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CROWDFUNDING AND GOVERNANCE: A REVIEW AND RESEARCH ROADMAP

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ABSTRACT

Crowdfunding is a growing area of interest in entrepreneurial finance for both academics and practitioners, and the prospects for future research are abundant. This paper reviews recent research related to crowdfunding and governance. Our aim is to synthesize current findings and provide suggestions for future work.

The growth in the crowdfunding marketplace can be gauged from the fact that while worldwide funds raised in 2012 was $2.7 Billion, that figure went up to almost $14B in 2019, with projections that funds raised will triple to more than $40B by 2026. Entrepreneurs have recognized this opportunity and are increasingly using crowdfunding. Compared to more traditional sources of funding, however, it is still a relatively small fraction. Going forward, the large, projected growth rate is likely to be heavily reliant on Asian markets. In that region, new ventures have less access to professional investors such as venture capitalists, leaving an important void in entrepreneurial financing that can be filled through crowdfunding.

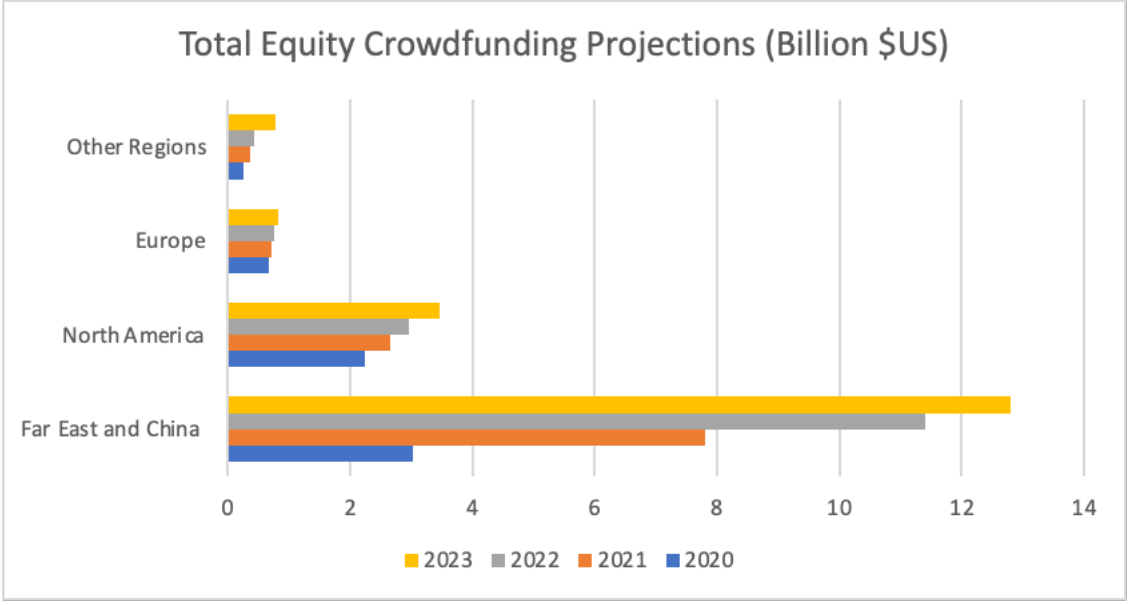
Scholars have taken note of this emerging research area. Most of the early research in crowdfunding focused on factors that are associated with successful campaigns. The contribution of this review is to highlight the excellent research that has been done related to crowdfunding and governance.

INTRODUCTION

Crowdfunding is a growing area of interest in entrepreneurial finance for both academics and practitioners. The growth in this marketplace can be gauged from the fact that while funds raised worldwide in 2012 was $2.7 Billion, that figure went up to almost $14B in 2019, with projections that funds raised will *triple* to more than $40B by 2026 (Statista: Market Size, 2021). Entrepreneurs have seized on this opportunity to obtain funds, and are increasingly using crowdfunding to seek money for new ventures. The current and projected funds raised through equity offerings in crowdfunding demonstrate this growing interest, as depicted in Figure 1. In comparison to other, more traditional sources of new venture funding, this is still a relatively small fraction. For instance, venture capital investments in the US hit a record high of approximately $120B in 2020 (Statista: Value of Venture Capital investment, 2021). The bright side of the crowdfunding story is, however, the large, projected growth rate in Asia. In that part of the world, new ventures have less access to professional investors such as venture capitalists

(e.g., in China, venture capital investment was estimated to be only $24.7B in 2019), leaving an important void in entrepreneurial financing that can be filled through crowdfunding.

Figure 1: Estimated Region-wise Total Spend (2021 – 2023) on Equity Crowdfunding (Source: Statista, 2021)



Scholars have taken note of this emerging research domain, underscoring the need to examine how this market operates for both the entrepreneur and the individuals funding the campaign. The scholarly work is also beneficial to practitioners, especially those who have influence in regions with little to no financing resources for aspiring entrepreneurs. Most of the early research in crowdfunding focused on factors that are associated with successful campaigns (e.g., Allison, Davis, Short, & Webb, 2015; Calic & Mosakowski, 2016). The large volume of research has also led to reviews of the broader literature (Cumming, Vanacker, & Zahra, 2021; Short, Ketchen, McKenney et al., 2017). Our review differs from these by focusing on crowdfunding research that intersects with corporate governance concepts (i.e., the various governance mechanisms, such as pre-investment screening and post-investment involvement, that are used by crowdfunding investors to reduce information asymmetry about the new venture). In this intersection, there are far fewer articles, and the work is fairly fragmented. The contribution of this review is to showcase the excellent recent work that has been done in this area, and particular emphasis is placed on providing details about research questions that are yet to be explored.

This paper proceeds as follows. First, the methodology used to collect the articles from the top journals is provided. Second, a section specifically dedicated to the data sources that appear in the research is included as a guide for potential use in future projects. Third, we review the crowdfunding and governance papers after classifying them into three categories: platform

type and fit, research that examines the use of signals by the new venture, and actions by the entrepreneur and backers in crowdfunding. Within each category is a subsection that outlines the important research questions that are still to be addressed. Finally, we provide a brief conclusion.

METHODOLOGY

To locate the research articles to include in this review, we followed the process outlined in prior review publications (e.g., Shepherd, Williams, & Patzelt, 2015). Article titles from premier journals and key word searches in Business Source Premier, JSTOR and ProQuest were used to identify the relevant articles. Searches used the keywords 'crowdfunding', 'startup', 'start-up', 'new venture', and 'governance'. The journals included: *Entrepreneurship Theory and Practice, Journal of Business Venturing, Strategic Entrepreneurship Journal, Small Business Economics, Strategic Management Journal, Academy of Management Journal, Academy of Management Review, Journal of Management, Management Science, Organization Science, Research Policy, Corporate Governance: An International Review, Journal of Corporate Finance, and Journal of Banking and Finance*. To capture the latest work in this area, we also added articles from SSRN using similar search parameters. This resulted in a very large number of articles, and steps were taken to narrow the scope of the review to concentrate on recent, governance-related work. This requirement aided in limiting the number of articles for our review to 28. In terms of date range, 22 of the articles were from 2018 onward, and 6 were between 2014 and 2017.

DATA SOURCES

Before reviewing the findings from the literature, it may be enlightening to provide information on the data sources used in the articles reviewed. It is often a struggle for researchers to find quality data sources to test their hypotheses. As noted, the majority of the articles reviewed here have appeared in the top journals in which entrepreneurship scholars aspire to publish, and most of the articles reviewed were empirical. The few that were not empirical either provided a conceptual view of crowdfunding and governance, or used econometric modeling. Table 1 provides a summary of the data sources for the articles reviewed, with separate columns providing information on the crowdfunding platform, the host country of the platform, and additional notes concerning the articles published. That is because crowdfunding campaigns can receive funds from anywhere in the world, yet the crowdfunded venture's host country is especially relevant as the country's laws and regulations can largely shape the governance mechanisms used by the venture. Here it is interesting to note that the list of crowdfunding platforms mentioned in the reviewed articles is not limited to only the largest platforms.

CROWDFUNDING AND GOVERNANCE RESEARCH REVIEW RESEARCH ROADMAP

This review of articles related to crowdfunding and governance is organized into three categories. The first section discusses the differences among crowdfunding platforms, and the governance implications of these differences that will determine the extent of goal alignment between the entrepreneur and the investors. This section also lays the groundwork for the

Table 1
Crowdfunding Data Sources

Platform	*Country*	*Additional Notes*
Crowdcube	UK	▪ Campaigns between 2011 – 2014 (Vismara, 2016) ▪ Equity investment level (Walthoff-Borm et al., 2018) ▪ 132 equity offerings for 2014 (Vismara, 2018) ▪ Ownership structure (Cumming, Meoli, & Vismara, 2019) ▪ 1,018 ECF campaigns on Crowdcube & Seedrs (Coakley, Cumming, Lazos, & Vismara, 2021)
Seedrs	UK	▪ Campaigns between 2011 – 2014 (Vismara, 2016) ▪ Nominee equity investment (Walthoff-Borm et al., 2018)
Innovestment	Germany	▪ Backers' (i.e., investors') pricing information (Hornuf & Neuenkirch, 2017)
Kickstarter	USA	▪ Comparison of crowd vs. expert backing decisions (Mollick & Nanda, 2016) ▪ Textual analysis of backers' comments (Courtney, Dutta, & Li, 2017) ▪ Impact of large angel investor on the campaign (Gutiérrez-Urtiaga & Sáez-Lacave, 2018) ▪ Information posted by entrepreneurs (Scheaf, Davis, Webb et al., 2018) ▪ Campaign data & characteristics over 20 days in May, 2013 (Li & Martin, 2019) ▪ Over 20,000 Kickstarter pitches and their results (Gafni, Marom, & Sade, 2019)
SiamoSoci	Italy	▪ Textual analysis of project information for offerings between 2012 – 2013 (Piva & Rossi-Lamastra, 2018)
Equity platform undisclosed	UK	▪ Investor and campaign data from 07/12 to 08/17 (Wang, Mahmood, Sismeiro et al., 2019)
Australian Small Scale Offerings Board (ASSOB)	Australia	▪ 104 campaigns with founding headquarters' information (Ahlers, Cumming, Gunther, & Schweizer, 2015) ▪ Campaigns from 2006 to 2012 (Guenther, Johan, & Schweizer, 2018)
National Crowdfunding Research survey	Netherlands	▪ 1,278 responses from national survey conducted in 2013 (Polzin, Tozopeus, & Stam, 2018)
National Crowdfunding & Fintech Association	Canada	▪ Crowdfunding data from 2014-2017 that includes 93 different platforms within the country (Cumming, Johan & Zhang, 2019)
FundedByMe	Sweden	▪ 40 successful equity campaigns with 2,537 investments by 1979 unique investors between 2012 and March, 2015 (Mohammadi & Shafi, 2018)

Various	USA	▪ 293 firms' regulation crowdfunding offering pages submitted in accordance with regulations for JOBS Act, with SEC approved platforms (Aland, 2021) ▪ SEC data on ECF campaigns (Cumming, Johan, & Reardon, 2021)
Ulule, SmartAngels, and WiSeed	France	▪ Follows funding progress of Tech start-ups through funding platforms (Bessiere, Stephany, & Wirtz, 2018)
Various	Various	▪ 432 investment platforms – examines platform survival (Meoli, Rossi, & Vismara, 2022) ▪ 108 CF campaigns to examine governance configurations (Schulz & Blohm, 2019)

crowdfunding terminology that is used throughout the remainder of the paper. The second section examines how entrepreneurs use signals to provide information about the new venture to potential investors. The need for signaling arises from the acute information asymmetry between the entrepreneur and those outside the new venture (e.g., investors), and this is a topic that has long been discussed in the entrepreneurship literature (Schumpeter, 1934). The third section deals with actions by either the entrepreneur or influential campaign backers. Each section concludes with a discussion of research opportunities.

The review covers a large amount of information. To aid in organizing the research findings, an overview of the papers is provided in Table 2. This table contains the journal name, year of publication, authors, and a brief summary of pertinent findings from each of the reviewed articles. The table is arranged to correspond with the three sections used in this paper, and then further arranged within each section by lead author first name.

PLATFORM INFLUENCE AND GOVERNANCE IMPLICATIONS

The first area we will cover for crowdfunding and associated governance mechanisms deals with the crowdfunding platform itself. There are a multitude of platform options from which an entrepreneur may choose. This section describes the differences among the platforms and also explains common crowdfunding terminology. This terminological information is useful for the other two sections of the review.

Three broad categories are used to distinguish between the types of crowdfunding platforms, and these are equity, reward, and donation (Rossi, Vismara, & Meoli, 2019). There are other platforms that are variations of these three basic types, with some platforms offering multiple options, hybrids, and additional features. When a person or team posts a request on an online crowdfunding site, this is labeled as starting a 'campaign'. A person who sees the campaign and chooses to send in money is referred to as a 'backer', since this person is backing or supporting the campaign. A campaign that offers ownership rights in the new business to the backers is equity crowdfunding (ECF), and several authors refer to ECF backers as investors. ECF can have different structures. A direct ownership structure, which is the structure used by the vast majority

of crowdfunding platforms, is where the backer/investor receives ownership rights equal to their investment. Since the backers' investment is small, this adversely impacts their ability to

employ corporate governance mechanisms. With a nominee ECF structure, the crowdfunding platform pools the backers' investments together, and selects a nominee to represent them in matters of governance (e.g., Seedrs platform). A third ECF type is the syndicate, where a lead investor is chosen from the backers to represent them in governance-related matters. ECF regulations also vary by country. For instance, the U.S. and Germany are examples of countries where ECF is subject to strict government regulations (Cumming, Meoli, & Vismara, 2019). In general, the ECF structure, which incorporates corporate governance mechanisms and processes usually associated with entrepreneurial financing, best fits the traditional investor model. Most of the articles reviewed in this section are for ECF campaigns. Admittedly, our paper is not the first to review the research on crowdfunding and its associated corporate governance. Another review, by Cumming, Vanacker, & Zahra (2021), also focuses on the formal/informal governance mechanisms of crowdfunding using a conceptual model. The current research is meant to supplement this review by focusing on empirical results and providing a research agenda.

Table 2
Article Summaries

Platform Influence and Governance Implications

Sl No	Journal	Year	Authors	Governance mechanism
1	Journal of Business Venturing	2014	Belleflamme, P., Lambert, T., & Schwienbacher, A.	Comparison of reward and ECF, with choice depending on capital requirements.
2	Working Paper	2021	Coakley, J., Cumming, D. J., Lazos, A., & Vismara, S.	Short and long-term success comparison for nominee versus direct ownership models.
3	Academy of Management Perspectives	2021	Cumming, D. J., Vanacker, T., & Zahra, S. A.	Both formal and informal governance mechanisms, such as due diligence provided by crowdfunding platforms, voting rights, wisdom of the crowd, signaling, formal country-level institutions, etc.
4	Research Policy	2019	Cumming, D., Meoli, M., & Vismara, S.	Discusses the governance structure of equity crowdfunding in the UK, where dual-class shares with voting rights are given only to investors who invest above a certain threshold.

5	Small Business Economics	2017	Hornuf & Neuenkirch	Positive campaign funding correlated to the entrepreneur's reputation but not related to geographic distance of the backers from the entrepreneur.
6	Corporate Governance: An International Review	2022	Meoli, M., Rossi, A., & Vismara, S.	Differences among crowdfunding platforms in terms of value offerings and the impact of backer's financial literacy
7	Journal of Industrial and Business Economics	2019	Rossi, A., Vismara, S., & Meoli, M.	Voting rights given to investors (insights into variations across crowdfunding platforms).
8	Corporate Governance: An International Review	2018	Walthoff-Borm, X., Vanacker, T. R., & Collewaert, V.	Comparison of success of different ownership structures of equity crowdfunding firms (direct shareholder structure versus nominee structure)
Signaling as a Governance Mechanism in Crowdfunding				
9	Entrepreneurship Theory and Practice	2015	Ahlers, G. K., Cumming, D., Gunther, C., & Schweizer, D.	Impact of signaling via human capital, social capital, and intellectual capital on funding success.
10	Entrepreneurship Theory and Practice	2017	Courtney, C., Dutta, S., & Li, Y.	Signaling via third-party endorsements and founder's past success.
11	Journal of Corporate Finance	2019	Li, E., & Martin, J. S.	Signaling via human capital (entrepreneur's reputation, skills, and use of media).
12	Small Business Economics	2018	Piva, E., & Rossi-Lamastra, C.	Significance of signaling to backers of founder's human capital (e.g., experience, education etc.)
13	Journal of Business Venturing	2018	Scheaf, D. J., Davis, B. C., Webb, J. W., Coombs, J. E., Borns, J., & Holloway, G.	Visual cues (e.g., high-quality video pitches) and other signals in the campaign, such as media and patents.
14	Small Business Economics	2016	Vismara, S.	Entrepreneurs signaling to backers via equity retention and social capital.

15	Research Policy	2019	Wang, W., Mahmood, A., Sismeiro, C., & Vulkan, N.	Co-investment by angel investors in crowdfunding platforms acts as a signal of the early-stage venture's quality.
Actions by the Entrepreneur and Backers in Crowdfunding				
16	Working Paper	2021	Aland, J.	More than financial disclosures, campaigns that convincingly tell the venture's 'story' are more likely to get funded.
17	Working Paper	2018	Bessière, V., Stephany, E., & Wirtz, P.	Examines co-funding and the increase in governance mechanisms as more professional investors are added.
18	Working Paper	2021	Cumming, D. J., Johan, S., & Reardon, R.	Delaware incorporation, security design, and role of crowdfunding platforms as three governance mechanisms pertinent to equity crowdfunding.
Actions by the Entrepreneur and Backers in Crowdfunding				
19	Journal of Banking & Finance	2019	Cumming, D., Johan, S., & Zhang, Y.	Impact of screening and due diligence provided by crowdfunding platforms.
20	Small Business Economics	2018	Estrin, S., Gozman, D., & Khavul, S.	Both formal and informal governance mechanisms in equity crowdfunding, such as due diligence provided by crowdfunding platforms, voting rights, legal restrictions, wisdom of the crowd, etc.
21	Strategic Entrepreneurship Journal	2019	Gafni, H., Marom, D., & Sade, O.	Due to the lack of sophistication among crowdfunding investors, entrepreneurs try to build trust through familiarity.
22	Small Business Economics	2018	Guenther, C., Johan, S., & Schweizer, D.	Retail investors in equity crowdfunding platforms are sensitive to geographic distance. Shorter distance is associated with better monitoring.
23	Corporate Governance: An International Review	2018	Gutiérrez-Urtiaga, M., & Sáez-Lacave, M. I.	Benefit of no-penalty contract in the reward crowdfunding context for unknown talent and early adopters.

24	Small Business Economics	2018	Mohammadi & Shafi	In terms of backers, CF opens (democratizes) investing to underrepresented groups such as women.
25	Management Science	2016	Mollick, E., & Nanda, R.	Comparison of 'wisdom of the crowd' to professional investors.
26	Small Business Economics	2018	Polzin, F., Toxopeus, H., & Stam, E.	Screening based on 'soft' information about the entrepreneur that could be collected on account of the close relationship between the entrepreneur and the investor.
27	Working Paper	2019	Schulz, M., & Blohm, I.	Archetypes of governance mechanisms in CF and the relative emphasis on the venture's story versus finances
28	Entrepreneurship Theory and Practice	2018	Vismara, S.	The influence of high-profile public backers, including those with high human capital.

Another form of crowdfunding is the reward campaign, and this is the type of crowdfunding most recognized by the general public (e.g., Kickstarter). The backer sends funds to a campaign to receive a product at some point in the future. The entrepreneur raises money to start offering the product or service, and the backers get the 'reward' of being the first customers to receive the product or service. No ownership rights are transferred to the backers. The final form of crowdfunding structure is a donation. In this case, the campaign does not provide any reward or ownership to the backers. It is a charitable type of donation. Examples include a high school sports team raising money for uniforms, or an organization supporting the cure of a serious medical disease (e.g., GoFundMe, or Mightycause).

As mentioned, there are different types of ECF. Research has examined the differences between traditional direct ownership ECF platforms and crowdfunding platforms that use a nominee structure (e.g., Seedrs). The nominee structure allows for more traditional governance oversight of the entrepreneur through mechanisms such as approval of asset transfer and limits on the entrepreneur's salary (Cumming, Vanacker, & Zahra, 2021). Differences in underlying platform characteristics and governance also foster significant differences in financial and innovation performance. The firms funded under the ECF nominee structure had much lower failure rates, but the direct ownership equity crowdfunded firms were seen as more innovative as evident in the number of patents they filed (Walthoff-Borm, Vanacker, & Collewaert, 2018). A benefit noted for ECF compared to VC (or angel funding) is that ECF enables small investors to participate in entrepreneurial financing without large access fees, which democratizes financing (Coakley, Cumming, Lazos, & Vismara, 2021).

Research on ECF has also explored governance using voting versus non-voting shares. Some ECF platforms allow the entrepreneur to set up different classes of equity. One study examined dual-class equity (class A/class B), in which a crowdfunding backer must invest above a threshold to receive a class A ownership share (Cumming et al., 2019). These class A shares enable stronger governance through voting rights. Research has shown that having multiple share classes can have a negative impact on the firm, including lower likelihood of a successful funding campaign and lower long-run success (Cumming et al., 2019). The authors note that this is analogous to traditional equity markets, where investors with lower voting rights are concerned that those with greater rights may not represent their interests (Cumming et al., 2019). One study showed strong support for the nominee structure versus direct ownership, with nominee campaigns having a higher success rate, raising more funds, and showing a higher probability of survival (Coakley et al., 2021). A unique feature of the Coakley et al (2021) paper is the tracking of both the short and long-term success of the venture, and documenting the positive impact of the nominee structure in both cases. Additional ECF research examining voting rights has compared different crowdfunding platforms and found a number of governance tools that are used by these investors (Rossi, Vismara, & Meoli, 2019). This comparison examined direct, nominee, and accredited investor categories, and the results from this study showed that direct ownership rights lowered the chances of success; nominee rights were insignificant; and the accredited category was very small. They also examined the differences among countries, and in particular the regulations/policies involving ECF. The US, UK, and Canada have stringent aggregate limits related to ECF, France and New Zealand do not impose any limitations, and many others are somewhere in-between (Rossi et al., 2019).

There are additional crowdfunding platform types. Research has examined a German crowdfunding platform (Innovestment) whose financing model varies from the normal fixed price investment to an auction-style investing with sealed bids and limited information provided about other investors' positions (Hornuf & Neuenkirch, 2017). This platform requires a minimum investment from backers, any additional investment must conform to a set increase, and there is a maximum allowed investment ("How does it work", Innovestment, 2021). Campaigns backed early on by well-respected investors were more likely to achieve full funding, but there was no evidence that factors like geographic distance (between the entrepreneur and backer) or auction sniping behaviour could affect the success of the campaign (Hornuf & Neuenkirch, 2017). This research has, however, demonstrated that campaign success is influenced by platform design.

Research has also examined the viability of crowdfunding platforms as opposed to CF campaigns. One study, by Meoli, Rossi, & Vismara (2022), included over 400 different platforms across numerous countries to assess the impact of the backer's financial literacy, value-added services provided by the platform (e.g., strategic guidance, contract design, marketing), and the types of campaign (e.g., reward, ECF) offered on the platform. In comparison to the high growth seen in CF campaigns, the number of platforms has remained fairly stagnant because the failure rate of platforms is similar to the number of new platforms created (Meoli et al., 2022). A positive effect from backers' financial literacy was found in ECF

campaign structures that give backers voting rights. However, this influence was weakened where the platform offered several value-added services (Meoli et al., 2022).

A study using econometric modeling compared ECF to the reward type of crowdfunding (Belleflamme, Lambert, & Schwienbacher, 2014). Note that these authors refer to reward crowdfunding as 'pre-ordering' and ECF as 'profit sharing'. Belleflamme and co-authors' (2014) findings indicate that entrepreneurs will prefer equity unless the context involves a low capital investment compared to the size of the potential market. The authors propose that the entrepreneur will choose the platform type based on the capital requirements needed to start the new venture. For a start-up with low capital requirements, the entrepreneur will use a reward platform and market products/services to consumers who are early adopters, while an entrepreneur with a start-up that needs considerable capital will choose an ECF platform.

RESEARCH OPPORTUNITIES

The majority of the research on platform types uses secondary data sourced from public sources. This provides insights into statistically significant relationships between the research variables, but lacks insights into causation. The drivers behind the decision to choose one platform type over another are important to know, and future research should explore the decision processes used by both entrepreneurs and backers to select a particular platform type. Qualitative work would be beneficial to explore the entrepreneurial thought process in that selection, and to also pinpoint the relevant decision variables, which may then be used in a survey to conduct quantitative research. This need for more granular research was also noted by authors who used a modeling approach, and it is relevant for research on all three types of crowdfunding platforms. Future work could also explore the motivation to use crowdfunding to test the viability of a product, as a marketing technique, to gain consumer information, and to create user-based innovation (Belleflamme et al., 2014). A particularly interesting insight might be obtained from user-based innovation. It has characteristics similar to 'open-sourced' software development, and could provide an entrepreneur with free assistance in the development of a product.

Rossi et al. (2019) outlined differences in investment regulations regarding ECF across several countries. Policies continue to evolve, and this is an opportunity to examine the differences among countries, explain how these policies may favor either the entrepreneur or the investor, and inform policy development that can serve as best practices to aid governance and ensure efficient economic development. It is also worth noting that the information put forth in extant research has focused on prosperous Western countries with mature financial systems. Yet, the projections from Table 1 indicate high growth in Eastern countries, and other countries with low and middle-income levels. The unique regulations found in these countries, where entrepreneurs typically have fewer financing options, will have a significant impact on the growth and monitoring of crowdfunding platforms. For example, these regulatory differences can allow crowdfunding platforms the flexibility to use unique structures such as those associated with Innovestment (Hornuf & Neuenkirch, 2017). Future research can also explore how government policies can have a significant influence on entrepreneurs' chances of receiving

funding from the platforms, and how such policies can shape both platform design as well as the services offered by the platforms to both entrepreneurs and backers.

SIGNALING AS A GOVERNANCE MECHANISM IN CROWDFUNDING

Research into the use of signals has a long history in management and entrepreneurship research, with emphasis placed on the signals used by entrepreneurs and IPO firms (Connelly, Certo, Ireland, & Reutzel, 2011). Signaling theory was found to be the most commonly used theoretical lens in the research articles reviewed in this paper. Signals can act as pre-investment screening mechanisms that help new venture investors resolve the information asymmetry problems that can lead to adverse selection (Akerlof, 1970). Early empirical work that examined signaling and crowdfunding focused on human, social, and intellectual capital. The work in the ECF domain is a good fit with traditional entrepreneurial financing mechanisms. This research shows that if the entrepreneur indicates that she/he has worked to retain equity in the start-up, it significantly enhances the chances of a successful campaign (Ahlers, Cumming, Gunther, & Schweizer, 2015). Additionally, signal from the entrepreneur that provides detailed information about the risks associated with the start-up seems to help allay investor fears, and was an important factor that led to successful funding campaigns (Ahlers et al., 2015). However, the authors found that signals associated with social or intellectual capital did not play a significant role in campaign success (Ahlers et al., 2015).

Vismara (2016) notes that while seeking equity financing the entrepreneur's signal quality is critical in contexts characterized by information asymmetry, and this is particularly true for ECF. Two aspects of signal quality, equity retained by the entrepreneur and the entrepreneur's social capital, were assessed, and both were found to have a positive association with successful campaigns (Vismara, 2016). Equity retention has a robust track record as a signal of new venture quality. The observed benefit of social capital, on the other hand, comes from the importance of a large social network that enhances the entrepreneur's crowdfunding campaign visibility (Vismara, 2016). Other research has explored if there are differences in the use of signals based on the type of crowdfunding campaign (e.g., reward vs. equity), and whether signal quality differs across platforms. Video quality was a particularly useful signal that was effective across campaign types (Scheaf, Davis, Webb, Coombs et al., 2018). However, text-based signals that convey information about patents were not useful (Scheaf et al., 2018). This work can help entrepreneurs focus their efforts on the effective means to send signals to potential backers, who can then do better venture screening and selection. Signal flexibility, which is the ability of a signal to remain effective across different contexts, also needs to be considered by entrepreneurs when they determine the type of signal that is appropriate (Scheaf et al., 2018).

Signaling can be examined in terms of fit, quality, and ambiguity. Piva and Rossi-Lamastra (2018) examined human capital signals for ECF campaigns and found that the entrepreneur's business education and prior entrepreneurial experience contributed significantly to a successful campaign. Both these measures have good fit as quality measures and are not ambiguous. Measures that lacked these qualities had no significant impact on campaign success. These included measures that were a bad fit (e.g., other education and other work experience), or

were ambiguous (e.g., industry education and work experience) (Piva & Rossi-Lamastra, 2018). Subsequent research has also considered prior entrepreneurial experience and its outcomes. Prior successful campaigns signaled a positive entrepreneurial reputation, while unsuccessful campaigns signaled a negative reputation (Li & Martin, 2019). It followed that while entrepreneurs with a positive reputation could obtain funding, those with negative reputations could not (Li & Martin, 2019). This same research also explored entrepreneurs without a reputation score (first-time crowdfund seekers). Entrepreneurs without a reputation score were more likely to obtain funding (and larger funds) if they can send signals indicating high skill-levels or increased media attention (Li & Martin, 2019).

A large majority of papers on crowdfunding deal with the interactions between the entrepreneur and the campaign backers, and these backers are assumed to be very small investors. For ECF, some platforms limit the total amount a person may invest, while others do not. Research has also investigated the impact of having 'Angels', a small number of campaign backers who choose to make a large investment, as such investment serves as a positive signal (Wang, Mahmood, Sismeiro, & Vulkan, 2019). For entrepreneurs seeking a large amount of funding through crowdfunding, Angel investment is a strong signal that helps obtain successful funding for the new venture, and also attract other Angels as well as the smaller (i.e., typical) crowdfunding backers (Wang et al., 2019).

RESEARCH OPPORTUNITIES

A common observation by researchers is the need to compare ECF with conventional VC financing. The main question is why an entrepreneur would choose one over the other. It may be difficult to create a matched dataset of new ventures for this type of comparison, which seems more suited for a qualitative, narrative style of research. One article speculates that for ECF the entrepreneur believes the idea has a compelling message that will attract a large number of investors, while also noting that ECF is seen as a last resort when other options are not available (Ahlers et al., 2015). With the growing use of ECF by entrepreneurs, this view may change in the near future. An important point to note is that VC funding in prosperous countries is mostly geared towards high-tech start-ups. An entrepreneur with a start-up that is neither high-tech nor based in a developed economy, may have very different choices and preferences.

Signals are used to promote the start-up. People who consider becoming an investor (or backer) in a crowdfunding campaign have multiple sources from which to obtain information. In addition to signals from the entrepreneur, such sources include third party endorsements for reward crowdfunding campaigns (Courtney, Dutta, & Li, 2017). This research has also shown that the entrepreneur's use of media and the founder's crowdfunding experience convey similar signals, and hence each will diminish the other signal's benefit (Courtney et al., 2017). However, when both these signals were present along with third party endorsements, it enhanced the signaling benefits (Courtney et al., 2017). This work can be linked to the concept of 'wisdom of the crowd' that is discussed in crowdfunding. An important point is that crowdfunding campaigns have a number of ways to convey signals, and these signals may influence one another, leading to several possibilities for future research.

Signals used in crowdfunding entail greater complexity than what existing crowdfunding research has examined. Some work has considered the interactions among different types of signals (Courtney et al., 2017). However, there are many other questions to explore, including differences between different campaign types (reward, equity, donation), and whether some signals are better suited to a specific type of campaign (Scheaf et al., 2018). There are numerous signaling choices, and work on customer testimonial signals, patent signaling, and pro-social motivational signals have been specifically noted (Scheaf et al., 2018).

The reviewed research showed the importance of social networks in campaign success, and this work also considered the size of that network (Vismara, 2016). Additional research can explore other aspects of network quality. Some options could be the reputation of individuals in the network, weak or close ties within the network, and the network's fit with the campaign (equity vs. donation). The bulk of the research on human and social capital signals focuses on the founding entrepreneur. In many cases, the start-up has a team of individuals (Piva & Rossi-Lamastra, 2018), and this has a significant impact on variables such as the breadth of the social capital network, prior industry experience, prior entrepreneurial experience, and whether team members characteristics are complementary or redundant, and this is something that future research needs to consider.

Crowdfunding research has assumed that all backers make small investments. However, Wang et al (2019) examined ECF where a few backers made large investments and labeled them as Angels. Future research could explore this in more detail. There are also questions as to what constitutes a large versus small investment, and why different levels of investment, if appropriate, cannot be used together. The benefits from Angel backers were demonstrated in ECF research, and it is possible that these benefits (as a signaling tool that promotes legitimacy) can also be seen in other types of crowdfunding.

It was interestingly to note that none of the SSRN articles emphasized theory. This may be related to the intended outlet for publication. Some entrepreneurship journals (e.g., *Entrepreneurship Theory and Practice*) have requirements for theory development, while other journal outlets rarely address theory. Most of the SSRN articles could easily adopt signaling theory as a theoretical lens. This topic is a multidisciplinary intersection of entrepreneurship, finance, and governance research. Academics interested in crowdfunding research can find a variety of publication outlets by properly constructing their papers for a journal, and theory development is important in most of the top journals.

ACTIONS BY THE ENTREPRENEUR AND BACKERS IN CROWDFUNDING

Legitimacy is an important research area within entrepreneurship (Aldrich, 1999), and it is quite influential in the area of entrepreneurial finance (Lounsbury & Glynn, 2001). Aspiring entrepreneurs may obtain certain benefits from using crowdfunding rather than more traditional financing sources, as the risk assumed by individual backers is small due to their low investments. Research has argued that crowdfunding, especially the reward type, may be optimal for entrepreneurs of unknown talents (low legitimacy), connecting them with backers who are open to be early adopters (Gutiérrez-Urtiaga & Sáez-Lacave, 2018). That said, not all

crowdfunding campaigns will be successful, and indeed most reward crowdfunding campaigns are not fully funded, with a 64 percent failure rate noted on Kickstarter for 2017 (Gutiérrez-Urtiaga & Sáez-Lacave, 2018).

The term 'wisdom of the crowd' is frequently mentioned in crowdfunding research. This 'wisdom' was the subject of a research study on Kickstarter campaigns. A comparison was made among the funding decisions of a panel of experts and the campaigns funded by the crowd, and the research showed statistically significant agreement, with the most successful campaigns (i.e., those that exceeded their crowdfunding goals) also being the experts' top-ranked project choices (Mollick & Nanda, 2016). In situations where there were disagreements between the crowd and the experts, it was observed that the signals from the entrepreneur to the crowd were of higher quality, such as multiple updates, tier rewards, and more extensive use of videos (Mollick & Nanda, 2016). The researchers also examined outcome variables comparing the projects supported by both the experts and the crowd backers, with the projects only supported by the crowd, and found no significant difference, thereby indicating that the crowdfunding backers did a good job of evaluating the potential of the campaigns (Mollick & Nanda, 2016).

Other research on the 'wisdom of the crowd' has explored whether the backer has some prior relationship with the entrepreneur. These were designated as in-crowd or out-crowd, based on whether the person had prior ties with the entrepreneur (Polzin, Toxopeus, & Stam, 2018). The funding decision is relationship-driven, with in-crowd backers relying more on information about the entrepreneur (Polzin et al., 2018). However, the authors found no evidence that out-crowd backers significantly utilized project/financial information in their decisions, except in the case of donation campaigns (Polzin et al., 2018). Financial information about the start-up is also less important where there is a strong in-crowd relationship with the entrepreneur (Polzin et al., 2018).

Entrepreneurs have options on how they structure a crowdfunding campaign. There are decisions to be taken on text content, video production, and the message to convey to the audience. In entrepreneurship education, an emphasis is placed on how to create a pitch for the entrepreneur's idea, based loosely on a common structure that has a central issue/problem description, and how the entrepreneur's idea provides a solution to this issue/problem. If the entrepreneur brings in something unique (e.g., skill sets, resources), then this would be added to the pitch. Crowdfunding research has also highlighted the potential for creating a different form of pitch. Entrepreneurs are more likely to talk about financials in their campaign if the venture has a strong record of revenues. However, this was not found to be related to CF funding success, but campaigns that convincingly tell the venture's 'story' are more likely to meet their goals (Aland, 2021). In examining Kickstarter campaigns, the frequency with which the entrepreneur's name was mentioned had a positive, significant effect on the likelihood of securing funding, as well as the level of funding (Gafni, Marom, & Sade, 2019). This was true for campaigns related to art, but it was not important for tech-related campaigns (Gafni et al., 2019). Crowdfunding backers browsing for artwork are more influenced by the artist's information than by the campaign idea, and researchers link this to the building of trust and familiarity between the backers and the artist/entrepreneur (Gafni et al., 2019). Entrepreneurs are incentivized to engage in actions that signal their trustworthiness and reduce crowd-investors'

moral hazard concerns, as it reduces the need for having formal governance mechanisms (Cumming, Vanacker, & Zahra, 2021).

Additional research that highlights the importance of storytelling in a CF campaign grouped different campaign governance approaches into five categories (Schulz & Blohm, 2019). The work examined donation, reward, and ECF campaigns. Four of these categories utilize socialization and framing related to social aspects of telling the venture's story (Schulz & Blohm, 2019). The story was linked closely with donations and backers relying on their emotions to choose to support the campaign. Another category associated with receiving something (ECF or a reward) was characterized by governance systems related to reputation (Schulz & Blohm, 2019). This does highlight an important difference between CF and other forms of entrepreneurial finance, which is the emphasis on social aspects as opposed to unemotional financial analysis.

Equity crowdfunding research has also highlighted the differences with more traditional funding sources such as venture capitalists and angel investors. This research notes that funds obtained through ECF are new and unique, rather than being simply diverted from another source such as angel investors (Estrin, Gozman, & Khavul, 2018). Even though the ECF backers are not experienced, professional venture capitalists, they do understand the high-risk nature of ECF investments, and evaluate risks accordingly (Estrin et al., 2018). The entrepreneur benefits from ECF as it allows her/him to access new funding sources, test products, and develop a customer following (Estrin et al., 2018). This is a win-win situation for both the entrepreneur and the investors who are early adopters. Research that followed co-investment strategies of a case-study crowdfunding venture found emerging and increasing levels of governance at each stage as the venture progressed through crowdfunding, angel investment, and venture capital stages (Bessiere, Stephany, & Wirtz, 2018). The authors did note that the CF success was instrumental in moving on to the following financing stages (Bessierre et al., 2018).

Crowdfunding backers seem to place less emphasis on the financials of the venture, which is contrary to the financial focus of professional investors as well as the requirements of regulatory agencies such as those in the US (Cumming, Johan, & Reardon, 2021; Aland, 2021). Cumming et al. (2021) found no link between the venture's financial statement disclosure and campaign success. What came out significant in their research were the form of security design (common equity, preferred equity, or debt) and whether or not the venture had been incorporated (Cumming et al., 2021).

It would be reasonable to ask if the location of the entrepreneur might matter for ECF campaigns. Geographic distance was found to be an important factor in ECF campaigns with investors (Guenther, Johan, & Schweizer, 2018). There was a negative correlation between investment likelihood and geographic distance for within-home country ECF backers, but the relationship was not significant if the backers were from outside the home country (Guenther et al., 2018). There could also be other factors in this relationship. Investment likelihood may increase if the ECF backers can visit the entrepreneur's store, talk to the new venture's employees, or if the entrepreneur could somehow create a sense of familiarity and trust (Guenther et al., 2018).

The crowdfunding platforms also introduce variability into the picture. Regulations for crowdfunding vary by country, and naturally, platforms need to comply with their home country regulations, which in turn impacts the type of backing that is available and also determines the need for due diligence. Research has shown that when platforms conduct greater due diligence, it

translates into a higher probability of campaign funding, a larger amount of funds raised by the campaign, and a larger number of backers (Cumming, Johan, & Zhang, 2019). Interestingly, platform involvement goes beyond mere due diligence as these platforms also provide additional services to both the entrepreneur and the backers (Cumming et al., 2019).

Much of the discussion on signaling in the crowdfunding literature focuses on the entrepreneur. On the other side of the equation, Mohammadi & Shafi (2018) explore the investment side, and how crowdfunding allows greater options for non-traditional investors such as women who are under-represented in the VC and Angel investing domains. Prior research in financing has shown that women are more risk averse than men (Croson & Gneezy, 2009). Consistent with this prior work, female ECF backers are less likely to invest in firms that are high tech, very young, or where the entrepreneur retains little equity in the offering (Mohammadi & Shafi, 2018).

Another unique aspect of crowdfunding is the amount of information that is available on the campaign backers. The platforms provide the means to sort campaigns by parameters such as popularity or newness. Early backers may use their public profile as a means to promote the project's investment potential to others. Research shows that backers with a public profile have higher educational capital, more relevant industry-specific experience, and more experience with investments on the ECF platform (Vismara, 2018). The early backers with public profiles can also help attract more backers and ensure the eventual success of the campaign (Vismara, 2018).

RESEARCH OPPORTUNITIES

There is a need for more work on the 'wisdom of the crowd' to understand the investors' decision criteria while making an equity investment. This information could impact the growth of the crowdfunding marketplace, as information on investor financing decisions can be used to promote the crowdfunding campaign. In crowdfunding, there is only a limited amount of information about the start-up, backers' incentives for detailed research about the start-up are low due to the small amount of funds involved, and the backer typically has little experience with investing. The investment decisions by backers are influenced by a myriad of items, with little importance being given to the venture's prior financial record. This context is quite different from other entrepreneurial financing modes. Mohammadi & Shafi (2018) note that work from the heuristics literature could be helpful in exploring new topics in crowdfunding. This has interesting implications for investor decision-making in crowdfunding, as research on heuristics finds that the mental shortcuts used may not actually impose a penalty that prevents successful decision-making.

A major benefit of crowdfunding for entrepreneurial financing is that it is suitable for all types of new ventures. In contrast, while venture capital provides a greater amount of funds to entrepreneurs, these funds flow almost exclusively to the technology and pharmaceutical new

ventures. Crowdfunding research provides opportunities to investigate how backers evaluate campaigns, and how this process varies from that used in VC investments. Research has identified differences in the information used by backers while comparing tech-based campaigns with art-based campaigns. An art-based campaign benefited from a focus on the artist, while a tech-based campaign benefited from an emphasis on the start-up idea (Gafni et al., 2019). More work is needed in this area to assess how the information used by backers can vary across other types of campaigns such as health-related fundraising, event sponsorships, etc.

Further work is also needed on how far backers rely, or can rely, on the due diligence provided by the crowdfunding platform. Platforms vary in the screening and due diligence they perform for a campaign. Increased levels of new venture screening by the platform may replace, or be complementary to, the 'wisdom of the crowd'. Platforms also need to comply with local regulations in matters of due diligence. Policies must balance the need to protect campaign backers through appropriate regulations with the freedom that is currently associated with crowdfunding. Research has shown that increased due diligence raises more money from a larger number of backers, and platforms can use these additional resources to pay for the increased workload to perform the due diligence (Cumming et al., 2019).

As Estrin, Gozman, & Khavul (2019) note, ECF is an emerging source of entrepreneurial financing that is not well-understood. This provides numerous opportunities for researchers. There are added complexities arising from the level of analysis, platform characteristics, and regulations. Guenther, Johan, & Schweizer (2018) found a negative association between the chances of investment and geographic distance for within-home country ECF backers. However, more work is needed to understand why this is significant. It is also possible that this relationship applies to other forms of crowdfunding. 'Pledge crowdfunding' in particular could be influenced by geographic distance. For example, a crowdfunding campaign for an event that raises funds for a local hospital would have a region-specific focus. The crowdfunding idea itself may be better suited to certain geographic regions. An example would be an entrepreneur starting a surfing-related business seeking crowdfunding. This person would likely be located near well-known surfing locations (e.g., in California), and would likely raise funds mainly from that region as opposed to the Midwest or Northeastern US.

Research has shown that investors' relationships with the entrepreneur were more important for committing funds than the new venture's financial information, a finding contrary to the usual VC evaluation criteria (Polzin et al., 2018). A number of other aspects of this process warrant more investigation.

There are concepts such as trust and altruism that could play a role in the investor decision-making process. The crowdfunding campaign backer is noted to be less sophisticated than VCs or Angels, and usually invest small amounts of funds. However, the CF experience can be useful in pitching the venture in subsequent funding rounds, and longitudinal work is needed to track these ventures, an idea that finds mention in a couple of recent papers (Aland, 2021; Cumming et al., 2021). Investment decisions from backers could be influenced by a number of characteristics such as trust, community involvement by the entrepreneur, and promotion of campaign ideas associated with a cause. These are areas for potential future research. Researchers have also noted that the information needs of backers depend on the type of

crowdfunding campaign. Specifically, in both ECF and donation crowdfunding campaigns, the backers sought similar kind of detailed information about the entrepreneur, while the kind of information sought was different for reward crowdfunding, where the focus was on the reward itself (Polzin et al., 2018).

The information that is used by backers and provided by entrepreneurs offers several potential areas of study. Backers need to decide whether to make their personal information public. Work has shown the benefits gained from public, high-profile backers in the early parts of a campaign (Vismara, 2018). Research needs to examine if these benefits are muted by the enhanced presence of accredited backers, and by Angels who enter crowdfunding. As opposed to VC funding, crowdfunding creates a great deal of public information that transpires real-time, and this creates research opportunities regarding different kinds of information/communication, interactions of parties involved, and media coverage (Vismara, 2018).

CONCLUSION

This paper reviewed 28 recent research papers related to crowdfunding and its associated governance. It was noted that the increased interest in crowdfunding research has coincided with the growing importance of crowdfunding as a means of entrepreneurial financing. There is a significant disconnect between this recognized growth and the research context. The region that has seen the largest increase is in the Far East and Asia, but none of the articles appearing in top journals for crowdfunding and governance explore entrepreneurial campaigns from this region. Recurring topics included signals used in crowdfunding campaigns and their role in reducing information asymmetries, how differences in voting rights impact ECF-backed new ventures, and the complexities of crowdfunding due to various platform types and differing regulations. A major portion of the paper is dedicated to outlining the future research possibilities in this domain. It is quite evident that crowdfunding is a complex topic, and more work is needed to get a better understanding of this important source of entrepreneurial funding. We are hopeful that this review will help guide future work on crowdfunding and its related governance issues.

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THE EFFECTS OF M/B RATIO COMPONENTS ON CORPORATE LIQUIDITY CHOICES

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ABSTRACT

We study the effects of market-to-book ratio components on corporate liquidity choices by using the market-to-book decomposition of Rhodes-Kropf, Robinson, and Viswanathan (2005). We find that sector overvaluation and long-term growth increase firms' cash holdings. The effect is stronger in firms with higher growth opportunities, better corporate governance, or more long-term investors. The choices between cash and credit lines for firms without credit ratings are more sensitive to the sector overvaluation and long-term growth.

Key words: M/B decomposition, liquidity, credit lines, cash holdings

INTRODUCTION

External financing may not always be available at reasonable costs for firms due to their financial conditions or market friction. Under the precautionary motive for holding liquid assets, firms build cash reserves and keep credit lines as buffers against negative shocks to their cash inflows. With sufficient liquidity, firms may avoid the high cost of external financing to ensure that they can fund profitable investment opportunities if necessary. The choice between cash and credit lines is an important topic in firms' financial policy management.

Previous literature has documented that both cash and bank lines of credit provide corporate liquidity for corporate funding. Demiroglu and James (2011) have reviewed the usage of these two methods in corporate liquidity management and find that the access to lines of credit is dependent on several factors, such as credit quality of both the borrower and lender. Therefore, bank lines of credit are not a perfect substitute for cash. For example, Demiroglu, James, and Kizilaslan (2009) find that it may cost more for small, private junk-rated and unprofitable firms to have access to lines of credit. Although both are internal sources for corporate liquidity, there are more contingent conditions on lines of credit. Thus, it is important to understand how a firm's market to book (*M/B*) ratio affects the choice between cash and lines of credit.

M/B ratio affects corporate liquidity management in several ways. Previous studies (e.g., Opler, Pinkowitz, Stulz, and Williamson 1999; Harford, 1999; DeAngelo, DeAngelo, and Stulz, 2010) show that *M/B* ratio affects managerial decisions regarding the overall level of liquidity. Sufi (2009) shows that firms with higher *M/B* ratio have lower liquidity ratios. Alternatively, credit lines are less important liquidity components for firms with higher *M/B* ratio. Both Yun (2009) and Acharya, Almeida, and Campello (2013) reinforce the negative relationship. We follow Sufi (2009) to develop two liquidity ratios: *CL/(CL+cash)* and *UCL/(UCL+cash).* The

first ratio *CL/(CL+cash)* is total credit lines over cash holdings plus total credit lines, which measures the percentage of total credit lines in the total liquidity. The second ratio is unused credit lines over cash holdings plus unused credit lines, which measures the percentage of unused credit lines in the total available liquidity. We try to look at the impact of the components of *M/B* ratios on the choice between cash and lines of credit in this paper.

Rhodes-Kropf, Robinson, and Viswanathan (2005) (RRV, thereafter) decomposes the *M/B* ratio into three components: stock price deviations from contemporaneous industry valuations (firm-specific error), deviations of contemporaneous industry valuations from valuations implied by long-run industry multiples (sector error), and long-term value to book (long-term growth). RRV decomposition is widely used in different areas of finance literature. For example, Fu, Lin, and Officer (2013) explore whether acquisitions driven by stock overvaluation are good deals or not. They find that when acquirers use the overvalued stocks as the payment method, they tend to pay a higher premium to buy the targets, which leads to no synergies. Hertzel and Li (2010) employ *M/B* decomposition and find that firms issuing SEOs are overvalued and have higher growth opportunities compared to non-issuers. Badertscher (2011) examines how the degree and duration of overvaluation affect managers' choice in different earnings management.

In this paper, we explore how the *M/B* components affect the corporate liquidity choice between cash and credit lines. We analyze the impact of the three *M/B* components (firm-specific error, sector error, long-term growth) on cash holdings, total granted amount of credit lines, and the two liquidity ratios. Furthermore, we examine whether *M/B* components have different impacts on firms' choices when they are characterized by different levels of corporate governance, investor horizons, or credit rating. To our knowledge, our study is the first paper to examine the effects of *M/B* components on corporate choices between cash and bank lines of credit.

In a sample with 11,369 firm-year observations from 1996 to 2016, we find that sector error and long-term growth significantly increase cash holdings (cash) and reduce the amount of total credit lines (CL) in total corporate liquidity. Cash holdings are relatively more important than credit lines for companies with higher sector error or long-term growth. Specifically, we use the two liquidity ratios (*CL/(CL+cash)* and *UCL/(UCL+cash))* developed by Sufi (2009). The liquidity ratios are lower for firms with higher sector error or long-term growth. We have not found significant effects of firm misvaluation on the choice of cash and credit lines. Polk and Sapienza (2009) find that overvalued cash-rich firms have incentives to invest in negative net present value (NPV) projects, because managers try to boost short term performance. Therefore, overvalued firms prefer to dissipate cash instead of hoarding it and firm overvaluation may not lead to higher cash holdings due to over-investment. The results suggest that industry misvaluation and long-term growth are more important factors that determine the composition of liquidity compared to firm misvaluation. Our results *reinforce* the notion that firms would prefer to increase cash holdings when long-term growth opportunity exists.

The previous literature shows that corporate governance or agency cost is a key determinant for corporate liquidity management (e.g., Yun, 2009; Harford, Mansi, and Maxwell, 2008; Dittmar, Mahrt-Smith, and Servaes, 2003). In this paper, we divide the whole sample by

Gompers, Ishii, and Metrick (2003) governance index (G index, thereafter) and find that the effects of sector errors and long-term growth on cash or credit lines are stronger for firms with lower G index (stronger corporate governance). The result demonstrates that firms with stronger corporate governance tend to hold more cash and have less access to bank credit lines. Our result supplements Harford, Mansi, and Maxwell (2008), who find that firms with weaker corporate governance tend to have lower cash reserves.

The monitoring role of institutional investors has been recognized in the literature (Hartzell and Starks, 2003). Chen, Harford, and Li (2007) show that long-term horizon institutions will focus more on monitoring instead of trading. Gaspar, Massa, and Matos (2005) find that firms with weak monitoring shareholders are more likely to be acquired with a lower premium. According to Derrien, Kecskés, and Thesmar (2013), the existence of long-term investors will reduce the effects of stock mispricing on corporate policies. Moreover, Cella, Ellul, and Giannetti (2013) show that short-horizon investors are more sensitive to negative shocks on the stock market and create price pressure for the companies by selling the stocks during market turmoil. Using two different investor horizon measures, we find that firms with more long-term investors hold more cash and less credit lines when sector misvaluation or long-term growth is higher.

On the other hand, precautionary savings motive states that firms hold cash to capture investment opportunities. Cash gives companies flexibility. However, when the companies have access to the capital markets, the benefits of holding cash will decrease. Opler, Pinkowitz, Stulz, and Williamson (1999) find that firms with access to capital markets tend to have lower cash holdings. Using credit rating as an indicator for the access to public bond market (Faulkender and Petersen, 2006; Harford and Uysal, 2014), we investigate the effects of *M/B* components on corporate liquidity choices by firms with or without credit ratings. We find that the effects of sector error and long-term growth on cash holdings and credit lines are stronger for firms without credit ratings. For example, *CL/(CL+cash)* reduces by 14.95% if the sector error increases by one standard deviation for companies without credit ratings. However, the ratio only decreases by 3.38% if the sector error increases by one standard deviation for companies with credit ratings. In addition, we examine the effect of market valuation on corporate liquidity over different lengths of time. We find that high sector misvaluation and long-term growth will lead to higher cash holdings and lower credit lines in the next one, two, and three years. Therefore, if a firm's industry is overvalued or it has high growth potential, the firm will hold more cash instead of bank lines of credit in the next three years.

Our paper contributes to the literature by employing the RRV (2005) framework to investigate how *M/B* components (firm misvaluation, sector misvaluation, or growth) affect corporate choices between credit line and cash holdings. We identify the importance of cash holdings for growth firms, in which cash is preferred due to the long-term growth potential. In addition, we investigate the results in different time horizons and find that firms' choices in one to three years are consistent if firms have high sector misvaluation or long-term growth. We fill the gap in the literature to capture the impact of detailed *M/B* components on corporate liquidity choices.

What follows in this paper is a literature review and hypothesis development, sample and methodology, empirical results, and a conclusion.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Although cash is convenient, it always comes with costs. For instance, holding excess cash is one source of shareholder-manager conflicts. According to Jensen and Meckling (1976), companies are subject to agency costs when ownership and management are separated. Jensen (1986) states that agents can act for their best interest by excessively hoarding cash. Both Stulz (1990) and La Porta, Lopez-de-Silanes, Shleifer, and Vishny (2000) state that managers have discretionary power to overly retain cash to benefit themselves. To reduce agency costs, the principal must either design incentives or incur monitoring costs. Corporate governance is a measure of how efficiently the principal controls the agency costs. Dittmar, Mahrt-Smith, and Servaes (2003) show that corporate governance is an important determinant of cash holdings internationally. Companies from countries with weaker shareholder protection are more likely to hold excess cash. Dittmar and Mahrt-Smith (2007) further find that $1 of cash holding is worth only $0.42 for high agency cost companies. Harford, Mansi, and Maxwell (2008) argue that poorly controlled managers from companies with excess cash prefer to spend cash quickly on investments rather than hold it, leading to a smaller cash balance.

Besides cash holdings, firms can also keep committed credit lines with banks as an alternative way to cover liquidity shortages. By paying the commitment fees, companies have the right to draw down any amount within the granted total credit line limits. Previous literature shows that outstanding unused credit lines of U.S. corporations totaled $1.7 trillion as of December 31, 2004, while aggregate corporate cash holdings for public firms totaled $1.67 trillion (Yun, 2009). Total credit lines equal to about 15.9% of total assets (Sufi, 2009) and undrawn credit under committed credit lines accounts for 10.6% of cash adjusted assets (Acharya, Almeida, Ippolito, and Pérez-Orive, 2014). Bank lines of credit provide an additional buffer for the firm, while the access to lines of credit is contingent on credit quality of the borrower and financial market condition.

A large literature discusses how firms changed their liquidity management strategies during the financial crisis and the consequences of poor liquidity positions on investments and other financial decisions. Cash holdings were especially critical during the financial crisis, since the access to credit lines becomes more difficult when the financial market is in a weak condition. Duchin, Ozbas, and Sensoy (2010) show that there is a decline in corporate investment during the onset of the crisis; firms with low cash reserves experience the greatest decline in investment. Also consistent with an interruption of the supply of credit, the chief financial officers surveyed in Campello, Graham, and Harvey (2010) report that they had to give up investment opportunities because it was difficult to initiate or renew credit lines during the crisis. Bliss, Cheng, and Denis (2015) find that firms with low cash balance were more likely to cut dividend payout during the 2008-2009 financial crisis with the purpose of saving cash to fund investments. Recent literature (e.g., Acharya and Mora, 2015; Chava and Purnanandam, 2011; Cornett, McNutt, Strahan, and Tehranian, 2011) has shown that banks' role as a liquidity

provider was hurt during the crisis because they experienced a credit crunch. Acharya and Mora (2015) find that banks failed to act as liquidity providers during the crisis and could not fulfill their credit line commitments without support from the government and government sponsored agencies. Ivashina and Scharfstein (2010) state that bank lending during the financial crisis fell by 47% during the fourth quarter of 2008 relative to the prior quarter which made it more difficult for companies to borrow from these constrained banks and renew credit lines.

As we stated before, managers and shareholders may have a conflict of interest regarding the preference between cash and credit lines. Managers may intend to accumulate extra cash to pursue their own interests at the expense of shareholders. On the other hand, credit lines will limit managers' discretion by allowing them to draw down credit lines only when the companies stay compliant with the financial covenants. Credit lines are contingent liquidity sources with restrictions; therefore, firms with different characteristics or facing different economic conditions may prefer credit lines over cash holdings, or vice versa. Sufi (2009) finds that financially constrained companies prefer to use cash more in liquidity management rather than credit lines because they are more likely to violate cash-flow-based covenants. Yun (2009) shows that the choice between cash and credit lines is affected by corporate governance. Acharya, Almeida, and Campello (2013) find that firms with greater aggregate risk should prefer cash holdings to credit lines because they need to pay liquidity premium for credit lines. Acharya, Almeida, Ippolito, and Pérez-Orive (2014) propose that banks provide credit lines to firms as monitored liquidity insurance. Firms with high liquidity risk will use cash instead of credit lines due to the higher cost of credit lines.

Opler, Pinkowitz, Stulz, and Williamson (1999) find that cash balances are positively related to *M/B* ratios. Harford (1999) finds that industries with higher *M/B* ratios have higher cash to sales ratios. DeAngelo, DeAngelo, and Stulz (2010) find that firms with high *M/B* ratio and low operating cash flows will take advantage of market timing and have a higher probability of issuing seasoned equity offerings (SEO); otherwise, companies will have cash shortage one year after the SEO year. Moreover, the *M/B* ratio is also a factor that determines the resulting composition of liquidity. It is unclear how the components of the *M/B* ratio affect the corporate liquidity choices and our paper attempts to fill the gap. According to the literature, we develop the Hypothesis 1.

Hypothesis 1. Among the three M/B components, sector misvaluation and long-term growth have a significant impact on firms' corporate liquidity decision, while firm-specific error does not have a significant effect on corporate liquidity choices.

Specifically, sector error and long-term growth are positively associated with cash holdings, leading to lower liquidity ratios, because these two components are related to the long-term firm valuation. However, the firm-specific misvaluation may be largely related with firm-level idiosyncratic risk, which probably has no significant effect on corporate liquidity management. Furthermore, we examine the impact of sector error and long-term growth on firms with different firm characteristics and develop the Hypothesis 2.

Hypothesis 2. The effects of sector error and long-term growth on liquidity choices are more pronounced for firms with higher growth opportunities, better corporate governance, more long-term investors, or without S&P long-term credit rating.

SAMPLE AND METHODOLOGY

Data & Sample

Firms who are required to file 10-K fillings with the SEC have been required to submit their filings through the SEC's Electronic Data Gathering, Analysis, and Retrieval (EDGAR) system since 1996, which is the starting year of available credit line information. Our sample construction starts with companies listed on the 1996 Standard & Poor's (S&P) 500, S&P Midcap 400, and S&P Smallcap 600 or the S&P Composite 1500 Index, which cover 90% of the market capitalization of U.S. stocks (El-Khatib, Fogel, and Jandik, 2015). To be consistent with previous studies (Liu and Mauer, 2011), we exclude firms in the financial services industries (SIC code 6000-6999) and utility industries (SIC code 4900-4999). We further exclude companies with negative book values of equity and/or total assets. We hand collect the credit line data for 1,012 companies from 1996 to 2016 and keep all the firm-year observations with credit line data available in SEC EDGAR 10-K filings. Our final sample contains 11,369 firm-year observations for 716 companies.

In our sample, the number of companies decreases with time because some companies dropped out of the indices for different reasons, such as mergers and acquisitions or firm size. In 2016, there are only 375 companies in our sample still listed on the S&P Composite 1500 Index. We do not include in our sample any companies that are added into the indices after 1996 for several reasons. First, Brisker, Colak, and Peterson (2013) find that S&P 500 additions will change the precautionary motive for cash holdings and the company's cash policy. Second, this method can reduce the survivorship bias of our sample. Among the 716 companies, 242 firms are listed on S&P 500; 197 firms are listed on S&P Midcap 400; 277 firms are listed on S&P Smallcap 600. We get the firm equity and accounting data from the Center for Research in Security Prices (CRSP) and yearly Compustat. We calculate investor horizon measures using Thomson Reuters 13F institutional holdings database.

The Summary Statistics

The cash holdings refer to the balance of cash plus the amount of short-term investments (Compustat item #1). All cash holdings and total granted credit lines are scaled by the firm's non-cash assets. The scaled cash holdings and total granted credit lines are called cash and total credit lines, respectively. Specifically, we collect firms' total granted credit lines and year-end outstanding credit lines from their 10-Ks' notes called "liquidity and capital resources". A firm's unused credit line is measured as the difference between the firm's total granted credit line and the firm's year-end outstanding credit lines. The total granted credit line, outstanding credit lines, and unused credit lines are all from year-end financial statements which means that they only reflect the situation of credit lines at one point in time-the fiscal year end. However, by nature, revolving credit lines may be borrowed, repaid, and renewed multiple times during a fiscal year. For example, Genzyme Corp. drew down $300 million dollars several times under its revolving credit line during the fiscal year of 2003. However, it repaid the principal plus accrued interest in December 2003. Therefore, there is no amount outstanding on December 31, 2003. In this example, the outstanding credit line is zero on December 31, 2003; however, the company did

use this credit line during the 2003 fiscal year. The outstanding credit lines and unused credit lines can't capture the usage while the maximum and average outstanding can reflect the usage during a whole fiscal year. Thus, we collect the maximum and average credit line outstanding if the companies report the information in the 10-Ks. However, the number of observations is limited. We only have 630 and 743 firm-year observations for the maximum and average credit lines, respectively.

The average net assets, which equal total assets minus cash holdings, is about $6.9 billion in our sample, while it is only $1.6 billion in the sample of Sufi (2009). The reason is that we use S&P 1500 companies, while Sufi (2009) randomly draws 300 companies from the Compustat database. The average cash holdings are $557 million, which is lower than the average granted amount of credit lines by about $100 million. The average unused amount is $561 million based on the year-end 10-K data, which means that companies only use 14.7% of their granted amounts at the year end. We follow RRV (2005) to construct firm-specific error, sector error, and long-term growth measures. The average firm-specific error, average sector error, and average long-term growth for our sample are 0.087, 0.203, and 0.602, respectively. The statistics suggest that the majority of *M/B* ratio comes from long-term growth.

We report the firm characteristics in Table 1. The cash flow indicates that earnings after interest, dividend, and taxes but before depreciation accounts for 9.7% of net assets. On average, companies spend about 3.4% and 2.8% of net assets for research and development (R&D) and acquisitions, respectively. About 68.8% of firm-year observations have cash dividend payouts. Roughly 61.0% companies have an S&P domestic long-term credit rating. We investigate how corporate governance, or agency costs, (G index) affects the companies' choice between cash and credit lines and report the G index at the bottom of Table 1. There are about 4,713 firm-year observations with a G index. The G index covers from 1996 to 2006 in our sample. Churn rate and transient investors reported in Table 1 are investor horizon measures. They estimate how long the institutional investors hold the shares. All variables are winsorized at 1% and 99% levels and defined in Appendix A. All dollar values are in 1996 dollars.

Table 1
Summary Statistics

	N	Mean	Median	Std	25th Pctl.	75th Pctl.
Net assets (in millions)	11,369	6,867.78	1,474.98	23,904.28	546.71	4,779.49
Cash (in millions)	11,369	556.99	111.30	1,282.48	30.91	406.70
Total credit lines (in millions)	11,369	658.16	264.30	1,131.69	94.24	690.81
Unused credit lines (in millions)	11,369	561.20	196.49	1,029.65	56.42	579.96
Firm-specific error	11,369	0.087	0.048	0.562	-0.256	0.389
Sector error	11,369	0.203	0.222	1.411	0.056	0.374
Long-term growth	11,369	0.602	0.645	1.524	0.345	0.975
Cash flow	11,369	0.097	0.095	0.093	0.062	0.135
Industry sigma	11,369	0.099	0.094	0.034	0.070	0.128
Capital expenditure	11,369	0.064	0.047	0.056	0.027	0.082
Leverage	11,369	0.241	0.240	0.164	0.121	0.346
R&D	11,369	0.034	0.003	0.067	0.000	0.032
Acquisition	11,369	0.028	0.000	0.061	0.000	0.022
Dividend	11,369	0.688	1.000	0.463	0.000	1.000
Net working capital	11,369	0.287	0.213	0.329	0.080	0.385
Size	11,369	7.411	7.296	1.610	6.304	8.472
Networth	11,369	0.402	0.402	0.196	0.288	0.524
Tangibility	11,369	0.336	0.281	0.225	0.163	0.460
Credit rating	11,369	0.610	1.000	0.488	0.000	1.000
G index	4,713	9.539	10.000	2.723	8.000	12.000
Churn rate (minimum)	10,052	0.062	0.061	0.013	0.053	0.070
Transient investors	9,685	0.191	0.177	0.094	0.126	0.243

Note:
(1) This table presents summary statistics for variables used in this paper. The sample contains 11,369 firm-year observations for 716 companies from 1996 to 2016.

Market-to-Book Ratio Decomposition

Following RRV (2005), we decompose the *M/B* ratio into three specific components and test the impact of different components on firms' liquidity choice. According to RRV (2005),

$$Ln\left(\frac{M}{B}\right) = LnM - LnB = m - b = Ln\left(\left(\frac{M}{v}\right) * \left(\frac{V}{B}\right)\right) = (m - v) + (v - i \quad 1)$$

M, *B*, and *V* are market value, book value, and true value expressed in standard units; *m*, *b*, and *v* in lowercase letters denote values expressed in logs. *m* is the logarithm of market equity, which equals to CRSP stock price times the number of shares outstanding. *b* is the logarithm of

book equity (Compustat data item 60 CEQ). By inserting *v* into the equation, they decompose the *M/B* ratio into two components: (*m*-*v*) is the difference between market value to true value, which captures market misvaluation; (*v*-*b*) is the difference between true value to book value, which captures long-term growth. If the stock market can correctly predict future growth opportunities, discount rates, and cash flows, the fundamental value or true value (*v*) should equal to m; then (*m*-*v*) should be zero. However, if there is no perfect measure of *v*, (*m*-*v*) reflects stock market pricing error. Moreover, RRV (2005) further divides (*m*-*v*) into two parts: the first part of pricing error (*m*-*v*) is shared by all firms in a sector and another part of pricing error (*m*-*v*) is firm specific. Therefore, RRV rewrites equation (1) as:

$$m_{it} - b_{it} = \underbrace{m_{it} - v(\theta_{it}; \alpha_{jt})}_{firm-specific\ error} + \underbrace{v(\theta_{it}; \alpha_{jt}) - v(\theta_{it}; \alpha_{j})}_{sector\ error} + \underbrace{v(\theta_{it}; \alpha_{j}) -}_{long-term\ gr} \quad 2)$$

The equation decomposes the *M/B* ratio into three components. $m_{it} - v(\theta_{it}; \alpha_{jt})$ is the firm-specific error, which measures firm specific deviation from valuation implied by contemporaneous sector multiples; $v(\theta_{it}; \alpha_{jt}) - v(\theta_{it}; \alpha_{j})$ is the sector error, which measures the difference of valuation estimated by contemporaneous sector multiples and long-term sector multiples; the last term $v(\theta_{it}; \alpha_{j}) - b_{it}$ measures the long-term growth opportunity.

To quantify *M/B* ratio components, we follow model (3) in RRV (2005) to estimate $v(\theta_{it}; \alpha_{jt})$ and $v(\theta_{it}; \alpha_{j})$. RRV (2005) estimates *v* conceptually and involves expressing *v* as a linear function of firm-specific accounting information at a point in time, θ_{it} and a vector of conditional accounting multiples, *α.* We use a set of accounting variables in Compustat for fiscal year 1961 to 2016 to run the following regression model:

$$m_{it} = \alpha_{0jt} + \alpha_{1jt} b_{it} + \alpha_{2jt} Ln(NI)^{+}_{it} + \alpha_{3jt} I_{(<0)} Ln(NI)^{+}_{it} + \alpha_{4jt} LEV_{it} \quad 3)$$

In this equation, b_{it} is the logarithm of book equity, NI^{+} is the absolute value of net income, and $I_{(<0)} Ln(NI)^{+}_{it}$ is a function to indicate whether the net income is a negative figure. LEV_{it} is the leverage ratio.

We group firms based on 12 Fama-French industries and run annual, cross-sectional regressions within each industry to get the coefficients, $\hat{\alpha}_{0jt}$, $\hat{\alpha}_{1jt}$, $\hat{\alpha}_{2jt}$, $\hat{\alpha}_{3jt}$, and $\hat{\alpha}_{4jt}$ which are contemporaneous sector multiples. Then, we take the average over time for each industry to obtain $1/T \sum \alpha_{jt} = \bar{\alpha}_{j}$ for α_{k}, k= 0, 1, 2, 3, and 4. $\bar{\alpha}_{0j}$, $\bar{\alpha}_{1j}$, $\bar{\alpha}_{2j}$, $\bar{\alpha}_{3j}$, and $\bar{\alpha}_{4j}$ are long-term multiples which are reported in Panel A of Appendix C. We can see that $\hat{\alpha}_{0jt}$, $\hat{\alpha}_{1jt}$, $\hat{\alpha}_{2jt}$, $\hat{\alpha}_{3jt}$, and $\hat{\alpha}_{4jt}$ will change with time for each company while $\bar{\alpha}_{0j}$, $\bar{\alpha}_{1j}$, $\bar{\alpha}_{2j}$, $\bar{\alpha}_{3j}$, and $\bar{\alpha}_{4j}$ are constant for different years.

After we get the contemporaneous sector multiples and long-term multiples, we calculate

$$v(\theta_{it};\alpha_{it}) = \hat{\alpha}_{0jt} + \hat{\alpha}_{1jt}b_{it} + \hat{\alpha}_{2jt}Ln(NI)^{+}_{it} + \hat{\alpha}_{3jt}I_{(<0)}Ln(NI)^{+}_{it} + \hat{\alpha}_{4jt} \quad 4)$$

for each firm in different years. To obtain $v(\theta_{it};\alpha_j)$, we calculate

$$v(\theta_{it};\alpha_j) = \bar{\alpha}_{0j} + \bar{\alpha}_{1j}b_{it} + \bar{\alpha}_{2j}Ln(NI)^{+}_{it} + \bar{\alpha}_{3j}I_{(<0)}Ln(NI)^{+}_{it} + \bar{\alpha}_{4j}LI \quad 5)$$

At last, we plug $v(\theta_{it};\alpha_{it})$ and $v(\theta_{it};\alpha_j)$into the equation (2) to get the three *M/B* components: firm-specific error, sector error, and long-term growth. We report the results for our sample in Panel B of Appendix C.

EMPIRICAL RESULTS

We investigate how misvaluation or long-term growth affects the choice between cash and credit lines. We also examine the relation among firms characterized by different levels of long-term growth opportunity, corporate governance, investor horizon, and credit rating.

Impacts on Firm's Liquidity Choices

We first investigate the impact of *M/B* components on corporate liquidity choice in the whole sample and present the results in Table 2. We include industry sigma, the mean of the standard deviations of cash flow over ten years for firms in the same two-digit SIC code industry, as one of the firm characteristic control variables, because it is an important factor in determining corporate liquidity choices (Sufi, 2009). We also include capital expenditure, R&D, acquisition, and cash dividend as our control variables because these factors determine the precautionary need of corporate liquidity. According to Sufi (2009), net worth and tangibility will affect companies' ability to borrow credit lines from banks. We have included a credit rating dummy that equals to one in our regressions, if the company has an S&P domestic long-term issuer credit rating in Compustat; otherwise, the credit rating equals to zero. We not only include controls for firm characteristics but also incorporate firm and year fixed effects in all the regressions. We report the heteroskedasticity corrected standard errors clustered by firms and years in parenthesis. Our regression model is the following:

$$Dependent\ variable_t = \alpha_0 + \alpha_1 firm-specific\ error_t + \alpha_2 sector\ error_t \alpha_3 long-term\ growth_t + \alpha_i firm\ characteristics\ controls_{it} + firm\ fixed\ year\ fixed\ effect + \xi_{it} \quad 6)$$

In the first two specifications of Table 2, the dependent variables are cash holdings and total granted credit lines scaled by net assets, respectively; in Models (3) and (4), the dependent variables are two liquidity ratios - *CL/(CL+cash)* and *UCL/(UCL+cash)*. In the last two models,

we use the maximum and average credit lines as the dependent variables to investigate how the factors affect the usage of credit lines.

As we can see from Table 2, higher sector error and long-term growth are associated with larger amounts of cash holdings which supports our hypothesis 1. The coefficients on both factors are positively significant at the 1% level in the first specification. If sector error increases by one standard deviation, cash as a percentage of net assets will increase by 2.7%. Similar as sector error, long-term growth has significantly positive relation with cash holding. An increase of one standard deviation in long-term growth will increase the cash ratio by 3.1%. On average, cash and short-term assets accounts for 18.5% of net assets. However, firm-specific error has no effect on cash holdings or credit lines while long-term growth can slightly reduce firm's total granted credit lines which is significant at the 10% level. Sector error and long-term growth both have negative impacts on the liquidity ratios. Model (3) shows that one standard deviation increase in sector error or long-term growth will decrease the ratio of credit lines to the total liquidity by 7.7% or 8.7%, respectively. Model (5) and (6) show that firm misvaluation will marginally affect the maximum and average usages of credit lines. If the firms are heavily misvalued, they will use less credit lines, which might result from using overvalued stock to acquire another company. Our significant results of industry misvaluation may reflect the fact that sector error is associated with business cycle risk at the industry level, which might affect firms' corporate liquidity decisions. However, the firm-specific misvaluation is largely related with firm-level idiosyncratic risk, which probably has no significant effect on corporate liquidity management.

Among the control variables, net working capital, size, and leverage are significant at the 1% level in all the specifications. The higher the net working capital and size, the higher the cash holdings and the lower the total credit lines. The higher the leverage, the lower the cash holdings and the higher the total credit lines. If the companies spend more on R&D expenses, the companies prefer cash holdings over credit lines. One possible explanation could be that credit lines are short-term liquidity and can't be used to fund long-term investment in R&D. Capital expenditure does not affect firms' liquidity choices, while acquisition increases cash holdings.

Table 2
Regressions of Liquidity Ratios on M/B Components and Controls

	(1)	(2)	(3)	(4)	(5)	(6)
	Cash	CL	CL/ (CL+ Cash)	UCL/ (UCL+ Cash)	Max. CL usage	Avg. CL usage
Firm-specific error	0.0012	-0.0009	-0.0167**	-0.0119	-0.0158*	-0.0135*
	(0.33)	(-0.17)	(-2.12)	(-1.36)	(-1.90)	(-1.82)
Sector error	0.0192***	-0.0122	-0.0546***	-0.0445***	0.0075	-0.0004
	(3.48)	(-1.66)	(-5.22)	(-3.86)	(0.75)	(-0.04)
Long-term growth	0.0202***	-0.0120*	-0.0574***	-0.0484***	0.0054	-0.0055
	(3.80)	(-1.74)	(-5.62)	(-4.39)	(0.59)	(-0.68)
Cash flow	0.0469	0.2076***	-0.0706	-0.0624	0.0741	0.0446
	(1.33)	(4.86)	(-1.15)	(-1.03)	(0.81)	(0.91)
Capital expenditure	0.0605	-0.0367	0.0561	0.0028	0.2683*	-0.0012
	(1.32)	(-0.65)	(0.42)	(0.02)	(2.03)	(-0.01)
Leverage	-0.2524***	0.1001***	0.3844***	0.3111***	0.3841***	0.2770***
	(-6.34)	(2.97)	(8.35)	(6.77)	(6.13)	(5.62)
R&D	0.7878***	-0.3554***	-1.1498***	-1.0813***	0.9627**	0.3878
	(10.19)	(-6.08)	(-11.87)	(-11.12)	(2.27)	(1.34)
Acquisition	0.1437***	-0.0212	0.0940**	0.0313	-0.1386	-0.2191**
	(4.94)	(-0.48)	(2.38)	(0.78)	(-1.30)	(-2.68)
Dividend	-0.0079	0.0400***	0.0701***	0.0766***	-0.0090	-0.0133
	(-1.15)	(4.82)	(5.51)	(5.92)	(-0.68)	(-1.54)
Net working capital	0.8413***	-0.0771***	-0.4131***	-0.3860***	-0.1923***	-0.1207***
	(38.54)	(-3.95)	(-15.42)	(-14.86)	(-4.12)	(-3.90)
Size	0.0138***	-0.0460***	-0.0333***	-0.0297***	-0.0189**	-0.0097*
	(3.42)	(-13.10)	(-5.38)	(-4.85)	(-2.63)	(-1.79)
Industry sigma	-0.3360*	-0.1097	-0.9723**	-0.9120**	-0.1924	0.0065
	(-1.74)	(-0.41)	(-2.51)	(-2.42)	(-0.38)	(0.02)
Networth	-0.3951***	-0.1234***	0.1057**	0.1083**	0.0946*	0.0146
	(-10.27)	(-3.74)	(2.62)	(2.68)	(1.79)	(0.27)
Tangibility	0.1980***	-0.0783***	-0.1147***	-0.0911**	-0.2475***	-0.0476
	(8.22)	(-3.30)	(-3.12)	(-2.33)	(-4.32)	(-1.32)
Credit rating	-0.0027	-0.0042	0.0072	0.0207	-0.0627***	-0.0290**
	(-0.36)	(-0.42)	(0.52)	(1.38)	(-3.66)	(-2.50)
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
N	11,369	11,369	11,369	11,369	630	743
Adj. R2	0.89	0.25	0.54	0.49	0.53	0.49

Note:

(1) Table 2 investigates the impact of different *M/B* components on cash holding, credit lines, *CL/(CL+cash)* ratio, *UCL/(UCL+cash)* ratio, and the usages of credit lines.

(2) Due to the data availability, the numbers of observations in Models (5) and (6) are much smaller than the other four models.

(3) We also employ year fixed effect and firm fixed effect. Heteroskedasticity corrected standard errors are clustered by firms and years and reported in the parenthese.

(4) *, ** and *** represent significance at the 10%, 5% and 1% level, respectively.

Impacts on Firm's Liquidity Choice by Long-term Growth

Next, we divide the whole sample into two sub-samples by the median level of long-term growth and investigate the impact of *M/B* components on corporate liquidity choice within each sub-sample and report the results in Table 3. Models (1) to (4) are for companies with long-term growth greater than median long-term growth. Models (5) to (8) are for companies with long-term growth less than or equal to median long-term growth. We employ the same empirical settings as in Table 2.

According to Table 3, firm misvaluation has no impact on the firms' choice between cash holdings and credit lines, no matter the long-term growth opportunity level. However, sector error and long-term growth have significantly positive impact on cash holdings and negative impact on total credit lines for companies with long-term growth greater than or equal to the median which supports our hypothesis 2. Therefore, for firms with long-term growth higher than the median, the higher the sector error and long-term growth, the lower the total credit line as a percentage of total liquidity. According to Model (3), one standard deviation increase in sector error or long-term growth decreases the credit line ratio among total liquidity by 14.66% or 16.22%, respectively.

Opler, Pinkowitz, Stulz, and Williamson (1999) find that firms with strong growth opportunities will hold relatively high levels of cash. Moreover, Hertzel and Li (2010) find that firms, which are overvalued and have greater growth opportunities, have higher probability to issue SEOs and that issuing firms will increase cash holdings. Our findings support both Opler, Pinkowitz, Stulz, and Williamson (1999) and Hertzel and Li (2010) by confirming a significant positive relationship between growth opportunities and cash holdings. Furthermore, we find that stock overvaluation has no effect on firms' cash holdings and credit lines which supports Polk and Sapienza (2009), who find that cash-rich firms have incentive to invest in negative NPV projects when the stocks are overvalued because the managers try to cater the current sentiment.

Table 3
Sub-sample Results by Long-term Growth

	High Long-Term Growth				Low Long-Term Growth			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Cash	CL	CL/ (CL+ Cash)	UCL/ (UCL+ Cash)	Cash	CL	CL/ (CL+ Cash)	UCL/ (UCL+ Cash)
Firm-specific error	-0.0030	-0.0030	-0.0033	-0.0006	0.0049	0.0051	-0.0121	-0.0048
	(-0.52)	(-0.39)	(-0.30)	(-0.05)	(1.25)	(0.82)	(-1.14)	(-0.40)
Sector error	0.0233**	-0.0346**	-0.1040***	-0.0987***	0.0070	0.0035	-0.0097	-0.0006
	(2.16)	(-2.62)	(-5.24)	(-4.97)	(1.21)	(0.50)	(-0.79)	(-0.04)
Long-term growth	0.0254**	-0.0335**	-0.1067***	-0.1053***	0.0075	0.0037	-0.0131	-0.0050
	(2.26)	(-2.54)	(-5.18)	(-5.15)	(1.41)	(0.53)	(-1.08)	(-0.39)
Firm characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	5,682	5,682	5,682	5,682	5,684	5,684	5,684	5,684
Adj. R^2	0.91	0.25	0.57	0.53	0.87	0.27	0.52	0.46

T-test for Regression Coefficients Difference

		(1) and (5) Cash		(2) and (6) CL		(3) and (7) CL/ (CL+ Cash)		(4) and (8) UCL/ (UCL+ Cash)	
Firm-specific error	*F statistics*	1.61		0.20		0.98		0.51	
	p-value	0.2169		0.6564		0.3329		0.4820	
Sector error	*F statistics*	2.10		6.35		15.78		16.87	
	p-value	0.1593		0.0185	**	0.0005	***	0.0004	***
Long-term growth	*F statistics*	2.35		5.40		14.95		16.64	
	p-value	0.1375		0.0286	**	0.0007	***	0.0004	***

Note:

(1) Models (1) to (4) are for companies with long-term growth greater than the median. Models (5) to (8) are for companies with long-term growth less than or equal to the median.

(2) We also employ year fixed effect and firm fixed effect. Heteroskedasticity corrected standard errors are clustered by firms and years and reported in the parenthesis.

(3) We also test the difference of the regression coefficients between firms with high long-term growth and firms with low long-term growth. The t-test results are reported under the regression results. We use "Test" command in Stata to perform the hypothesis testing, the output contains the F-statistics and the p-values. The F-statistic is the square of the t-statistic, and it has the same p-value with t-statistic.

(4) *, ** and *** represent significance at the 10%, 5% and 1% level, respectively.

Impacts on Firm's Liquidity Choice by Corporate Governance

According to Jensen and Meckling (1976), firms with weak corporate governance should hold less free cash flow because managers tend to use the free cash flow to extract rent from the shareholders instead of maximizing shareholders' wealth, because these firms usually lack an effective mechanism available to prevent the agency problem. In this section, we examine how *M/B* components affect liquidity choices of firms with different levels of corporate governance.

We use the most common corporate governance index: G index to divide the whole sample into two sub-samples. The sub-sample result by G index is reported in Table 4. Models (1) to (4) are for companies with G index greater than or equal to the median of the sample. Models (5) to (8) are for companies with G index less than the median.

The results show that sector misvaluation and long-term growth have more pronounced impacts on liquidity ratios for firms with stronger corporate governance mechanisms which further supports our hypothesis 2. However, all three *M/B* components have negative impacts on Models (7) and (8) including firm-specific error, which indicates that the higher the misvaluation or long-term growth, companies with strong corporate governance will prefer to hold more cash instead of keep credit lines. However, while sector error shows no impact, long-term growth only has marginal effects on the liquidity choice for companies with weak corporate governance. Long-term growth is significant at the 10% level in Models (1) and (3). Moreover, the magnitudes of the coefficients for firms with strong corporate governance are almost double the one for firms with weak governance. For example, one standard deviation increase in long-term growth decreases the ratio of total credit lines divided by total liquidity by 11.92% for companies with strong corporate governance and only 4.1% for companies with weak corporate governance.

Our results support the conclusion that firms with strong corporate governance mechanisms can hold more cash instead of credit lines because there are effective mechanisms to

reduce the agency costs. With higher firm-specific error, sector error, or long-term growth, firms have higher precautionary need to hold more cash to capture random investment opportunities and strong corporate governance mechanisms allow companies to do so.

Table 4
Sub-sample Results by G Index

	Weak Corporate Governance				Strong Corporate Governance			
	(1) Cash	(2) CL	(3) CL/ (CL+ Cash)	(4) UCL/ (UCL+ Cash)	(5) Cash	(6) CL	(7) CL/ (CL+ Cash)	(8) UCL/ (UCL+ Cash)
Firm-specific error	-0.0047	-0.0024	-0.0022	0.0007	0.0140	0.0052	-0.0465**	-0.0464**
	(-0.64)	(-0.24)	(-0.14)	(0.04)	(1.44)	(0.38)	(-2.66)	(-2.68)
Sector error	0.0149	-0.0022	-0.0325	-0.0233	0.0347***	0.0015	-0.0662***	-0.0568**
	(1.64)	(-0.23)	(-1.72)	(-1.06)	(3.35)	(0.09)	(-3.21)	(-2.66)
Long-term growth	0.0165*	-0.0060	-0.0374*	-0.0277	0.0307***	-0.0007	-0.0707***	-0.0610**
	(1.84)	(-0.69)	(-1.91)	(-1.29)	(3.09)	(-0.04)	(-3.48)	(-2.90)
Firm characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2,997	2,997	2.997	2,997	1,715	1,715	1,715	1,715
Adj. R^2	0.90	0.29	0.54	0.48	0.92	0.36	0.62	0.58

T-test for Regression Coefficients Difference

		(1) and (5) Cash		(2) and (6) CL		(3) and (7) CL/ (CL+ Cash)		(4) and (8) UCL/ (UCL+ Cash)	
Firm-specific error	*F statistics*	2.66		0.40		6.68		9.25	
	p-value	0.1165		0.5311		0.0160	**	0.0055	***
Sector error	*F statistics*	3.65		0.93		4.21		4.08	
	p-value	0.0677	*	0.3439		0.0514	*	0.0534	*
Long-term growth	*F statistics*	1.94		0.81		3.92		4.00	
	p-value	0.1764		0.3781		0.0576	*	0.0567	*

Note:

(1) Models (1) to (4) are for companies with G index greater than or equal to the median. Models (5) to (8) are for companies with G index less than the median.

(2) We employ firm characteristics controls, year fixed effect, and firm fixed effect. Heteroskedasticity corrected standard errors are clustered by firms and years and reported in the parenthesis.

(3) We also test the difference of the regression coefficients between firms with weak corporate governance and firms with strong corporate governance. The t-test results are reported under the regression results. We use "Test" command in Stata to perform the hypothesis testing, the output contains the F-statistics and the p-values. The F-statistic is the square of the t-statistic, and it has the same p-value with t-statistic.

(4) *, ** and *** represent significance at the 10%, 5% and 1% level, respectively.

Impacts on Firm's Liquidity Choice by Investor Horizons

Furthermore, institutional investors with longer investment horizons have higher incentives to reduce the agency cost by closely watching the managers. They may force the managers to adopt liquidity positions that are consistent with their investment horizons. In this section, we examine how *M/B* components affect firms' choices between cash and credit lines by investor horizons.

We employ two investor horizon measures: churn rate and transient investors. They are defined in Appendix A. Churn rate captures the minimum aggregate purchase and sale of institutional investors' portfolios. The higher the churn rate means that the investors' portfolios turnover faster; in other words, the investment horizon is shorter. Transient investors measure the percentage of institutional ownerships that are held by investors with short-term investment horizons. The higher the transient investors, the higher the percentage of short-term investors.

Consistent with hypothesis 2, sector error and long-term growth significantly increase the cash holdings and decrease credit lines for firms with long investor horizons in both Panel A and Panel B. However, for firms with short investor horizons, the effects of *M/B* components on cash and total credit lines are not significant, expect for Model (5) in Panel B. *The CL/(CL+cash)* ratio and *UCL/(UCL+cash)* ratio are all affected by the sector error and long-term growth no matter whether companies have long or short investor horizons, but the effects on firms with long investor horizons are more pronounced, as we can see from the coefficients. For example, one standard deviation increase in sector error will decrease the *CL/(CL+cash)* by 10.75% for firms with long investor horizons (Model (3) in panel A) and by 4.63% for firms with short investor horizons (Model (7) in panel A). We test the difference of the regression coefficients for companies with long and short investor horizons and report the t-test results below the regression results. We can see that coefficients of firm-specific error are not significantly different for companies with different investor horizons; however, coefficients of sector error and long-term growth are significantly different which means that sector error and long-term growth do have different impact on companies with long investor horizons and short investor horizons.

Table 5
Sub-sample Results by Investor Horizons
Panel A: Churn Rate (Minimum)

	Long-term investment horizons				Short-term investment horizons			
	(1) Cash	(2) CL	(3) CL/ (CL+ Cash)	(4) UCL/ (UCL+ Cash)	(5) Cash	(6) CL	(7) CL/ (CL+ Cash)	(8) UCL/ (UCL+ Cash)
Firm-specific error	0.0039	0.0016	-0.0133	-0.0062	-0.0024	-0.0028	-0.0162*	-0.0145
	(0.77)	(0.23)	(-1.44)	(-0.61)	(-0.65)	(-0.43)	(-1.76)	(-1.41)
Sector error	0.0310***	-0.0174*	-0.0668***	-0.0572***	0.0066	-0.0058	-0.0399***	-0.0301**
	(4.32)	(-1.85)	(-4.46)	(-3.37)	(1.04)	(-0.68)	(-3.36)	(-2.38)
Long-term growth	0.0304***	-0.0171*	-0.0682***	-0.0599***	0.0098	-0.0064	-0.0442***	-0.0351***
	(4.32)	(-1.88)	(-4.78)	(-3.78)	(1.64)	(-0.83)	(-3.85)	(-2.85)
Firm characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	5,750	5,750	5,750	5,750	5,619	5,619	5,619	5,619
Adj. R^2	0.89	0.28	0.54	0.48	0.90	0.23	0.56	0.51

T-test for Regression Coefficients Difference

		(1) and (5) Cash		(2) and (6) CL		(3) and (7) CL/ (CL+ Cash)		(4) and (8) UCL/ (UCL+ Cash)	
Firm-specific error	*F statistics*	2.19		0.01		0.02		0.01	
	p-value	0.1512		0.9125		0.8869		0.9103	
Sector error	*F statistics*	12.05		4.15		7.31		4.61	
	p-value	0.0019	***	0.0524	*	0.0122	**	0.0416	**
Long-term growth	*F statistics*	8.62		4.00		7.25		4.59	
	p-value	0.0071	***	0.0566	*	0.0125	**	0.0420	**

Panel B: Transient Investors

	Long-term investment horizons				Short-term investment horizons			
	(1) Cash	(2) CL	(3) CL/ (CL+ Cash)	(4) UCL/ (UCL+ Cash)	(5) Cash	(6) CL	(7) CL/ (CL+ Cash)	(8) UCL/ (UCL+ Cash)
Firm-specific error	0.0066	-0.0086	-0.0163	-0.0091	-0.0020	-0.0010	-0.0173*	-0.0146
	(1.26)	(-1.15)	(-1.55)	(-0.79)	(-0.47)	(-0.15)	(-1.76)	(-1.32)
Sector error	0.0291***	-0.0170**	-0.0607***	-0.0558***	0.0105*	-0.0124	-0.0479***	-0.0351**
	(3.68)	(-2.14)	(-4.18)	(-3.61)	(1.77)	(-1.33)	(-3.99)	(-2.65)
Long-term growth	0.0292***	-0.0175**	-0.0627***	-0.0574***	0.0131**	-0.0116	-0.0516***	-0.0417***
	(3.77)	(-2.30)	(-4.49)	(-3.91)	(2.34)	(-1.36)	(-4.45)	(-3.30)

Firm characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	4,681	4,681	4,681	4,681	6,687	6,687	6,687	6,687
Adj. R^2	0.89	0.27	0.53	0.47	0.90	0.25	0.56	0.51

T-test for Regression Coefficients Difference

		(1) and (5) Cash		(2) and (6) CL		(3) and (7) CL/ (CL+ Cash)		(4) and (8) UCL/ (UCL+ Cash)	
Firm-specific error	*F statistics*	2.44		1.72		0.22		0.05	
	p-value	0.1311		0.2016		0.6415		0.8177	
Sector error	*F statistics*	5.73		1.84		2.92		2.94	
	p-value	0.0246	**	0.1868		0.0997	*	0.0990	*
Long-term growth	*F statistics*	4.60		2.61		2.96		2.42	
	p-value	0.0419	**	0.1189		0.0975	*	0.1321	

Note:

(1) In Table 5, we relate the *M/B* components with cash holdings and credit lines, by institutional investors' investment horizons. We use two different investor horizon measures, churn rate and the percentage of transient investors. The results are reported in panel A and B, respectively.

(2) We employ firm characteristics controls, year fixed effect, and firm fixed effect. Heteroskedasticity corrected standard errors are clustered by firms and years and reported in the parenthesis.

(3) We also test the difference of the regression coefficients between firms with long-term investment horizon investors and firms with short-term investment horizon investors. The t-test results are reported under the regression results. We use "Test" command in Stata to perform the hypothesis testing, the output contains the F-statistics and the p-values. The F-statistic is the square of the t-statistic, and it has the same p-value with t-statistic.

(4) *, ** and *** represent significance at the 10%, 5% and 1% level, respectively.

Impacts on Firm's Liquidity Choice by Credit Rating

The access to the bond market can probably change companies' precautionary need for holding liquid assets. Companies with bonds outstanding tend to have an S&P domestic long-term credit rating. In this section, we investigate how *M/B* components affect the liquidity choices for firms with or without credit ratings. We use the same empirical setting as previous tables, but we exclude the credit rating dummy from the control variables. We report results for companies without an S&P long-term credit rating in Models (1) to (4). Models (5) to (8) are for companies with an S&P long-term credit rating. If the companies don't have access to the public bond market, their liquidity positions are more sensitive to the sector misvaluation and long-term growth opportunities. They more heavily rely on internal liquidity to fund the investment opportunities, such as acquisitions; for example, Genzyme Corp. (Appendix B) drew down $300 million to fund the acquisition of SangStat in September 2003.

In Table 6 Model (3), *CL/(CL+cash)* reduces by 14.95% if the sector error increases by one standard deviation for companies without credit ratings. However, the ratio only decreases

by 3.38% for companies with credit ratings. Moreover, for companies with credit ratings, firm misvaluation will be considered when the companies choose between cash and credit lines. Firm-specific error is significant at the 5% level for both Models (3) and (4). We also test the difference of the regression coefficients for companies without and with credit rating and report the t-test results below the regression results. The impacts of *M/B* ratio components on liquidity ratios are significantly different for firms without and with credit ratings.

Firms with higher R&D expenses have higher cash holdings and lower credit lines. Therefore, companies with higher sector error or long run growth tend to hold more cash and less credit lines so that they can take advantage of growth opportunities. The result indicates that credit lines are less important for companies without credit ratings compared with cash holdings.

Table 6
Sub-sample Results by Credit Rating

	Without S&P long-term credit rating				With S&P long-term credit rating			
	(1) Cash	(2) CL	(3) CL/ (CL+ Cash)	(4) UCL/ (UCL+ Cash)	(5) Cash	(6) CL	(7) CL/ (CL+ Cash)	(8) UCL/ (UCL+ Cash)
Firm-specific error	-0.0008	-0.0039	-0.0309**	-0.0277**	0.0012	0.0087	0.0020	0.0031
	(-0.12)	(-0.43)	(-2.75)	(-2.35)	(0.31)	(1.22)	(-0.20)	(0.28)
Sector error	0.0211**	-0.0206	-0.0804***	-0.0739***	0.0130**	0.0035	-0.0331**	-0.0227
	(2.25)	(-1.51)	(-4.97)	(-4.24)	(2.11)	(0.47)	(-2.74)	(-1.70)
Long-term growth	0.0225**	-0.0209	-0.0827***	-0.0767***	0.0140**	0.0020	-0.0382***	-0.0293**
	(2.51)	(-1.57)	(-5.21)	(-4.52)	(2.37)	(0.29)	(-3.13)	(-2.25)
Firm characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	4,431	4,431	4,431	4,431	6,937	6,937	6,937	6,937
Adj. R^2	0.93	0.29	0.62	0.56	0.79	0.29	0.51	0.45

T-test for Regression Coefficients Difference

		(1) and (5) Cash		(2) and (6) CL		(3) and (7) CL/ (CL+ Cash)		(4) and (8) UCL/ (UCL+ Cash)	
Firm-specific error	*F statistics*	0.16		1.38		2.65		2.43	
	p-value	0.6956		0.2516		0.1164		0.1317	
Sector error	*F statistics*	1.81		5.73		9.02		8.73	
	p-value	0.1908		0.0245	**	0.0060	***	0.0067	***
Long-term growth	*F statistics*	2.15		5.98		8.05		7.62	
	p-value	0.1551		0.0219	**	0.0089	***	0.0107	***

Note:

(1) In Table 6, we relate the *M/B* components with cash holdings, credit lines, CL/(CL+ cash) ratio, and UCL/(UCL+ cash) ratio by S&P long-term credit rating. Models (1) to (4) are for companies without S&P long-term credit rating. Models (5) to (8) are for companies with S&P long-term credit rating.

(2) We employ firm characteristics controls, year fixed effect, and firm fixed effect. Heteroskedasticity corrected standard errors are clustered by firms and years and reported in the parenthesis.

(3) We also test the difference of the regression coefficients between firms with credit rating and firms without credit rating. The t-test results are reported under the regression results. We use "Test" command in Stata to perform the hypothesis testing, the output contains the F-statistics and the p-values. The F-statistic is the square of the t-statistic, and it has the same p-value with t-statistic.

(4) *, ** and *** represent significance at the 10%, 5% and 1% level, respectively.

Impacts of *M/B* Components on Corporate Liquidity in Longer Horizon

In this section, we test whether the *M/B* components and control variables in year t-1, t-2, and t-3 can predict future cash holdings, credit lines, the *CL/(CL+cash)* ratio and *UCL/(UCL+cash)* ratio in year t. We present the results in Panel A, B, and C, respectively.

The cash will increase with the increases of sector error and long-term growth, while the total credit line will decrease with the increases of sector error and long-term growth in all three panels. Firm-specific error doesn't have an impact on cash and total credit lines separately. However, the *CL/(CL+cash)* ratio and *UCL/(UCL+cash)* ratio will decrease with the increases of all three *M/B* components. We also notice that the coefficients of Models (3) and (4) for sector error and long-term growth are decreasing with the lags, while the coefficients for firm-specific error are increasing. This means that firm-specific error's impact on the *CL/(CL+cash)* ratio and *UCL/(UCL+cash)* ratio in a longer horizon is increasing, while sector error and long-term growth's impacts are decreasing with time.

Table 7

Impact of M/B Components on Corporate Liquidity Choice in Longer Horizon

Panel A: One-year Horizon

	(1)	(2)	(3)	(4)
	Cash	CL	CL/ (CL+ Cash)	UCL/ (UCL+ Cash)
Firm-specific error$_{t-1}$	0.0094*	-0.0049	-0.0237**	-0.0204**
	(1.82)	(-0.83)	(-2.78)	(-2.20)
Sector error$_{t-1}$	0.0282***	-0.0166**	-0.0513***	-0.0422***
	(3.69)	(-2.32)	(-4.54)	(-3.58)
Long-term growth$_{t-1}$	0.0292***	-0.0157**	-0.0542***	-0.0469***
	(3.92)	(-2.29)	(-5.04)	(-4.22)
Firm characteristics controls$_{t-1}$	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes
N	10,773	10,499	10,499	10,508
Adj. R^2	0.72	0.25	0.52	0.47

Panel B: Two-year Horizon

	(1)	(2)	(3)	(4)
	Cash	CL	CL/ (CL+ Cash)	UCL/ (UCL+ Cash)
Firm-specific error$_{t-2}$	0.0068	-0.0073	-0.0254**	-0.0240**
	(1.08)	(-1.20)	(-2.78)	(-2.50)
Sector error$_{t-2}$	0.0299***	-0.0169**	-0.0400***	-0.0354**
	(2.92)	(-2.15)	(-3.40)	(-2.67)
Long-term growth$_{t-2}$	0.0311***	-0.0168**	-0.0438***	-0.0407***
	(2.99)	(-2.20)	(-3.82)	(-3.17)
Firm characteristics controls$_{t-2}$	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes
N	10,099	9,814	9,815	9,828
Adj. R^2	0.62	0.25	0.51	0.46

Panel C: Three-year Horizon

	(1)	(2)	(3)	(4)
	Cash	CL	CL/ (CL+ Cash)	UCL/ (UCL+ Cash)
Firm-specific error$_{t-3}$	0.0038	-0.0071	-0.0280***	-0.0273**
	(0.46)	(-1.04)	(-3.14)	(-2.93)
Sector error$_{t-3}$	0.0394***	-0.0167**	-0.0377***	-0.0342**
	(3.00)	(-2.31)	(-3.35)	(-2.88)
Long-term growth$_{t-3}$	0.0388***	-0.0155**	-0.0391***	-0.0372***
	(2.97)	(-2.30)	(-3.55)	(-3.23)
Firm characteristics controls$_{t-3}$	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes
N	9,427	9,157	9,158	9,173
Adj. R^2	0.56	0.25	0.49	0.45

Note:

(1) In Table 7, we use previous years' *M/B* components to predict future cash holdings, credit lines, CL/(CL+cash) ratio, and UCL/(UCL+cash) ratio. We use lags in one-, two-, three-years in panel A, B, and C, respectively.

(2) We employ firm characteristics controls, year fixed effect, and firm fixed effect. Heteroskedasticity corrected standard errors are clustered by firms and years and reported in the parenthesis.

(3) *, ** and *** represent significance at the 10%, 5% and 1% level, respectively.

ROBUSTNESS CHECKS

We conduct several robustness tests. First, we follow D'Mello and Shroff (2002) and Elliott, Koëter-Kant, and Warr (2007) to compute an alternative market misvaluation measure to

replace firm-specific error and sector error in Table 2. Estimated equity misvaluation is based on an earnings-based fundamental valuation model and measured as *VP*, a ratio of intrinsic value to market value. Overvalued firms have *VP*<1; undervalued firms have *VP*>1. *VP* is negative if firms have negative intrinsic value. The mean and median of *VP* for our sample are 0.71 and 0.46, respectively. We use *VP* to replace three *M/B* components and rerun Table 2 Models (1) to (4). Higher *VP* leads to higher cash holdings and lower liquidity ratios. All three coefficients are significant at 1% or 5% level. Then, we add long-term growth from RRV (2005) into the regressions. While the coefficient of *VP* for cash holdings changes from positive to negative, all the other coefficients are consistent with Table 2 in terms of signs and significance.

Recent literature shows that bank's willingness to lend money to companies through previous committed credit lines is determined by banks' financial health and liquidity risk (Ippolito, Almeida, Pérez-Orive, and Acharya 2019; Acharya, Almeida, Ippolito, and Pérez-Orive 2021). We further investigate how the 2008-2009 financial crisis affects the findings of our study. We divide the whole sample into two subsamples. We define the financial crisis period as years 2008 and 2009 and rerun Table 2 Models (1) to (4) for financial crisis and non-financial crisis periods. We find that none of three M/B components have significant effects on cash, credit lines, and two liquidity ratios during the financial crisis. Our results are driven by years under normal economic condition which reinforce that liquidity choice during 2008-2009 financial crisis is more dependent on banks' willingness instead of firm characteristics.

While the long-term growth opportunities may affect firms' liquidity choices, firms' liquidity constraint can also lead to lower future growth. If the reverse causality is true, our results should be driven by more financial constrained firms. Dividing the whole sample by the median level of the Altman's Z-score or the size-age (SA) index from Hadlock and Pierce (2010), we find that less financial constrained firms with higher sector misvaluation or long-term growth prefer to hold more cash and keep less credit lines, while more financial constrained firms are not affected by M/B components. In our whole sample, the median for Z-score equals 4.91, which is much higher than 2.99 (the lower bound of safe zone). These companies are more likely to have access to credit lines and less likely to violate financial covenants. Therefore, the results show that firms in solid financial positioning choose to hold cash to support high growth rate instead of credit lines which reduces the concern that financial constraint leads to lower growth rate.

In addition, we use Fama-French 48 industry classification instead of Fama-French 12 industry classification to recalculate three *M/B* components. Industry classification significantly affects all of three M/B components. For example, the correlation between 12 industry sector misvaluation and 48 industry sector misvaluation is only 0.1372 and not significant. Even though, our major results are robust. Sector error and long-term growth have impacts on liquidity choice. The signs and significance levels of our coefficients of interest do not change by the industry classification.

All the results are available upon request.

CONCLUSIONS

In summary, sector error and long-term growth are two important factors that affect firms' choices between cash and credit lines, while firm mis-valuation is more related to firm-level idiosyncratic risk and has little impact on the choice between cash and credit lines. Furthermore, we find that the effects of the M/B components on liquidity choices vary among firms characterized by different corporate governance, credit rating, and investor horizons.

Firms with higher sector error and long-term growth tend to hold more cash and less credit lines correspondingly. Firms with higher long-term growth opportunities are more sensitive to sector error and long-term growth when they make liquidity choices. In addition, this effect is more pronounced among firms with stronger corporate governance, with longer investor horizons, and without credit ratings. We also find that sector misvaluation and long-term growth have persistent effects on corporate liquidity in the long run.

On the other hand, firm mis-valuation is less important than the other two components for liquidity management. The only exception is that firm-specific error lowers liquidity ratios for firms with strong corporate governance. The firm-specific error coefficients between weak and strong corporate governance for two liquidity ratios are significantly different.

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Appendix A. Variable Name

Variable name	Variable definitions and constructions
Acquisition	acquisitions/net assets (#129 / (#6-#1))
Age	the difference between the current year and the first year the firm shows up in Compustat
Avg. CL usage	average credit line usage during a fiscal year / net asset (#6-#1)
Capital expenditure	capital expenditures (#128) /net assets (#6-#1)
Cash	Cash (#1) /net assets (#6-#1)
Cash flow	the ratio of earnings after interest, dividend, and taxes but before depreciation to the book value of net assets (#13-#15-#16-#21) / (#6-#1)
CL/(CL+cash)	liquidity ratio which equals to total credit line divided by the sum of total credit line and cash
Churn rate (minimum)	follow Yan and Zhang (2009) to construct churn rate (minimum)
Credit line (CL)	total credit line / net assets (#6-#1)
Dividend	a dummy variable equal to one if the firm paid a common dividend and zero otherwise (#21)
G index	Gompers, Ishii, and Metrick (2003) governance index
Industry sigma	the mean of the standard deviations of cash flows over ten years for firms in the same two-digit SIC code industry
Leverage	(debt in current liabilities + long-term debt) (#34+#9) / net assets (#6-#1)
Max. CL usage	maximum credit line usage during a fiscal year / net asset (#6-#1)
Networth	(common equity - cash) (#60-#1) / net assets (#6-#1)
Net assets	total assets minus cash (#6-#1)
Net working capital	(current assets - current liabilities) (#4-#5) / net assets (#6-#1)
R&D	the ratio of research and development expense to sales (#46/#12) R&D is set equal to zero when research and development expense is missing.
Size	the natural logarithm of net assets (Log (#6-#1))
Tangibility	property, plant, and equipment (#8) / net assets (#6-#1)
Transient investors	the fraction of institutional investors' shares held by transient investors Transient investors are identified following Bushee's (1998 and 2001) classification of 13F investors.
UCL/(UCL+cash)	liquidity ratio which equals to unused credit line divided by the sum of unused

Appendix B. Genzyme Corp 2003 10-K Filling

Prior to December 10, 2003, we had access to a $350.0 million revolving credit facility, all of which matured on December 15, 2003. In May 2003, we drew down $16.0 million under this facility. In August 2003 we repaid the full $300.0 million in principal outstanding under the facility plus accrued interest. In September 2003, we drew down $300.0 million under this facility to finance a portion of the cash consideration for our acquisition of SangStat. We repaid the $300.0 million in principal outstanding under this facility plus accrued interest upon termination of this facility on December 9, 2003. On December 10, 2003, we entered into a three-year $350.0 million revolving credit facility. In December 2003, we drew down $300.0 million under this new facility, which we also repaid in December 2003, with accrued interest. As of December 31, 2003, no amounts were outstanding under this new revolving credit facility.

Borrowings under this credit facility bear interest at LIBOR plus an applicable margin. The terms of the revolving credit facility include various covenants, including financial covenants, that require us to meet minimum liquidity and interest coverage ratios and to meet maximum leverage ratios. We currently are in compliance with these covenants.

Appendix C. Market-to-Book Ratio Decomposition

Panel A: Long-term multiples

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$E_t(\hat{\alpha}_0)$	1.20	1.34	1.26	0.98	1.48	1.58	1.45	1.51	1.54	1.82	0.88	1.18
	0.18	0.23	0.12	0.12	0.25	0.08	0.22	0.26	0.14	0.09	0.07	0.06
$E_t(\hat{\alpha}_1)$	0.61	0.58	0.62	0.72	0.52	066	0.62	0.55	0.58	0.58	0.69	0.63
	0.05	0.07	0.03	0.03	0.07	0.02	0.05	0.06	0.04	0.03	0.02	0.02
$E_t(\hat{\alpha}_2)$	0.43	0.42	0.43	0.27	0.50	0.34	0.33	0.38	0.45	0.41	0.32	0.40
	0.05	0.08	0.03	0.04	0.07	0.02	0.05	0.06	0.04	0.03	0.02	0.02
$E_t(\hat{\alpha}_3)$	-0.25	-0.14	-0.16	-0.16	-0.27	-0.15	-0.14	-0.09	-0.22	-0.09	-0.16	-0.21
	0.05	0.06	0.03	0.02	0.06	0.02	0.03	0.04	0.03	0.03	0.02	0.02
$E_t(\hat{\alpha}_4)$	0.57	0.51	0.04	0.54	0.75	0.16	1.07	1.19	0.05	0.50	0.39	0.36
	0.34	0.55	0.24	0.25	0.53	0.20	0.31	0.43	0.22	0.21	0.10	0.15
R^2	0.66	0.66	0.64	0.65	0.68	0.63	0.67	0.67	0.64	0.60	0.65	0.63

Panel B: M/B ratio components

	N	Mean	Std.	5%	Median	95%
$m_{it} - b_{it}$	11,369	0.55	1.16	-1.07	0.45	2.46
$m_{it} - v(\theta_{it};\alpha_{jt})$	11,369	0.00	0.94	-1.44	-0.01	1.45
$nu(\theta_{it};\alpha_{jt}) - v(\theta_{it};\alpha_j)$	11,369	-0.01	0.30	-0.55	0.02	0.42
$v(\theta_{it};\alpha_j) - b_{it}$	11,369	0.56	0.62	-0.41	0.53	1.61

Note:

(1) Panel A reports the results of the long-term multiples by Fama-French 12 industries. The long-term multiples are the time-series average of intercept and contemporaneous sector multiples. Fama-Macbeth standard errors are reported below the average point estimates.

(2) Panel B reports the three *M/B* ratio components: firm-specific error, sector error, and long-term growth.

THE EFFECT OF ANALYST FORECAST ACCURACY ON ACCRUAL QUALITY

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ABSTRACT

In this study, we investigate the effect of analysts' earnings forecast accuracy on firms' accrual quality and whether the presence of cash flow forecast in addition to the earnings forecast (i.e., "bundle" forecasts) moderates such relationship. While prior literature has largely focused on the effect of the stand-alone cash flow or earnings forecast on market reaction, the earnings forecast accuracy-accruals quality relationship has been underexplored. Using a sample of firms from 2010 to 2018, we first find that analysts' earnings forecast accuracy is strongly positively associated with accrual quality, while earnings forecast dispersion is negatively associated with accrual quality. Next, we examine the moderating effect of cash flow forecast and find that issuing "bundle" forecasts improves the accrual quality to a greater extent than those without cash flow forecast. We further examine whether analysts issuing "bundle" forecasts are more accurate than those issuing earnings forecast only but do not find supporting evidence. Our study contributes to the literature by documenting the effect of 'bundle' forecasts on accrual quality. Our study also has implications for analysts and investors.

Keywords: Accrual quality, Earnings forecast accuracy, Cashflow forecast, Bundle forecasts

INTRODUCTION

Financial analysts play one of the most important roles in the business world; they can generate important numbers regarding earnings forecasts and stock recommendations (Givoly, Hayn, & Lehavy, 2009). A large body of research investigates the relation between accounting accruals and analyst forecasts optimism (Barth & Hutton, 2004; Drake & Myers, 2011), while others are interested in the association between future earnings performance and negative forecast errors (Bradshaw, Richardson, & Sloan, 2001). However, the relation between accrual quality and analyst forecast accuracy is underexplored.

On the one hand, accrual quality is a proxy for information risk (Zhang & Wilson, 2018), and low accrual quality indicates poor financial health (e.g., Eliwa, Gregoriou, & Paterson, 2019; García-Teruel, Martínez-Solano, & Sánchez-Ballesta 2014; Le, Vo, & Vo, 2021) and weaknesses in internal controls (Doyle, Ge, & McVay, 2007). On the other hand, one of the main roles of financial analysts is to monitor firms' activities and reduce agency costs (Jung, Sun, & Yang, 2012; Yu, 2008). In addition, analysts' forecast accuracy reflects firms' information environment (Chou & Shiah-Hou, 2010). Therefore, we are motivated to examine how analysts' forecasts impact the accounting information regarding accrual quality as it reveals a different channel of

monitoring mechanism. Accordingly, we expect that accrual quality is strongly associated with analysts' forecasts.

Firms are at greater risk of financial misstatement when accruals are high; thus, it is normal for financial press to express their concerns about the company with large accruals and often demand to use cash flows for validating earnings. DeFond & Hung (2003) support this point of view by collecting feedback from several sell-side analysts who state that large accruals can influence their decisions on cash flow forecasts. Therefore, prior studies document that the market finds cash flow information more useful and supplements earnings when accruals are relatively large. On the one hand, Givoly et al. (2009) documented that accruals have a smoothing effect on earnings, thus making earnings easier to predict than volatile cash flows. Moreover, since earnings are the most popular measure followed by the investors and the media, one would anticipate greater resources in an earnings forecast. Therefore, earnings forecasts are expected to have higher quality than cash flow forecasts.

On the other hand, earnings based on accruals are subject to estimation errors. As a result, earnings are more vulnerable to management manipulations, thus making earnings more difficult to forecast than cash flow. Call, Chen, & Tong (2009) express that analysts do more work analyzing firms' financial statements to understand firms' key components better when they issue both earnings and cash flow forecasts. As such, we expect an increase of accrual quality when analysts issue the "bundle" forecasts compared to when only an earnings forecast is issued.

We first use the most popular measurement EPS (earnings per share) forecast to examine the accrual quality-forecast accuracy relation. We employ two empirical approaches for the earnings forecast: accuracy and dispersion. Accuracy is the absolute difference between the mean of analyst earnings estimations and the actual earnings, scaled by the share price at the beginning of the reporting period, then multiplied by negative one. Dispersion measures analysts' disagreement with earnings, calculated using the standard deviation of earnings per share divided by the share price at the beginning of the reporting period. The empirical test results indicate that the inverse accruals quality decreases as earnings forecast accuracy increases. Therefore, our results support the hypothesis that accrual quality is significantly positively associated with earnings forecast accuracy and is significantly negatively associated with earnings forecast dispersion.

Next, we compare the accrual quality with and without cash flow forecasts, and we expect that the accrual quality would be higher when analysts issue both earnings and cash flow forecasts. We test this assumption by adding a cash flow forecast dummy variable in the regression model. Regression analysis shows that the coefficient of the dummy variable (*D_CPS*) is statistically significant in both accuracy and dispersion models. Therefore, issuing the "bundle" forecasts improves the accrual quality. However, we did not find supporting evidence that analysts who issue both earnings and cash flow forecasts are more accurate than those who only issue earnings forecasts. One plausible explanation is that because earnings are the most prevalent measurement used by analysts, investors, and the media, more resources are available for earnings forecasts. As a result, earnings forecasts accuracy should not be affected much.

Our study contributes to both literature and practice in several ways. First, we provide evidence to the literature that the quality of accrual can project analyst forecast accuracy, where accrual manipulation facilitates greater analyst forecasts error. Our study is different from prior studies since they only examine either the impact of stand-alone cash flow or earnings forecast on market reactions. We extend the literature using another perspective by investigating how the "bundle" forecast impacts accrual quality. Academic researchers rely greatly on analyst forecasts when examining earnings management. A better understanding of the forecast accuracy lets researchers develop more accurate proxies and enhance their credibility to research findings (Call et al., 2009). This finding warns analysts, who are more concerned about the accuracy of their forecast, to be cautious while using the financial information provided by management. Our study also benefits investors and sheds light on the mechanism and the role of analysts' cash flow forecasts, which serve as a moderator in the relationship between analysts' earnings forecasts and accrual quality. As McInnis & Collins (2011) stated, analysts' cash flow forecasts are a low cost to investors compared to other regulatory monitoring mechanisms, such as annual audits.

The remainder paper is constructed as follows. Section 2 summarizes related literature and develops the hypotheses. Section 3 describes sample collection and research method. Section 4 presents descriptive statistics and empirical results, and Section 5 concludes.

RELATED RESEARCH AND HYPOTHESES DEVELOPMENT

1. Literature Review

1.1 Research on Analyst Forecast

Financial analysts serve as information intermediaries and providers. Mattei & Platikanova (2017) conclude that securities firms' financial analysts are crucial in the capital markets. Analysts work hard on gathering and interpreting important facts regarding the firm's market position and financial performance. The quality of analysts' work depends on the difficulty level in forecasting changes in real-world business decisions and on the predictive ability of past financial information in projecting future performance (Mattei & Platikanova, 2017). Further, analysts' accurate recommendations and information quality of their recommendations are important factors for the precision of analyst forecasts. Analyst forecast accuracy reflects both public information and analysts' private information (Keskek, Myers, Omer, & Shelley, 2017). Analysts usually gather private information when they have access to management and then generate private information when they can analyze public information. Analysts' forecast is preferred over any mechanical models because of accuracy and stock return association around the time of earnings announcements (Schipper, 1991).

It is not surprising if analysts are better at reporting accurate earnings forecasts because they have more information to evaluate future earnings than any other accounting system. Brown et al. (1987a, 1987b) state that analyst forecasts can predict future earnings more accurately than any other time-series statistical models, suggesting analyst forecasts contain value-relevant information about earnings. Loh & Mian (2006) conclude that investors benefit greatly from accurate earnings forecasts while making investment decisions, which can greatly reduce

investors' information search costs. In addition, forecast accuracy is crucial for analysts because their careers and rewards depend greatly on forecast accuracy (Call et al., 2009).

1.2 Research on Financial Reporting and Accounting Accruals

Financial reporting quality is defined as an information communication channel of a firm's underlying economics and can discipline the free cash problem. The outcome view by Jensen (1986) and La Porta et al. (2000) indicate that managers have incentives to over-keep cash for personal benefits. Thus, high-quality reporting mitigates the free cash flow issue and reduces managers' incentives to manipulate the cash. The substitute view by Rozeff (1982) and La Porta et al. (2000) indicate that managers have incentives to restrain the free cash flow problem to build a good reputation to obtain more capital at a lower cost. Financial reporting is not just a final output; the disclosure of the company transactions, information, accounting policies, and judgment decisions are also critical (Jonas & Blanchet, 2000). Noncash assets and liabilities are the main accounts circling in accrual accounting. Therefore, distinguishing cash versus noncash asset accounts, and liability versus equity accounts is necessary (Larson, Sloan, & Giedt, 2018).

Accounting accruals quality evaluates the firm's matching level of reported accruals and cash flow and is always used as a proxy for information risk (Zhang & Wilson, 2018). Consistent with the notion that accrual quality is a proxy for information risk, prior studies have provided evidence that low accrual quality is associated with poor internal controls (Doyle, Ge, & McVay, 2007), a decrease in auditor independence (Abdul et al., 2020), decreased access to bank debt (García-Teruel, Martínez-Solano, & Sánchez-Ballesta 2014), higher cost of debt (Eliwa, Gregoriou, & Paterson, 2019; Le, Vo, & Vo, 2021), and higher cost of capital (Hong, Ma, & Zhang, 2019; Kim et al., 2020).

Accrual quality was first introduced by Dechow & Dichev (2002) and is measured using within-firm standard deviation residuals from a regression. Therefore, a poor accrual quality indicates accruals have a weak relationship with realized cash flows (Zhang & Wilson, 2018). Dechow & Dichev (2002; D&D hereafter) measure accrual quality using working capital accruals as a proxy to reflect operating cash flow realizations. The intuition of D&D's model is that the timing between the firm's accomplishment and efforts is always different and that the accruals can adjust the cash flow timing problems. D&D uses residuals from the firm-specific regression model to measure accrual estimation errors, and these residuals are unrelated to cash flow realizations. Further, D&D indicates that the residuals' standard deviation is the accruals quality measurement, where a larger standard deviation denotes lower accruals quality.

In the same year, McNichols (2002) points out the limitations in D&D's model and provides evidence of measurement error in their regression. In McNichols' opinion, D&D did not consider the possible influential factors in the accruals and cash flow relationships, such as firm environment uncertainty, management ability, and the level of accrual manipulation. Lobo, Song, & Stanford (2012) argue that sometimes accruals are impossible to map into cash flow. For example, operations in volatile industries are so unstable that even highly skilled managers with good intentions can still make large estimation errors.

1.3 Research on the Relation Between Analyst Forecast and Accounting Accruals

Barth & Hutton (2004) indicate that high accruals positively correlate with over-optimism in analyst forecasts. Drake & Myers (2011) explain this over-optimism as proof that analysts do not fully interpret the impact of earnings reversals on high accruals in their forecasts. The authors provide two possible explanations. First, analysts may not be experienced enough to understand the close connection between high accruals and future earnings. Second, analysts may connive with management to inflate their future earnings forecasts, thus misleading investors' expectations.

Analyst forecast reveals lots of information obtained from the accrual component because analysts collect various information to develop their earnings forecasts. Firms with abnormally high accruals are more likely to result in declines in subsequent earnings performance and SEC enforcement actions for violations (Bradshaw et al., 2001). Bradshaw et al. (2001) also document that when firms have abnormally high accruals, analysts' forecast errors are usually large and negative. However, Barth & Hutton (2004) indicate that the revised analyst forecast is significantly positively associated with future changes accruals while controlling for current year accruals. In addition, they find that analyst forecast revisions can improve the accrual strategy and that accruals can also refine the forecast revision strategy. Lobo et al. (2012) suggest that if accounting earnings cannot provide a precise signal about firm value, subsequently, analysts are more likely to acquire private information to supplement the noisy accounting information, thus demanding more information for firms with lower accrual quality. Therefore, this leads to higher analyst coverage for lower accruals quality firms.

When analysts play the role of information intermediaries, the key message first goes from the firm to the analysts, analyzing and translating the information to the capital market. In such a setting, firms with better disclosure lead to a more valuable analyst report and a demand for analyst services. If analysts act as information providers who compete with management disclosures made directly to investors, the demand for analyst services will decrease if management disclosures have higher quality. Since lower quality accruals cause greater information asymmetry, Lobo et al. (2012) suggest that firms with lower accruals quality are more likely to attract more analysts who can profit more from using private information. McInnis & Collins (2011) further indicate that analysts' cash flow forecasts increase the transparency of management accrual manipulations, thus causing the likelihood of restatement and regulatory punishment, which increases the expected costs to both the firm and the managers. As a result, analysts' forecasts constrain earnings management and increase the accruals quality.

2. Hypotheses Development

Prior research examined the effect of financial reporting on firm policies and financing and investment decisions. For example, Koo et al. (2017) provide evidence on how financial reporting quality affects dividend policy. They find that reporting quality and dividends are positively related when a firm has more cash flow from operations and fewer investment opportunities. One stream of study linked accounting accruals with analyst forecasts optimism (e.g., Barth & Hutton, 2004; Drake & Myers, 2011). Another stream of research shows that abnormally high accruals can harm future earnings performance and cause large and negative

forecast errors (e.g., Bradshaw et al., 2001). However, the studies on the relationship between accrual quality and analyst forecast accuracy are limited. Thus, our goal is to examine the effect of accounting accrual quality on the analyst forecast. Financial statement numbers contain accruals, and at the same time, analysts rely greatly on financial and nonfinancial accounting information included in the financial statements. Therefore, analyst forecast accuracy should relate to accruals. We formulate the following hypothesis concerning the relationship between analyst forecasts accuracy (dispersion) and accounting accruals.

H1*: Accrual quality is positively (negatively) related to analyst forecast accuracy (dispersion).*

Givoly et al. (2009) indicate that analysts use a more structured and disciplined method for earnings forecast when cash flow forecast is also part of the package. If analysts choose to release earnings and operating cash flow, they are also stealthily providing a forecast of operating accruals (McInnis & Collins, 2011). Cash flow forecasts serve as a preventer to accrual manipulation and provide investors and regulators useful information to break down earnings surprise into the cash flow portion and the accruals portion. DeFond & Hung (2003) document a steady increase in the proportion of analyst earnings forecasts and cash flow forecasts, from 1% to 15% in 1993-1999. Later, McInnis & Collins (2011) state that U.S. firms in the I/B/E/S database for analysts releasing both forecasts increased to 39% in 2003. This suggests that the cash flow forecasts play a more important role in firms. Call et al. (2009) find that analysts who issue both earnings and cash flow forecasts are 10% more accurate than those who only issue earnings forecasts. In addition, they find that issuing an additional cash flow forecast can significantly help analysts understand the time series properties of earnings. Therefore, we predict that analysts' cash flow forecasts positively affect firms' accrual quality. Based on prior evidence, we posit that the accrual quality would be higher when analysts' earnings forecasts are accompanied by cash flow forecasts relative to stand-alone analysts' earnings forecasts. Also, we expect a stronger relationship between earnings forecasts accuracy (dispersion) and accrual quality when analysts issue the "bundle" forecast relative to the stand-alone analysts' earnings forecasts.

H2*: Accrual quality improves when analysts' earnings forecasts are accompanied by cash flow forecasts relative to stand-alone analysts' earnings forecasts.*

H3: *The positive (negative) relation between analysts' earnings forecasts accuracy (dispersion) and accrual quality is stronger when analysts' earnings forecasts are accompanied by cash flow forecasts relative to stand-alone analysts' earnings forecasts*

SAMPLE AND METHODOLOGY

1.1 Data Collection

The primary data sources obtained during the period from 2010 to 2018 are: 1) analyst earnings and cash flow forecasts (I/B/E/S Summary file); 2) financial data to estimate accrual quality (COMPUSTAT). We use the period starting from 2010 to overcome the confounding effect of the financial crises during 2008 and 2009. Following prior studies (Call et al., 2009;

DeFond & Hung, 2003; McInnis & Collins, 2011), we restricted the observations to one-year-ahead forecasts since cash flow forecasts in the database are annual. We excluded the observations lacking necessary data for accruals calculations from COMPUSTAT. For Hypothesis 1, we require our sample to have observations with one-year ahead annual earnings forecasts (EPS) because EPS is the most popular measurement used by analysts. For Hypothesis 2 and 3, we also collected cash flow forecasts (CPS) for the same period in addition to the EPS. The non-U.S. firms and firms in the financial and utility industries (SIC 6000-6999 and 4900-4999) are all eliminated because their capital structures are different from those of the industrial firms. To minimize the potential outliers, we winsorized all continuous dependent and independent variables at the 1% and 99% levels.

1.2 Empirical Methods

1.2.1 Measurement of Accrual Quality

Following Koo et al. (2017), we measure the change of total current accruals (*ΔTCA*) by adopting McNichols' (2002) modified Dechow & Dichev (2002; D&D after) model. Based on D&D, McNichols added the variables, level of property, plant, and equipment (*PPE*), and changes in revenue (*ΔSALES*), which can significantly increase the explanatory power of the accruals model. If the accruals do not match up with operating cash flows over three years, then the accruals are highly unlikely to be realized; therefore, the unexplained portion of the changes in working capital accruals is treated as noisy signals. In other words, the standard deviation of regression residuals is used as an inverse measure of accrual quality. We use the following model to regress the total change in current accruals (*ΔTCA*). The cash flow from operations (*CFO*) is assessed using consecutive three years from *t-1* to *t+1*. Then, we use the residual (e_{it}) as a proxy for the accrual quality.

$$\Delta TCA_{it}=\alpha_0+\alpha_1 CFO_{it-1}+\alpha_2 CFO_{it}+\alpha_3 CFO_{it+1}+\alpha_4 \Delta SALES_{it}+\alpha_5 PPE_{it}+e_{it} \quad (1)$$

1.2.2 Measurement of Analyst Earnings Forecast Accuracy

Following Mattei and Platikanova (2017), we estimate the analyst forecast accuracy using two approaches: *ACCURACY* and *DISPERSION*. As for the analysts' forecast estimation period, I/B/E/S database provides information for every month. We use the mean number of analyst earnings estimations in the last month of the firm's fiscal year. The number for the last month can be obtained from I/B/E/S statistical period (STATPERS)[1]. As Mattei and Platikanova (2017) suggested, the analyst forecasts in the last month of the year should contain all available information for the forecast accuracy calculation before the annual earnings announcement. In model (2), *ACCURACY* is calculated using the absolute value of the difference between the mean of analyst earnings estimations (MEANEST) of the last month of I/B/E/S statistical period

[1] STATPERS is a set of date obtained from I/B/E/S database in WRDS.

(STATPERS) and the actual earnings (ACTUAL) for the year as reported by I/B/E/S, divided by the share price at the beginning of the reporting period (PRICE), then multiplied by -1. The variable is multiplied by negative one to show that as the negative value of *ACCURACY* goes up, the earnings forecasts would be more accurate. The absolute value of the difference measures the gap between analysts' earnings per share estimation and the actual earnings value. Therefore, multiplying -1 means the larger the negative value of accuracy, the smaller the gap (i.e., -1 is larger than -10), which stands for a more precise forecast. Model (3) uses *DISPERSION* as a proxy, and it measures the disagreement about future earnings within analysts, which is calculated using the standard deviation of forecasted earnings per share (*EPS*), scaled by the share price at the beginning of the reporting period (PRICE).

$$ACCURACY_{it} = (|MEANEST_{it} - ACTUAL_{it}|) \div PRICE \times (-1) \quad (2)$$

$$DISPERSION_{it} = EPS\ Standard\ Deviation \div PRICE \quad (3)$$

1.2.3 Measurement of Analyst Forecasts Effect on the Accrual Quality

In models (4) and (5), the dependent variable is the value of the standard deviation of regression residuals e_{it} from model (1). It measures accrual quality over five years from time $t - 4$ to time t as the accrual quality score (Zhang & Wilson, 2018). Zhang and Wilson (2018) also point out that a higher standard deviation of the residuals reflects a weaker mapping between accruals and cash flow. We use a *positive* value so that the higher the value of *ACCQ* variable, the lower the accrual quality. Therefore, we call *ACCQ* the inverse of accrual quality because it is measured using the standard deviation of residuals from a regression. Thus, a high value of *ACCQ* refers to poor accrual quality. The main variables of interest in model (4) are $ACCURACY_{it}$ and $DISPERSION_{it}$ for firm i at time t, where β_1 captures the impact of analyst accuracy on accrual quality. For *ACCURACY*, we expect the coefficient to be negative and expect the opposite for *DISPERSION*. For model (5), we set *D_CPS* as a dummy variable to examine the existence of cash flow forecasts' effect on accrual quality; it equals 1 if analysts issue both earnings and cash flow forecast, and 0 if analysts only analysts issue earnings forecast. $D\_ACCURACY_{it}$ and $D\_DISPERSION_{it}$ are the interaction terms between the dummy variable and *ACCURACY* as well as *DISPERSION*. We expect γ_1 and γ_2 to be significantly negative (positive) for accuracy (dispersion). Also, we expect γ_2 to have a larger (smaller) magnitude than γ_3 for accuracy (dispersion).

$$\begin{aligned} ACCQ_{it} = {} & \beta_0 + \beta_1(ACCURACY_{it} \text{ or } DISPERSION_{it}) + \beta_2 FirmSize + \beta_3 Age + \beta_4 MtB + \beta_5 ROA + \\ & \beta_6 Leverage + \beta_7 LossForward + \beta_8 Growth + \beta_9 R\&D + \beta_{10} Cash + \beta_{11} OperatingProfit \\ & + \beta_{12} Inventory + \beta_{13}\ Receivable + \beta_{14}\ Litigation + \sum \lambda_k IND + \sum \delta_t YEAR + \varepsilon_{it} \end{aligned} \quad (4)$$

$$ACCQ_{it} = \gamma_0 + \gamma_1 D\_CPS + \gamma_2(D\_ACCURACY_{it} \text{ or } D\_DISPERSION_{it}) + \gamma_3(ACCURACY_{it} \text{ or } DISPERSION_{it}) + \gamma_4 FirmSize + \gamma_5 Age + \gamma_6 MtB + \gamma_7 ROA + \gamma_8 Leverage + \gamma_9 LossForward + \gamma_{10} Growth + \gamma_{11} R\&D + \gamma_{12} Cash + \gamma_{13} OperatingProfit + \gamma_{14} Inventory + \gamma_{15} Receivable + \gamma_{16} Litigation + \sum \lambda_k IND + \sum \delta_t YEAR + \varepsilon_{it} \quad (5)$$

Control variables are: *FirmSize*, *MtB,* and *Age* capture firm size, value, and age, respectively. We expect the coefficients on these variables to be negative because larger and mature firms are more stable and tend to have better corporate governance, suggesting better-managed accruals. *ROA*, *Growth,* and *OperatingProfit* capture profitability. We expect negative coefficients on profitability variables since low accrual quality will cause lower profit. We expect the coefficients for *Leverage* and *LossCarry* to be positive because larger long-term debt and loss carry forward to the next year can harm the accrual quality. *R&D* is included to evaluate the risky investment, *Inventory* and *Receivable* can reflect the complexity; thus, we expect all three coefficients to be positive. *Litigation* is expected to have a positive relationship with low accrual quality because the higher the litigation risk, the higher the possibility of poor accrual quality. In addition, accrual quality is likely to correlate with cash flow holdings (*Cash*), and we expect the coefficient to be negative. As Call et al. (2009) suggest, the same analysts appear multiple times in the sample and in the same industry; thus earnings forecast properties are highly likely to persist over time. As a result, we calculate analyst-clustered standard errors by including industry and year dummies to control for cross-sectional and time-series dependence. All the detailed variable definitions are provided in the Appendix.

RESULTS

1.3 Descriptive Statistics

Table 1 shows the sample selection process. The initial sample obtained from COMPUSTAT with industry SIC has 204,338 observations. Since we use a variety of accounting variables in the regression models, we first delete observations lacking necessary data from COMPUSTAT. Then, we delete all the missing lag and lead values for the three-year period operating cash flow; the final sample consists of 40,480 observations. The initial I/B/E/S sample with only earnings per share estimates for Hypothesis 1 contains 37,850 observations. Next, to calculate variables for analysts' forecast accuracy and dispersion, we delete observations lacking necessary data (mean estimate, EPS standard deviation, actual earnings value, and price) from the initial sample collected from I/B/E/S/ Summary File. The final sample consists of 28,430 observations. After merging the sample from COMPUSTAT and I/B/E/S Summary File, including only earnings per share estimates, the final sample consists of 132,054 observations with 4,040 unique firms.

The initial I/B/E/S sample with earnings per share and cash per share estimates for Hypotheses 2 and 3 using the last month of IBES Statistical Period contains 39,196 observations. Within this sample, we delete observations lacking necessary data to calculate analysts' earnings forecast accuracy and dispersion (mean estimate, EPS standard deviation, actual earnings value, and price) from the initial sample collected from I/B/E/S/ Summary File. The final sample

consists of 23,257 observations. After merging the sample from COMPUSTAT and I/B/E/S Summary File, including earnings per share and cash per share estimates, the final sample consists of 108,365 observations with 3,835 unique firms.

Table 1
SAMPLE SELECTION

Initial sample from COMPUSTAT for the years 2010-2018		204,338
Less: observations without necessary data for calculation		(143,194)
Less: missing lag and lead values of operating cash flow		(20,664)
Final sample from COMPUSTAT		40,480
Initial sample from I/B/E/S for Hypothesis 1 for the years 2010-2018		37,850
Less: observations without analysts' mean estimate		(170)
Less: observations without EPS standard deviation		(6,357)
Less: observations without actual earnings and stock price		(2,893)
Final sample from I/B/E/S for Hypothesis 1		28,430
Merged COMPUSTAT and I/B/E/S sample	132,054	
Unique firms	4,040	
Initial sample from I/B/E/S for Hypothesis 2 and 3 for the years 2010-2018		39,196
Less: observations without analysts' mean estimate		(9,372)
Less: observations without EPS standard deviation		(979)
Less: observations without actual earnings and stock price		(5,588)
Final sample from I/B/E/S for Hypothesis 2 and 3		23,257
Merged COMPUSTAT and I/B/E/S sample	108,365	
Unique firms	3,838	

Table 2 tabulates the descriptive statistics. The mean and median of total current accruals are both 0.08%. The average five-year standard deviation of the total current accruals model residuals (*ACCQ*) is 4.5. The cash flow from operations is about 5.01% average of total assets, and the property, plant, and equipment is about 52.39% average of total assets. The mean (median) earnings forecast accuracy is 1.38% (0.29%) of the share price, and the mean (median) of dispersion is 0.76% (0.17%) of the share price. The average total assets for the sample firms is \$1,540 million ($e^{7.34}$), and the average age is 5.02.

Table 2
DESCRIPTIVE STATISTICS

Variables	N	Mean	P50	StdDev	p25	P75
Dependent Variables						
ΔTCA%	132,054	0.08%	0.08%	0.051	-1.77%	2.04%
ACCQ	110,117	4.45	4.36	1.76	3.29	5.55
Independent Variables						
CFO%	132,054	5.01%	8.53%	18.70%	4.20%	13.14%
ΔSALES	132,054	173.92	35.51	1425.95	-7.38	199.00
PPE	132,054	52.39%	38.68%	44.07%	16.65%	81.81%
ACCURACY%	132,054	1.38%	0.29%	0.036	0.09%	0.95%
DISPERSION%	132,054	0.76%	0.17%	0.019	0.07%	0.55%
Control Variables						
FirmSize	132,054	7.34	7.34	2.02	5.93	8.70
Age	132,054	5.02	5.00	1.95	3.00	7.00
MtB	128,744	2.28	2.41	27.34	1.41	4.19
ROA	132,054	-0.02	0.04	0.23	-0.02	0.08
Leverage	132,054	0.22	0.19	0.21	0.02	0.34
LossForward	132,054	0.69	1.00	0.46	0.00	1.00
Growth	129,044	6.96	7.11	2.25	5.75	8.41
R&D	132,054	0.06	0.00	0.13	0.00	0.06
Cash	132,054	0.21	0.11	0.24	0.04	0.28
OperatingProfit	132,054	0.29	0.27	0.27	0.14	0.41
Inventory	130,550	0.08	0.04	0.10	0.00	0.13
Receivable	132,054	0.11	0.09	0.10	0.04	0.16
Litigation	132,054	0.72	1.00	0.45	0.00	1.00

Note: The baseline sample contains 132,054 observations with 4,020 unique firms from 2010-2018. Variables are defined in Appendix.

Table 3 shows the Pearson correlation coefficients. The five-year standard deviation of the total current accruals model residuals is positively correlated with dispersion (ρ=0.102) and negatively correlated with accuracy (ρ=-0.164). Both coefficients are significant at the 1% level. Therefore, the univariate test indicates a significant positive relation between accruals quality and dispersion, and a significant negative association between accruals quality and accuracy. This table also shows that the larger (ρ=-0.827) and older (ρ=-0.119) firms have a lower standard deviation of the model residuals; that is, large and old firms have higher accruals quality. In addition, the forecast accuracy is higher for large (ρ=0.263) and old firms (ρ=0.010). Analysts' forecast accuracy is negatively related with more R&D projects (ρ=-0.074) and litigation risk (ρ=-0.142) and is positively related to more cash holdings (ρ=0.124).

Table 3
CORRELATION MATRIX

Variables	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***
1.ACCQ	1.00							
2.DISPERSION	**0.10**	1.00						
3.ACCURACY	**-0.16**	**-0.65**	1.00					
4.FirmSize	**-0.83**	**-0.21**	**0.26**	1.00				
5.Age	**-0.12**	**-0.02**	*0.01*	**-0.07**	1.00			
6.MtB	-0.00	**-0.30**	**0.26**	**-0.05**	**-0.08**	1.00		
7.ROA	**-0.17**	**-0.39**	**0.32**	**0.30**	**0.07**	**0.25**	1.00	
8.Leverage	**0.29**	**0.01**	**-0.05**	**0.43**	**-0.11**	**-0.08**	**-0.05**	1.00
9.LossForward	**0.05**	**0.05**	**-0.06**	**-0.15**	**-0.06**	**0.06**	**-0.21**	**-0.07**
10.Growth	**0.76**	**-0.25**	**0.27**	**0.92**	**-0.06**	**0.01**	**0.36**	**0.32**
11.R&D	**0.15**	**0.04**	**-0.07**	**-0.36**	-0.00	**0.22**	**-0.22**	**-0.34**
12.Cash	**-0.16**	**-0.11**	**0.12**	**-0.45**	**0.03**	**0.22**	**-0.12**	**-0.50**
13.OperatingProfit	**-0.14**	**-0.34**	**0.21**	**-0.12**	**0.03**	**0.27**	**0.45**	**-0.21**
14.Inventory	**0.03**	**-0.10**	**-0.02**	**0.08**	-0.01	**-0.06**	**0.20**	**-0.02**
15.Receivable	**-0.07**	**-0.19**	**-0.09**	**-0.04**	**0.04**	**0.04**	**0.21**	**-0.10**
16.Litigation	**0.07**	**0.21**	**-0.14**	**0.07**	**0.02**	**-0.12**	**-0.08**	**0.08**
Variables	***9***	***10***	***11***	***12***	***13***	***14***	***15***	***16***
9.LossForward	1.00							
10.Growth	**-0.14**	1.00						
11.R&D	**0.28**	**-0.34**	1.00					
12.Cash	**0.22**	**-0.39**	**0.59**	1.00				
13.OperatingProfit	**0.03**	**0.05**	**0.10**	**0.13**	1.00			
14.Inventory	**-0.05**	**0.22**	*0.01*	**-0.15**	**0.34**	1.00		
15.Receivable	**0.04**	**0.11**	**0.08**	**-0.04**	**0.44**	**0.30**	1.00	
16.Litigation	**-0.05**	**0.03**	**0.16**	**-0.07**	**-0.28**	**0.31**	**-0.01**	1.00

Note: The bold numbers are significant at the 1% level, the italicized numbers are significant at the 5% level.

1.4 Empirical Results

1.4.1 Results for Hypothesis 1

Table 4 shows the estimated results of analysts earning forecast accuracy (column 1) and dispersion (column 2) on the average five-year standard deviation of the total current accruals residuals (*ACCQ*), which is the inverse of accruals quality. The coefficient of interest is β_1 (*ACCURACY* or *DISPERSION*) in model 4, which we expect the sign to be negative for accuracy and positive for dispersion because the larger (smaller) the inverse of accruals quality, the lower (higher) of the accuracy (dispersion). The effects of earnings forecast accuracy and dispersion are statistically significant and economically significant. By using the coefficient estimate in column 1 for accuracy (-1.1913, $p<0.01$), and the standard deviation of accuracy and inverse accrual quality from Table 2, one standard deviation change in *ACCURACY* will lead to a 2.44%

improvement of accruals quality.[2] In addition, by using the coefficient in column 2 for dispersion (2.4995, p<0.01) and the standard deviation of dispersion and inverse accrual quality from Table 2, one standard deviation change in *DISPERSION* will lead to a 2.70% decrease of accrual quality. Overall, the tabulated results support the first hypothesis that as earnings forecast accuracy (*ACCURACY*) increases, the inverse accrual quality decreases (*ACCQ*). In other words, earnings forecast accuracy is significantly positively related with high accruals quality. Moreover, the results indicate that as earnings forecast dispersion (*DISPERSION*) gets higher, the inverse accrual quality decrease, suggesting earnings forecast dispersion is significantly negatively associated with high accruals quality.

As expected, FirmSize and MtB ratio are negatively related with ACCQ at 5% and above significant level in both columns 1 and 2. This indicates that larger and mature firms have better-managed accruals. Moreover, *Leverage* and *LossForward* have the expected sign, indicating that a large portion of long-term debt and loss is carried forward to the next year, hindering the accrual quality. The coefficient for variable *Cash* is negatively significant, as we expected; the intuition here is that the more cash that firms have in hand, the better the accrual quality, that is, the lower the *ACCQ* (inverse accruals quality). The *OperatingProfit* has the same expected sign, suggesting *ACCQ* (inverse accruals quality) is negatively related to operating profit. *Receivable* reflects the complexity of daily company transactions and is closely related to accrual quality. The positive significant coefficient suggests that the higher the complexity of the daily transactions, the lower the accrual quality, which in turn, the higher the *ACCQ* (inverse accruals quality). Last, *Litigation* is positively related to *ACCQ*, indicating a high litigation risk when a firm has low accrual quality.

1.4.2 Results for Hypothesis 2 and 3

Table 5 shows the results for Hypotheses 2 and 3 after adding the dummy variable (*D_CPS*), analysts issuing both earnings and cash flow forecasts, as well as the interaction terms between the dummy variable and forecast accuracy (dispersion). Column 1 provides evidence for *ACCURACY*, and column 2 provides evidence for *DISPERSION*. The coefficients of interest in model 5 are γ_1 (*D_CPS*) for Hypotheses 2 and γ_2 ($D\_ACCURACY_{it}$ *or* $D\_DISPERSION_{it}$) for Hypotheses 3. Based on prior studies, we expect both coefficients γ_1 (*D_CPS*) and γ_2 ($D\_ACCURACY_{it}$ *or* $D\_DISPERSION_{it}$) to be significantly negative for accuracy and significantly positive for dispersion. Consistent with Hypotheses 2, the coefficient of *D_CPS* is statistically significant in both column 1 (-0.0806, p<0.01) and column 2 (-0.0728, p<0.01), suggesting accrual quality is higher (ranging from 7% to 8%) when analyst issues both earnings and cash flow forecasts, rather than only issues earnings forecast.

As for Hypotheses 3, although γ_2 ($D\_ACCURACY_{it}$ *or* $D\_DISPERSION_{it}$) has a larger (smaller) magnitude than γ_3 ($ACCURACY_{it}$ *or* $DISPERSION_{it}$) for accuracy (dispersion), both coefficients for the interaction terms *D_ACCURACY* and *D_DISPERSION* are not significant.

[2] The marginal effect is calculated as follows: |β(*ACCURACY*) × std. (*ACCURACY*)|/std. (*ACCQ*) = |-1.1913 × 0.036| / 1.76 = 0.0244 or 2.44%

This suggests that analysts' earnings forecast accuracy and dispersion are not affected when analysts choose to issue both earnings and cash flow forecasts. Overall, our results support the notion that cash flow forecasts mitigate accrual manipulation and provide valuable information to break down earnings surprise into the cash flow and accruals two separate portions. However, the evidence contradicts Call et al. (2009) that analysts who issue both earnings and cash flow forecasts are more accurate than those who only issue earnings forecasts. In untabulated results, models 4 and 5 with firm fixed effects show similar findings.

Table 4
REGRESSION ANALYSIS FOR HYPOTHESIS 1

		Dependent Variable: *ACCQ*					
		(1)			**(2)**		
Variables	**Predicted**	**Coefficient**	**SE**		**Coefficient**	**SE**	
Intercept	?	-2.1062	(0.0742)	***	-2.0401	(0.0747)	***
Independent Variable							
ACCURACY	-	**-1.1913**	**(0.0880)**	***			
DISPERSION	+				**2.4995**	**(0.1705)**	***
Control Variables							
FirmSize	-	-0.8507	(0.0054)	***	-0.8490	(0.0054)	***
Age	-	-0.1091	(0.0278)	***	-0.0132	(0.0100)	
MtB	-	-0.0002	(0.0001)	**	-0.0002	(0.0001)	**
ROA	-	1.0021	(0.0229)	***	0.9972	(0.0228)	***
Leverage	+	0.0847	(0.0162)	***	0.0869	(0.0161)	***
LossForward	+	0.1004	(0.0065)	***	0.1005	(0.0065)	***
Growth	-	0.0493	(0.0051)	***	0.0506	(0.0051)	***
R&D	+	0.0142	(0.041)		0.0204	(0.0401)	
Cash	-	-1.9011	(0.0197)	***	-1.8887	(0.0197)	***
OperatingProfit	-	-0.1378	(0.0168)	***	-0.1389	(0.0168)	***
Inventory	+	0.0450	(0.0440)		0.0391	(0.0441)	
Receivable	+	0.3014	(0.0395)	***	0.2980	(0.0395)	***
Litigation	+	0.2675	(0.0912)	**	0.2545	(0.0915)	**
Industry Fixed Effect		Yes			Yes		
Year Fixed Effect		Yes			Yes		
N		132054			132054		
Adj. R^2		0.77			0.77		

Note: *, **, *** represent the 10 percent, 5 percent, and 1 percent significance levels, respectively. Industry and year fixed effects are included. Industry fixed effects are the industry indicator variables for industries based on the two-digit SIC code. The standard errors in parentheses are clustered within the industry level.

Table 5
REGRESSION ANALYSIS FOR HYPOTHESIS 2 AND 3

		Dependent Variable: *ACCQ*					
		(1)			(2)		
Variables	**Predicted**	**Coefficient**	**SE**		**Coefficient**	**SE**	
Intercept	?	-2.1540	(0.0878)	***	-2.1537	(0.0883)	***
Independent Variables							
D_CPS	-	**-0.0806**	**(0.0103)**	***			
D_ACCURACY	-	-0.0054	(0.1209)				
ACCURACY	-	**-0.3574**	**(0.1163)**	**			
D_CPS	+				**-0.0728**	**(0.0104)**	***
D_DISPERSION	+				0.3779	(0.2585)	
DISPERSION	+				**0.8690**	**(0.2465)**	**
Control Variables							
FirmSize	-	-0.8463	(0.0059)	***	-0.8453	(0.0060)	***
LogAge	-	-0.0779	(0.0312)	**	-0.0745	(0.0312)	**
MtB	-	-0.0002	(0.0001)	*	-0.0002	(0.0001)	**
ROA	-	-0.9980	(0.0254)	***	-0.9879	(0.0253)	***
Leverage	+	0.1147	(0.0181)	***	0.1133	(0.0180)	***
LossForward	+	0.1012	(0.0072)	***	0.1028	(0.0072)	***
Growth	-	0.0406	(0.0057)	***	0.0412	(0.0057)	***
R&D	+	0.0213	(0.0451)		0.0119	(0.0450)	
Cash	-	-1.8792	(0.0221)	***	-1.8707	(0.0220)	***
OperatingProfit	-	-0.1365	(0.0189)	***	-0.1394	(0.0188)	***
Inventory	+	0.0623	(0.0487)		0.0520	(0.0487)	
Receivable	+	0.3353	(0.0434)	***	0.3193	(0.0433)	***
Litigation	+	0.2411	(0.0909)	**	0.2288	(0.0911)	**
Industry Fixed Effect		Yes			Yes		
Year Fixed Effect		Yes			Yes		
N		108365			108365		
Adj. R^2		0.775			0.775		

Note: *, **, *** represent 10 percent, 5 percent, and 1 percent significance levels, respectively. Industry and year fixed effects are included. Industry fixed effect are the industry indicator variables for industries based on two-digit SIC code. The standard errors in parentheses are clustered within industry level.

CONCLUSION

This study examines how analysts' forecast accuracy and dispersion impact accrual quality. Using the difference between average earnings estimation and actual earnings over shares price to measure for accuracy, and the earnings per share deviation over share price to measure for dispersion, we first investigate whether the accuracy of analysts' forecast impacts the accounting information regarding accruals. The results show a positive relationship between accrual quality and analyst forecast accuracy. In addition, the evidence indicates that the accrual quality improves when analysts choose to issue both earnings and cash flow forecasts. Our findings supplement prior studies' results that cash flow information is more useful when accruals are relatively large. However, different from Call et al.'s (2009) findings, we did not find supporting evidence that issuing both earnings and cash flow forecasts will impact the accuracy of earnings forecasts. One plausible explanation is that because earnings are the most

prevalent measurement used by analysts, investors, and the media. Thus, more resources are available for earnings forecasts. As a result, earnings forecasts accuracy should not be affected much due to many reliable resources.

Overall, our study contributes to the literature by providing insights into the effect of earnings forecast accuracy on accrual quality. Moreover, we provide a new perspective by examining the impact of the "bundle" forecast on accrual quality. Finally, this study also contributes to practice that helps investors understand the importance of analysts' cash flow forecast; firms covered by analysts' earnings and cash flow forecasts signal better financial health.

Our study is not without several limitations, which can be addressed in future studies. First, in this study, we followed Koo et al. (2017) and adopted McNichols' (2002) modified D&D model to measure accrual quality. Future studies can utilize more refined measure of accrual quality by dividing total accrual quality into innate and discretionary components (e.g., Gray, Koh, & Tong, 2009). Second, we only considered the case in which analysts 'bundle' earnings forecast with a cash flow forecast. Analysts issue other types of forecasts including revenue, tax, dividend, and others. Future studies can identify potential effect of bundling more than two types of analyst forecasts. Finally, our study examined forecast accuracy and dispersion as the properties of analyst forecast. Future studies can investigate either different properties of analyst forecast or characteristics of analyst such as industry expertise and its effect on accrual quality.

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APPENDIX

Variable Definitions (1)	
Dependent and Independent variables	
ΔTCA	Change in total current accruals computed as change in current assets (Compustat item ACT) – change in current liabilities (Compustat item LCT) – change in cash (Compustat item CHE) + change in debt in current liabilities (Compustat item DLC), scaled by average assets (Compustat item AT)
CFO	Cash flow from operations (Compustat item OANCF) scaled by average assets (AT)
ΔSALES	Change in revenues (Compustat item SALE) scaled by average assets (Compustat item AT)
PPE	Property, plant, and equipment (Compustat item PPEGT) scaled by average assets (Compustat item AT)
ACCURACY	The absolute difference between the mean earnings per share forecast (I/B/E/S/ item MEANEST) and the actual earnings per share (I/B/E/S/ item ACTUAL), divided by the share price at the beginning of the reporting period (I/B/E/S item PRICE). The variable is multiplied by minus one, indicating the higher the values, the more precise forecasts.
DISPERSION	The standard deviation of the earnings per share forecast (I/B/E/S/ item STDEV), divided by the share price at the beginning of the reporting period (I/B/E/S item PRICE).
ACCQ	Log of the *positive* value of the standard deviation of regression residuals e_{it} of the model (1) from time $t - 4$ to time t. We use a *positive* value so that the higher the *ACCQ,* the lower the accrual quality.
D_CPS	A dummy variable equal to 1 if analysts issue both earnings and cash flow forecast, and zero otherwise.
D_ACCURACY	The interaction term between *D_CPS* and *ACCURACY* measures the earnings forecast accuracy when analysts issue earnings and cash flow forecasts.
D_DISPERSION	The interaction term between *D_CPS* and *DISPERSION* measures earnings forecast dispersion when analysts issue earnings and cash flow forecasts.

Variable Definitions (2)	
Control Variables	
FirmSize	Log of book value of total assets (Compustat item AT)
Age	Log value of the number of the sample period ending year (2018) minus the year in datadate (Compustat item Datadate)
MtB	Market value of equity (Compustat items PRCC_F*CSHO) divided by book value of equity (Compustat item CEQ)
ROA	Net income (Compustat item NI) divided by total asset (Compustat item AT).
Leverage	Long-term debt (Compustat item DLTT) divided by book value of assets (Compustat item AT)

LossForward	Equal to 1 if the firm has positive net operating loss carryforward (Compustat item TLCF), and zero otherwise.
Growth	Log of current year sales over last year sales (Compustat item SALE)
R&D	Research and development expenditure (Compustat item XRD) divided by book value of assets (Compustat item AT). XRD will be set to zero when there is a missing value from Compustat.
Cash	Cash holdings (Compustat item CHE) scaled by total assets (Compustat item AT)
OperatingProfit	Profit from operating activities, calculated by revenue (Compustat item SALE) minus the cost of goods sold (Compustat item COGS), scaled by total assets.
Inventory	Inventory (Compustat item INVT) to average total assets (Compustat item AT)
Receivable	Receivables (Compustat item RECT) to average total assets (Compustat item AT)
Litigation	A dummy variable equal to 1 if industry SIC falls into codes 2833-2836 and 8731-8734 (biotechnology), 3570-3577 and 7370-7374 (computers), 3600-3674 (electronics), and 5200-5961 (retailing), and 0 otherwise (Francis, Philbrick, & Schipper, 1994).

TYPES OF INSIDER SALES AND LITIGATION RISK

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ABSTRACT

This paper examines which types of insider trades trigger litigation by classifying insider sales based on insider identity, abnormal nature of sales, and timing of sales over the sample period of 1995–2020. The study finds that only opportunistic sales by CEOs and CFOs that occur in the quarter before a stock price crash significantly increase litigation risk. This incremental increase is about six times larger than the unconditional likelihood of a lawsuit. Sales by other insiders, including their opportunistic sales prior to crashes, do not increase the likelihood of a lawsuit. These results hold even for firms with blackout periods that restrict insider trades to a short window after earnings announcements. Additionally, this study finds that the Sarbanes-Oxley (SOX) Act of 2002 has attenuated the impact of opportunistic sales by CEOs and CFOs on litigation risk.

Keywords: stock price crash; litigation risk; insider trading; insider sales; securities class action

INTRODUCTION

Securities class action lawsuits are filed by a firm's shareholders and typically allege that managers intentionally withheld material information or provided misleading information resulting in losses to their investment in the firm. In these lawsuits, insider sales are commonly provided as evidence in support of scienter. The claim is that insiders knowingly sold their shares at inflated prices and enriched themselves.[3]

Consistent with this reasoning, Johnson, Kasznik and Nelson (2000) and Johnson, Nelson and Pritchard (2007) document that insider selling is positively associated with litigation risk. On the contrary, Kim and Skinner (2012) find a negative relation between litigation risk and insider sales. These mixed findings in existing literature might be due to different definitions and measures of insider selling. As some insider sales are not motivated by inside information but rather by liquidity or diversification needs, not all insider sales are likely to increase litigation risk equally. Therefore, it is imperative to classify insider sales to clearly understand the impact of insider sales on shareholder litigation risk.

It is important to understand what types of insider sales attract shareholder litigation because litigation imposes substantial costs on companies, both directly and indirectly.[4] Once a

[3] Insider buys seldom attract litigation (Cheng & Lo, 2006).

[4] For instance, Montgomery Moran, the CEO of Chipotle Mexican Grill, without any routine trading pattern over the past three years, sold shares worth about $5 million in April 2012 when the company's stock prices peaked. The company's stock plunged by more than 23% in the following month. Shareholders then filed a

lawsuit is filed, the defendant collects evidence against the case and prepares for potential trials unless the case is dismissed. This process can take several months or even longer. Therefore, irrespective of its outcome, litigation incurs significant legal fees and reputational damage as well as opportunity costs, such as management's time and resources spent on litigation (Bhagat et al., 1998; Arena & Ferris, 2018). Additionally, litigation causes significant negative filing effects on shareholder wealth. Gande and Lewis (2009) show that "the filing date effects understate the magnitude of shareholder wealth loss by a third" because investors partially anticipate these lawsuits and capitalize part of the losses in advance.

This paper investigates what types of insider sales increase shareholder litigation risk using a large US dataset for 1995–2020.[5] Lawsuit risk is expected to increase with the extent to which insider sales are based on private information. The inference of scienter is likely to depend on:

(i) Timing of sales: recent quarter versus distant quarters to litigation.
(ii) Identity of the insider who sells: top executives with superior access to insider information versus low-level executives or directors with few direct operational responsibilities within the firm.
(iii) Abnormal nature of sales: opportunistic versus routine sales. If each type of insider sales has a distinctive ability to attract litigation, such a finding would be useful in designing a firm's insider trading policies.

Insider sales are likely to affect litigation risk only if they are made prior to a period in which investors have suffered deep losses. Periods without any significant drop in share prices are unlikely to trigger litigation, irrespective of the type of insider sale in the prior periods. Thus, I examine how insider sales around a stock price crash affect litigation risk using interactions between price crashes and each category of insider sales.

While most prior studies measure insider sales at an annual level, inferences of scienter from sales may be weak with yearly data. Specifically, insider sales might have followed the stock price drop with contemporaneous yearly data. Using insider sales from the previous year could also be problematic because some sales might have occurred well before the stock price declined. Therefore, I use monthly data in this study to identify the timing of insider sales precisely and thus capture the sequence of events around lawsuit filings.

This paper finds that all the classifications of insider sales described above are necessary to predict litigation risk. Litigation risk increases significantly when *CEOs* or *CFOs* sell during *a*

class action lawsuit against the company. Upon the announcement, the filing event itself reduced shareholder wealth by -2.5%. According to the 10-Q report at the fiscal quarter end, "we intend to defend these cases vigorously, but it is not possible at this time to reasonably estimate the outcome of or any potential liability from the cases," indicating that the lawsuit and responding to it cost a significant amount of the management's time and effort, although the case was eventually dismissed in 2013.

[5] While a firm can face various types of litigation, this paper focuses on the risk of securities class action lawsuits, a major scope of litigation studies in the finance literature. Such securities lawsuits are the most common in the US (Arena & Ferris, 2018).

quarter prior to a *price crash* and when selling *differs from their routine* pattern. The likelihood of litigation increases by nearly 4% relative to instances where opportunistic sales by CEOs or CFOs do not precede a price crash (in Models 1–3 of Table 6-Panel A). The magnitude of this effect is about six times larger than the unconditional probability of litigation in any given three-month period (0.68%). On the other hand, sales by other insiders or sales that occur earlier than a quarter before price crashes do not increase the likelihood of lawsuits. In firms with blackout periods, opportunistic sales by CEOs or CFOs just prior to a stock price crash significantly increase the likelihood of litigation by about 5% compared to those sales that do not precede a crash (in Models 1–3 of Table 6-Panel B). This finding suggests that the existence of blackout periods does not fully insulate firms from litigation. However, the *Sarbanes-Oxley (SOX) Act of 2002* has mitigated the link between litigation risk and insider sales, as the new legislation discourages managers' opportunistic behaviors. Thus, a firm's insider trading policy may not be so effective as to lower litigation risk in the post-SOX era unless it completely blocks non-routine sales by CEOs and CFOs. I validate the findings of this paper using alternative definitions of opportunistic sales, *Crash*, and *Lawsuit*. Additionally, I rerun regressions using a subsample that includes one month per calendar quarter to address concerns of an overlapping window on *Lawsuit*. My results are qualitatively similar.

This study contributes to the literature in the following ways. First, it separates insider trading based on the incidence of a stock price crash. While it may *ex post* seem obvious that a price decline is necessary for insider selling to affect litigation risk, previous studies examine whether insider selling, in general, increases the likelihood of shareholder litigation. Since periods with insider selling but without substantial price drops are common, the relationship between insider sales and litigation may look insignificant or even negative. Second, it identifies a specific subset of trades that significantly increase the likelihood of litigation by examining multiple aspects of insider sales simultaneously: timing, insider identity, and abnormal nature of insider trades. Without refining insider trades through these classifications, a positive link between insider selling and litigation may be elusive, given that insiders often sell shares for their diversification needs.

RELATED LITERATURE AND HYPOTHESIS DEVELOPMENT

Relative to a large volume of research on consequences of litigation risk for corporate decision making and outcomes,[6] few studies exist on determinants of litigation risk. Findings on the impact of insider sales on litigation risk are mixed in existing literature. Johnson et al. (2000) find that insider selling is positively related to securities litigation risk using a sample of 489 US

[6] Researchers have examined the impact of litigation risk on corporate disclosure (Skinner, 1994, 1997; Kasznik & Lev, 1995; Billings & Cedergren, 2015), costs of capital (Ashbaugh-Skaife et al., 2009), loan contract terms and cost of debt (Deng et al., 2014), corporate tax avoidance (Arena et al., 2021), corporate liquidity and investment policy (Arena & Julio, 2015; McTier & Wald, 2011), governance changes (Ferris et al., 2007; Helland, 2006), audit quality (Khurana & Raman, 2004), managers' insurance purchases (Chalmers et al., 2002), IPO underpricing (Lowry & Shu, 2002; Hanley & Hoberg, 2012), institutional investor behavior (Barabanov et al., 2008), and value losses (Gande & Lewis, 2009).

firms in high-tech industries from 1994–1995. A later study by Johnson et al. (2007) examine the effect of the Private Securities Litigation Reform Act of 1995 (PSLRA) on lawsuits. They find that insider selling is more strongly associated with lawsuit risk in the post-PSLRA period (1996–2000) than in the pre-PSLRA period (1991–1995). In their study, insider selling is defined as the difference in net insider sales during class period[7] and during an equal number of days preceding the start of class period. Although this definition of insider selling may capture abnormal nature of insider sales prior to lawsuit filing, their sample is small and limited to 114 US firms in high-tech industries. Kim and Skinner (2012) assess the power of industry classification-based dummy variables as a determinant of litigation risk using a broad sample of US public companies from 1996 to 2009. While insider sales are associated with lower lawsuit risk in their sample, Kim and Skinner (2012) do not explain the negative association between insider sales and litigation risk because it was not a primary focus of their paper. On the other hand, Rogers et al. (2011) find that in their sample of 165 firms from 2003–2008 insider selling is not related to lawsuits in general but is positively associated with lawsuits that occur after positive disclosures by managers.

As mentioned earlier, these papers do not separately examine (a) the effect of insider sales that occur prior to a price drop and (b) whether certain types of insider sales are more likely to result in litigation than others. In this section, I develop hypotheses linking insider sales prior to a price drop and several aspects of insider sales (timing, insider identity, and abnormal nature) with litigation risk.

Insider Sales Before a Crash and Litigation

Previous literature documents that sharp declines in share prices are a crucial determinant of class action lawsuits (e.g., Ferris et al., 2003). Thus, an analysis of whether insider trading is an important predictor of shareholder lawsuits requires a focus on insider selling prior to a stock price crash. The absence of a price decline following an insider sale goes against the claim that the insiders knowingly sold their shares at inflated prices. I present this as a hypothesis, emphasizing that my empirical specification differs from the literature. Insider selling prior to a crash, rather than insider selling by itself, increases the likelihood of litigation.

H1: Insider sales that occur before a price crash increase the likelihood of litigation, while insider sales that do not precede a price crash do not increase the likelihood of litigation.

Insider Sale Characteristics and Litigation

Timing of Insider Sale

The proximity of insider sales relative to the month may be a critical determinant of litigation. If the value of information decays quickly, shareholders may consider only recent sales informative. On the other hand, Marin and Olivier (2008) argue that insiders who wish to profit from their private information will optimally trade many months before the actual event due to portfolio constraints. Consistently, they document that insider selling peaks several

[7] In a securities lawsuit, a class period refers to the specific period during which alleged fraud occurred.

months before a large stock price drop. Ke et al. (2003) provide evidence that insiders trade upon economically significant accounting disclosures up to two years prior to the disclosure.

Furthermore, the median class action period in securities litigation is about a year, suggesting that plaintiffs may consider insider trading over the past year to litigation as potentially illegal. Therefore, I divide a year before the firm-month into four quarters and examine whether the effect of insider sales on the likelihood of litigation is limited to insider sales in the most recent quarter or extends to distant quarters. Then, insider sales in each of the previous four quarters interact with *Crash*[8] to check if a stock price crash occurs during the month.

Insider Identity

Insider trading refers to trading not only by top-level officers but also by other officers and directors of their firm. Low-level executives are unlikely to have the same access to inside information as top-level officers. A firm's directors meet, on average, only about seven times a year (Vafeas, 1999). Thus, it may be difficult to claim that selling by other officers and directors is motivated by advance knowledge of price declines. Scienter is also likely to be strong if the material misstatement is orchestrated by the insider who sells the shares. Since directors and low-level executives are less likely to make these statements, I do not expect a strong relationship between selling by these insiders and the likelihood of litigation. In contrast, CEOs (and possibly other top executives, such as CFOs) are more likely to be aware of adverse information concerning their company's stock before a stock price crash compared to other insiders. Wang et al. (2012) find that CFOs' trades are followed by higher subsequent abnormal returns than CEOs' trades, suggesting that CFOs' sales may affect litigation risk more than CEOs' sales.

If top executives find that the expected costs[9] of insider selling exceed their expected benefits,[10] they may abstain from selling in advance of price declines; other insiders, such as directors, may still routinely sell shares before a stock crash. In this case, I may not observe a link between insider selling and litigation. Therefore, this paper investigates whether sales by top executives before a stock price drop result in litigation.

Type of Insider Sale

Securities litigation is likely to depend on whether insider trade patterns are suggestive of trading on private information. Niehaus and Roth (2011) and Choi et al. (2009) point out that courts focus on "abnormal" or "strategic" insider selling as supportive of intentional deception of investors. Insiders regularly sell for diversification or liquidity reasons, and such usual insider

[8] *Crash* is an indicator variable of stock price crashes for the firm-month. I provide detailed variable definitions in Appendix.

[9] The expected cost can be decomposed into the probability of a lawsuit and penalty (if the case goes to trial) or the probability of settlement and settlement amount (if the case is settled).

[10] The expected benefit is an expected stock price drop multiplied by the number of shares sold.

sales are unlikely to trigger lawsuits. Hence, it is critical to distinguish between routine insider selling and non-routine insider selling for predicting shareholder litigation.

When an insider has established a pattern of trading in the same month every year for many years, it is difficult to argue that such routine trades are the outcome of trading on private information. Consistently, Cohen et al. (2012) classify insiders who trade at the same time each year as "routine" traders and others as "opportunistic" traders. They find that opportunistic trades (but not routine trades) are associated with subsequent abnormal returns. This paper uses their algorithm to classify routine and opportunistic trades. Then I test whether opportunistic sales trigger litigation.

According to Bettis et al. (2000), about 92% of the 626 firms participating in their 1996 survey had corporate insider trading policies in place to reduce insiders' ability to trade opportunistically in advance of the revelation of inside information. These firms allowed insiders to trade only during a small window *after* an earnings announcement.[11] If so, insider trades in such firms would not be considered opportunistic and thus would not increase the likelihood of litigation. Therefore, I examine whether opportunistic sales increase the likelihood of shareholder litigation, even for companies with blackout periods.

Combining the discussions above, I construct the second hypothesis:

H2 (i): Insider sales are more likely to increase the likelihood of litigation when sales occur in a recent quarter prior to the month rather than in distant quarters, when sales are made by top executives (CEOs and CFOs) of the firm rather than by other insiders, and when sales are opportunistic.

H2 (ii): The positive impact of these types of insider sales on the likelihood of litigation is stronger when insider sales occur before the month with a stock price crash than when insider sales occur before the month without a stock price crash.

DATA AND SUMMARY STATISTICS

Data

Insider trading data come from the Thomson Financial Insider Filing Data Feed. This database provides all insider transactions on Forms 3, 4 and 5 starting in January 1986, but the information is sparse prior to the mid-1990s. Following Cohen et al. (2012), I retrieve open market sales and purchases of common stock reported on Form 4 in the Table 1 file and aggregate them within a calendar firm-month. I then merge the insider data with CRSP and Compustat. Data on shareholder litigation are drawn from the Securities Class Action Clearinghouse (SCAC) Web site (http://securities.stanford.edu/) with the filter of the 1934 Act Section 10b. There are more than 2,600 lawsuits in the sample. Across 49 Fama-French

[11] Companies can implement their insider trading policies in various forms, such as blackout windows or pre-approval by general counsels. However, details (e.g., restrictions and disciplinary actions on failure to comply with insider trading policies) are often unknown to investors due to the lack of formal requirements to file a firm's insider trading policy with the SEC (Jagolinzer et al., 2011).

industries, only one industry has more than 10% of the observations (computer software with 10.7% of observations). No more than 6% of the observations are from the same calendar year. The final dataset has 1,154,073 firm-month observations of 12,151 unique firms with at least one officer or director who filed open market sales or purchases with the SEC from 1995–2020.[12]

Insider sales are classified as follows. First, insiders are categorized into four groups based on their identity, in decreasing order of accessibility to inside information: CEOs, CFOs, other officers, and directors. For an insider who belongs to more than one group, this study chooses the insider's higher rank. For example, a CEO who is also a director of the company is classified as a CEO only. Alternatively, I partition insiders into 1) three groups of CEOs, CFOs, and other officers and directors or 2) two groups of CEOs and other insiders.

Second, insiders are classified as routine or opportunistic traders based on the algorithm in Cohen et al. (2012). If an insider trades in the same month(s) and has no trade in other months over three consecutive years, that insider is classified as a routine trader at the end of the third year; otherwise, he or she will be classified as an opportunistic trader.[13] Once an insider is *ex ante* classified as a routine trader, all subsequent sales by this insider are classified as routine sales. The classification as an opportunistic trader remains until the insider has traded in the same month(s) for three consecutive years, at which point that insider is reclassified as a routine trader for subsequent years. All sales by an insider who is classified as an opportunistic trader are considered opportunistic sales. Since this classification requires three years of data, the sample used for this analysis began in 1998. Following Cohen et al. (2012), I label this as the *partitionable* sample. To address the possibility that a trader who used to have a routine trading pattern will trade on insider information later, this paper employs an alternative definition of opportunistic sales based on shares sold to the average shares sold over the past two consecutive years. With this trade-level classification, an insider who was once classified as the one with routine sales can have opportunistic sales in the following years.

Hypothesis H1 examines insider selling prior to stock price crashes. Following Marin and Olivier (2008), *Crash* is defined as the month for which the firm's equally weighted market-adjusted return is two standard deviations below its mean over the prior 60 months.[14] This definition of *Crash* identifies 27,578 firm-months with significant price declines (-31.2% mean of market-adjusted returns). There is a moderate concentration of crash months in 1999, 2000, 2008, 2009 and 2020. Each year accounts for 8–9% of the observations, and the other years collectively account for about 53%.

Figure 1 describes the timeline for the empirical analysis. Each month (t) is classified as a crash month or not, as discussed above. For regression analysis, insider sales are calculated over the previous three months from t-3 to t-1 (or Q_{-1}) based on the transaction date. The SOX Act requires insiders to file their transactions with the SEC within two business days. According to Cline and Houston (2018), 54.87% of violations are late by fewer than five business days, and

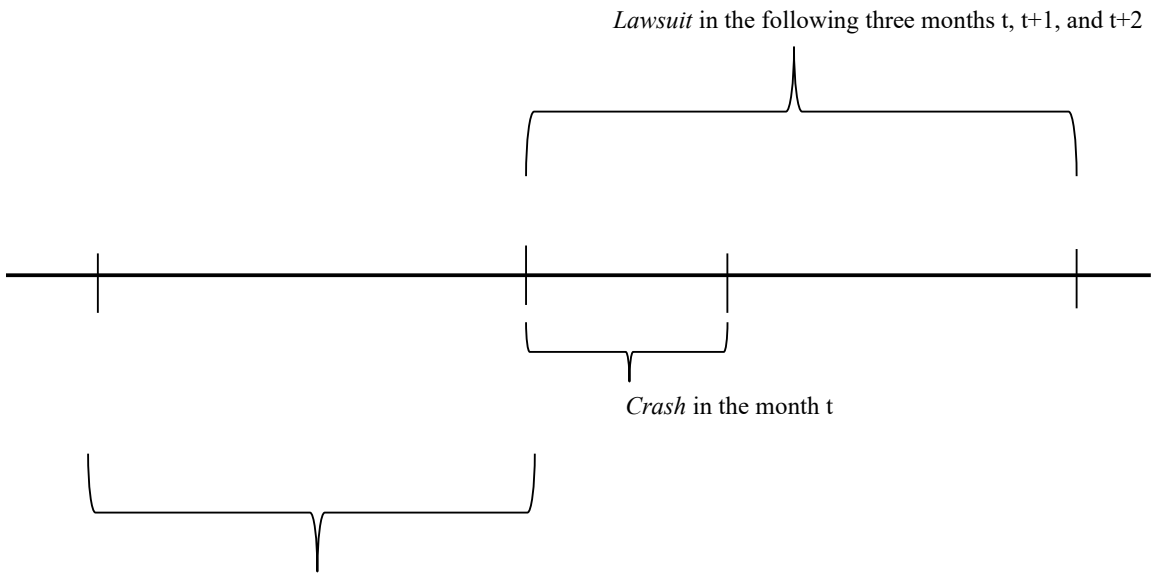
[12] This paper includes the firms in the sample from the firm-month when open market transactions by their officers or directors are first shown in the Table 1 file.

[13] Cohen et al. (2012) show that this trader-level classification works well in predicting future stock returns.

[14] This study requires at least 36 months of past stock returns to identify *Crash*.

"many insiders and firms likely have no nefarious intent but simply lack the attention to file in a timely manner." Insider sales in the quarters before Q_{-1} are labeled with Q_{-2}, Q_{-3}, and Q_{-4}, successively. *Lawsuit* attains value of one if a lawsuit occurs within the month (t) or next two months (t+1, t+2), with zero otherwise. I use a three-month window for *Lawsuit* instead of a one-month window since there could be some delay in filing a lawsuit associated with stock price crashes.

Figure 1 Timeline



Summary Statistics

Insider Trading

Consistent with earlier studies, insiders sell shares more frequently than they buy, and the transaction size is greater for insider sales than for insider buys for the sample period of 1995–2020. In Panel A of Table 1, the average number of insider sales per month is 2.28 (0.59 for insider buys). Insiders sell on average $380,306 of shares or 0.03% of shares outstanding per month ($9,066 or 0.01% for insider buys). I observe a similar pattern for opportunistic trades.

Panel B of Table 1 reports insider trading by insider identity. As in Panel A, buy transactions are less frequent and smaller in size than sell transactions for all insiders. CEOs sell 0.45 times per firm-month. Average sales by CEOs amount to $82,360 or 0.01% of outstanding shares per firm-month.[15] CFOs sell a smaller number of shares less frequently than CEOs. Not

[15] To reduce the effect of outliers, both dollar amounts of shares traded and percentages of shares traded to shares outstanding are winsorized at 1% and 99%.

surprisingly (given their larger number), other officers sell more than CEOs. Collectively, they sell 0.84 times per firm-month, on average, amounting to about $157,258 or 0.01% of shares outstanding.

Table 1
Insider Trading Activities for 1995-2020

Panel A. Overall Insider Trading Activity

	Sales		Buys	
	Mean	Std	Mean	Std
Number of trades				
All trades	2.28	19.36	0.59	10.11
Opportunistic trades	1.38	13.65	0.20	5.12
% of shares traded to shares outstanding				
All trades	0.03%	0.10%	0.01%	0.03%
Opportunistic trades	0.01%	0.03%	0.00%	0.00%
Dollar amount of shares traded ($thousands)				
All trades	380.31	1,382	9.07	40.38
Opportunistic trades	233.18	898	0.55	3.95

Panel B. By Insider Identity

	Sales		Buys	
	Mean	Std	Mean	Std
Number of trades				
CEOs	0.45	10.41	0.08	1.72
CFOs	0.14	2.10	0.02	0.35
Other officers (excl. CEOs/CFOs)	0.84	7.01	0.08	0.82
Directors (excl. all officers)	0.63	8.42	0.23	2.43
% of shares traded to shares outstanding				
CEOs	0.01%	0.03%	0.00%	0.00%
CFOs	0.00%	0.01%	0.00%	0.00%
Other officers (excl. CEOs/CFOs)	0.01%	0.04%	0.00%	0.00%
Directors (excl. all officers)	0.01%	0.06%	0.00%	0.02%
Dollar amount of shares traded ($thousands)				
CEOs	82.36	489.81	0.81	6.13
CFOs	15.55	101.59	0.05	0.44
Other officers (excl. CEOs/CFOs)	157.26	704.70	0.73	5.09
Directors (excl. all officers)	111.63	608.58	6.05	33.94

Firm Characteristics

Table 2 presents the univariate analysis of variables associated with litigation risk by *Crash* and *Lawsuit*. Firms with a lawsuit after a stock price crash have a mean market capitalization of $8,132 million, significantly higher than the mean $4,033 million for firms without any lawsuit after a price crash. A similar difference exists between sued and non-sued firms without a crash, indicating that shareholders are more likely to file lawsuits against large firms with potentially deep pockets. Firms with greater crashes are more likely to be sued subsequently. Conditional on a crash, sued firms experience an average drop of 31.5% in

shareholder value prior to a lawsuit, while non-sued firms experience a drop of 22.4%. Even in the absence of a crash, shareholders are more likely to sue firms with a large price decline. A similar pattern is observed in market-adjusted returns, indicating that lawsuits are generally filed after large shareholder losses resulting from a price decline.

Regardless of price crashes, sued firms tend to have higher stock volatility than non-sued firms. Sued firms also have higher share turnover than non-sued firms (3.35 versus 1.79 when a crash precedes the lawsuit; 3.48 versus 1.81 when a crash does not), consistent with prior literature. Lawsuits are more likely to be filed against firms with high share turnover since the amount of damages increases with the number of shares traded during the alleged violations of Rule 10b-5. Poorly performing firms in the recent past are more likely to be sued than well-performing firms. Consistently, the average return on assets (ROA) of sued firms is significantly lower than that of non-sued firms in both cases, with and without any price crash. Like Arena and Julio (2021), who document a negative relationship between payout policy and litigation risk, I find a negative association between dividend yield and the likelihood of lawsuits in both subsamples of a crash and no crash. Lastly, Pratt and Stice (1994) show that sales growth predicts a higher litigation risk because high-growth firms are more likely to make material misstatements due to incapability of handling transaction volume related to high sales growth. Consistently, conditional on a crash, sued firms have significantly higher sales growth before a stock price crash than non-sued firms (5.4% versus 2.0%). On the other hand, conditional on no price crash, sales growth is significantly lower for sued firms than non-sued firms.

Table 2
Firm Characteristics by Lawsuit and Crash

Panel A. Crash

	Lawsuit	No lawsuit	T-tests		
	902 obs.	26,676 obs.	(Lawsuit-No lawsuit)		
Variables	Mean	Mean	Mean		p-val.
Mktcap ($millions)	8,132	4,033	4,098	***	0.000
Raw return	-0.315	-0.224	-0.091	***	0.000
Mkt-adj. return	-0.312	-0.250	-0.062	***	0.000
Volatility	0.036	0.034	0.002	***	0.002
Share turnover	3.354	1.789	1.565	***	0.000
ROA	0.008	0.017	-0.008	***	0.001
Dividend yield	0.002	0.003	-0.001	***	0.000
Sales growth	0.054	0.020	0.034	***	0.003

Panel B. No Crash

	Lawsuit	No lawsuit	T-tests		
	5,196 obs.	928,963 obs.	(Lawsuit-No lawsuit)		
Variables	Mean	Mean	Mean		p-val.
Mktcap ($millions)	8,555	3,440	5,115	***	0.000
Raw return	-0.017	0.018	-0.035	***	0.000
Mkt-adj. return	-0.023	0.009	-0.032	***	0.000
Volatility	0.037	0.033	0.004	***	0.000
Share turnover	3.484	1.807	1.678	***	0.000
ROA	0.010	0.019	-0.009	***	0.000
Dividend yield	0.002	0.003	-0.001	***	0.000
Sales growth	0.034	0.042	-0.008	*	0.066

Panel C. Difference (Crash - No crash)

	Lawsuit			No lawsuit		
	T-tests			T-tests		
Variables	Mean		p-val.	Mean		p-val.
Mktcap ($millions)	-424		0.499	593	***	0.000
Raw return	-0.299	***	0.000	-0.242	***	0.000
Mkt-adj. return	-0.289	***	0.000	-0.258	***	0.000
Volatility	-0.001		0.232	0.001	***	0.000
Share turnover	-0.130		0.133	-0.018		0.120
ROA	-0.002		0.535	-0.002	***	0.000
Dividend yield	0.000		0.008	0.001	***	0.000
Sales growth	0.019		0.110	-0.022	***	0.000

*, **, and *** indicate significance at 10%, 5%, and 1% level, respectively.

RESULTS

Insider Selling Before a Price Crash and Litigation

This paper uses logistic regression to formally assess the ability of insider identity and insider trade characteristics to predict subsequent litigation. Standard errors are clustered by firm

and year to account for possible within-cluster correlation (Petersen, 2009). The dependent variable is *Lawsuit*, which attains value of one if a lawsuit is filed within the next three months (t, t+1, and t+2) and zero otherwise.

All regressions include control variables of stock volatility, firm size, share turnover, ROA, sales growth, dividend yield, year dummies, and industry dummies based on two-digit SIC codes. Johnson et al. (2000) show that litigation is usually preceded by sharp price declines. Plaintiff attorneys tend to exploit firms with higher stock volatility. Firm size is a proxy for a firm's ability to pay (deep pockets). Prior studies (e.g., Field et al., 2005; Ferris et al., 2003) argue that share turnover is an element in calculating damages in securities class action lawsuits and thus an essential determinant of litigation risk. Kim and Skinner (2012) use ROA and sales growth to predict litigation risk. Arena and Julio (2021) find that firms modify their payout policy in anticipation of future litigation costs. I control for industry effects because some industries are argued to be more sensitive to shareholder litigation than others (Francis et al., 1994). US insider trading law requires not only officers and directors of a company but also outside shareholders with more than 10% of the company's stock to file their transactions with the SEC. Thus, I additionally control for large stockholders' selling as opposed to insider selling and its interaction with *Crash*. As Compustat-based variables (ROA, sales growth, and dividend yield) are available up to 2019, Tables 3–6 are estimated using observations up to 2019, which are evenly distributed except for 1995–1996 and 2019, accounting for about 4–5% each year.

In Table 3, Model 1 includes *Sale,* an indicator variable that attains value of one if there was any insider selling in the previous three months [t-3, t-1]. This regression is similar to prior research that does not include an interaction of insider selling with *Crash*. As in Kim and Skinner (2012), insider selling is negatively associated with litigation risk. This result indicates that insider selling, by itself, does not trigger lawsuits and counterintuitively decreases the likelihood of lawsuits. The coefficient of *Crash* is positive and statistically significant. Model 2 has an interaction term, *Crash*Sale,* to test Hypothesis H1. Hypothesis H1 predicts that insider selling occurring before a price crash significantly increases the likelihood of a lawsuit. Consistent with the prediction, I find the coefficient of the interaction term is positive and statistically significant (coefficient=0.267), which is supportive of H1. Compared to insider sales that are not followed by a crash, insider sales followed by a crash increase the likelihood of litigation by 2.65% in Model 2. The economic magnitude of this incremental likelihood is about four times the unconditional likelihood of litigation for a given three-month period of firms in the sample (0.68%). The coefficient of blockholders' sales interacted with *Crash* is positive but insignificant in Model 2, indicating that outside large shareholders' sales prior to *Crash* do not have the same triggering effect as insiders' sales prior to *Crash*. Consistent with previous studies, the coefficients of stock volatility, firm size, and share turnover are positive and statistically significant; the coefficients of ROA, sales growth, and dividend yield are negative and significant in both models.

Table 3
Logit Regressions of Lawsuit on Insider Sales and Crash

	Dependent Variable: Lawsuit	
Variables	(1)	(2)
Crash*Sale		0.267***
		[0.003]
Sale	-0.286***	-0.321***
	[0.000]	[0.000]
Crash	1.871***	1.732***
	[0.000]	[0.000]
Crash*BLK sale		0.354
		[0.142]
BLK sale	-0.012	-0.057
	[0.924]	[0.668]
Volatility	15.696***	15.653***
	[0.000]	[0.000]
Size	0.406***	0.406***
	[0.000]	[0.000]
Share turnover	0.211***	0.211***
	[0.000]	[0.000]
ROA	-3.623***	-3.626***
	[0.000]	[0.000]
Sales growth	-0.130*	-0.133*
	[0.094]	[0.088]
Dividend yield	-21.287**	-20.952**
	[0.014]	[0.016]
Constant	-9.276***	-9.265***
	[0.000]	[0.000]
Year fixed effect	Y	Y
Industry fixed effect	Y	Y
Observations	805,216	805,216
Pseudo R^2	0.118	0.119

*, **, and *** indicate significance at 10%, 5%, and 1% level, respectively. P-values in brackets.

Characteristics of Insider Selling and Litigation

This paper examines whether some characteristics of insider selling affect the likelihood of litigation (Hypothesis 2). Specifically, I test whether sales by top two executives (CEO/CFO), opportunistic sales, and sales in the near past are more likely to affect litigation. For brevity, I report the coefficients of key variables only in Tables 4–6, as the coefficients of control variables are similar to those in Table 3.

Timing of the Insider Sale

In Table 4, this paper tests whether insider sales in the recent past are more likely to trigger a lawsuit than insider sales in the distant past. In Model 1, which is the same as Model 2 of Table 3, insider sales in the recent past quarter [Q_{-1}] have a significantly positive coefficient.

Models 2–4 replace insider sales [Q_{-1}] with insider sales in the earlier quarters Q_{-2}–Q_{-4}. The coefficients of insider sales in these three quarters differ in their sign and significance level. Insider sales [Q_{-2}] are negatively related to lawsuits, but insider sales [Q_{-3}] are not associated with lawsuits. Insider sales [Q_{-4}] are positively associated with lawsuits. On the other hand, in all three instances, the interaction terms are insignificant, suggesting that insider sales in the distant past (Q_{-4} to Q_{-2}) before a price crash do not increase the likelihood of lawsuits.

Model 5 includes all insider sales in the past four quarters and their interactions with *Crash*. I find that only the insider sales in the quarter (Q_{-1}) just before *Crash* increase the likelihood of lawsuits, controlling for the variables correlated to lawsuits. Trades made well before the crash do not affect this likelihood.

Table 4
Logit Regressions of Lawsuit on Timing of Insider Sales and Crash

	Dependent variable: Lawsuit				
Variables	(1)	(2)	(3)	(4)	(5)
Crash*Sale[Q_{-1}]	0.267***				0.311***
	[0.003]				[0.002]
Crash*Sale[Q_{-2}]		0.138			0.133
		[0.119]			[0.203]
Crash*Sale[Q_{-3}]			-0.032		-0.077
			[0.728]		[0.467]
Crash*Sale[Q_{-4}]				-0.135	-0.250**
				[0.138]	[0.014]
Sale[Q_{-1}]	-0.321***				-0.343***
	[0.000]				[0.000]
Sale[Q_{-2}]		-0.155***			-0.112**
		[0.002]			[0.023]
Sale[Q_{-3}]			-0.013		0.049
			[0.792]		[0.317]
Sale[Q_{-4}]				0.108**	0.197***
				[0.037]	[0.000]
Crash	1.732***	1.797***	1.884***	1.948***	1.833***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Year fixed effect	Y	Y	Y	Y	Y
Industry fixed effect	Y	Y	Y	Y	Y
Observations	805,216	791,061	777,562	763,700	763,700
Pseudo R^2	0.119	0.117	0.118	0.118	0.120

*, **, and *** indicate significance at 10%, 5%, and 1% level, respectively. P-values in brackets.

Insider Identity

As discussed in Hypothesis Development, top executives' selling is more likely to be evidence of scienter. Therefore, it is more likely to result in litigation than other insiders' selling. In Table 5, I test this hypothesis by estimating models similar to Model 2 of Table 3, except that insider sales are parsed out based on insider identity. I focus on the effect of insider sales just

before a crash on litigation risk, as I find that only the insider sales in the most recent quarter affect litigation risk.

I partition insiders into four groups (CEO, CFO, other officers, and directors) in Model 1 and three groups (CEO, CFO, and other officers and directors) in Model 2. The coefficients of *Crash*CFO sale* are positive and statistically significant. When CFO sales occur prior to a crash, the likelihood of litigation increases (relative to CFO sales that occur in the absence of a crash) by 3.31% and 3.21% in Models 1 and 2, respectively. Surprisingly, the coefficients of *Crash*CEO sale* are positive but marginally significant. The coefficients of *Crash* interacted with sales by other officers and directors are insignificant.

In Model 3 of Table 5 where there are two groups of insiders (CEOs and other insiders, including CFOs), the coefficient of *Crash*CEO sale* is 0.244 and statistically significant. The marginal effect indicates that when CEO sales occur prior to a crash, the likelihood of litigation increases (relative to CEO sales that occur in the absence of a crash) by 3.20% in Model 3, which is an economically significant magnitude compared to the unconditional mean of 0.68% of litigation in any given three-month period. By adding CFO sales to other insiders' sales, the coefficient of *Crash*CFO/OFF/DIR sale* becomes significantly positive. These results suggest that the effect of insider sales on litigation risk is led by the top two executives' sales, consistent with Hypothesis H2.

In all three models, the interaction terms of outside large shareholders' sales with *Crash* are insignificant. As in Table 3, the coefficients of stock volatility, firm size, and share turnover are positive at the 1% significance level. The other control variables (ROA, sales growth, and dividend yield) have negative and statistically significant coefficients.

Table 5
Logit Regressions of Lawsuit on Insider Sales by Insider Identity and Crash

	Dependent variable: Lawsuit		
Insider group	4 groups	3 groups	2 groups
Variables	(1)	(2)	(3)
Crash*CEO sale	0.168	0.167	0.244**
	[0.193]	[0.191]	[0.045]
Crash*CFO sale	0.332**	0.329**	
	[0.020]	[0.019]	
Crash*CFO/OFF/DIR sale			0.205**
			[0.032]
Crash*OFF sale	0.161		
	[0.120]		
Crash*OFF/DIR sale		0.143	
		[0.144]	
Crash*DIR sale	-0.038		
	[0.727]		
CEO sale	0.030	-0.004	-0.033
	[0.656]	[0.952]	[0.617]
CFO sale	-0.103	-0.142*	
	[0.170]	[0.057]	
CFO/OFF/DIR sale			-0.320***
			[0.000]
OFF sale	-0.318***		
	[0.000]		
OFF/DIR sale		-0.291***	
		[0.000]	
DIR sale	-0.109**		
	[0.047]		
Crash	1.747***	1.730 ***	1.726***
	[0.000]	[0.000]	[0.000]
Year fixed effect	Y	Y	Y
Industry fixed effect	Y	Y	Y
Observations	805,216	805,216	805,216
Pseudo R^2	0.119	0.119	0.119

*, **, and *** indicate significance at 10%, 5%, and 1% level, respectively. P-values in brackets.

Opportunistic Insider Sales

In Table 6, I replace insider sales with opportunistic insider sales to test whether combining insider identity, insider sale type, and timing of the sale (in the quarter before a crash versus no crash) results in a stronger (positive) effect of insider sales on litigation risk. Shareholders are more likely to perceive opportunistic sales (non-routine sales) as driven by private information than routine sales. Therefore, opportunistic sales are more likely to be positively associated with subsequent litigation.

In Model 1 of Table 6-Panel A, the coefficients of *Crash*CEO opportunistic sale* and *Crash*CFO opportunistic sale* are 0.400 and 0.356, respectively. Both are statistically significant. In contrast, the coefficients of other interactions are insignificant. The economic significance of CEO opportunistic sales and CFO opportunistic sales prior to a price crash is considerable. Based on Model 1, CEO opportunistic sales prior to a crash result in a 3.97% increase in the likelihood of litigation for the subsequent three months relative to instances where CEO opportunistic sales are not followed by crashes (a 3.80% increase for CFO opportunistic sales prior to a crash relative to instances where CFO opportunistic sales are not followed by crashes). These increases are about six times larger than the unconditional mean of the likelihood of lawsuits in three months (0.68%). For comparison, Kim and Skinner (2012) document a marginal effect (at the annual level) of 2.4% for firms in litigious industries and 2.2% for firm size.

In Models 2 and 3 of Table 6-Panel A, opportunistic sales are partitioned into sales by three groups (CEO, CFO, and other officers and directors) or two groups (CEO and other insiders). Similar to Model 1 of Table 6-Panel A, I find that opportunistic sales by CEOs and CFOs just before a crash are associated with higher incidences of lawsuits. The economic significance of CEO opportunistic sales before a crash is 3.79% and 3.83% in Models 2 and 3 (3.58% for CFO opportunistic sales in Model 2), relative to the instance where a price crash does not follow those insiders' sales. Overall, the results support hypothesis H1 and elements of hypothesis H2, suggesting that all insider sales do not have the same effect on litigation risk. The impact of insider selling on litigation risk is stronger when opportunistic sales by CEOs or CFOs occur just before a crash.

As for control variables, the interactions of opportunistic sales by large outside shareholders with *Crash* are positive but insignificant in all models. As in Tables 3–5, the coefficients of stock volatility, firm size, and share turnover are statistically positive at the 1% level in Table 6-Panel A, while those of dividend yield are insignificant. The coefficients of ROA and sales growth are negative at the 1%–5% levels, indicating that firms with good operating performance are less likely to be a target of shareholder lawsuits.

Additionally, this paper examines whether the effect of insider sales on litigation risk is weaker for firms with insider trading policies that allow insiders to trade only during a short window *subsequent* to earnings announcements. If investors perceive that blackout periods dissuade insiders from trading on private information, insider sales in firms with such blackout periods will have little or no ability to predict litigation. In this context, I assume that insider trades in firms with blackout periods are non-opportunistic trades. Roulstone (2003) classifies a firm as restricting insider trading (buying or selling) if at least 75% of insider trading occurs within a "safe period" of one month after an earnings announcement (twenty trading days). His definition is motivated by the survey findings of Bettis et al. (2000), who document that firms set up blackout periods restricting insider trading around information events to protect themselves from lawsuits. Following Roulstone (2003), I create a variable "safe" and calculate the proportion of shares traded (either open market sales or purchases) by the firm's officers within one month following an earnings announcement for each calendar year (t). I classify firms with safe (t) >= 75% as one with blackout periods for the year.

Table 6-Panel B reports regressions using the subsample of firms with blackout periods (safe>=75%). For firms with blackout periods, opportunistic sales by CEOs and CFOs before a stock price crash significantly increase litigation risk. The economic significance is also large, ranging from 4.72% to 5.01% for CEO opportunistic sales before a crash in Models 1–3 of Panel B (4.43%–4.62% for CFO opportunistic sales before a crash in Models 1–2). Instead of the sub-sample analysis above, I use an indicator variable of blackout policy as a control in the regressions using a full sample. The results are qualitatively similar.

In summary, the findings of this paper suggest that all three aspects of insider sales—insider identity, type of insider sales, and timing of insider sales—matter in predicting litigation risk. Opportunistic sales by CEOs or CFOs that occur in the quarter immediately preceding a share price crash significantly increase litigation risk. Insider sales that occur in the absence of a significant price drop do not increase litigation risk since it is difficult to establish scienter and argue that insiders knowingly sold their shares at inflated prices. Sales by other insiders and sales that occur well prior to a share price crash also do not increase litigation risk. Instituting blackout policies also does not seem to insulate a firm from litigation after a crash if CEOs or CFOs have sold opportunistically before price crashes.

The effect of the Sarbanes-Oxley Act of 2002

SOX has discouraged insiders from trading opportunistically by tightening the reporting window for insider transactions to the following two business days and thus accelerating the incorporation of private information into the market.[16] Therefore, this paper examines whether SOX reduces the effect of insider sales on litigation risk using the subsample of the post-SOX period (2003–2019). The results are reported in Models 4–6 of Table 6-Panel B. I find that the effect of CEO opportunistic sales preceding a price crash on litigation risk becomes insignificant after the passage of the SOX legislation. The impact of CFO opportunistic sales before a crash on litigation risk remains significant, but the coefficients of *Crash*CFO opportunistic sale* decrease in the post-SOX period.

[16] The two-business day reporting requirement for insider trading is in Section 403 of SOX, which amends Section 16(a) of the Securities Exchange Act of 1934. A failure to comply with the reporting requirements of Section 16 incurs civil penalties ranging from $5,000 to $100,000 per violation. The real-time electric filing system (EDGAR) at the SEC website automatically detects delinquent filing of insider transactions. If the SEC obtains a cease-and-desist order prohibiting future violations of the reporting requirements, each day that a filing is late may be treated as a separate offense, thereby multiplying the penalty amount by the number of delinquent days. (Source: https://www.sec.gov/Archives/edgar/data/704384/000119312504051976/dex995.htm).

Table 6
Logit Regressions of Lawsuit on Opportunistic Sales by Insider Identity and Crash

Panel A. Full (partitionable) Sample

	Dependent variable: Lawsuit		
Insider group	4 groups	3 groups	2 groups
Variables	(1)	(2)	(3)
Crash*CEO opportunistic sale	0.400**	0.356**	0.394**
	[0.016]	[0.031]	[0.014]
Crash*CFO opportunistic sale	0.581***	0.525**	
	[0.010]	[0.019]	
Crash*CFO/OFF/DIR opportunistic sale			0.219*
			[0.071]
Crash*OFF opportunistic sale	-0.041		
	[0.771]		
Crash*OFF/DIR opportunistic sale		0.100	
		[0.426]	
Crash*DIR opportunistic sale	-0.002		
	[0.990]		
CEO opportunistic sale	-0.036	-0.048	-0.079
	[0.694]	[0.593]	[0.384]
CFO opportunistic sale	-0.325**	-0.338***	
	[0.013]	[0.010]	
CFO/OFF/DIR opportunistic sale			-0.186***
			[0.003]
OFF opportunistic sale	-0.140**		
	[0.048]		
OFF/DIR opportunistic sale		-0.140**	
		[0.028]	
DIR opportunistic sale	-0.109		
	[0.166]		
Crash	1.763***	1.729***	1.713***
	[0.000]	[0.000]	[0.000]
Year fixed effect	Y	Y	Y
Industry fixed effect	Y	Y	Y
Observations	489,304	489,304	489,304
Pseudo R^2	0.118	0.118	0.118

Panel B. Subsamples

	Firms with blackout periods (safe>=75%)			Post-SOX period (2003-2019)		
Insider group	4 groups	3 groups	2 groups	4 groups	3 groups	2 groups
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Crash*CEO opportunistic sale	0.596**	0.529**	0.603**	0.124	0.086	0.126
	[0.024]	[0.043]	[0.017]	[0.524]	[0.658]	[0.496]
Crash*CFO opportunistic sale	0.656*	0.615*		0.528**	0.491**	
	[0.050]	[0.066]		[0.034]	[0.048]	
Crash*CFO/OFF/DIR opportunistic sale			0.17			0.204
			[0.373]			[0.126]
Crash*OFF opportunistic sale	0.006			0.107		
	[0.978]			[0.484]		

Crash*OFF/DIR opportunistic sale		0.082			0.104	
		[0.665]			[0.449]	
Crash*DIR opportunistic sale	-0.182			-0.195		
	[0.491]			[0.303]		
Observations	181,092	181,092	181,092	422,116	422,116	422,116
Pseudo R^2	0.116	0.116	0.116	0.121	0.120	0.120

*, **, and *** indicate significance at 10%, 5%, and 1% level, respectively. P-values in brackets.

Additional Robustness Tests

In the following set of robustness tests, I validate the findings in Table 6-Panel A. First, I re-estimate the models using a subsample that includes one month per calendar quarter (e.g., February, May, August, November) to address the issue of overlapping windows for the variable *Lawsuit*. Second, I estimate *Lawsuit* for shorter periods of one month (t+1) and two months (t+1 and t+2). My findings are qualitatively similar. Nevertheless, I acknowledge the limitation of this study resulting from confounding events that may occur between crashes and lawsuits. Third, I estimate *Crash* based on one standard deviation instead of two standard deviations of the past stock returns and using returns for fewer months (48 or 36 months) than the past 60 months. Fourth, I redefine opportunistic sales by creating an indicator variable of opportunistic sales that attains value of one if an insider sells more shares (percentage of shares sold by the insider to shares outstanding) than the average sales by the insider over the past two years. Lastly, I replicate the analysis using percentages of net shares sold to shares outstanding and natural logarithms of (1+min value of net insider sales + net insider sales). The results are robust to the alternative specifications.[17]

DISCUSSIONS AND ADDITIONAL ANALYSIS

Although there is no a priori reason why insider trading should lead to shareholder litigation only in specific industries, plaintiff lawyers may focus on firms in some litigious industries. Thus, I replicate the analysis, excluding companies in high technology industries such as pharmaceuticals (SIC 2833–2836), computer hardware (3570–3577), and computer software (7371–7379) as a robustness check. The results are similar to Table 6-Panel A[18], confirming that my findings can be generalized for firms in any industry, unlike Johnson et al. (2000, 2007), who find a positive link using a small sample of firms in high technology industries only. Moreover, I find that the positive association between insider sales and litigation risk exists primarily when sales are by CEOs or CFOs of the firm, when sales are non-routine, and when sales occur just before (within three months of) a price crash. Sales by other insiders (e.g., other officers or directors) or non-opportunistic sales and sales that occur in the distant past do not have a similar effect.

[17] Detailed results are not tabulated separately but are available from the author upon request.

[18] For the subsample, I further control for industry effects using the 49 Fama-French industry classification.

Shareholders and their lawyers may selectively focus on firms with large price drops and file lawsuits against a subset of firms with preceding insider sales. While my analysis does not speak to the merits of the case, the results indicate that plaintiffs in a lawsuit do seem to discriminate between different types of insider sales. Plaintiffs are more likely to file lawsuits when they observe opportunistic sales by CEOs or CFOs prior to a price drop. Given that the filing of a lawsuit imposes substantial costs on a firm regardless of whether the claims are meritorious, the results suggest that curtailing certain types of insider sales may benefit the firm.

Do Some Insiders Change Their Pattern of Insider Sales?

If lawsuits are costly and opportunistic sales by CEOs and CFOs prior to a price crash increase the likelihood of a lawsuit, at least some CEOs or CFOs should cut their opportunistic sales before an expected price crash to reduce litigation risk. I find that, in the absence of a price crash, the frequency of insider sales remains relatively constant over the past four quarters. With a price crash, the number of CEOs' opportunistic sales declines by more than 40% (35% for CFOs' opportunistic sales) over the preceding four quarters. I then examine whether a decrease in CEOs' or CFOs' opportunistic sales lowers litigation risk by augmenting Model 1 in Table 6-Panel A. The extended model includes an indicator variable that attains value of one if the top two executives reduce their opportunistic sales from Q_{-4} to Q_{-1} and their interactions with *Crash* and opportunistic sales by CEOs and CFOs. The interaction effects of (*Crash*CEO opportunistic sale *reduction in CEO opportunistic sales*) and (*Crash*CFO opportunistic sale*reduction in CFO opportunistic sales*) are not statistically significant. This result suggests that, as long as CEOs or CFOs sell before the crash, a reduction in their opportunistic sales does not deter lawsuits.

CONCLUSION

This paper investigates which types of insider trades attract litigation using a large US sample. To identify potentially informative sales, it separates sales based on insider identity, abnormal nature, and timing of insider sales. The results suggest that all these categorizations of insider sales are jointly important in determining litigation risk. Insider sales before a crash increase litigation risk, especially when CEOs or CFOs sell their firm's shares opportunistically in the quarter prior to a crash. Sales by other insiders and sales in the distant past do not increase the likelihood of lawsuits. These results hold even for firms with blackout periods. While not conclusive of merit, evidence indicates that plaintiff lawyers do not rely solely on whether the firm has deep pockets to settle the lawsuit. On the contrary, shareholders differentiate between different types of insider sales when they decide to file a lawsuit. In addition, this paper finds that the impact of opportunistic sales by the top two executives on litigation risk has been mitigated in the post-SOX period as the new legislation constrains managerial opportunism.

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Appendix
Variable Definitions

Variable	Definition
Lawsuit	Equals 1 if the firm is sued by shareholders within the three months of t, t+1, t+2; 0 otherwise
Crash	Equals 1 if the CRSP equally-weighted (EW) market-adjusted stock return of the month is two standard deviations below the mean of the EW market-adjusted monthly stock returns for the past 60 months; 0 otherwise
Sale (or Sale[Q_{-1}])*	Equals 1 if insiders sell shares for the previous three months of t-3, t-2, and t-1; 0 otherwise
CEO sale	Equals 1 if CEOs sell shares for the previous three months of t-3, t-2, and t-1; 0 otherwise
CEO opportunistic sale	Equals 1 if CEO opportunistically sell shares for the previous three months of t-3, t-2, and t-1; 0 otherwise
Volatility	Standard deviation of daily stock returns for the previous one year
Share turnover	Sum of the ratios of (monthly trading volume to shares outstanding) for the previous twelve months
Market capitalization	Market capitalization of the firm at the end of the previous month (in $Mil)
Size	Natural logarithm of market capitalization
Raw Return	Monthly stock return for the month
Market-adj return	Raw Return minus the CRSP value-weighted market return for the month
ROA	A ratio of operating income before depreciation to total assets for the quarter before the month
Dividend yield	A ratio of dividends paid per share to the stock price at the end of the quarter before the month
Sales growth	A ratio of the change in quarterly sales to sales for the quarter before the firm-month

* The values over [t-6, t-4], [t-9, t-7], and [t-12, t-10] are calculated analogously for Sale [Q_{-2}], Sale [Q_{-3}], and Sale [Q_{-4}], respectively.

THE SPEEDS AND CHANNELS OF CASH ADJUSTMENT

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ABSTRACT

We first document a considerable variation in the speed of cash adjustment (SOA) across firms and scenarios, which suggests the existence of heterogeneity in the adjustment cost. Thus, we conduct a channel analysis to show how firms adjust their cash levels. Internal channels (investment adjustments and operating cash flows) are more important than external channels (debt and equity financing) for a firm's cash level to converge to the target level, suggesting the severity of financial market frictions. Firms have comparative advantages in employing different adjustment channels, which leads to their different SOAs. Last, we find that firms have abnormal cash accumulation through external channels and incur abnormal cash dissipation due to extra investment needs or negative cash flow.

INTRODUCTION

Maintaining adequate cash is crucial for firms. A cash deficit may pose an immediate threat to a firm's financial safety and growth, while a cash surplus entails low investment returns and agency concerns. The literature has discussed different determinants of optimal cash holdings (e.g., Opler et al., 1999; Foley et al., 2007; Harford et al., 2008; Bates et al., 2009; Fresard, 2010). Recently, more attention has been given to the speed of cash adjustment (SOA), which has generated piecemeal evidence on the cross-sectional heterogeneity in the SOA (Dittmar and Duchin, 2011; Venkiteshwaran, 2011; Jiang and Lie, 2016; Orlova and Rao, 2018).

Against this backdrop, we target two important and closely related questions on cash adjustment in this paper. We start by examining the extent to which the SOA varies with firm characteristics. It should not be surprising to observe a variation in the SOA across firms, but we distinguish this analysis from the existing literature that uses univariable comparisons by examining the roles of different factors in SOA in a horse-race manner.

We then take the research one step further to explain the observed variation in the SOA using a channel analysis, distinguishing the cash surplus and cash deficit scenarios. When cash holdings drift away from the optimal level and need to be restored, a firm, based on the cash flow identity, can rely on its operating cash flow, investment adjustment or interactions with financial markets (i.e., payouts, new equity issuances, and net debt retirement).[19] A faster SOA suggests that the firm bears a lower adjustment cost in at least one of these adjustment channels. Thus, the

[19] We study cash payouts (including dividends and repurchases) and new equity issuances separately because these two variables are not significantly correlated in the sample. However, debt retirement and new debt issuances have a correlation of 0.9, which suggests that most of the new debt is used to repay old debt. Therefore, it is reasonable to focus only on net debt issuance.

channel analysis reveals the comparative advantages held by different firms in using the adjustment channels for cash recovery.

A major innovation of the channel analysis is the decomposition of cash adjustment into normal and abnormal adjustments. Normal adjustment (NormalAdjust) measures the extent to which a firm's cash converges to the target level. Meanwhile, a firm's cash level can also either deviate further away from (ReverseAdjust) or overshoot (OverAdjust) the target level. It is necessary to differentiate between the three types of cash adjustment because they are driven by different forces and rely on different adjustment channels. Our focus is on NormalAdjust which is most relevant to the speed of cash convergence.

All our analyses depend on reliable estimates of the target cash level and SOA. To this end, we employ the two-stage, two-step system GMM approach to estimate the target cash level and SOA. In the full sample, the average SOA is 0.472, suggesting a 47.2% convergence to the target cash level in the subsequent year. In addition, firms adjust their cash levels faster when there is a cash surplus versus a deficit: the SOAs are 0.506 and 0.393, respectively.

We then calculate the cash adjustment ratio for each firm and regress it on a series of firm characteristics that are associated with adjustment costs and thus SOA. We find that firm size and leverage seem to persistently explain the SOA: the SOA varies with firm size and leverage regardless of the cash adjustment direction. Specifically, under a cash surplus, the SOAs of small and low-leverage firms are almost double those of large and high-leverage firms. When cash is below the target level, the SOAs of large and low-leverage firms are at least 30% faster than those of small and high-leverage firms.

The different SOAs suggest that firms with faster SOAs must have some advantage of using at least one channel to restore the target cash level. Based on cash flow identity, we next examine the relative importance of the five adjustment channels (investment, payout, new equity issuance, net debt retirement and operating cash flow) in cash adjustment for different scenarios and different types of firms.

The channel analysis generates a rich set of results on how firms adjust their cash levels. We find that internal channels (investment adjustments and operating cash flows) are more important than external channels (debt and equity financing) to NormalAdjust, which measures the extent to which a firm's cash level *converges* to the target level. When there is a cash surplus, one dollar of cash dissipation is associated with 22 cents of investment and 31 cents of negative cash flow. This implies that the excess cash held by firms mainly serves as a cushion for subsequent negative operating cash flows and investment needs. The association between cash dissipation and operating cash flows is especially strong for small firms, which provides an explanation for why small firms dissipate excess cash faster. When there is a cash deficit, investment cuts and operating cash flows continue to be the two major channels of cash adjustment. One dollar of cash accumulation is associated with 48 cents of investment cuts and 32 cents of operating cash flow. This suggests that the ability to adjust investments and earn internal cash flows is the key to cash recovery (from a cash deficit). Large firms seem to have more flexible investment and this helps explain why large firms recover faster from a cash deficit.

The need to reduce leverage seems to slow down the SOA of high-leverage firms. Under a cash surplus, high-leverage firms spend more excess cash on debt retirement but do not increase payout as much as low leverage firms; under a cash deficit, high-leverage firms still allocate a large portion of available cash to retire debt.

Abnormal cash adjustment, namely ReverseAdjust and OverAdjust, rely on different channels. Abnormal cash accumulation (OverAdjust under a cash deficit or ReverseAdjust under a cash surplus) is largely driven by external channels. This echoes the argument that firms, especially financially constrained firms, stockpile more cash than they need to save financing costs when they can do so (Hennessy and Whited, 2007). By contrast, abnormal cash dissipation (OverAdjust under a cash surplus or ReverseAdjust under a cash deficit) is driven by internal channels (negative cash flows and extra investments).

To our knowledge, we are the first to extensively analyze the cash adjustment channels to understand the variation in the SOA. We contribute to the literature in multiple ways by disclosing the dynamics among cash management, operating performance, investment and financing policies. First, we show the associations between firm characteristics and SOA in a horse-race manner, showing which firms are especially slow in their cash adjustment and subject to liquidity-related concerns.

Second, we show that internal channels are more important than external channels to the convergence to the target cash level (NormalAdjust). When there is a cash deficit, a heavy reliance on internal channels for cash recovery would suggest the severity of the frictions in financial markets.[20] Meanwhile, the channel analysis for the cash surplus scenario is equivalent to demonstrating how firms use excess cash. While Chang et al. (2014) examine how firms use contemporaneous internal cash flows, our channel analysis under the cash surplus scenario targets the usage of excess cash. Chang et al. (2014) document that retiring debt is a major usage of operating cash flows. However, our results show that the main reason for firms to stockpile excess cash is to provide a cushion against subsequent negative cash flows and finance investment.

Third, we show that different firms have different comparative advantages over the adjustment channels, leading to different SOAs. For example, large firms have more flexible investments while small firms have more volatile cash flows, which is the major reason that large firms recover faster from a cash deficit but use excess cash slower.

Fourth, we integrate the capital structure adjustment literature with the analysis of cash adjustment, and find that the need to reduce debt leads to high-leverage firms having slower SOAs. Thus, firms adjust cash and capital structure at the same time.

The remainder of this paper proceeds as follows. Section 2 presents theoretical predictions. Section 3 describes the data, sample and methodology. Section 4 reports the SOA results. Section 5 presents the results of the channel analysis and Section 6 concludes.

HYPOTHESES DEVELOPMENT

In this section, we develop the hypotheses on the variation in SOA among firms and how firms adjust cash.

The Speed of Cash Dissipation

Our first hypothesis is about how fast firms dissipate excess cash. Based on the cash flow identity, firms can retain a portion of excess cash and use the remaining portion for investment, payout, avoiding new equity issuance, net debt retirement or covering subsequent negative cash

[20] Examples include the uncertainty of capital supply (e.g., Lemmon and Roberts, 2010), adverse selection (e.g., Stiglitz and Weiss, 1981) or moral hazard (e.g., Holmstrom and Tirole. 1997).

flows (the five cash adjustment channels). We believe that different firms have different benefit-cost tradeoffs across the channels. We now suggest some theoretical arguments that link firm characteristics to the speed of cash dissipation.

Keynes' (1936) proposes the transactional and precautionary motives for holding cash, which are especially relevant to firms that are subject to high financial constraints and operating risks (such as small firms). These firms are more likely to store up cash for a real need of cash. For example, it is costlier for small firms to obtain immediate funding to meet emergency needs of cash. When they expect a negative cash flow shock, they would store up cash in advance. This type of cash reserve will be quickly absorbed by the subsequent negative cash flow shock, which may lead to a faster SOA under cash surplus.

H1a: Firms that are subject to high financial constraints and operating risks (such as small firms) dissipate excess cash faster.

Based on the free cash flow theory (Jensen, 1986), firms that are subject to more managerial agency concerns, such as large or low market-to-book firms (Stulz, 1990), may keep a larger portion of excess cash at the controller's discretion (for example, for managerial entrenchment and empire building). Admittedly, these firms can also use excess cash for extra investment, but due to lack of growth opportunities, we hypothesize that they should keep more at hand for future needs or financial security, which leads to a slower SOA. By contrast, firms with strong corporate governance are more likely to pay out excess cash to outside investors and have a faster SOA under cash surplus.

H1b: Firms that are subject to more agency concerns (such as large and low market-to book firms) dissipate excess cash slower.

Based on the optimal capital structure theories, high-leverage firms may use excess cash to adjustment their capital structure. On the one hand, high-leverage firms should abstain from paying excess cash to shareholders because it will further reduce the weight of equity, which leads to a slower SOA. On the other hand, high-leverage firms may use a large portion of excess cash to retire debt, which leads to a faster SOA. However, using a large portion of excess cash to retire debt is not necessary, because cash is considered "negative debt" and holding cash already reduces the level of net debt (total debt net of cash). Besides, holding cash can also help with unexpected needs for funds. By contrast, low-leverage firms should pay out excess cash to increase leverage. Thus, the optimal capital structure theory leans towards low-leverage firms having a faster SOA under cash surplus.[21]

H1c: High-leverage firms dissipate excess cash slower than low-leverage firms.

The Speed of Cash Accumulation

Our second hypothesis is about how and how fast firms recover from a cash deficit. The cash flow identity shows five major channels for cash recovery: investment cut, payout reduction, equity financing, debt financing and operating cash flow. Different firms have different advantages over the five channels, which leads to different SOAs under a cash deficit.

[21] We want to give special thanks to one of the reviewers for suggesting the integration of the decisions on cash adjustment and capital structure adjustment.

We now present some theoretical arguments that link some firm characteristics to the speed of recovery from cash deficits.

Based on the financial constraint literature, firms that are subject to high financing costs have less support from financial markets and thus restore cash slower. For example, it is harder for low market-to-book firms and small firms to raise new capital from equity and debt markets respectively, and such firms should have a slower SOA under a cash deficit.[22]

H2a: Firms that are subject to lower financing costs (such as large and high market-to book firms) recover faster from cash deficits.

Financial constraints are also relevant to the cost of cutting investment to restore cash. Investments serve as collateral for future financing. This implies that small firms are less likely to scale down investment than large firms even if cash is below the target since small firms face greater costs to obtain outside funds than large firms (Riddic and Whited, 2009). Thus, large firms have more flexibility to cut investment when there is a cash deficit. In addition, a firm with assets on its balance sheet that can be easily converted into cash can raise funds at low costs by selling these assets (Shleifer and Vishny 1993). This form of investment cut is more available for large firms. Therefore, the stickiness of investment is expected to slow down SOA under a cash deficit, especially for small firms.

H2b: Firms that can cut investment more flexibly (such as large firms) recover faster from cash deficits.

Considerations with regard to capital structure adjustment can also provide a perspective for the analysis on cash recovery. High-leverage firms under a cash deficit may have to rely on equity markets or payout cuts, which may not provide enough help because high-leverage firms usually have high costs of equity and low payouts already. At the same time, high-leverage firms may have pressure to use some cash to retire debt, which will further slowdown their SOAs. By contrast, low-leverage firms do not have as much pressure to retire debt and may be able to cut payouts to save cash.

H2c: High-leverage firms recover slower from cash deficits.

Internal vs. External Channels

Our last hypothesis also addresses an empirical question: which channels, internal versus externals, are more important to cash adjustment? In a world of prefect financial markets, firms with a cash deficit can raise capital from external investors and do not have to adjust investment or rely on internal cash flows. Firms should also pay out all excess cash when they have it. However, in imperfect financial markets, we expect internal channels to be more important than external channels in cash adjustment.

Let us consider the cash deficit scenario first. Myers and Majluf (1984) argue that external funds are more expensive than internal funds due to the information asymmetry between

[22] High market-to-book firms have lower costs of equity and should obtain more help from new equity issuance when facing cash deficit. Myers (1977) argues that risky debt reduces the present value of real options from growth opportunities. This implies that high market-to-book firms will probably rely more on the equity issuance channel than on debt to raise cash.

outside investors and management. Therefore, firms prefer internal to external financing. Consistent with this pecking order theory, Byoun (2008), Faulkender et al., (2012) and other scholars document that capital structure adjustment is faster when firms have large amounts of financial surplus. Applying this logic of hierarchy financing, we hypothesize that the internal channels, namely investment cut and operating cash flow, are generally more important to reducing cash deficit than the external channels.

With regard to the cash surplus scenario, we can also follow the logic of the pecking order theory and hypothesize that the excess cash is more likely to be used to fund investments or cushion negative cash flow shocks than to be paid out to investors, due to the lower cost of internal funds versus external financing.

Hypothesis 3: Internal channels are more important than external channels in cash adjustment, regardless of the direction of cash adjustment.

DATA AND METHODOLOGY

We use firm-year observations from the Compustat annual dataset between 1989 and 2016. We select only U.S. firms and eliminate financial and utility firms, resulting in an initial sample of 92,004 observations. To be included in the SOA analysis, a firm should have at least two consecutive years of non-missing values for all the relevant variables. This criterion trims the initial sample down to 74,844 observations for the SOA analysis (full sample). The definitions of the variables used in this study are reported in Appendix A. We trim all the variables at the top and bottom one percentile.

We employ a two-stage approach to estimate the speed of cash adjustment. In the first stage, the cash ratio (Cash) is regressed on a vector of explanatory variables. The purpose of the first-stage regression is to estimate a firm's optimal or target cash ratio. The target cash ratio is determined by both observed and unobserved firm characteristics. Flannery and Rangan (2006) strongly suggest lagged firm characteristics and firm fixed effects to be included in the regression. Therefore, our first-stage regression specification is:

$$Cash_{it} = \alpha Cash_{it-1} + v_i + \beta X_{it-1} + \epsilon_{it} \quad (1)$$

where v_i is the firm fixed effect, and X_{it-1} is a vector of firm characteristics in year t-1 and includes the cash determinants identified by Bates et al. (2009).[23]

The second-stage regression estimates the adjustment speed, and the specification is:

$$Cash_{it} - Cash_{it-1} = \gamma\left(Cash_{i,t}^{T} - Cash_{it-1}\right) + v_i + \varepsilon_{it} \quad (2)$$

where $Cash_{i,t}^{T}$ is the fitted value from Equation (1). If firms make active cash adjustments, the partial adjustment coefficient γ should be significantly positive.[24]

[23] When estimating SOAs, we do not include year fixed effects. In unreported tests, inclusion of year fixed effects does not change our results qualitatively.

[24] Most literature on partial adjustment only performs the first stage regression and uses one minus the coefficient on the lagged dependent variable to estimate the adjustment speed. Our choice of the two-stage approach

We also employ the system GMM approach in both stages.[25] The results of the first-stage regression based on Equation (1) are presented in the first two columns in Table 1. All the explanatory variables have coefficients with the expected signs. The coefficient of the lagged cash ratio, 0.649, is statistically significant and very close to 0.620, reported by Dittmar and Duchin (2011).

Table 1: Two-step system GMM vs. long differencing estimators of target cash holding

The first two columns present the two-step system GMM estimators based on Equation (1) with firm fixed effects, and the last two columns present the LD estimators based on Equation (3). See Appendix A for detailed variable definitions. $\Delta Cash_{it,t-k}$ is the change in the cash ratio between the end of year t and the end of year t-k (where k=4) for firm *i*. We employ $Cash_{it-k-1}$ as the instrument and conduct a two-stage least squares regression (2SLS). *, ** and *** indicate two-tail statistical significance at 10%, 5% and 1% levels, respectively.

Independent Variables	System, Two-Step GMM	Independent Variables	Long Differencing k=4, Initial Values
$Cash_{i,t-1}$	0.649***	$\Delta Cash_{i,t-1,t-4-1}$	0.707***
	(0.010)		(0.011)
$Size_{i,t-1}$	-0.018***	$\Delta Size_{i,t-1,t-4-1}$	-0.008***
	(0.002)		(0.001)
$CashFlowStd_{i,t-1}$	0.745***	$\Delta CashFlowStd_{i,t-1,t-4-1}$	0.082*
	(0.073)		(0.047)
$BkLeverage_{i,t-1}$	-0.079***	$\Delta BkLeverage_{i,t-1,t-4-1}$	0.023***
	(0.007)		(0.004)
$Market\text{-}to\text{-}Book_{i,t-1}$	0.002**	$\Delta Market\text{-}to\text{-}Book_{i,t-1,t-4-1}$	-0.001*
	(0.001)		(0.000)
$DividendDummy_{i,t-1}$	-0.003*	$\Delta DividendDummy_{i,t-1,t-4-1}$	-0.009***
	(0.002)		(0.001)
$CashFlow_{i,t}$	0.038***	$\Delta CashFlow_{i,t-1,t-4-1}$	-0.002
	(0.009)		-0.004
$NetWorkingCapital_{i,t-1}$	-0.073***	$\Delta NetWorkingCapital_{i,t-1,t-4-1}$	0.048***
	(0.011)		(0.004)
$Aquisition_{i,t}$	-0.325***	$\Delta Aquisition_{i,t-1,t-4-1}$	-0.057***
	(0.027)		(0.008)
$R\&D_{i,t}$	0.113***	$\Delta R\&D_{i,t-1,t-4-1}$	0.067***
	(0.030)		(0.012)
$CapitalExpenditure_{i,t}$	-0.424***	$\Delta CapitalExpenditure_{i,t-1,t-4-1}$	-0.092***
	(0.025)		(0.010)
$Last5YearIPO_{i,t}$	0.008***	$\Delta Last5YearIPO_{i,t-1,t-4-1}$	0.000
	(0.002)		(0.001)
Constant	0.148***	Constant	0.002***
	(0.011)		(0.001)
Observation	74,876		47,592

has more practical appeal. If the target level specification should include the lagged dependent variable, then one minus the coefficient of the lagged dependent variable is not strictly the SOA coefficient. Furthermore, our two-stage results are closer to those from the long differencing (LD) method with iterations proposed by Hahn et al. (2007) and Huang and Ritter (2009). However, our approach has an advantage over LD in that it does not lead to a significant reduction in the sample size. Our approach also facilitates examination of the cross-section SOA.

[25] Blundell and Bund (1998) suggest that the dynamic panel data specification should be estimated with the system GMM approach, which has been applied in the literature on capital structure adjustment (e.g., Antoniou et al., 2008; Lemmon et al., 2008; Baum et al., 2016) and cash holding adjustment (Dittmar and Duchin, 2011).

To corroborate our choice of the system GMM approach, we report the long differencing (LD) estimator proposed by Huang and Ritter (2009) in the last two columns of Table 1. The long differencing model is specified as follows:

$$Cash_{it} - Cash_{it-k} = \lambda(Cash_{it-1} - Cash_{it-k-1}) + \delta(X_{it-1} - X_{it-k-1}) + \varepsilon_{it} - \varepsilon_{it-k}$$

or,

$$\Delta Cash_{it,t-k} = \lambda \Delta Cash_{it-1,t-k-1} + \delta \Delta X_{it-1,t-k-1} + u_{it,t-k} \quad (3)$$

The initial values (without iteration)[26] from the LD estimator with k=4 are reported in the last two columns of Table 1. The coefficient of lagged cash is 0.707, which is very close to our first-stage GMM estimator (0.649). The other explanatory variables have coefficients similar to those in column 2.

We report our estimate of SOA based on Equation (2) using the system GMM approach in Table 2. The estimated SOA is 0.472 with a statistical significance below 1% (in the first panel). In the third panel of Table 2, the LD estimator of SOA is 0.436, which is again very close to the GMM estimator in the first panel of Table 2. We thus will employ the GMM approach to estimate the SOA to take advantage of a larger sample and the ease of constructing subsamples.

Table 2: Two-step System GMM vs. Long Differencing Estimators of SOA

The first panel reports the two-step systematic GMM estimators of the speed of cash adjustment (SOA) based on Equation (2) with firm fixed effects. The second panel repeats the analysis in the first panel based on Equation (4) with firm fixed effects, which examines the SOA for the cash surplus and deficit scenarios separately. The third panel employs the long differencing technique based on Equation (3). Using $Cash_{it-k-1}$ as an instrument, we first estimate the equation with two-stage least squares (2SLS) and obtain the initial estimated values of $\hat{\lambda}$ and $\hat{\delta}$. Hahn et al. (2007) suggest that the residuals $Cash_{it-1} - \hat{\lambda}Cash_{it-1} - \hat{\delta}X_{it-2}, .., and\ Cash_{it-k-1} - \hat{\lambda}Cash_{it-k-1} - \hat{\delta}X_{it-k-1}$ are also valid instruments. We then use $Cash_{it-k-1}$ and the residuals as instruments to estimate the equation with 2SLS. This is the first iteration. We then further iterate this estimation and in the third panel report the value of one minus $\hat{\lambda}$ from the third iteration. *, ** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

	System Two-Step GMM		System Two-Step GMM		Long Differencing k=4	
	Coeff.	Half-Life	Coeff.	Half-Life	Coeff.	Half-Life
DVT	0.472***	1.09			0.436***	1.21
$DVT \cdot D^{above}$			0.506***	0.98		
$DVT \cdot D^{below}$			0.393***	1.39		
N	74,876		74,876		47,592	

[26] See Huang and Ritter (2009) in appendix B for more details.

THE VARIATION OF SOA

The results generated by the system GMM approach in Table 2 show that the average SOA is 47.2% of the deviation from the target level. This adjustment is quick, which is reasonable because cash is critical to financial flexibility and safety (Denis and Sibilkov, 2010; Denis, 2011).[27] However, firms with various comparative advantages in cash adjustment should rely on different channels and have different SOAs. In this section, we examine the variation of SOA along two dimensions. First, we show the different SOAs under cash surplus versus deficit. Second, we test how SOA varies with firm characteristics.

SOA is determined by the adjustment costs relative to the costs of operating with nonoptimal cash. If it is costlier to operate with a cash deficit than with a cash surplus, SOA should be faster when cash is below versus above the target. However, Dittmar and Duchin (2011), Jiang and Lie (2016), and Orlova and Rao (2018) document a faster SOA when firms adjust their cash levels down. Their interpretation of this adjustment asymmetry is that the adjustment cost is lower when cash is above the target. In other words, it is easier to dissipate than raise cash.

To confirm the asymmetric SOAs, we apply the same system GMM approach to a revision of Equation (2): [28]

$$Cash_{it} - Cash_{it-1} = \left(Cash_{i,t}^{T} - Cash_{it-1}\right) + v_i + \varepsilon_{it} \quad (4)$$

where $D_{i,t-1}^{above}/D_{i,t-1}^{below}$ is an indicator that equals 1 if the actual cash level is above/below the target at t-1. In the second panel of Table 2, we find that SOA is approximately 50.6% when firms have above-target cash and approximately 39.3% when firms have below-target cash. These results confirm that firms with a cash deficit adjust their cash levels slower than those with a cash surplus.

We now examine the extent to which SOA varies with firm characteristics. We first regress a firm's cash adjustment ratio, $(Cash_{i,t} - Cash_{i,t-1})/(Cash_{i,t}^{T} - Cash_{i,t-1})$, on a handful of lagged firm characteristics that are related to the severity of financial constraints or the need to adjust capital structure, including firm size, market-to-book ratio (Q), leverage, cash flow volatility, asset tangibility (PP&E), debt rating status and Z-score. We also control for financial surplus (FinSurplus), measured by the sum of net debt retirement and net payout, which has been shown to affect the speed of capital structure adjustment (Byoun, 2008).

The results are reported in Table 3. Model (1) addresses the cash-surplus scenario. Two of the lagged factors show a significant association with SOA. Large and high-leverage firms seem to have a slower SOA when they have a cash surplus (consistent with H1). Model (2) shows that three of the lagged firm characteristics predict SOA when there is a cash deficit.

[27] Strategically, large cash reserves may also provide firms a competitive edge over industry rivals (Fresard, 2010).

[28] In Equation (4) and (5), we do not include constants, following most of the adjustment literature. Our goal is to measure how fast a firm adjusts cash relative to the distance between the previous cash holding and the target cash. Thus, we "force" all cash adjustment to be a portion of the deviation from the target. In unreported tests, we find that adding constants into Equation (4) and (5) does not qualitatively change the results.

Leverage is still negatively associated with SOA, while firm size and Q are positively associated with SOA (consistent with H2).

The coefficients of FinSurplus in Table 3 are quite easy to understand. A positive value of FinSurplus represents cash dissipation (to investors) and thus should always reduce the level of cash holding. Therefore, it is not surprising to observe that FinSurplus is associated with a faster SOA (Model 1) under a cash surplus and a slower SOA (Model 2) under a cash deficit.

Since firm size, Q and leverage show significant impacts on SOA, we will focus on these three firm characteristics in the subsequent analyses. To further show the associations between these factors and SOA, we divide the full sample into subsamples constructed based on the industry-year medians of these three characteristics.[29] We do not do this analysis for FinSurplus because our focus is on what lagged firm characteristics affect the costs of cash adjustment but FinSurplus, by definition, is itself a part of cash adjustment. Thus, we will examine how firms employ FinSurplus (payout, equity issuance and debt retirement) to adjust cash in the next section.

Table 3: Determinants of SOA

We regress a firm's actual SOA, $(Cash_{i,t} - Cash_{i,t-1})/(Cash_{i,t}^{T} - Cash_{i,t-1})$, on a handful of lagged firm characteristics. Model (1) reports the results for firms with excess cash at t-1. Model (2) presents the results for firms with cash deficit at t-1. See Appendix A for detailed variable definitions. *, ** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

	(1) Above Target	(2) Below Target
$Size_{t-1}$	-0.172***	0.069***
	(0.03)	(0.03)
$Market\text{-}to\text{-}Book_{t-1}$	-0.006	0.127***
	(0.04)	(0.04)
$Bkleverage_{t-1}$	-0.506***	-0.419**
	(0.18)	(0.18)
CashFlowStd	2.632	-0.552
	(1.71)	(1.63)
$PP\&E_{t-1}$	-0.113	-0.173
	(0.16)	(0.15)
$No\ Rating\ Indicator_{t-1}$	0.094	0.359***
	(0.10)	(0.12)
$Z\text{-}score_{t-1}$	-0.012	-0.014
	(0.01)	(0.01)
$FinSurplus_{t}$	1.687***	-0.956***
	(0.32)	(0.29)
Constant	1.340***	-0.181
	(0.25)	(0.24)
N	26,763	25,740
Adjusted R^2	0.006	0.002

[29] For example, a firm is in the large-firm subsample if its size is above the industry (defined by the 2-digit SIC codes) median in year t-1.

We employ the following revision of Equation (2) to examine the differential SOAs across the subsamples:

$$Cash_{i,t} - Cash_{i,t-1} = \left(\lambda_1 D_{i,t-1}^{above} + \lambda_2 D_{i,t-1}^{below}\right)\left(Cash_{i,t}^{T} - Cash_{i,t-1}\right) + \left(\lambda_3 D_{i,t-1}^{above} + \lambda_4 D_{i,t-1}^{below}\right)\left(Cash_{i,t}^{T} - Cash_{i,t-1}\right) \times D_{i,t-1}^{Subsample_j} + v_i + \varepsilon_{it} \quad (5)$$

$D_{i,t-1}^{Subsample_j}$ is an indicator of a firm's subsample assignment in t-1. Based on Equation (5), the SOA of Subsample j when the cash level is above the target level is the sum of λ_1 and λ_3, while the SOA of Subsample j when the cash level is below the target level is the sum of λ_2 and λ_4. We report the calculated SOAs of the subsamples in Table 4, distinguishing the cash surplus and deficit scenarios.

Table 4: Cash Adjustment Speeds of Subsamples

We report the differential speeds of cash adjustment (SOA) among subsamples constructed by firm characteristics. The estimates are based on Equation (5) using system two-step GMM. The SOA for each subsample under cash surplus versus deficit is calculated and reported in the table. *, ** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

	Under Cash Surplus			Under Cash Deficit		
Subsamples	SOA	Std. Error	Half-life	SOA	Std. Error	Half-life
Small size	1.00***	(0.049)	0.00	0.39***	(0.045)	1.40
Big size	0.47***	(0.065)	1.09	0.53***	(0.038)	0.92
Low M-to-B	0.60***	(0.050)	0.76	0.33***	(0.040)	1.73
High M-to-B	0.69***	(0.053)	0.59	0.53***	(0.034)	0.92
Zero leverage	0.84***	(0.058)	0.38	0.69***	(0.057)	0.59
Low leverage	0.76***	(0.051)	0.49	0.50***	(0.035)	1.00
High leverage	0.44***	(0.052)	1.20	0.31***	(0.040)	1.87

The results in Table 4 echo those in Table 3 and show the different SOAs between the subsamples. When firms have a cash surplus, the cash adjustment by small and zero-leverage firms are almost twice as fast as that by large and high-leverage firms. Under a cash deficit, the cash adjustment by large and zero-leverage and high-Q firms are 35%, 60% and 123% faster than that of small, high-leverage and low-Q firms, respectively.

Interestingly, asymmetric SOAs, i.e., that firms dissipate cash faster than they store up cash, do not exist among large firms. This finding challenges the argument by Dittmar and Duchin (2011), Jiang and Lie (2016), and Orlova and Rao (2018) that adjustment costs are higher under cash deficit versus surplus. Their argument does not seem to be valid for large firms that store up cash faster than they dissipate cash. This suggests that large firms have special reasons to hold excess cash for a longer period of time, which is consistent with Foley et al. (2007) and Fresard (2010). Foley et al. (2007) argue that partly due to the tax costs associated with repatriating foreign income, U.S. multinationals (and usually large firms) have higher ratios of cash holdings. Fresard (2010) suggests that large cash reserves are a strategic dimension for large firms.

CASH ADJUSTMENT CHANNELS

In the previous section, we have shown that SOA varies with the cash adjustment direction and three lagged firm characteristics. To understand the reasons for the differential SOAs, we examine the usage of the adjustment channels in this section. According to the cash flow identity, cash adjustment can be realized through five channels: investment adjustments, payouts, new equity issuances, net debt retirement and operating cash flows. Firms should rely on the channels that are most efficient for them.

Empirical Design

Based on the cash flow identity, we attribute cash adjustment to five adjustment channels:

$$\text{CashFlow} + \text{EquityIss} - \text{Investment} - \text{Payout} - \text{NetDebtRetire} = \text{Adjust} \quad (6)$$

Investment is the sum of capital expenditures and acquisition. Payout is the sum of cash dividends and repurchases. EquityISS is new equity issuances. NetDebtRetire is the difference between the retirement and new issuance of long-term debt. CashFlow is the operating cash flow. Adjust is the difference between the cash levels of the current and previous years.

We then run the following set of regressions to show how firms adjust their cash levels through the five channels:

$$\text{Channel}_{c,t} = \alpha_c + \phi_c \text{Adjust}_t + \beta X_{t-1} + v + t + \epsilon_{c,t} \quad (7)$$

The dependent variable is one of the five cash adjustment channels in Equation (6). We control for a vector of lagged firm characteristics (X_{t-1}), which includes firm size, asset tangibility, operating cash flow, Z-score, Q and leverage. We also include firm fixed effects (v) and year fixed effects (t). All the variables (except for firm size) in Equation (7) are scaled by total assets. The coefficient ϕ_c shows the association between Adjust and Channel_c and can be interpreted as the contribution of Channel_c to cash adjustment. For example, a value of -0.3 for ϕ_c when Investment is the dependent variable suggests that out of every one dollar of cash adjustment, 30 cents are contributed by investment adjustment. Based on the nature of the five adjustment channels, ϕ_c is expected to be negative when Investment, Payout or NetDebtRetire is the dependent variable and positive when EquityIss or CashFlow is the dependent variable. To ease the concern that the cash flow identity does not hold among firms that are experiencing major restructurings, we remove the observations for which the discrepancy between the two sides of Equation (6) exceeds 20% of total assets.

A major innovation in this paper is that we investigate different types of cash adjustment and their channels. A firm's cash level, following a deviation from the target level, may converge to, drift further away from, or overshoot the target cash level. We therefore define three types of cash adjustment by decomposing the overall Adjust into three mutually exclusive components. 'Normal' cash adjustment is the convergence to the target cash level (NormalAdjust). 'Abnormal' cash adjustment is either a further divergence from the target (ReverseAdjust) or an over-adjustment passing the target (OverAdjust). The decomposition is summarized as follows.

	$NormalAdjust_t$	$ReverseAdjust_t$	$OverAdjust_t$
When $T_t>C_{t-1}$ and $C_t-C_{t-1}>T_t-C_{t-1}$	T_t-C_{t-1}	0	C_t-T_t
When $T_t<C_{t-1}$ and $C_t-C_{t-1}<T_t-C_{t-1}$	T_t-C_{t-1}	0	C_t-T_t
When $T_t>C_{t-1}$ and $C_t-C_{t-1}<0$	0	C_t-C_{t-1}	0
When $T_t<C_{t-1}$ & $C_t-C_{t-1}>0$	0	C_t-C_{t-1}	0
Otherwise	C_t-C_{t-1}	0	0

In the table, T and C are the target and actual cash levels (not ratios), respectively. $Adjust_t$ equals C_t-C_{t-1}. The three components of cash adjustment always sum into Adjust but measure different aspects of cash adjustment. $NormalAdjust_t$ is the extent to which a firm's cash holding level regresses to its target level in year t. $ReverseAdjust_t$ is the extent to which a firm's cash level, instead of converging to the target level, deviates farther from the target level. $OverAdjust_t$ is the extent to which a firm's cash level overshoots the target level in year t. In subsequent analysis, we scale the three measures of cash adjustment by total assets.

With the decomposition of total cash adjustment, our channel analysis is based on the following model:

$$\mathrm{Channel}_{c,t} = \alpha_c + \gamma_c \mathrm{NormalAdjust}_t + \delta_c \mathrm{ReverseAdjust}_t + \theta_c \mathrm{OverAdjust}_t + \beta X_{t-1} + v + t + \epsilon_{c,t} \quad (8)$$

Abnormal cash adjustments may be driven by factors that are not related to cash convergence, such as extraordinary investment needs or financing opportunities and thus it is necessary to differentiate NormalAdjust from ReverseAdjust and OverAdjust. We conjecture that normal versus abnormal cash adjustments are driven by different forces and thus should be conducted through different channels. We place the focus of the channel analysis on NormalAdjust, which is most relevant to how a firm adjusts its cash level towards the target level.

Normal vs. Abnormal Cash Adjustment under Cash Surplus

In this subsection, we focus on firms that need to dissipate cash in order to achieve the target cash level and examine the channels through which they conduct normal versus abnormal cash adjustment. We only report the coefficients of the three cash adjustment measures for brevity in Panel A of Table 5.

The results in Panel A show that the two internal channels, namely investment and operating cash flow, are the two most important ones for firms to dissipate cash to converge to the target cash level (NormalAdjust), consistent with Hypothesis 3. A dollar of NormalAdjust is associated with 22 cents of investment (Model 1) and 31 cents of operating cash flow shortfall (Model 5). This suggests that the main reason for firms to hold excess cash is to provide a cushion against negative cash flow shocks or to fund extra investment opportunities. Additionally, a considerable portion of excess cash is paid out to shareholders (21.2% in Model 2) or used to reduce the need for new equity issuance (11.5% in Model 3). Interestingly, debtholders do not obtain much excess cash (6.4% in Model 4) as recorded by Chang et al. (2014) for contemporary internal cash flows.

Furthermore, the relative importance of the five adjustment channels is distinct between abnormal (namely, ReverseAdjust and OverAdjust) and normal adjustment. New equity issuance

is most important to ReverseAdjust (the coefficient is 0.228 in Model 3). Given that ReverseAdjust is also associated with less contemporaneous investment (Model 1), it seems that firms continue to stockpile cash possibly for future investment, which is consistent with the lump sum nature of investment. Investment is the most important channel for OverAdjust (the coefficient is -0.245 in Model 1) and thus is the major explanation of firms overusing excess cash. The results on ReverseAdjust and OverAdjust echo each other here: firms stockpile more cash reserves when investment needs are low and they use up excess cash when investment needs are high.

Why Does SOA Vary under Cash Surplus?

In Panel B of Table 5, we further examine the associations between firm characteristics and the usage of channels to disclose the reasons for the observed differential SOAs under cash surplus (found in Table 3 and 4). To this end, we interact NormalAdjust with three indicators: Big, High Q and High Leverage. Big (High Q, High Leverage) takes a value of one if a firm's size (market-to-book, leverage) is above the industry median in year t-1 and zero otherwise. For brevity, we only report the coefficients on the interactions in Panel B.

How NormalAdjust is done should be highly relevant to the different SOAs observed in Table 3 and 4 because NormalAdjust measures the extent of cash convergence. The results in Panel B of Table 5 show that the excess cash of small firms, when converging to the target cash level, is to a larger extent absorbed by operating cash flow deficits (consistent with H1a and H1b) and used to reduce the need for new equity issuances (in Models 3 and 5 of Panel B, NormalAdjust×Big has coefficients of -0.173 and -0.377, respectively). Large firms spend a larger portion of their excess cash on investment (Model 1) and payouts (Model 2). The results on NormalAdjust×Big suggest that an important reason why small firms dissipate cash faster than large firms is their higher cash flow volatility, which absorbs most of excess cash.

Table 5: Channels of Normal vs. Abnormal Cash Adjustment under Cash Surplus

Panel A presents results from the channel analysis on normal versus abnormal cash adjustment based on Equation (8) for firms with a cash surplus. The dependent variable is one of the five cash adjustment channels: Investment, Payout, EquityIss, NetDebtRetire and CashFlow. We control for a vector of lagged firm characteristics, which includes size, market-to-book ratio, tangible assets ratio, book leverage, operating cash flow and Z-score. We also include firm fixed effects (v) and year fixed effects (t). Panel B repeats analyses in Panel A, additionally including the interactions between NormalAdjust and the indicators of the firm characteristics that are associated with SOA. Big, High Q, High Leverage and High PP&E are indicators showing that a firm's size, market-to-book, leverage and PP&E is above the industry median in year t-1, respectively. The estimates on the control variables are not reported for brevity. The standard errors are corrected for firm-level clusters. *, ** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
	Investment	Payout	EquityIss	NetDebtRetire	CashFlow
Panel A: How firms use excess cash					
NormalAdjust	-0.217***	-0.212***	0.115***	-0.064***	0.308***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
ReverseAdjust	-0.170***	-0.100***	0.228***	-0.130***	0.109***
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
OverAdjust	-0.245***	-0.053***	0.031*	-0.075***	0.096***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Intercept and controls	Yes	Yes	Yes	Yes	Yes
Year and firm fixed effects	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.514	0.445	0.578	0.170	0.730
Panel B: How different firms use excess cash					
NormalAdjust×Big	-0.157***	-0.175***	-0.168***	-0.075***	-0.388***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.05)
NormalAdjust×High Q	0.014	-0.111***	0.083***	0.019	-0.152***
	(0.02)	(0.02)	(0.03)	(0.02)	(0.04)
NormalAdjust×High Leverage	-0.006	0.185***	0.056**	-0.227***	-0.051
	(0.03)	(0.02)	(0.03)	(0.04)	(0.06)
Normal-, Over-, ReverseAdjust, other controls, intercept	Yes	Yes	Yes	Yes	Yes
Year and firm fixed effects	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.517	0.459	0.584	0.177	0.743

High-leverage firms seem to take advantage of excess cash for debt reduction. The literature on capital structure adjustment has shown that it is less costly for firms to adjust capital structure when they have positive or negative cash flow realizations (Byoun, 2008; Faulkender et al., 2012), but we show here that excess cash is also conducive to capital structure adjustment. High-leverage firms use excess cash more for debt retirement (Model 4) but at the same time do not increase as much payouts to shareholders as low-leverage firms (Model 2), which is consistent with H1c. Thus, high-leverage firms adjust down the debt level through debt retirement and retaining some excess cash (which is negative debt). Not increasing payouts to shareholders may contribute to the slower speed of cash dissipation by high-leverage firms.

Normal vs. Abnormal Cash Adjustment under Cash Deficit

In this subsection, we focus on firms that need to stockpile cash and examine the channels through which they conduct normal versus abnormal cash adjustment. The results are reported in Panel A of Table 6.

The results in Panel A of Table 6 indicate that the relative importance of the five cash accumulation channels varies by the type of cash adjustment, as is the case for the cash dissipation scenario. What does not change is that the internal channels, i.e., investment and operating cash flow, remain the most important channels for NormalAdjust (the coefficient on NormalAdjust is -.480 in Model 1 and 0.318 in Model 5). The coefficient on NormalAdjust is positive (0.244 in Model 4) when NetDebtRetire is the dependent variable, indicating that not only do firms have little help from debt financing but also have pressure to pay down debt as they regress a cash deficit to the target cash ratio. Thus, in the convergence to the target cash ratio (NormalAdjust), the internal channels (namely, investment cuts and operating cash flows) are more important than the external channels, suggesting the severity of frictions in financial markets and supporting Hypothesis 3.

ReverseAdjust is also largely associated with operating cash flows (the coefficient on ReverseAdjust is 0.334 in Model 5 of Panel A) and investment cuts (the coefficient on ReverseAdjust is -0.149 in Model 1 of Panel A), suggesting that disappointing operating cash flows and continuous investment can further worsen firms' existing cash deficit. The results echo what we documented for NormalAdjust: investment cuts and operating cash flows are the two major channels that determine whether a firm's a cash deficit can improve. The difference is that investment cut matters more than operating cash flows to NormalAdjust, while operating cash flow is more important to ReverseAdjust.

The majority of OverAdjust seems to be caused by external financing: the coefficients on OverAdjust are 0.476 and -0.388 in Models 3 and 4 of Panel A, respectively. These results imply that, although they do not provide enough help for NormalAdjust, cash from equity and/or debt issuance are the main reasons for firms to flip a cash deficit into a surplus. Thus, external financing is used more for accumulating excess cash than for improving a cash deficit, which is consistent with firms' clustering visits to the capital markets (Leary and Roberts, 2005) and the existence of a fixed component in the debt and equity issuance costs (Altinkilic and Hansen 2000). Interestingly, investment is also positively associated with OverAdjust (Model 1 of Panel A), which is intuitive: firms that are able to overshoot the target cash level from a cash deficit with external financing are also those with increased investment.

Why Does SOA Vary in Cash Recovery (from A Deficit)?

In Panel B of Table 6, we further examine the associations between firm characteristics and the usage of channels to disclose the reasons for the observed differential SOAs under a cash deficit. To this end, we follow the analysis in Panel B of Table 5 and interact NormalAdjust with the three indicators: Big, High Q and High Leverage.

First, in the convergence to the target cash level, large firms conduct significantly more investment cuts to bridge the cash gap (the coefficient on NormalAdjust×Big is -0.420 in Model 1) than small firms. This flexibility in investment seems to be a leading reason that large firms restore cash faster from a cash deficit than small firms (consistent with H2b). Riddick and Whited (2009) argue that investment could serve as collateral for financially constrained firms and thus cannot be adjusted easily. This inflexibility especially applies to small firms.

Table 6: Channels of Normal vs. Abnormal Cash Adjustment under A Cash Deficit

Panel A presents results from the channel analysis on normal versus abnormal cash adjustment based on Equation (8) for firms with a cash deficit. The dependent variable is one of the five cash adjustment channels: Investment, Payout, EquityIss, NetDebtRetire and CashFlow. We control for a vector of lagged firm characteristics, which includes size, market-to-book ratio, tangible assets ratio, book leverage, operating cash flow and Z-score. We also include firm fixed effects (v) and year fixed effects (t). Panel B repeats analyses in Panel A, additionally including the interactions between NormalAdjust and the indicators of the firm characteristics that are associated with SOA. Big, High Q, High Leverage and High PP&E are indicators showing that a firm's size, market-to-book, leverage and PP&E is above the industry median in year t-1, respectively. The estimates on the control variables are not reported for brevity. The standard errors are corrected for firm-level clusters. *, ** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
	Investment	Payout	EquityIss	NetDebtRetire	CashFlow
Panel A: How firms store up cash					
NormalAdjust	-0.480***	-0.070***	0.177***	0.244***	0.318***
	(0.05)	(0.03)	(0.04)	(0.06)	(0.05)
ReverseAdjust	-0.149***	-0.120***	0.037**	-0.099***	0.334***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
OverAdjust	0.205***	-0.020*	0.476***	-0.388***	-0.102***
	(0.02)	(0.01)	(0.03)	(0.03)	(0.02)
Intercept and controls	Yes	Yes	Yes	Yes	Yes
Year and firm fixed effects	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.451	0.455	0.513	0.175	0.589
Panel B: How different firms store up cash					
NormalAdjust×Big	-0.421***	-0.045	-0.225***	0.089	-0.144***
	(0.05)	(0.03)	(0.03)	(0.06)	(0.05)
NormalAdjust×High Q	-0.083**	-0.034	0.214***	0.049	-0.072
	(0.04)	(0.03)	(0.04)	(0.04)	(0.05)
NormalAdjust×High Leverage	-0.118***	0.087***	0.191***	0.163***	0.061
	(0.04)	(0.02)	(0.05)	(0.05)	(0.05)
Normal-, Over-, ReverseAdjust, other controls, intercept	Yes	Yes	Yes	Yes	Yes
Year and firm fixed effects	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.461	0.457	0.520	0.177	0.590

Additionally, high-Q firms, not surprisingly, obtain more help from equity issuance for NormalAdjust than low-Q firms (the coefficient on NormalAdjust×High Q is 0.219 in Model 3). This can explain why they recover from cash deficit faster than low-Q firms (consistent with H2a).

One outstanding observation for high-leverage firms is that they to a larger extent pay down debt when they have cash deficit (the coefficient on NormalAdjust×High Leverage is 0.131 in Model 4), which partially explains why high-leverage firms restore cash slower (consistent with H3c).

CONCLUSION

In this paper, we examine how fast and how firms adjust cash and generate a rich set of findings. The SOA varies considerably across firms, which suggests that different firms are subject to different adjustment costs. The internal channels are more important to NormalAdjust than the external channels, but the relative importance of the two internal channels is different when firms adjust their cash levels up versus down toward the target level. The majority of cash dissipation is absorbed by negative cash flows (31%) and investment (22%), while most cash accumulation is done through investment cuts (48%) and operating cash flows (32%). Interestingly, debt financing is never a major channel of NormalAdjust.

Abnormal cash dissipation and accumulation also rely on different channels. Internal channels are the major channels for abnormal cash dissipation, namely, OverAdjust under a cash surplus and ReverseAdjust under a cash deficit. By contrast, external channels (equity and debt financing) are more important to abnormal cash accumulation, namely, OverAdjust under a cash deficit and ReverseAdjust under a cash surplus.

Thus, internal channels play major roles in firms' liquidity management (NormalAdjust) and are also responsible for firms experiencing (further) cash deficits, suggesting considerable frictions in financial markets. External channels are more useful in the scenario of abnormal cash accumulation and may be more accessible to firms that are less financially constrained.

We also find that different firms have different comparative advantages over the adjustment channels. Firm size is the most prominent factor that determines how a firm adjusts cash. Large firms largely have more flexible investments, especially when there is a cash deficit, while small firms' cash adjustment is more subject to their operating cash flows. This explains why it is harder for small firms to recover from a cash deficit.

Q is associated with a firm's interactions with equity markets. High-Q firms pay out more when there is a cash surplus and receive more help from new equity issuance when there is a cash deficit, which explains the faster SOA of high-Q firms.

The effect of leverage on cash adjustment is mainly caused by the need to adjust capital structure. High-leverage firms tend to pay down debt and hold payouts to shareholders at the same time when they have excess cash, and still pay down debt when they need to raise cash to reduce cash deficits, which explains the slower SOAs of high-leverage firms.

APPENDIX A: VARIABLES

All symbols in the parentheses refer to Compustat items.
Size = log value of total assets (at) measured in 1992 dollars.
NetWorkingCapital = (current Assets (act) – Current Liabilities (lct) – Cash and Equivalents (che)) / (at)
CashFlow= operating cash flow(oancf)/total assets.
CashFlowStd = Mean of standard deviations of CashFlow with at least 10 periods of record across the industry. The industries are defined by 2-digit SIC codes.
Market-to-book = (market equity + total debt + preferred stock liquidating value – deferred taxes and investment tax credits)/total assets.
R&D = research and development expenses (xrd) / total assets
Bkleverage = [long-term debt (dltt) + short-term debt (dlc)]/total assets
CapitalExpenditure = capital expenditure (capx) /total assets.
Acquisitions = acquisitions (aqc) / total assets
Dividend dummy = A dummy variable equal to one if the firm paid a common dividend in that year, and zero otherwise
Cash = cash and marketable securities (che) / total assets

Last 5 year IPO = Dummy variable equal to one if the firm went public within last 5 years.
Investment =[capital expenditure(capx) + acquisition(aqc)]/total assets
Payout = [cash dividend (dv)+purchase of common and preferred stock (prstkc)]/total assets. EquityISS = sale of common and preferred stock (sstk)/total assets.
NetDebtRetire = [long-term debt reduction (dltr) -long-term debt issues (dltis)]/total assets.
FinSurplus= NetDebtRetire+Payout-EquityISS
Z-score = [3.3 × pretax income + sales + 1.4 × retained earnings + 1.2 × (current assets – current liabilities)]/ total assets.
No Rating Indicator= the indicator showing that a firm never had its public debt rated in our sample or had debt in default rating of "D" or "SD", with the data from S&P Long-Term Senior Debt Rating.
PP&E=Property, plant and equipment (ppent) scaled by total assets.

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THE IMPACT OF CULTURAL FACTORS ON DIVIDEND PAYOUT: BANK INDUSTRIES IN MUSLIM COUNTRIES

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ABSTRACT

This study investigates the relationship between some cultural factors and the level of dividend payouts of banks in a number of Muslim countries. We examine whether cultural factors play any role in determining dividend payout policy in banks. The results suggest that banks in high masculinity countries tend to pay higher dividends than low masculinity countries.

The results also show that banks in high uncertainty avoidance (UA) countries tend to pay lower dividends than high UA countries. Additionally, the results of this study indicate that banks in high long-term orientation (LTO) countries tend to pay lower dividends than low LTO countries. However, two other cultural factors of power distance (PD) and individualism do not have any incremental explanatory power on the dividend payouts.

Overall, this research adds to our understanding of the bank's dividend payout policies. First, evidence on the relationship between the cultural factors and bank's level of dividend payouts should be useful to investors. Second, the findings of this study provide financial statement users with useful information about the bank's dividend payout levels. Third, in general, it also adds to the accounting and finance literature on dividends.

INTRODUCTION

Dividends seem to be one of the important factors for investors. Some investors look for dividend-paying stocks (Baker and Wurgler 2004). In general, investors like dividends. Some previous studies identify that investors like to see the same amount of dividends or increase over time. Tse (2005) suggests that dividends are used to signal firms' future prospects. Dividend payout patterns have been examined in some international business context and managers' behavioral aspects. Besides, some studies have investigated relationships between culture and corporate governance, structure, and other policy decisions. More specifically, some researchers have examined cultural factors and adoption of IFRS. However, none of the literatures examined the impact of cultural factors on for-profit organizations' dividend payout levels.

Specifically, this study investigates whether cultural factors have any impact on dividend payout decisions by the banks in many Muslim countries. We examine why banks in one country

pay high dividends comparing to banks in another country. We try to identify cultural factors which may affect the banks' dividend paying decisions. The findings of our study provide evidence that even financial institutions' dividend payouts are significantly affected by their culture. The paper is a significant addition to the accounting and finance literature on dividends. It also contributes to the body of knowledge about dividend payout.

LITERATURE REVIEW

Khambata & Wei Wendy (2005) constructs measures of risk based on two cultural dimensions developed by Hofstede to study the impact of risk aversion on dividend payout. Using data for firms in 14 countries, they provide evidence that firms in countries with higher risk aversion exhibit both lower dividend ratios and lower propensity to pay dividends. Liang et al (2010) using Schwartz's culture model and find Conservatism is positively and Mastery negatively related to dividend payouts for a sample from 21 countries. The study concludes that culture affects perceptions of and responses to agency and information asymmetry have important implications for policymakers and multinational enterprises.

Jana et al (2010) conjecture that social normative nature of culture influences the character of agency relations and determines the acceptance and legitimacy of different dividend strategies. By linking dividends to culture across 5797 firms in 41 countries, their analysis shows that high individualism, low PD, and low UA are significantly associated with higher dividend. Zhihua et al (2011) tests the impact of family control, institutional environment on cash dividend policy using a sample of 1486 Chinese A-share listed firms. The results indicate that (1) family firms have a lower dividend and propensity to pay dividends than non-family firms; (2) a favorable regional institutional environment has a positive impact on dividend; and (3) the impact of regional institutional environment on dividends is stronger in family firms than in non-family firms.

Sung et al (2012) find that Hofstede's cultural dimensions -UA, masculinity, and LTO- remain significant in the determination of firms' dividend. The study also shows that this association varies with the strength of investor protection. Zheng et al (2014) examine the relations between culture (based on three dimensions of Hofstede and three dimensions of House et al (2004)) and dividend policies of banks using a sample from 51 countries. They find a significant influence of the three dimensions of culture on bank dividend policies.

Erdem (2016) investigates whether geographical variations in local culture affect dividend demand and dividend policy for a large sample of US firms. Firms located in Protestant counties are more likely to be dividend payers, initiate dividends, and have higher dividend yields, while firms located in Catholic counties are less likely to be dividend payers and have lower dividend yields. Ender and Oguz (2017) examine the effect of Economic Policy Uncertainty (EPU) on cash holding decisions of firms in BRIC countries. They find firms prefer to hold more cash when uncertainty increases. The study also concludes that global EPU has a positive impact on cash holdings. Julie and O'Connor (2017) emphasize the importance of accounting for the interactions between creditor rights and culture in determining dividend policy.

Bennink (2018) based on Hofstede's framework; the results indicate a negative linkage between UA and dividend. Additionally, they find a positive relationship between individualism and cash dividend. Finally, the study supports the proposition that culture explain variations in cash dividend. Based on 12150 companies across 83 countries, Yaseen (2018) find a significant influence of socio-cultural factors on dividend. He concludes that religion, law system, and business freedom have a significant impact on dividend

Naeem and Khurram (2019) provide evidence on the impact of CEOs cultural background on dividend. The individualistic CEOs are more likely to pay dividends. This result is more pronounced in firms with severe agency problems and information asymmetry. Manhwa et al (2019) reveals that family-controlled firms pay less cash dividends than non-family-controlled firms in Taiwan. The dividend for family-controlled firms in the West and east might be affected by culture, nationality, and philosophy.

Imamah et al (2019) examine the link between Islamic law (Shariah), corporate governance, and dividend policy. Using a sample for companies listed on the Indonesia Stock Exchange, it provides evidence that Shariah-compliant firms have higher dividend payouts. It confirms that Islamic law is an important factor affecting dividend policy in Islamic countries. Zagdbazar (2019) argues that social capital influences the dividend policy directly by affecting behavior and indirectly by reducing opportunity cost. It finds a positive link between social capital and dividends. Ucar (2019) find that firms have corporate risk-taking behavior and policies consistent with variations in local risk-taking propensity induced by creative culture. Firms located in areas with a strong creative culture have higher levels of risk exposure, investment, and growth. These firms accumulate more cash consistent with the precautionary motive.

RESEARCH METHODS

Hypotheses

Power Distance Index (PD) is the extent to which the less powerful members of organizations and institutions (like the family) accept and expect that power is distributed unequally (Hofstede 2008). Since investors in high power distance countries tend to take everything for granted such that their demand for high dividends may not be as high as those in low power distance countries. Hence, the first hypothesis is formed as follows:

H1: Banks in the high power distance countries are less likely to pay higher dividends then those in the low power distance countries.

Individualism (IDVI) is the degree to which individuals are integrated into groups. In societies where individualism is high, everyone tends to take care of himself. On the other hand, in societies with low individualism, people tend to work collectively being integrated into strong, cohesive in-groups, often extended families. As individual investors in high individualism countries may ask for higher dividends than those in low individualism countries. It leads to the second hypothesis.

H2: The banks in high individualism countries are less likely to pay high dividends that those in low individualism countries.

Masculinity (MASC) versus its opposite, femininity, refers to the distribution of roles between the genders which is another fundamental issue for any society to which a range of solutions are found. The assertive pole has been called 'masculine' and the modest, caring pole 'feminine' (Hosftede 2003). External stockholders' pressures on high dividend payments due to their higher expectation on dividends in high masculinity countries lead to the following hypothesis:

H3: Banks in the high masculinity countries are more likely to pay higher dividends than those in the low masculinity countries.

Uncertainty Avoidance Index (UNCERT) deals with a society's tolerance for uncertainty and ambiguity. It indicates to what extent a culture programs its members to feel either uncomfortable or comfortable in unstructured situations. People in uncertainty avoiding countries are also more emotional and motivated by inner nervous energy. Uncertainty avoiding countries tend to have more regulations and rules. The opposite type, uncertainty accepting cultures, is more tolerant of opinions different from what they are used to. (Hofstede 2003) Some example countries are United States of America and Great Brain.

The uncertainty avoidance index may closely relate to better accountability of banks performance and satisfaction of investors. The high uncertainty avoidance countries may have more regulations that may be designed to protect investors. Due to this kind of regulations, banks in more regulated countries may have to pay higher dividends than those in low uncertainty avoidance countries. This leads to the fourth hypothesis.

H4: Banks in the high uncertainty avoidance countries are more likely to pay higher dividends then those in the low uncertainty avoidance countries.

Long-Term Values associated with Long Term Orientation (LTOR) are thrift and perseverance; values associated with Short Term Orientation are respect for tradition, fulfilling social obligations, and protecting one's 'face'. (Hofstede 2003)

Banks in high long-term orientation countries may focus on long-term growth and success rather than short-term profits and hence may pay lower dividends than those in low long-term orientation countries. Hence, the following hypothesis is formed, accordingly.

H5: Banks in the high long-term orientation countries are less likely to pay high dividends than those in the low long-term orientation countries.

Empirical Models

The primary focus of our research is the investigation of the impact of cultural factors on banks' dividend payout policies and practices. To test our hypotheses, we use regression analyses to determine the association between the dividend payouts and cultural factors that may affect banks. The coefficients of independent variables from the model (presented below) and their significance levels are used to test our hypotheses.

To examine the relationship between dividend payout choices and cultural factors, the following equation is employed in the analysis.

$$PAYOUT = a_0 + a1\ PD_{it} + a_2\ INDI_{it} + a3\ MASC_{it} + a4\ UNCERT_{it} + a5\ LTOR_{it} + a6\ TA_{it} \quad (1)$$

(predicted signs) (-) (+) (?) (+) (-) (+)

where:

PAYOUT = Dividend Payout Percentage

PD_{it} = Power distance,

$INDI_{it}$ = Individualism,

$MASC_{it}$ = Masculinity,

$UNCERT_{it}$ = Uncertainty Avoidance,

$LTOR_{it}$ = Long-term Orientation,

TA_{it} = Total Assets

Payout is defined as the ratio of the total amount of dividends paid out to shareholders relative to the net income of the bank. Power Distance (PD) is the degree to which authority is distributed equally inside society and the level to which society agrees with this allocation of power, from moderately equal to exceptionally unequal, Scale of value for Power Distance (PD) starts from 1 to 100 with greater value being greater in level of PD. Individualism (INDI) is measured as the level of which persons base their activities on self-interest against the benefits of the group. Individualism against collectivism takes value on a measure from 1 to 100 with greater values being more individual.

Masculinity is defined as a measure of a society's objective direction: a masculine culture highlights position resulting from salaries and position; a feminine culture underlines excellence of life and social relatives. Scale of Masculine (MASC) against feminine starts from 1 to 100 and greater value being more masculine. Uncertainty Avoidance (UNCERT) is measured as the extent people in country favor planned over unplanned conditions, from fairly flexible to very inflexible, to manage innovation and threat; a low level of Uncertainty Avoidance highlights a greater degree of regularization. Scale for UNCERT is between 1to100 with greater value being great UNCERT.

Long-term Orientation (LTOR) is a measure that shows how each society have keep some relations with its own history whereas interacting with challenges of the current and upcoming situations, and main concern for societies have existential objectives inversely. The scale value for Log Asset against Short-term versus is between 1 to 100 with higher value being more LTOR. Total Assets (TA) are the sum of all the assets' value of the bank.

Sample Selection and Data Collection

There are 400 banks whose dividend payment data is available in Bankscope database in our selected countries, which have both Islamic banks and conventional banks. Financial data items are obtained from Research Insight database. To be included in the sample all of the following conditions must have been satisfied:

1. The bank must be available in the Bankscope database.
2. Financial data for the firm must be available on Research Insight for all the years 2008-2017.

The time period of 2008-2017 is chosen because it includes the most recent period and the period in which relevant data items are available in the databases.

EMPIRICAL RESULTS

Descriptive Statistics

Table 1 presents the sample selection procedures that resulted in a final sample of 219 banks based on the availability of data items for this study. There are 400 banks whose dividend payment data is available in Bankscope database in our selected countries which hosting Islamic banks as well as conventional banks. Research Insight data availability further limits the sample to 219 for the 10 years period of 2008-2017.

Our sample includes 149 Islamic banks and 70 conventional banks across 21 different Muslim countries out of 57 Muslim countries around the world. Our selected countries are Iran; Kingdom of Saudi Arabia (KSA); Kuwait; United Arab Emirates (UAE); Malaysia; Bahrain; Qatar; Turkey; Egypt; Brunei; Jordan; Pakistan; Yemen; Syria; Sudan; Bangladesh; Iraq; Tunisia; Lebanon; Oman and Mauritania.

Table 1
Sample Selection

Selection Criterion	Firm observations
Total number of Islamic banks available in Bankscope (2008-2017) across Muslim countries	200
Total number of conventional banks available in Bankscope (2008-2017) across Muslim countries	350
Availability of Bankscope data for banks' dividends values across banks in Muslim countries	219
Total	219

Table 2 shows descriptive statistics for the dependent and independent variables used in the regression analysis for hypotheses H1 to H5. The firm's payout variable, div, ranges from 0 to 545.07 and the mean score for POWERDIS is 81.60685 indicating that the sample banks tend to

have unequal power distances. The mean for INDIVIDU is 31.78082 which indicates low individualism. As POWERDIS variable, this is explained by fact that Muslim countries are less individualistic. The mean for MACULIN is 51.46575 which is less than expected. The variable of UNCERTAI has a mean of 69.0045, which shows a relatively high UA whereas LOG_TER has a mean value, 21.07899 indicating the short-term orientation.

Table 2
Descriptive Statistics

Variable	N	Mean	Std Dev	Minimum	Maximum
PAYOUT	219	45.8922	50.3937	0	545.0700
PD	219	81.5068	14.3737	35.000	100.0000
INDI	219	31.7808	11.4736	14.0000	89.0000
MASC	219	51.4657	6.6111	36.0000	6.0000
UNCERT	219	69.0045	14.2380	8.0000	95.0000
LTOR	219	21.0789	17.7309	0	81.3602
TA	219	5,253.0740	10,846.	529.4156	82,954.7568

Variable Definitions

PAYOUT = Dividend Payout Percentage
PD = Power distance,
INDI = Individualism
MASC = Masculinity
UNCERT = Uncertainty Avoidance
LTOR = Long-term Orientation
TA = Total Assets

The Pearson correlation coefficients for the variables in model (1) are reported in Table 3, which presents correlations among the dependent variable, PAYOUT and the independent variables. As expected, there are significant and positive correlations between PAYOUT and some of the independent variables. The correlation between PAYOUT and INDI is positive and significant at 5% level whereas the correlations between PAYOUT and UNCERT, TA are significant but negative at 5% level indicating that dividend payouts are closely related to individualism (INDI), Uncertainty Avoidance (UNCERT), and the size of the bank (TA). There are significant correlations among the independent variables, suggesting that these measures may contain common information to a certain extent. Table 3 shows that despite some significant correlations, data are not subject to multicollinearity problem.

Table 3
Correlation Matrix

	PAYOUT	PD	INDI	MASC	UNCERT	LTOR	TA
PAYOUT	1.0000	-0.0629	0.1215	0.0539	-0.0832	-0.0181	-0.0730
	0.0000	0.1198	0.0026	0.1819	0.0393	0.6547	0.0709
PD		1.0000	-0.5270	0.1571	0.2264	-0.1890	0.1039
		0.0000	0.0001	0.0001	0.0001	0.0001	0.0001
INDI			1.0000	0.3194	-0.2845	0.0723	-0.0663
			0.0000	0.0001	0.0001	0.0025	0.0055
MASC				1.0000	-0.0006	0.2810	-0.0023
				0.0000	0.9798	0.0001	0.9222
UNCERT					1.0000	-0.4699	0.1707
					0.0000	0.0001	0.0001
LTOR						1.0000	-0.1234
						0.0000	0.0001
TA							1.0000
							0.0000

Variable Definitions

PAYOUT = Dividend Payout Percentage
PD = Power distance,
INDI = Individualism
MASC = Masculinity
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LTOR = Long-term Orientation
TA = Total Assets

Logistic Regression Analysis for Hypotheses (H1-H5)

The relationship between the bank's payouts and its cultural factors is examined using logistical regression analysis and correlations on the variables within the linear regression framework. The coefficient for Masculinity (MASC) is significant at p=0.06. So Hypothesis 3 (H3) is supported. The coefficient for Uncertainty Avoidance (UNCERT) is also significant at p=0.10 in two-tail test, thus supporting H4. The coefficient for Long-term Orientation (LTOR) is significant at p=0.03. Hypothesis 5 (H5) is also supported. The coefficient for Power Distance (PD) is not significant. The Individualism variable is also insignificant. Hypotheses 1 and 2 are

not supported. The control variable, Total Assets (TA) is not significant, which implies that Total Assets is not likely to have enough explanatory power.

Table 4
Logistic Regression Analysis

	INTERCEPT	PD	INDI	MASC	UNCERT	LTOR	TA
Expected Sign		-	+	?	+	-	+
	51.3374*	-0.2634	0.2553	0.9905**	-0.4529*	-0.3999***	-1.6174
	(1.55)	(-0.84)	(0.68)	(1.97)	(-1.48)	(-2.20)	(-1.02)

R^2 = 0.027

***** Statistically significant at p < 0.01 (two-tailed)**
**** Statistically significant at p < 0.05 (two-tailed)**
*** Statistically significant at p < 0.10 (two-tailed)**

Variable Definitions

PAYOUT = Dividend Payout Percentage
PD = Power distance,
INDI = Individualism
MASC = Masculinity
UNCERT = Uncertainty Avoidance
LTOR = Long-term Orientation
TA = Total Assets

Also, it is noted that throughout Table 4, the intercept term is non-zero and statistically significant. This may suggest possible omitted variables or measurement error in the regressors. The results presented in Table 4 suggest that hypothesis H3 and H5 are supported whereas H1 and H2 are not. Table 4 indicates that Banks in the high masculinity countries and in the high long-term orientation countries are more likely to pay higher dividends than those in the low masculinity and long-term orientation countries.

Empirical results in Table 4 show some interesting finding on Hypothesis 4 (H4). It turns out that lower Uncertainty Avoidance countries pay higher dividends as opposed to the hypothesis. It could be explained by some factors that in low uncertainty avoidance countries may have better investment and business opportunities due to less regulations. In addition, less regulations and rules may lead to higher entrepreneurship and innovations yielding higher profits resulting in higher dividends.

Sensitivity Analyses

The robustness of the results reported earlier was also checked by different control variables. Instead of total assets, log of total assets is used in the equation 1. Log Assets are defined as natural

logarithm of total assets of a bank at the end of each financial year of the bank. Table 5 shows that the results are qualitatively the same as those reported in Table 4.

Table 5
Sensitivity Analysis

	INTERCEPT	PD	INDI	MASC	UNCERT	LTOR	TA
Expected Sign		-	+	?	-	-	+
	63.5740**	-0.1989	0.3164	0.9112**	-0.4242*	-0.3935***	-2.9576
	(1.90)	(-0.61)	(0.83)	(1.78)	(-1.35)	(-2.16)	(-1.00)

R^2 = 0.027

***** Statistically significant at p < 0.01 (two-tailed)**
**** Statistically significant at p < 0.05 (two-tailed)**
*** Statistically significant at p < 0.10 (two-tailed)**

Variable Definitions
PAYOUT = Dividend Payout Percentage
PD = Power distance,
INDI = Individualism
MASC = Masculinity
UNCERT = Uncertainty Avoidance
LTOR = Long-term Orientation
LA = Log of Total Assets

To further ensure the robustness of our results, we conducted the Tobit analysis. Table 6 presents the results of estimating equation (3) by adding another categorical variable, ISLAM which takes 1 if an Islam bank or 0 otherwise.

The coefficient for Power Distance (PD) has a correct sign and is significant at p=0.05, supporting H1. The coefficient for Masculinity (MASC) is significant at p=0.05. So Hypothesis 3 (H3) is supported. The coefficient for Long-term Orientation (LTOR) is significant at p=0.01. Hypothesis 5 (H5) is also supported.

The coefficient for Uncertainty Avoidance (UNCERT) is not significant in this Tobit test. Hypothesis 4 (H4) is not supported. This may be explained by a factor that the ISLAM variable includes some aspects of uncertainty avoidance. The Individualism variable is also insignificant. Hypotheses 2 is not supported. The control variable, Total Assets (TA) is not significant.

Table 6
Tobit Analysis

	INTERCEPT	ISLAM	PD	INDI	MASC	UNCERT	LTOR	TA
Expected Sign		?	-	+	?	-	-	+
	5.0124***	-0.1856***	-0.0076**	0.0022	0.0169**	-0.0042	-0.0102***	-0.2911
	(88.03)	(7.72)	(2.94)	(0.17)	(5.17)	(0.62)	(-10.68)	(-0.16)

R^2 = 0.027

***** Statistically significant at p < 0.01 (two-tailed)**
**** Statistically significant at p < 0.05 (two-tailed)**
*** Statistically significant at p < 0.10 (two-tailed)**

Variable Definitions
PAYOUT = Dividend Payout Percentage
ISLAM = 1 if Islam banks, otherwise 0
PD = Power distance,
INDI = Individualism
MASC = Masculinity
UNCERT = Uncertainty Avoidance
LTOR = Long-term Orientation
LA = Log of Total Assets

SUMMARY AND CONCLUSIONS

In summary, this paper proposes a new approach to test the impact of cultural factors on dividend payout in bank industries in Muslim countries. In general, the results provide support for the proposed hypotheses 1, 3, and 5. However, hypotheses 2 and 4 are not supported. It suggests that the use of a larger sample size with more countries, along with extended analyses periods would increase the external reliability of the findings. Future studies may also benefit from the consideration of additional factors, such as bank governance structures and government regulations and so on.

In conclusion, this study hopes to contribute to the financial literature by providing a new approach. It is expected that consideration to different cultural factors may yield better investment decisions by investors and financial market participants in general can benefit from the empirical evidence from the proposed model by enhancing efficiency and effectiveness in equity investment on bank industries in Muslim countries

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