Roberts (2008); Roberts and Sufi (2009); Nini et al. (2012)), it is of interest to see whether they also vary with concern about future covenant violations.

The top panel of Figure 5 plots the average response of capital expenditure normalized by beginning of quarter book assets. While there is a downward trend in capital expenditure in the four quarters prior to the event, there is a clear acceleration of cut backs after firms express concern about future covenant violations. In particular, capital expenditures fall by 13.5 basis points over the three quarters from $h = -4$ to $h = -1$, but by 27.7 basis points over the subsequent three quarters from $h = -1$ to $h = 2$. By the fourth quarters after firms express concerns about debt covenants, capital expenditures is 32.3 basis points lower relative to its level in $h = -1$. The decline is economically significant when compared to the decline in capital expenditures following covenant violations. In particular, the decline corresponds to 21 percent of a standard deviation (1.53 percent). By comparison, Nini et al. (2012) find a decline in capital expenditures of 19.2 percent of a standard deviation. [9]

[9] I compute the decline in capital expenditures following a covenant violations from the average (annualized) capital expenditures around covenant violations reported in Figure 4 of Nini et al. (2012). In particular, average capital expenditures is around 6.25 percent one quarter prior to violation and 4.75 four quarters after violation. Given an unconditional sample average of 5.9 percent and standard deviation of 7.8 percent (Table 5), this translates to a decline of $(6.25 - 4.75)/5.9 = 25.4$ percent of unconditional average, or

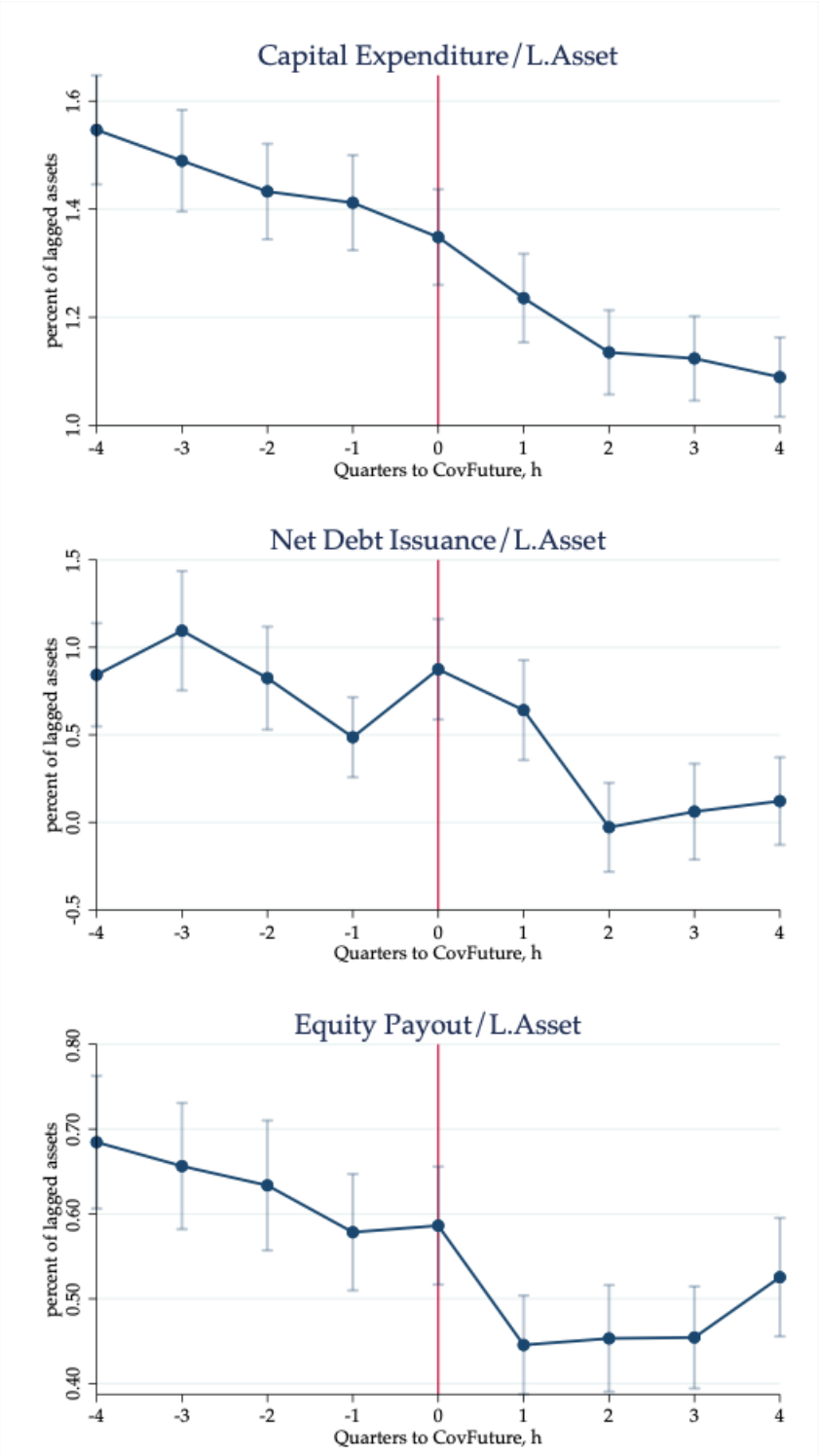


Figure 5: Firm outcomes around covenant concerns. Blue lines show the average responses. Vertical bars report 95 percent confidence interval of the sample mean. Event study windows restricted to windows where no covenant concerns expressed in four quarters prior to event and no covenant violations occur in four quarters prior to and including quarter of event. ($NEvents = 1,283$)

The middle panel of Figure 5 plots the average response of net debt issuance normalized by beginning of quarter book assets. While there is no discernable trend in net debt issuance in the four quarters prior to the event, we see a sharp decline in net debt issuance in the four quarters following the event. Net debt issuance falls from an average of 81.2 basis points in the four quarters prior to the event to close to zero two quarters after. In relative terms, this corresponds to a 17.2 percent of a standard deviation (4.72 percent) decline, which is slightly smaller in magnitude to the decline of 24 percent of standard deviation decline following covenant violations as reported in Nini et al. (2012).[10]

Finally, the bottom panel of Figure 5 plots the average response of equity payouts, defined as the sum of cash dividends and repurchase of equity scaled by the beginning of quarter book assets. While there is a slight downward trend in equity payouts prior to mentions of concern about future covenant violations, the decline is small relative to the steep drop in equity payouts in the quarter after mentions. In particular, equity payouts fall by 14 basis points from 58.6 basis points in the quarter of mention to 44.5 basis points in the quarter after mention, which corresponds to 11 percent of a standard deviation (1.19 percent) in relative terms. As with capital expenditures and net debt issuance, the decline is sizable relative to the decline following covenant violations. In particular, Nini et al. (2012) finds a 0.1 log point decline in equity payouts in the one quarter after a covenant violation, which corresponds to 4.9 percent of a standard deviation (2.04 log points) in their sample.

The finding thus far suggests that concern about future covenant violations are associated with significant changes to firm investment, debt, and equity payout policies. Given that concern about future covenant violations predicts subsequent violations, one concern is that the responses are driven by actual violations in the quarters following mentions. I examine this hypothesis in Appendix Figure A.3. In particular, I drop events where a violation occurs in any of the four quarters after mention. To ensure that responses are not an artefact of changing sample composition, I also require that firms survive for up to four quarters after concerns are expressed. The results are robust to implementing these additional restrictions. In other words, changes in firm policies are not attributed to subsequent realizations of covenant violations or firms exiting the sample.

A plausible explanation is that changes in policy correspond to periods with significant deterioration of cash flows and expected profitability. In particular, standard q-theory predicts that firms cut investments when they expect lower returns to investments in subsequent quarters. Lower investment demand may in turn lower external financing needs, thus ex-

$(6.25 - 4.75)/7.8 = 19.2$ percent of the unconditional standard deviation.

[10] In Figure 4, Nini et al. (2012) finds that (annualized) net debt issuance falls from around 7 percent in the quarter of violation to zero two quarters after. Given an unconditional (annualized) standard deviation of 28.9 percent, this translates to a decline of $7/28.9 = 24.2$ percent as reported in the text.

plaining the fall in net debt issuance. Lower cash flows also increase incentives to preserve internal funds, hence contributing to the fall in equity payouts. To shed light on this hypothesis, I turn to examining changes in cash flows and expected profitability around concerns about future covenant violations.

Appendix Figure A.4 shows the dynamics of three measures of cash flows: operating earnings scaled by lagged assets, earnings growth, which is the difference in earnings relative to four quarters prior scaled by the standard deviation of earnings, and market-to-book assets, which is a common empirical implementation of Tobin's Q – the ratio of market value of a firm to the replacement cost of its capital stock. As before, the event windows are restricted to no covenant concerns expressed in the four quarters prior to the event, and no covenant violations occurring in four quarters prior and including the quarter of event.

The figures share a consistent message: cash flows deteriorate in the quarters leading up to the quarter firms express concern about covenants, and then recovers in the quarters that follow. In particular, we see cash flows deteriorate in the four quarters leading up to when firms first express concern about covenants. For instance, earnings growth falls from 6.4 percent to -15.6 percent, which is equivalent to a fall from the 55th percentile to 35th percentile of the unconditional earnings growth distribution. In the quarters after firms express concern about covenants, we see a gradual recovery in cash flows over the four quarters after firms express concern about future covenant violations.

To conclude, while the observed changes in investment and financing policies could in principle be fully explained by the deterioration of cash flows, I show that the opposite holds in the data. In particular, both realized and expected cash flows improve in the quarters following discussions of concerns about future covenant violations, just as firms implement more severe cuts to their investment, debt, and equity financing.

4.2 Panel regression estimates

While the event study of average responses provides a transparent description of the data, the analysis leaves open the question of how investments and financing evolve in the absence of concern about future covenants. In other words, how do these responses compare with those of a firm *unconcerned* about covenants with similar fundamentals?

There are two plausible reasons why a firm with similar fundamentals may be unconcerned about covenants. The first is straightforward; the unconcerned firm has no covenants or have non-restrictive covenants in their debt contracts. These firms are likely characteristically different from firms that face restrictive covenants. In Kermani and Ma (2020), firms that face restrictive covenants have higher leverage and lower liquidation value. As

lenders have more to lose in these cases, the optimal contract provides a stronger threat of early liquidation to incentivize borrowers to exert optimal effort. Through the lens of this model, firms with and without covenants differ in terms of leverage and liquidation value. To the extent that leverage is correlated with investment opportunities, for instance if highly levered firms are young firms with significant growth opportunities, it is important to control for differences in leverage. Liquidation value may also correlate with industry specific investment opportunities.

A second reason why a firm facing similar cash flows and investment opportunities may be unconcerned about covenants is that they expect no ex-post consequences to violating their covenants. In Garleanu and Zwiebel (2009), violations are waived with no ex-post consequences when there is lower information asymmetry between borrowers and lenders. In particular, firms with fewer asset substitution opportunties optimally choose more restrictive covenants in exchange for lower interest rates on their loans. Firms with less scope for asset substitution tend to be those with less complex operations, have less fungible capital (e.g. machinery instead of cash), are larger, more mature, and with fewer growth opportunities. It is important to control for these characteristics as they may correlate with investment opportunities. I discuss how I control for these potential confounding factors using observable proxies below.

To evaluate how responses of a concerned firm compare with those of an observationally similar firm that is unconcerned about covenants, I turn to a regression framework that includes time varying controls as well as firm and time fixed effects. Given that I cannot rule out time varying unobserved differences across firms, the usual caveat against a causal interpretation applies. Formally, I estimate the regression specification

$$Y_{it} = \beta_0 + \beta_1 CovFuture_{it} + \beta_2 CovFuture_{it-1} + \sum_{j=0,1} \gamma_j' X_{it-j} + \alpha_i + \delta_t + \epsilon_{it} \qquad (1)$$

where Y_{it} are the firm response of interest, $X_{it-j}, j = 0, 1$ are controls discussed below, and α_i and δ_t are firm and time fixed effects. The coefficients of interest are β_1 and β_2, which estimate the relationship between covenant concerns and changes in firm responses in the contemporaneous and following quarter, respectively.

Similar to the event study analysis, I focus on three key firm responses: capital expenditures, net debt issuance, and equity payouts. The following analysis shows that covenant concerns are significantly associated with reductions in all three firm responses. Moreover, the magnitude of response is comparable to the response to actual covenant violations.

Capital expenditures. Table 3 reports regression estimates with capital expenditure to lagged assets as the dependent variable. The baseline set of controls and their rationale

	(1) Capx/L.Asset	(2) Capx/L.Asset	(3) Capx/L.Asset	(4) Capx/L.Asset
CovFuture	-0.143***	-0.115***	-0.145***	-0.105***
	(-4.07)	(-3.39)	(-4.38)	(-3.23)
L.CovFuture	-0.208***	-0.179***	-0.181***	-0.145***
	(-5.27)	(-4.80)	(-6.13)	(-5.13)
Violation	-0.056*	-0.026	-0.086***	-0.047*
	(-1.95)	(-0.93)	(-3.16)	(-1.70)
L.Violation	-0.117***	-0.092***	-0.094***	-0.062**
	(-4.54)	(-3.67)	(-3.22)	(-2.15)
Earnings control		✓		✓
Slack controls			✓	✓
Firm & Time FE	✓	✓	✓	✓
R-squared	0.65	0.66	0.70	0.71
Nobs	85390	85390	42527	42527

Table 3: Capital expenditure (% of lagged assets). Earnings controls: current and lagged earnings, earnings squared, Tobin's Q, and indicator for earnings growth below 25th percentile. Slack controls: current and lagged covenant slack, covenant slack squared, indicator for credit downgrade. All specifications control for lagged log asset, log PPE, log equity payout, cash holdings, log total debt, credit rating, current and lagged interest expense and depreciation. Standard errors clustered by firm and quarter. t-stat in parentheses. * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

follows. Control for current and lagged violation status isolate the response to covenant concerns as opposed to actual covenant violations. The coefficient estimates on violation status also provides a benchmark for evaluating the relative impact of covenant concerns on firm responses. I also include additional lagged controls that builds on the discussion of differences between firms with and without restrictive covenants. In particular, I control for lagged log assets and lagged log total debt to proxy for leverage, lagged equity payouts to proxy for maturity and growth opportunities, aand lagged capital stock and lagged cash holdings to proxy for capital fungibility. Controls for current and lagged depreciation and interest expense account for changes in responses that reflect temporary accounting adjustments. I also control for whether the firm has a credit rating at the beginning of the quarter to account for possible differences in access to debt capital markets. Finally, firm and time fixed effects absorb unobserved time-invariant heterogeneity across firms and over time.

In the baseline specification (Column 1), I find that covenant concerns are associated with a significant decrease in capital expenditures. Moreover, the magnitude of decline is more than twice the response to actual covenant violations. In particular, covenant concerns explain a cumulative decline in capital expenditures by $(14.3 + 20.8 =)$ 35.1 basis points (bps) ($s.e. = 5.8$ bps). Over the same two quarter period, actual covenant violations explain a $(5.6 + 11.7 =)$ 17.2 bps ($s.e. = 4.5$ bps) decline in capital expenditures. The difference of 17.9 bps ($s.e. = 7.3$ bps) is significant at the 5 percent level.

Column 2 show that the relationship between covenant concerns and capital expenditures is not fully explained by differences in cash flows. To allow for a non-linear relationship between earnings and capital expenditure, I control for both current and lagged earnings and the square of earnings. To show that the effects are not explained by an usually large decline in earnings, I include as controls current and lagged indicators for earnings growth below the 25th percentile. Finally, to control for changes in expected cash flows, I incorporate information in current and lagged market-to-book ratio (tobin's q) as well as indicators for ratings downgrade. In this specification, covenant concerns are associated with a cumulative decline of $(11.5+17.9 =)$ 29.4 bps ($s.e. = 5.4$ bps), whereas covenant violations are associated with a cumulative decline of $(2.6 + 9.2 =)$ 11.8 bps ($s.e. = 4.3$ bps). The difference of 17.6 bps ($s.e. = 7.0$ bps) is significant at the 5 percent level.

Column 3 compares the information content in covenant concerns with covenant slack, which is the standardized difference between the covenant threshold and the firm's actual financial ratios. Conceptually, covenant slack is linked to covenant concerns as a lower slack implies a higher probability of violating covenants. However, in the data the correlation between covenant slack and covenant concerns is low (correlation of -0.1). A key reason why these two variables differ is 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. Nonetheless, as prior work finds that covenant slack is associated with reductions in investments (Adler (2020)) as well as total debt growth (Lian and Ma (2021)), it is important to investigate whether $CovFuture$ remains informative after controlling for covenant slack.

I find that controlling for covenant slack does not diminish the relationship between covenant concerns and capital expenditures. The specification controls for both current and lagged covenant slack, as well as their second order polynomials. The higher order terms allow for a non-linear relationship between covenant slack and capital expenditures, for instance if firm decisions are more sensitive to a fall in slack when they are closer to violation. Here, covenant concerns explain a cumulative decline of $(14.5 + 18.1 =)$ 32.6 bps ($s.e. = 5.3$ bps) in the quarter contemporaneous and following mention. The size of decline is comparable to the response following a one standard deviation decrease in covenant slack at the median covenant slack, which is 32.1 bps ($s.e. = 4.8$ bps). Appendix Table A.4 shows that the results are robust to including the interaction of covenant concerns and violations as well as its lag. This check confirms that the effects are not driven by different severities of violation.

Column 4 shows that the relationship between covenant concerns and capital expenditure is robust to including the full kitchen sink of controls. In this specification, covenant concerns is associated with a cumulative decline of $(10.5 + 14.5 =)$ 25.0 bps ($s.e. = 5.0$ bps) decline in capital expenditures in the quarter contemporaneous to and following mention. This is $(10.5 + 14.5 - 4.7 - 6.2 =)$ 14.2 bps ($s.e. = 6.7$ bps) larger than the decline in capital expenditures due to actual covenant violations. To conclude, I find a firm concerned about covenants significantly cut back on capital expenditures relative to an observably similar firm unconcerned about covenants. Moreover, the change in capital expenditures explained by covenant concerns are twice as large as the response to actual covenant violations.

Financing policies. Table 4 shows that covenant concerns also predict a significant decline in net debt issuance, both in the quarter when firms become concerned about covenants as well as in the quarter that follows. Moroever, the magnitude of response is comparable, even larger, than the response to actual covenant violations. In the baseline specification (Column 1), covenant concerns explain a cumulative decline of $(24.5 + 32.2 =)$ 56.7 basis points ($s.e. = 17.4$ bps) over the two quarters. By comparison, covenant violations explain a cumulative decline of $(-23.1 + 57.2 =)$ 34.1 bps ($s.e. = 13.4$ bps) over the two quarters. Estimates from the remaining specifications support this conclusion. In the most restrictive specification (Column 4), the covenant concerns explain a cumulative decline of

	(1) NDI/L.Asset	(2) NDI/L.Asset	(3) NDI/L.Asset	(4) NDI/L.Asset
CovFuture	-0.245*	-0.266**	-0.445***	-0.355**
	(-1.85)	(-2.04)	(-2.84)	(-2.32)
L.CovFuture	-0.322**	-0.346**	-0.426**	-0.331**
	(-2.37)	(-2.48)	(-2.62)	(-2.07)
Violation	0.231*	0.214*	-0.113	-0.043
	(1.91)	(1.74)	(-0.74)	(-0.28)
L.Violation	-0.572***	-0.590***	-0.566***	-0.521***
	(-6.22)	(-6.54)	(-3.55)	(-3.29)
Earnings control		✓		✓
Slack controls			✓	✓
Firm & Time FE	✓	✓	✓	✓
R-squared	0.10	0.10	0.17	0.18
Nobs	84990	84990	42321	42321

Table 4: Net debt issuance (% of lagged assets). Earnings controls: current and lagged earnings, earnings squared, Tobin's Q, and indicator for earnings growth below 25th percentile. Slack controls: current and lagged covenant slack, covenant slack squared, indicator for credit downgrade. All specifications control for lagged log asset, log PPE, log equity payout, cash holdings, log total debt, credit rating, current and lagged interest expense and depreciation. Standard errors clustered by firm and quarter. t-stat in parentheses. * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

	(1) D.Log(Equity)	(2) D.Log(Equity)	(3) D.Log(Equity)	(4) D.Log(Equity)
CovFuture	-0.086***	-0.067***	-0.092***	-0.070**
	(-3.90)	(-3.03)	(-2.85)	(-2.17)
L.CovFuture	-0.116***	-0.096***	-0.093***	-0.076***
	(-4.86)	(-4.19)	(-3.57)	(-3.09)
Violation	-0.014	0.005	-0.031	-0.009
	(-0.74)	(0.27)	(-1.12)	(-0.32)
L.Violation	-0.063***	-0.049**	-0.041	-0.024
	(-3.33)	(-2.55)	(-1.61)	(-0.97)
Earnings control		✓		✓
Slack controls			✓	✓
Firm & Time FE	✓	✓	✓	✓
R-squared	0.30	0.30	0.31	0.32
Nobs	84141	84141	42049	42049

Table 5: Change in log equity payouts (log points). Earnings controls: current and lagged earnings, earnings squared, Tobin's Q, and indicator for earnings growth below 25th percentile. Slack controls: current and lagged covenant slack, covenant slack squared, indicator for credit downgrade. All specifications control for lagged log asset, log PPE, log equity payout, cash holdings, log total debt, credit rating, current and lagged interest expense and depreciation. Standard errors clustered by firm and quarter. t-stat in parentheses. * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

$(35.46 + 33.08 =)$ 68.5 bps ($s.e.$ = 19.3 bps), whereas actual covenant violations explain a cumulative decline of $(-4.3 + 52.1 =)$ 56.4 bps ($s.e.$ = 21.0 bps).

Finally, Table 5 shows that covenant concerns are also associated with significant declines in log equity payouts, with a magnitude of response larger than the response to actual covenant violations. In the baseline specification (Column 1), covenant concerns are associated with a cumulative decline of $(8.6 + 11.6 =)$ 20.2 log percentage point ($s.e.$ = 3.5 log pp) decline in equity payouts. In the most restrictive specification (Column 4), covenant concerns explain a slightly smaller but still significant decline of $(7.0 + 7.6 =)$ 14.6 log pp ($s.e.$ = 4.1 log pp) decline in equity payouts. By comparison, actual covenant violations are associated with a cumulative decline of $(1.4 + 6.3 =)$ 7.7 log pp ($s.e.$ = 2.5 log pp) in the baseline specification, and no significant relationship in the most restrictive specification. Prior literature similarly finds a weak relationship between actual covenant violations and equity payouts (Roberts and Sufi (2009); Nini et al. (2012)).[11]

5 Discussion of findings

In this section, I examine whether the predictions of a standard model of investments with an earnings-based borrowing constraint are qualitatively consistent with the empirical findings. I focus on two key empirical findings: (1) covenant concerns when earnings growth falls, with the sensitivity increasing with lower earnings growth, (2) covenant concerns are associated with decreases in investments, debt issuance, and equity payouts.

5.1 Entrepreneur's problem

Entrepreneurs have access to production technology $y_t = z_t k_t^{\alpha}$, where z_t is a productivity shock, k_t is the entrepreneur's capital stock. Capital used in production in period t is predetermined 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 entrepreneur's investment in period t and δ is the depreciation rate of capital. Installing capital is costly and incurs quadratic adjustment cost $\frac{\psi}{2}\frac{(k_{t+1}-k_t)^2}{k_t}$.

Entrepreneurs can borrow and lend only 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

[11] As with capital expenditures, Appendix Tables A.5 and A.6 show that the results are robust to including the interaction of covenant concerns and violations as well as its lag. This check confirms that the effects are not driven by different severities of violation.

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

$$V(z_t, k_t, d_t) = \max_{c_t, k_{t+1}, d_{t+1}} \frac{c_t^{1-\gamma}}{1-\gamma} + \beta E\Big[V(z_{t+1}, k_{t+1}, d_{t+1})\Big| z_t\Big] \tag{2}$$

subject to

$$c_t = y_t - d_t + \frac{d_{t+1}}{R} - i_t - \frac{\psi}{2}\frac{(k_{t+1} - k_t)^2}{k_t} \tag{3}$$

$$i_t = k_{t+1} - (1-\delta)k_t \tag{4}$$

$$y_t = z_t k_t^{\alpha} \tag{5}$$

$$\frac{d_{t+1}}{R} \leq \kappa y_t \tag{6}$$

Productivity follows a log AR(1) process given by

$$\log z_t = \rho_z \log z_{t-1} + \sigma_z \epsilon_t \tag{7}$$

where $\epsilon_t \sim N(0,1)$ are innovations in productivity. Appendix Section D.1 describes the optimality conditions of the entrepreneur's problem.

5.2 Future covenant violations affect optimal policy in the present

To see how the expectation of future borrowing constraints binding affects the entrepreneur's choices today, consider the first order condition for d_{t+1}. Define μ_t as the Lagrange multiplier

on the borrowing constraint (3). After substituting in the first order condition for c_t and iterating the equation forward by $J < \infty$ periods, we have

$$c_t^{-\gamma} = \beta^J R^J \underbrace{\left(\frac{1}{1-\mu_t}\right)}_{\text{actual violations}} E_t\Big[\prod_{j=1}^{J-1} \underbrace{\left(\frac{1}{1-\mu_{t+j}}\right)}_{\text{expected violations}} c_{t+J}^{-\gamma}\Big] \tag{8}$$

Equation (8) implies that the optimizing enterpreneur equalizes the present value of marginal benefit of 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 entrepreneur's consumption depends not only on the borrowing constraint binding today, but also the expectation of the constraint binding in future periods.

Note that the expectation of future Lagrange multipliers is weakly decreasing in consumption today. In particular, holding fixed c_{t+J}, an increase in μ_{t+j} for any $j = 0, ..., J-1$ increases the present value of marginal benefit of consumption in period $t+J$. This implies an increase in the marginal value of consumption today $c_t^{-\gamma}$, which corresponds to a lower value of consumption c_t today.

We can also see how this affects investment and borrowing today. For simplicity, suppose that adjustment costs are zero $\psi = 0$ for all t. From the budget constraint (3), we have

$$c_t = y_t + (1-\delta)k_t - d_t + \left(\frac{d_{t+1}}{R} - k_{t+1}\right)$$

Since y_t, k_t, and d_t are fixed at the start of each period, lower consumption c_t today implies lower $\frac{d_{t+1}}{R} - k_{t+1}$ It follows that the entrepreneur's borrowing and investment decisions in period t changes when any of the Lagrange multipliers μ_{t+j} for $j = 0, ..., J-1$ changes.

The preceding analysis assumes that entrepreneurs have a preference for smoothing consumption over time, which is governed by the parameter γ. Entrepreneurs with high elasticity of intertemporal substitution (low γ) are sensitive to changes in the discount rate of future marginal benefits of consumption. One intrepretation 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.

5.3 Mapping model to data

In this section, I examine whether the model predictions are qualitatively consistent with the empirical findings. I focus on two key empirical findings: (1) covenant concerns rise when earnings growth falls, with the sensitivity increasing with lower earnings growth, (2) covenant concerns are associated with decreases in investments, debt issuance, and equity payouts.

I start by defining covenant concerns in the model. Building on the discussion in the previous section, I link covenant concerns to the expectation of the Lagrange multiplier on the borrowing constraint $E_t\mu_{t+j}$ for some $j > 0$. Given that covenant concerns have the strongest predictive power for violations in the next quarter, I focus on the expectation of the Lagrange multiplier in the next quarter $E_t\mu_{t+1}$. To interpret the units of the Lagrange multiplier μ_t, rewrite the first order condition for d_t to get

$$\mu_t = \frac{\lambda_t - \beta R E_t \lambda_{t+1}}{\lambda_t}$$

where λ_t is equal to the marginal benefit of consumption in period t. In words, the Lagrange multiplier μ_t is the percentage difference in the maginal benefit of consumption in period t and the marginal benefit of consumption in period $t+1$ discounted at rate βR.

To compare the model predictions with the data, I calibrate the nine parameters in the model using standard values from the literature as well as to match key moments of the data. I find that the model matches the four targeted moments well: mean and standard deviation of investment rate, average debt-to-asset, and the share of covenant violations. Having solve for the policy functions in the model, I simulate the model for five million periods, dropping the first 500 thousand observations as burn-in. Appendix Sections D.2 and D.3 describes the calibration and model fit in detail.

Having solved the model numerically, I examine how covenant concerns covary with earnings growth in the model. Appendix Figure A.2 replicates the empirical finding documented in Figure 4 using model simulated data.[12] The figure shows that the model predictions are qualitatively consistent with the empirical findings. First, the left panel shows that the model predicts a significant negative relationship between covenant concerns and earnings growth. Second, the simulations also show that the sensitivity of covenant concerns to earnings growth increases as earnings growth falls. Third, the right panel shows that covenant concerns increase when leverage increases, conditional on earnings growth. To conclude, I

[12]In particular, I group simulated observations into 25 quantile bins based on the distribution of earnings growth and compute the average value of the expectation of Lagrange multiplier next quarter for each bin. This is a similar to how Figure 4 is constructed in the data.

find that the rise in covenant concerns is consistent with an increase in the expectation of future constraints binding as earnings growth falls.

Next, I turn to investigating the relationship between covenant concerns and firm responses. As in the data, I focus on three key firm responses: investments, debt issuance, and equity payouts, all scaled by beginning of quarter capital. In the model, investments is defined as the change in capital stock after depreciation, $k_{t+1} - (1-\delta)k_t$, debt issuance is defined as the change in total debt, $d_{t+1}/R - d_t$, and change in equity payouts is defined as the log change in consumption, $\log c_t - \log c_{t-1}$. Appendix Figure A.5 shows that that covenant concerns are negatively associated with investments, debt issuance, and equity payouts, respectively. This is consistent with the empirical findings that higher concerns about borrowing constraints binding lead to more conservative investments and financing policies.

6 Conclusion

In this paper, I present evidence that the expectation of future covenant violations matter for firm investment and financing decisions. Applying textual analysis to earnings call transcripts, I construct a measure of covenant concerns by distinguishing between discussions of covenants that relate to the future as opposed to the past or present. This approach ensures that the proposed measure is informative about future covenant violations as opposed to realizations of past or current violations.

Using the measure of covenant concerns, I document four key findings. First, covenant concerns rise when earnings fall, both at the macro and micro level. Second, covenant concerns predict future violations, which suggest that any anticipatory responses taken do not fully mitigate violations from happening. Third, covenant concerns are associated with lower investments, debt issuance, and equity payouts, with effects comparable in size to the effects of actual covenant violations. Taken together, the findings support the idea that financial covenants are effective financial constraints on firm decisions. Moreover, they suggest these constraints matter not just when they bind, but also when they are expected to bind.

References

Abis, S. (2020): "Man vs. Machine: Quantitative and Discretionary Equity Management," *SSRN Electronic Journal*.

Acharya, V. V., H. Almeida, F. Ippolito, and A. P. Orive (2021): "Credit Lines and the Liquidity Insurance Channel," *Journal of Money, Credit and Banking*, 53, 901–938.

Adler, K. (2020): "Financial Covenants, Firm Financing, and Investment," *SSRN Electronic Journal*.

Antweiler, W. and M. Z. Frank (2004): "Is All That Talk Just Noise? The Information Content of Internet Stock Message Boards," *The Journal of Finance*, 59, 1259–1294.

Becher, D. A., T. P. Griffin, and G. Nini (2021): "Creditor Control of Corporate Acquisitions," *The Review of Financial Studies*.

Becker, B. and V. Ivashina (2016): "Covenant-Light Contracts And Creditor Coordination," Working Paper Series 325, Sveriges Riksbank (Central Bank of Sweden).

Berlin, M., G. Nini, and E. G. Yu (2020): "Concentration of control rights in leveraged loan syndicates," *Journal of Financial Economics*, 137, 249–271.

Bianchi, J. (2011): "Overborrowing and Systemic Externalities in the Business Cycle," *American Economic Review*, 101, 3400–3426.

Bodnaruk, A., T. Loughran, and B. McDonald (2015): "Using 10-K Text to Gauge Financial Constraints," *Journal of Financial and Quantitative Analysis*, 50.

Bolton, P., H. Chen, and N. Wang (2013): "Market timing, investment, and risk management," *Journal of Financial Economics*, 109, 40–62.

Bradley, M. and M. R. Roberts (2015): "The Structure and Pricing of Corporate Debt Covenants," *Quarterly Journal of Finance (QJF)*, 5, 1–37.

Brauning, F., V. Ivashina, and A. K. Ozdagli (2021): "High-Yield Debt Covenants and Their Real Effects," *SSRN Electronic Journal*.

Buehlmaier, M. M. M. and T. M. Whited (2018): "Are Financial Constraints Priced? Evidence from Textual Analysis," *The Review of Financial Studies*, 31, 2693–2728.

Caldara, D. and M. Iacoviello (2022): "Measuring Geopolitical Risk," *American Economic Review*, 112, 1194–1225.

Calomiris, C. W., H. Mamaysky, and R. Yang (2020): "Measuring the Cost of Regulation: A Text-Based Approach," NBER Working Papers 26856, National Bureau of Economic Research, Inc.

Cao, S. S., W. Jiang, J. L. Wang, and B. Yang (2021): "From Man vs. Machine to Man Machine: The Art and AI of Stock Analyses," *SSRN Electronic Journal*.

Chava, S., V. Nanda, and S. C. Xiao (2017): "Lending to Innovative Firms," *Review of Corporate Finance Studies*, 6, 234–289.

Chava, S. and M. Roberts (2008): "How Does Financing Impact Investment? The Role of Debt Covenants," *Journal of Finance*, 63, 2085–2121.

Chava, S., R. Wang, and H. Zou (2019): "Covenants, Creditors Simultaneous Equity Holdings, and Firm Investment Policies," *Journal of Financial and Quantitative Analysis*, 54.

Chodorow-Reich, G. and A. Falato (2021): "The Loan Covenant Channel: How Bank Health Transmits to the Real Economy," *The Journal of Finance*.

Cieslak, A. and A. Vissing-Jorgensen (2020): "The Economics of the Fed Put," *The Review of Financial Studies*, 34, 4045–4089.

Cooper, R. W. and J. Ejarque (2001): "Exhuming Q: market power capital market imperfections," Working Papers 611, Federal Reserve Bank of Minneapolis.

Demerjian, P. R. and E. L. Owens (2016): "Measuring the probability of financial covenant violation in private debt contracts," *Journal of Accounting and Economics*, 61, 433–447.

Demiroglu, C. and C. M. James (2010): "The Information Content of Bank Loan Covenants," *Review of Financial Studies*, 23, 3700–3737.

Drechsel, T. (2018): "Earnings-Based Borrowing Constraints and Macroeconomic Fluctuations," 2018 Papers pdr141, Job Market Papers.

Falato, A. and N. Liang (2016): "Do Creditor Rights Increase Employment Risk? Evidence from Loan Covenants," *Journal of Finance*, 71, 2545–2590.

Ferreira, D., M. A. Ferreira, and B. Mariano (2018): "Creditor Control Rights and Board Independence," *Journal of Finance*, 73, 2385–2423.

Garleanu, N. and J. Zwiebel (2009): "Design and Renegotiation of Debt Covenants," *Review of Financial Studies*, 22, 749–781.

Gentzkow, M., B. Kelly, and M. Taddy (2019): "Text as Data," *Journal of Economic Literature*, 57, 535–574.

Glasserman, P., K. Krstovski, P. Laliberte, and H. Mamaysky (2020): "Choosing news topics to explain stock market returns," in *Proceedings of the First ACM International Conference on AI in Finance*, ACM.

Gomes, J. F. (2001): "Financing Investment," *American Economic Review*, 91, 1263–1285.

Graham, J. R. (2022): "Presidential Address: Corporate Finance and Reality," *The Journal of Finance*, 77, 1975–2049.

Greenwald, D. (2019): "Firm Debt Covenants and the Macroeconomy: The Interest Coverage Channel," 2019 Meeting Papers 520, Society for Economic Dynamics.

Griffin, T., G. Nini, and D. C. Smith (2018): "Losing Control: The 20-Year Decline in Loan Covenant Restrictions," *SSRN Electronic Journal*.

Hassan, T. A., S. Hollander, L. van Lent, and A. Tahoun (2019): "Firm-Level Political Risk: Measurement and Effects∗," *The Quarterly Journal of Economics*, 134, 2135−−2202.

——— (2020a): "The Global Impact of Brexit Uncertainty," NBER Working Papers 26609, National Bureau of Economic Research, Inc.

Hassan, T. A., M. Schwedeler, J. Schreger, and A. Tahoun (2021): "Country Risk," Tech. rep.

Hassan, T. A., L. van Lent, S. Hollander, and A. Tahoun (2020b): "Firm-Level Exposure to Epidemic Diseases: Covid-19, SARS, and H1N1," Boston University - Department of Economics - The Institute for Economic Development Working Papers Series dp-340, Boston University - Department of Economics.

Hoberg, G. and V. Maksimovic (2014): "Redefining Financial Constraints: A Text-Based Analysis," *The Review of Financial Studies*, 28, 1312–1352.

Honnibal, M. and M. Johnson (2015): "An Improved Non-monotonic Transition System for Dependency Parsing," in *Proceedings of the 2015 Conference on Empirical Methods in*

Natural Language Processing, Lisbon, Portugal: Association for Computational Linguistics, 1373–1378.

Horwich, A. (2009): "Cleaning the murky safe harbor for forward-looking statements: An inquiry into whether actual knowledge of falsity precludes the meaningful cautionary statement defense," *J. Corp. L.*, 35, 519.

Huddleston, R. D. and G. K. Pullum (2002): *The Cambridge Grammar of the English Language*, Cambridge University Press.

Jeanne, O. and A. Korinek (2020): "Macroprudential Regulation versus mopping up after the crash," *The Review of Economic Studies*, 87, 1470–1497.

Jurafsky, D. and J. H. Martin (2000): *Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition*, USA: Prentice Hall PTR, 1st ed.

Kaplan, S. N. and L. Zingales (1997): "Do Investment-Cash Flow Sensitivities Provide Useful Measures of Financing Constraints?" *The Quarterly Journal of Economics*, 112, 169–215.

Kermani, A. and Y. Ma (2020): "Two Tales of Debt," Working Paper 27641, National Bureau of Economic Research.

Lian, C. and Y. Ma (2021): "Anatomy of Corporate Borrowing Constraints*," *The Quarterly Journal of Economics*, 136, 229–291.

Lintner, J. (1956): "Distribution of incomes of corporations among dividends, retained earnings, and taxes," *The American Economic Review*, 46, 97–113.

Loughran, T. and B. McDonald (2011): "When Is a Liability Not a Liability? Textual Analysis, Dictionaries, and 10-Ks," *The Journal of Finance*, 66, 35–65.

——— (2020): "Textual Analysis in Finance," *Annual Review of Financial Economics*, 12, 357–375.

Mendoza, E. and K. Smith (2006): "Quantitative implications of a debt-deflation theory of Sudden Stops and asset prices," *Journal of International Economics*, 70, 82–114.

Mendoza, E. G. (2010): "Sudden Stops, Financial Crises, and Leverage," *American Economic Review*, 100, 1941–1966.

Murfin, J. (2012): "The Supply-Side Determinants of Loan Contract Strictness," *The Journal of Finance*, 67, 1565–1601.

Nini, G., D. C. Smith, and A. Sufi (2012): "Creditor Control Rights, Corporate Governance, and Firm Value," *Review of Financial Studies*, 25, 1713–1761.

Roberts, M. and A. Sufi (2009): "Control Rights and Capital Structure: An Empirical Investigation," *Journal of Finance*, 64, 1657–1695.

Rosen, R. A. and J. S. Carey (2016): "The Safe Harbor for Forward-Looking Statements after Twenty Years," Tech. rep., Paul, Weiss, Rifkind, Wharton Garrison LLP.

Schmitt-Grohé, S. and M. Uribe (2014): "Finite-State Approximation Of VAR Processes: A Simulation Approach," Tech. rep., Columbia University.

Schmitt-Grohe, S. and M. Uribe (2021): "Multiple Equilibria in Open Economies with Collateral Constraints," *Review of Economic Studies*, 88, 969–1001.

Tetlock, P. C. (2007): "Giving Content to Investor Sentiment: The Role of Media in the Stock Market," *The Journal of Finance*, 62, 1139–1168.

Appendix to "Anticipating binding constraints: an analysis of financial covenants"

A Additional figures and tables

	(1) CovFuture	(2) CovFuture	(3) CovFuture	(4) CovFuture
Violation		3.401***	0.460	0.460
		(3.82)	(0.65)	(0.65)
L.Violation		1.105	0.035	0.035
		(1.63)	(0.05)	(0.05)
Earnings chg.	0.262**	0.241**	0.198	0.198
	(2.59)	(2.42)	(1.34)	(1.34)
1(Earnings chg.<0)	0.297**	0.288**	0.047	0.047
	(2.16)	(2.11)	(0.33)	(0.33)
Earn chg. x 1(Earn chg.<0)	-1.661***	-1.571***	-1.004***	-1.004***
	(-6.74)	(-6.50)	(-3.63)	(-3.63)
Earn chg. x 1(Earn chg.<0) x High lev			-0.899***	-0.899***
			(-2.65)	(-2.65)
Controls		✓		✓
Firm & Time FE	✓	✓	✓	✓
R-squared	0.11	0.12	0.12	0.12
Nobs	89702	89702	89702	89702

Table A.1: Relationship between *CovFuture*, earnings growth, and book leverage (net debt/asset). Permanent component of leverage removed by subtracting firm average. Low (high) leverage refers to leverage below (above) 50th percentile. Earnings growth is the year-over-year difference in earnings, normalized by firm-level standard deviation of earnings. Columns 1 and 2 include current and lagged violation status as controls, Columns 3 and 4 additionally includes their interactions with the high leverage indictor. Standard errors clustered by firm. t-stat in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Table A.2: Summary statistics of full sample and conditional on forward-looking covenant concern $CovFuture$.

	All						CovFuture=1					
	Nobs	Mean	SD	10th	Median	90th	Nobs	Mean	SD	10th	Median	90
CovMention(%)	86694	7.98	27.10	0.00	0.00	0.00	1651	100.00	0.00	100.00	100.00	100.00
CovFuture(%)	86694	1.90	13.67	0.00	0.00	0.00	1651	100.00	0.00	100.00	100.00	100.00
Investment/L.Assets (%)	85840	1.22	1.48	0.16	0.74	2.77	1632	1.23	1.54	0.18	0.74	2.75
NDI/L.Assets (%)	85433	0.49	4.50	-2.04	0.00	2.86	1633	0.18	4.32	-3.32	-0.09	3.68
D.Log(Equity) (log pts)	84529	0.02	1.01	-0.71	0.00	0.78	1610	-0.04	0.90	-0.66	0.00	0.50
D.Cash/L.Asset (%)	86671	-0.16	5.15	-4.30	-0.00	3.68	1651	0.14	3.47	-2.30	0.00	3.02
Log(Asset) (log pts)	86692	6.84	1.61	4.74	6.85	8.95	1651	7.04	1.29	5.46	7.08	8.64
Log(PPE) (log pts)	86663	4.99	2.09	2.04	5.12	7.65	1650	5.54	1.75	3.26	5.67	7.64
Log(Equity) (log pts)	84529	1.52	1.81	0.00	0.64	4.39	1610	1.07	1.47	0.00	0.06	3.33
Cash/L.Asset (%)	86671	18.61	21.47	1.09	10.08	51.67	1651	6.96	9.97	0.40	3.60	16.62
EBITDA/L.Asset (%)	86694	2.23	5.06	-1.69	2.96	6.20	1651	1.88	4.28	-0.71	2.31	4.90
Tobinq	86694	1.75	1.35	0.69	1.33	3.34	1651	1.05	0.68	0.54	0.87	1.69
Violation(%)	44108	35.05	47.71	0.00	0.00	100.00	1136	64.52	47.86	0.00	100.00	100.00
Violation, SEC (%)	86694	2.69	16.19	0.00	0.00	0.00	1651	10.90	31.18	0.00	0.00	100.00
Covenant slack (sd)	44108	0.02	0.35	-0.31	0.04	0.38	1136	-0.20	0.38	-0.71	-0.09	0.13

	(1) AnyMention	(2) CovFuture
Horizon=-3	-0.039***	-0.100**
	(-3.41)	(-2.02)
Horizon=-2	-0.025**	-0.098**
	(-2.49)	(-2.08)
Horizon=0	0.077***	-0.081**
	(6.95)	(-2.09)
Horizon=1	0.044***	-0.077*
	(3.52)	(-1.73)
Horizon=2	0.017	-0.134***
	(1.41)	(-2.91)
Constant	0.157***	0.414***
	(24.07)	(14.60)
Firm & Time FE	✓	✓
R-squared	0.43	0.45
Nobs	9204	1336

Table A.3: Event study of covenant mentions around SEC violations. The base horizon is one quarter prior to violation ($Horizon = -1$), with estimates are given by the constant term. Column 1 shows the change in probability of any covenant mention $AnyMention$ in each horizon, relative to one quarter prior to violation. Column 2 shows the change in probability of covenant concerns $CovFuture$ conditional on $AnyMention = 1$. Standard errors clustered by firm and time. t-stat in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

	(1) Capx/L.Asset	(2) Capx/L.Asset	(3) Capx/L.Asset	(4) Capx/L.Asset
CovFuture	-0.155***	-0.127***	-0.150***	-0.110***
	(-4.06)	(-3.42)	(-4.43)	(-3.30)
L.CovFuture	-0.220***	-0.192***	-0.191***	-0.155***
	(-5.40)	(-4.95)	(-6.28)	(-5.26)
Violation	-0.065**	-0.035	-0.093***	-0.053*
	(-2.27)	(-1.27)	(-3.34)	(-1.92)
L.Violation	-0.124***	-0.100***	-0.102***	-0.070**
	(-4.84)	(-4.00)	(-3.42)	(-2.38)
CovFuture x Violation	0.120	0.122	0.073	0.072
	(1.49)	(1.49)	(0.96)	(0.93)
L.CovFuture x Violation	0.111	0.121	0.110	0.112
	(1.32)	(1.42)	(1.38)	(1.35)
Earnings		1.982***		2.830***
		(6.97)		(5.03)
Sq. earnings		3.152***		3.661
		(3.88)		(1.27)
L.Earnings		1.769***		3.644***
		(6.90)		(6.27)
L.Sq. earnings		1.337***		5.838**
		(4.60)		(2.11)
Covenant slack			0.030	-0.161***
			(0.52)	(-2.77)
Sq. covenant slack			-0.044	-0.097***
			(-1.34)	(-3.06)
L.Covenant slack			0.290***	0.250***
			(5.03)	(4.46)
L.Sq. covenant slack			0.069*	0.069*
			(1.95)	(1.99)
Earnings control		✓		✓
Slack controls			✓	✓
Firm & Time FE	✓	✓	✓	✓
R-squared	0.65	0.66	0.70	0.71
Nobs	85390	85390	42527	42527

Table A.4: Capital expenditure (% of lagged assets). Earnings controls: current and lagged earnings, earnings squared, Tobin's Q, and indicator for earnings growth below 25th percentile. Slack controls: current and lagged covenant slack, covenant slack squared, indicator for credit downgrade. All specifications control for lagged log asset, log PPE, log equity payout, cash holdings, log total debt, credit rating, current and lagged interest expense and depreciation. Standard errors clustered by firm and quarter. t-stat in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

	(1) NDI/L.Asset	(2) NDI/L.Asset	(3) NDI/L.Asset	(4) NDI/L.Asset
CovFuture	-0.226	-0.240*	-0.462***	-0.376**
	(-1.62)	(-1.75)	(-3.00)	(-2.51)
L.CovFuture	-0.309**	-0.326**	-0.425**	-0.327**
	(-2.19)	(-2.24)	(-2.63)	(-2.02)
Violation	0.245*	0.234*	-0.131	-0.065
	(1.97)	(1.86)	(-0.76)	(-0.37)
L.Violation	-0.563***	-0.577***	-0.563***	-0.515***
	(-5.92)	(-6.21)	(-3.53)	(-3.25)
CovFuture x Violation	-0.190	-0.257	0.204	0.258
	(-0.53)	(-0.71)	(0.36)	(0.45)
L.CovFuture x Violation	-0.127	-0.195	-0.022	-0.050
	(-0.30)	(-0.47)	(-0.04)	(-0.09)
Earnings		-1.179		3.507
		(-1.00)		(1.42)
Sq. earnings		-5.464**		-5.104
		(-2.06)		(-0.51)
L.Earnings		1.655		8.295***
		(1.56)		(3.10)
L.Sq. earnings		6.358***		0.224
		(4.95)		(0.02)
Covenant slack			-7.416***	-7.824***
			(-8.87)	(-9.14)
Sq. covenant slack			-3.170***	-3.252***
			(-6.68)	(-6.83)
L.Covenant slack			6.893***	6.860***
			(8.47)	(8.50)
L.Sq. covenant slack			2.861***	2.853***
			(6.02)	(6.07)
Earnings control		✓		✓
Slack controls			✓	✓
Firm & Time FE	✓	✓	✓	✓
R-squared	0.10	0.10	0.17	0.18
Nobs	84990	84990	42321	42321

Table A.5: Net debt issuance (% of lagged assets). Earnings controls: current and lagged earnings, earnings squared, Tobin's Q, and indicator for earnings growth below 25th percentile. Slack controls: current and lagged covenant slack, covenant slack squared, indicator for credit downgrade. All specifications control for lagged log asset, log PPE, log equity payout, cash holdings, log total debt, credit rating, current and lagged interest expense and depreciation. Standard errors clustered by firm and quarter. t-stat in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

	(1) D.Log(Equity)	(2) D.Log(Equity)	(3) D.Log(Equity)	(4) D.Log(Equity)
CovFuture	-0.078***	-0.060**	-0.084**	-0.062*
	(-3.40)	(-2.62)	(-2.58)	(-1.92)
L.CovFuture	-0.117***	-0.100***	-0.092***	-0.075***
	(-4.63)	(-4.05)	(-3.46)	(-2.95)
Violation	-0.007	0.010	-0.023	-0.001
	(-0.38)	(0.52)	(-0.78)	(-0.04)
L.Violation	-0.065***	-0.051**	-0.041	-0.024
	(-3.27)	(-2.58)	(-1.53)	(-0.93)
CovFuture x Violation	-0.084	-0.072	-0.099	-0.090
	(-1.29)	(-1.09)	(-0.99)	(-0.91)
L.CovFuture x Violation	0.023	0.039	-0.007	-0.007
	(0.50)	(0.84)	(-0.12)	(-0.11)
Earnings		1.108***		1.620***
		(5.74)		(4.20)
Sq. earnings		3.733***		3.742***
		(5.82)		(2.82)
L.Earnings		0.799***		1.368***
		(5.65)		(3.93)
L.Sq. earnings		0.769***		7.154***
		(4.76)		(5.73)
Covenant slack			-0.041	-0.134**
			(-0.77)	(-2.59)
Sq. covenant slack			-0.088***	-0.116***
			(-3.15)	(-4.19)
L.Covenant slack			0.264***	0.251***
			(4.99)	(4.81)
L.Sq. covenant slack			0.093***	0.097***
			(3.27)	(3.52)
Earnings control		✓		✓
Slack controls			✓	✓
Firm & Time FE	✓	✓	✓	✓
R-squared	0.30	0.30	0.31	0.32
Nobs	84141	84141	42049	42049

Table A.6: Change in log equity payouts (log points). Earnings controls: current and lagged earnings, earnings squared, Tobin's Q, and indicator for earnings growth below 25th percentile. Slack controls: current and lagged covenant slack, covenant slack squared, indicator for credit downgrade. All specifications control for lagged log asset, log PPE, log equity payout, cash holdings, log total debt, credit rating, current and lagged interest expense and depreciation. Standard errors clustered by firm and quarter. t-stat in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

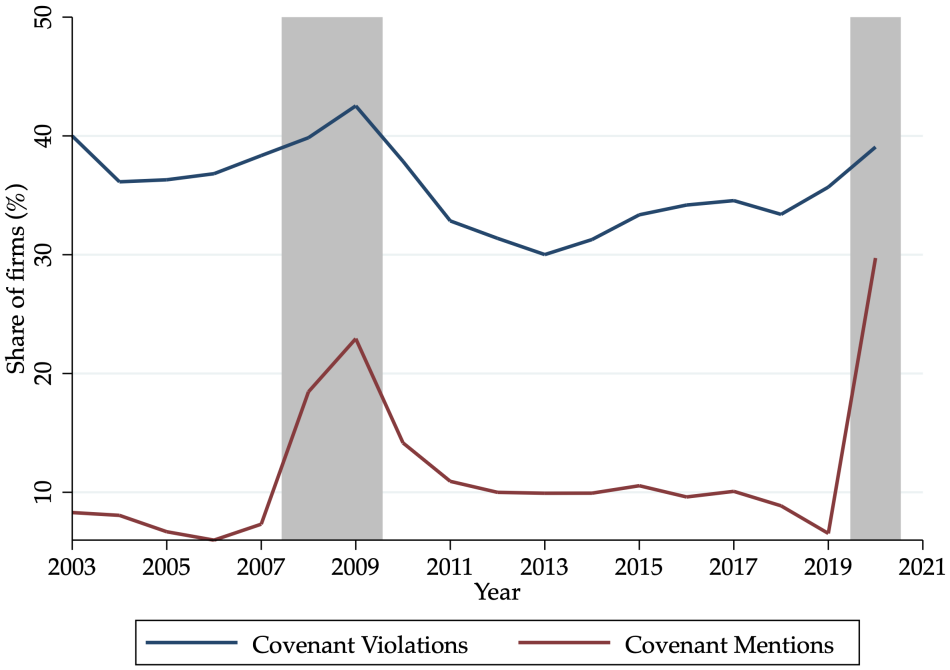


Figure A.1: Annual frequency of covenant violations imputed from DealScan and covenant mentions from 2003 to 2020. Sample consists of Compustat firms, excluding utilities and financials, with covenant information in DealScan and earnings call transcripts, from 2003Q1 to 2020Q1. Shaded bars denote year-quarters with NBER recession months.

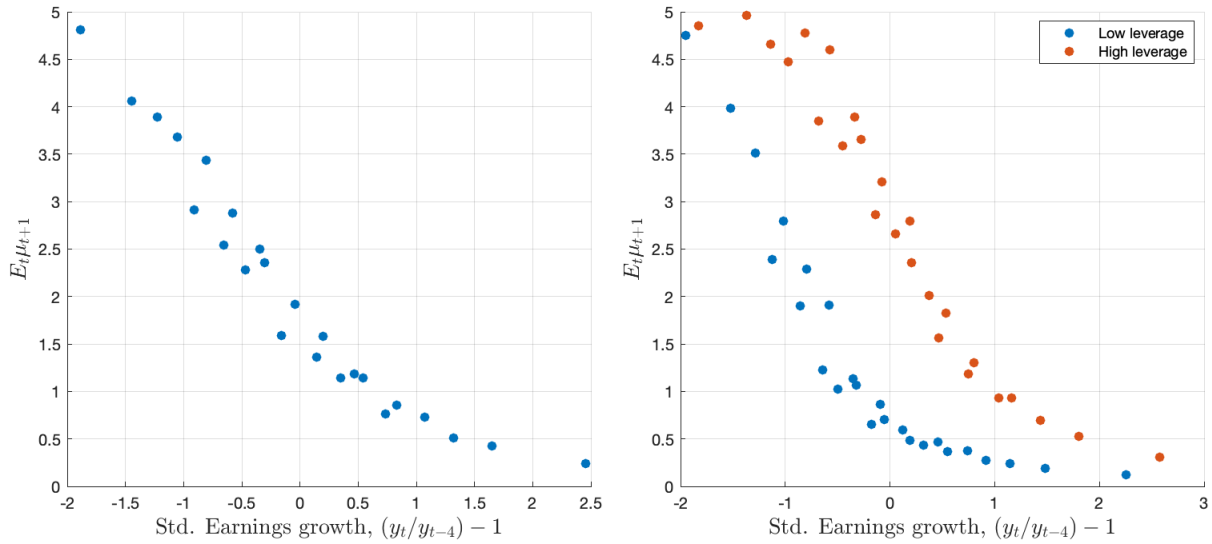


Figure A.2: Covenant concerns, earnings growth, and leverage in the model. Figures shows binscatter plot using model simulated data.

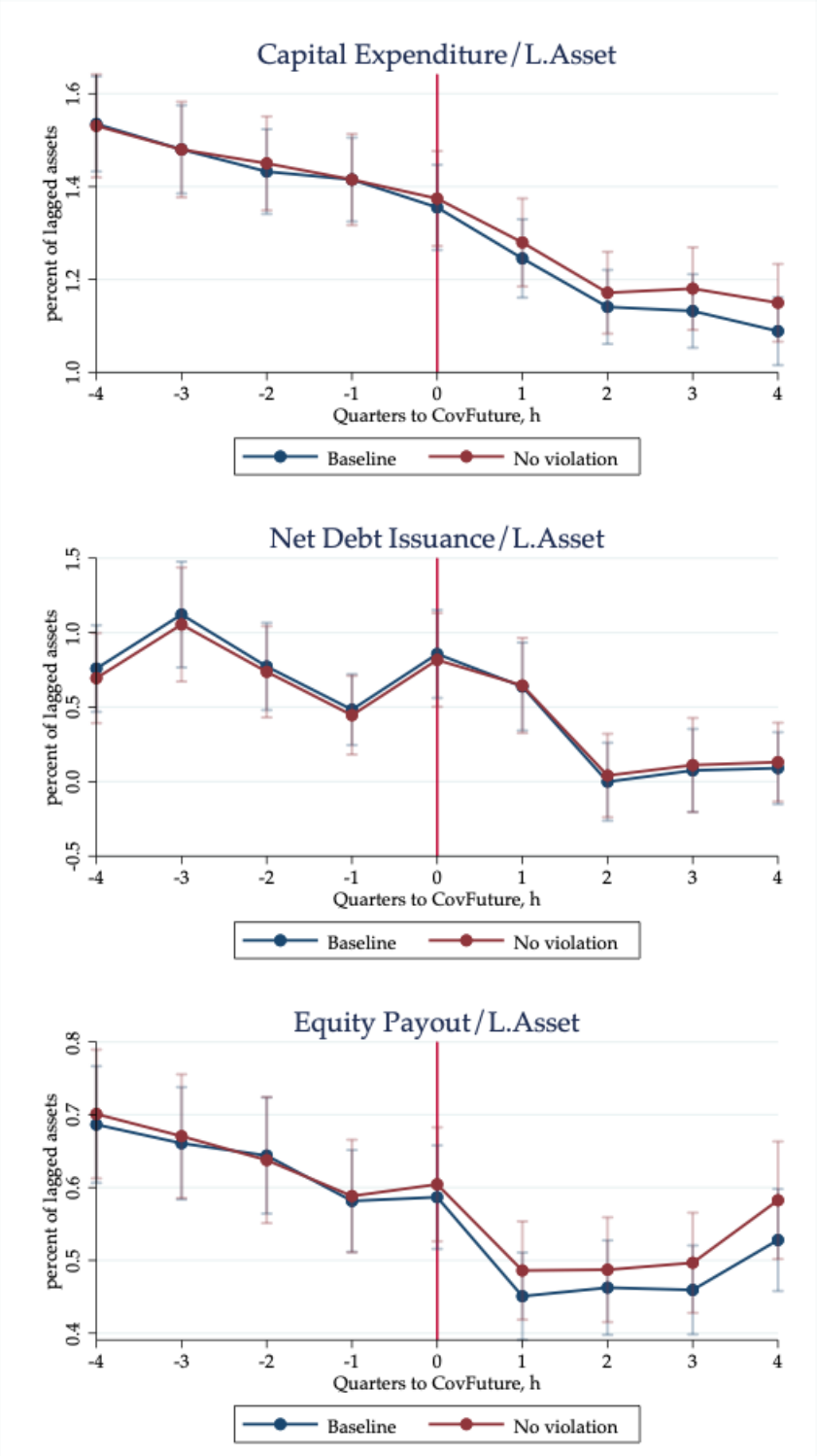


Figure A.3: Firm outcomes around covenant concerns. Blue lines show average responses in baseline sample, where event study windows restricted to windows where no covenant concerns occur in four quarters prior to event and no covenant violations occur in four quarters prior to and including quarter of event. ($NEvents = 1,283$). Red lines show average responses in sample further restricted to events with no covenant violations in any quarter in event study windows. ($NEvents = 1,080$)

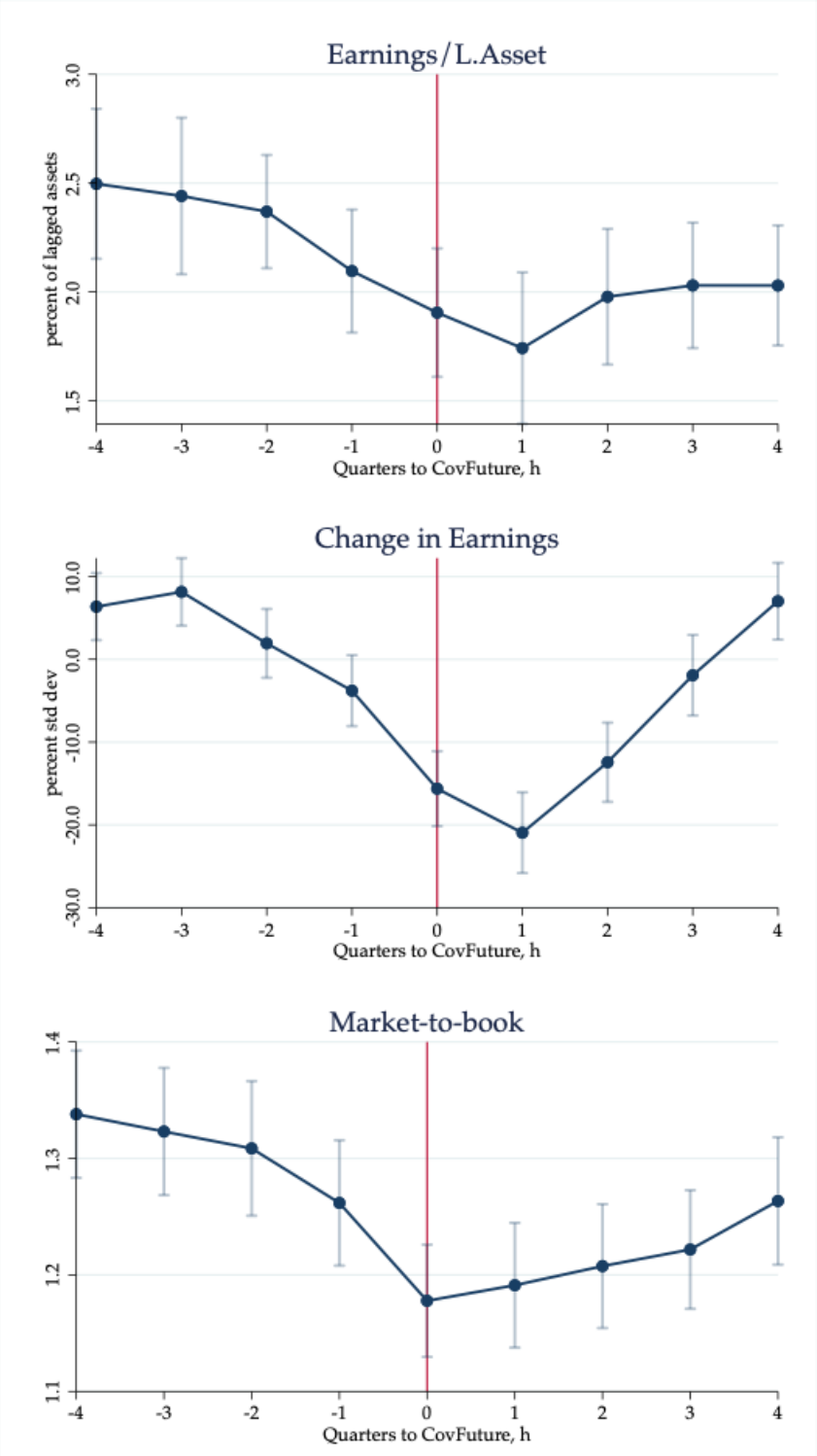


Figure A.4: Firm outcomes around covenant concerns. Blue lines show the average responses. Vertical bars report 95 percent confidence interval of the sample mean. Event study windows restricted to windows where no covenant concerns expressed in four quarters prior to event and no covenant violations occur in four quarters prior to and including quarter of event. ($NEvents = 1,283$)

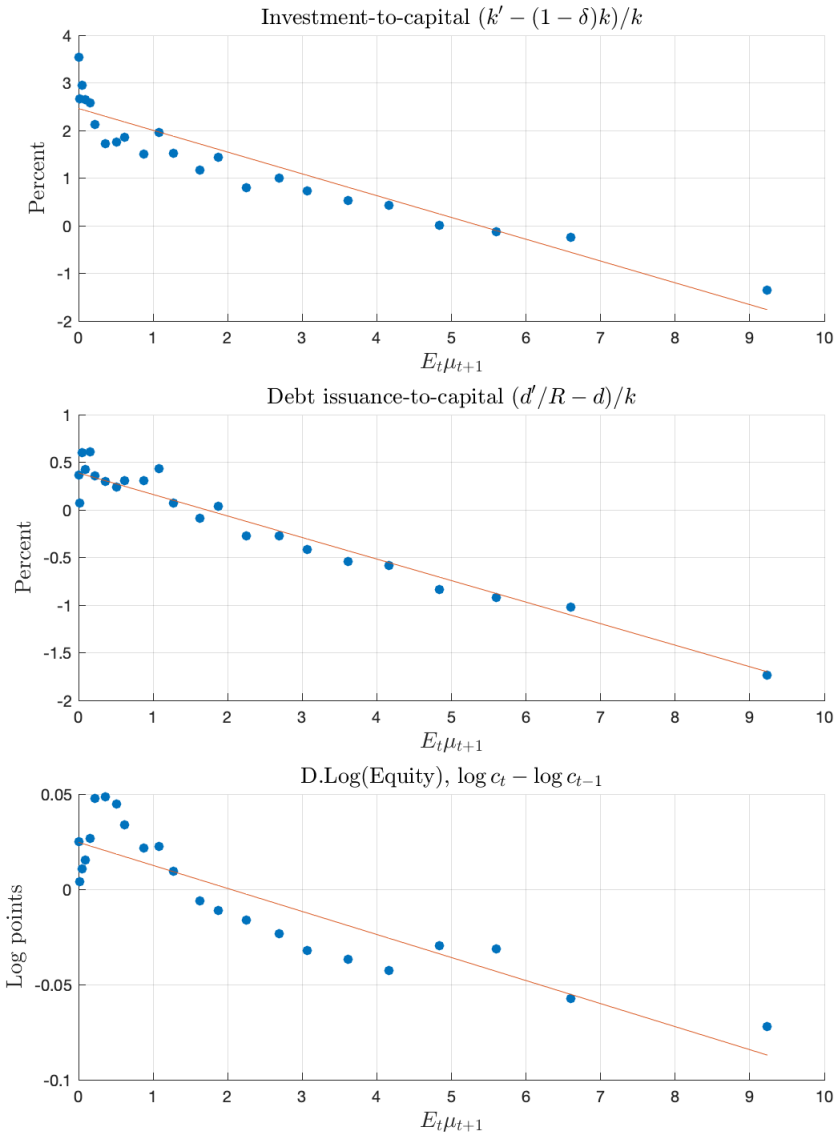


Figure A.5: Covenant concerns, investment, and financing in the model. Figures shows binscatter plot using model simulated data.

B Data

B.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 et al. (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.

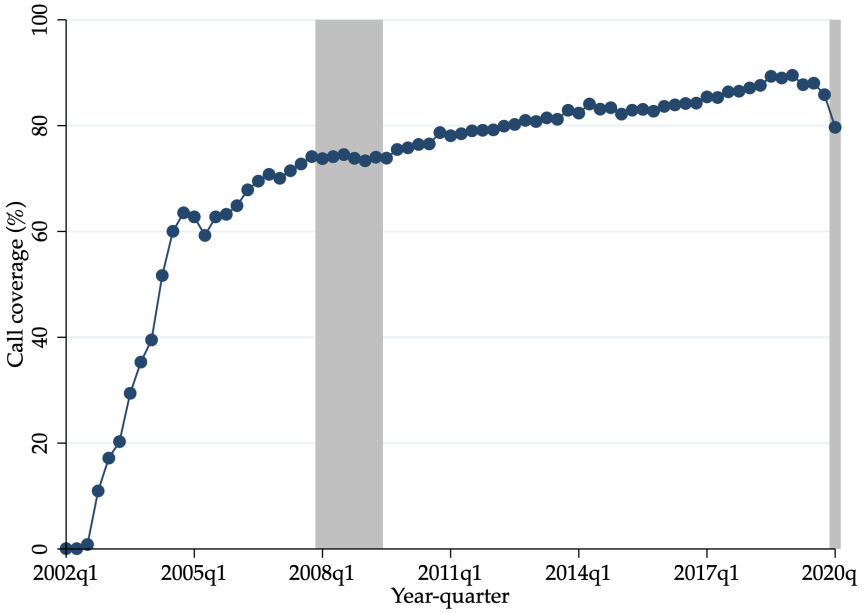
Information on financial covenants comes from the variable "all_covenants_financial", which provides a textual description of the types of financial covenants as well as their respective thresholds. The covenant information provided is common across tranches within a deal package. I use this text-based 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 ("tranche_maturity_date") or if the tranche is amended, that is if a new "tranche_active_date" is recorded for the same "lpc_tranche_id" that is before the "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.

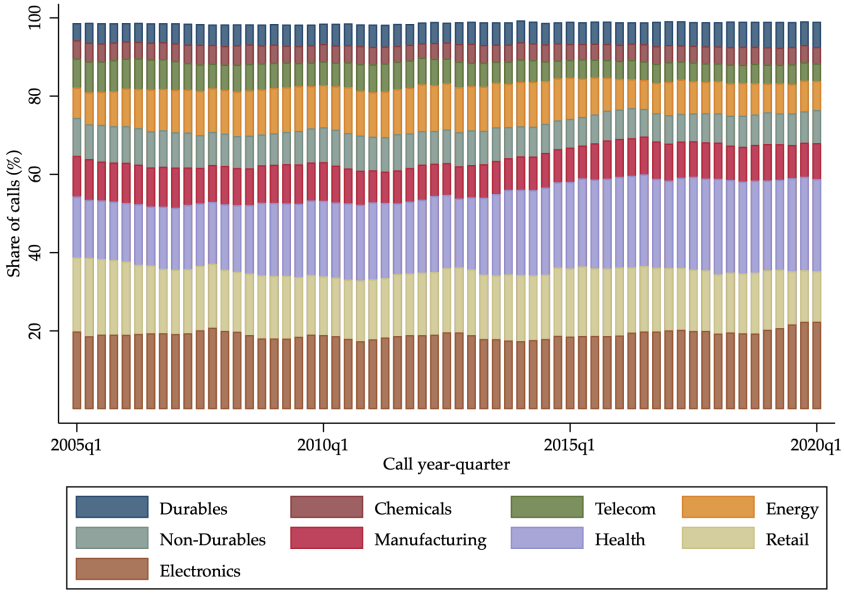
Covenant Type	No. Obs	p25	p50	p75	Mean
Max. Debt to EBITDA	118788	2.5	3	3.9	3.34
Min. Interest Coverage	94024	2.5	3	3.5	2.98
Min. Fixed Charge Coverage	73679	1.15	1.3	1.6	1.5
Min. Tangible Net Worth	37438	45	275	1500	4367
Max. Leverage ratio	36738	0.5	0.6	0.65	0.8
Min. Net Worth	31247	87	257	800	3373
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

Table B.1: Prevalence of financial covenants in Dealscan. "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 across all firm-quarter observations. 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_covenants_financial" in Dealscan from 2002Q1 to 2020Q1.

Table B.1 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); 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 firm's 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).

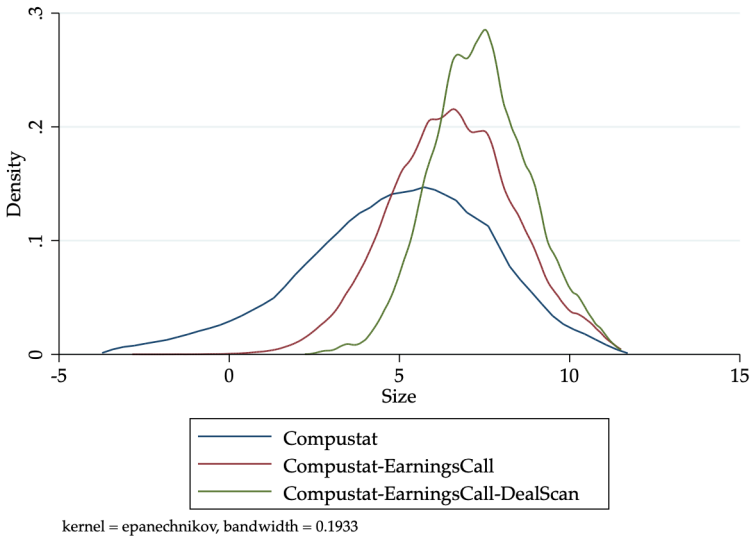


(a) Share of firms in Compustat, excluding utilities (SIC 4900-4999) and financials (SIC 6000-6999) with maximum debt-to-earnings and minimum interest coverage covenants in DealScan, that have matched earnings call transcripts from FactSet.

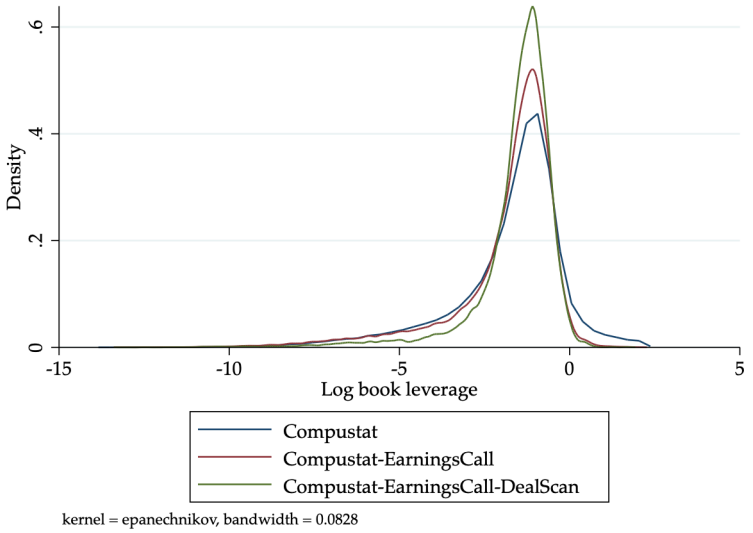


(b) Share of calls by Fama-French 12 industry classifications. Figure shows that industry representation of earnings call transcripts remain relatively stable over the relevant time period.

Figure B.1: Call coverage.

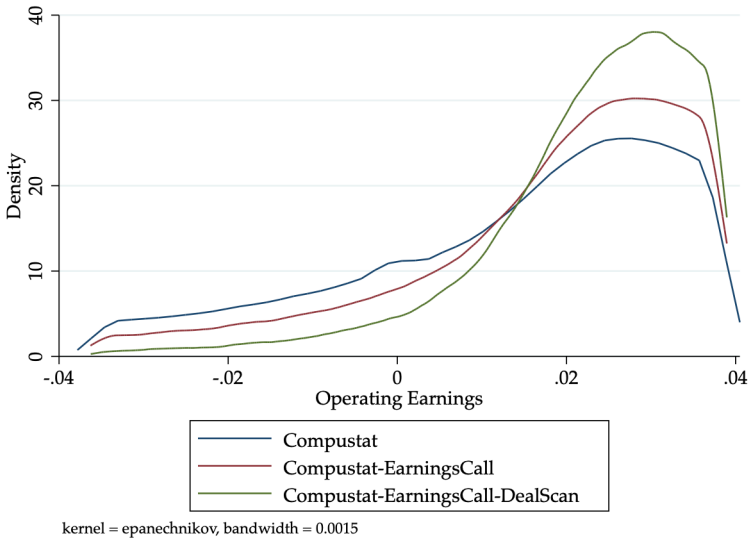


(a) Size distribution by sample. Size is the natural logarithm of asset book value.

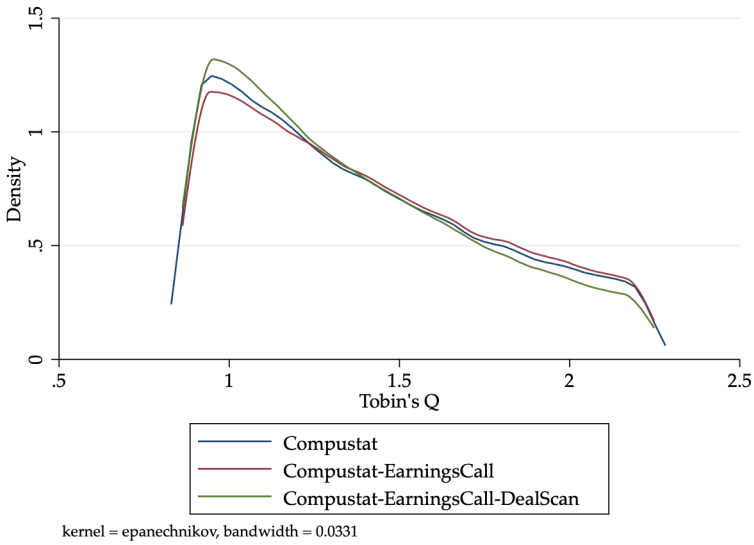


(b) Log book leverage distribution by sample. Book leverage is the ratio of debt to asset book value.

Figure B.2: Distribution by sample. 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.

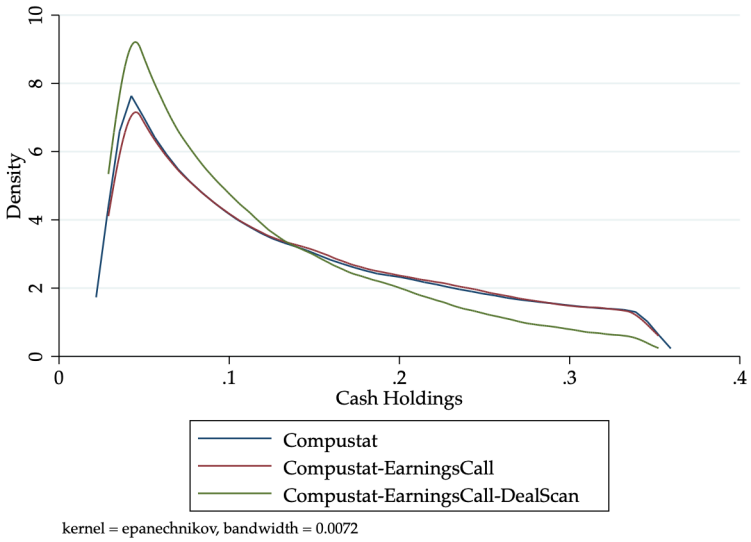


(a) Operating earnings distribution by sample. Operating earnings is the ratio of EBITDA to lagged book value of asset.

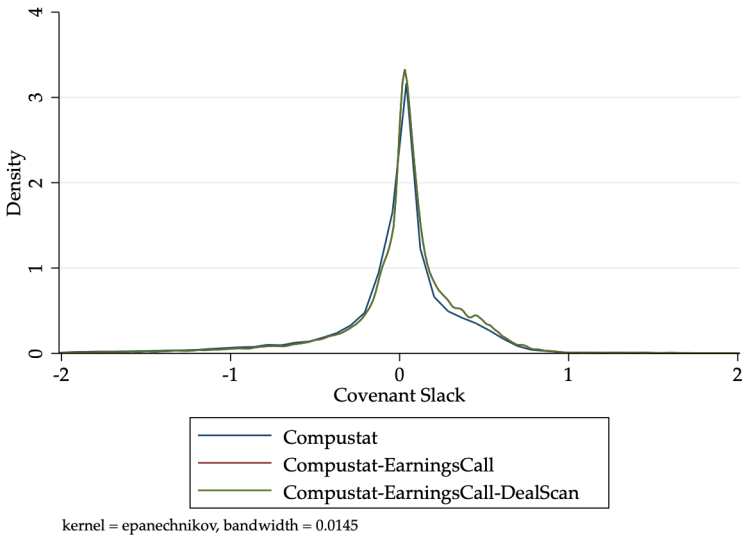


(b) Tobin's Q distribution by sample. Tobin's Q is the ratio of market to book value of asset.

Figure B.3: Distribution by sample. 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) Cash holdings distribution by sample. Cash holdings is the ratio of cash to lagged book value of asset.



(b) Covenant slack distribution by sample.

Figure B.4: Distribution by sample. 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.

B.2 Variable definitions

Variable	Compustat formula and notes	Source
Investments	capxq / l1.atq where capxq = capxy - l1.capxy if fqtr!=1 and capxq = capxy if fqtr==1	Compustat
Net debt issuance	(dltisq - dltrq) / l1.atq	Compustat
Operating earnings	oibdpq / l1.atq	Compustat
Size	log(atq)	Compustat
Acquisitions	acq / l1.atq	Compustat
Book leverage	(dlttq + dlcq) / atq	Compustat
Tobin's Q	(dlttq + dlcq + mcap) / atq where mcap = prc * shrout / 1000	Compustat, CRSP
Cash holdings	cheq / atq	Compustat
PPE	ppentq / atq	Compustat
Interest expense	xintq / l1.atq	Compustat
Depreciation	dpq / l1.atq	Compustat
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
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
Violation	Covenant slack ≤ 0	Compustat, Dealscan
Earnings persistence	Coefficient of regressing operating earnings on its one-quarter lagged value. Regression estimated firm-by-firm on a rolling basis using the previous 20 quarters of observations, with a minimum of 8 quarters of observations.	Compustat

C Textual analysis

C.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 SpaCy's 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.

C.2 Tense detection

The algorithm for detecting tenses are as follows. I use SpaCy's dependency parser to learn the grammatical structure of each subsentence. The relevant output of the dependency parser is each word's 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. Root words do not depend on any other word in the sentence. 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.

C.3 Forward-looking keywords

Table C.1: Forward-looking keywords or key phrases obtained from safe-harbor disclosures of SEC 10-K and 10-Q filings. Keywords and key phrases are stemmed to their roots using the NLTK library's 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.

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

Table C.3: Forward-looking keywords or key phrases obtained from safe-harbor disclosures of SEC 10-K and 10-Q filings. Keywords and key phrases are stemmed to their roots using the NLTK library's 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.

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

Table C.5: Forward-looking keywords or key phrases obtained from safe-harbor disclosures of SEC 10-K and 10-Q filings. Keywords and key phrases are stemmed to their roots using the NLTK library's 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.

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

Table C.7: Forward-looking keywords or key phrases obtained from safe-harbor disclosures of SEC 10-K and 10-Q filings. Keywords and key phrases are stemmed to their roots using the NLTK library's 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.

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

C.4 Sentence examples

Table C.9: Example of subsentences that contains forward-looking covenant mentions. Quarters to violation refer to the fiscal quarter relative to violation event in quarter 0. Bolded 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.

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) "You'll note that we have continued to **improve** on our covenant ratios." (Pharmerica Corp, Feb 5, 2010) 8) "...we **will** proactively reach out to our lender's 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 don't **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)

Table C.10: Example of subsentences that contains forward-looking covenant mentions. Quarters to violation refer to the fiscal quarter relative to violation event in quarter 0. Bolded 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.

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 we've 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 that's what the bank's 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 don't have a concern about an issue with that covenant and the payment rate is in line with our **expectations**." (Conn's 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)

Table C.11: Example of subsentences that contains forward-looking covenant mentions. Quarters to violation refer to the fiscal quarter relative to violation event in quarter 0. Bolded 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.

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..." (Conn's 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)

Table C.12: Example of subsentences that contains forward-looking covenant mentions. Quarters to violation refer to the fiscal quarter relative to violation event in quarter 0. Bolded 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.

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)

Table C.13: Example of subsentences that contains covenant mentions in the past tense. Quarters to violation refer to the fiscal quarter relative to violation event in quarter 0. Bolded words are keywords that identifies a subsentence as in the past tense. 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.

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)

Table C.14: Example of subsentences that contains covenant mentions in the past tense. Quarters to violation refer to the fiscal quarter relative to violation event in quarter 0. Bolded words are keywords that identifies a subsentence as in the past tense. 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.

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 company's 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." (Pilgrim's 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)

Table C.15: Example of subsentences that contains covenant mentions in the past tense. Quarters to violation refer to the fiscal quarter relative to violation event in quarter 0. Bolded words are keywords that identifies a subsentence as in the past tense. 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.

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)

D Model

D.1 Optimality conditions

Consider the entrepreneur's problem characterized by Equations (2)-(7) in the main text. Let λ_t be the Lagrange multiplier on the budget constraint (3) and $\lambda_t\mu_t$ the Lagrange multiplier on the earnings-based borrowing constraint (6). These Lagrange multipliers represent the additional value in utils of relaxing the budget constraint and earnings-based constraint, respectively, by one unit. The first order conditions for optimality are given by

$$\lambda_t = c_t^{-\gamma} \tag{9}$$

$$\beta E[V_{d,t+1}] + \frac{\lambda_t}{R} - \frac{\lambda_t\mu_t}{R} = 0 \tag{10}$$

$$\beta E[V_{k,t+1}] - \lambda_t\Big(1 + \Psi_{1,t}\Big) = 0 \tag{11}$$

where $V_{d,t+1}$ and $V_{k,t+1}$ are, respectively, the first derivative of the value function $V(z_t, k_t, d_t)$ and $\Psi_{1,t}$ is the first derivative 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}.

From the envelope conditions, we have

$$V_{d,t} = \lambda_t \tag{12}$$

$$V_{k,t} = \lambda_t\Big(\alpha z_t k_t^{\alpha-1}(1 + \mu_t\kappa) + 1 - \delta - \Psi_{2,t}\Big) \tag{13}$$

where $\Psi_{2,t}$ is the first derivative of $\Psi(k_{t+1}, k_t)$ with respect to k_t. Simplify by substituting (9) and (12) into (10) and by substituting (9) and (13) into (11).

The equilibrium allocations $\{c_t, d_{t+1}, k_{t+1}\}_{t=0}^{\infty}$ and Lagrange multipliers $\{\lambda_t, \mu_t\}_{t=0}^{\infty}$ are characterized by the following conditions

$$\lambda_t = c_t^{-\gamma} \tag{14}$$

$$\lambda_t(1 - \mu_t) = \beta R E[\lambda_{t+1}] \tag{15}$$

$$\lambda_t(1 + \Psi_{1,t}) = \beta E\Big[\lambda_{t+1}\Big(\alpha z_{t+1} k_{t+1}^{\alpha-1}(1 + \mu_{t+1}\kappa) + 1 - \delta - \Psi_{2,t+1}\Big)\Big] \tag{16}$$

$$c_t = y_t + (1 - \delta)k_t - d_t + \frac{d_{t+1}}{R} - k_{t+1} - \Psi(k_{t+1}, k_t) \tag{17}$$

$$\mu_t\Big(\kappa y_t - \frac{d_{t+1}}{R}\Big) = 0; \mu_t \geq 0; \kappa y_t \geq \frac{d_{t+1}}{R} \tag{18}$$

given stochastic productivity process $\{z_t\}_{t=0}^{\infty}$.

Derivation of Equation (8) in the main text. I show that the entrepreneur balances

the present value of marginal benefit of consumption across periods. To see this, substitute (14) into (15) and iterate the equation forward by $J < \infty$ periods

$$c_t^{-\gamma} = \beta^J R^J E\Big[\prod_{j=0}^{J-1}\Big(\frac{1}{1-\mu_{t+j}}\Big)c_{t+J}^{-\gamma}\Big]$$

From (16), we have

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

From (15), we have

$$E\Big[\frac{\lambda_{t+1}}{\lambda_t}\Big] = \frac{1-\mu_t}{\beta R}$$

Applying the definition of covariances and combining both equations we have

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

Assume that $\psi = 0$, and $\mu_t = 0$, we have

$$\underbrace{E\Big[\alpha z_{t+1}k_{t+1}^{\alpha-1}(1+\mu_{t+1}\kappa)\Big]}_{\text{marginal benefit of capital}} = \underbrace{r+\delta-\beta RCov\Big(\frac{\lambda_{t+1}}{\lambda_t},\alpha z_{t+1}k_{t+1}^{\alpha-1}(1+\mu_{t+1}\kappa)\Big)}_{\text{marginal cost of capital}}$$

Under the more general assumption that $\psi = 0$, and $\mu_t \geq 0$, we have

$$E\Big[\alpha z_{t+1}k_{t+1}^{\alpha-1}(1+\mu_{t+1}\kappa)\Big] = \frac{r+\delta+\mu_t(1-\delta)-\beta RCov\Big(\frac{\lambda_{t+1}}{\lambda_t},\alpha z_{t+1}k_{t+1}^{\alpha-1}(1+\mu_{t+1}\kappa)\Big)}{1-\mu_t}$$

Since $\mu_t \geq 0$, a presently binding constraint has the effect of increasing the marginal cost of capital.

D.2 Parametrization

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 loans
Depreciation rate	δ	0.015	Target steady state avg. investment rate
Capital adjustment cost	ψ	4	Target steady state std. dev. investment rate
Subjective discount factor	β	0.95	Target steady state share constrained & avg. debt/asset
Debt-to-earnings covenant	κ	1.15×4	Target steady state share constrained & avg. debt/asset

Table D.1: Quarterly calibration of the baseline model.

Table D.1 lists the parameter values adopted in the baseline model, which is calibrated to a quarterly frequency. The nine parameters can be assigned into two groups based on their calibration methods. The first set of parameters $(\alpha, \gamma, R, \rho_z, \sigma_z)$ are chosen based on standard values from the literature or data sources external to the model. The second set of parameters $(\delta, \psi, \beta, \kappa)$ are chosen to match key moments of the data. I describe how these values are set below.

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 first set of parameters (δ, ψ) are calibrated by targeting moments related to the firm's investment policy reported in Lian and Ma (2021) based on large nonfinancial firms in Compustat with earnings-based constraints over the sample period from 1997 to 2018. In particular, I set the depreciation rate δ to match the average annualized investment-to-capital ratio of 6 (1.5) percent per year (quarter), and the capital adjustment cost ψ to 4 to match the standard deviation of investment-to-capital ratio of 8 (2) percent per year (quarter).

The second set of parameters (β, κ) are calibrated to target moments related to the firms' debt financing policy. In particular, the subjective discount factor β and debt-to-earnings covenant κ are calibrated by targeting the share of violations of 23 percent and the average book leverage (debt-to-asset) of 32 percent. I draw statistics on covenant violations from Chodorow-Reich and Falato (2021), who study loan data from the Shared National Credit Program (SNC) from 2006 to 2009. Statistics on book leverage are drawn from Lian and Ma (2021). The calibrated subjective discount rate β is 0.95. The financial covenant κ restricts borrowing d_{t+1}/R to a maximum of 4.6 (1.15) times quarterly (annual) 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, 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 $[0.25 \times k_{nss}, 2.75 \times k_{nss}]$, where k_{nss} is the non-stochastic steady state of capital stock. While a relatively large grid is adopted, given the calibration of productivity process adopted in the baseline calibration, all points of the capital grid are visited with positive probability in equilibrium.

The grid for debt d is $[150, 2100]$. In the baseline calibration of the model, all but four end points of the capital grid are visited with positive probability. The solution of the model are the policy functions for next period's capital $k' = g(z, k, d)$ and debt $d' = g(z, k, d)$. Given the policy functions, I then simulate the model for 5 million periods, dropping the first 500 thousand observations as burn-in.

D.3 Model fit: Distributional moments

Targeted moments	Definition	Model	Data
Share constrained	$E[1\{d'/y = \kappa\}]$	0.17	0.23
Debt-to-asset	$E[d/k]$	0.31	0.32
Avg. annualized investment rate	$E[i/k]$	0.061	0.060
Std. annualized investment rate	$\sigma(i/k)$	0.097	0.080

Table D.2: Stochastic steady state distributional moments in the baseline calibration.

Table D.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 23 percent, which matches the share of covenant violations documented in Chodorow-Reich and Falato (2021). The average book debt-to-asset ratio of firms in the sample is 32 percent, which matches the average debt-to-asset ratio of firms in Lian and Ma (2021). Similarly, average investments is a close match to the empirical moment from the literature of 6 percent per year. However, investments in the model are slightly more volatile relative to the data, with a standard deviation of 10 percent per year relative to a standard deviation of 8 percent per year in the data.

Some discussion of the empirical moments are warranted. In my sample, I find that around 29.8 percent of firms are in violation in the average quarter. This is within the estimates in Chodorow-Reich and Falato (2021), who document between 24 to 34 percent of loans were in violation between 2006 to 2009. Chava and Roberts (2008) similarly reports that between 25 and 32 percent of loans are in violation of the net worth and current ratio covenants in a later sample between 1994 and 2005.

Notably, Nini et al. (2012) documents lower fraction of loans in violation when they examine violations reported in SEC filings. They find between 10 to 20 percent of firms were in violation in the average quarter between 1997 and 2008. A key reason is that regulation does not require firms to report violations if they obtain an amendment or waiver before the end of the quarter (Chodorow-Reich and Falato (2021)). However, covenant amendments and waivers are still costly to firms as they incur substantial amendment fees (Lian and Ma (2021)). As such, in the baseline model I do not differentiate between violations that result in changes to loan terms or those that are waived.

I compare the remaining three empirical moments to those in the literature. The average book leverage (debt-to-asset) in my sample is 0.32, which is similar to what Lian and Ma (2021) finds in their sample of large US non-financial Compustat firms. Chava and Roberts

(2008) finds an average book leverage of between 0.26 and 0.29 in the sample of firms with net worth or current ratio covenants. Roberts and Sufi (2009) reports an average book leverage of 0.23 in their sample.

Firms in my sample have an average annualized investment-to-lagged asset ratio of 5.3 percent and standard deviation of 6.2 percent. This is lower than the average annualized investment-to-lagged asset ratio of 6 percent and standard deviation of 8 percent documented in Lian and Ma (2021). Chava and Roberts (2008) examines investments normalized by lagged PPE, hence do not report statistics related to investments normalized by lagged assets. In the model, assets at the beginning of each period is equivalent to the capital stock net depreciation, hence there is no difference between lagged assets and lagged PPE.