

C-SUITE'S ATTENTION AND LEVERAGE DYNAMICS

by

Dingqian (Sara) Liu

dl5165a@american.edu

Updated on August 8, 2021

ABSTRACT

C-Suite managers have limited attention. With massive information from both macro and firm-specific environments, managers try to optimally allocate their limited attention, usually accompanied by judgment biases. To address the role of information rigidity in C-Suite managers' decision-making process, I construct two novel measurements: attention capacity and attention allocation. The measurements are constructed by using public listed firms' quarterly earnings call transcripts and Natural Language Processing (NLP). I demonstrate that managerial attention is associated with firm characteristics and is state-dependent. Using firm-level accounting data, I document the substitution and complementary effect of managerial attention towards macroeconomics in financial decision making. By paying more attention to macroeconomics, managers increase attention capacity and hence learn more about the optimal leverage, resulting in a higher leverage ratio. Paying attention to macroeconomics distracts managers from focusing on firm-specific issues. Therefore, managerial attention to macroeconomics has a negative overall effect on the firm-level leverage ratio. I further document that the substitution and complementary effect together amplifies the role of the business cycle on the manager's financial decision. Finally, I use a theoretical model ...

Keywords: Capital Structure, information rigidity, rational inattention, Natural Language Processing (NLP)

1. Introduction

Since the last financial crisis, the nonfinancial business leverage has mounted to record-high levels¹. The change has been accompanied by a growing body of literature which highlights the impact of macroeconomics on a firm's capital structure decisions². The 2008 Financial Crisis could potentially change the way that managers perceive the macro and systematic risks. The research of corporate finance mainly looks at the changes in macroeconomics, policy, liquidity and adjustment cost³. Part of volatility and heterogeneity in firm-level leverage remains unexplained⁴. The behavioral side of managers is largely neglected, especially in empirical studies due to measurement challenges. Most research is built on the assumption that executive managers are rational and have perfect information.

Limited attention and suboptimal attention allocation are not uncommon. Managers are faced with information rigidity problems in both inner communication (Robson and Tourish, 2005) and during perceiving macroeconomic environment (Hassan et al., 2019; Baker et al., 2016). Limited attention will affect how managers interpret news from macroeconomics and firm-specific conditions and cause cognitive biases. The role of limited attention can help explain a firm's capital structure fluctuations. A few questions come out naturally. Is managerial attention capacity constant or variable? Do managers pay more attention to firm-specific or macroeconomic issues? Does limited attention af-

¹The U.S. non-financial corporate business's debt securities and loans over GDP reach 52% in Quarter four, 2020. See Board of Governors of the Federal Reserve System (US), Non-financial Corporate Business; Debt Securities and Loans; Liability, Level [BCNSDODNS], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/BCNSDODNS>, June 30, 2021.

²See (Duffie et al., 2003; Fama, 1986; Hackbarth et al., 2006)

³See Hackbarth et al. (2006), Karpavičius and Yu (2017), Faccio and Xu (2015), Heider and Ljungqvist (2015), Leary (2009) and Jordà et al. (2020). Faccio and Xu (2015) and Heider and Ljungqvist (2015) found a significant positive correlation between tax rate and leverage ratio.

⁴Lemmon et al. (2008) points out that firm-level leverage has an unobserved time-varying unexplained. Graham and Leary (2011) makes the same argument of cross-section leverage variations

fect firm-level leverage? Does managerial attention play a role in amplifying the leverage cycles? Can managerial attention help to explain the unprecedented high level of business leverage?

This paper seeks to analyze the role of manager behavior in explaining the record-high business leverage by providing two novel measurements of public listed firms' manager attention for the past two decades. Making use of quarterly earnings call transcripts and Natural Language Processing (NLP), I construct two attention measurements at the firm level: attention capacity and attention allocation. With these two measurements, I document that managers' leverage ratio decision is positively correlated with their attention capacity and negatively correlated with attention allocation towards macroeconomics. As a result, paying attention to macroeconomics has both substitution and complementary effects on managerial financial decisions using firm-specific information. By looking at the role of the business cycle, I further document that because of cognitive bias, paying attention to macroeconomics amplifies the effect of the business cycle on firm-level leverage ratio.

Related Literature There are three related strands of literature. The first addresses with the role of macroeconomics in a firm's financial decision. The second literature is about information rigidity. The last strand is about machine learning.

Traditional studies of corporate finance ignore the role of business cycle and focus more on firm-specific conditions⁵. A heightened volume of research appearing in the past 20 years focuses on how macroeconomics determinate capital structure⁶. Business cycles

⁵?, Rajan and Zingales (1995), Hovakimian et al. (2001) and Hovakimian et al. (2004) provide evidence that various firm characteristics are related to firm's leverage ratio.

⁶Choe et al. (1993) first show that macroeconomics are important factors to a firm's financing choices. Levy and Hennessy (2007) and Brunnermeier and Krishnamurthy (2020) share the same idea. Indeed the three major theories (trade-off, pecking-order, and market timing) about a firm's financing decisions all emphasize the role of macroeconomics.

can affect a firm's financial choice with default risk, credit risk, liquidity and cash flow⁷.

There are several discrepancy remains in the literature. Firstly, theoretical studies yield both pro-cyclical and counter-cyclical patterns of leverage ratio⁸. Meanwhile, empirical findings⁹ report a pro-cyclical aggregate leverage ratio. A large variation and heterogeneity in firm's leverage choice¹⁰ remains unexplained.

This paper makes an contribution to the corporate finance literature in the following three ways: 1) I introduce information rigidity as a new factor of firm-level leverage variations, which also has cyclical patterns; 2) I point out that information rigidity can further serve as psychological channels of how managers perceive the macroeconomic changes. 3) I blend variant attention capacity and attention allocation into a structural model.

This paper also closely connects with information rigidity literature. As Gabaix (2019) points out, "Traditional rational economics assumes that we process all the information that is freely available to us". The numerous research shows that roughly halfway between paying attention and not paying attention (Gabaix, 2019). A new wave of studies investigate how would agent's attention impact the decision process. Most research focuses on the real economic activity, such as consumer decisions, manager's decisions on

⁷Fama (1986), and Duffie et al. (2003) provide evidence that business cycles impact the probability of default. Hackbarth et al. (2006) study the role of credit risk. Faulkender and Petersen (2006) firstly document the role of the supply-side of liquidity. Firms that have access to public bond markets choose to have more leverage

⁸Hackbarth et al. (2006) reported a counter-cyclical leverage. Similar results are found in Levy and Hennessy (2007) with less financially-constrained firms, Chen (2010) with firm's actual leverage ratio, Halling et al. (2016) with target leverage ratio, and Erel et al. (2012) with financially unconstrained firms. Oppositely, Bhamra et al. (2010) found the capital structure pro-cyclical using a consumption-based asset-pricing model. Chen (2010) found the firm's target leverage ratio pro-cyclical. Erel et al. (2012) found the capital raising of non-investment grade borrowers pro-cyclical.

⁹Frank and Goyal (2009) and Jermann and Quadrini (2006)

¹⁰Korajczyk and Levy (2003) document that macroeconomic conditions affects financially unconstrained firm's capital structure choice but not for financially constrained firms. Begenau and Salomao (2019) note that big and small firms use different financing policy over the business cycle.

real production and hiring, professional forecaster's behavior on forecasting.

Recent findings show that managers treat information from macro and micro sources differently¹¹. Efforts in finance are mostly made in explaining an investor's investment behavior. Hirshleifer and Sheng (2021) focus on investor's attention to macro and micro news. Dessein and Santos (2021) build a theoretical model and focus on the allocation of managerial attention. They also yield that a manager's behavior matters more in a complex environment. Hirshleifer and Teoh (2003) point out investors have limited attention and ability to process information. Hirshleifer et al. (2009) demonstrate that limited attention results in market reactions to relevant news. Kacperczyk et al. (2016) focus on mutual fund manager's attention allocation. Overall, there is a good amount of theoretical paper. Comparatively, empirical research on attention has been slowly developed because of measurement challenges. There are so far six ways to measure attention¹²: 1) deviations from an optimal action (Coibion and Gorodnichenko, 2015; Baker et al., 2020; An, 2019); 2) deviations from normative cross-partials; 3) physical measurement (e.g. eye-tracking); 4) surveys (Meyer et al., 2021; Candia et al., 2021); 5) imputations from the impact of attentional interventions ; 6) Natural Language Processing(Hassan et al., 2019, 2021; Flynn and Sastry, 2020).

The caveat of using deviations from an optimal action may cause misalignment issues. As the microdata usually speaks about forecasters' attention instead of managers' attention. Thus, it's problematic to connect forecaster's expectations with managers' actions. The drawback of using survey data is that the managers may not fully understand

¹¹Meyer et al. (2021), Chen et al. (2021) and Candia et al. (2021) show that comparing to firm-specific issues, managers pay less attention towards macro conditions. Candia et al. (2021) further points out that most CEO are unaware of the current rate of inflation and the Fed's inflation goals. Maćkowiak et al. (2009) point out that decision-makers in firms pay significantly more attention to sector-specific conditions than to aggregate conditions. Similar findings see Zhang (2017)

¹²This classification builds on Gabaix's (2019) and DellaVigna's (2009).

macroeconomics terms such as inflation and GDP growth.¹³. The results from the survey data may be contaminated by managers' partial understanding of the macroeconomic variables. Using NLP would consider managerial comprehensive understanding and attention distributed to the macro conditions. The result shows that the same pattern exists.

This paper differs from the literature in the following ways: 1) I provide novel measurements of firm-level manager's attention capacity and attention allocation for around two decades. This is the first attempt looking into these two concepts in finance to the author's best knowledge; 2) Using NLP, the way that I use to measure the attention variables are free from manager's inaccurate understanding of macroeconomic variables, which could be common in survey data; 3) This paper is the first one (to the best knowledge of author) using non-survey data to uncover this firm-level attention distribution.

This paper also relates to the application of machine learning as well as natural language processing in social science. Classic applications can be found in Baker et al. (2016), Hassan et al. (2019, 2021) and Flynn and Sastry (2020). "*Measuring attention is still a hard task*" (Gabaix, 2019). Measuring an abstract concept such as *attention* is challenging. This paper mainly follows the methodology introduced in Flynn and Sastry (2020) (hereafter FS), which uses the *Term Frequency-Inverse Document Frequency (TF-IDF)* and 10-Q documents to construct the macroeconomic attention. They focus on the aggregate level of informativeness and found that at the aggregate level, firms' attention to macroeconomics is counter-cyclical. Despite asking the firm's macro attention, they didn't push further and consider the important role of attention capacity and attention allocation.

This paper differs from the previous research in the following two ways: 1) I focus on the information perspective of the measurement using TF-IDF and provide rationalization

¹³See Meyer et al. (2021)

that two independent measurements are additive; 2) I make the connection of empirical measurement with the theoretical model based on information theory. Because both TF-IDF and rational inattention model are built on information theory and share the same unit - one bit of information.

The rest of the paper is structured as follows: Section 2 introduces the measurement of managers' attention capacity and attention allocation, using quarterly earnings call transcripts and TF-IDF, and presents the time series of the two variables. Section 3 documents two major empirical pieces of evidence that paying attention to macroeconomics has both substitute and complementary effects on leverage ratio. Section 4 presents the robust test of my empirical results with two sets of difference categorization using the main sample data. Section 5 describes my model of firm-level ...and discusses how I solve and estimate the model. Section 6 concludes.

2. Measuring C-Suite's Attention Capacity and Attention Allocation

This section aims at introducing the construction of the two key variables of this paper: attention capacity and attention allocation. I start this section with the definition of attention capacity and attention allocation. I then introduce the text data used to generate the variable, which are the quarterly earnings call transcripts and the textbooks. Next, I show the methods to prepare the documents. Finally, I demonstrate the TF-IDF algorithm in detail, the key terms selected for each attention category, and how to interpret the results.

2.1 Attention Capacity and Attention Allocation

Entering the big data era, we are fighting for limited attention and learning to optimally allocate our attention. The limited attention comes from three parts. First, we all have twenty-four hours per day, and we each decide how to make the best of it. Second, the most majority of us can only focus on one thing at a time. Multitasking

usually lowers one's work efficiency. Third, we have limited capacity for information processing. For example, human performs poorer in complicated computation compared to computers. In this paper, I define attention capacity as a manager's total attention as the units of useful information that are paid to work. This is the key to understand that executive managers in big firms have on average higher attention capacity than the same level managers in small firms, as I will show in the empirical research part. Because first, acquiring knowledge about the macro environment is harder and more costly than firm-specific issues. Big firms can afford news terminals, such as Bloomberg, and macro consultancy services. Second, big firms usually have larger exposure to macroeconomics, making the cost of not paying attention higher. In another word, executive managers in smaller firms are rationally inattentive to macroeconomic information.

We are making attention allocation decisions all the time. The problem can come from, whether multitasking, to should I spend the time working, or have fun in nature. In this paper, I provide a narrow definition of attention allocation. Only considering executive managers' working time, I define attention allocation as the percent ratio of attention that an executive manager pays to macroeconomic information. Executive managers are known to have tight schedules. When making a decision, they need to consider both the outside environment and only firm-related issues. They also make an effort with both inner and outer communication. Sometimes a decision has to be made before thorough considerations. Thus, paying attention to macroeconomics can help managers collect useful information as well as distracts managers from focusing on tasks that are known critical to firm development.

2.2 the Quarterly Earnings call Transcripts

I use the quarterly Earnings Call Transcript¹⁴ of publicly listed firms to construct

¹⁴Also used in Hassan et al. (2019), Flynn and Sastry (2020) and Hassan et al. (2021)

manager's attention. I first measure managers' attention toward macroeconomic and firm-specific conditions separately.

An earnings call conference is held once every quarter before its 10-Q or 10-K available, in the form of teleconference or webcast. A public listed company uses the call as an opportunity to discuss the financial results, the cause, and the forecasting of future operations of a reporting period (quarterly). The calls usually happen when the stock market is closed so that all investors can have a chance to learn about this company's performance before trading. To make sure investors and analysts are informed about the calls, the notices of the earnings calls are usually announced a few days or weeks in advance. The notifications are usually posted on the firm's website under a section named Investor Relations or Investors. Of course, professional financial data providers such as Bloomberg, FactSet, and Thomson Reuters will remind analysts about the upcoming earnings call. For individual investors, brokers such as Robinhood, push the notifications too. Many companies provide the recordings or presentation slides from the calls for investors who missed the meeting. It is worth noting that though the vast majority of firms host the earnings call conference, some small firms with very few investors have the exemption not to host the earnings call. The call often starts with a safe harbor statement¹⁵, a presentation, and a discussion of the firm's financial result and a Q&A session. In the call, the C-Suite also discusses the details of its coming SEC Form 10-Q (quarterly report) or 10-K (annual report).

I choose earnings call transcripts over Form 10-Q for the following three reasons. 1) It consists of the executive manager's speaking, making sure that I'm measuring the manager's attention; 2) The statement updates more promptly than the risk part in Form 10-Q, where the same statements can repeat a few times; 3) The call transcripts

¹⁵A safe harbor statement is made to inform the audience that the discussion can consist of forward-looking statements, which are not factual statements

include a Q& A session where the institutional investors and professional analysts can ask the executive team questions. With the question session, the chance that the executive managers intentionally hide information is smaller than in Form 10-Q and 10-K.

2.3 Textbooks

During the term selection phase, I use three classic textbooks of Corporate Finance to select terms about firm-specific issues. *Essentials of Corporate Finance* by Ross, Stephen A., Randolph Westerfield, Bradford D. Jordan, and Ernest N. Biktashev, *Financial Reporting and Analysis* by Gibson, Charles H, *Principles of Corporate Finance* by Brealey, Richard A., Stewart C. Myers, Franklin Allen, and Pitabas Mohanty¹⁶. I use two classic textbooks of Macroeconomics to select terms about macroeconomic conditions. *Macroeconomics Principles and Policy* by Baumol, J. W., and S. A. Blinder. *Principles of Macroeconomics* by Mankiw, N. Gregory, Ronald D. Kmec, Kenneth James McKenzie, and Nicholas Rowe¹⁷. I present the justification of using text to reference the most informativeness terms in the *Term Identification* section.

2.4 Preparing The Documents

After obtaining the transcripts from the FactSet database, I conduct the following steps for pre-processing¹⁸. 1) Each transcript consists of paragraphs and sentences, which are seen as strings in NLP. I perform string tokenization by simply split each document into words and use the Natural Language Toolkit (NLTK)¹⁹ to drop stop words. 2) I use word stemming to normalize the words with the same root. In this way, words with the same word root can be aggregated. Otherwise, the frequency of the words can be

¹⁶The edition of the textbooks are 9th, 12th and 12th separately.

¹⁷The edition of the textbooks are 14th and 6th separately.

¹⁸Pre-processing refers to the process of converting data to something a computer can understand. Here the goal is to decompose a document into useful words, which serve as a unit.

¹⁹A common library in Python for Natural Language Processing

underestimated and thus bias the measurement. The same steps apply to textbooks too.

The NLP algorithm that I use to conduct this measurement is called *Term Frequency-Inverted Document Frequency (TF-IDF)*. It measures whether a word is frequent in a given document, relative to its frequency in the entire corpus. Here, the single document could be a textbook or an earnings call transcript. The corpus is the set of call transcripts.

2.5 Introducing TF-IDF

I start the demonstration of *TF-IDF* with the definition of the symbols. In this section, w represents each individual term, $d_{f,t}$ represents each individual document for firm f at quarter t , which can also be seen as a vector of w . D represents the set of earnings call transcript documents across all firms f and all quarters t and B represents the set of textbooks b .

The definition of *TF-IDF* is as follows. *term-frequency* can be seen as the occurrence number of each term w over the total number of words in document d . Define N_d as the number of all terms in document d , and define $n_{w,d}$ as the frequency of term w appear in document d .

$$tf(w, d) := \frac{n_{w,d}}{N_d} \quad (1)$$

document-frequency can be seen as the fraction of documents $d_{f,t}$ in the set of documents D , that contains the term w . Define N_D as the number of documents in the set D , and define $n_{w,D}$ as the number of documents $d_{f,t}$ that contains the term w .

$$df(w, D) := \frac{n_{w,D}}{N_D} \quad (2)$$

$$idf(w, D) := \log\left(\frac{1}{df(w, D)}\right) \quad (3)$$

Putting together, the *tf-idf*, or *term-frequency-inverse-document-frequency*, measures the weighted occurrence of a term in a document relative to its weighted occurrence in the entire corpus:

$$tf\text{-}idf(w, d_{f,t}, D) := tf(w, d_{f,t}) \cdot idf(w, D) \quad (4)$$

Equation (1) indicates that $0 \leq tf(w, d_{f,t}) \leq 1$. Equation (2) implies that $0 \leq df(w, D) \leq 1$, thus, in equation (3), $idf(w, D) \geq 0$. According to information theory, $tf(w, d_{f,t})$ is the probability of a term w appears in a random word in document $d_{f,t}$. Analogically, $df(w, D)$ is the probability of w appears in in a random document $d_{f,t}$. Aizawa (2003) demonstrates a way to interpret *tf-idf* from the information theory perspective. $idf(w, D)$ can be seen as the amount of information gain after observing the term w and $tf(w, d_{f,t})$ represents the probability that the term w is observed. *tf-idf* can be the expected information gain of a term w .

2.6 An Example to Present TF-IDF Calculation

In Table 1 below, I present the *tf-idf* and the inter-median calculation process for four represented terms. Comparing *gdp* and *monetari*, *gdp* occurs more in both the textbook and the D corpus, thus *gdp* has higher *tf* and lower *idf*. As the value of *tf-idf* is a simple product of *tf* and *idf*, *gdp* ends up with a higher *tf-idf* value than *monetari*. The term *use* is a very common word. Thus it has a higher frequency in both textbook and the corpus comparing to *monetari*. The *tf* value of *monetari* and *use* is the same, but *use* has a lower *idf*. It means that to my sample corpus, *use* is less informative than *monetari*. Thus, *use* has a much lower *tf-idf* value than *monetari*. *handicraft*, on the other hand, rarely occur in either textbook or my sample corpus. Though *handicraft* is very informative (with a high *idf*), it's misleading when expressing macroeconomics news. Thus, *handicraft* has a low *tf-idf* despite a high *idf*. To conclude, *idf* measures the *informativeness* of a term within the corpus, while *tf* measures the *relevance* of a term to

a certain context, which in this paper, it's how much a term is relevant to macroeconomic or firm-specific conditions.

Table 1: An Example for Term-level *tf-idf* Calculation

Term	Term Frequency	tf	Document Frequency	idf	<i>tf-idf</i>
gdp	1080	0.006	11952	2.813	0.017
monetari	494	0.003	3340	4.088	0.011
use	501	0.003	199065	0.00001	0.000000028
handicraft	1	0.000006	1	12.201	0.000068

Note: This table shows an example of intermediate steps while calculating *tf-idf*. The data is extracted from W_{macro} term identification process using *Macroeconomics Principles and Policy* by Baumol, J. W., and S. A. Blinder.

2.7 Term Identification

The goal of this section is to select a set of terms w_{macro} and a set of terms w_{firm} which can represent the informativeness of macroeconomic and idiosyncratic conditions separately in the earnings call transcripts. Using each textbook b_i , where i represents textbooks of macroeconomics or corporate finance. I first calculate the $tf(w, b_i)$ for each term w appears in b . Then for each term w in the earnings call transcript corpus D , I calculate the $idf(w, D)$. Finally, by combining $tf(w, b_i)$ and $idf(w, D)$, I calculate $tf-idf(w, b_i, D)$. Terms that don't appear in b_i and D , will be dropped automatically at this step. I then take the top 200 terms with the highest $tf-idf(w, b_i, D)$ values from terms in each textbook b_i , and take the *intersection*²⁰ to generate the candidate bag of words

²⁰This step helps to eliminate bias from any single textbook.

w_{macro} and w_{firm} ²¹. It's possible that w_{macro} and w_{firm} contain the same terms that may bias the measurement, thus I exclude the mutual terms of the two-word sets from each bag of words. In the next section, I use w_{macro} and w_{firm} to construct the manager's attention toward macroeconomic and idiosyncratic conditions. Table 2 below shows the final terms for each category.

²¹For macroeconomics, I take intersection across terms of two textbooks, and for firm-specific conditions, I take intersection across terms of three textbooks.

Table 2: Terms Selected with TF-IDF

Category	Terms
Macro	gdp, monetari, deficit, equilibrium, inflat, unemploy, polici, aggreg, multipli, economist, economi, suppli, wage, export, govern, recess, fed, nation, demand, expansionari, labor, phillip, stagflat, fiscal, consumpt, feder, bushel, nomin, surplu, econom, consum, employ, macroeconom, currenc, crisi, tariff, foreign, deflat, crowd, polit, policymak, boom, societi
Micro	bond, firm, dividend, stock, discount, creditor, bankruptci, equiti, return, financ, loan, yield, stockhold, asset, turnov, payment, inventori, matur, valuat, nyse, borrow, debt, liabil, paid, premium, payabl, flow, vote, tax, analysi, owner, pay, depreci, payout, mutual, default, yahoo, taxabl, worth, fix, principl, short, inflow

¹ I use the following three textbooks of corporate finance to select firm-specific terms. *Essentials of Corporate Finance* by Ross, Stephen A., Randolph Westerfield, Bradford D. Jordan, and Ernest N. Biktimirov, *Financial Reporting and Analysis* by Gibson, Charles H, *Principles of Corporate Finance* by Brealey, Richard A., Stewart C. Myers, Franklin Allen, and Pitabas Mohanty. I use the following two textbooks of Macroeconomics to select terms about macroeconomic conditions. *Macroeconomics Principles and Policy* by Baumol, J. W., and S. A. Blinder. *Principles of macroeconomics* by Mankiw, N. Gregory, Ronald D. Kneebone, Kenneth James McKenzie, and Nicholas Rowe.

2.8 Construct the Measurements

The firm-level attention to macroeconomic conditions and firm-specific conditions is defined as follows:

$$\text{AttentionToMacro}(f, t) := \sum_{w \in w_{macro}} \text{tf-idf}(w, d_{f,t}, D) \quad (5)$$

$$\text{AttentionToFirm}(f, t) := \sum_{w \in w_{firm}} \text{tf-idf}(w, d_{f,t}, D) \quad (6)$$

To construct the panel database of manager's attention capacity, I simply take the sum of $\text{AttentionToMacro}(f, t)$ (hereafter ATM) and $\text{AttentionToFirm}(f, t)$ (hereafter ATF). To adjust for the scale for a better display, I also time the obtained value with 100. For attention allocation, I define it as the manager's attention allocating to macroeconomics. I time the value with 100 to present it in the percentage format.

$$\text{AttentionCapacity}(f, t) := (\text{AttentionToMacro}(f, t) + \text{AttentionToFirm}(f, t)) \times 100 \quad (7)$$

$$\text{AttentionAllocation}(f, t) := \frac{\text{AttentionToMacro}(f, t) \times 100}{\text{AttentionCapacity}(f, t)} \times 100 \quad (8)$$

In the following sections, I will mainly use AttentionCapacity and $\text{AttentionAllocation}$ in empirical analysis as well as in theoretical model.

2.9 Presenting C-Suite's Attention

In this section, I use the constructed novel attention measurements to document the findings of C-Suite managers' attention, specifically:

1. Paying attention to macroeconomics have both substitution and complementary effect to an executive manager's financial decisions. When paying more attention to macroeconomics, an executive manager expands attention capacity, which has a significantly positive effect (complementary) on leverage ratio. Meanwhile, paying more attention to macroeconomics also makes an executive manager allocation more attention to macroeconomics, which has a significantly negative effect (substitution) on leverage ratio. The substitution effect is stronger than the complementary effect.

2. The complementary effect described above amplifies the role of the business cycle towards firms' capital structure. In a recession, the negative real GDP growth rate has a positive effect on the leverage ratio through the attention capacity channel.

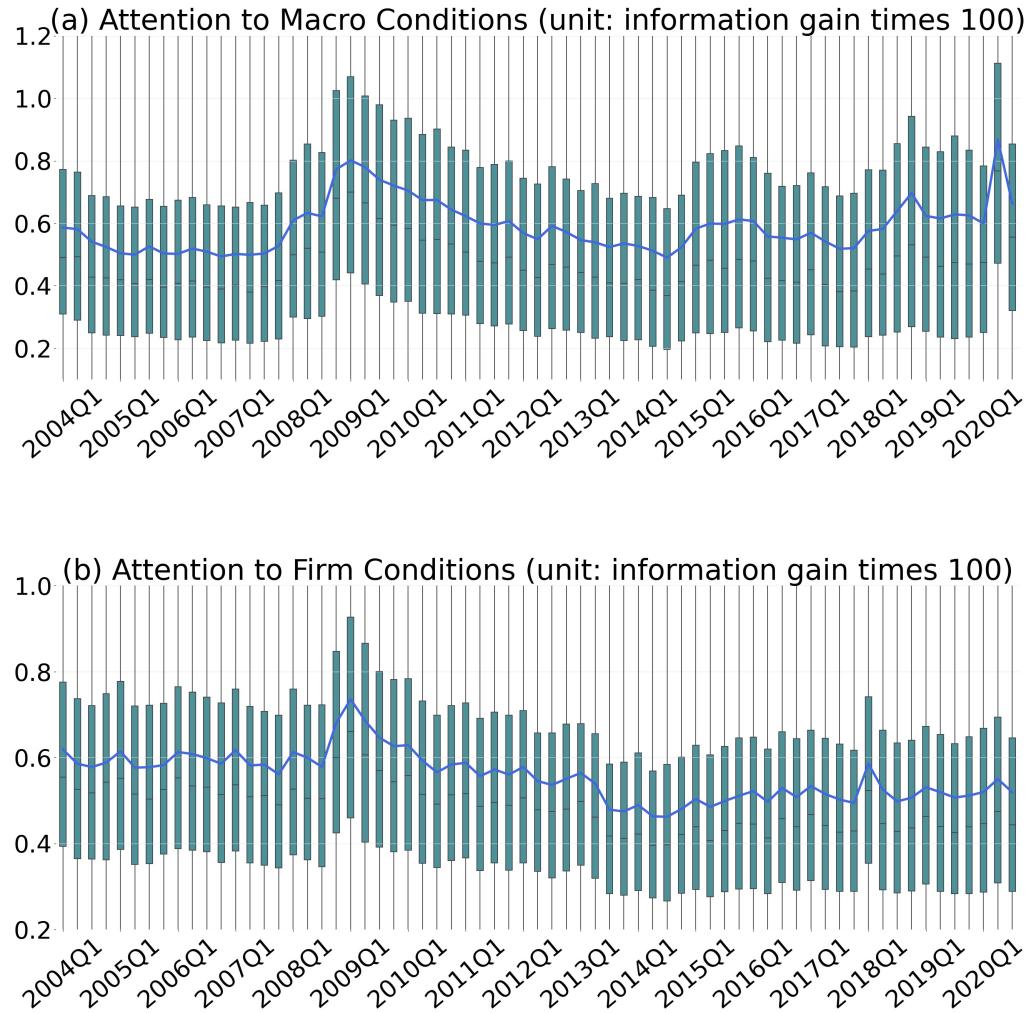
Figure 1 shows the aggregated C-Suite's attention towards macroeconomic and firm-level conditions. The manager's attention capacity is counter-cyclical and positively correlated with firm size and profitability. Intuitively, larger firms have more financial capacity to afford more information towards both macroeconomic and idiosyncratic shocks. The counter-cyclical pattern in the managers' attention is mainly driven by their attention towards macroeconomics. The Covid-19 pandemic triggers more attention towards macroeconomics than the 2008 Financial Crisis. There is no cyclical pattern on attention towards idiosyncratic shocks. The Covid-19 pandemic brings more common shocks than idiosyncratic shocks. It could be that firms with higher exposure to macroeconomics will tend to pay more attention to macroeconomics. This finding is surprisingly consistent with Lemmon et al. (2008).

These findings are consistent with rational inattention theory. When the shock is too big to ignore, meaning the cost of not paying attention becomes too big, the agents will choose to pay attention. Firms expand more than 30% of their attention capacity towards macroeconomics during economic downturns.

Figure 2 shows the aggregated attention capacity and allocation, the key variables in this paper.

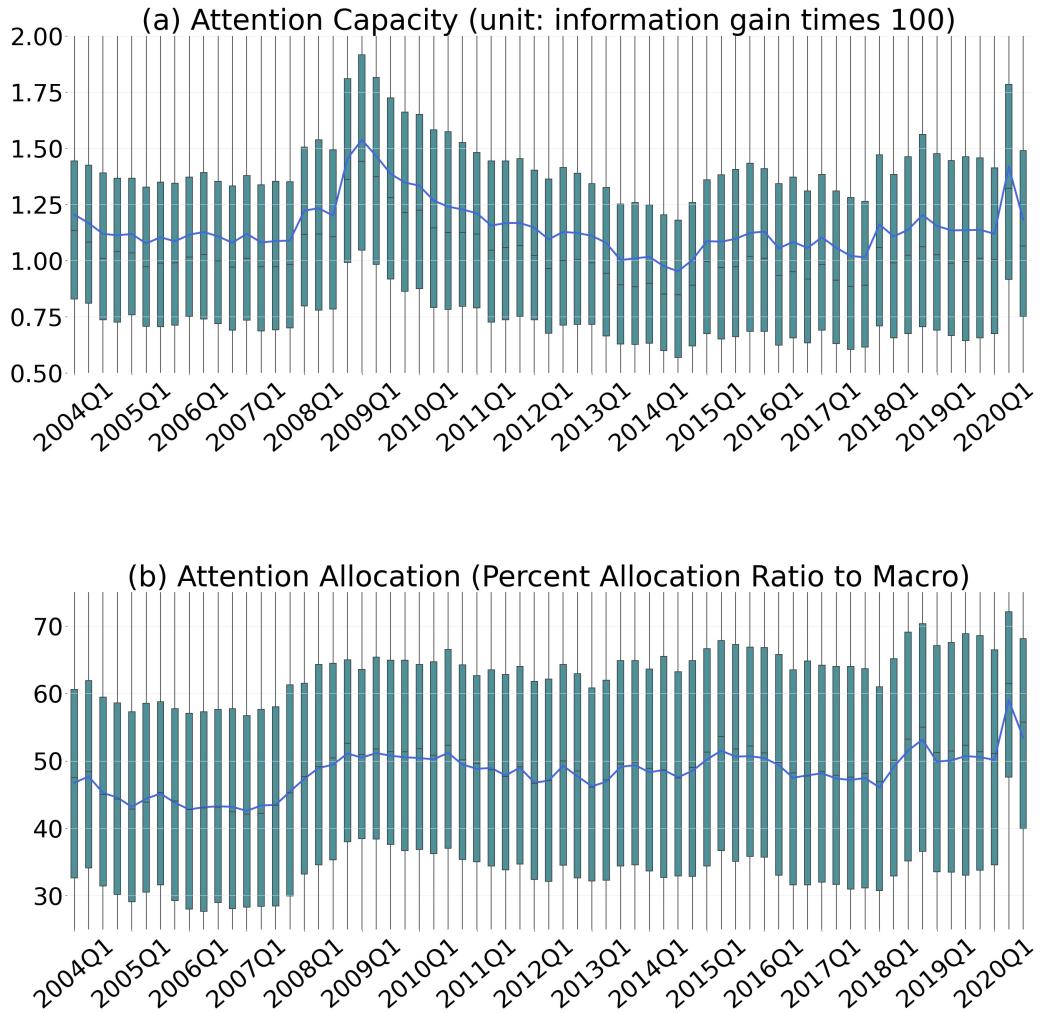
These findings are consistent with rational inattention theory. When the shock is too big to ignore, meaning the cost of not paying attention becomes too big, the agents will choose to pay attention. Firms expand more than 30% of their attention capacity towards macroeconomics during economic downturns.

Figure 1: Aggregated Manager's Attention towards Macro and Idiosyncratic Conditions, 2004Q1 – 2020Q3



Note: This figure shows manager's attention to macroeconomic and firm-specific conditions. The Box-Whisker plots represent the distribution of firm's attention in each quarter. The line plot shows the aggregated attention.

Figure 2: Aggregated Executive Manager's Attention Capacity and Allocation, 2004Q1 – 2020Q3



Note: This figure shows manager's attention capacity and attention allocation. The Box-Whisker plots represent the distribution of firm's attention in each quarter. The line plot shows the aggregated attention.

Cross-sectional Heterogeneity and Managerial Attention

A natural question after having the measurement of attention capacity and attention allocation is that what causes this difference. In general, a manager's attention capacity is positively correlated with firm size, profitability, tangibility, market to book value, and leverage, while it is negatively correlated with the real GDP growth rate. Executive manager's attention allocation is positively correlated with firm size and profitability, while it is negatively correlated with the market to book value, tangibility, leverage, and real GDP growth rate.

1. Managerial attention capacity (hereafter AC) and attention allocation (hereafter AA) towards macroeconomics are counter-cyclical, as macroeconomics news are more salient in recession than in expansion. See Figure A.1.
2. AC and AA are size-dependent. Big firms run business in different states and even different countries, thus they are more exposed to macroeconomic fluctuations than smaller firms. See Figure A.2.
3. For similar reasons, financially unconstrained firms have higher AC and AA because they attend the public bond market and are more exposed to common shocks than financially constrained firms²². See Figure A.3.
4. AC and AA are higher for firms with higher profitability. Because it is costly to understand macroeconomic news and policies. Thus, more profitable firms will be more likely to afford the expenses such as hiring an economist as a consultant and purchasing media services. See Figure A.4.

Table 3 shows the correlation matrix.

²²In the later section, I define financially constrained firms as those who has bond ratings, while financially unconstrained firms don't have bond ratings

Table 3: Variable Correlation Matrix

	Leverage(market)	Leverage(book)	AttenCapacity	AttenAllocation
Firm Size	0.32	0.36	0.18	0.10
Profitability	0.06	0.07	0.18	0.10
Market to Book	0.04	0.36	-0.02	-0.03
Tangibility	0.37	0.27	0.15	-0.07
Leverage(market)			0.22	-0.09
Leverage(book)	0.79		0.15	-0.06

¹ This table presents correlation. All values are significant at 1% level

3. Empirical Analysis

3.1 Data and Sample Selection

The primary sample includes firms in the quarterly Compustat database. I first restrict the sample to the firms that are listed on the major US Stock Exchange – the New York Stock Exchange (NYSE), and National Association of Securities Dealers Automated Quotation (NASDAQ). I then exclude firms that are in Finance, Insurance, and Real Estate (SIC Codes 6000-6799), regulated division (SIC Codes 4000-4999) and Non-classifiable division(SIC Codes 9900-9999). Table A.1 provides more information on the SIC code and corresponding Divisions. I further drop the firms that last less than two years (eight quarters) as young firms have different financing policies. Finally, to mitigate the effect of outliers and eradicate errors in the data, I trim all variables at the upper and lower 0.5 percentiles. The earnings call transcripts are obtained from the FactSet database and written in English. When indexing the quarter of each call transcript file, I use the quarter when the call happens instead of the quarter to which the discussion applies. In this way, each transcript documents the C-Suite’s belief of that time with less

than one quarter forward-looking horizon. After merging the two databases, the sample consists of 127678 documents covering the period from 2004Q1 to 2020Q3 for 3481 firms.

Following Welch (2011), I define financial debt (FD) over capital (CP) as the leverage ratio, where capital equals to financial debt plus equity. Welch (2011) points out that the widely-used leverage ratio defined as financial debt over total assets is biased, as this definition ignores the role of non-financial liabilities. He argues that when using FD over total Asset (AT) as the leverage ratio, the leverage ratio becomes lower when a firm has more equity, and when it has more non-financial liabilities. In effect, non-financial liabilities are counted the same as equity. Under this definition, there are two ways to define capital: book value of capital (BCP) and market value of capital (MCP). Other variables are shown in Table 3. Table 4 shows the summary of variables.

Figure A.5 shows the industry distribution of the sample.

Table 4: Variable Construction using the Compustat Sample (Quarterly)

Variable Name	Variable Construction
Financial Debt (FD)	long-term debt (DLTTQ)+debt in current liabilities (DLCQ)
Market value of capital(MCP)	Financial Debt (FD)+market value of equity (MEQ)
Market value of equity (MEQ)	close price (PRCCQ)×common share outstanding (CSHOQ)
Book value of capital (BCP)	Financial Debt (FD) + Book value of equity (BEQ)
Book value of equity (BEQ)	Stock-holders equity (SEQQ)+non-controlling interests (MIBTQ)
Firm size	$\log(\text{assets(ATQ)})$, where assets are deflated by the GDP deflator
Profitability	Operating income before depreciation(OIBDPQ)/Assets (ATQ)
Market-to-Book ratio	Market value of equity (MEQ)/Book value of equity (BEQ)
Tangibility	Net Property Plant and Equipment (PPENTQ)/Asset (ATQ)
AttentionToMacro	author calculation
AttentionToFirm	author calculation
AttentionCapacity	(AttentionToMacro + FirmAttention)*100
AttentionAllocation	((AttentionToMacro*100)/AttentionCapacity)*100

¹ The capitalized abbreviations in parenthesis follow the Compustat mnemonics when not otherwise defined. The definition of the leverage follow Welch (2011) and his website (the part of Notes on Debt Ratios). In Compustat raw data, DLC can be negative, I treat it as missing value (na). These firm characteristics are commonly used in corporate finance literature.

Table 5: Variable Definition and Transformation

Variable	Transformation	Mean	Standard Error	Median
Leverage(book)	FD^1 / BEQ^2	0.32	0.28	0.29
Leverage(market)	FD / MEQ	0.19	0.20	0.13
Firm Size	$\log(bookassets^3)$	9.20	1.77	0.75
Profitability		0.02	0.05	0.03
Tangibility		0.23	0.23	0.15
Market to Book	MEQ / BEQ	9.09	33.76	2.53
ATM	ATM times 100	0.59	0.49	0.47
ATF	ATF times 100	0.55	0.34	0.48
AttentionCapacity		1.14	0.64	1.03
AttentionAllocation		48.42	21.15	48.94

¹ FD stands for Financial Debt

² BEQ is the book value of equity = *stockholders' equity + noncontrolling*

³ deflated with GDP deflator

3.2 Variance Decomposition

To find the dominance of the firm-level leverage changes, I decompose the variation in leverage changes into its common (aggregate), industrial and idiosyncratic components using the panel variance decomposition methods²³. The variance decomposition follows a two-stage panel regression strategy. At the first stage, the aggregate component is uncovered by regressing market leverage ratio (or leverage ratio growth rate) on time dummies and clustering standard errors at the firm level. At the second stage, the regression takes the residual series from the first stage and regress on the interaction of time dummies and sector dummies. From the second stage, the residual series were separated into a sector (SIC division) component and an idiosyncratic component. The result shows that the idiosyncratic component is the most volatile. The relative standard deviation of the idiosyncratic component (0.20) is 5 times bigger than that of the aggregate component (0.04) and 6.7 times bigger than that of the sector-specific component (0.03). It further suggests that the aggregate component and the sector-specific component play a similar role. Whereas, the literature agrees that industry characteristics can play an important role in explaining corporate leverage. This gives me the guidance in designing the role of macroeconomy and sector in the empirical analysis.

I applied the same variance decomposition exercise with the manager's attention towards macro conditions. The standard deviation of the idiosyncratic component (0.005) is 5.5 times that of aggregated component (0.0009), and is 10 times than sector component.

The manager's attention capacity is counter-cyclical and size-dependent. Larger firms have more financial capacity to afford more information towards both macroeconomic and idiosyncratic shocks. The counter-cyclical pattern in the managers' attention capacity is mainly driven by their attention towards macroeconomics. The Coronavirus

²³It was proposed by Carlsson and Skans (2012) and then used in Meyer et al. (2021). Lemmon et al. (2008) made a similar decomposition for firm-level leverage ratio change.

	size	profitability	M_to_B	tangibility	lev_m	lev_b	gdp
leverage_m	0.32	0.05	-0.01	0.38			-0.04
leverage_b	0.34	0.04	0.11	0.27			-0.01
attention_cap	0.19	0.15	-0.01	0.15	0.23	0.15	-0.06
attention_allo	0.09	0.07	-0.01	-0.08	-0.1	-0.06	-0.04

¹ This table presents correlation. All values are significant at 1% level

pandemic triggers more attention towards macroeconomics than the 2008 Financial Crisis. There is no cyclical pattern on attention towards idiosyncratic shocks. The Coronavirus pandemic brings more common shocks than idiosyncratic shocks. It could be that firms with higher exposure to macroeconomics will tend to pay more attention to macroeconomics.

3.3 C-Suite's Attention as A Factor of Leverage Dynamics

The variations and dynamics in a firm's leverage ratio haven't been well explained (Graham and Leary, 2011). This section aims at introducing managers' attention capacity and attention allocation as two important factors in a firm's leverage ratio.

$$\text{leverage}_{i,t} = \delta_i + \delta_t + \alpha_1 \times \text{AttentionCapacity}_{i,t} + \alpha_2 \times \text{AttentionAllocation}_{i,t} + \gamma \times Z_{i,t} + \varepsilon_{i,t} \quad (9)$$

where $\text{leverage}_{i,t}$ is market leverage, δ_i and δ_t stand for firm fixed effect and time fixed effect. $Z_{i,t}$ is a vector of control variables, including firm size, profitability, market to book ratio, and tangibility.

Table 5 presents the regression result using the firm-level panel data. There are two findings I would like to highlight. First, at the firm level attention capacity has a significantly positive effect on market leverage ratio. Second, attention allocation towards

macroeconomics has a significantly negative effect on the manager's leverage decisions. Both results hold even after controlling for firm characteristics, time, and firm fixed effects, comparing columns (4) and (6). Besides, by including attention capacity and attention allocation, I obtain the regression with the best adjusted R-square, shown in column (6). After considering the business cycle, measured by the real GDP growth rate, my result is still robust and significant.

The results suggest that a manager's attention towards macroeconomics have both substitution and complementary effect on leverage ratio. When a manager pays attention to macroeconomics, the attention capacity increases, motivating more information collection. Higher information volume will help a manager make better decisions (complementary effect). On the other hand, paying attention to macroeconomics may distract a manager from focusing on issues that are important for the firm.

Table 6: Panel Regression, Leverage and Manager's Attention

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Attention Capacity	1.69*** (0.07)			2.01*** (0.07)		1.93*** (0.07)	2.79*** (0.07)
Attention Allocation		-5.53*** (0.21)		-6.39*** (0.21)		-6.11*** (0.20)	-4.06*** (0.21)
Firm Size				4.29*** (0.07)		4.34*** (0.07)	5.93*** (0.07)
Profitability					-64.1*** (1.13)	-62.5*** (1.12)	-69.5*** (1.15)
Market to Book Value					0.013*** (0.00)	0.013*** (0.00)	0.018*** (0.00)
Tangibility					23.8*** (0.51)	23.9*** (0.51)	30.0*** (0.51)
Real GDP Growth Rate							-0.098*** (0.00)
Constant	19.3*** (0.03)	17.4*** (0.09)	22.0*** (0.10)	20.1*** (0.12)	-24.7*** (0.69)	-24.4*** (0.70)	-42.2*** (0.63)
Time Fixed Effect	YES	YES	YES	YES	YES	YES	NO
Firm Fixed Effect	YES	YES	YES	YES	YES	YES	YES
Observations	124617	124617	124617	124617	120444	120444	120444
Adjusted R^2	0.75	0.75	0.75	0.75	0.76	0.77	0.75

Note: Standard errors in parentheses. *** $p < 0.01$. I present the coefficient of Market to Book Value as 100 times the original values. The attention allocation is in decimal format instead of percentage for coefficient presentation purpose.

The interaction of macro news versus micro news, and how it affects an agent's decision, has not yet developed in the corporate finance field. In recent investor behavior literature, Peng and Xiong (2006) propose that investors see the macro news and firm-level news as substitutes, and they process macro and sector news first, then turn to firm-specific information. Hirshleifer and Sheng (2021) first find that macro news and micro news can be complementary too.

3.4 C-Suite's Attention as An Amplifier of Business Cycles

It's well researched that the economic state affects the firm-level leverage ratio. But the channel through which the business cycle transmits to a firm's capital structure is still underdeveloped. I demonstrate that executive managers' attention can amplify the effect of the business cycle on a firm's financial decisions. To uncover this relationship, I add interaction terms of attention capacity times real GDP growth rate and attention allocation times real GDP growth rate into the baseline equation (9). run the following regression.

$$\begin{aligned}
 \text{leverage}_{i,t} = & \delta_i + \alpha_1 \times \text{AttentionCapacity}_{i,t} + \alpha_2 \times \text{AttentionAllocation}_{i,t} + \\
 & \beta_1 \times \text{realGDPgrowthrate}_t + \beta_2 \times \text{realGDPgrowthrate}_t \times \\
 & \text{AttentionCapacity}_{i,t} + \beta_3 \times \text{realGDPgrowthrate}_t \times \text{AttentionAllocation}_{i,t} \\
 & + \gamma \times Z_{i,t} + \varepsilon_{i,t}
 \end{aligned} \tag{10}$$

where $\text{leverage}_{i,t}$ is market leverage, δ_i stand for firm fixed effect. $Z_{i,t}$ is a vector of control variables, including firm size, profitability, market to book ratio, and tangibility.

In Table 6, column (3) shows that the interaction term of attention capacity and real GDP growth rate is negative. It suggests that during a recession, when the real GDP growth rate is negative, the firm-level leverage increases, and more than half of the

effect work through the attention capacity channel. When executive managers have rising awareness of the uncertainties, they tend to take actions to offset them. Here, the action is to increase leverage ratio to cope with economic downturns. This acts as the amplifier of business cycles. Column (4) shows that the interaction term of attention allocation and real GDP growth rate is positive. It suggests that during the recession, when the real GDP growth rate is negative, paying attention to macroeconomics can be a distraction for managers to evaluate what is a proper leverage ratio, which includes rising credit risk. Managers may downplay the effect of firm-specific conditions and choose to lower the leverage ratio.

Table 7: Panel Regression, Manager's Attention as An Amplifier of the Business Cycle on Leverage

	(1)	(2)	(3)	(4)	(5)
Attention Capacity	1.93*** (0.07)	2.79*** (0.07)	2.84*** (0.07)	2.80*** (0.07)	2.87*** (0.07)
Attention Allocation	-6.11*** (0.20)	-4.06*** (0.21)	-4.04*** (0.21)	-4.39*** (0.21)	-4.50*** (0.21)
Firm Size	4.34*** (0.07)	5.93*** (0.07)	5.92*** (0.07)	5.93*** (0.07)	5.93*** (0.07)
Profitability	-62.5*** (1.12)	-69.5*** (1.15)	-69.5*** (1.15)	-69.4*** (1.15)	-69.3*** (1.15)
Market to Book Value	0.013*** (0.00)	0.018*** (0.00)	0.018*** (0.00)	0.018*** (0.00)	0.018*** (0.00)
Tangibility	23.9*** (0.51)	30.0*** (0.51)	30.0*** (0.51)	30.0*** (0.51)	30.0*** (0.51)
Real GDP Growth Rate		-0.098*** (0.00)	-0.037*** (0.01)	-0.19*** (0.02)	-0.15*** (0.02)
AttentionCapacity \times Real GDP Growth Rate			-0.047*** (0.01)		-0.064*** (0.01)
Constant	-24.4*** (0.70)	-42.2*** (0.63)	-42.2*** (0.63)	-42.1*** (0.63)	-42.1*** (0.63)
Time Fixed Effect	YES	NO	NO	NO	NO
Firm Fixed Effect	YES	YES	YES	YES	YES
Observations	120444	120444	120444	120444	120444
Adjusted R^2	0.77	0.75	0.75	0.75	0.75

Note: Standard errors in parentheses. *** $p < 0.01$. I present the coefficient of Market to Book Value as 100 times the original values. The attention allocation is in decimal format instead of percentage for coefficient presentation purpose.

4. Robustness Checks

To investigate the heterogeneity in the firm-level leverages and whether executive managers' attention plays a major role for all of them, I apply a series of robustness checks in this section. The first comes with the liquidity supply faced by individual firms. The second part includes the studies of cyclical industries and non-cyclical industries.

4.1 considering supply market

To categorize firms into financially constrained and financially non-constrained groups, I look at if a firm has access to the public debt market. Specifically, I use the bond rating from S&P 500²⁴. I then merge the data with the accounting data from Compustat using the firm's stock ticker, resulting in 114923 observations. I first add a term *liquidity* into equation (9) and then run the same regression with the financially constrained group as well as the financially unconstrained group separately. The term *liquidity* is a dummy variable. *liquidity* equals 1 when a firm has access to the public debt market. Otherwise, it equals 0. Table 7 presents the results and they are robust across the whole sample and groups with different liquidity.

Column (2) shows that with better liquidity, a firm chooses to have a higher leverage ratio. To further compare the financially constrained group and financially unconstrained group, I separate the sample firms into two groups and present the exercise results in columns (3) and (4) separately. While it yields a robust result, the coefficients also show that financially unconstrained firms are affected by attention allocation more. Financially constrained firms are affected by attention capacity more.

²⁴The data is fetched from the WRDS Bond Returns database. I choose the rating from S&P 500 instead of Moody's and Fitch, because of data availability.

Table 8: Manager's Attention to Firm-level Leverage, considering liquidity

	(1)	(2)	(3)	(4)
Attention Capacity	1.94*** (0.07)	1.95*** (0.07)	1.47*** (0.15)	1.92*** (0.08)
Attention Allocation	-5.69*** (0.21)	-5.69*** (0.21)	-6.72*** (0.48)	-5.00*** (0.22)
Firm Size	4.34*** (0.07)	4.14*** (0.07)	3.68*** (0.22)	3.93*** (0.08)
Profitability	-59.2*** (1.13)	-58.5*** (1.13)	-127.5*** (3.53)	-49.5*** (1.17)
Market to Book Value	0.015*** (0.00)	0.014*** (0.00)	0.015*** (0.00)	0.013*** (0.00)
Tangibility	23.4*** (0.52)	23.2*** (0.51)	22.7*** (1.28)	23.0*** (0.56)
Liquidity		4.33*** (0.15)		
Constant	-24.7*** (0.70)	-23.7*** (0.70)	-12.9*** (2.51)	-21.8*** (0.72)
Time Fixed Effect	YES	YES	YES	YES
Firm Fixed Effect	YES	YES	YES	YES
Financially Constrained			NO	YES
Observations	114923	114923	20585	94152
Adjusted R^2	0.76	0.77	0.80	0.76

Note: Standard errors in parentheses. *** $p < 0.01$. I present the coefficient of Market to Book Value as 100 times the original values. The attention allocation is in decimal format instead of percentage for coefficient presentation purpose.

4.2 cyclical industry vs non-cyclical industry

(In the process of finding a well-defined way to categories industries shown in Figure A.5 into two groups: cyclical industry and non-cyclical industry).

5. Theoretical Model

I'm building the model with inspiration from two strands of literature. The first

comes the role of macroeconomics in firm-level dynamic capital structure decision making. The second relates to information rigidity literature. Chen et al. (2021) propose a model where managers have constant attention capacity and dynamic attention allocation. Inspired from my empirical results, managers' attention capacity is also variable. This is the new feature I am adding to the model).

6. Conclusion

Executive managers are confronted with stimuli from both macroeconomic and firm-specific issues. Though making efforts to fully comprehend them, top managers can still have cognitive bias, which is quantified as dynamic attention capacity and attention allocation in this paper. Firm characteristics and the business cycle can affect the dynamics of managerial attention capacity.

Using public-listed firms' quarterly earnings call transcript and NLP, I first quantify managerial attention capacity and attention allocation. I have three findings regarding managerial attention: First, attention capacity and allocation are related to firm characteristics. Big firm size, high profitability, access to the credit market, and growth opportunities will make the managers expand attention capacity and allocation more attention to macroeconomics. Second, both attention capacity and attention allocation are counter-cyclical. They increase during a recession mainly due to increasingly salient macroeconomic information. Third, on average managers allocate more than half attention towards macroeconomics.

I also look into the role of managerial attention in explaining the unprecedented high level of business leverage. My results show that paying attention to macroeconomics provides both substitution and complementary effects. Paying attention to macroeconomics concurs with attention capacity, which significantly increases a firm's leverage ratio by (XXX or XX unit of standard deviation). Meanwhile, paying more attention to macroeconomics coincides with higher attention allocation towards macroeconomics, supplanting attention paid to firm-specific issues. This, in turn, results in a lower leverage ratio. My finding is robust after controlling for the business cycle, firm characteristics, and consideration of liquidity supply. The finding is also robust with different leverage ratio measurements.

I further investigate the role of managerial attention in amplifying the leverage

cycles. By adding intersection terms of managerial attention and business cycles, I find that since attention capacity and attention allocation are counter-cyclical, they amplify the effect of the business cycle on firm level financial decisions. During a recession, the economic downturn will put pressure on a firm's leverage ratio. My estimation shows that expanded attention capacity doubles the effect from macroeconomics.

My attention measurements as well as the findings of substitution and complementary effect point to some questions for future work. Is managerial attention nature or nurture? Does managerial attention affect financial information release to investors? How do managerial attention impact business cycle dynamics, or long-run innovation, creative destruction, and growth?

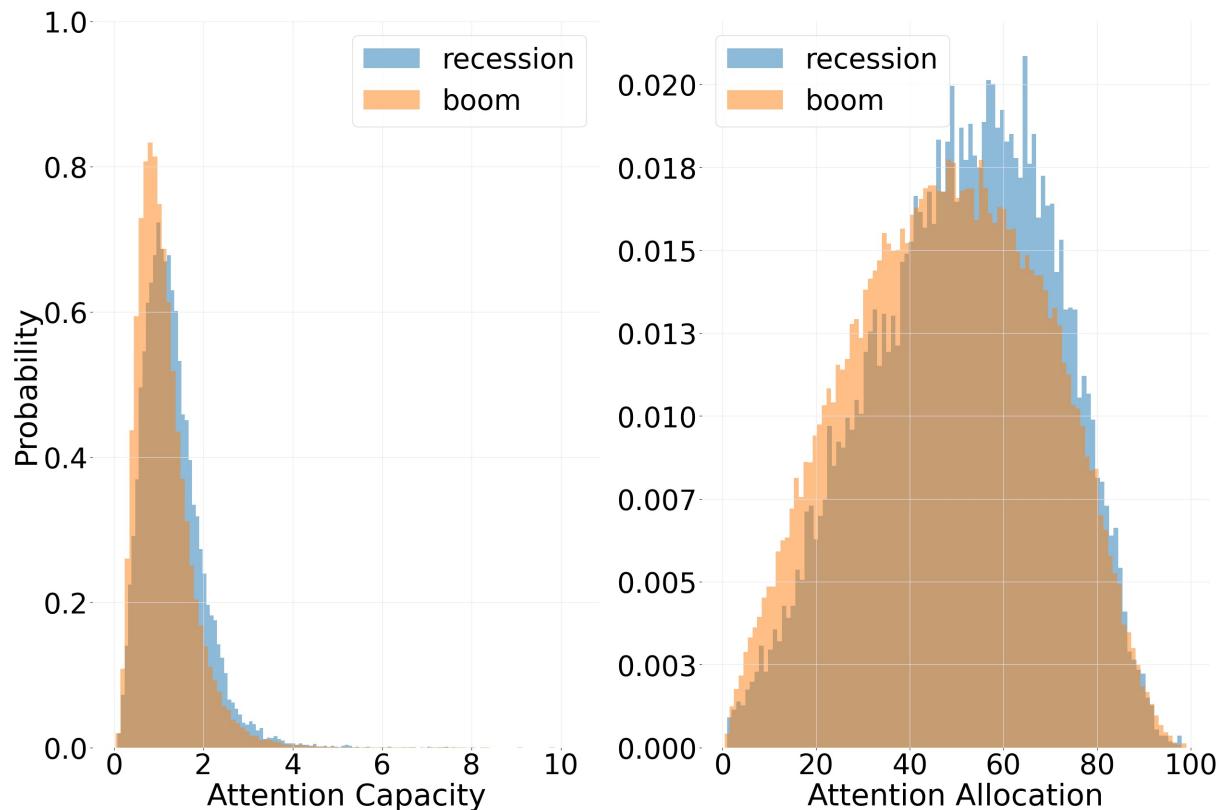
Appendix

Table A.1: Standard Industrial Classification (SIC) Manual

Range of SIC Codes	Division
0100-0999	Agriculture, Forestry and Fishing
1000-1499	Mining
1500-1799	Construction
2000-3999	Manufacturing
4000-4999	Transportation, Communications, Electric, Gas and Sanitary service
5000-5199	Wholesale Trade
5200-5999	Retail Trade
6000-6799	Finance, Insurance and Real Estate
7000-8999	Services
9100-9729	Public Administration
9900-9999	Non-classifiable

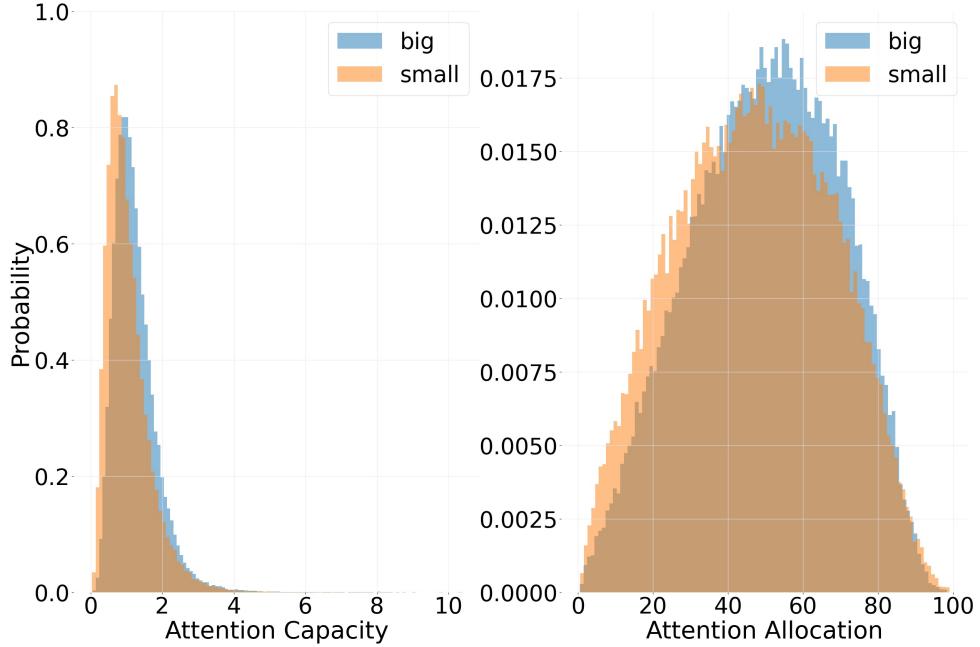
^a This table is reproduced from the United States Department of Labor website. The SIC codes 1800-1999 are not used.

Figure A.1: Manager's Attention is State-dependent



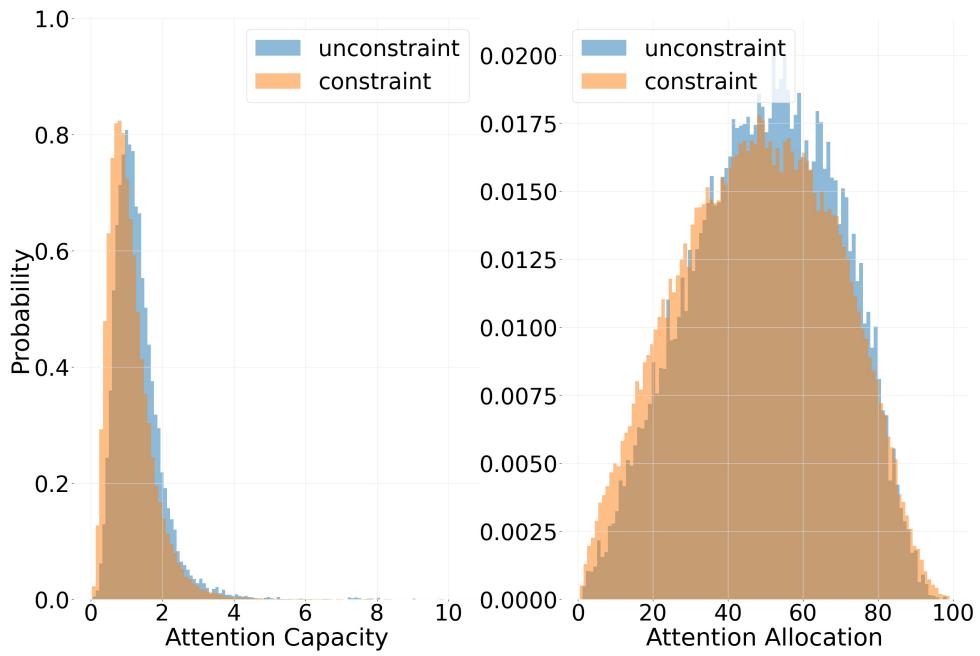
Note: This figure shows that managerial attention capacity and attention allocation towards macroeconomics are counter-cyclical. In recession, managers have higher attention capacity and attention allocation.

Figure A.2: Manager's Attention is Size-dependent



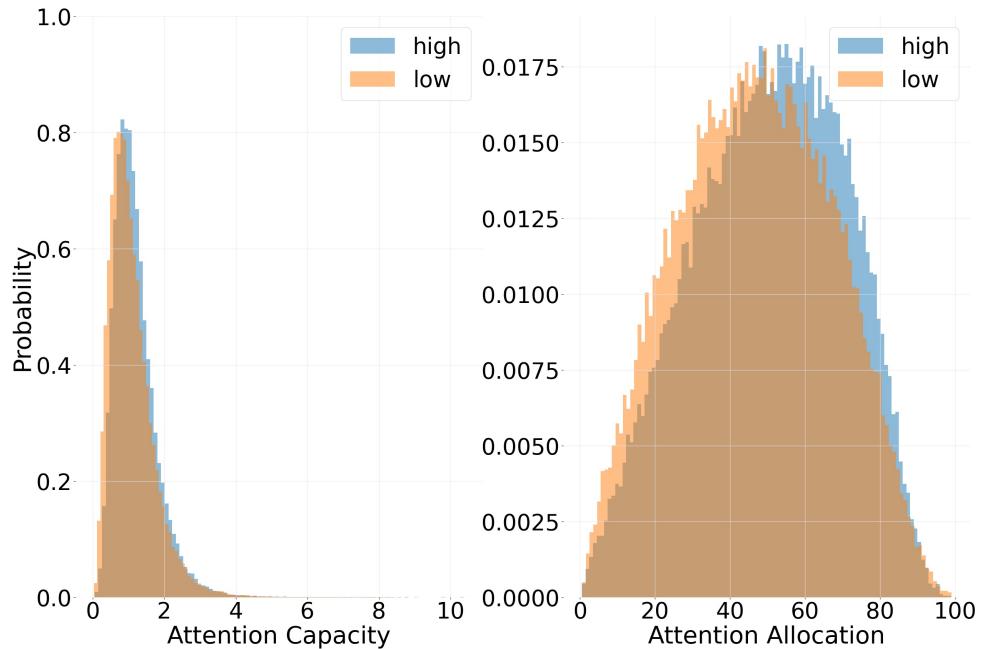
Note: This figure shows that managerial attention capacity and attention allocation towards macroeconomics are higher for bigger firms.

Figure A.3: Manager's Attention is Liquidity-dependent



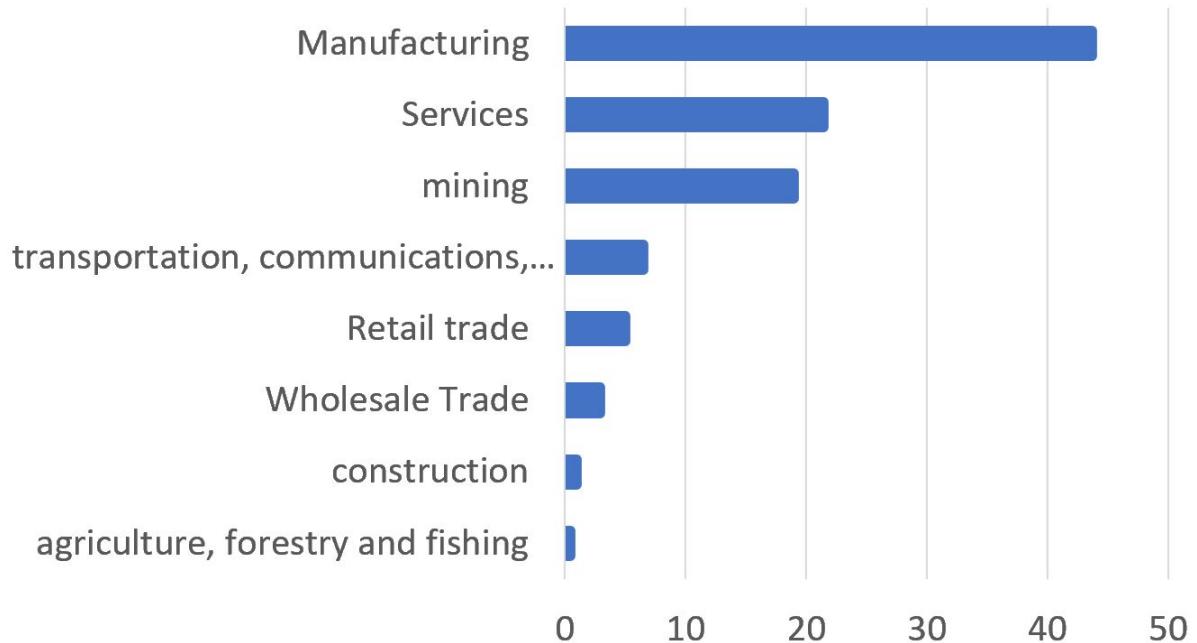
Note: This figure shows that managerial attention capacity and attention allocation towards macroeconomics are higher for financially unconstrained firms. Here I define financially unconstrained firms as those who have access to public debt market.

Figure A.4: Manager's Attention is Profitability-dependent



Note: This figure shows that managerial attention capacity and attention allocation towards macroeconomics are higher for firms with higher profitability.

Figure A.5: Sample Industry Distribution (percent)



REFERENCES

- Aizawa, Akiko (2003). “An information-theoretic perspective of tf–idf measures.” *Information Processing & Management* 39(1), 45–65.
- An, Zidong (2019). *Inattention, Uncertainty, and Macroeconomic Dynamics*. American University.
- Baker, Scott R, Nicholas Bloom, and Steven J Davis (2016). “Measuring economic policy uncertainty.” *The quarterly journal of economics* 131(4), 1593–1636.
- Baker, Scott R, Tucker S McElroy, and Xuguang S Sheng (2020). “Expectation formation following large, unexpected shocks.” *Review of Economics and Statistics* 102(2), 287–303.
- Begenau, Juliane and Juliana Salomao (2019). “Firm financing over the business cycle.” *The Review of Financial Studies* 32(4), 1235–1274.
- Bhamra, Harjoat S, Lars-Alexander Kuehn, and Ilya A Strebulaev (2010). “The aggregate dynamics of capital structure and macroeconomic risk.” *The Review of Financial Studies* 23(12), 4187–4241.
- Brunnermeier, Markus and Arvind Krishnamurthy (2020). “The macroeconomics of corporate debt.” *The Review of Corporate Finance Studies* 9(3), 656–665.
- Candia, Bernardo, Olivier Coibion, and Yuriy Gorodnichenko (2021). “The inflation expectations of us firms: Evidence from a new survey.” Technical report, National Bureau of Economic Research.
- Carlsson, Mikael and Oskar Nordström Skans (2012). “Evaluating microfoundations for aggregate price rigidities: evidence from matched firm-level data on product prices and unit labor cost.” *American Economic Review* 102(4), 1571–95.
- Chen, Cheng, Takahiro Hattori, and Yulei Luo (2021). “Information rigidity and elastic attention: Evidence from japan.
- Chen, Hui (2010). “Macroeconomic conditions and the puzzles of credit spreads and capital structure.” *The Journal of Finance* 65(6), 2171–2212.

- Choe, Hyuk, Ronald W Masulis, and Vikram Nanda (1993). "Common stock offerings across the business cycle: Theory and evidence." *Journal of Empirical finance* 1(1), 3–31.
- Coibion, Olivier and Yuriy Gorodnichenko (2015). "Information rigidity and the expectations formation process: A simple framework and new facts." *American Economic Review* 105(8), 2644–78.
- Dessein, Wouter and Tano Santos (2021). "Managerial style and attention." *American Economic Journal: Microeconomics* 13(3), 372—403.
- Duffie, Darrell, Lasse Heje Pedersen, and Kenneth J Singleton (2003). "Modeling sovereign yield spreads: A case study of russian debt." *The journal of finance* 58(1), 119–159.
- Erel, Isil, Brandon Julio, Woojin Kim, and Michael S Weisbach (2012). "Macroeconomic conditions and capital raising." *The Review of Financial Studies* 25(2), 341–376.
- Faccio, Mara and Jin Xu (2015). "Taxes and capital structure." *Journal of Financial and Quantitative Analysis* 50(3), 277–300.
- Fama, Eugene F (1986). "Term premiums and default premiums in money markets." *Journal of Financial Economics* 17(1), 175–196.
- Faulkender, Michael and Mitchell A Petersen (2006). "Does the source of capital affect capital structure?" *The Review of Financial Studies* 19(1), 45–79.
- Flynn, Joel P and Karthik Sastry (2020). "Attention cycles." Available at SSRN 3592107.
- Frank, Murray Z and Vidhan K Goyal (2009). "Capital structure decisions: which factors are reliably important?" *Financial management* 38(1), 1–37.
- Gabaix, Xavier (2019). "Behavioral inattention." In *Handbook of Behavioral Economics: Applications and Foundations* 1, Volume 2, pp. 261–343. Elsevier.
- Graham, John R and Mark T Leary (2011). "A review of empirical capital structure research and directions for the future." *Annu. Rev. Financ. Econ.* 3(1), 309–345.
- Hackbarth, Dirk, Jianjun Miao, and Erwan Morellec (2006). "Capital structure, credit risk, and macroeconomic conditions." *Journal of financial economics* 82(3), 519–550.
- Halling, Michael, Jin Yu, and Josef Zechner (2016). "Leverage dynamics over the business cycle." *Journal of Financial Economics* 122(1), 21–41.
- Hassan, Tarek A, Stephan Hollander, Laurence Van Lent, and Ahmed Tahoun (2019). "Firm-level political risk: Measurement and effects." *The Quarterly Journal of Economics* 134(4), 2135–2202.
- Hassan, Tarek A, Jesse Schreger, Markus Schwedeler, and Ahmed Tahoun (2021). "Country risk." *Institute for New Economic Thinking Working Paper Series* (157).

- Heider, Florian and Alexander Ljungqvist (2015). "As certain as debt and taxes: Estimating the tax sensitivity of leverage from state tax changes." *Journal of financial economics* 118(3), 684–712.
- Hirshleifer, David, Sonya Seongyeon Lim, and Siew Hong Teoh (2009). "Driven to distraction: Extraneous events and underreaction to earnings news." *The Journal of Finance* 64(5), 2289–2325.
- Hirshleifer, David and Jinfei Sheng (2021). "Macro news and micro news: Complements or substitutes?" Technical report, National Bureau of Economic Research.
- Hirshleifer, David and Siew Hong Teoh (2003). "Limited attention, information disclosure, and financial reporting." *Journal of accounting and economics* 36(1-3), 337–386.
- Hovakimian, Armen, Gayane Hovakimian, and Hassan Tehranian (2004). "Determinants of target capital structure: The case of dual debt and equity issues." *Journal of financial economics* 71(3), 517–540.
- Hovakimian, Armen, Tim Opler, and Sheridan Titman (2001). "The debt-equity choice." *Journal of Financial and Quantitative analysis* 36(1), 1–24.
- Jermann, Urban and Vincenzo Quadrini (2006). "Financial innovations and macroeconomic volatility."
- Jordà, Òscar, Martin Korniejew, Moritz Schularick, and Alan M Taylor (2020). "Zombies at large? corporate debt overhang and the macroeconomy." Technical report, National Bureau of Economic Research.
- Kacperczyk, Marcin, Stijn Van Nieuwerburgh, and Laura Veldkamp (2016). "A rational theory of mutual funds' attention allocation." *Econometrica* 84(2), 571–626.
- Karpavičius, Sigitas and Fan Yu (2017). "The impact of interest rates on firms' financing policies." *Journal of Corporate Finance* 45, 262–293.
- Korajczyk, Robert A and Amnon Levy (2003). "Capital structure choice: macroeconomic conditions and financial constraints." *Journal of financial economics* 68(1), 75–109.
- Leary, Mark T (2009). "Bank loan supply, lender choice, and corporate capital structure." *The Journal of Finance* 64(3), 1143–1185.
- Lemmon, Michael L, Michael R Roberts, and Jaime F Zender (2008). "Back to the beginning: persistence and the cross-section of corporate capital structure." *The journal of finance* 63(4), 1575–1608.
- Levy, Amnon and Christopher Hennessy (2007). "Why does capital structure choice vary with macroeconomic conditions?" *Journal of monetary Economics* 54(6), 1545–1564.

- Maćkowiak, Bartosz, Emanuel Moench, and Mirko Wiederholt (2009). “Sectoral price data and models of price setting.” *Journal of Monetary Economics* 56, S78–S99.
- Meyer, Brent, Nicholas Parker, and Xuguang Sheng (2021). “Unit cost expectations and uncertainty: Firms’ perspectives on inflation.
- Peng, Lin and Wei Xiong (2006). “Investor attention, overconfidence and category learning.” *Journal of Financial Economics* 80(3), 563–602.
- Rajan, Raghuram G and Luigi Zingales (1995). “What do we know about capital structure? some evidence from international data.” *The journal of Finance* 50(5), 1421–1460.
- Robson, Paul JA and Dennis Tourish (2005). “Managing internal communication: an organizational case study.” *Corporate Communications: An International Journal*.
- Welch, Ivo (2011). “Two common problems in capital structure research: The financial-debt-to-asset ratio and issuing activity versus leverage changes.” *International review of finance* 11(1), 1–17.
- Zhang, Fang (2017). “Rational inattention in uncertain business cycles.” *Journal of Money, Credit and Banking* 49(1), 215–253.