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THREE ESSAYS ON NEW ISSUES IN CORPORATE FINANCE

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THREE ESSAYS ON NEW ISSUES IN CORPORATE FINANCE

A Dissertation

by

ABDULLAH AL SHOEB

Submitted to Texas A&M International University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

May 2023

Major Subject: International Business Administration (Finance Concentration)

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Chair of Committee,	Nathaniel P. Graham
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ABSTRACT

Three Essays On New Issues In Corporate Finance (May 2023)

Abdullah Al Shoeb, BBA, North South University; MS, Colorado State University;

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This dissertation focuses on three new issues in corporate finance, each aiming at different aspects of a firm's behavior. First, I propose a novel way to classify domestic manufacturing firms based on their level of financial constraint. Using the operating cash flow ratio as my new measure, I find that the behavior of constrained and unconstrained firms differ significantly, unlike existing constraint measures from the literature. My results indicate that constrained firms cannot engage in equity recycling, have a higher sensitivity to cash flow, use the proceeds from the sales of their fixed assets in R&D, and cannot change leverage quickly. Overall, my findings support using a cash flow-based constraint measure as it performs better at identifying constrained firms that indeed behave as if they are financially constrained. My second essay discusses factors that drive a firm's financing choices and aims to evaluate competing capital structure theories. Six factors are identified as a reliable basis for explaining leverage changes from a comprehensive range of farm-specific and macroeconomic factors used in prior studies. The reliable impact of market-to-book, Firm Size, and expected inflation factors observed in market-based leverage is not present when studying book leverage. However, median industry leverage, tangibility, and profitability are statistically significant. The pecking order theory offers an intuitive explanation for the observation that more profitable firms tend to have lower leverage. The trade-off theory can

account for many factors, including industry leverage, firm size, tangibility, and market-to-book. In my third essay, I investigate whether firms behave differently based on the type of performance goal set for their CEOs. I find correlations between CEO performance-based grants and the utilization of accrual and real activities-based earnings management by examining a comprehensive dataset of CEO performance goals. I hope my findings could lead to recommendations for compensation committees and consultants to structure performance-pay contracts differently to reduce earnings management efforts.

DEDICATION

I dedicate this thesis to my three most important people: my mom (Rina), dad (Salam), and sister (Shefat). Your love, support, and sacrifices have been the driving force behind my academic success. This achievement is not just mine; it belongs to all of us.

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INTRODUCTION

Financial constraints and their impact on firms' behavior are crucial in various fields, including asset pricing, monetary policy, firm dynamics, and entrepreneurship. The existing literature has proposed various measures to identify constrained firms, including dividend payments, size, age, and leverage ratios. However, these measures have limitations and accurately identifying financially constrained firms remains challenging. This study introduces a cash flow-based proxy and investigates its ability to identify constrained firms more accurately than existing measures.

According to Modigliani & Miller (1963), in a frictionless financial market, any firm can invest in projects with a positive net present value regardless of the project type. However, real-world financial markets are not frictionless and are characterized by information asymmetry, agency costs, transaction costs, and taxes. Firms can rely on their internal cash flow and cash holdings to mitigate these frictions. Previous research has suggested that cash flow can be a valuable source of funds for companies that do not have easy access to external capital. This study focuses on a cash flow-based constraint measure as Almeida et al. (2004) found that financially distressed firms tend to have higher cash holdings relative to their total assets than firms not facing such frictions. These findings support that cash inflows are more valuable for firms under financial constraints.

According to Choe et al. (1993), financing choices vary across firms and time, with equity issues increasing during economic upswings and debt issues during downturns for firms accessing the financial markets. However, financially constrained firms do not follow this counter-cyclical debt pattern as strongly. Additionally, firms are more likely to issue equity after a significant increase in their equity price, suggesting that firm-specific factors drive financing choices and that the degree of financial market access plays a role. In this context, the study conducted by the author aims to quantify the relative importance of these factors by performing an empirical analysis on a

This dissertation follows the journal model of *Journal of Financial Economics*.

sample of firms divided by their level of financial constraints, using dividend payments, Hadlock-Pierce, Whited-Wu indices, and the Operating Cashflow ratio to categorize firms into financially constrained and not.

The practice of earnings management has been a source of concern for regulators and investors alike. It is argued that firms engage in earnings management to either exploit the information asymmetry and achieve various benefits for themselves and their firms (opportunistic accrual management hypothesis) or to allow outsiders to make a reliable forecast about firms' future performance (performance measure hypothesis) (Watts et al., 1997; Guay et al., 1997; Chan et al., 2001). Shareholders can suffer substantial losses due to distorted information from earnings management based on opportunistic managerial motives (Dechow et al., 1995). Even firms that engage in aggressive earnings management but are not accused of fraudulent behavior can lead to shareholders losing value (Chan et al., 2001). Initial public offerings from firms involved in aggressive accrual management significantly underperform in the five years after their IPOs compared to firms that use less aggressive accruals management before their IPOs (Teoh et al., 1998a, 1998b; Teoh, Wong, et al., 1998).

This study employs three empirical models to estimate firms' access to the equity market, cash flow sensitivity, and R&D investment through asset sales to examine the impact of financial constraints on firms' behavior. The results demonstrate that the new cash flow-based measure can accurately identify constrained firms. Moreover, it shows that financially constrained firms tend to hold more cash and marketable securities than their unconstrained counterparts, regardless of the measure used, except for the KZ index. In addition, financially constrained firms use their cash reserves to engage in activities that increase firm value.

The study aims to investigate how financial constraints affect capital structure decisions, as these factors can lead to heterogeneity in both time series and cross-sectional firm behavior. According to Coles et al. (2012), recent studies have emphasized the significance of financial constraints on firm financing. By examining the effects of financial constraints on capital structure decisions, the study can evaluate competing capital structure theories, including the trade-off and pecking order theories.

Overall, this study contributes to the ongoing debate on the reliability of current financial constraint measures by proposing a novel approach to measuring a firm's degree of financial constraint and demonstrating its ability to identify constrained firms more accurately. The results of this study extend earlier literature and contribute to a better understanding of the link between financial constraints and firm behavior.

Harris and Raviv (1991) suggest that existing studies generally agree on certain factors that influence leverage, such as fixed assets, growth opportunities, firm size, and nondebt tax shields, while decreasing volatility, advertising, R&D expenditures, bankruptcy probability, profitability, and product uniqueness. However, Titman et al. (1988) find no evidence to support the influence of nondebt tax shields, collateral value, volatility, or future growth on debt ratios. The study aims to clarify this empirical challenge by explaining the deviation through constraints.

Finally, the study also addresses the ongoing debate as to which measure reflects leverage more accurately - book or market leverage. According to Myers (1977), managers focus on book leverage, as existing assets rather than growth opportunities typically support debt. Welch (2004), however, argues that the book value of equity may even be negative, whereas assets cannot. In this context, the study considers both measures of leverage to establish a clear definition.

This study explores the relationship between CEO compensation contracts and a firm's earnings management behavior. CEOs are responsible for developing a firm's strategy and business model, and thus, their compensation contracts often tie monetary compensation to achieving explicit performance goals. The study examines whether the performance metric type (EPS, sales, etc.) a CEO has to beat affects the firm's earnings management behavior, focusing on both accrual and real activities-based earnings management in sample firms. Previous studies have focused on specific aspects of CEO compensation, such as the effect of a manager's bonus plan, the influence of compensation contracts on option awards, and the opportunistic manipulation of investor expectations around scheduled option award dates. This study takes a more comprehensive view of the relationship between compensation contracts and earnings management, considering the interplay between different components of total compensation and metrics (Anderson et al., 2000). The study's findings contribute to a better understanding of the nature of CEO compensation contracts and their relationship with earnings management.

CHAPTER I: A NEW CASH FLOW BASED FINANCIAL CONSTRAINT MEASURE

1.1 Introduction

According to Modigliani & Miller (1963), any firm can invest in projects with a positive net present value regardless of the project type in a frictionless financial market. A company can raise capital quickly through debt or equity markets if it lacks sufficient funds. However, real-world financial markets are not frictionless and are characterized by information asymmetry (Myers and Majluf, 1984), agency costs (Jensen and Meckling, 1976), transaction costs, and taxes, which businesses must consider while setting their policies. To mitigate the adverse effects of these frictions, firms can rely on their internal cash flow and cash holding (Denis and Sibilkov, 2010). Previous research has suggested that cash flow can be a valuable source of funds for companies that do not have easy access to external capital. This study focuses on a cash flow-based constraint measure as Almeida et al. (2004) found that financially distressed firms tend to have higher cash holdings relative to their total assets than firms not facing such frictions. These findings support the notion that cash inflows are more valuable for firms under financial constraints.

My study contributes to the ongoing debate on the reliability of current financial constraint measures by conducting a comparative analysis from three different perspectives. The impact of financial constraints on a firm's behavior is a crucial question in various fields, including asset pricing (Gomes et al., 2006; Whited and Wu, 2006), monetary policy (Bernanke et al., 1996), firm dynamics (Cooley and Quadrini, 2001), and entrepreneurship (Kerr and Nanda, 2009). However, accurately identifying constrained firms remains challenging as their financial constraints are not directly observable, and researchers rely on indirect measures such as dividend payments, size, age, and leverage ratios (e.g., the Kaplan-Zingales, Hadlock-Pierce, and Whited-Wu indices).

This paper introduces a cash flow-based proxy and investigates its ability to identify constrained firms more accurately than existing measures. My findings show that the new cash flow-based measure can identify constrained firms with reasonable accuracy. Moreover, I demonstrate that firms identified as financially constrained by my cash flow-based measure face challenges accessing equity markets and cannot recycle the proceeds from new issues to increase shareholder payouts. This behavior is only significant among the unconstrained firms classified by my new measure.

To examine the impact of financial constraints on firms' behavior, I employ three empirical models to estimate firms' access to the equity market, cash flow sensitivity, and R&D investment through asset sales. To measure a firm's extent of financial constraints while accessing equity markets, I utilize the concept of "equity recycling," which refers to firms' tendency to raise and payout equity simultaneously (Grullon et al., 2011). A constrained firm with limited access to equity cannot engage in equity recycling. I use this assumption to test the accuracy of my proposed index in identifying firms that are genuinely constrained in the equity market.

Next, I explore the relationship between a firm's financial constraint and its demand for liquidity, which can provide insights into the impact of constraints on the firm's behavior. I adopt a model Almeida et al. (2004) proposed to capture this behavior. According to this model, as firms anticipate financial constraints in the future, they respond by accumulating cash reserves in the present. However, holding cash requires the firm to reduce its current investment. Constrained firms carefully weigh the profitability of current and future investments when deciding on their optimal cash policy (Almeida et al., 2004). In contrast, unconstrained firms can finance all their positive net present value (NPV) investments, making their cash policy indeterminate to cash inflow.

Subsequently, I examine how financial constraints impact non-traditional firm activities by analyzing the source and utilization of funds. Specifically, I focus on the sensitivity of firms' investment in intangible capital, such as research and development (R&D), to the cash proceeds generated by the sales of tangible fixed assets. Borisova & Brown (2013) suggest that the relationship between asset sales and intangible investment provides a more reliable test for financing constraints because no clear alternative financing channel connects fixed asset sales with corporate R&D investments.

I propose a novel approach to measuring a firm's degree of financial constraint and compare it to existing measures such as dividend payments, Kaplan Zingales, Hadlock-Pierce, and Whited-Wu indices. I construct two portfolios using the operating cash flow ratio and analyze their behaviors. This study employs a sample of 100,691 firm-year observations from Compustat between 1989 and 2020. My findings demonstrate that financially constrained firms tend to hold more cash and marketable securities than their unconstrained counterparts, regardless of the measure used, except for the KZ index. In addition, I use regression analysis to model changes in cash holdings against a set of control variables, finding that the sensitivity of cash flow on cash holding is higher for firms with higher financial constraints. This suggests that cash is more valuable for firms in financial distress. I also find that capital investment and acquisitions have a more substantial effect on cash holdings for constrained firms, indicating that cash enables them to invest in value-enhancing projects. These results extend earlier literature and contribute to a better understanding the link between financial constraints and firm behavior.

My study receives additional support from the findings of Almeida et al. (2004) regarding the behavior of financially constrained firms. Specifically, I find that financially constrained firms tend to invest more when they hold higher cash levels than unconstrained firms. Furthermore, my results contribute to the existing literature on cash holdings by demonstrating that financially constrained firms use their cash reserves to engage in activities that increase firm value, such as capital expenditures or acquisitions.

In summary, my study supports using the OCF Index to measure financial constraints in future research. My method addresses the critique of Kaplan & Zingales (1997) on earlier studies that compare investment finance sensitivities across all firms to identify financing constraints. Specifically, my approach overcomes this issue as R&D investment in unconstrained firms is insensitive to cash inflows from fixed asset sales. Furthermore, my findings demonstrate a robust relationship between cash proceeds from asset sales and R&D investment in constrained firms, highlighting the significant impact of financing friction. This conclusion echoes the argument by Hovakimian & Titman (2006) on the role of asset sales proceeds in new capital spending.

In the final part of my analysis, I conduct robustness tests to confirm the validity of my results. First, to test for sampling bias, I retest using constrained and unconstrained groups based on top and bottom 10%, 20%, and 50%. The overall findings remain consistent among these alternate groups. I also create two different groups of firms based on their likelihood of failure as measured by the Merton (1974) distance to default and Altman (1968) Z-score models. I find that firms with a high probability of default exhibit similar behaviors to those identified as financially constrained by the OCF index. These firms do not engage in equity recycling and display high sensitivity to cash flow, further supporting the validity of my earlier findings.

1.2 Literature Review and Hypotheses Development

Earlier research has suggested that constrained firms rely more heavily on changes in cash flow to determine their marginal capital spending, mainly when external financing is more expensive than internal financing. The sensitivity of investment to cash flow is also believed to increase with the degree of financial constraints. However, recent studies challenge this assertion on both theoretical and empirical grounds. Kaplan & Zingales (1997) argue that investment cash flow sensitivities are not a reliable measure of financial constraints, and they propose a different method for ranking firms based on information in their financial statements. They find that constrained firms exhibit higher investment cash flow sensitivity levels. This finding is supported by Erickson & Whited (2000) and Alti (2003), who suggest that Tobin's Q (a measure of a firm's market value) is an imprecise proxy for marginal Q (the marginal value of a firm's assets). Thus, less constrained firms are better able to adjust their investment in response to changes in investment opportunities, which leads to higher investment cash flow sensitivities for unconstrained firms.

In order to investigate the impact of expensive external financing on financial policies, Almeida et al. (2004) adopt a different approach by examining the sensitivity of cash flow to cash. They argue that financially constrained firms are more likely to hold onto cash reserves. Using various criteria to distinguish between constrained and unconstrained firms, they discover that cash flow sensitivity to cash is positive for financially constrained firms, while it is not statistically significant for financially unconstrained firms.

By examining the factors that determine a firm's cash holdings across various companies, Opler et al. (1999) discovered a negative correlation between a firm's cash reserves and the availability and level of its bond rating. Specifically, firms without a bond rating or those with a below-investment-grade rating tend to hold more cash than those with an investment-grade rating. In addition, Kim et al. (1998) and Harford (1999) find that industry cash flow volatility positively relates to firms' cash holdings. Therefore, companies that operate in industries with greater cash flow volatility and have no or lower bond ratings face higher external financing costs. These findings support the notion that financially constrained firms hold more cash than unconstrained firms.

My study aims to assess the effectiveness of a novel measure for financial constraints based on cash flow and compare its ability to identify financially constrained firms to that of existing measures. Additionally, I aim to identify potential reasons current measures may misclassify firms regarding their financial constraints.

1.2.1 Financial Constraint Measures

Presently available financial constraint proxies attempt to identify constraints from various sources, including firms' funding statements, anticipated investment plans, and company characteristics such as age or size. However, there is a debate in the literature about which measures most accurately reflect financial constraints. Consequently, researchers often use various measures in empirical studies to ensure the robustness of their findings.

One of the measures of constraint that I have incorporated is the payment of dividends. Fazzari et al. (1988) suggest that firms without financial constraints tend to have higher payout ratios than firms facing constraints, which tend to have lower payout ratios. Accordingly, I classify firms as constrained if they did not make any dividend payments in the previous year, while unconstrained firms have a record of dividend payments from the previous year. I also conducted tests using the payout ratio approach previously employed in research by categorizing firms into constrained and unconstrained groups based on the top and bottom terciles. These tests did not have any significant impact on my overall findings.

The KZ index utilized in this study builds upon the work of Lamont et al. (2001). They employed an ordered logit model to establish a relationship between the level of financial constraint and five accounting variables based on Kaplan & Zingales (1997) classification. These variables include cash flow, market-to-book ratio, leverage, dividends, and cash holdings. The resulting index positively correlates with the market-to-book ratio and leverage, while it negatively associates with cash flow, dividends, and cash holdings. A higher value of the KZ index indicates a greater degree of financial constraint. It is important to note that this model assumes that financial constraints remain constant over time and are not affected by changes in business cycles.

The text-based approach developed by Kaplan & Zingales (1997) was updated by Hadlock & Pierce (2010). They randomly selected companies between 1995 and 2004 and analyzed their 10-K submissions for indications of financial constraint. Hadlock & Pierce (2010) constructed their constraint index based on firm size, size squared, and age. Similar to the KZ index, subsequent studies have used the HP index by applying the coefficients developed by Hadlock and Pierce to their respective samples.

Whited & Wu (2006) created their constraint index using coefficients derived from a structural model. Their index measures the shadow price of raising equity capital based on various factors, such as cash flow to assets, a dummy variable indicating if a firm pays dividends, long-term debt to total assets, size, sales growth, and industry sales growth. I adopt Whited and Wu's reported coefficient estimates in my sample to construct my portfolio of constrained and unconstrained firms, similar to other researchers who have utilized the WW index before.

My final financial constraint measure is the OCF index, based on the operating cash flow ratio. Despite being a popular topic in empirical accounting research, there has been limited interest in finance. Financial Accounting Standards Board (1981) argues that a higher amount of future net cash inflows from operations indicates a firm's greater ability to withstand adverse changes in operating conditions. Gombola & Ketz (1983 and Gombola et al. (1983) demonstrate that ratios based on operating cash flow load on a separate statistical factor that is useful in descriptive and predictive studies. I construct my operating cash flow ratio by dividing cash flow from operations by current liabilities to indicate how well a firm can pay off its current liabilities using the cash generated from its primary business operations. The operating cash flow ratio is considered more reliable in measuring a firm's short-term liquidity, as management can manipulate earnings through accruals. While there has been an overall decline in cash holdings relative to current liabilities, firms tend to increase their cash holdings during periods of significant financial uncertainty, such as in 1998, 2007-11, and 2020. Therefore, I contend that if a firm cannot generate sufficient cash flow from its primary operations to pay off its current liabilities, it must seek external capital from the market.

1.3 Model Development and Data

This study examines public manufacturing companies in the United States with available financial data on Compustat and CRSP from 1989 to 2020. I followed the firm selection criteria Heider & Ljungqvist (2015) proposed to ensure consistency with prior research. I excluded financial firms (SIC code 6), utilities (SIC code 49), public sector entities (SIC code 9), firms not incorporated or headquartered in the US, firms traded on OTC or Pink Sheets, and firms with missing or negative total assets or missing return on assets. My final sample includes 8,599 firms, comprising 100,691 firm-year observations.

1.3.1 Cross tabulations

Table 1.1 presents a summary of my five constraint measures outlined in section 2.1. The first measure categorizes firms based on their dividend payment history, while the remaining three measures classify firms based on their placement in the top tercile of the KZ, HP, and WW indices. The unconstrained firms are those that fall in the bottom tercile of these indices.

Table 1.1

Cross-tabulation of financial constraints measure

		Financial Constraints measures				
		Dividends	KZ Index	Hadlock Pierce	Whited-Wu	OCF
Constrained firm	Fraction no dividend	**1.00**	0.81	0.91	0.91	0.89
	Fraction constrained KZ	0.28	**1.00**	0.16	0.24	0.14
	Fraction constrained HP	0.38	0.19	**1.00**	0.65	0.58
	Fraction constrained WW	0.34	0.25	0.58	**1.00**	0.48
	Fraction constrained OCF	0.38	0.17	0.59	0.55	**1.00**
Unconstrained firms	Fraction no dividend	**0.00**	0.65	0.76	0.31	0.58
	Fraction constrained KZ	0.16	**0.00**	0.61	0.30	0.36
	Fraction constrained HP	0.10	0.46	**0.00**	0.02	0.21
	Fraction constrained WW	0.09	0.45	0.16	**0.00**	0.21
	Fraction constrained OCF	0.12	0.50	0.26	0.13	**0.00**

This table shows the cross-tabulation of five constraint measures evaluated in this paper to show the extent to which each measure produces overlapping classification. The first five rows show the fraction of firms classified as constrained by each measure that would also be classified as constrained by each of the other four measures. For example, 28% of the firms classified as constrained by dividend measure have also been classified as constrained by the KZ index. The last five rows show the fraction of firms classified as unconstrained by each measure that would also be constrained under the other measures. For example, 16% of the firms identified as unconstrained by the dividend measure are classified as constrained by the KZ index.

The first five rows of Table 1.1 display the proportion of firms categorized as constrained according to each of my five measures. This illustrates how similar the groups of firms identified by each measure are. The KZ index is the only measure that does not correlate strongly with the others. Firms that do not pay dividends are the most likely to be classified as constrained by the other four measures. Approximately 90% of firms identified as constrained by all four indices did not pay dividends in the previous year. The HP index has the highest overlap with other measures, with 91% of firms identified as constrained by this measure also not paying dividends, 58% identified as constrained by the WW index, and 59% identified as constrained by my OCF index.

The last five rows of the table report the fraction of firms classified as unconstrained by each measure but identified as constrained by the other four measures. The results indicate that dividend-paying firms are less likely to be classified as constrained by the other measures. For example, only 16%, 10%, 9%, and 12% of dividend-paying firms were classified as constrained by the KZ, HP, WW, and OCF indices. It is worth noting that the KZ index stands out as an outlier, classifying a considerable proportion of unconstrained firms as constrained, where 65% of unconstrained firms did not pay dividends, and roughly 46% and 50% of these firms were classified as constrained by the HP and WW indices, respectively, and 50% by the OCF index.

1.4 Summary Statistics

Table 1.2 presents the summary statistics for all the public manufacturing companies in this study, categorized as constrained or unconstrained according to five different measures. Except for the KZ index, all four financial constraint measures categorize firms with comparable characteristics as either constrained or unconstrained. Overall, the dividend, HP, WW, and OCF indices effectively identify constrained firms that are smaller, younger, have more cash, and possess fewer tangible assets. These constrained firms also exhibit lower returns on assets and lower marginal tax rates.

Table 1.2

Summary statistics of "constrained" and "unconstrained" firms

	Dividend		KZ Index		HP Index		WW Index		OCF Index	
	Nondiv. payer	Dividend payer	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
Total real assets,	957.432	4778.867	2416.247	1584.36	158.456	4962.022	895.673	5646.637	849.028	2698.096
Cash/asset	.259	.111	.072	.383	.356	.113	.323	.105	.359	.15
Age (since IPO)	22.097	24.369	24.146	22.572	5.073	13.615	22.563	24.638	21.113	23.7
Tangibility	.23	.323	.383	.123	.184	.313	.204	.315	.164	.356
ROA	-.023	.151	.122	-.07	-.115	.139	-.062	.138	-.178	.17
Marginal tax rate	.14	.225	.174	.148	.117	.202	.113	.208	.081	.216
Total book leverage	.23	.244	.346	.137	.163	.277	.19	.274	.194	.257
Long-term book leverage	.178	.208	.292	.103	.108	.242	.14	.238	.129	.232
% short-term debt (1 year)	.299	.192	.182	.351	.411	.165	.358	.166	.391	.165
Investment opportunities	2.057	1.572	1.411	2.549	2.594	1.513	2.358	1.514	2.324	1.929
Sales growth	.314	.098	.135	.318	.453	.1	.289	.13	.47	.144
Employment growth	.136	.053	.079	.146	.181	.053	.124	.089	.134	.113
R&D	.155	.032	.034	.186	.202	.04	.173	.033	.215	.049
Gross investment	.434	.618	.684	.28	.384	.586	.437	.581	.347	.641
No of firm-years	72,047	30,644	24,996	25,019	30,403	30,423	26,992	27,018	30,603	30,603

The table reports summary statistics for 100,691 firm-years for 8,599 nonfinancial and nonutility public U.S. firms between 1989 and 2020 classified as “constrained” and “unconstrained” by the five financial constrained measures compared in this paper. For variable definitions and details of their construction, see Appendix A.

Except for the KZ index, firms classified as Constrained exhibit higher book-to-market ratios and considerably greater sales and employment growth than their unconstrained counterparts. Moreover, Constrained firms tend to allocate substantial resources towards R&D, with non-dividend-paying firms devoting as much as 15% of their assets to this activity, compared to only 3% for dividend-paying firms. In terms of growth, non-dividend-paying firms experience annual increases of 31% and 14% in sales and employment, respectively, while dividend-paying firms' growth rates are limited to 9% and 5%. Similar patterns are evident in the OCF index, where unconstrained firms possess roughly three times the asset value of their constrained peers. Furthermore, constrained firms tend to maintain a higher level of cash, representing twice the amount relative to their assets compared to unconstrained firms.

The KZ index tends to capture a distinct group of firms from the other measures presented in Table 1.2 across nearly all the variables. The Constrained firms identified by the KZ index tend to be relatively large, hold lower cash levels, and possess more tangible assets than their unconstrained peers. Additionally, these Constrained firms exhibit high leverage levels and low market-to-book ratios.

These trends suggest that the “constrained” group of firms identified by the dividends, HP index, WW index, and OCF Index measures tend to be smaller, younger, less profitable, and less leveraged than their unconstrained counterparts. Nevertheless, this group of firms also appears to experience rapid growth, invest in R&D, and have ample investment opportunities.

1.5 Does OCF Index Measure Financial Constraints?

Tables 1.1 and 1.2 present summary statistics and cross-tabulation results, indicating that except for the KZ index, comparable firms are classified as constrained based on the dividend, HP, WW, and the newly proposed OCF indices. Given these findings, I focus on analyzing the performance of the OCF index in detail to address the research questions posed at the outset.

1.5.1 Equity Recycling Test

My initial assessment examines a firm’s capacity to generate cash by issuing new equity. Fazzari et al. (1988) suggest that “the cost of new debt and equity may differ substantially from the opportunity cost of internal finance generated through cash flow and retained earnings,” implying that constrained firms face higher external capital market costs. Grullon et al. (2011) proposed an “equity recycling” test, where firms pay off debt using funds from issuing new shares to capture this concept. Issuing new shares is feasible for financially constrained firms since they generally hesitate to reduce or cancel dividend payments.

To understand how firms utilize the proceeds of their equity offerings, I adopt Kim & Weisbach's (2008) framework.

$$\Delta Payout_{ijt} = \beta\Delta Equity\ Issue_{ijt} + \delta\Delta Other\ Sources\ of\ Funds_{ijt}$$

$$+\gamma\Delta Size_{ijt} + \alpha_{jt} + \varepsilon_{ijt} \qquad (1)$$

My dependent variable is the sum of dividends and repurchases, where i represents firms, j represents industries, and t represents fiscal years. The primary independent variable is the equity issue, which measures a firm’s earnings from initiating an equity issue (McKeon, 2015). I also include other sources of funds, such as operating cash flows, debt issues, proceeds from stock option exercises, and asset sales. To account for differences in firm sizes and industry-specific effects, I include industry-by-year fixed effects and scale all variables except size by the beginning-of-year total assets (Farre-Mensa and Ljungqvist, 2016a).

1.5.1.1 Comparing the behavior of "constrained" and "unconstrained" firms

Table 1.3 presents the empirical results. I observe that firms identified as constrained by the KZ index, HP index, and WW index engage in equity recycling, while those identified using the OCF index do not. On the other hand, firms identified as unconstrained by the OCF index display evidence of "equity recycling." These results support the previous assumption that constrained firms face difficulties raising capital to pay dividends due to a highly inelastic equity supply curve. Furthermore, the behavior of "constrained" and "unconstrained" firms differs for the dividend, HP, and WW indices, with constrained firms recycling significantly less than their unconstrained counterparts. My findings align with those of Farre-Mensa & Ljungqvist (2016).

Given that my "equity recycling" measure includes total payouts, including dividends and share repurchases, one might question whether this test relies too heavily on dividend payments. To address this concern, I conducted an analysis where I excluded dividend payments from the dependent variable and only considered share repurchases. The results of this analysis are presented in Table 1.3, panel B, and suggest that the OCF index accurately identified constrained firms that did not engage in equity recycling. These findings indicate that my equity tests are not solely dependent on information about dividends to capture constraints.

An additional concern with my equity test is that the measures may not capture a firm's status switches in real-time, causing newly unconstrained firms to engage in equity recycling while still being classified as constrained by these financial constraint measures. This delay could undermine the ability of constraint measures to differentiate between constrained and unconstrained firms. To address this concern, I used forward-looking measures of financial constraints, identifying firms as constrained in year *t* if they were identified as constrained in year *t+1*, and similarly for identifying unconstrained firms. The results of this analysis are presented in Table 1.3, Panel C, and indicate little change in the results. This suggests that the staleness of the constraint measures does not significantly affect my findings. My proposed OCF index accurately identifies constrained firms that do not engage in equity recycling, even after adjusting for dividend payments and the potential delay in identifying constraint status.

Table 1.3
Equity recycling by financial constraints measure

Panel A. Baseline results

Dep. Var.: Change in dividends and repurchases

	Dividend		KZ Index		HP Index		WW Index		OCF Index	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variables	Nondiv. payer	Dividend payer	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
Change in Equity issuance proceeds	0.0240**	0.1994***	0.0848**	0.0124**	0.0275**	0.0938***	0.0158***	0.1550***	0.0148	0.1935***
	(2.1875)	(5.3663)	(2.3442)	(2.2790)	(2.3322)	(3.5854)	(2.9437)	(6.6367)	(1.3593)	(5.2181)
Change other sources of funds	0.0019**	0.1023**	0.0007	0.0037	0.0025***	0.0329**	0.0012	0.0369**	0.0010	0.1542***
	(2.3890)	(2.3314)	(1.0659)	(1.3033)	(2.6159)	(2.4622)	(1.2415)	(2.2192)	(1.3988)	(6.2876)
Change in log total assets	-0.0026***	-0.0103***	-0.0039***	-0.0050***	-0.0031**	-0.0047***	-0.0036***	-0.0066***	-0.0006	-0.0137***
	(-4.6425)	(-7.3506)	(-4.9944)	(-4.0343)	(-2.3096)	(-6.5575)	(-3.7521)	(-6.8610)	(-0.6694)	(-8.9180)
Observations	24,679	10,692	8,763	8,685	12,727	10,573	9,903	9,014	9,216	13,004
R-squared	0.1537	0.3673	0.2229	0.2198	0.1875	0.1182	0.1529	0.1552	0.2247	0.3321

Panel B. Focusing on share repurchases only

Dep. Var.: Change in repurchases

	Dividend		KZ Index		HP Index		WW Index		OCF Index	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variables	Nondiv. payer	Dividend payer	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
Change in Equity issuance proceeds	0.0225**	0.0723**	0.0761**	0.0085**	0.0228**	0.0880***	0.0142***	0.1271***	0.0151	0.1206***
	(2.1253)	(2.4421)	(2.1366)	(2.3690)	(2.0812)	(3.9131)	(3.2473)	(2.9620)	(1.4036)	(3.8486)

Table 1.3 Continued

	Dividend	KZ Index	HP Index	WW Index	OCF Index		Dividend	KZ Index	HP Index	WW Index
Change other sources of funds	0.0016**	0.0343**	0.0009	0.0013	0.0016**	0.0264**	0.0006	0.0300**	0.0010	0.0577***
	(2.2291)	(2.2620)	(1.0839)	(1.1662)	(2.1074)	(2.4952)	(1.1836)	(2.2050)	(1.4050)	(3.7740)
Change in log total assets	-0.0029***	-0.0040***	-0.0035***	-0.0030***	-0.0031***	-0.0037***	-0.0026***	-0.0046***	-0.0014*	-0.0082***
	(-5.7132)	(-5.0725)	(-4.7115)	(-3.6172)	(-3.5803)	(-5.8063)	(-3.6060)	(-5.7753)	(-1.8190)	(-6.9258)
Observations	25,177	10,813	8,893	8,818	13,039	10,704	10,090	9,158	9,497	13,181
R-squared	0.1476	0.1369	0.1872	0.1737	0.1874	0.1117	0.1698	0.1320	0.2238	0.2364

Panel C. Forward-looking measures of financial constraints

Dep. Var.: Change in dividends and repurchases

	Dividend		KZ Index		HP Index		WW Index		OCF Index	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variables	Nondiv. payer	Dividend payer	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
Change in Equity issuance proceeds	0.0254**	0.2249***	0.0848**	0.0167**	0.0262**	0.0730***	0.0685*	0.0818***	0.0148	0.1567***
	(2.2924)	(3.1667)	(2.3442)	(2.5269)	(2.1756)	(4.0791)	(1.9516)	(4.6619)	(1.3254)	(4.9991)
Change other sources of funds	0.0022**	0.0788**	0.0007	0.0031**	0.0023**	0.0154*	0.0092**	0.0343**	0.0012	0.1510***
	(2.5530)	(2.3181)	(1.0659)	(2.0336)	(2.4770)	(1.6820)	(2.0129)	(2.4818)	(1.4528)	(6.4804)
Change in log total assets	-0.0025***	-0.0090***	-0.0039***	-0.0058***	-0.0029*	-0.0045***	-0.0056***	-0.0068***	0.0007	-0.0123***
	(-3.7302)	(-7.2096)	(-4.9944)	(-4.4349)	(-1.8592)	(-6.3578)	(-3.3699)	(-7.6576)	(0.5040)	(-8.9471)
Observations	24,506	10,819	8,763	10,228	10,868	11,618	10,573	10,514	8,204	13,327
R-squared	0.1692	0.2731	0.2229	0.1663	0.2079	0.1167	0.2523	0.1381	0.2335	0.2761

I compare the extent to which "constrained" and "unconstrained" firms use the proceeds of firm-initiated equity issues to increase their payouts to shareholders. In panel A, the payout is measured as the sum of dividends and share repurchases. Panel B focuses on share repurchases only. In panels A and B, firms are categorized as "constrained" and "unconstrained" according to the five measures of financial constraints introduced in Table 1.2. Panel C uses a forward-looking measure of financial constraints, identifying firms as "constrained" and "unconstrained" in year *t* if the relevant constraints measure identifies the firm as "constrained" or "unconstrained" in year *t*+1. My choice of control variables follows Kim and Weisbach (2008). All specifications are estimated using OLS firm-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level are shown underneath the coefficient estimates in italics. I use ***, **, * to denote significance at 1%, 5%, and 10% levels, respectively.

In conclusion, Table 1.3 presents results indicating that, except for the proposed OCF index, none of the other four constraint measures accurately identify firms whose behavior does not differ from those classified as unconstrained. Specifically, the constrained and unconstrained firms selected by the other measures do not exhibit any discernible differences, suggesting that there is not a significant gap between their internal and external cost of equity.

1.5.2 Cashflow sensitivity test

Figure **1.**1 illustrates that the average cash-to-asset ratio increased by over two-fold from 1989 to 2019 before declining in 2020. Typically, firms with agency problems accumulate cash if they lack investment opportunities, and their management hesitates to distribute the cash to shareholders (Michael C. Jensen, 1986). However, even without agency problems, firms today continue to hoard cash, despite advancements in financial technology such as derivatives. To understand this phenomenon, Almeida et al. (2004) develop a model to assess the impact of financial constraints on corporate policies. Their research identifies two potential reasons why firms accumulate cash. Firstly, a liquid balance sheet can offer firms a significant advantage when taking on profitable projects as they arise (Keynes, 1936).

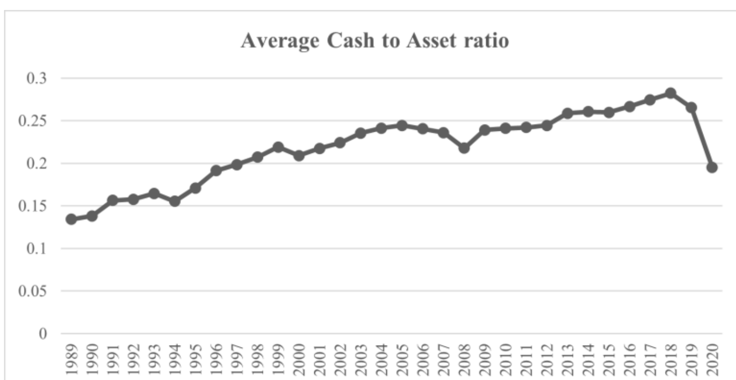

Figure 1.1. The Figure shows the trend of the average cash-to-asset ratio for 8,599 nonfinancial and nonutility public U.S. firms between 1989 and 2020.

Despite the potential benefits of having a liquid balance sheet, Keynes recognized that the importance of balance sheet liquidity depends on a firm's ability to access external capital markets (p. 196). If a firm can easily access external capital at a lower cost, the need to accumulate cash for future investment opportunities becomes less relevant. However, if a firm faces financing constraints, managing liquidity may become critical in its corporate policies.

I propose that by examining the relationship between a firm's financial constraints and its demand for liquidity, I can determine if financial constraints play a significant role in a firm's behavior. To do this, I utilize a model introduced by (Almeida et al., 2004), which suggests that constrained firms anticipating future financial constraints would accumulate cash to safeguard against future investment opportunities. However, holding cash is costly, so these firms would choose an optimal cash policy that balances current and future investment profitability. In contrast, financially unconstrained firms that can fund all profitable future investments have no use for cash and face no cost of accumulating cash. Consequently, their cash policies will be indeterminate of their cash flow. The difference in cash policies between constrained and unconstrained firms allows me to differentiate the effect of financial constraints on financial policies using the next empirical model. If a firm has a higher propensity to save cash from cash inflows, it suggests an inability to raise cash from external sources. This is crucial because cash is a financial variable, and the ability of cash flow to forecast investment demand may explain its explanatory power over cash policy. However, for unconstrained firms, there will be no systematic pattern between changes in cash holdings and the firm's current cash flow and future investment opportunities.

My baseline empirical model to estimate the cash flow sensitivity of cash includes firm size, proxies for cash flow innovation and investment opportunities, and can be expressed as follows:

$$\Delta CashHoldings_{it} = \beta_1 CashFlow_{it} + \beta_2 Q_{it} + \beta_3 Size_{it} + \varepsilon_{it} \qquad (2)$$

The ratio of cash and marketable securities to total assets defines cash holdings, while cash flow is the ratio of earnings before extraordinary items and depreciation minus dividends to total assets. The variable Q represents the market value divided by the book value of assets, and size is the natural logarithm of total assets. I expect the coefficient β_1 to capture the response of cash holdings to a shock in cash flow. Specifically, I anticipate that constrained firms will exhibit a positive β_1, while the sign for unconstrained firms is indeterminate.

I have developed an alternative empirical model for cash flow sensitivity that incorporates various factors that affect a firm's sources and uses of funds. These factors include investment demand (Calomiris et al., 1995; S. Fazzari et al., 1988; Fazzari and Petersen, 1993) and cash management (Calomiris et al., 1995; Harford, 1999; Kim et al., 1998). In this model, I estimate the annual change in a firm's cash-to-total assets ratio as a function of capital expenditure, acquisitions, changes in non-cash net working capital, and changes in short-term debt. All of these variables are scaled by total assets. I anticipate that β_1 will be positive and statistically significant for financially constrained firms while insignificant for financially unconstrained firms.

$$\Delta CashHoldings_{it} = \beta_1 CashFlow_{it} + \beta_2 Q_{it} + \beta_3 Size_{it} + \beta_4 Expenditures_{it} + \beta_5 Acquisitions_{it} + \beta_6 \Delta NWC_{it} + \beta_7 \Delta ShortDebt_{it} + \varepsilon_{it} \quad (3)$$

I include expenditure and acquisition variables as controls because a company may use its cash reserves to fund investment and acquisition activities in a particular year. Therefore, I anticipate that β_4 and β_5 will have negative values.

1.5.2.1 Comparing the cash flow sensitivity of "constrained" and "unconstrained" firms

Table 1.4

Cash holdings sensitivity to cash flow by constraints measure

Dep. Var.: Change in Cash holdings

	Dividend		KZ Index		HP Index		WW Index		OCF Index	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variables	Nondiv. payer	Dividend payer	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
CashFlow	0.0035***	0.0204	0.0013	0.0105**	0.0029***	-0.0032	0.0018	0.0234***	0.0033***	0.0082
	(2.9252)	(1.3176)	(0.3626)	(2.4175)	(2.5865)	(-0.6002)	(0.5014)	(3.3073)	(2.7316)	(0.9061)
Q	0.0005***	0.0003	0.0005	0.0009	0.0004**	0.0026***	0.0004	0.0035***	0.0004*	0.0031***
	(3.9040)	(0.3699)	(1.2982)	(1.5194)	(2.0954)	(3.0410)	(0.9703)	(3.5250)	(1.6508)	(3.5925)
Size	-0.0064***	-0.0040***	-0.0027*	-0.0109***	0.0029	-0.0029***	-0.0005	-0.0030*	-0.0026	-0.0105***
	(-5.1284)	(-3.7292)	(-1.8333)	(-5.0355)	(0.9791)	(-3.0417)	(-0.2583)	(-1.7958)	(-1.0840)	(-7.4151)
Observations	56,108	25,952	26,680	26,337	24,039	28,985	26,462	25,750	24,733	28,078
R-squared	0.0638	0.0806	0.1627	0.1052	0.0889	0.0720	0.0831	0.1206	0.0946	0.1328

This table report results from the OLS estimation of the baseline regression model (2). All data are from COMPUSTAT annual, and the sample period is from 1989 to 2020. My choice of control variables follows that of Almeida et al. (2004). All specifications are estimated using OLS with firm-by-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level are shown underneath the coefficient estimates in italics. I use ***, **, * to denote significance at 1%, 5%, and 10% levels, respectively.

The results of my base regression model are presented in Table 1.4. The findings indicate that constrained firms exhibit significant positive cash flow sensitivities, while unconstrained firms do not show significant cash flow sensitivities, except for the KZ index. The constrained measures, except for the KZ index, show sensitivity estimates at the 1% level. This implies that for every additional dollar of cash flow (normalized by total assets), a constrained firm saves around 0.2 to 0.4 cents. These results are consistent with my model's assumption that constrained firms are more sensitive to cash flow due to their uncertain future access to external capital.

The Q sensitivity is generally positive and significant for most of the constrained groups in my sample. The effect of firm size varies widely depending on the financial constraint measures. For example, firms identified as constrained by the OCF index exhibit a negative coefficient for both constrained and unconstrained firms. This can be attributed to the fact that larger firms tend to hold relatively less cash holdings than smaller firms.

Table 1.5
Cash holdings sensitivity to cash flow by financial constraints measure

Dep. Var.: Change in Cash holdings

	Dividend		KZ Index		HP Index		WW Index		OCF Index	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variables	Nondiv. payer	Dividend payer	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
CashFlow	0.0033***	-0.0904***	0.0037	-0.0307***	0.0024**	-0.0311*	0.0032	-0.1493***	0.0028***	-0.0755***
	(2.8140)	(-5.9648)	(1.4662)	(-3.9196)	(2.3891)	(-1.9006)	(0.8349)	(-3.9024)	(2.7522)	(-6.0660)
Q	0.0006***	-0.0021**	0.0009***	-0.0022*	0.0005***	-0.0037***	0.0007	0.0038***	0.0005***	-0.0035***
	(3.5677)	(-2.1338)	(2.6929)	(-1.9582)	(2.8235)	(-4.5085)	(1.5440)	(2.5895)	(2.8800)	(-3.9596)
Size	-0.0003	-0.0051***	0.0010	-0.0126***	0.0103***	-0.0035***	0.0059***	-0.0012	0.0024	-0.0021
	(-0.2550)	(-4.5296)	(0.7127)	(-4.2292)	(3.4598)	(-3.5086)	(3.1747)	(-0.6420)	(0.9554)	(-1.6054)
Expenditures	-0.4701***	-0.2071***	-0.2229***	-0.8328***	-0.6323***	-0.1803***	-0.5962***	-0.2487***	-0.5654***	-0.1819***
	(-17.3186)	(-13.3125)	(-15.2709)	(-11.5056)	(-14.2834)	(-8.8865)	(-16.4270)	(-9.8514)	(-8.7328)	(-15.1353)
Acquisitions	-0.4681***	-0.2719***	-0.2169***	-0.5637***	-0.5737***	-0.2765***	-0.5905***	-0.2634***	-0.5326***	-0.2688***
	(-18.9868)	(-20.1104)	(-19.4377)	(-11.3553)	(-6.7456)	(-25.8018)	(-22.5748)	(-21.5314)	(-6.4419)	(-19.7348)
ΔNWC	0.0010**	0.4312***	0.0032***	0.1207***	0.0008***	0.4092***	0.0008***	0.2113***	0.0008***	0.5824***
	(2.3455)	(18.1491)	(3.6884)	(5.3036)	(2.8116)	(22.2114)	(2.5889)	(3.1505)	(2.8632)	(34.6216)
ΔShortDebt	-0.0108	0.3258***	0.0149*	0.1380***	-0.0109	0.3499***	-0.0136	0.1662**	-0.0102	0.4923***
	(-1.5718)	(7.9829)	(1.7460)	(6.1184)	(-1.5495)	(20.5397)	(-1.4819)	(2.4498)	(-1.4699)	(21.3602)
Observations	53,069	23,613	24,805	24,720	23,314	25,993	25,405	23,069	23,275	26,356
R-squared	0.1403	0.4259	0.2503	0.3038	0.1598	0.4219	0.1645	0.3213	0.1540	0.5901

This table report results from the OLS estimation of the extended regression model (3). All data are from COMPUSTAT annual, and the sample period is from 1989 to 2020. my choice of control variables follows that of Almeida et al. (2004). All specifications are estimated using OLS with firm-by-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level are shown underneath the coefficient estimates in italics. I use ***, **, * to denote significance at 1%, 5%, and 10% levels, respectively.

Table 1.5 shows the results of my alternative regression model, which uses industry-year fixed effects and clustered standard errors at the firm level. I find that the cash flow sensitivity of cash follows the same pattern as my base model: financially constrained firms have a higher sensitivity to cash flow, while financially unconstrained firms have no significant sensitivity. The KZ index group does not exhibit any variation in cash flow sensitivity, regardless of its financial constraint status. As anticipated, expenditure and acquisition show a significant negative coefficient for all firms, indicating that they use their internal cash reserves for these purposes.

Based on my findings, I can conclude that the OCF index performs as well as the dividend, HP, and WW indexes in identifying financially constrained firms that display significant cash flow sensitivity, while financially unconstrained firms do not show any such sensitivity.

1.5.3 R&D sensitivity test

I have added a third test to evaluate the impact of financing friction on real corporate activity and the effectiveness of the five measures in identifying this friction. One major challenge in studying financing constraints is distinguishing financing effects from other factors that may also generate a correlation between finance and investment. Therefore, it is crucial to consider both the source and use of a firm's funds when investigating how constraints affect nontraditional real firm activities.

My primary test examines the sensitivity of a firm's investment in intangible assets to cash generated from the sale of tangible fixed assets. This method is based on Hovakimian & Titman (2006), who find that a fixed investment response to asset sales proceeds provides relatively reliable evidence of financial constraints. Unlike cash and other financial variables, asset sales proceeds are not positively associated with investment opportunities, making them a more robust test of financing constraints. Examining the link between asset sale proceeds and intangible investment offers a more robust test of financing constraints, as there is no apparent alternative financing channel connecting fixed asset sales to corporate R&D investments (Borisova and Brown, 2013).

Cash inflow from asset sales negatively correlates with proxies for investment opportunities (such as Q and sales growth), and other financing sources and proceeds from asset sales are also negatively correlated with concurrent and future R&D investments (Hovakimian and Titman, 2006). This test allows me to evaluate how well the five measures can identify financing friction in real corporate activity.

In order to examine if R&D investment is influenced by cash inflow generated from sales of fixed assets, I incorporate the proceeds received from the sale of property, plant, and equipment.

Additionally, my dynamic investment model accounts for investment opportunities and the accessibility of key R&D financing sources. The baseline empirical model is as follows:

$$RD_{i,t} = \beta_1 AssetSales_{i,t} + \beta_2 RD_{i,t-1} + \beta_3 RD_{i,t-1}^2 + \beta_4 Q_{i,t-1} + \beta_5 CashFlow_{i,t} + \beta_6 StkIssues_{i,t} + \beta_7 DbtIssues_{i,t} + \beta_8 \Delta NWC_{i,t} + \varepsilon_{i,t} \qquad (4)$$

My primary focus in this model is on the total R&D spending ($RD_{j,t}$) for a firm *i* in a particular period *t*. To account for investment opportunities, I incorporate Tobin's Q, the market-to-book ratio at the beginning of the period. I also consider other financing sources, including cash flow from the current period, new debt and stock issuances, and changes in net working capital. To control for unobserved determinants of R&D, I include both firm and year fixed effects. The firm-level fixed effects capture all time-invariant factors that could affect R&D spending, while year fixed effects to control for any macro-level shocks that may impact R&D demand. As with my previous regressions, I calculate standard errors using clustering at the firm level to ensure robustness to within-firm serial correlation.

1.5.3.1 Comparing the R&D sensitivity to asset sales of "constrained" and "unconstrained" firms

Table 1.6 presents the results of my model, which includes Tobin's Q and various financing sources to explain R&D expenditures. Among the five constrained measures I examined, only the OCF index identifies financially constrained firms that rely on proceeds from fixed asset sales to fund their R&D spending. None of the other constrained groups identified by earlier measures show any significant relationship between fixed asset sales and R&D expenditure. Cash flow is an important funding source for R&D expenditure for unconstrained firms, while constrained firms do not exhibit a significant relationship between cash flow and R&D spending, regardless of the measure used to identify them. Both unconstrained and constrained firms use new stock and debt issues to finance their R&D spending. The negative values of net working capital indicate that constrained firms, identified by all measures except for the KZ index, use this method to obtain funds for R&D expenditure. These results support my initial assumption that financially constrained firms are more likely to use proceeds from fixed asset sales to fund their R&D expenditures. Firm and year fixed effects are also included in the model, and standard errors are clustered at the firm level to account for within-firm serial correlation.

Table 1.6

R&D sensitivity to asset sales proceeds by financial constraints measure

Dep. Var.: $R\&D_t$ expenditure

	Dividend		KZ Index		HP Index		WW Index		OCF Index	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variables	Nondiv. payer	Dividend payer	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
$AssetSales_t$	0.0824	-0.0179	-0.0030	0.3633	0.0803	-0.0078	0.1002	-0.0048	0.1477**	-0.0514
	(1.5012)	(-0.7403)	(-0.1440)	(1.5315)	(1.1159)	(-0.7109)	(1.3474)	(-0.2956)	(1.9663)	(-0.9277)
$R\&D_{t-1}$	0.0158	0.2401	0.7391***	0.0379	0.0069	0.3585***	0.0505*	0.0139	0.0092	0.0708
	(0.4620)	(1.3005)	(6.0136)	(1.4459)	(0.1896)	(5.5336)	(1.7574)	(0.1395)	(0.2625)	(0.9000)
$R\&D^2_{t-1}$	0.0000	-0.3219	-0.4243*	-0.0003	0.0000	-0.2496***	-0.0009*	0.1048	0.0000	-0.0323*
	(0.1201)	(-1.4115)	(-1.6600)	(-0.4387)	(0.3592)	(-6.2096)	(-1.8719)	(1.6060)	(0.3050)	(-1.6504)
Q_{t-1}	-0.0001**	-0.0073**	-0.0024***	-0.0001	-0.0001**	-0.0003	-0.0001**	0.0000	-0.0001**	-0.0002
	(-2.0070)	(-2.3885)	(-2.5976)	(-1.5260)	(-2.4629)	(-0.2648)	(-2.2995)	(0.0409)	(-2.0849)	(-1.3599)
$CashFlow_t$	-0.0054	0.4373**	0.0008	-0.0047**	-0.0051	0.0957***	-0.0447	0.0426*	-0.0045	0.1877
	(-0.7201)	(2.0734)	(0.8914)	(-2.4601)	(-0.6779)	(6.5099)	(-1.5141)	(1.8119)	(-0.5747)	(1.5605)
$StkIssues_t$	0.1524***	0.1090**	0.0442**	0.1903***	0.1527***	0.0418***	0.1150***	0.0319	0.1552***	0.0305**
	(5.9771)	(2.2358)	(2.1312)	(6.7338)	(5.8980)	(3.6767)	(7.7138)	(1.3382)	(5.8306)	(1.9816)
$DbtIssues_t$	0.1532***	0.0123	0.0219**	0.0835***	0.1782***	0.0279***	0.0606***	0.0435***	0.1834***	0.0314***
	(3.4176)	(1.2063)	(2.4616)	(3.4675)	(3.1257)	(3.5765)	(3.0696)	(3.7118)	(3.2253)	(4.4534)
ΔNWC_t	-0.0031***	-0.0395*	0.0186	-0.0797***	-0.0031***	-0.0132	-0.0066**	0.0163	-0.0031***	-0.0160
	(-4.0108)	(-1.7337)	(1.0923)	(-2.6375)	(-4.0764)	(-1.4069)	(-2.2812)	(1.3223)	(-3.9378)	(-0.5694)
Observations	23,929	7,812	7,329	12,861	11,756	9,028	12,782	7,377	11,167	9,270
R-squared	0.6747	0.7183	0.8596	0.5648	0.6536	0.8116	0.5115	0.8306	0.6495	0.6739

This table report results from the OLS estimation of the extended regression model (4). All data are from COMPUSTAT annual, and the sample period is from 1989 to 2020. My choice of control variables follows that of Borisova and Brown (2013). All specifications are estimated using OLS with firm-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level are shown underneath the coefficient estimates in italics. I use ***, **, * to denote significance at 1%, 5%, and 10% levels, respectively.

My analysis shows that there are distinct variations in how constrained and unconstrained firms handle their corporate cash policy. However, my tests suggest that only firms categorized as constrained by the proposed OCF index demonstrate this difference. In contrast, unconstrained firms identified by the new measure do not display any significant correlation between asset sales proceeds and R&D expenditures.

1.6 Robustness Test

The results of my previous tests present a consistent view. The four existing measures that classify firms as financially constrained do not exhibit a distinct behavior from those of unconstrained firms that these measures select. Specifically, both average constrained and unconstrained firms identified by existing measures can use a significant portion of the proceeds from equity issues to increase their payout to shareholders. On the other hand, the OCF index effectively distinguished between constrained and unconstrained firms, showing significant differences in behavior between them in all three previous tests.

To assess the effectiveness and potency of the proposed OCF index, I conducted the same three tests on public firms that are more likely to be financially constrained, as measured by Merto's (1974) distance to default measure and Altma's (1968) proposed Z score.

1.6.1 Firms close to default

I assess the robustness of my proposed financial constraints measure by comparing it to two sets of firms close to default by Merton’s distance to default and Altman’s Z score. I have reasons to believe that near-default firms are more likely to face financing constraints. When firms are in such a situation, they may be unable to access public equity markets, which can force them to seek private investments that are costly and restrictive instead (Chaplinsky and Haushalter, 2010).

1.6.1.1 Summary statistics of Firms close to default

Table 1.7

Summary statistics of "constrained" and "unconstrained" firms

	Merton Model		Altman Z-Score		OCF Index	
	High default probability	Low default probability	High default probability	Low default probability	Constrained	Unconstrained
Total real assets,	729.575	2332.569	2418.655	1846.251	849.028	2698.096
Cash/assets	.25	.211	.166	.239	.359	.15
Age (since IPO)	7.673	9.951	9.507	7.799	6.746	9.84
Tangibility	.251	.253	.351	.233	.164	.356
ROA	-.094	.057	-.06	.03	-.178	.17
Marginal tax rate	.072	.173	.084	.182	.081	.216
Total book leverage	.317	.21	.491	.185	.194	.257
Long-term book leverage	.233	.174	.395	.145	.129	.232
% short-term debt (1 year)	.366	.245	.214	.289	.391	.165
Investment opportunities	1.819	1.853	1.676	2.052	2.324	1.929
Sales growth	.394	.766	2.392	1.044	3.075	.201
Employment growth	.119	.263	.183	.31	.567	.151
R&D	.157	.105	.164	.129	.215	.049
Gross investment	.533	.494	.664	.447	.347	.641

The table reports summary statistics for nonfinancial and nonutility public U.S. firms between 1989 and 2020 classified as "constrained" and "unconstrained" by Merton's Distance to Default model, Altman Z model, and OCF Index. For variable definitions and details of their construction, see Appendix 1.

Table 1.7 summarizes the features of firms that fall under the high and low default probability categories as determined by their distance to default and z-score measures. The distance to default measure is based on the methodology Bharath and Shumway (2008) proposed, while the z-score measure follows Altma's (1968) approach.

Similar to the firms constrained by the OCF and other indices, firms identified as having a high probability of default by Merton's model tend to be smaller, younger, and have lower returns on their assets. However, there is a noticeable difference in sales and employment growth rates between these high default probability firms and those identified as having low default probability by most other constraint measures. Merton's model tends to identify firms with low sales and employment growth rates as having a higher probability of default than firms with low default probability.

On the other hand, Altman's z-score measure shows that firms with a high probability of default tend to be relatively larger, older, and have lower returns on assets compared to those with low default probability. Additionally, the high default probability group identified by this measure significantly increases their long-term book leverage compared to their low default probability counterparts.

1.6.1.2 Regression results of firms close to default

Table 1.8

Equity recycling by financial constraints measure

Panel A. Baseline results

Dep. Var.: Change in dividends and repurchases

	Merton Model		Altman Z-Score		OCF Index	
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	High default probability	Low default probability	High default probability	Low default probability	Constrained	Unconstrained
Change in Equity issuance proceeds	0.0218	0.0218**	0.0027	0.0355**	0.0142	0.1826***
	(1.4646)	(2.2673)	(1.2196)	(2.4269)	(1.5684)	(5.6145)
Change other sources of funds	0.0040	0.0009*	0.0002	0.0016*	0.0006	0.1179***
	(1.0543)	(1.6671)	(1.6214)	(1.9318)	(1.6075)	(2.7406)
Change in log total assets	0.0004	-0.0007***	-0.0012**	-0.0008**	0.0001	-0.0031***
	(0.2958)	(-2.6969)	(-2.4712)	(-2.2069)	(0.1748)	(-3.7055)
Observations	326	30,419	2,558	32,025	10,690	13,945
R-squared	0.2954	0.0191	0.1256	0.0240	0.0334	0.1401

Panel B. Focusing on share repurchases only

Dep. Var.: Change in repurchases

	Merton Model		Altman Z-Score		OCF Index	
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	High default probability	Low default probability	High default probability	Low default probability	Constrained	Unconstrained
Change in Equity issuance proceeds	0.0267**	0.0135**	0.0035	0.0299**	0.0138	0.1276***
	(2.0393)	(2.1529)	(1.6403)	(2.2450)	(1.5550)	(4.4243)
Change other sources of funds	0.0026	0.0004	0.0003**	0.0007*	0.0005	0.0384***
	(0.7284)	(1.5580)	(2.0641)	(1.6772)	(1.4575)	(2.5902)
Change in log total assets	0.0006	-0.0007***	-0.0009*	-0.0008***	-0.0000	-0.0025***
	(0.4809)	(-4.0228)	(-1.8105)	(-3.1653)	(-0.0385)	(-4.9417)
Observations	346	30,787	2,664	32,517	10,977	14,128
R-squared	0.2754	0.0177	0.1186	0.0276	0.0225	0.0823

I compare the extent to which "constrained" and "unconstrained" firms use the proceeds of firm-initiated equity issues to increase their payouts to shareholders. In panel A, the payout is measured as the sum of dividends and share repurchases. Panel B focuses on share repurchases only. In panels A and B, firms are categorized as "high default probability" and "low default probability" according to Merton's Distance to Default model, Altman Z model, and OCF Index. My choice of control variables follows Kim and Weisbach (2008). All specifications are estimated using OLS with firm-by-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level are shown underneath the coefficient estimates in italics. I use ***, **, * to denote significance at 1%, 5%, and 10% levels, respectively.

Table 1.8 examines the equity recycling behavior of public firms categorized by their default probability. Panel A presents the findings for firms identified by Merton's model and Z score as having a low probability of default (below 30%), indicating that they engage significantly in equity recycling. These results are consistent with the behavior of constrained firms classified by the OCF index. Panel B, similar to Table 1.3, reports that the findings are robust when using an alternative measure that focuses solely on share repurchases and excludes dividend payments. These results suggest that firms with a low default probability can recycle equity, similar to unconstrained firms identified by my proposed constraint measure.

Table 1.9

Cash holdings sensitivity to cash flow by financial constraints measure

Dep. Var.: Change in Cash holdings

	Merton Model		Altman Z-Score		OCF Index	
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	High default probability	Low default probability	High default probability	Low default probability	Constrained	Unconstrained
CashFlow	0.0344**	0.0018	0.0016	0.0024*	0.0020**	0.0083
	(2.5581)	(1.6123)	(1.0939)	(1.9230)	(2.2511)	(0.9105)
Q	0.0061***	0.0004***	-0.0005	0.0005***	0.0003	0.0025***
	(3.0597)	(4.3961)	(-1.5382)	(5.4959)	(1.6095)	(4.8775)
Size	-0.0066**	0.0011***	-0.0044***	-0.0010***	-0.0013**	-0.0014***
	(-2.1997)	(5.3530)	(-6.6919)	(-4.2846)	(-2.3740)	(-4.9558)
Observations	1,442	71,135	10,092	64,514	26,922	28,409
R-squared	0.1009	0.1350	0.0762	0.0914	0.0872	0.1061

This table report results from the OLS estimation of the baseline regression model (3). All data are from COMPUSTAT annual, and the sample period is from 1989 to 2020. My choice of control variables follows that of Almeida et al. (2004). All specifications are estimated using OLS with firm-by-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level are shown underneath the coefficient estimates in italics. I use ***, **, * to denote significance at 1%, 5%, and 10% levels, respectively.

Table 1.10

Cash holdings sensitivity to cash flow by financial constraints measure

Dep. Var.: Change in Cash holdings

This table report results from the OLS estimation of the extended regression model (3). All data

	Merton Model		Altman Z-Score		OCF Index	
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	High default probability	Low default probability	High default probability	Low default probability	Constrained	Unconstrained
CashFlow	-0.0138	0.0024	0.0027*	0.0018	0.0017**	-0.0980***
	(-0.8240)	(1.5891)	(1.6997)	(1.1109)	(2.1263)	(-6.4561)
Q	0.0045**	0.0004*	-0.0007	0.0005***	0.0004***	-0.0037***
	(2.2806)	(1.7771)	(-1.4136)	(3.0619)	(2.9144)	(-7.4273)
Size	-0.0047	0.0028***	-0.0045***	0.0010***	0.0008	0.0014***
	(-1.6348)	(11.9213)	(-5.9589)	(3.4667)	(1.2552)	(4.2098)
Expenditures	-0.1171	-0.3128***	-0.1878***	-0.3446***	-0.4047***	-0.1154***
	(-1.3089)	(-22.6260)	(-6.5431)	(-21.4971)	(-11.5201)	(-9.8336)
Acquisitions	-0.2220**	-0.4017***	-0.2584***	-0.4027***	-0.4730***	-0.2763***
	(-2.2128)	(-34.7059)	(-8.6717)	(-22.9010)	(-7.8983)	(-24.0152)
ΔNWC	0.1393***	0.0008***	0.0061***	0.0008**	0.0008**	0.4949***
	(3.2968)	(2.8527)	(2.6499)	(2.3260)	(2.4193)	(34.1448)
ΔShortDebt	0.0904	0.0040	0.0048	-0.0368*	-0.0104	0.4228***
	(1.4810)	(0.2309)	(0.7188)	(-1.6902)	(-1.6314)	(13.2705)
Observations	1,374	66,563	9,732	59,921	25,352	26,730
R-squared	0.2273	0.0948	0.0623	0.0815	0.0677	0.4592

are from COMPUSTAT annual, and the sample period is from 1989 to 2020. My choice of control variables follows that of Almeida et al. (2004). All specifications are estimated using OLS with firm-by-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level are shown underneath the coefficient estimates in italics. I use ***, **, * to denote significance at 1%, 5%, and 10% levels, respectively.

Table 1.9 showcases the behavior of high-default probability and low-default probability firms concerning their cash holdings management. Prior research (Almeida et al., 2004) has noted significant differences in how financially constrained and unconstrained firms respond to an additional cash flow. As anticipated, firms with a high default probability tend to save more cash in response to a positive cash flow shock. Specifically, firms classified as having high default probability by Merton's model save 3 cents for each additional dollar of positive cash flow. When I extend my base model to include four other factors that could impact a firm's cash holdings, the results are consistent with those obtained using my OCF index. Firms with a high default probability by z-score also display a high sensitivity to cash inflow.

Table 1.11

R&D sensitivity to asset sales proceeds by financial constraints measure

Dep. Var.: $R\&D_t$ expenditure

	Merton Model		Altman Z-Score		OCF Index	
Variables	(1) High default probability	(2) Low default probability	(3) High default probability	(4) Low default probability	(5) Constrained	(6) Constrained
$AssetSales_t$	0.0464	0.0586	0.0997	0.0775	0.1477**	-0.0514
	(0.2707)	(1.0487)	(1.1249)	(0.9412)	(1.9663)	(-0.9277)
$R\&D_{t-1}$	-0.1592	-0.0476	-0.1350	-0.0398	0.0092	0.0708
	(-0.8925)	(-1.2681)	(-1.1153)	(-1.4584)	(0.2625)	(0.9000)
$R\&D^2_{t-1}$	-0.1051	0.0001*	0.0224***	0.0001**	0.0000	-0.0323*
	(-0.8801)	(1.8646)	(4.7133)	(2.2681)	(0.3050)	(-1.6504)
Q_{t-1}	0.0004	0.0000	-0.0079*	-0.0000	-0.0001**	-0.0002
	(1.2892)	(0.1958)	(-1.6600)	(-1.2802)	(-2.0849)	(-1.3599)
$CashFlow_t$	-0.0134	0.0111	-0.0057	-0.0323	-0.0045	0.1877
	(-0.1958)	(0.6165)	(-0.8660)	(-1.2195)	(-0.5747)	(1.5605)
$StkIssues_t$	0.1206***	0.1793***	0.1294***	0.1511***	0.1552***	0.0305**
	(3.0170)	(5.6746)	(4.4713)	(4.3107)	(5.8306)	(1.9816)
$DbtIssues_t$	-0.0511	0.0757***	0.1673***	0.0866***	0.1834***	0.0314***
	(-0.8681)	(2.7804)	(3.2755)	(2.7063)	(3.2253)	(4.4534)
ΔNWC_t	-0.0583	-0.0022	0.0029	-0.0061**	-0.0031***	-0.0160
	(-1.2075)	(-1.1789)	(0.2897)	(-2.1845)	(-3.9378)	(-0.5694)
Observations	235	29,257	2,655	26,296	11,167	9,270
R-squared	0.8727	0.6012	0.8718	0.5566	0.6495	0.6739

This table report results from the OLS estimation of the extended regression model (4). All data are from COMPUSTAT annual, and the sample period is from 1989 to 2020. My choice of control variables follows that of Borisova and Brown (2013). All specifications are estimated using OLS with firm-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level are shown underneath the coefficient estimates in italics. I use ***, **, * to denote significance at 1%, 5%, and 10% levels, respectively.

In conclusion, my analysis suggests that firms nearing default exhibit similar behavior to constrained firms identified by the OCF index regarding equity recycling and cash flow sensitivity. It is important to note that my tests capture sufficient but not necessary conditions for a firm to be considered unconstrained, and passing these tests does not definitively prove that public firms close to default are genuinely unconstrained. However, using these two groups of high probability to default firms, I can alleviate concerns that my tests may reject public firms that other constrained measures identify as constrained, while the OCF index may misclassify these firms.

1.7 Limitation

Some of my tests have suffered from a poor measurement of Q. To address this issue, I can follow the approach of Cummins et al. (2006) and Abel & Eberly (2002) by using financial analysts' forecasts of Q in my earlier equation. I can define the forecast as the median of two-year ahead earnings scaled by lagged total assets, as Polk & Sapienza (2003) suggested. I can collect earnings data from IBES, where forecast data has been available since 1984.

Additionally, I have not taken macroeconomic shocks into account in my model. As seen in Figure 1, the overall market condition reflected in the average cash-to-asset ratio greatly suffered during financial distress. While such an event would be exogenous and not dictated by firm policy, it is more likely to affect all firms in my sample at a cross-section of time. I can test firm behavior during macroeconomic shocks using a two-step approach developed by Kashyap & Stein (2000) and Campello (2003).

My study has raised interesting questions regarding why financially constrained and unconstrained firms' cash holdings are affected differently by factors such as cash flow, size, capital expenditures, acquisition, networking capital, and short-term debt. A more in-depth study is needed to understand better the underlying causes of these variations in sensitivity between these two groups of firms.

Acharya et al. (2007) suggested that while financially constrained firms rely on cash holdings to hedge against future investment in the face of earnings shortfalls, they can boost investment by reducing their current debt when faced with future high cash flow. This is an intriguing proposition that can be tested. My findings in Table 1.5 show that financially unconstrained firms tend to use their cash holdings rather than current debt (high sensitivity), while constrained firms' cash holdings are less sensitive to changes in their short-term debt.

1.8 Conclusion

Identifying financially constrained firms is crucial to understanding financing frictions' impacting investment, risk management policies, and capital structure (Denis and Sibilkov, 2010; S. Fazzari et al., 1988; WHITED, 1992). Financing frictions also play a significant role in various topics, including a cross-section of returns (Gomes et al., 2006) and monetary policy transmission (Gertler and Gilchrist, 1994).

My study shows that commonly used measures of financial constraints, such as the dividend, KZ, HP, and WW indices, do not accurately capture financially constrained firms' behavior. However, my proposed OCF index can identify firms that behave as if they were financially constrained. In particular, in my test of R&D expenditure sensitivity to asset sales proceeds, the OCF index is the only measure that differentiates between the behavior of constrained and unconstrained firms. Public firms not paying dividends or classified as constrained by other measures can engage in equity recycling, similar to unconstrained firms. I also find evidence that financially constrained firms can mitigate the adverse effects of financial constraints by adopting a restrictive cash management policy focusing on greater cash retention. My regression coefficients show statistically significant differences in cash management behavior in firms classified as financially constrained by the OCF index.

I hope that future researchers will find the proposed OCF index a valuable tool for addressing questions about the effect of agency on firm policies, the efficiency of the internal capital market, and the influence of managerial characteristics on firm behavior.

CHAPTER II: FINANCIAL CONSTRAINTS AND CAPITAL STRUCTURE DECISION

2.1 Introduction

Financing choices vary across firms and time, with equity issues increasing during economic upswings and debt issues during downturns for firms accessing the financial markets. However, firms with higher financial constraints do not follow this counter-cyclical debt pattern as strongly (Choe et al., 1993). Additionally, firms are more likely to issue equity after a significant increase in their equity price (Korajczyk et al., 1992). These findings suggest that firm-specific factors drive financing choices and that the degree of financial market access plays a role. This study aims to quantify the relative importance of these factors by performing an empirical analysis on a sample of firms divided by their level of financial constraints.

Myers (2003) states that theories related to firm financing are not universally applicable but instead rely on certain conditions. Recent studies have emphasized the significance of financial constraints on firm financing (Coles et al., 2012). Thus, I investigate whether the factors influencing leverage differ for firms that face more significant financial constraints. I use dividend payments, Hadlock-Pierce, Whited-Wu indices, and the Operating Cashflow ratio to categorize firms into financially constrained and not.

My study aims to investigate how financial constraints affect capital structure decisions, as these factors can lead to heterogeneity in both time series and cross-sectional firm behavior. Financially constrained firms may have different capital structure preferences than unconstrained firms, and macroeconomic conditions can also influence a firm's capital structure choice. By examining these effects, I can evaluate competing capital structure theories, including the trade-off and pecking order theories. The trade-off theory posits that firms weigh the benefits of increased leverage, such as tax advantages and reduced agency costs, against the costs of higher leverage, such as increased bankruptcy risk, to determine the optimal level of leverage. In contrast, the pecking order theory suggests that firms prefer to finance first with internal funds, then with debt, and finally with equity, as external financing may be more costly for riskier securities due to informational asymmetries between managers and security holders.

When corporations finance their operations with debt, they divert some of their expected future cash flows away from equity holders in exchange for immediate cash. Despite extensive theoretical and empirical research on this topic over the years, the drivers of this decision remain elusive. One reason is that many empirical studies have been designed to support a particular theory, making it difficult to draw overarching conclusions from the vast amount of evidence. While this approach may be suitable for individual research papers, it has hindered the development of a solid empirical foundation for understanding capital structure decisions. Consequently, in recent decades, the literature has lacked the necessary empirical basis to effectively assess the strengths and weaknesses of the leading theories (Frank and Goyal, 2009).

Determining which capital structure theories hold merit between constrained and unconstrained firms is debatable, as opinions vary. Numerous theories have been proposed, but only a handful have garnered widespread support. The most prominent theory, as outlined in many corporate finance textbooks, is the trade-off theory, which emphasizes the importance of taxation and deadweight bankruptcy costs. Another popular theory is the pecking order theory, first proposed by Myers (2003), which posits a financing hierarchy that prioritizes retained earnings, followed by debt and equity. A newer concept gaining traction is the idea of "market timing," while agency theory also plays a role in much of the theoretical discourse, often incorporated into the trade-off framework. Supporters of various capital structure theories often cite empirical evidence favoring their preferred model.

Harris and Raviv (1991) suggest that existing studies generally agree on certain factors that influence leverage, such as fixed assets, growth opportunities, firm Size, and nondebt tax shields, while decreasing volatility, advertising, R&D expenditures, bankruptcy probability, profitability, and product uniqueness. However, Titman et al. (1988) find no evidence to support the influence of nondebt tax shields, collateral value, volatility, or future growth on debt ratios. This conflicting evidence presents a dilemma for proponents of different capital structure theories, who must choose between opposing outlines of previous literature. This study aims to clarify this empirical challenge by explaining the deviation through constraints.

This study aims to enhance my understanding of capital structure in multiple ways. First, by considering numerous factors previously discussed in the literature, I investigate which factors are consistently significant predictors of leverage. Second, since corporate financing patterns may have changed over the years, I consider the time-varying nature of this phenomenon mainly due to the influence of market forces and other factors. Lastly, there is a belief that diverse theories may apply to firms based on their particular circumstances. In order to tackle this issue, I analyze the impact of conditioning on firm-specific financial constraint factors.

When testing for a correlation between leverage and other factors, it is crucial to establish a clear definition of leverage. Various definitions of leverage have been employed in empirical research, with some scholars favoring book leverage while others prefer market leverage. There is ongoing debate as to which measure reflects leverage more accurately.

Myers (1977) asserts that managers tend to focus on book leverage, as existing assets rather than growth opportunities typically support debt. Furthermore, financial markets can be highly volatile, leading managers to view market leverage as an unreliable indicator of corporate financial policy. This perspective is supported by Graham and Harvey (2001), who found that many managers do not adjust their capital structure in response to equity market changes due to adjustment costs that make continuous rebalancing impractical.

Supporters of market leverage argue that the book value of equity is not a meaningful measure in terms of managerial decision-making but instead is used to balance the balance sheet. Welch, (2004) further argues that the book value of equity may even be negative, whereas assets cannot. In addition, the book measure only reflects past events, whereas markets are forward-looking. Therefore, these two measures do not need to align (Barclay et al., 2006).

My primary focus in reporting my findings is on the Total Debt Market Value (TDMV) ratio, but I also include results for three other definitions of leverage due to the different perspectives on this concept. Using a market-based definition of leverage, I have discovered reliable empirical patterns that explain a substantial amount of the variation in market leverage among publicly traded financially constrained and unconstrained firms from 1989 to 2019. my analysis indicates that six factors account for over 66% of the variation in leverage, while the remaining factors only contribute 3%. I estimate the "core leverage model" proposed by Frank and Goyal (2009), incorporating these factors after dividing firms based on financial constraints, which display consistent signs and statistical significance across various data treatments. Conversely, the remaining factors are less consistent. The six factors for market leverage include:

- *Industry leverage*: financially constrained firms operating in industries where the median firm has high leverage typically exhibit higher leverage than unconstrained firms in the same industry.
- *Tangibility*: financially unconstrained firms with a more significant proportion of tangible assets usually have higher leverage than unconstrained firms.
- *Profits*: financially unconstrained firms generally have lower leverage than constrained firms with the same level of profits.
- *Firm Size*: Regarding similar assets, financially unconstrained firms have higher leverage than constrained firms.
- *Market-to-book assets ratio*: financially unconstrained firms with a high market-to-book ratio usually have lower leverage than constrained firms.
- *Expected inflation*: financially constrained Firms tend to lower leverage during expected high inflation than unconstrained firms.

These six factors explain that a market-based definition of leverage is more effective than a book-based one. Regarding a book-based definition of leverage, the market-to-book ratio, firm Size, and expected inflation would have been omitted from the core model. However, the remaining factors - median industry leverage, tangibility, and profits - demonstrate robustness across various alternative definitions of leverage among my constrained and unconstrained groups.

It is important to note that market-based leverage is forward-looking, while book-based leverage is backward-looking. Therefore, the market-to-book ratio, firm Size, and expected inflation factors may reflect forward-looking effects, while median industry leverage, tangibility, and profitability factors reflect the effects of the past.

I include dividend payment as a proxy for financial soundness when evaluating firms in varying financial situations. Hadlock & Pierce (2010) and Whited & Wu (2006) proposed two financial constraint measures, respectively. My final constraint measure is based on the operating cash flow ratio.

Overall the static trade-off theory predicts that the sign of five out of the six core factors is as expected, where the trade-off between deadweight bankruptcy costs and the tax saving of debt is considered. However, the sign-on profits do not align with the static trade-off theory. Instead, it is consistent with dynamic trade-off models proposed by Fischer et al. (1989). According to these models, firms let their leverage drift most of the time and only adjust it when it deviates too far from the target. This finding also aligns with Tsyplako's (2008) theory, which suggests that firms accumulate retained earnings until the time is right to purchase physical capacity due to the time-to-build factor.

Although the tax versus bankruptcy trade-off is the most widely recognized version of the trade-off theory, other models fall under the general trade-off theory category. Stulz (1990) and Morellec (2004) are examples of such models where agency costs are paramount. Stulz, for instance, argues that financing policies influence the resources available to managers, which reduces the costs associated with over and underinvestment. I hypothesize that agency costs, such as managerial discretion and stockholder-bondholder conflicts, are more critical than taxes for financially constrained firms. My findings support the well-known fact that it is challenging to identify tax effects in the data.

Nevertheless, taxes still matter to some extent, as Graham (2003) noted. Furthermore, Hennessy and Whited (2007) suggest that tax effects may be challenging to identify even when they are part of the firm's problem due to transaction costs. Hence, I believe that more research is necessary to distinguish the relative importance of the agency costs versus the tax-bankruptcy costs trade-offs in financially constrained and unconstrained firms.

The pecking order theory is commonly utilized to explain firms' financing decisions and accurately predicts the effect of profits (Shyam-Sunder and Myers, 1999). However, as Fama and French (2002) and Frank and Goyal (2003) pointed out, the theory has other shortcomings. In its current state, the pecking order theory cannot account for several of the characteristics I observe in how firms finance themselves.

Although the market timing theory correctly predicts the impact of expected inflation and the market-to-book assets ratio, it does not make predictions for many of the patterns in the data explained by the trade-off theory. Considerable theoretical development is required to account for all the empirical regularities observed in the data.

No unified leverage model can directly explain the six reliable factors affecting firms on various levels of constraints. However, the key elements required to establish such a theory are present in the existing literature. The theory must explicitly incorporate intertemporal effects to reflect the impact of market-to-book and expected inflation. To account for profits, the theory may have friction, such as significant fixed costs of adjustment or time-to-build. The theory must also incorporate the role of tangibility by including a mechanism for the repossession of the asset by debt suppliers. Additionally, the theory may consider some form of financial constraints to explain the effect of firm Size.

The remainder of this paper is structured as follows. In Section 2.2, I offer a concise summary of the key predictions of prominent capital structure theories. Section 2.3 details my hypotheses. I then detail the data utilized in my analysis in Section 2.4. Section 2.5 discusses the factor selection process and presents the resulting outcomes. Subsequently, Section 2.6 presents the primary leverage model derived from my analysis. Finally, in Section 2.7, I provide my conclusions.

2.2 Capital Structure Theories

This section briefly overviews the primary capital structure theories and summarizes their predictions concerning observable leverage factors.

2.2.1 Trade-off theory

The trade-off theory suggests that the balance between the benefits and costs of debt determines a firm's capital structure. The costs and benefits can be obtained in different ways. The tax-bankruptcy trade-off perspective suggests that firms weigh the tax benefits of debt against bankruptcy costs. On the other hand, the agency perspective suggests that debt helps discipline managers and reduces agency problems of free cash flow. However, debt increases conflicts between shareholders and debt holders.

Furthermore, the interactions between the product and factor markets suggest that in some firms, making significant firm-specific investments is necessary for efficiency. Capital structures that make such investments insecure will generate few such investments. This perspective differs from the tax-bankruptcy trade-off as the costs of debt arising from the disruption of normal business operations and not just bankruptcy costs. These theories trade-off the advantages of debt with liquidation costs rather than bankruptcy costs. For instance, Titman (1984) argues that firms offering unique products risk losing customers if they seem likely to fail. Maksimovic and Titman (1991) examine how leverage affects a firm's incentives to provide a high-quality product.

2.2.2 Pecking order theory

The pecking order theory, first introduced by Myers (1984), proposes that firms prefer to use internal funds first, then debt, and finally equity when raising capital. This is because external financing, such as equity, signals that the firm is overvalued, leading to a drop in equity value, while investors view debt as less risky. Retained earnings, on the other hand, do not have this signaling problem. The pecking order theory does not suggest an optimal leverage ratio and is often associated with asymmetric information. However, it can also be motivated by other factors such as tax considerations, agency problems, or behavioral biases.

2.2.3 Market timing theory

Market timing, also introduced by Myers (1984), is gaining renewed interest in academic literature. Surveys show that managers still support the concept, and empirical studies have found evidence consistent with market timing behavior, such as firms issuing equity after stock price increases. Some models combine market timing with the pecking order theory to explain pre-issue run-ups. Others argue that capital structure is best understood as the cumulative effect of past attempts to time the market. The basic idea behind market timing is that managers consider current conditions in debt and equity markets and raise funds from whichever market appears more favorable. If neither market looks good, they may defer issuances. However, they may raise funds without the immediate need if conditions seem favorable. While this idea does not address all factors in corporate leverage studies, it highlights the role of stock returns and debt market conditions in capital structure decisions.

2.2 Hypotheses development

I have compiled an extensive list of factors that are purported to impact corporate leverage from previous literature. These factors include profitability, Size, growth, industry, asset type, taxation, risk, supply-side constraints, debt market conditions, and macroeconomic conditions. Further details about these factors are provided in Appendix 2. However, these theories are not formulated using standard accounting definitions, which necessitates making judgments about the relationship between observable data and theory to test them. Although some of these findings are undisputed, there may be significant differences of opinion in certain instances.

2.3.1 Financial constraints and profitability on leverage

The tax and bankruptcy costs perspective suggests that profitable firms face lower expected costs of financial distress and hence, find interest tax shields more valuable. Consequently, profitable firms are predicted to use more debt. Moreover, according to the agency costs perspective, the discipline provided by debt is likely to be more valuable for profitable firms, as they may have significant free cash flow problems (Jensen, 1986).

However, recent studies indicate that the predictions of the trade-off theory concerning profitability are more intricate than those based on static models (Strebulaev, 2007). In a dynamic trade-off model, there can be various frictions that may lead to the appearance of a negative relationship between leverage and profitability in the data. Empirically, it has been argued that firms accumulate profits passively, which explains the negative relationship between leverage and profitability (Kayhan and Titman, 2007).

In contrast, the pecking order theory suggests that firms prefer internal finance over external funds. If investments and dividends remain fixed, more profitable firms tend to become less levered over time.

Therefore I propose the following hypothesis:

H_1: Financially constrained firms will lower leverage less than unconstrained firms when profitability increases.

2.3.2 Financial constraints and firm Size on leverage

According to the trade-off theory, larger, more diversified firms will likely face lower default risk. Additionally, older firms that have established a positive reputation in debt markets are expected to incur lower agency costs related to debt. Therefore, the trade-off theory suggests that larger, more mature firms will have relatively higher debt levels. On the other hand, the pecking order theory is often interpreted as predicting an inverse relationship between firm size and leverage and between firm age and leverage. Large firms are generally better known as they have existed for longer, and older firms have had the opportunity to retain earnings.

Therefore I propose the following hypothesis:

H_2: Financially constrained firms will have lower leverage than unconstrained firms of the same Size.

2.3.3 Financial constraints and growth on leverage

The costs of financial distress increase as firms grow, but the free cash flow problem decreases, and debt-related agency issues become more acute. As growing firms value stakeholder co-investment, the trade-off theory predicts a negative relationship between growth and leverage. Conversely, the pecking order theory predicts that firms with more investments (holding profitability fixed) should accumulate more debt over time. Therefore, growth opportunities and leverage are positively related under the pecking order theory.

The market-to-book asset ratio is the most widely used measure of growth opportunities and is also the most dependable. However, a higher market-to-book ratio may also be influenced by stock mispricing. If capital structure decisions are driven by market timing, a higher market-to-book ratio should reduce leverage because firms exploit equity mispricing through equity issuances. Additionally, a negative mechanical relation between a market-based definition of leverage and the market-to-book assets ratio may exist.

Capital expenditures and the change in log assets, also proxies for growth, represent outflows. As discussed in Shyam-Sunder and C. Myers (1999), they directly increase the financing deficit. Therefore, under the pecking order theory, these variables should positively relate to debt.

Therefore I propose the following hypothesis:

H_3: Financially constrained firms will lower leverage less than unconstrained firms of the same growth level.

2.3.4 Financial constraints and industry conditions on leverage

There is a well-known variation in leverage ratios across different industries, as highlighted in corporate finance textbooks like Smolira et al. (2008) and supported by empirical studies such as Lemmon et al. (2008). The reasons for this variation can be interpreted in different ways. One possibility is that managers use the industry median leverage as a benchmark for their own firm's leverage, and therefore industry median leverage is often used as a proxy for target capital structure. Evidence suggests that firms adjust their debt ratios toward the industry average (Hovakimian et al., 2001).

Another explanation for industry effects on leverage ratios could be attributed to correlated but unobserved factors, such as product market interactions, competition, heterogeneity in assets, business risk, technology, or regulation. I examine two industry variables - industry median growth and industry median leverage - and apply trade-off theory to predict that higher industry median growth would result in less debt, while higher industry median leverage would result in more debt. I also explore the impact of regulation on leverage, with regulated firms expected to have more debt due to stable cash flows and lower expected costs of financial distress but less desirable from a control perspective due to reduced shareholder-manager conflicts. Trade-off theory predicts an ambiguous effect of regulation on leverage.

From the pecking order perspective, the industry is only relevant to the extent that it is a proxy for the firm's financing deficit. On the other hand, market timing theory suggests that the industry matters only if valuations are correlated across firms within an industry.

Therefore I propose the following hypothesis:

H_4: Financially constrained firms' leverage is more sensitive to industry conditions than unconstrained firms.

2.3.5 Financial constraints and nature of assets on leverage

The valuation of tangible assets such as property, plant, and equipment is easier for outsiders than intangible assets like goodwill, which lowers expected distress costs. Tangibility also makes it difficult for shareholders to substitute high-risk assets for low-risk ones, reducing debt-related agency problems. Therefore, I predict a positive relationship between tangibility and leverage. Conversely, firms making large discretionary expenditures like SGA and R&D expenses have more intangible assets and, consequently, less debt.

According to stakeholder co-investment theory (Titman, 1984), firms producing unique products, such as durable goods, should have less debt in their capital structure. This is because unique industries have more specialized labor, which results in higher financial distress costs and, subsequently, less debt. To protect unique assets resulting from large expenditures on SG&A and R&D, these firms will also have less debt.

In contrast, the pecking order theory predicts the opposite. The low information asymmetry associated with tangible assets makes equity issuances less costly, leading to lower leverage ratios for firms with higher tangibility. However, if adverse selection is associated with assets in place, tangibility increases adverse selection and results in higher debt. This ambiguity under the pecking order theory arises because tangibility can be considered a proxy for different economic forces. Furthermore, R&D expenditures increase the financing deficit and are particularly prone to adverse selection problems, affecting debt positively under the pecking order theory.

Therefore I propose the following hypothesis:

H_5: Financially constrained firms will have lower leverage than unconstrained firms of the same tangibility level.

2.3.6 Financial constraints and taxes on leverage

When tax rates are high, the interest tax benefits of debt increase. The trade-off theory predicts firms will issue more debt to take advantage of higher-interest tax shields. DeAngelo and Masulis (1980) have demonstrated that nondebt tax shields are a substitute for the tax benefits of debt financing. Nondebt tax shields proxies, such as net operating loss carryforwards, depreciation expense, and investment tax credits, are expected to affect leverage negatively.

Therefore I propose the following hypothesis:

H_6: Financially constrained firms' leverage is more sensitive to taxes than unconstrained firms.

2.3.7 Financial constraints and debt market conditions on leverage

Taggart (1985) states that the actual value of tax deductions on debt increases when inflation is expected to be high. Therefore, the trade-off theory predicts a positive relationship between leverage and expected inflation. Market timing in debt markets also leads to a positive relationship between expected inflation and leverage if managers issue debt when expected inflation is higher than current interest rates. Barry et al. (2009) found that firms issue more debt when current interest rates are lower than historical levels.

The term spread is a reliable indicator of economic performance and anticipated growth prospects. If a higher term spread indicates greater growth, then the term spread is expected to have a negative impact on leverage.

Therefore I propose the following hypothesis:

H_7: As term spread widens, financially constrained firms will lower leverage less than unconstrained firms.

2.3.8 Financial constraints and macroeconomic conditions on leverage

According to Gertler and Gilchrist's (1994) study, large firms experience an increase in aggregate net debt issues after monetary contractions induce recessions, whereas small firms' debt levels remain stable. During expansions, stock prices rise, expected bankruptcy costs decrease, taxable income increases, and cash reserves increase, leading to firms borrowing more. Additionally, collateral values are likely procyclical, and borrowing against collateral may result in procyclical leverage.

However, agency problems between managers and shareholders may be more severe during downturns because managers' wealth decreases relative to shareholders. If the debt can align managers' incentives with those of shareholders, leverage should be counter-cyclical.

If the pecking order theory is valid, leverage should decrease during expansions since firms have additional internal funds, all else being equal. Furthermore, if corporate profits have recently increased, agency problems between shareholders and managers should be less severe. Therefore, firms should issue less debt.

Therefore I propose the following hypothesis:

H_8: Financially constrained firms' leverage is more sensitive to changing microeconomic conditions than unconstrained firms.

2.3 Data Description

My sample comprises US firms listed on Compustat between 1989 and 2019. The data are quarterly and adjusted to 2012 dollars using the GDP deflator. Stock return data are sourced from the Center for Research in Security Prices (CRSP) database, while macroeconomic data are obtained from the Federal Reserve Bank Of St. Louis website, as detailed in the Appendix. Financial and utility firms and companies lacking book value of assets are excluded. The analysis employs winsorized ratios at the 1% level in both distribution tails to substitute outliers and the most severely misrecorded data.

2.4.1 Defining Leverage

Various definitions of leverage are employed in the literature, with most studies using a debt ratio of some sort. These ratios differ based on whether book or market values are utilized and whether only long-term debt or total debt is considered. Additionally, the interest coverage ratio can be viewed as a measure of leverage. Further adjustments can be made by considering a range of assets and liabilities.

In this study, I analyze four alternative definitions of leverage: first, the ratio of total debt to the market value of assets (TDMV); second, the ratio of total debt to book value of assets (TDBV); third, the ratio of long-term debt to the market value of assets (LTDMV); fourth, the ratio of long-term debt to book value of assets (LTDBV). TDMV is my primary focus, though the literature often claims that results are robust across various leverage definitions.

Upon reviewing earlier studies, I anticipate that the results will remain broadly consistent across the four measures, which is reassuring. However, some results' robustness to significant variations between different measures can be troublesome.

2.4.2 Descriptive statistics

Table 2.1 presents the descriptive statistics, showing that the median leverage is lower than the mean leverage. There is a significant difference in leverage across firms, with the 25th percentile of TDMV being 0.008 and the 75th percentile being 0.357. However, the other thre e leverage measures have mean values that diverge significantly from the medians.

There are also remarkable changes in the cash flows. The mean for profitability is negative, but the median is positive. It appears that public firms now include currently un profitable firms with expectations of future profitability, as Fama and French (2002) and DeAngelo et al. (2004) noted. Additionally, corporate income taxes have declined over time, likely due to the dropping of statutory tax rates and the average including more unprofitable firms. The median firm both issues and reduces a significant debt each year. Nevertheless, the overall market and economic factors mean and median does not vary significantly during the sample period.

Table 2.1

Summary statistics for non-financial U.S. firms.

Variable	N	Mean	Std. Dev.	Distribution		
				p25	Median	p75
Leverage measure						
TDMV	514667	.2203	0.2506	.0078	.1255	.3565
TDBV	610160	.3766	0.7959	.0269	.2092	.4175
LTDMV	514667	.1519	0.2055	0	.0514	.2397
LTDBV	626908	.2019	0.2701	0	.1037	.3071
Factors						
Profitability						
Profit	578121	-.0532	0.3279	-.0182	.0228	.0426
Firm Size						
Assets	631707	4.3659	2.6756	2.6089	4.4076	6.2369
Mature	634144	.6203	0.4853	0	1	1
Growth						
Mkt-Book	512847	4.5185	15.5869	.8365	1.3293	2.5502
ChgAsset	603298	.0274	0.2168	-.0338	.0103	.0552
CapEx	619591	.0353	0.0517	.0058	.0172	.0418
Industry						
IndLvg	632608	.172	0.1687	.0348	.1293	.2616
IndGrw	628695	.0095	0.0489	-.0044	.0106	.0248
Nature of Assets						
Tangibility	629989	.2601	0.2402	.0711	.1807	.3831
R&D	287154	.4038	0.9352	.0087	.0744	.2095
SGA	517630	.6215	1.6428	.1453	.2657	.4676
Taxes						
Dep.	595961	.0358	0.0405	.0118	.0241	.0444
InvTxCr	68	0	0.0001	0	0	0
Debt market Conditions						
TermSprd	634060	.0164	0.0115	.0068	.0156	.0264
Macroeconomic conditions						
Inflation	634060	.0256	0.0085	.0193	.026	.0313
MacroProf	606038	.0168	0.0745	-.0088	.0201	.043
MacroGrw	606038	.0064	0.0057	.0036	.0068	.0098

Table 2.1 shows the summary statistics of the key variables used in this study. The data covers the period from 1989-2019. The firm data is from Compustat quarterly, and The debt market and macroeconomic conditions data were collected from the federal reserve bank St. Louis.

The following table presents a breakdown of Table 2.1 based on financial constraint levels. I created eight groups based on four constraint measures. Overall, the dividend, HP, WW, and OCF indices effectively identify constrained firms that are smaller, younger, have more cash, and possess fewer tangible assets. These constrained firms also exhibit higher R&D and SGA expenses than their unconstrained counterparts.

Table 2.2

Summary Statistics of financially constrained and unconstrained firms.

Variable	Dividend Cons.	Dividend Uncons.	HP Cons.	HP Uncons.	WW Cons.	WW Uncons.	OCF Cons.	OCF Uncons.
Leverage Measures								
TDMV	.22	.37	.16	.28	.18	.29	.17	.19
TDBV	.38	.4	.55	.29	.42	.32	.44	.24
LTDMV	.15	.35	.07	.24	.1	.25	.1	.17
TDMV	.2	.39	.14	.25	.16	.27	.17	.21
Factors								
Profitability								
Profit	-.05	.03	-.2	.03	-.09	.03	-.17	.04
Firm size								
Assets	4.37	7.92	1.64	6.88	2.47	7.1	2.93	5.49
Mature	.62	.92	.52	.8	.64	.75	.55	.71
Growth								
Mkt-Book	4.52	1.1	9.48	1.5	4.86	1.59	7.54	2.07
ChgAsset	.03	.03	.04	.02	.02	.02	.02	.04
CapEx	.04	.06	.03	.04	.03	.04	.03	.05
Industry								
IndLvg	.17	.2	.12	.22	.12	.24	.13	.19
IndGrw	.01	.01	.01	.01	0	.01	0	.01
Nature of Assets								
Tangibility	.26	.72	.2	.31	.22	.34	.19	.34
R&D	.4	.	.7	.1	.72	.1	.89	.11
SGA	.62	.	1.39	.24	1.14	.24	1.37	.28
Taxes								
Dep.	.04	.04	.04	.03	.04	.03	.04	.04
InvTxCr	0	0	.	0	.	0	.	0
Debt Market Conditions								
TermSprd	.02	.02	.02	.02	.02	.02	.02	.02
Macroeconomic conditions								
Inflation	.03	.02	.03	.03	.03	.03	.03	.03
MacroProf	.02	.01	.02	.02	.02	.02	.02	.02
MacroGrw	.01	0	.01	.01	.01	.01	.01	.01

Table 2.2 shows the summary statistics of the key variables used in this study. The data covers the period from 1989-2019. Firms are divided into groups based on four financial constraint measures. The firm data is from Compustat quarterly, and The debt market and macroeconomic conditions data were collected from the federal reserve bank St. Louis.

Table 2.2 focuses on firm characteristics and the differences between financially constrained and unconstrained firms. Financially constrained firms have less market value of total debt, the market value of long-term debt, and the book value of long-term debt compared to financially unconstrained firms in my sample. In contrast, financially constrained firms have higher book leverage than unconstrained firms. This difference is observable among all the groups of the four constrained measures. All the constrained groups have negative profitability, whereas unconstrained firms have positive profitability values on average. I also find that constrained firms have a higher market-to-book ratio, lower capital expenditures, fewer tangible assets, higher R&D expenditures, and higher SGA expenses than their unconstrained counterparts.

2.4.3 Empirical Evidence on Factor Selection

The correlations between the factors and each of the leverage measures are reported in Table 2.3. The sample period from 1989 to 2019 is divided into each quarter, and firms are also divided into constrained and unconstrained groups based on four measures. Positive and significant correlations with leverage are found for the log of assets, age, median industry leverage, and tangibility. In contrast, significant negative correlations are found for profitability, the market-to-book ratio, and expected inflation. Linear regressions are used to study the effects of the factors, with the firm i's leverage denoted as $L_{i,t}$ and the set of factors observed at firm i at date $t-1$ denoted as $F_{i,t-1}$. The constant α and the vector β are the parameters to be estimated, and t-statistics corrected for clustering at the firm, industry, and year level are used in the tests to remove the effects of clustering on the estimated standard errors, as suggested by Petersen (2008).

$$Leverage_{i,t} = \alpha + \beta Factor_{i,t\text{-}1} + \varepsilon_{i,t} \qquad (1)$$

Table 2.3

Correlations between Market Value Leverage Ratios and Factors.

TDMV	Full	Dividend		HP		WW		OCF	
VARIABLES	Sample	Cons.	Uncons.	Cons.	Uncons.	Cons.	Uncons.	Cons.	Uncons.
Profit	-0.02***	-0.02***	-2.44***	-0.01***	-1.42***	-0.02***	-0.74***	-0.01***	-0.38***
	(-4.87)	(-4.87)	(-6.96)	(-3.04)	(-7.16)	(-3.47)	(-5.08)	(-3.11)	(-5.02)
Assets	0.02***	0.02***	0.06	0.001	0.03***	0.01***	0.03***	0.01***	0.03***
	(5.94)	(5.94)	(1.54)	(0.12)	(7.00)	(2.75)	(8.28)	(4.05)	(7.56)
Mature	0.05***	0.05***	0.10***	0.06***	0.01	0.05***	0.03***	0.06***	0.03***
	(7.06)	(7.06)	(13.77)	(11.45)	(0.87)	(8.44)	(3.51)	(11.84)	(4.21)
Mkt-Book	-0.01***	-0.01***	-0.27***	-0.00***	-0.03***	-0.01***	-0.01***	-0.01***	-0.01***
	(-9.74)	(-9.74)	(-13.09)	(-11.03)	(-4.05)	(-8.32)	(-4.29)	(-12.11)	(-4.60)
ChgAsset	-0.06***	-0.06***	-0.01	-0.04***	-0.11***	-0.06***	-0.10***	-0.04***	-0.09***
	(-8.19)	(-8.18)	(-0.01)	(-9.57)	(-8.43)	(-9.92)	(-7.64)	(-9.66)	(-6.63)
CapEx	-0.30***	-0.30***	-0.27	-0.21***	-0.40***	-0.23***	-0.42***	-0.14***	-0.23***
	(-6.31)	(-6.31)	(-0.88)	(-8.01)	(-5.43)	(-6.30)	(-5.99)	(-5.82)	(-4.41)
IndLvg	0.47***	0.47***	0.38***	0.48***	0.45***	0.51***	0.54***	0.51***	0.40***
	(7.08)	(7.08)	(2.07)	(18.77)	(6.07)	(19.71)	(21.04)	(20.87)	(5.06)
IndGrw	-0.21***	-0.21***	-0.81***	-0.12***	-0.25***	-0.22***	-0.25***	-0.17***	-0.22***
	(-4.18)	(-4.18)	(-2.76)	(-2.92)	(-3.58)	(-3.40)	(-3.53)	(-3.91)	(-2.62)
Tangibility	0.20***	0.20***	0.72**	0.15***	0.15***	0.23***	0.15***	0.17***	0.21***
	(13.27)	(13.27)	(2.35)	(10.61)	(4.27)	(12.93)	(3.69)	(14.84)	(6.8)
R&D	-0.01***	-0.01***	-	-0.01***	0.01***	-0.01***	-0.01	-0.01***	0.01
	(-8.21)	(-8.21)	-	(-12.61)	(3.78)	(-8.68)	(-1.53)	(-12.11)	(-1.30)
SGA	-0.00***	-0.01***	-	-0.01***	0.01	-0.01***	-0.01	-0.01***	0.01
	(-4.32)	(-4.32)	-	(-4.08)	-0.22	(-4.23)	(-0.51)	(-5.62)	(-1.29)
Dep.	0.50***	0.50***	-0.37	0.45***	0.43***	0.49***	0.35**	0.53***	0.30***
	(8.25)	(8.25)	(-1.56)	(11.41)	(3.28)	(7.67)	(2.57)	(12.7)	(3.24)
InvTxCr	111.47***	-	111.47***	-	111.47	-	111.47***	-	111.47***
	(13.63)	-	(-13.63)	-	(0.01)	-	(22.59)	-	-13.63
TermSprd	-0.18	-0.18	2.43**	-0.01	-0.05	-0.03	0.05	-0.17	-0.16
	(-0.68)	(-0.68)	(2.20)	(-0.05)	(-0.16)	(-0.12)	(0.14)	(-0.71)	(-0.65)
Inflation	-1.51***	-1.51***	-5.26***	-2.57***	-0.67	-2.20***	-1.22**	-2.21***	-1.06**
	(-3.12)	(-3.12)	(-2.62)	(-5.72)	(-1.21)	(-4.87)	(-2.00)	(-4.75)	(-2.14)
MacroProf	-0.05	-0.05	-0.04	-0.03	-0.06	-0.03	-0.06	-0.05	-0.05
	(-0.81)	(-0.81)	(-0.37)	(-0.69)	(-0.78)	(-0.67)	(-0.74)	(-1.08)	(-1.01)
MacroGrw	-2.33***	-2.33***	-2.84*	-2.16***	-2.48***	-2.27***	-2.60***	-2.16***	-1.87***
	(-5.79)	(-5.79)	(-1.70)	(-7.40)	(-4.38)	(-6.94)	(-4.32)	(-5.59)	(-4.20)

This table reports results from the OLS estimation of the regression model (1) using leverage measures and various factors. All data are from COMPUSTAT quarterly, and the sample period is from 1989 to 2019. T-stats reported in parentheses are robust to heteroskedasticity and are clustered at the year and four-digit SIC industry levels. The macroeconomics data are from the Federal Reserve Bank of St. Louis. (∗∗∗); (∗∗); (∗) denote statistical significance at 1%, 5%, and 10% levels, respectively.

When I compare the factors and leverage ratios, there are some significant differences between constrained and unconstrained firms. Based on my findings, all firms lower their leverage when profitability increases, which aligns with the dynamic pecking order theory. However, a constrained firm will lower its leverage less compared to an unconstrained firm. Similarly, a firm's size positively correlates with its leverage ratio. All my estimated coefficients share the same positive or negative sign between the constraint and unconstrained groups, indicating that factors affect firm leverage in the same way regardless of their financial status. Even if the signs are the same, coefficient values tell a different story. As firm profitability increases, all firms will lower their market leverage ratio, but an unconstrained firm would significantly lower its leverage compared to a constrained firm. This difference in coefficient remains consistent among all four measures.

A similar trend also can be observed with firm size on the market value of debt. Financially unconstrained firms can raise three times more debt than a financially constrained firm of the same size. A market value of debt is negatively correlated with growth rate. A higher growth rate is resulting a lower market value of debt for firms, whereas constrained firms lower their debt less than an unconstrained firm. I can find differences in firm behavior among constrained and unconstrained firms when considering a firm's capital expenditure and its relation to the market value of debt. As a firm's capital expenditure increases, it lowers its total market value of debt ratio. An unconstrained firm can lower its market value of debt ratio almost twice as much as a constrained firm. Similar to firm growth, the industry a firm operates in also correlates to its market value of debt. On average, a financially unconstrained firm would lower its market value of debt more than a constrained firm if the industry saw growth the previous year. Depreciation is positively related to the market value of debt, and an unconstrained firm's debt increases faster than a constrained firm. This behavior can be explained by how depreciation affects a firm's taxable income. As depreciation lowers a firm's taxable income, it also increases the value of the firm's tax shield. The market value of debt is directly related to the firm's tax shield. As constrained firms' cash holdings are more sensitive to cash inflow, these firms' debt market value is also more sensitive to depreciation than unconstrained firms. Expected inflation is another important factor that significantly correlates negatively with the market value of debt across all groups of constrained and unconstrained firms. Higher expected inflation results in higher borrowing costs. Constrained firms' financial strength is limited compared to financially solvent firms, so it is reasonable to expect constrained firms to lower their debt level steeper to dampen the impact of higher borrowing costs compared to unconstrained firms.

Although I put the market value of leverage as the focus of this study, empirical research typically relies on the book value of debt rather than the market value. So I also estimated the correlation coefficient for all these firm and macro level factors to the book value of debt. The role of constrained and unconstrained firms reverse for some factors, which indicates that firms' behavior impacts the market value and the book value of leverage differently.

If I compare the results between Table 2.3 and Table 2.4, I find that constrained and unconstrained firms lower their book and market value of debt when profit increases. In the case of the market value of debt, unconstrained firms lower their debt more than constrained firms. On the other hand, constrained firms lower their book value of debt compared to unconstrained firms when profit increases. Similar differences can be observed among factors such as firm size, market-to-book ratio, asset change, and tangibility. The market value of leverage generally reflects the present borrowing cost of a firm, whereas the book value of debt represents historical borrowing cost depending on how each of these factors interacts with firms' financial statements. I can also observe that macro-level factors such as expected inflation, industry profit, and growth significantly impact the coefficients among the constrained and unconstrained firms. Specifically, on the macro level, constrained firms lower their market value of leverage more significantly than unconstrained firms as the growth rate increases. A similar trend can also be observed when considering any expected inflation change. A constrained firm's market leverage ratio is significantly more sensitive to expected inflation than unconstrained firms.

Table 2.4

Correlations between Book Value Leverage Ratios and Factors.

TDBV VARIABLES	Full Sample	Dividend Cons.	Dividend Uncons.	HP Cons.	HP Uncons.	WW Cons.	WW Uncons.	OCF Cons.	OCF Uncons.
Profit	-0.92***	-0.92***	-0.8***	-0.92***	-0.54***	-0.90***	-0.84***	-0.87***	-0.37***
	(-29.52)	(-29.52)	(-4.08)	(-30.33)	(-8.56)	(-20.93)	(-6.26)	(-29.51)	(-4.87)
Assets	-0.11***	-0.11***	0.03	-0.38***	0.02***	-0.19***	0.02***	-0.21***	0.01***
	(-8.59)	(-8.60)	(1.05)	(-27.84)	(4.11)	(-4.67)	(4.22)	(-12.35)	(5.33)
Mature	0.09***	0.09***	0.09***	0.22***	0.01	0.14***	0.01	0.17***	0.02***
	(6.89)	(6.88)	(19.25)	(10.38)	(0.24)	(7.6)	(1.44)	(9.68)	(3.08)
Mkt-Book	0.02***	0.02***	-0.09*	0.02***	-0.01***	0.02***	0.01*	0.01***	0.01
	(21.14)	(21.14)	(-1.87)	(22.34)	(-4.52)	(14.89)	(1.86)	(19.92)	(1.5)
ChgAsset	-0.21***	-0.21***	-0.06***	-0.27***	-0.05***	-0.21***	-0.05***	-0.22***	-0.07***
	(-14.13)	(-14.13)	(-2.92)	(-10.17)	(-4.66)	(-9.21)	(-4.45)	(-10.73)	(-6.26)
CapEx	-0.31***	-0.31***	-0.01	-0.51***	-0.21***	-0.38***	-0.19***	-0.06	-0.08*
	(-5.80)	(-5.80)	(-0.17)	(-4.89)	(-3.30)	(-4.77)	(-3.19)	(-0.43)	(-1.95)
IndLvg	0.31***	0.31***	0.28***	0.60***	0.22***	0.47***	0.23***	0.49***	0.22***
	(7.58)	(7.57)	(2.84)	(5.38)	(6.6)	(6.08)	(14.11)	(6.57)	(5.44)
IndGrw	-0.31***	-0.31***	-0.62	-0.50***	-0.12**	-0.27**	-0.11**	-0.50***	-0.10*
	(-5.59)	(-5.59)	(-1.50)	(-5.42)	(-2.53)	(-2.51)	(-2.42)	(-5.77)	(-1.79)
Tangibility	0.19***	0.19***	0.58***	0.21**	0.08**	0.33***	0.07*	0.29***	0.14***
	(3.69)	(3.69)	(2.57)	(2.37)	(2.05)	(6.49)	(1.95)	(4.14)	(5.25)
R&D	-0.01	-0.01	-	-0.01	0.01**	-0.02	-0.01	-0.01	-0.01
	(-1.03)	(-1.03)	-	(-0.83)	(2.01)	(-1.12)	(-0.65)	(-1.14)	(-0.86)
SGA	0.02***	0.02***	-	0.03***	-0.01	0.02***	-0.01	0.02***	-0.01
	(4.82)	(4.82)	-	(5.29)	(-0.65)	(4.59)	(-1.15)	(3.94)	(-1.54)
Dep.	2.48***	2.48***	0.07	3.35***	0.44***	2.37***	0.44***	3.68***	0.41***
	(9.20)	(9.2)	(0.22)	(10.99)	(4.12)	(8.19)	(4.30)	(10.69)	(5.24)
InvTxCr	29.77***	-	29.77***	-	29.77	-	29.77***	-	29.77***
	(5.60)	-	(5.6)	-	(0.01)	-	(4.51)	-	(5.6)
TermSprd	0.01	0.01	0.47	1.37*	-0.72***	0.51	-0.61***	1.12*	-0.58***
	(0.03)	(0.03)	(0.37)	(1.79)	(-3.75)	(1.07)	(-3.05)	(1.66)	(-3.40)
Inflation	-4.48***	-4.48***	-2.72	-15.40***	-0.37	-8.35***	-0.61	-9.95***	-0.76**
	(-4.64)	(-4.64)	(-1.00)	(-7.15)	(-1.00)	(-5.45)	(-1.57)	(-5.80)	(-2.22)
MacroProf	-0.01	-0.01	-0.01	0.03	-0.06**	-0.01	-0.06**	-0.08	-0.04**
	(-0.30)	(-0.30)	(-0.28)	(0.32)	(-2.45)	(-0.17)	(-2.47)	(-0.73)	(-2.13)
MacroGrw	-1.90***	-1.90***	-0.64	-4.85***	-0.41	-3.32***	-0.51*	-4.03***	-0.41*
	(-3.37)	(-3.37)	(-1.10)	(-3.37)	(-1.44)	(-4.34)	(-1.85)	(-2.96)	(-1.67)

This table reports results from the OLS estimation of the regression model (1) using leverage measures and various factors. All data are from COMPUSTAT quarterly, and the sample period is from 1989 to 2019. T-stats reported in parentheses are robust to heteroskedasticity and are clustered at the year and four-digit SIC industry levels. The macroeconomics data are from the Federal Reserve Bank of St. Louis. (∗∗∗); (∗∗); (∗) denote statistical significance at 1%, 5%, and 10% levels, respectively.

Next, I focus on the long-term portion of a firm's leverage instead of considering total debt. Earlier studies have noted some benefits of using long-term debt over total debt, as long-term debt is a stable information source of financing compared to short-term debt. That makes long-term debt a better indicator of overall financial well-being and ability to meet a firm's long-term obligations. Another reason long-term debt is a more reliable source of information is that it is less sensitive to interest rate changes, as short-term debt may have variable interest rates that change quickly.

I recreated Tables 2.3 and 2.4 next by using only the long-term portion of the company's balance sheet. The overall results of these new tables follow my earlier findings. Changes in these firm-level and macro-level factors affect the market value and book value of leverage depending on the sample firm's financial constraint level.

Table 2.5

Correlations between Long-term Market Value Leverage Ratios and Factors.

LTDMV	Full	Dividend		HP		WW		OCF	
VARIABLES	Sample	Cons.	Uncons.	Cons.	Uncons.	Cons.	Uncons.	Cons.	Uncons.
Profit	0.01**	0.01**	-2.1***	0.01***	-1.01***	0.01***	-0.55***	0.01***	-0.31***
	(2.05)	(2.05)	(-3.75)	(5.47)	(-7.28)	(3.49)	(-4.84)	(4.2)	(-4.95)
Assets	0.02***	0.02***	0.06	0.01***	0.03***	0.02***	0.03***	0.02***	0.03***
	(8.30)	(8.3)	(1.2)	(6.18)	(8.86)	(5.16)	(10.17)	(6.94)	(8.08)
Mature	0.03***	0.03***	0.10***	0.02***	0.01	0.02***	0.02***	0.03***	0.03***
	(6.02)	(6.02)	(13.4)	(7.11)	(1.51)	(5.09)	(4.4)	(8.35)	(4.48)
Mkt-Book	-0.00***	-0.01***	-0.26***	-0.01***	-0.03***	-0.01***	-0.01***	-0.01***	-0.01***
	(-11.37)	(-11.37)	(-8.20)	(-15.59)	(-4.06)	(-7.31)	(-4.41)	(-13.17)	(-4.55)
ChgAsset	-0.02***	-0.02***	0.01	-0.01***	-0.06***	-0.02***	-0.06***	-0.01***	-0.06***
	(-7.73)	(-7.73)	(0.07)	(-7.55)	(-6.08)	(-8.50)	(-5.94)	(-10.08)	(-5.85)
CapEx	-0.13***	-0.13***	-0.28	-0.03**	-0.29***	-0.06**	-0.30***	-0.06***	-0.18***
	(-3.89)	(-3.89)	(-1.02)	(-2.02)	(-4.88)	(-2.32)	(-5.38)	(-3.81)	(-3.79)
IndLvg	0.31***	0.31***	0.39**	0.20***	0.35***	0.25***	0.42***	0.30***	0.34***
	(6.93)	(6.93)	(2.23)	(14.23)	(6.02)	(9.84)	(17.61)	(18.96)	(5.01)
IndGrw	-0.11***	-0.11***	-0.83***	-0.03**	-0.18***	-0.09***	-0.18***	-0.07***	-0.19***
	(-3.65)	(-3.65)	(-3.16)	(-2.13)	(-3.39)	(-2.98)	(-3.30)	(-2.83)	(-2.70)
Tangibility	0.13***	0.13***	0.72	0.09***	0.11***	0.14***	0.11***	0.11***	0.16***
	(10.19)	(10.2)	(0.01)	(9.21)	(3.11)	(11.12)	(2.73)	(11.31)	(4.99)
R&D	-0.00***	-0.01***	0.01**	-0.01***	0.01***	-0.01***	-0.01	-0.01***	-0.01
	(-4.92)	(-4.92)	(2.51)	(-5.49)	(5.1)	(-8.89)	(-0.10)	(-9.27)	(-1.16)
SGA	-0.00***	-0.01***	-	-0.01***	-0.01	-0.01***	-0.01	-0.01***	-0.01*
	(-5.69)	(-5.69)	-	(-7.06)	(-0.30)	(-7.12)	(-0.95)	(-7.52)	(-1.75)
Dep.	0.19***	0.19***	-0.37	0.12***	0.24**	0.18***	0.19*	0.17***	0.21***
	(5.90)	(5.91)	(-1.62)	(8.87)	(2.49)	(7.78)	(1.77)	(10.16)	(2.69)
InvTxCr	7.17	-	7.17	-	7.17	-	7.17	-	7.17
	(0.79)	-	(0.79)	-	(0.01)	-	(1.21)	-	(0.79)
TermSprd	-0.25	-0.25	2.57**	-0.17*	-0.06	-0.19*	0.04	-0.33**	-0.14
	(-1.44)	(-1.44)	(2.53)	(-1.76)	(-0.26)	(-1.71)	(0.16)	(-2.48)	(-0.65)
Inflation	-0.93***	-0.93***	-5.07**	-0.52***	-0.95**	-0.88***	-1.49***	-0.93***	-1.20***
	(-2.85)	(-2.86)	(-2.39)	(-2.59)	(-2.24)	(-3.12)	(-3.10)	(-3.24)	(-2.76)
MacroProf	-0.04	-0.04	-0.03	-0.02	-0.05	-0.02	-0.05	-0.03	-0.05
	(-1.10)	(-1.10)	(-0.25)	(-1.35)	(-0.84)	(-1.01)	(-0.77)	(-1.37)	(-1.11)
MacroGrw	-1.26***	-1.26***	-3.02*	-0.71***	-1.71***	-0.92***	-1.90***	-0.91***	-1.48***
	(-4.28)	(-4.28)	(-1.95)	(-5.55)	(-3.72)	(-5.51)	(-3.73)	(-4.84)	(-3.76)

This table reports results from the OLS estimation of the regression model (1) using leverage measures and various factors. All data are from COMPUSTAT quarterly, and the sample period is from 1989 to 2019. T-stats reported in parentheses are robust to heteroskedasticity and are clustered at the year and four-digit SIC industry levels. The macroeconomics data are from the Federal Reserve Bank of St. Louis. (∗∗∗); (∗∗); (∗) denote statistical significance at 1%, 5%, and 10% levels, respectively.

Similar to Table 2.4, I can observe the same correlation pattern among the constrained and unconstrained firms in Table 2.6.

Table 2.6

Correlations between Long-term Book Value Leverage Ratios and Factors.

LTDBV	Full	Dividend		HP		WW		OCF	
VARIABLES	Sample	Cons.	Uncons.	Cons.	Uncons.	Cons.	Uncons.	Cons.	Uncons.
Profit	-0.05***	-0.05***	-0.59***	-0.05***	-0.36***	-0.06***	-0.22***	-0.05***	-0.15***
	(-8.92)	(-8.92)	(-4.12)	(-8.93)	(-6.10)	(-9.56)	(-4.06)	(-7.99)	(-3.20)
Assets	0.01***	0.01***	0.02	-0.02***	0.02***	-0.01	0.02***	-0.01	0.02***
	(4.02)	(4.02)	(0.73)	(-8.67)	(5.32)	(-0.46)	(5.71)	(-0.77)	(9.75)
Mature	0.02***	0.02***	0.09***	0.02***	0.01	0.03***	0.01*	0.04***	0.02***
	(4.66)	(4.66)	(19.85)	(4.67)	(1.17)	(2.81)	(1.79)	(4.63)	(3.91)
Mkt-Book	0.01***	0.01***	-0.09	0.01***	-0.01***	0.01***	-0.01***	0.01***	-0.01***
	(4.05)	(4.05)	(-1.64)	(4.36)	(-4.07)	(4.2)	(-2.92)	(4.76)	(-3.89)
ChgAsset	-0.02***	-0.02***	-0.06***	-0.02***	-0.02**	-0.02***	-0.01*	-0.02***	-0.03***
	(-7.59)	(-7.59)	(-2.65)	(-8.68)	(-2.17)	(-6.02)	(-1.88)	(-7.24)	(-3.93)
CapEx	-0.03	-0.03	-0.02	0.06**	-0.16***	0.02	-0.13**	0.03	-0.08*
	(-0.89)	(-0.89)	(-0.30)	(2.19)	(-2.76)	(0.65)	(-2.48)	(0.77)	(-1.97)
IndLvg	0.16***	0.16***	0.28***	0.17***	0.16***	0.18***	0.17***	0.20***	0.18***
	(7.48)	(7.48)	(3.16)	(7.81)	(6.38)	(7.48)	(10.13)	(8.82)	(5.5)
IndGrw	-0.06**	-0.06**	-0.64*	-0.03*	-0.08**	-0.07*	-0.07**	-0.06*	-0.08*
	(-2.36)	(-2.35)	(-1.71)	(-1.77)	(-2.18)	(-1.83)	(-2.01)	(-1.87)	(-1.82)
Tangibility	0.14***	0.14***	0.58***	0.15***	0.02	0.18***	0.03	0.15***	0.10***
	(11.27)	(11.27)	(2.79)	(9.67)	(0.73)	(10.97)	(0.88)	(10.28)	(3.97)
R&D	-0.01	-0.01	-	0.01	0.02**	-0.01	0.01	-0.01**	0.01
	(-1.56)	(-1.56)	-	(0.08)	(2.61)	(-0.93)	(0.14)	(-2.50)	(0.11)
SGA	0.01	0.01	-	0.01**	-0.01	0.01*	-0.01*	0.01	-0.01***
	(0.61)	(0.61)	-	(2.43)	(-0.64)	(1.81)	(-1.79)	(0.15)	(-4.61)
Dep.	0.41***	0.41***	0.07	0.43***	0.26***	0.45***	0.18**	0.49***	0.23***
	(9.39)	(9.39)	(0.25)	(11.48)	(2.93)	(11.1)	(2.02)	(10.28)	(3.81)
InvTxCr	-56.31***	-	-56.31***	-	-56.31	-	-56.31***	-	-56.31***
	(-15.33)	-	(-15.33)	-	(0.01)	-	(-10.08)	-	(-15.33)
TermSprd	-0.52***	-0.52***	0.69	-0.06	-0.59***	-0.36**	-0.50***	-0.41**	-0.53***
	(-3.92)	(-3.92)	(0.61)	(-0.49)	(-3.58)	(-2.40)	(-2.92)	(-2.46)	(-3.70)
Inflation	-1.02***	-1.02***	-2.74	-1.34***	-0.87**	-1.34**	-0.97***	-1.85***	-0.95***
	(-3.02)	(-3.01)	(-1.02)	(-3.17)	(-2.56)	(-2.40)	(-2.85)	(-2.90)	(-3.25)
MacroProf	-0.03**	-0.03**	0.01	-0.01	-0.04**	-0.01	-0.05**	-0.03*	-0.04**
	(-2.42)	(-2.42)	(0.06)	(-0.68)	(-2.13)	(-1.63)	(-2.23)	(-1.72)	(-2.29)
MacroGrw	-0.32	-0.32	-0.82*	-0.75***	-0.15	-0.63**	-0.22	-0.70**	-0.26
	(-1.54)	(-1.53)	(-1.64)	(-2.71)	(-0.61)	(-2.36)	(-0.94)	(-2.05)	(-1.27)

This table reports results from the OLS estimation of the regression model (1) using leverage measures and various factors. All data are from COMPUSTAT quarterly, and the sample period is from 1989 to 2019. T-stats reported in parentheses are robust to heteroskedasticity and are clustered at the year and four-digit SIC industry levels. The macroeconomics data are from the Federal Reserve Bank of St. Louis. (∗∗∗); (∗∗); (∗) denote statistical significance at 1%, 5%, and 10% levels, respectively.

2.4 Core Leverage Model

Section 2.4's analysis has identified factors that consistently influence leverage across all constrained and unconstrained groups. My next objective is to utilize these factors to estimate Equation (1). The parameter estimates and t-statistics for the core model are presented in Table 2.7, which have been computed using standard errors corrected for clustering by firm, industry, and year.

In my test, all six factors generate statistically significant coefficients concerning the market value of leverage. Financially constrained and unconstrained firms identified by HP and WW indices do not exhibit a significant difference in their changes in market leverage when industry leverage changes. The operating cash flow ratio shows the most significant differences among the constrained and unconstrained group coefficients. Another notable finding is that my model consistently explains the variation in market value better in unconstrained (R^2 around 70%) firms than in constrained (R^2 around 60%) firms. This finding is crucial because it can also explain the discrepancies earlier research found when investigating constrained firms' behavior.

Table 2.7

A Core Model of Leverage: Constrained and Unconstrained Firms

	Full	Dividend		HP		WW		OCF	
VARIABLES	Sample	Cons.	Uncons.	Cons.	Uncons.	Cons.	Uncons.	Cons.	Uncons.
IndLvg	0.46***	0.46***	0.23	0.48***	0.41***	0.49***	0.52***	0.51***	0.38***
	(6.24)	(6.23)	(1.42)	(19.21)	(5.31)	(21.14)	(22.77)	(23.36)	(4.60)
Tangibility	0.19***	0.19***	-0.11	0.14***	0.17***	0.22***	0.17***	0.15***	0.21***
	(14.57)	(14.57)	(-0.24)	(10.56)	(6.45)	(15.65)	(5.81)	(14.81)	(8.67)
Profit	-0.08***	-0.08***	-1.14	-0.03***	-0.97***	-0.06***	-0.69***	-0.05***	-0.34***
	(-8.19)	(-8.19)	(-0.64)	(-6.86)	(-6.89)	(-5.17)	(-7.29)	(-9.34)	(-6.15)
Assets	0.02***	0.02***	0.00	-0.01**	0.03***	0.01*	0.04***	0.01***	0.03***
	(5.86)	(5.86)	(0.19)	(-2.49)	(8.83)	(1.94)	(10.85)	(3.69)	(9.94)
Mkt-Book	-0.00***	-0.00***	-0.22*	-0.00***	-0.02***	-0.00***	-0.01***	-0.00***	-0.01***
	(-9.50)	(-9.49)	(-9.59)	(-11.90)	(-3.56)	(-8.83)	(-5.10)	(-10.41)	(-4.80)
Inflation	-0.73*	-0.73*	1.69	-2.64***	1.29***	-2.19***	1.10***	-2.08***	1.15***
	(-1.97)	(-1.98)	(0.76)	(-6.30)	(2.95)	(-5.61)	(2.65)	(-5.39)	(2.87)
Observations	446,454	436,334	10,120	151,290	139,649	147,791	119,798	150,502	147,925
R-squared	0.66	0.66	0.80	0.58	0.74	0.61	0.75	0.64	0.74

This table reports estimates from regressions of leverage on the core model. The factors are defined in the Appendix and are lagged by one quarter. All data are from COMPUSTAT quarterly, and the sample period is from 1989 to 2019. T-stats reported in parentheses are robust to heteroskedasticity and are clustered at the year and four-digit SIC industry levels. The macroeconomics data are from the Federal Reserve Bank of St. Louis. (∗∗∗); (∗∗); (∗) denote statistical significance at 1%, 5%, and 10% levels, respectively.

Table 2.7 presents the results of Equation (1), where I included six of the most significant factors from my earlier correlation test. I can conclude that industry leverage change effect constrained firms more than it does unconstrained firms. By contrast, changes in tangibility impact my unconstraint groups of firms more significantly than constraint firms. Expected inflation and market-to-book ratio also have a negative effect on the firms' market value of leverage.

2.5 Robustness Tests

My earlier tests provide me with a consistent overview of the factors and how they relate to the book and market value of leverage. I can also find statistically significant differences in the impact of any changes in these factors on firms' leverage change. First, to ensure I am not ignoring any vital factor from my core leverage model, I ran the test where I included all sixteen factors and the results are presented in Table 8 below.

Table 2.8

Model of Leverage including all factors: Constrained and Unconstrained firms

	Full	Dividend	HP		WW		OCF	
VARIABLES	Sample	Cons.	Cons.	Uncons.	Cons.	Uncons.	Cons.	Uncons.
Profit	-0.12***	-0.12***	-0.05***	-1.11***	-0.07***	-0.69***	-0.07***	-0.38***
	(-6.98)	(-6.98)	(-4.89)	(-8.34)	(-4.49)	(-3.77)	(-6.82)	(-5.37)
Assets	0.02***	0.02***	-0.02***	0.03***	0.01	0.02***	0.01**	0.02***
	(5.86)	(5.86)	(-3.36)	(5.35)	(1.03)	(5.04)	(2.03)	(11.36)
Mature	0.02***	0.02***	0.03***	-0.01	0.03***	-0.00	0.04***	-0.01*
	(4.85)	(4.85)	(6.21)	(-1.60)	(6.06)	(-0.53)	(7.06)	(-1.77)
Mkt-Book	-0.00***	-0.00***	-0.00***	-0.01***	-0.00***	-0.01***	-0.00***	-0.00***
	(-5.74)	(-5.74)	(-7.84)	(-2.71)	(-6.78)	(-2.74)	(-6.83)	(-4.10)
ChgAsset	-0.02***	-0.02***	-0.01***	0.01	-0.02***	-0.01	-0.01***	-0.00
	(-5.09)	(-5.09)	(-3.03)	(1.49)	(-5.29)	(-1.08)	(-4.67)	(-0.99)
CapEx	-0.45***	-0.45***	-0.36***	-0.51***	-0.35***	-0.48***	-0.32***	-0.29***
	(-12.91)	(-12.91)	(-11.15)	(-8.67)	(-9.80)	(-7.67)	(-8.43)	(-9.61)
IndLvg	0.46***	0.46***	0.41***	0.43***	0.44***	0.42***	0.43***	0.38***
	(23.88)	(23.88)	(11.70)	(16.73)	(13.28)	(15.32)	(14.58)	(17.25)
IndGrw	-0.08***	-0.08***	-0.09**	-0.09*	-0.13**	-0.06*	-0.11***	-0.03
	(-2.68)	(-2.68)	(-2.11)	(-1.92)	(-2.53)	(-1.91)	(-3.29)	(-0.86)
Tangibility	0.22***	0.22***	0.20***	0.18***	0.21***	0.15***	0.21***	0.18***
	(10.37)	(10.37)	(6.78)	(4.75)	(7.57)	(3.81)	(8.55)	(8.04)
R&D	-0.01**	-0.01**	-0.00*	-0.03***	-0.01***	-0.02*	-0.01**	-0.03***
	(-2.38)	(-2.38)	(-1.86)	(-2.80)	(-2.84)	(-1.74)	(-2.12)	(-3.10)

Table 2.8 Continued

VARIABLES	Full Sample	Dividend Cons.	HP Cons.	HP Uncons.	WW Cons.	WW Uncons.	OCF Cons.	OCF Uncons.
SGA	-0.00***	-0.00***	-0.00	-0.00	-0.00	-0.01	-0.00	-0.02***
	(-2.96)	(-2.96)	(-1.31)	(-1.17)	(-1.40)	(-1.29)	(-1.39)	(-5.33)
Dep.	0.45***	0.45***	0.31***	0.69***	0.37***	0.63***	0.40***	0.25***
	(8.49)	(8.49)	(8.72)	(5.75)	(8.08)	(5.12)	(8.55)	(4.07)
TermSprd	-0.13	-0.13	-0.05	-0.07	-0.13	0.05	-0.21	-0.08
	(-0.93)	(-0.93)	(-0.27)	(-0.41)	(-0.85)	(0.24)	(-1.10)	(-0.73)
Inflation	-0.04	-0.04	-1.35***	1.04**	-0.93**	0.91*	-0.82**	0.81**
	(-0.13)	(-0.13)	(-3.59)	(2.12)	(-2.48)	(1.89)	(-2.15)	(2.61)
MacroProf	-0.01	-0.01	0.00	-0.03	0.01	-0.03	-0.02	-0.02
	(-1.18)	(-1.18)	(0.07)	(-1.00)	(0.31)	(-1.08)	(-1.43)	(-1.14)
MacroGrw	-0.89***	-0.89***	-1.38***	-0.45	-1.26***	-0.57	-1.00***	-0.17
	(-3.96)	(-3.96)	(-4.46)	(-1.16)	(-4.25)	(-1.39)	(-3.26)	(-0.71)
Observations	174,161	174,161	54,688	52,619	66,247	40,799	56,304	58,960
R-squared	0.69	0.69	0.64	0.76	0.63	0.78	0.66	0.76

This table reports estimates from regressions of leverage on the core model. The factors are defined in the Appendix and are lagged by one quarter. All data are from COMPUSTAT quarterly, and the sample period is from 1989 to 2019. T-stats reported in parentheses are robust to heteroskedasticity and are clustered at the year and four-digit SIC industry levels. The macroeconomics data are from the Federal Reserve Bank of St. Louis. (∗∗∗); (∗∗); (∗) denote statistical significance at 1%, 5%, and 10% levels, respectively.

I can observe that the inclusion of additional ten factors does not improve the explanatory power of my model. The R^2 increased by roughly 2% across all my groups. So I can conclude that my earlier model is robust, and I included six of the most critical factors in determining firms' market leverage ratio.

Next, I ask whether the overall economic conditions are driving my results and if I will get the same results if I only focus on the financial crisis period (207-2010).

Table 2.9

A Core Model of Leverage (2007-2010): Constrained and Unconstrained Firms

VARIABLES	Full Sample	Dividend Cons.	Dividend Uncons.	HP Cons.	HP Uncons.	WW Cons.	WW Uncons.	OCF Cons.	OCF Uncons.
IndLvg	0.48***	0.48***	0.03	0.45***	0.43***	0.49***	0.50***	0.45***	0.45***
	(7.64)	(7.65)	(0.06)	(6.76)	(8.14)	(7.45)	(7.76)	(5.94)	(6.97)
Tangibility	0.16***	0.16***	-0.57	0.12***	0.23***	0.18***	0.27***	0.13***	0.19***
	(4.45)	(4.45)	(-1.20)	(4.42)	(3.84)	(4.57)	(3.25)	(4.82)	(3.54)
Profit	-0.03***	-0.03***	-0.30	-0.01	-0.46***	-0.02**	-0.34***	-0.01	-0.27***
	(-4.02)	(-4.02)	(-0.15)	(-0.97)	(-5.05)	(-2.29)	(-4.71)	(-1.47)	(-8.96)
Assets	0.01*	0.01*	-0.10	-0.02***	0.07***	-0.01*	0.11***	-0.01*	0.07***
	(2.05)	(2.05)	(-0.45)	(-4.07)	(4.08)	(-1.97)	(5.92)	(-1.97)	(3.80)
Mkt-Book	-0.00***	-0.00***	-0.34	-0.00***	-0.03***	-0.00***	-0.00	-0.00***	-0.00
	(-4.37)	(-4.38)	(-2.55)	(-5.99)	(-3.91)	(-5.68)	(-1.47)	(-5.71)	(-1.29)
Inflation	-0.91	-0.91	1.44	-1.01	0.17	-0.98	-0.03	-1.25	0.12

Table 2.9 Continued

VARIABLES	Full Sample	Dividend Cons.	Dividend Uncons.	HP Cons.	HP Uncons.	WW Cons.	WW Uncons.	OCF Cons.	OCF Uncons.
	(-0.92)	(-0.92)	(0.34)	(-1.29)	(0.15)	(-1.22)	(-0.02)	(-1.36)	(0.13)
Observation	55,194	50,162	1,032	19,536	16,665	18,792	14,437	18,414	18,045
R-squared	0.84	0.84	0.72	0.78	0.89	0.81	0.88	0.80	0.90

This table reports estimates from regressions of leverage on the core model. The factors are defined in the Appendix and are lagged by one quarter. All data are from COMPUSTAT quarterly, and the sample period is from 2007 to 2010. T-stats reported in parentheses are robust to heteroskedasticity and are clustered at the year and four-digit SIC industry levels. The macroeconomics data are from the Federal Reserve Bank of St. Louis. (∗∗∗); (∗∗); (∗) denote statistical significance at 1%, 5%, and 10% levels, respectively.

My core models' explanatory power improves across all groups during the financial crisis (2007-2010). One notable exception in the result is the effect of expected inflation. None of the groups exhibit a statistically significant coefficient for inflation during extreme financial duress. So I can conclude that my findings are robust during the financial crisis, and my core leverage model includes the most critical factors.

2.6 Conclusion

This research analyzed publicly traded American companies from 1989 to 2019 to identify the factors that significantly correlate with market-based leverage. Sample firms are divided into constrained and unconstrained groups based on four constraint measures. Companies that distribute dividends tend to have lower leverage than those that do not. The current theories on capital structure present conflicting predictions regarding the relationship between dividend payments and leverage. Therefore, I believe there is a need to develop the interpretation of dividends beyond the existing literature.

The reliable impact of market-to-book, Firm Size, and expected inflation factors observed in market-based leverage is not present when studying book leverage. However, median industry leverage, tangibility, and profitability are statistically significant.

This surprising result can be interpreted through Barclay et al. (2006) argument that book leverage is backward-looking, while market leverage is forward-looking. Accordingly, the effects of market-to-book assets ratio, firm Size (as measured by book assets), and expected inflation are operating through their ability to capture aspects of the firm's anticipated future. On the other hand, median industry leverage, tangibility, and profitability appear to reflect the firm's past impact.

I believe that this distinction warrants further exploration by corporate finance theorists.

In this study, I evaluate how well the major theories explain the main patterns observed in the data from publicly traded American firms over the past 30 years. My findings suggest that each theory has weaknesses, with some being more detrimental than others. The nature of these weaknesses varies.

Behavioral finance advocates often attribute market timing to irrational behavior. However, rational optimization by managers could also result in market timing (Baker and Wurgler, 2002). In fact, any realistic optimization model of corporate leverage is likely to have varying costs and benefits, leading to time-varying optimal choices. Despite this, market timing provides limited refutable cross-sectional implications within this empirical framework and no direct explanation for the observed patterns. Furthermore, this idea does not naturally explain most of the observed cross-sectional capital structure regularities independent of the broader trade-off framework.

The pecking order theory offers an intuitive explanation for the observation that more profitable firms tend to have lower leverage. However, the most significant empirical factor is industry leverage, which the pecking order theory does not directly predict. Additionally, the roles of tangibility and firm Size are not easily explained by the pecking order theory. Therefore, considerable theoretical development would be necessary for a model based on the pecking order approach to entirely account for the robust evidence.

On the other hand, the trade-off theory can account for many factors, including industry leverage, firm size, tangibility, and market-to-book. The trade-off theory's main empirical weakness is that more profitable firms generally have lower leverage. However, dynamic trade-off models suggest that leverage and profits can be negatively related. For example, (Tsyplakov, 2008) argues that when firms need time to build productive capacity, they tend to retain earnings to build internal equity before spending the money to build capacity. This process would show up empirically as profits reducing leverage, as buying physical capital involves spending money that increases leverage.

As the statistician Box (1979) famously noted, "All models are wrong, but some are useful." I hope the core leverage model will provide a useful basis for further studies of financial constraints, as they are pretty robust and have generally similar effects across firms. This suggests that a unified theory of leverage may be achievable for financially constrained and unconstrained firms, with some crucial elements in common with the trade-off theory. However, it is likely that some frictions, such as time-to-build or transaction costs, will be essential in such a theory.

CHAPTER III: EFFECT OF CEO COMPENSATION METRIC ON FIRM'S EARNINGS MANAGEMENT

3.1 Introduction

Earnings management has dominated the corporate financial news over the years, and these public concerns resulted in various preventative steps taken by security regulators. As to why firms are involved in earnings management, Watts et al. (1997), Guay et al. (1997), and Chan et al. (2001) explain the possibility of discretionary accruals satisfying either the opportunistic accrual management hypothesis or the performance measure hypothesis. The opportunistic earnings management hypothesis argues that managers use accruals to exploit information asymmetry in the marketplace by manipulating the current year's income to achieve various benefits for themselves and their firms. On the other hand, the performance measure hypothesis focuses on how accruals lead to future cash flow, and managers use discretionary accruals to allow outsiders to make a reliable forecast about firms' future performance.

The cost to shareholders can be substantial due to distorted information from opportunistic managerial motives-based earnings management. Dechow et al. (1995) document that firms alleged to have committed accounting fraud resulted in the announcement related loss of shareholders' wealth by 9% on average. Even without any accusation of fraudulent behavior, shareholders lose value in firms engaging in aggressive earnings management. Future stock returns are also negatively related to a firm's accruals (Chan et al., 2001). Teoh et al. (1998a, 1998b) and Teoh, Wong, et al. (1998) find that initial public offerings issued by firms that are involved in aggressive accrual management significantly underperform in a five-year period compared to firms that employ a less aggressive accruals management before their initial public offerings.

My study aims to identify CEO's compensation contract-specific factors that influence the extent of a firm's earnings management behavior. There has been a growing list of finance literature focusing on firm performance (Grinyer et al., 1988; Miller, 1986; White, 1986; White & Hamermesh, 1981; and Lenz, 1981), CEO performance (Bertrand & Schoar, 2003; Mackey, 2008) and CEO compensation contracts (Bebchuk & Fried, 2003; Angelis & Grinstein, 2015) that have mainly investigated various elements of CEO performance contracts and firm performance. Healy (1985); Sloan (1993); Gaver et al. (1995); Holthausen et al. (1995); Balsam (1998), and Guidry et al. (1999) focus on the effects of a CEO's bonus plans. Managers can also influence their compensation contracts to include more option awards linked to the release of good news (Yermack, 1997). There is also evidence that CEOs opportunistically manage investors' expectations during the interval around scheduled option award dates (Aboody et al., 2006).

This paper aims to show a relationship between CEO performance metrics and a firm's earnings management behavior. Research shows that firms utilize earnings management to avert losses or beat analysts' expectations. (Roychowdhury, 2006). So, in this paper, I ask if the performance metric type (EPS, sales, etc.) a CEO has to beat affects the firm's earnings management behavior. I focus on the Chief executive officers because they are responsible for developing a firm's strategy and business model and overseeing its operations management. CEOs require monetary compensation for their work as other employees, and in their ongoing effort to link executive pay to performance, firms are increasingly tying compensation contracts to achieving explicit performance goals. Typical equity or non-equity compensation grant linked to firm performance identifies threshold, target, and maximum values for one or more stock price-based or accounting metrics. To achieve these set goals, a firm may employ a wide range of accrual or/and real activities-based manipulation. Dechow et al. (1995) have proposed a modified Jones

(1991) model to detect and measure accrual-based earnings management in a firm's accounting statement. Roychowdhury (2006) found evidence that firms temporarily offer price discounts to increase sales, overproduction to report the lower cost of goods sold, and reduced discretionary expenditure to improve reported margins. They also found that industry membership, the stock of inventories and receivables, and incentives to meet zero earnings are the overall evidence of real activities manipulation to meet the annual analyst forecast. So, I focus on the presence of both accrual and real activities-based earnings management in sample firms and any changes in a firm's earnings management behavior based on the performance metric (EPS, Sales, Earnings, etc.) that the firm's CEO compensation contract has.

This study contributes to two elements of literature. First, earlier empirical studies focused on different aspects of a CEO's compensation concerning earnings management. Healy (1985), Sloan (1993), Gaver et al. (1995), Holthausen et al. (1995), Balsam (1998), Guidry et al. (1999) focus on the effect of a manager's bonus plan. Managers influence compensation contracts to include more option awards (Yermack, 1997). Aboody et al. (2006) find that CEO opportunistically manages investor expectations around scheduled option award dates. This study investigated the relationship between compensation contracts and earnings management from a comprehensive view rather than focusing on a narrower aspect. If different components of total compensation have different risk and incentive profiles, then empirical analysis of the pay-performance relation must also consider the interplay between the various components (Anderson et al., 2000). There has also been a growing recognition that a more complex representation (i.e., metrics) of the nature of compensation contracts is required. No study I am aware of extends the literature by assessing earnings management in the context of performance metrics, specifically focusing on the different performance metrics in CEOs' compensation contracts. Further knowledge of the comparative differences in performance metrics on firm behavior is desirable, given the recent growth in the importance of compensation contracts and overall public sentiment about them.

This study also focuses on earnings management, as there are gaps in the perceptions of academics, practitioners, and regulators regarding the impact of earnings management on market participants (Dechow and Skinner, 2000). The extent and method of earnings management related to CEO compensation are important for regulators, practitioners, and investors alike because of the concerns over earning management. Many earlier studies have investigated the motivation of managers to manipulate earnings, including using discretionary accruals to maximize short-term bonus compensation (Healy, 1985). Gaver et al. (1995) and Guidry et al. (1999) also find mixed evidence of short-term bonus plans and earnings management. Previous studies also suggest that managers engage in income smoothing (stock ownership, reputation, stock-based compensation) for competing incentives or bonus maximization (bonus-based compensation). My current study bridges a gap between earnings management research and other areas in finance. Specifically, I investigate the reach of compensation metrics included in CEOs' contracts. Compensation contracts have been undergoing significant changes in recent years. More firms have used sales and cash-flow-based performance metrics in the last fifteen years than earnings-based ones. So, I focused on the level and form of earnings management in this study. Some earlier studies have investigated the magnitude of earnings management (Bernard and Skinner, 1996) or the form of earnings management (DeFond & Park, 1997; Skinner, 1993).

My empirical results suggest that the performance metric type statistically affects the firm's earnings management methods, specifically between firms where CEOs meet their performance goals and firms where CEOs fail to meet the set performance goals. I find significant earnings management activity in five of my six tests when CEOs meet a specific performance metric. I observe a 21% increased abnormal accruals level in firms where CEOs meet their EPS goals. This higher accrual level persists among firms where CEOs meet their earnings goal, compared to firms where CEOs fail their earnings goal. Firms, where CEOs meet EBITDA goals, have not shown any unusual earnings management activity. By contrast, sales, operating income, and cashflow-based metrics highlighted real activity-based earnings management behavior. Firms, where CEOs met sales goals, showed significant abnormal inventory and receivable-based earnings management. CEOs with operating income and cashflow goals use abnormal cash flow-based earning management to achieve their goals. I also observe similar differences in firm spending in R&D and SG&A among firms where CEOs meet their compensation goals and CEOs fail their goals.

The remainder of the paper is organized as follows: Section 2 provides background information and hypotheses development; Section 3 describes the construction of my empirical models and data; Section 4 presents results, and Section 5 checks the validity of the main results and reports additional robustness test results; Section 6 concludes this study.

3.2 Literature Review and Hypotheses Development

Earlier studies in economics treated the firm as contracts among individuals who aim to maximize their utility (Fama, 1980; Fama and Jensen, 1983; Jensen and Meckling, 1976). Gordon (1964) assumed that management selects accounting procedures to maximize utility. This assumption implies that management acts in their interests. This potential conflict of interest between managers and shareholders has been extensively investigated in subsequent finance literature. Jensen & Meckling (1976) investigated this conflict and found that as managers' ownership percentage oa firm's residual claim decreases, the residual claims' value has a more negligible effect on managers' wealth. Watts & Zimmerman (1978) assumed that management utility is a positive function of expected compensation and a negative function of dispersion of future compensation. However, Holthause (1981) states that conflicts of interest arise because the compensation of these individuals is determined differently. The degree to which managers manipulate reported earnings for their gains is a crucial issue in financial accounting. So researchers focus on managers' compensation to manipulate earnings. Managers in control of deferring expenditures (such as advertising and R&D) can choose between acceptable accounting methods to report the same economic transaction (such as depreciating and inventory valuation) and estimate numerous economic events (such as expected service lives and salvage values of long term assets, the obligation to pension benefits and other post-employment benefits, deferred taxes, and losses from bad debt).

A central issue in accounting research is finding how managers alter reported earnings for their benefit. Many studies investigated the determinants of accounting choices in the 1970s and early 1980. These studies provided evidence consistent with managers' incentives to choose beneficial ways to report earnings in regulatory (Holthausen and Leftwich, 1983) and contractual contexts (Watts and Zimmerman, 1986). After the mid-1980, the focus of these studies shifted to primary accruals. Beneis (2001) identify three likely causes for this explosive growth in accrual-based earnings management research. First, accruals are part of GAAP (Generally Accepted Accounting Principles); earnings management is more likely to occur on the accruals rather than the cash flow component of the earnings. Second, Watts & Zimmerman (1990) find that studying accruals minimizes the issues linked with the failure to measure the effect of different accounting choices on earnings. Third, investors are less likely to disentangle the effect of earnings management on reported earnings as earnings management is an unobservable component of accruals.

Earnings management researchers face a significant challenge as neither academics nor investors can observe or measure the earnings management component of accruals. The managerial accounting actions aimed at increasing compensation, raising capital, avoiding covenant default, or influencing regulatory outcomes are mostly unobservable. So earlier models have drawn inferences from joint hypotheses, testing both incentives to manage earnings and the construct validity of the various accruals models used to estimate managers accounting discretion. McNichols & Wilson (1988), Holthausen et al. (1995), Beneish (1997), and McNichols (2000) argued that inferences from these studies are confounded because studied incentive contexts are correlated. Accrual models also estimate discretionary accruals with considerable imprecision, and some models randomly decompose earnings into discretionary and non-discretionary components (Guay et al., 1996). Beneish (1997) found evidence of accrual models' poor detective performance among firms under investigation by regulators for extreme behavior. Thomas and Zhang (2000) suggest that the performance of accrual models is dismal. Healy & Wahlen (1999, p. 368) state, "Earnings management occurs when managers use judgment in financial reporting and in structuring transactions to alter financial reports to either mislead some stakeholders about the underlying economic performance of the company or to influence contractual outcomes that depend on reported accounting numbers."

Earnings management has two perspectives. The opportunistic perspective states that managers seek to mislead investors, whereas the information perspective states that managers use earnings management to reveal their private expectations about the firm's future to investors (Holthausen and Leftwich, 1983). Healy & Wahlen's (1999) definition of earnings management includes the word "misled," which can indicate the possibility that earnings management occurs to enhance the signal in reported earnings due to the inclusion of contractual incentives.

Researchers have used three approaches to evaluate the existence of earnings management. The first approach investigates the aggregate accruals and uses regression models to compute the expected and unexpected accruals. The second approach studies specific accruals, for example, the provision for bad debts or accruals in a specific sector, like the claim loss reserve in the insurance industry. The Jones (1991) model is the most widely used model for aggregate accruals. Jones (1991) hypothesis is based on Kaplan's (1985) suggestion that managers exercise discretion and a firm's changing economic conditions result in accruals. The model related total accruals to the changes in sales and the gross property, plant, and equipment level. The Jones model is based on two assumptions. First, it assumes that current accruals resulting from the changes in the firm's economic environment are related to changes in sales or sales growth. Second, the gross property, plant, and equipment control for the protection of total accruals related to the non-discretionary depreciation expense. Dechow et al. (1995) proposed a modified version of the Jones (1991) model with a receivable adjustment for the prediction period.

Roychowdhury (2006) develop empirical methods to detect real activities manipulation. They find evidence consistent with managers manipulating real activities to avoid reporting annual losses. They also find evidence that managers offer price discounts to boost sales temporarily, overproduce to report the lower cost of goods sold, and cut back discretionary expenditures to improve reported margins. Industry membership, the stock of inventories and receivables, and incentives to meet zero earnings also influence real activities manipulation. There is some less robust evidence that to achieve analyst expectations; managers involve in real activities manipulation.

Healy (1985), Gaver et al. (1995), and Holthausen et al. (1995) find evidence that managers alter reported earnings to increase their compensation. Except for Healy (1985), these studies also find evidence that managers decrease reported earnings to increase future compensation. Income-decreasing earnings management is consistent with managers lowering earnings temporarily to increase the possibility of a negotiated or regulatory outcome. Nelson et al. (2000) find that income-decreasing earnings management is pervasive as a "cookie jar."

Graham et al. (2005) surveyed 400 U.S. corporate executives and found strong evidence that managers are willing to manipulate real business activities to manage reported earnings. For example, 80% of surveyed executives admit being willing to reduce discretionary expenditures on R&D and advertising to meet an earnings target. Over half of them are willing to postpone new projects to meet an earnings target, even if such delay decreases the firm value. Consistent with the findings of Graham et al. (2005), prior research documents substantial empirical evidence about instances of real earnings management. Firms are found to manage earnings by manipulating various operating, investing, and financing activities.

Therefore I propose the following six hypotheses.

$$H_1: Firms\ use\ accrual\ based\ earnings\ management\ to\ reach\ their\ CEOs'\ EPS\ goals.$$

$$H_2: Firms\ use\ accrual\ based\ earnings\ management\ to\ reach\ their\ CEOs'\ Earnings\ goals.$$

$$H_3: Firms\ use\ accrual\ based\ earnings\ management\ to\ reach\ their\ CEOs'\ EBITDA\ goals.$$

Public firms are generally required to report earnings per share (EPS), calculated by net earnings available to common shareholders divided by the weighted average number of common shares outstanding during the period. Thomas (1989) observes more zeroes and fewer nines in the second from left-most digit for firms reporting profits and a reverse pattern for firms reporting losses. They also document that a more significant proportion of EPS numbers is divisible by 5 cents and 10 cents for firms reporting profits. This suggests that firms exercise discretion to increase their earnings when the level of earnings or EPS is slightly below a round number. Das & Zhang (2003) find that firms frequently rounded earnings per share to the nearest cent. They also find that working capital accruals are used to round up reported EPS. DeFond and Park (2000) also find evidence between rounding up EPS and meeting the analyst's forecast.

$$H_4: Firms\ use\ Inventory\ and\ receivable\ focused\ real\ earnings\ management\ to\ meet\ their\ CEOs'\ sales\ goals.$$

Prior research finds firms' production manipulation, inventory, and sales to smooth earnings and meets earnings targets (i.e., positive earnings, increasing trends, or analyst earnings forecasts). These manipulations of production, inventory, and sales discounts should occur mainly in the fourth quarter because of their business nature. Dhaliwal et al. (1994) find evidence that firms use LIFO liquidation to maintain earnings increases, reduce earnings variations, and avoid debt covenant violations. Roychowdhury (2006) shows that managers grant sales price discounts in the fourth quarter to avoid losses and decrease year-to-year earnings. They also find that firms utilize price discounts and overproduction to increase sales and reduce the cost of goods sold. These actions appear to be taken to avoid reporting losses and to meet analyst earnings forecasts.

$$H_5: Firms\ use\ cashflow\ focused\ real\ earnings\ management\ on\ reaching\ their\ CEOs'\ Operating\ Income\ Goals.$$

$$H_6: Firms\ use\ cashflow\ based\ real\ earnings\ management\ to\ meet\ their\ CEOs'\ Cashflow\ from\ Operation\ goals.$$

The role of discretionary expenditures in earnings management is well documented in extant literature. Because discretionary expenditures are expensed immediately under GAAP rather than capitalized, managers can adjust their R&D and SGA expenditures to achieve specific earnings management goals, such as avoiding losses, maintaining an increasing trend of earnings, meeting analyst earnings forecasts, and smoothing earnings. Although the extant literature does not provide any direct evidence about the timing of R&D manipulation, some researchers (Perry and Grinaker, 1994) suggest that it is either performed throughout the year or primarily in the fourth quarter. Baber et al. (1991) find that their sample of U.S. industrial firms tends to cut their R&D expenditures when the spending jeopardizes their ability to report positive earnings or maintain an increase in their earnings. The reduction in R&D spending is not attributable to differences in overall investment opportunities.

After controlling for financial conditions and investment opportunities, Perry and Grinaker (1994) document a positive linear relationship between unexpected R&D expenditures and earnings. The evidence indicates that firms adjust their R&D expenditures to bring their reported earnings closer to analysts' expectations, i.e., reducing R&D expenditures when they expect to miss analyst earnings forecasts and increasing R&D expenditures when they expect earnings to exceed analyst forecasts.

Bange & de Bondt (1998) examine 100 U.S. companies with large R&D budgets and find results similar to those of Perry and Grinaker (1994). These firms are found to smooth earnings by adjusting their R&D budgets to reduce the anticipated gap between analyst earnings forecasts and reported income. The above studies on the manipulation of R&D did not explicitly examine the timing of R&D adjustments. However, Perry & Grinaker (1994) infer that the adjustment may be primarily a fourth-quarter phenomenon or a continuing process throughout the year.

Dechow and Sloan (1991) find that CEOs with earnings-based incentive compensation reduce R&D expenditures to increase current reported earnings in their final years of office. These results persist after controlling for firm performance and capital investments. The evidence suggests that earnings-based incentives induce managers to reduce discretionary expenditures to increase short-term performance. Gunny (2005) shows that in addition to R&D expenditures, managers manipulate SGA (selling, general and administrative) expenses to increase current period income. Roychowdhury (2006) documents that to avoid reporting earnings losses or missing analyst earnings forecasts, firms often reduce discretionary expenditures (for example, R&D, SGA, and advertising expenses).

3.3 Empirical Approach

3.3.1. Data

I use data from four sources: Incentive Lab, ExecuComp, Institutional Shareholder Services (ISS), and Compustat.

Data on CEO Performance metrics are from the Incentive lab. Incentive Lab collects compensation data from the largest 750 firms' proxy statements each year. For my sample period of 2005 – 2019, I observe a total of 1743 firms. I obtained CEO salaries and bonuses from ExecuComp. After removing sample firms where there are multiple CEOs or the same individual acting as CEO on multiple firms, I used CIK and firm ticker to match a firm's CEO payout with individual compensation package awards and grants from Incentive Labs. I use data from ISS to identify independent and female board members and then match individuals with their respective companies to calculate the percentage of independent and female board members in their governing boards. I also use ISS to collect data on various governance metrics. Using these governance indicators, I construct BCF metrics first proposed by Bebchuk et al. (2009). I match these governance measures with the compensation data above using CUSIP. I obtained firm financial data from Compustat and matched using CIK and CUSIP.

I focus on grants linked to an absolute accounting performance metric that can be compared with performance reported in Compustat. Incentive Lab categorizes its absolute accounting performance metrics into fifteen categories. I use the six most popular performance metrics used by the firms in my sample: EPS, Earnings, Sales, EBITDA, Operating Income, and Cash flow from Operations. This resulted in my final sample size of 1,539 firms and 14,892 grants.

3.3.2. Earnings Management and Compensation Metrics

The literature in accounting and finance has examined a variety of ways in which executives can alter firm behavior or accounting statements, which has resulted in various measures of suspicious activity. Some of these measures, such as Abnormal Cash Flows, indicate actual changes to firm performance and future cash flows, while others, such as Abnormal Accruals, may, in many cases, represent only changes to firms' reporting rather than any change in real activities. Different executive compensation metrics emphasize different measures of firm performance and accruals, so it makes intuitive sense that executives with different compensation metrics targets will have different incentives concerning earnings, accruals, receivables, and cash flow management.

I test this intuition by regressing six different earnings management measures (Abnormal Accruals (Dechow et al., 1995), Abnormal Cash Flows, Abnormal Cost of Goods Sold, Abnormal Inventory & Receivables, Abnormal Production Costs, and Abnormal Discretionary Expense (Roychowdhury, 2006) on indicator variables equal to 1 if a firm exceeded its CEO's compensation metric and a set of controls, shown in Equation (1).

$$FirmMeasure_{it} = ExceedThreshold_{it} + Controls_{it} + \varepsilon_{it} \qquad (1)$$

The controls in Equation 1 include the BCF Index (Bebchuk et al., 2009), Board Independence (Duchin et al., 2010; Chen et al., 2015), female members ratio in the board (Adams and Ferreira, 2009; Gul et al., 2011; Gul et al., 2013; Abbott et al., 2012; Cumming et al., 2015), firm size, market-to-book, the standard deviation of firm cash flow, and the standard deviation of firm sales growth. If exceeding a compensation metric is significantly related to an earnings management measure, it suggests that executives with that metric are more likely to use that manipulation to meet their compensation thresholds.

3.4 Results

3.4.1. Summary statistics

I summarize the compensation grants in Table 3.1. Sales is the most popular metric, with 38% (5,681 out of 14,892) of the grants in my sample. A single grant can use multiple metrics. Table 3.2 shows the proportion of my grant sample using each metric by year. Firms often use multiple metrics, so rows do not sum to 1.

Table 3.1

Percentage of each metric employed by firms.

Metric	No. of firms	No. of grants	Proportion of grants
EPS	702	4945	0.33
Earnings	508	2265	0.15
Sales	871	5681	0.38
EBITDA	564	3078	0.21
Operating Income	624	3590	0.24
Cashflow from Operating	558	2901	0.19
Total	1539	14892	.

Table 3.1 shows the summary statistics of the key variables used here. Grants are broken down based on the performance metric employed. The data covers the period from 2005-2019. The compensation data are collected from Incentive Lab (IL), Compustat, and CRSP.

Table 3.2 shows that EPS constitutes roughly 30% of all the grants in the last fifteen years. Earnings and Operating Income have also maintained a consistent share in total grants yearly. On the other hand, sales have seen a persistent increase in use as a performance metric in the CEO's compensation plan. EBITDA and Cash flow from operations have also gradually increased over the sample period.

Table 3.2

Percentage of each metric employed by firms in each sample year.

Firm-Year	EPS	Earnings	Sales	EBITDA	Operating Income	Cash Flow
2005	0.31	0.18	0.23	0.07	0.12	0.13
2006	0.35	0.18	0.33	0.11	0.20	0.16
2007	0.36	0.17	0.33	0.13	0.21	0.17
2008	0.34	0.18	0.34	0.14	0.23	0.19
2009	0.33	0.16	0.32	0.15	0.23	0.23
2010	0.33	0.16	0.36	0.17	0.24	0.21
2011	0.33	0.15	0.37	0.19	0.25	0.20
2012	0.33	0.17	0.37	0.19	0.25	0.21
2013	0.32	0.17	0.38	0.22	0.25	0.21
2014	0.33	0.16	0.40	0.23	0.25	0.22
2015	0.33	0.16	0.41	0.23	0.26	0.22
2016	0.34	0.16	0.43	0.25	0.26	0.22
2017	0.35	0.17	0.43	0.25	0.24	0.24
2018	0.34	0.15	0.44	0.25	0.25	0.24
2019	0.35	0.14	0.44	0.27	0.25	0.27

Table 3.2 shows the summary statistics of the key variables used in this study. Grants are broken down by year based on the performance metric employed. The data covers the period from 2005-2019. The compensation data are collected from Incentive Lab (IL), Compustat, and CRSP.

Approximately one-third of all firms in my sample use EPS and this proportion is very stable (see Figure 1). Earnings also have maintained a consistent share, appearing in 15-18% of grants. However, Sales and EBITDA have seen a steady increase in use as performance metrics over the sample period, with Sales as the most widely used metric from 2010 onward. Operating Income and Cashflow from Operations have also become more popular during the sample period.

Figure 1 below shows the percentage of CEOs with each of my six performance metrics during the sample period.

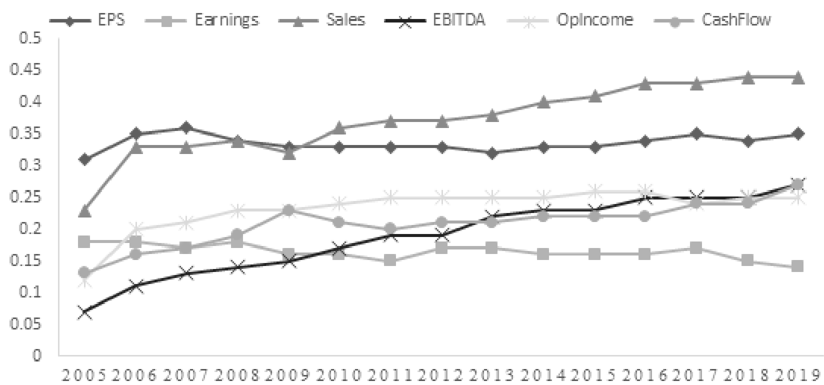

Figure 3.1. The figure reports the percentage of firms that have employed each of the most popular six performance metrics in their CEO's compensation contracts. The data covers the period from 2005-2019. The compensation data are collected from Incentive Lab (IL), Compustat, and CRSP

Table 3.3

No. of times metrics have been added and removed from the CEO's contract.

Metric	Changed to	Changed from
EPS	384	49
Earnings	313	15
Sales	461	26
EBITDA	308	17
Operating Income	379	14
Cashflow from Operations	374	22

Table 3.3 shows the summary statistics of the key variables used. Grants are broken down based on the performance metric employed. The data covers the period from 2005-2019. The compensation data are collected from Incentive Lab (IL), Compustat, and CRSP.

Table 3.3 shows the number of firms that added and removed each performance metric from their grants over the sample period. Consistent with Table 3.2, I can see sales has been added as a performance metric in CEO compensation grants by 461 firms compared to 26 firms that removed sales as a performance metric from their CEO's contract. This is the most significant net increase of the six primary metrics. EPS has seen the most significant decrease in popularity among CEOs' compensation contracts as a performance metric.

Table 3.4

Percentage of each metric employed by firms in each industry.

Industry (Fama-French 10 industries group)	EPS	Earnings	Sales	EBITDA	Operating Income	Cash Flow
Consumer Nondurable: Food, Tobacco, Textiles, Apparel, Leather, Toys	0.50	0.16	0.47	0.17	0.31	0.31
Consumer Durables: Cars, TVs, Furniture, Household Appliances	0.35	0.16	0.32	0.26	0.16	0.54
Manufacturing: Machinery, Trucks, Planes, Chemicals, Off Furn, Paper, Com Printing	0.41	0.17	0.32	0.19	0.22	0.34
Energy: Oil, Gas, and Coal Extraction and Products	0.19	0.15	0.07	0.31	0.04	0.25
Hi-tech: Business Equipment, Computers, Software, and Electronic Equipment	0.29	0.14	0.69	0.15	0.38	0.20
Telecom: Telephone and Television Transmission	0.18	0.07	0.46	0.46	0.10	0.58
Shops: Wholesale, Retail, and Some Services (Laundries, Repair Shops)	0.33	0.16	0.29	0.23	0.27	0.12

Table 3.4 Continued

Industry (Fama-French 10 industries group)	EPS	Earnings	Sales	EBITDA	Operating Income	Cash Flow
Health: Healthcare, Medical Equipment, and Drugs	0.39	0.18	0.65	0.12	0.16	0.23
Utilities: Utilities	0.57	0.29	0.01	0.12	0.14	0.18
Other: Mines, Constr, BldMt, Trans, Hotels, Bus Serv, Entertainment, Finance	0.29	0.16	0.26	0.18	0.22	0.10

Table 3.4 shows the summary statistics of the key variables used. Grants are broken down by industry based on the performance metric employed. The data covers the period from 2005-2019. The compensation data are collected from Incentive Lab (IL), Compustat, and CRSP.

Table 3.4 shows my entire sample of performance metrics across the Fama-French 10 industry groups. I find that more than half the consumer nondurable and utilities firms use EPS as a performance metric, whereas Sales is the dominant performance metric used in health care and the tech industry. More than fifty percent of the firms operating in the consumer durable and telecom industries use Cash flow from Operations in their CEO compensation contract.

In Table 3.5, I organize panels to present four summary statistics of firms, CEOs, and earnings management characteristics. Panel A represents firm Characteristics that include return on asset, earnings per share, and sales growth. Overall my sample firms exhibit positive returns on assets and sales growth. Panel B reflects the characteristics of a CEO in my sample. On average, they are fifty-six years old and eight years on the job. I also observe an upward trend of entrenchment score (3.9), indicating weaker governance. 81% of board members are independent, and 17% of the board members are female in my sample. Panel C presents five more accounting-related summary statistics.

Table 3.5

Summary statistics of sample firms and CEO's characteristics.

Panel A. Firm Characteristics

	N	Mean	Median	Std. Dev.
ROA (industry adjusted)	36179	.001	0	.0723
EBIT/Assets	36178	.0943	.0858	.0962
Earnings Per Share	35797	2.1491	1.77	4.9467
Operating Cash Flow	36169	.1018	.096	.0821
Sales Growth	35453	.0928	.0596	.5638

Panel B. CEO Characteristics & Governance

	N	Mean	Median	Std. Dev.
CEO's Age(years)	29884	56.1313	56	6.6295
CEO Tenure(years)	29012	8.1305	7	7.2533
BCF Index	24192	3.9685	4	.9418
Independent Dir%	23711	.8168	.8333	.0992
Female Dir%	23714	.1762	.1667	.106

Panel C. Other Firm Characteristics

	N	Mean	Median	Std. Dev.
Assets – Total	36991	19259.234	4934.282	69682.683
Market to Book	35462	2.5116	2.0839	2.8152
R&D	36991	.0305	.0019	.055
Leverage	36785	.2842	.2528	.2389
Secured Debt	28049	.2372	.0169	.3347

Panel D. Earnings Mgt. Characteristics

	N	Mean	Median	Std. Dev.
Abnormal Accruals	32807	-.0381	-.0357	.0477
Abnormal Cashflow	34528	.1995	.0906	.7659
Abnormal COFGS	35158	.0548	-.05	2.1987
Ab. Inventory & Receivable	33253	-.0008	.0003	.0421
Ab. Production Cost	33338	-.1081	-.0577	.9852
Ab. Discretionary Exp.	30527	-.1778	-.1002	4.6951

Table 3.5 shows the summary statistics of the key variables used here. Grants are broken down based on the performance metric employed. The data covers the period from 2005-2019. The compensation data are collected from Incentive Lab (IL), Compustat, and CRSP.

Panel D above shows the summary statistics regarding my sample firms' accrual and real activities-based earnings management during the sample period. I can see that the average abnormal accrual value is negative, indicating that firms are engaged in income-decreasing focused accrual manipulation. The following five variables are constructed based on the firm's abnormal real activities based on the model proposed by Roychowdhury (2006). Here I also find that three of the five metrics have income-decreasing properties. Existing research (Badertscher et al., 2009) has shown that firms manage earnings downward to create cookie jar reserves, depress share prices before corporate and insider stock purchases, and minimize political costs. In my sample, even the positive abnormal cost of goods sold depressed the firm's earnings.

3.4.2. Evidence from multivariate regression models

My main results begin in Table 3.6, which contains estimates from the multivariate regression in Equation 1. To test the first of my six hypotheses, I consider how earnings per share (EPS) as a performance goal may shape a firm's behavior. I calculate equation 1 for firms using EPS thresholds as the dependent variable with all six earnings management estimates. Here my primary independent variable is a dummy variable that takes the value one if the CEO met their goals and zero if they failed.

Table 3.6
Multivariate difference between firms that exceed and miss EPS goals.
Dep. Var.: Six earnings management measures

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Ab. Acc	Ab. CshFlw	Ab. COGS	Ab. InvRcv	Ab. PrdCst	Ab. DisExp
Met EPS Goal	**0.008*** **	0.001	-0.143	0.001	-0.035	-0.292*
	(4.138)	(0.024)	(-1.281)	(0.273)	(-0.614)	(-1.695)
BCF Index	0.003**	0.011	-0.181	-0.001	-0.019	0.006
	(2.444)	(0.607)	(-1.234)	(-1.124)	(-0.889)	(0.069)
Board Ind.	-0.007	-0.090	0.602	0.019*	-0.010	-1.500
	(-0.565)	(-0.683)	(0.676)	(1.749)	(-0.037)	(-1.312)
Female	-0.032**	0.194	-0.298	0.001	-0.104	-0.901
	(-2.368)	(1.560)	(-0.432)	(0.127)	(-0.504)	(-0.680)
Size	0.002	-0.016	0.048	-0.003***	0.067**	0.180*
	(1.264)	(-1.444)	(0.909)	(-3.197)	(2.269)	(1.687)

Table 3.6 Continued.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Ab. Acc	Ab. CshFlw	Ab. COGS	Ab. InvRcv	Ab. PrdCst	Ab. DisExp
Market to book	0.001	0.001	-0.001*	0.001	-0.001	-0.001
	(1.015)	(1.492)	(-1.857)	(1.224)	(-1.110)	(-1.066)
Std. Dev. cash flow	0.066	0.522	-3.227	-0.054	-0.797	5.147
	(0.755)	(0.847)	(-1.012)	(-0.782)	(-1.487)	(1.020)
Std. Dev. sales growth	-0.005	-0.033	0.266	-0.003	0.155	2.031
	(-0.288)	(-0.194)	(0.795)	(-0.237)	(0.631)	(0.971)
Observations	2,362	2,483	2,497	2,454	2,454	2,096
R-squared	0.199	0.239	0.049	0.052	0.067	0.124

This table report results from the OLS estimation of the regression model (1). All data are from IL, COMPUSTAT annual, and the sample period is from 2005 to 2019. T-stats reported in parentheses are robust to heteroskedasticity and are clustered at the two-digit SIC industry level. The compensation data are from Incentive Lab (IL), Compustat, CRSP, and ExecuComp. (∗∗∗); (∗∗); (∗) denote statistical significance at 1%, 5%, and 10%, levels respectively.

I find that exceeding executives' EPS thresholds is associated with increased abnormal accruals but not with any other measure of manipulation. These results for EPS compensation metrics are consistent with executives making accounting choices when given incentives based on accounting measures. This result supports my hypothesis 1 that firms use accrual-based earnings management to help their CEO achieve their EPS goals. In my sample, firms, where CEOs achieved their EPS goals exhibit 21% more accrual-based earnings management than those that failed their EPS goals.

Table 3.7

Multivariate difference between firms that exceed and miss Earnings goals.

Dep. Var.: Six earnings management measures

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Ab. Acc	Ab. CshFlw	Ab. COGS	Ab. InvRcv	Ab. PrdCst	Ab. DisExp
Met Earnings Goal	**0.008****	-0.032	-0.304	0.007*	0.046	0.458
	(2.192)	(-0.825)	(-1.192)	(1.747)	(0.839)	(1.183)

Table 3.7 Continued

VARIABLES	(1) Ab. Acc	(2) Ab. CshFlw	(3) Ab. COGS	(4) Ab. InvRcv	(5) Ab. PrdCst	(6) Ab. DisExp
BCF Index	0.003	-0.014	0.004	-0.001	0.020	-0.230
	(0.765)	(-0.580)	(0.050)	(-0.522)	(0.697)	(-1.294)
Board Ind.	-0.069**	-0.030	0.131	-0.027	-0.183	-1.969
	(-2.128)	(-0.129)	(0.161)	(-1.419)	(-0.595)	(-0.959)
Female	0.060**	-0.445*	0.149	0.048**	0.314	3.773*
	(2.138)	(-1.707)	(0.151)	(2.192)	(0.575)	(1.669)
Size	-0.001	-0.002	0.090	-0.002	0.020	0.014
	(-0.022)	(-0.061)	(1.079)	(-1.246)	(0.923)	(0.074)
Market to book	0.001	0.001	0.001	0.001	-0.001	0.001
	(0.870)	(0.760)	(1.343)	(0.096)	(-0.557)	(0.518)
Std. Dev. cash flow	-0.170	-0.590	-14.717	-0.344***	-2.950	-2.584
	(-1.237)	(-0.673)	(-1.204)	(-3.099)	(-1.585)	(-0.748)
Std. Dev. sales growth	-0.032	-0.147	-0.420	-0.010	-0.036	1.580
	(-1.491)	(-0.721)	(-0.379)	(-0.293)	(-0.224)	(1.513)
Observations	614	714	726	679	679	550
R-squared	0.345	0.255	0.229	0.135	0.084	0.104

This table report results from the OLS estimation of the regression model (1). All data are from IL, COMPUSTAT annual, and the sample period is from 2005 to 2019. T-stats reported in parentheses are robust to heteroskedasticity and are clustered at the two-digit SIC industry level. The compensation data are from Incentive Lab (IL), Compustat, CRSP, and ExecuComp. (∗∗∗); (∗∗); (∗) denote statistical significance at 1%, 5%, and 10%, levels respectively.

Table 3.7 reports estimates from Equation 1, which investigates the behavioral differences among firms where CEOs have earnings goals as their performance measure. Similar to EPS goals (Table 3.6), I find that firms where CEOs achieve earnings goals show similar abnormal accruals. This finding is unsurprising as EPS is derived from a firm's earnings. However, these firms also exhibit higher abnormal inventory and receivables. This result supports my second hypothesis. My third hypothesis is based on the assumption that CEOs use accrual-based earnings management to meet their EBITDA goal set by the board. The primary benefit of using EBITDA as a performance measure is its non-reliance on non-operating items, such as interest, taxes, depreciation, and amortization, that do not relate to a firm's core business.

Table 3.8
Multivariate difference between firms that exceed and miss EBITDA goals.

	Dep. Var.: Six earnings management measures					
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Ab. Acc	Ab. CshFlw	Ab. COGS	Ab. InvRcv	Ab. PrdCst	Ab. DisExp
Met EBITDA Goal	0.001	0.049	0.037	-0.001	-0.031	-0.361
	(0.392)	(0.871)	(0.480)	(-0.192)	(-0.594)	(-1.005)
BCF Index	-0.004	-0.014	-0.053	-0.001	-0.041	-0.022
	(-1.205)	(-0.367)	(-0.876)	(-0.511)	(-1.354)	(-0.165)
Board Ind.	-0.059**	0.402	0.008	-0.001	0.013	-2.543
	(-2.525)	(1.366)	(0.021)	(-0.024)	(0.053)	(-1.628)
Female	0.005	-0.153	0.057	-0.022	-0.379	1.081
	(0.203)	(-0.610)	(0.101)	(-1.252)	(-1.153)	(1.512)
Size	-0.004	-0.008	0.025	-0.005***	0.054**	-0.084
	(-1.541)	(-0.369)	(0.523)	(-3.656)	(2.118)	(-1.044)
Market to book	0.001**	0.001	-0.001	0.001	-0.001	-0.001
	(2.383)	(1.124)	(-1.077)	(0.722)	(-1.461)	(-0.794)
Std. Dev. cash flow	-0.297***	0.031	0.209	-0.085	-2.198*	-4.103
	(-3.603)	(0.040)	(0.175)	(-1.259)	(-1.722)	(-0.981)
Std. Dev. sales growth	-0.012	0.081	0.248	0.016*	0.163*	-0.522
	(-1.274)	(0.849)	(0.988)	(1.678)	(1.689)	(-0.943)
Observations	1,175	1,187	1,187	1,167	1,174	1,070
R-squared	0.255	0.200	0.180	0.096	0.065	0.100

This table report results from the OLS estimation of the regression model (1). All data are from IL, COMPUSTAT annual, and the sample period is from 2005 to 2019. T-stats reported in parentheses are robust to heteroskedasticity and are clustered at the two-digit SIC industry level. The compensation data are from Incentive Lab (IL), Compustat, CRSP, and ExecuComp. (∗∗∗); (∗∗); (∗) denote statistical significance at 1%, 5%, and 10%, levels respectively.

I can observe from the above table 3.8 that firms where CEOs met the EBITDA threshold do not show any significant level of earnings management compared to firms that failed. So, hypothesis three is proven. One possible explanation could be how EBITDA is calculated by removing nonfinancial items. A firm's financial position or capital expenditure also does not influence EBITDA. Prior research (Bartov, 1993; Dhaliwal et al., 1994; Ayers et al., 2002; Herrmann et al., 2003; Gunny, 2005) has shown that these items can be used to manage earnings.

I then test other avenues of earnings management that CEOs can use to help them meet their performance goals. Sales have become a prominent metric that more firms are using to judge the performance of their CEOs. In Table 3.10, I present the result of the six earnings management affect on firms where CEOs met their sales goals and where they did not.

Table 3.9

Multivariate difference between firms that exceed and miss Sales goals.

Dep. Var.: Six earnings management measures

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Ab. Acc	Ab. CshFlw	Ab. COGS	Ab. InvRcv	Ab. PrdCst	Ab. DisExp
Met Sales Goal	0.004	0.033	-0.159*	**0.004****	0.014	0.183
	(1.372)	(1.008)	(-1.728)	(2.143)	(0.223)	(1.515)
BCF Index	-0.001	-0.016	-0.222***	0.001	-0.008	0.060
	(-0.894)	(-0.743)	(-2.839)	(0.485)	(-0.355)	(0.640)
Board Ind.	-0.041**	0.086	0.377	-0.002	-0.027	-2.116**
	(-2.454)	(0.707)	(0.723)	(-0.182)	(-0.102)	(-2.254)
Female	-0.020	-0.041	-0.258	-0.003	-0.027	0.781
	(-1.175)	(-0.208)	(-0.517)	(-0.308)	(-0.108)	(0.891)
Size	-0.001	-0.016	0.031	-0.001	-0.005	0.001
	(-0.472)	(-1.095)	(0.920)	(-1.255)	(-0.306)	(0.009)
Market to book	0.001	0.001***	-0.001*	0.001	-0.001	-0.001
	(0.885)	(2.691)	(-1.739)	(0.863)	(-0.456)	(-1.125)
Std. Dev. cash flow	0.042	-1.327	-1.626	-0.130*	-0.852	-0.816
	(0.589)	(-0.956)	(-0.916)	(-1.781)	(-0.683)	(-0.284)
Std. Dev. sales growth	-0.028**	0.105	0.211	0.003	0.217	-0.182
	(-2.583)	(1.045)	(1.006)	(0.427)	(1.464)	(-0.646)
Observations	2,749	2,824	2,836	2,758	2,767	2,733
R-squared	0.171	0.246	0.165	0.053	0.064	0.109

This table report results from the OLS estimation of the regression model (1). All data are from IL, COMPUSTAT annual, and the sample period is from 2005 to 2019. T-stats reported in parentheses are robust to heteroskedasticity and are clustered at the two-digit SIC industry level. The compensation data are from Incentive Lab (IL), Compustat, CRSP, and ExecuComp. (∗∗∗); (∗∗); (∗) denote statistical significance at 1%, 5%, and 10%, levels respectively.

By contrast to my earlier results, where CEOs met sales goals, firms do not exhibit significantly more abnormal accruals than firms that did not meet their sales goals. Instead, firms meeting their sales goals have significantly higher abnormal inventories & receivables, which is not unexpected as inventory and accounts receivable are the balance sheet items most closely associated with sales, and tactics such as offering customers additional credit are straightforward ways to boost sales in the short term. In my sample firms, where CEOs achieved their sales goals exhibited 50% more abnormal inventory and receivables than those that failed their sales goals. This result follows my earlier assumption and supports hypothesis 4 that CEOs use inventories and receivables to meet their sales goals.

Table 3.10

Multivariate difference between firms that exceed and miss Op. Income goals.

Dep. Var.: Six earnings management measures

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Ab. Acc	Ab. CshFlw	Ab. COGS	Ab. InvRcv	Ab. PrdCst	Ab. DisExp
Met OpIncome goal	**0.009***	**0.089***	-0.167	-0.001	-0.014	-0.278
	(1.847)	(1.958)	(-1.235)	(-0.256)	(-0.341)	(-0.669)
BCF Index	-0.002	-0.024	-0.082	0.001	-0.011	0.239*
	(-1.309)	(-1.320)	(-1.096)	(0.304)	(-0.639)	(1.934)
Board Ind.	-0.038**	-0.010	0.854	-0.001	-0.005	-1.702*
	(-2.102)	(-0.053)	(1.070)	(-0.007)	(-0.030)	(-1.657)
Female	-0.001	-0.144	-1.185*	-0.007	0.401**	0.759
	(-0.058)	(-0.781)	(-1.706)	(-0.490)	(2.007)	(0.800)
Size	0.002	0.017	0.045	-0.001	0.028	0.027
	(1.332)	(0.964)	(1.412)	(-0.401)	(1.121)	(0.308)
Market to book	-0.001	-0.001	-0.001	0.001*	-0.001***	-0.001
	(-0.900)	(-0.140)	(-0.636)	(1.717)	(-2.596)	(-0.050)
Std. Dev. cash flow	0.027	-0.232	-2.323	-0.001	0.057	4.210
	(0.294)	(-0.282)	(-0.699)	(-0.008)	(0.080)	(0.881)
Std. Dev. sales growth	-0.039*	0.013	0.225	-0.012	0.189	-0.354
	(-1.731)	(0.114)	(0.494)	(-0.706)	(1.401)	(-0.641)
Observations	1,568	1,601	1,608	1,578	1,581	1,426
R-squared	0.198	0.263	0.040	0.058	0.116	0.142

This table report results from the OLS estimation of the regression model (1). All data are from IL, COMPUSTAT annual, and the sample period is from 2005 to 2019. T-stats reported in parentheses are robust to heteroskedasticity and are clustered at the two-digit SIC industry level.

The compensation data are from Incentive Lab (IL), Compustat, CRSP, and ExecuComp. (∗∗∗); (∗∗); (∗) denote statistical significance at 1%, 5%, and 10%, levels respectively.

Table 3.10 shows that meeting operating income thresholds is weakly associated with abnormal accruals and cash flows. This is reasonable given operating income's relationship to accrual accounts and cash flows. Firms that meet cash flow from operations goals are, perhaps unsurprisingly, associated with higher abnormal cash flows than firms that do not meet their cash flow goals. These firms also exhibit significantly lower abnormal accruals and abnormal inventories & receivables, possibly indicating that executives cannot effectively manipulate firm cash flows while simultaneously manipulating accounting choices. These findings support my earlier assumption and hypothesis 5 that firms use cash flow focused real earnings management to reach their CEOs' operating income goal.

Table 3.11

Multivariate difference between firms that exceed and miss Cash from Op. goals.

Dep. Var.: Six earnings management measures

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Ab. Acc	Ab. CshFlw	Ab. COGS	Ab. InvRcv	Ab. PrdCst	Ab. DisExp
Met Cashflow goal	**-0.012****	**0.073****	0.038	**-0.009*****	-0.015	0.235
	(-2.568)	(2.261)	(0.968)	(-2.673)	(-0.239)	(0.459)
BCF Index	-0.002	0.010	0.011	0.001	-0.025	0.185
	(-0.636)	(0.739)	(0.628)	(0.303)	(-0.704)	(1.057)
Board Ind.	-0.056***	0.040	-0.028	0.006	-0.307	-3.242*
	(-2.622)	(0.266)	(-0.156)	(0.477)	(-1.236)	(-1.784)
Female	0.006	-0.121	-0.084	-0.014	0.185	-0.226
	(0.256)	(-0.936)	(-0.505)	(-1.379)	(0.635)	(-0.188)
Size	0.001	-0.019	0.030**	-0.002*	0.003	0.214
	(0.120)	(-1.358)	(2.144)	(-1.759)	(0.123)	(1.402)
Market to book	0.001	0.001**	-0.001**	0.001	-0.001*	-0.001
	(0.909)	(2.167)	(-2.159)	(0.629)	(-1.867)	(-1.147)
Std. Dev. cash flow	-0.116	0.745	1.373	-0.216***	-2.435	-4.724
	(-1.002)	(0.847)	(1.397)	(-3.289)	(-1.039)	(-0.522)

Table 3.11 Continued

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Ab. Acc	Ab. CshFlw	Ab. COGS	Ab. InvRcv	Ab. PrdCst	Ab. DisExp
Std. Dev. sales growth	-0.019	0.057	0.285	0.008	0.188	0.148
	(-1.404)	(0.579)	(1.053)	(1.104)	(0.978)	(0.115)
Observations	1,365	1,391	1,392	1,377	1,382	1,261
R-squared	0.253	0.279	0.076	0.088	0.039	0.129

This table report results from the OLS estimation of the regression model (1). All data are from IL, COMPUSTAT annual, and the sample period is from 2005 to 2019. T-stats reported in parentheses are robust to heteroskedasticity and are clustered at the two-digit SIC industry level. The compensation data are from Incentive Lab (IL), Compustat, CRSP, and ExecuComp. (∗∗∗); (∗∗); (∗) denote statistical significance at 1%, 5%, and 10%, levels respectively.

The sixth performance metric included in my study is Cash flow from operation. I present the results in Table 3.11. Firms, where CEOs meet cashflow goals, show significant abnormal cashflow and abnormal inventory and receivable goal. Unlike the Sales goal, the cashflow goal depresses the abnormal inventory and receivables for firms that meet this goal. The findings from this test support my sixth hypothesis that firms use cash flow-focused real earnings management to reach their CEOs' cash flow from operation goals.

3.5 Robustness

The results of my earlier tests show an overall consistent picture. The type of performance metric in CEO compensation contracts affects how firms manage their earnings among firms that meet their goals and those that fail. In particular, the division among performance metrics depends on the type of earnings management they signify. Earnings-derived goals like EPS, Earnings, and EBITDA have a preferential effect on accrual-based earnings management. By contrast, sales, cash flow, and operating income-based performance goals generally encourage real activity-based earnings management among firms. However, earlier studies (Schipper, 1989; Dechow and Skinner, 2000; and Healy and Wahlen, 1999) note that earning management evidence's interpretations are controversial. Despite its widespread popularity, the aggregate accrual model (Jones, 1991) I used in this study, there is a limited understanding of how accruals behave in the absence of discretion, making it challenging to identify and control for correlated omitted variables (McNichols, 2000).

As my primary research objective is to validate that firms behave differently depending on their CEO's performance goal, I argue that any such difference would reflect in firms' discretionary business decisions as well as aggregate accruals that I have already tested. Previous research has uncovered links between Research and Development (R&D) efforts and various attributes like analyst coverage, forecast error, and forecast revisions (Barth et al., 2001; Gu and Wang, 2005; Ho et al., 2007). So as part of the robustness test, I replace firms' earnings management estimates with firms' changes in R&D expenditure in my model.

Table 3.12
The multivariate difference in R&D expenditure between firms that exceed and miss their CEOs' performance goals.
Dep. Var.: Changes in R&D expenditure

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Change R&D	Change R&D	Change R&D	Change R&D	Change R&D	Change R&D
Met EPS Goal	-0.106					
	(-0.329)					
Met Sales Goal		1.506***				
		(3.102)				
Met Earnings Goal			1.354*			
			(1.843)			
Met EBITDA Goal				-0.968		
				(-1.582)		
Met Op Income Goal					-0.886	
					(-0.766)	
Met Cashflow Goal						-0.460
						(-0.584)
Size	-0.335*	-1.073***	-1.045*	-0.798*	-0.266	-0.425
	(-1.917)	(-3.356)	(-1.868)	(-1.922)	(-0.776)	(-1.138)

Table 3.12 Continued

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Change R&D	Change R&D	Change R&D	Change R&D	Change R&D	Change R&D
Market to book	0.001	0.001***	0.001	0.001	0.001**	0.001
	(1.276)	(2.701)	(1.176)	(1.596)	(2.049)	(1.392)
Std. Dev. cash flow	11.225	35.811**	-54.901	15.774	39.007**	9.923
	(1.252)	(2.092)	(-1.516)	(1.116)	(2.094)	(0.505)
Std. Dev. sales growth	0.714	1.618	-2.700	1.056	0.271	1.053
	(0.398)	(0.943)	(-0.450)	(0.837)	(0.072)	(0.632)
Female	0.056	-0.351	-9.298*	1.302	-0.872	-0.573
	(0.031)	(-0.132)	(-1.879)	(0.684)	(-0.229)	(-0.271)
Board Ind.	-2.258	-2.779	3.313	-2.312	-5.510*	-1.226
	(-1.280)	(-1.042)	(0.923)	(-0.984)	(-1.739)	(-0.560)
BCF Index	0.271	0.408	0.470	0.140	0.230	0.292
	(1.227)	(1.232)	(1.151)	(0.382)	(0.667)	(0.956)
Observations	2,080	2,092	593	805	875	940
R-squared	0.065	0.111	0.156	0.122	0.107	0.091

This table report results from the OLS estimation of the regression from a modified model (1). All data are from IL, COMPUSTAT annual, and the sample period is from 2005 to 2019. T-stats reported in parentheses are robust to heteroskedasticity and are clustered at the two-digit SIC industry level. The compensation data are from Incentive Lab (IL), Compustat, CRSP, and ExecuComp. (∗∗∗); (∗∗); (∗) denote statistical significance at 1%, 5%, and 10%, levels respectively.

Table 3.12 presents the results of my robustness test. I can find that only sales significantly affected the firm R&D expenditure of my six performance metrics. CEOs who met their sales goal on average invest 67% more in R&D than CEOs who failed their sales goal. My result is supported by earlier research, which shows that a 1 dollar increase in R&D expenditures results in a 2 dollar increase in earnings and a 5 dollar increase in market value (Sougiannis, 1994).

In my second robustness test, I include the sales, general, and administrative (SGA) expenses and how firms manage SGA when their CEOs have a different performance metric in their compensation contracts. Castenholz (1931) emphasized the significance of controlling SG&A expenses by analyzing these expenses and stating that companies must incur costs to reach a specific level of performance. Capozza and Seguin (1996) divided General and Administrative (G&A) expenses into two categories: structured G&A expenses and style G&A expenses. They explored the effect these expenses have on a firm's valuation. As managements are in charge of disbursing SGA and SGA is counted on the accounting period it incurred, I hypothesized that firms are more likely to focus on these expenses to help their CEOs meet their performance goals. The results are presented in Table 3.13 below.

Table 3.13

Multivariate difference in SGA expenditure between firms that exceed and miss their CEOs' performance goals.

Dep. Var.: Changes in R&D expenditure

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Change SGA	Change SGA	Change SGA	Change SGA	Change SGA	Change SGA
Met EPS Goal	2.443**					
	(2.058)					
Met Sales Goal		12.274***				
		(6.629)				
Met Earnings Goal			5.670**			
			(2.132)			
Met EBITDA Goal				-0.126		
				(-0.052)		
Met Op Income Goal					4.049	
					(0.949)	
Met Cashflow Goal						3.099
						(1.454)
Size	-1.724**	-3.457***	-2.465*	-2.941**	-0.260	-0.413
	(-2.132)	(-3.297)	(-1.675)	(-2.035)	(-0.199)	(-0.368)
Market to book	0.001	0.001***	0.002**	0.001	0.001	0.001
	(0.811)	(2.925)	(2.338)	(0.686)	(0.201)	(0.353)
Std. Dev. cash flow	101.014***	42.647	-85.938	19.859	184.593**	210.196***
	(2.635)	(1.020)	(-1.066)	(0.317)	(2.549)	(3.487)
Std. Dev. sales growth	-14.937	0.661	-13.377	5.051	-27.474	-1.358
	(-1.484)	(0.134)	(-0.699)	(1.088)	(-1.518)	(-0.250)
Female	1.372	-11.142	-15.090	-6.754	-46.757**	-17.110
	(0.098)	(-0.987)	(-0.988)	(-0.550)	(-2.544)	(-1.379)
Board Ind.	-28.714**	-30.568***	10.503	-11.374	-19.897	-0.381
	(-2.205)	(-2.708)	(0.348)	(-1.000)	(-1.463)	(-0.041)

Table 3.13 Continued

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Change SGA	Change SGA	Change SGA	Change SGA	Change SGA	Change SGA
BCF Index	0.833	2.930***	-0.645	1.360	0.619	2.421*
	(0.929)	(2.921)	(-0.304)	(0.884)	(0.425)	(1.929)
Observations	1,729	1,965	429	707	759	851
R-squared	0.283	0.212	0.313	0.205	0.210	0.168

This table report results from the OLS estimation of the regression from a modified model (1). All data are from IL, COMPUSTAT annual, and the sample period is from 2005 to 2019. T-stats reported in parentheses are robust to heteroskedasticity and are clustered at the two-digit SIC industry level. The compensation data are from Incentive Lab (IL), Compustat, CRSP, and ExecuComp. (∗∗∗); (∗∗); (∗) denote statistical significance at 1%, 5%, and 10%, levels respectively.

I can see that three metrics statistically affect a firm's sales and general and administrative expense change if their CEOs meet their performance goals. On average, firms have 1.2 times more on sales, general and administrative expenses when their CEOs meet their sales goal, compared to firms where CEOs fail to meet sales goals. Similarly, firms spend 20% and 50% more on SGA when their CEOs successfully reach their EPS and Earnings goals. These results align with my earlier findings that firms behave differently to help their CEOs reach their goal based on the performance metric type they have in their compensation contracts.

3.6 Conclusion

The size of contemporary corporations often leads to a disconnect between ownership and control, particularly in the largest corporations. Owners who hold shares in these companies are often widespread and must trust professional managers to make decisions regarding investments and distributions. However, these managers may have a negligible personal stake in the company, and as a result, their actions may not align with the interests of the investors, potentially reducing the value of the latter's claims. This dissociation between ownership and control has been acknowledged for centuries as a significant source of issues in corporate governance (Berle and Means, 1930; Smith, 1776).

The 1990s witnessed a rise in the direct exposure of executives to changes in their company's share prices through significant grants of stock options and shares. This was driven by concerns over the insulation of managers from their company's performance, which could lead to value-destructive behavior. By the decade's close, the potential incentives for managers to impact their company's share prices had significantly increased. Although these changes aimed to align managers' incentives with those of shareholders, they also brought forth a new set of challenges. Linking executive incentives to the stock price may have ironically encouraged them to abuse their discretion in reporting earnings to manipulate their company's stock prices.

As firms strive to align pay with performance, they have increasingly incorporated performance goals into equity and non-equity compensation (Bettis et al., 2014). Overall I find evidence of a clear association between CEO performance metrics and the type of earnings management firms may employ. I find correlations between CEO performance-based grants and the utilization of accrual and real activities-based earnings management by examining a comprehensive dataset of CEO performance goals. My findings support the notion that to meet particular performance goals, CEOs manipulate the earnings management of their firms to achieve their target. I expect the outcome of my study will provide insight into the complexities surrounding CEO compensation contracts and the related performance metrics. I hope my findings could lead to recommendations for compensation committees and consultants to structure performance-pay contracts differently to reduce earnings management efforts.

CONCLUSION

Financial constraints, capital structure decision, and CEO compensation are interrelated and needs to be researched following a holistic view. Financial constraints can severely restrict a firm's source of capital, thus forcing management to look for alternative investment options, such that a financially sound or unconstrained firm would not consider. This discrepancy in access to capital leads to a different set of capital structure decisions based on the firm's financial well-being. Moreover, financial constraints can also affect a firm's performance, ultimately affecting CEO compensation, as most CEO compensation packages are linked to performance-based metrics.

On the other hand, many firm-specific and macroeconomic factors may also affect a firm's capital structure decision. Earlier studies observed inconsistent performance by the financial constraint measures as firms identified as financially constrained were not behaving as if they were financially constrained. As financially constrained firms may have different capital structure preferences than unconstrained firms, macroeconomic conditions can also influence a firm's capital structure choice differently based on their financial health.

CEO compensation contracts can also affect how a firm conducts its business and its capital structure decision. Recent trend shows that firms are more likely to align CEO pay with performance by incorporating performance-based metrics in their compensation packages. As I have shown, CEO manipulate earnings to achieve their set performance goals, and this highlights the complexities surrounding compensation contracts and related performance structures. My findings can also lead to developing more effective compensation structures that minimize earnings management efforts, improving corporate governance and financial performance.

Overall, a comprehensive understanding of the interrelation between financial constraint measures, the effect of financial constraint on firms' capital structure decisions, and CEO compensation are critical for predicting and explaining firm behavior. By considering these factors, future researchers can gain insight into how firms make strategic business decisions and allocate their recourse to optimize their financial health.

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APPENDIX

Appendix 1

Variable Definitions

A.1 Company-level variables

Total assets – defined as the book value of assets (Compustat item at)

Age – years since IPO has been issued (Compustat item ipodate)

Cash / Assets – Compustat item che/at

Tangibility – net property, plan and equipment (Compustat item ppent) over total assets

ROA – operating income before depreciation (Compustat item oibdp) over total assets

Marginal Tax Rate – John Graham (http://faculty.fuqua.duke.edu/~jgraham/taxform.html). Following Graham, Lemmon, and Schallheim (1998), i use after-interest marginal tax rates (variable mtrafter). Missing values are filled in as recommended by Graham and Mills (2008)

Total book leverage – sum of long-term debt (Compustat item dltt) and short term debt (Compustat item dlc) over total assets

Long term book leverage – long term debt (Compustat item dltt) over total assets

% of short term debt – Compustat item dlc / (dlc+dltt)

Investment opportunities – (Compustat item prcc_f * cshpri + pstkl + dltt + dlc – txditc) / at. (Frank and Goyal (2009))

Sales growth – Compustat item $\frac{sales_{i,t}}{sales_{i,t-1}} - 1$

Employment growth – Compustat item $\frac{emp_{i,t}}{emp_{i,t-1}} - 1$

R&D – Compustat item xrd over total asset

Gross Investment – Compustat item ppegt / at

Firm Size – natural logarithm of book value of total asset (Compustat item at)

Dividends and repurchases – sum of dividends and repurchases (Compustat item dv + prstkc) over total assets

Other sources of funds – sum of Compustat items dltis + ibc+ dpc + sppe + siv over total assets.

A.2 Financial Constraints Measures

Nondividend payer – firms not paid dividend (Compustat item dvc is zero or missing) previous year.

Dividend payer – firms paid dividends (Compustat item dvc is positive) previous year.

KZ index - –1.001909[(ib + dp)/lagged ppent] + 0.2826389[(at + prcc_ f × csho - ceq - txdb)/at] + 3.139193[(dltt + dlc)/(dltt + dlc + seq)] – 39.3678[(dvc + dvp)/lagged ppent] – 1.314759[che/lagged ppent]. (Lamont, Polk, and Saa-Requejo (2001))

WW Index - –0.091 [(ib + dp)/at] – 0.062[indicator set to one if dvc + dvp is positive, and zero otherwise] + 0.021[dltt/at] – 0.044[log(at)] + 0.102[average industry sales growth, estimated separately for each three-digit SIC industry and each year, with sales growth defined as above] – 0.035[sales growth]. (Whited and Wu (2006) and Hennessy and Whited (2007))

HP Index - $-0.737Size + 0.043Size2 - 0.040Age$, where Size equals the log of inflation-adjusted Compustat item at (in 2004 dollars), and Age is the number of years the firm is listed with a non-missing stock price on Compustat. (Hadlock and Pierce (2010))

OCF Index – earnings before interest minus tax over current liabilities (Compustat item (ebitda – tax) / lct)

A.3 Default Measure

Merton's (1974) Distance to Default Measure $DD = [\ln[(E+F) / F] + r - 0.5\sigma 2]/\sigma$, where E equals CRSP items $|prc| \times shrout / 103$, F equals Compustat items dlc +0.5dltt, r is the firm's annual stock return computed by cumulating monthly returns (CRSP item ret) over the previous 12 months, and $\sigma 2$captures the volatility of the firm's total value (debt and equity). σ is approximated as $(E/(E+F)) \times \sigma E + (F/(E+F)) \times (0.05 + 0.25\sigma E)$, where σE is the annualized percent standard deviation of returns, estimated from monthly stock returns (CRSP item ret) over the previous 12 months. A firm's probability of default is then defined as $N(-DD)$, where N is the cumulative standard normal distribution function. When F is 0, DD is not defined, and the probability of default is set to zero. I classify firm-years as having a high probability of default if the default probability at the beginning of the year exceeds 30%.

Altman Z Score - $Z = 0.012X1 + 0.014X2 + 0.033X3 + 0.006X4 + 0.999X5$; where X1 = wcap / at ; X2 = re / at; X3 = ebit /at; X4 = (cshpri * prcc_c) / (dltt +dlc); X5 = sale / at. Z score larger than 2.99 is considered low probability of default and z score below 1.8 is considered high default probability.

Table A1.1

Summary Statistics of FCP "constrained" and "unconstrained" firms

	FCP Index		OCF Index	
	Cons.	Uncon.	Cons.	Uncon.
Total real assets,	299.096	8039.881	1173.102	3518.46
Cash/assets	.118	.202	.36	.15
Age (since IPO)	7.458	9.459	6.741	9.839
Tangibility	.303	.269	.164	.357
ROA	-.156	.108	-.297	.173
Marginal tax rate	.165	.187	.081	.216
Total book leverage	.454	.254	.305	.26
Long-term book leverage	.243	.221	.142	.237
% short-term debt (1 year)	.318	.198	.391	.165
Investment opportunities	2.218	1.873	2.922	1.949
Sales growth	1.167	1.224	3.075	.201
Employment growth	.406	.177	.567	.151
R&D	.213	.079	.256	.049
Gross investment	.631	.494	.385	.658
No of firm-years	25,836	25,856	30,623	30,603

The table reports summary statistics for 100,691 firm-years for 8,599 nonfinancial and nonutility public U.S. firms between 1989 and 2020 classified as "constrained" and "unconstrained" by the five financial constrained measures compared in this paper. For variable definitions and details of their construction, see Appendix 1.

Table A1.2

Equity recycling by FCP financial constraints measure

Panel A. Baseline results

Dep. Var.: Change in dividends and repurchases

	FCP Index		OCF Index	
	(1)	(2)	(3)	(4)
	Constrained	Unconstrained	Constrained	Unconstrained
Change in Equity issuance proceeds	0.0237	0.0564**	0.0148	0.1935***
	(1.4199)	(2.3556)	(1.3593)	(5.2181)
Change other sources of funds	0.0037	0.0299**	0.0010	0.1542***
	(1.4766)	(2.2873)	(1.3988)	(6.2876)
Change in log total assets	-0.0027***	-0.0066***	-0.0006	-0.0137***
	(-3.1107)	(-5.2075)	(-0.6694)	(-8.9180)
Observations	8,162	8,555	9,216	13,004
R-squared	0.2537	0.1937	0.2247	0.3321

Panel B. Focusing on share repurchases only

Dep. Var.: Change in repurchases

	FCP Index		OCF Index	
	(1)	(2)	(3)	(4)
	Constrained	Unconstrained	Constrained	Unconstrained
Change in Equity issuance proceeds	0.0199	0.0476**	0.0151	0.1206***
	(1.2347)	(2.1829)	(1.4036)	(3.8486)
Change other sources of funds	0.0029	0.0224**	0.0010	0.0577***
	(1.2492)	(2.1557)	(1.4050)	(3.7740)
Change in log total assets	-0.0016**	-0.0057***	-0.0014*	-0.0082***
	(-2.3350)	(-5.0640)	(-1.8190)	(-6.9258)
Observations	8,330	8,700	9,497	13,181
R-squared	0.2134	0.1724	0.2238	0.2364

Panel C. Forward-looking measures of financial constraints

Dep. Var.: Change in dividends and repurchases

	FCP Index		OCF Index	
	(1)	(2)	(3)	(4)
	Constrained	Unconstrained	Constrained	Unconstrained
Change in Equity issuance proceeds	0.0237	0.0564**	0.0148	0.1567***
	(1.4199)	(2.3556)	(1.3254)	(4.9991)
Change other sources of funds	0.0037	0.0299**	0.0012	0.1510***
	(1.4766)	(2.2873)	(1.4528)	(6.4804)
Change in log total assets	-0.0027***	-0.0066***	0.0007	-0.0123***
	(-3.1107)	(-5.2075)	(0.5040)	(-8.9471)
Observations	8,162	8,555	8,204	13,327
R-squared	0.2537	0.1937	0.2335	0.2761

I compare the extent to which "constrained" and "unconstrained" firms use the proceeds of firm-initiated equity issues to increase their payouts to shareholders. In panel A, the payout is measured as the sum of dividends and share repurchases. Panel B focuses on share repurchases only. In panels A and B, firms are categorized as "constrained" and "unconstrained" according to the five measures of financial constraints introduced in Table 2. Panel C uses a forward-looking measure of financial constraints, identifying firms as "constrained" and "unconstrained" on year *t* if the relevant constraints measure identifies the firm as "constrained" or "unconstrained" on year *t*+1. My choice of control variables follows that of Kim and Weisbach (2008). All specifications are estimated using OLS firm-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level. T-stats are shown underneath the coefficient estimates in parentheses. I use ***, **, * to denote significance at 1%, 5% and 10% levels respectively.

Table A1.3

Cash holdings sensitivity to cash flow by FCP financial constraints measure

Dep. Var.: Change in Cash holdings

	FCP Index		OCF Index	
	(1)	(2)	(3)	(4)
	Constrained	Unconstrained	Constrained	Unconstrained
CashFlow	0.0033***	-0.0308**	0.0033***	0.0082
	(2.6618)	(-2.1343)	(2.7316)	(0.9061)
Q	0.0003	0.0042***	0.0004*	0.0031***
	(1.0405)	(4.7277)	(1.6508)	(3.5925)
Size	-0.0057**	-0.0121***	-0.0026	-0.0105***
	(-2.1698)	(-6.7593)	(-1.0840)	(-7.4151)
Observations	20,695	20,749	24,733	28,078
R-squared	0.1075	0.1292	0.0946	0.1328

This table report results from the OLS estimation of the baseline regression model (2). All data are from COMPUSTAT annual, and the sample period is from 1989 to 2020. My choice of control variables follows that of Almeida et al. (2004). All specifications are estimated using OLS with firm-by-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level. T-stats are shown underneath the coefficient estimates in parentheses. I use ***, **, * to denote significance at 1%, 5%, and 10% levels respectively.

Table A1.4

Cash holdings sensitivity to cash flow by FCP financial constraints measure

Dep. Var.: Change in Cash holdings

	FCP Index		OCF Index	
	(1)	(2)	(1)	(2)
	Constrained	Unconstrained	Constrained	Unconstrained
CashFlow	0.0034**	-0.1402***	0.0028***	-0.0755***
	(2.3304)	(-12.3373)	(2.7522)	(-6.0660)
Q	0.0004	-0.0010	0.0005***	-0.0035***
	(1.4136)	(-1.2941)	(2.8800)	(-3.9596)
Size	0.0015	-0.0095***	0.0024	-0.0021
	(0.5436)	(-5.0093)	(0.9554)	(-1.6054)
Expenditures	-0.3341***	-0.3057***	-0.5654***	-0.1819***
	(-12.2062)	(-12.8725)	(-8.7328)	(-15.1353)
Acquisitions	-0.3111***	-0.3785***	-0.5326***	-0.2688***
	(-15.0518)	(-22.4758)	(-6.4419)	(-19.7348)
NWC	0.0070**	0.4441***	0.0008***	0.5824***
	(2.2369)	(29.7156)	(2.8632)	(34.6216)
ShortDebt	-0.0053	0.3835***	-0.0102	0.4923***
	(-0.5850)	(12.7489)	(-1.4699)	(21.3602)
Observations	19,789	18,349	23,275	26,356
R-squared	0.1718	0.5224	0.1540	0.5901

This table report results from the OLS estimation of the extended regression model (3). All data are from COMPUSTAT annual, and the sample period is from 1989 to 2020. My choice of control variables follows that of Almeida et al. (2004). All specifications are estimated using OLS with firm-by-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level. T-stats are shown underneath the coefficient estimates in parentheses. I use ***, **, * to denote significance at 1%, 5% and 10% levels respectively.

Table A1.5

R&D sensitivity to asset sales proceeds by FCP financial constraints measure

Dep. Var.: $R\&D_t$ expenditure

	FCP Index		OCF Index	
	(1)	(2)	(1)	(2)
	Constrained	Unconstrained	Constrained	Unconstrained
$AssetSales_t$	-0.0188	0.0438	0.1477**	-0.0514
	(-0.3081)	(0.3602)	(1.9663)	(-0.9277)
$R\&D_{t-1}$	0.0456	0.4130***	0.0092	0.0708
	(0.5932)	(3.3160)	(0.2625)	(0.9000)
$R\&D^2_{t-1}$	-0.0000	-0.0926***	0.0000	-0.0323*
	(-0.3274)	(-4.4663)	(0.3050)	(-1.6504)
Q_{t-1}	-0.0000	-0.0010	-0.0001**	-0.0002
	(-1.4494)	(-1.5647)	(-2.0849)	(-1.3599)
$CashFlow_t$	-0.0022	0.0650**	-0.0045	0.1877
	(-0.6865)	(2.3027)	(-0.5747)	(1.5605)
$StkIssues_t$	0.1015**	0.1119***	0.1552***	0.0305**
	(2.0341)	(3.7739)	(5.8306)	(1.9816)
$DbtIssues_t$	0.1818***	0.0873***	0.1834***	0.0314***
	(2.7923)	(2.9844)	(3.2253)	(4.4534)
ΔNWC_t	-0.0726***	-0.0503*	-0.0031***	-0.0160
	(-3.6127)	(-1.6500)	(-3.9378)	(-0.5694)
Observations	7,112	7,209	11,167	9,270
R-squared	0.7673	0.6958	0.6495	0.6739

This table report results from the OLS estimation of the extended regression model (4). All data are from COMPUSTAT annual, and the sample period is from 1989 to 2020. My choice of control variables follows that of Borisova and Brown (2013). All specifications are estimated using OLS with firm-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level. T-stats are shown underneath the coefficient estimates in parentheses. I use ***, **, * to denote significance at 1%, 5% and 10% levels respectively.

Table A1.6

Equity recycling by financial constraints measures 2007 - 2010

Panel A. Baseline results

Dep. Var.: Change in dividends and repurchases

		Dividend		KZ Index		HP Index		WW Index		OCF Index
	(1) Nondiv. payer	(2) Dividend payer	(3) Constrained	(4) Unconstrained	(5) Constrained	(6) Unconstrained	(7) Constrained	(8) Unconstrained	(9) Constrained	(10) Unconstrained
Change in Equity issuance proceeds	0.1159	0.3232	0.3652*	-0.0086	0.1977**	0.1646**	0.0633	0.1401	-0.0037	0.6480***
	(1.5460)	(1.1868)	(1.8591)	(-0.5259)	(2.0131)	(2.2620)	(1.1798)	(1.2805)	(-0.2971)	(5.5452)
Change other sources of funds	-0.0047	0.2878***	0.0572***	0.0355**	-0.0042	0.1097**	0.0500*	0.2017***	-0.0104***	0.2393***
	(-0.6782)	(2.6467)	(3.0941)	(2.2148)	(-0.4889)	(2.3888)	(1.8434)	(2.8846)	(-4.7464)	(3.2452)
Change in log total assets	-0.0074*	-0.0181***	-0.0068**	-0.0091**	-0.0140	-0.0094**	-0.0066	-0.0116**	0.0032	-0.0308***
	(-1.9406)	(-2.6346)	(-2.3651)	(-2.0907)	(-1.6296)	(-2.5543)	(-1.4885)	(-2.4941)	(1.4319)	(-4.6630)
Observations	2,370	943	804	818	1,219	1,015	962	911	669	1,127
R-squared	0.3003	0.4612	0.5653	0.4266	0.3110	0.5031	0.2485	0.4983	0.5026	0.5985

Panel B. Focusing on share repurchases only

Dep. Var.: Change in repurchases

		Dividend		KZ Index		HP Index		WW Index		OCF Index
	(1) Nondiv. payer	(2) Dividend payer	(3) Constrained	(4) Unconstrained	(5) Constrained	(6) Unconstrained	(7) Constrained	(8) Unconstrained	(9) Constrained	(10) Unconstrained
Change in Equity issuance proceeds	0.0825	0.1279	0.3600*	0.0079	0.0889	0.1551**	0.0270*	0.1340	0.0111**	0.2304
	(1.3230)	(0.8644)	(1.8352)	(1.0285)	(1.4799)	(2.3012)	(1.7238)	(1.4009)	(2.1263)	(1.1612)
Change other sources of funds	-0.0056	0.1512**	0.0501***	0.0269*	-0.0085**	0.1075**	0.0108**	0.1820***	-0.0099***	0.0979**
	(-1.0028)	(2.1307)	(2.7154)	(1.8102)	(-2.1150)	(2.3826)	(2.0039)	(2.6845)	(-4.0450)	(1.9730)
Change in log total assets	-0.0061*	-0.0092**	-0.0046*	-0.0072*	-0.0094	-0.0087**	-0.0044**	-0.0096**	0.0013	-0.0191***
	(-1.8356)	(-2.0691)	(-1.8466)	(-1.8642)	(-1.5105)	(-2.4624)	(-2.0613)	(-2.1673)	(0.6874)	(-3.1402)
Observations	2,410	956	813	823	1,248	1,023	985	921	688	1,145
R-squared	0.2594	0.4650	0.5659	0.4125	0.2410	0.4994	0.3527	0.4992	0.5033	0.3779

Panel C. Forward-looking measures of financial constraints

Dep. Var.: Change in dividends and repurchases

	Dividend		KZ Index		HP Index		WW Index		OCF Index	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Nondiv. payer	Dividend payer	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
Change in Equity issuance proceeds	0.2179***	-0.0716	0.3652*	-0.0018	0.2034**	0.1448***	0.1216**	-0.0569	-0.0018	0.6086***
	(2.7266)	(-0.7626)	(1.8591)	(-0.0832)	(2.0101)	(2.9168)	(2.1799)	(-0.5604)	(-0.0919)	(5.0984)
Change other sources of funds	-0.0037	0.1895**	0.0572***	0.0336**	-0.0055	0.1038**	0.0378	0.1743***	-0.0085***	0.2047***
	(-0.4219)	(2.5004)	(3.0941)	(2.2477)	(-0.6886)	(2.4649)	(1.3166)	(2.8321)	(-2.7154)	(3.2027)
Change in log total assets	-0.0097**	-0.0123***	-0.0068**	-0.0112***	-0.0152	-0.0096***	-0.0084*	-0.0115**	-0.0011	-0.0302***
	(-2.4164)	(-2.5998)	(-2.3651)	(-2.6310)	(-1.4804)	(-2.6739)	(-1.8696)	(-2.5682)	(-0.3482)	(-4.5068)
Observations	2,322	976	804	912	1,081	1,109	925	1,020	568	1,173
R-squared	0.3807	0.4753	0.5653	0.3890	0.3215	0.4965	0.2661	0.4720	0.5072	0.5851

I compare the extent to which “constrained” and “unconstrained” firms use the proceeds of firm-initiated equity issues to increase their payouts to shareholders. In panel A, the payout is measured as the sum of dividends and share repurchases. Panel B focuses on share repurchases only. In panels A and B, firms are categorized as “constrained” and “unconstrained” according to the five measures of financial constraints introduced in Table 2. Panel C uses a forward-looking measure of financial constraints, identifying firms as “constrained” and “unconstrained” on year *t* if the relevant constraints measure identifies the firm as “constrained” or “unconstrained” on year *t*+1. My choice of control variables follows that of Kim and Weisbach (2008). All specifications are estimated using OLS firm-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level. T-stats are shown underneath the coefficient estimates in parentheses. I use ***, **, * to denote significance at 1%, 5% and 10% levels respectively.

Table A1.7

Cash holdings sensitivity to cash flow by constraints measure 2007-2010

Dep. Var.: Change in Cash holdings

	Dividend		KZ Index		HP Index		WW Index		OCF Index	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Nondiv. payer	Dividend payer	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
CashFlow	0.0196***	0.0358	0.0363***	0.0223***	0.0163***	0.0011	0.0260**	0.0347***	0.0150***	-0.0057
	(4.0581)	(1.1112)	(3.8395)	(3.3646)	(3.1057)	(0.0368)	(2.2813)	(3.2442)	(2.8710)	(-0.2145)
Q	0.0010	-0.0103*	0.0064	-0.0007	0.0004	0.0128**	0.0019	0.0009	-0.0008	0.0125***
	(0.4799)	(-1.7537)	(1.1086)	(-0.2465)	(0.1921)	(1.9960)	(0.7595)	(0.2008)	(-0.4060)	(2.9553)
Size	0.0202**	-0.0102	0.0081	0.0224	0.0414***	0.0048	0.0306**	0.0070	0.0299**	0.0278*
	(2.1059)	(-0.7887)	(0.6052)	(1.5648)	(3.2740)	(0.4406)	(2.3558)	(0.5569)	(2.2400)	(1.8972)
Observations	6,676	3,017	3,055	2,969	2,934	3,381	3,081	3,081	2,730	3,043
R-squared	0.2097	0.2478	0.2908	0.2358	0.2157	0.2234	0.2083	0.2255	0.2376	0.2689

This table report results from the OLS estimation of the baseline regression model (2). All data are from COMPUSTAT annual, and the sample period is from 1989 to 2020. My choice of control variables follows that of Almeida et al. (2004). All specifications are estimated using OLS with firm-by-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level. T-stats are shown underneath the coefficient estimates in parentheses. I use ***, **, * to denote significance at 1%, 5% and 10% levels respectively.

Table A1.8

Cash holdings sensitivity to cash flow by all constraints measure 2007 - 2010

Dep. Var.: Change in Cash holdings

		Dividend		KZ Index		HP Index		WW Index		OCF Index
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Nondiv. payer	Dividend payer	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
CashFlow	-0.0238	-0.0934***	-0.1088***	-0.0263*	-0.0161	-0.1038***	-0.0160	-0.2005***	-0.0156	-0.1272***
	(-1.6211)	(-3.0554)	(-4.5508)	(-1.9193)	(-1.1485)	(-5.1302)	(-0.6914)	(-5.2494)	(-1.2253)	(-4.5305)
Q	-0.0002	-0.0065	0.0091	-0.0030	-0.0000	0.0016	0.0016	-0.0007	-0.0017	0.0044
	(-0.0878)	(-1.3525)	(1.6188)	(-1.0538)	(-0.0175)	(0.2892)	(0.5628)	(-0.1795)	(-0.8068)	(0.9238)
Size	0.0251**	-0.0133	0.0424***	-0.0083	0.0276*	-0.0141	0.0166	0.0379***	0.0269**	0.0174
	(2.2534)	(-1.0039)	(3.1812)	(-0.4277)	(1.7007)	(-1.5063)	(0.8334)	(3.3099)	(2.0247)	(1.3117)
Expenditures	-0.5168***	-0.2972***	-0.2750***	-1.1273***	-0.7139***	-0.2153***	-0.6297***	-0.4291***	-0.7699***	-0.2213***
	(-7.9374)	(-4.2594)	(-6.0486)	(-4.6670)	(-5.9892)	(-4.9385)	(-5.1695)	(-6.2748)	(-5.0178)	(-3.8028)
Acquisitions	-0.5184***	-0.2475***	-0.2795***	-0.4610***	-0.4023***	-0.3146***	-0.6440***	-0.3500***	-0.3617**	-0.3178***
	(-5.6582)	(-4.8180)	(-7.0507)	(-2.9760)	(-2.7574)	(-8.6658)	(-8.6884)	(-7.5222)	(-2.2743)	(-4.5288)
ΔNWC	0.0752***	0.3384***	0.1026***	0.0980***	0.0650**	0.4663***	0.0956	0.1528***	0.0538***	0.4734***
	(3.0426)	(3.2001)	(6.0573)	(3.4306)	(2.4467)	(10.6993)	(1.6186)	(6.8945)	(2.7761)	(4.3142)
ΔShortDebt	0.1067***	0.3548***	0.1143***	0.1121***	0.0988***	0.3969***	0.1349**	0.1660***	0.0846***	0.3863***
	(4.5036)	(3.3562)	(5.4444)	(3.1576)	(3.6739)	(6.6724)	(2.5648)	(10.8066)	(4.4131)	(3.1632)
Observations	6,414	2,776	2,882	2,828	2,896	3,081	3,016	2,789	2,596	2,886
R-squared	0.3505	0.4743	0.4370	0.3811	0.3225	0.5775	0.3559	0.4257	0.3246	0.5723

This table report results from the OLS estimation of the extended regression model (3). All data are from COMPUSTAT annual, and the sample period is from 1989 to 2020. My choice of control variables follows that of Almeida et al. (2004). All specifications are estimated using OLS with firm-by-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level. T-stats are shown underneath the coefficient estimates in parentheses. I use ***, **, * to denote significance at 1%, 5% and 10% levels respectively.

Table A1.9

R&D sensitivity to asset sales proceeds by financial constraints measures 2007 - 2010

Dep. Var.: $R\&D_t$ expenditure

	Dividend		KZ Index		HP Index		WW Index		OCF Index	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Nondiv. payer	Dividend payer	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
$AssetSales_t$	-0.1268	0.0453	-0.0610	-0.6650	-1.2702	-0.0012	0.1148	0.0714	0.0768	0.0498
	(-0.4717)	(0.4702)	(-1.0003)	(-0.8123)	(-1.2090)	(-0.0431)	(0.5132)	(0.3986)	(0.2771)	(0.5852)
$R\&D_{t-1}$	-0.0956	0.4080	-0.2965	-0.0020	-0.1009	-0.1576	-0.0364	0.9790	-0.1069	0.2366
	(-0.5426)	(1.5646)	(-0.6961)	(-0.0281)	(-0.5290)	(-0.5922)	(-0.4243)	(1.5448)	(-0.5656)	(1.2305)
$R\&D^2_{t-1}$	-0.0068	-1.0459	0.2046	-0.0080	-0.0066	0.0432	-0.0106	-1.3762	-0.0064	-0.5459
	(-1.1560)	(-1.4621)	(0.3505)	(-0.4511)	(-1.0259)	(0.1504)	(-0.6119)	(-1.5409)	(-1.0057)	(-1.6305)
Q_{t-1}	0.0000	-0.0009	0.0002	-0.0005	0.0000	-0.0019	0.0010	0.0034	0.0000	-0.0001
	(0.1567)	(-1.0067)	(0.1937)	(-0.3837)	(0.0601)	(-1.2121)	(0.6780)	(0.9297)	(0.0066)	(-0.1264)
$CashFlow_t$	-0.0072	0.0684***	0.0394	0.0320	0.0024	0.0892***	0.0541	-0.0096	0.0026	0.1233***
	(-0.1420)	(4.5589)	(1.4767)	(0.5392)	(0.0442)	(3.3484)	(0.6941)	(-0.2377)	(0.0486)	(4.2924)
$StkIssues_t$	0.2714***	0.0205*	0.0493	0.2217***	0.2844***	0.0425**	0.2780***	-0.0775	0.2845***	0.0276**
	(2.9735)	(1.7575)	(1.1664)	(2.9195)	(2.8596)	(2.2641)	(2.6573)	(-0.9939)	(2.8370)	(2.0206)
$DbtIssues_t$	0.2562	0.0106***	0.0466	0.1133	0.3427	0.0387	0.0803	0.0192	0.3450	0.0256
	(1.4946)	(3.7336)	(1.4015)	(1.5841)	(1.2835)	(1.4100)	(0.9616)	(1.4298)	(1.2577)	(1.6485)
ΔNWC_t	-0.1200	-0.0215*	0.0119	-0.1429	-0.1308	-0.0157	-0.1678	0.1094	-0.1304	-0.0160
	(-1.2250)	(-1.9621)	(0.8072)	(-1.2415)	(-1.2795)	(-0.7977)	(-1.2308)	(1.3238)	(-1.2921)	(-1.3085)
Observations	3,170	996	837	1,668	1,616	1,166	1,698	955	1,375	1,042
R-squared	0.4776	0.9686	0.9259	0.7735	0.4665	0.9261	0.7832	0.8315	0.4621	0.9298

This table report results from the OLS estimation of the extended regression model (4). All data are from COMPUSTAT annual, and the sample period is from 1989 to 2020. My choice of control variables follows that of Borisova and Brown (2013). All specifications are estimated using OLS with firm-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level. T-stats are shown underneath the coefficient estimates in parentheses. I use ***, **, * to denote significance at 1%, 5% and 10% levels respectively.

Table A1.10

Equity recycling by financial constraints measure 1st and 10th (10%)

Panel A. Baseline results

Dep. Var.: Change in dividends and repurchases

	Dividend		KZ Index		HP Index		WW Index		OCF Index	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Nondiv. payer	Dividend payer	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
Change in Equity issuance proceeds	0.0240**	0.1994***	0.0980**	0.0058	0.0175	0.1490**	0.0005	0.0781*	0.0207	0.1618***
	(2.1875)	(5.3663)	(2.2401)	(1.0758)	(1.4227)	(2.2363)	(0.1170)	(1.7966)	(0.9804)	(3.5402)
Change other sources of funds	0.0019**	0.1023**	0.0001	0.0015	0.0014	0.0115	0.0006	0.0106	0.0026	0.2074***
	(2.3890)	(2.3314)	(0.4080)	(1.0275)	(1.6411)	(1.3900)	(1.0495)	(1.0590)	(0.9902)	(3.8439)
Change in log total assets	-0.0026***	-0.0103***	-0.0028	-0.0042	0.0027	-0.0050***	-0.0037*	-0.0041***	0.0032	-0.0227***
	(-4.6425)	(-7.3506)	(-1.4568)	(-1.3610)	(0.8964)	(-4.6990)	(-1.9543)	(-2.7246)	(0.8880)	(-6.0959)
Observations	24,679	10,692	2,140	2,032	3,526	2,761	2,741	2,247	2,217	3,685
R-squared	0.1537	0.3673	0.3475	0.3716	0.2811	0.2123	0.1529	0.2816	0.3678	0.4344

Panel B. Focusing on share repurchases only

Dep. Var.: Change in repurchases

	Dividend		KZ Index		HP Index		WW Index		OCF Index	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Nondiv. payer	Dividend payer	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
Change in Equity issuance proceeds	0.0225**	0.0723**	0.0801**	0.0060	0.0156	0.1567**	0.0009	0.0775*	0.0209	0.0500***
	(2.1253)	(2.4421)	(1.9664)	(1.3129)	(1.3148)	(2.3768)	(0.3358)	(1.9203)	(1.0013)	(2.6617)
Change other sources of funds	0.0016**	0.0343**	0.0006	0.0005	0.0011	0.0107	0.0003	0.0096	0.0026	0.0765***
	(2.2291)	(2.2620)	(0.8723)	(0.6877)	(1.3500)	(1.3892)	(1.2589)	(1.0581)	(0.9995)	(3.4736)
Change in log total assets	-0.0029***	-0.0040***	-0.0029	-0.0001	0.0003	-0.0039***	-0.0023	-0.0026*	0.0028	-0.0104***
	(-5.7132)	(-5.0725)	(-1.5944)	(-0.0382)	(0.2090)	(-3.9169)	(-1.3367)	(-1.9098)	(0.8511)	(-5.7360)
Observations	25,177	10,813	2,190	2,080	3,664	2,789	2,803	2,285	2,305	3,748
R-squared	0.1476	0.1369	0.2864	0.2749	0.2780	0.2144	0.1503	0.2030	0.3683	0.2591

I compare the extent to which "constrained" and "unconstrained" firms use the proceeds of firm-initiated equity issues to increase their payouts to shareholders. In panel A, the payout is measured as the sum of dividends and share repurchases. Panel B focuses on share repurchases only. In panels A and B, firms are categorized as "constrained" and "unconstrained" according to the five measures of financial constraints introduced in Table 2. My choice of control variables follows that of Kim and Weisbach (2008). All specifications are estimated using OLS with industry-by-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level are shown in italics underneath the coefficient estimates. I use ***, **, * to denote significance at 1%, 5% and 10% levels respectively.

Table A1.11

Cash holdings sensitivity to cash flow by financial constraints measure 1st and 10th (10%)

Dep. Var.: Change in Cash holdings

	Dividend		KZ Index		HP Index		WW Index		OCF Index	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Nondiv. payer	Dividend payer	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
CashFlow	0.0035***	0.0204	0.0013	0.0105**	0.0016	-0.0229*	-0.0028	0.0126	0.0015	-0.0071
	(2.9252)	(1.3176)	(0.3626)	(2.4175)	(1.5667)	(-1.8524)	(-0.8737)	(1.0976)	(1.3420)	(-0.4394)
Q	0.0005***	0.0003	0.0005	0.0009	0.0004*	0.0016	-0.0000	0.0014	-0.0003	0.0010
	(3.9040)	(0.3699)	(1.2982)	(1.5194)	(1.6876)	(1.1295)	(-0.0160)	(0.5962)	(-0.7962)	(0.6181)
Size	-0.0064***	-0.0040***	-0.0027*	-0.0109***	0.0256***	-0.0009	0.0024	-0.0025	0.0202***	-0.0097***
	(-5.1284)	(-3.7292)	(-1.8333)	(-5.0355)	(3.1629)	(-0.5647)	(0.6632)	(-0.8363)	(4.0487)	(-3.3658)
Observations	56,108	25,952	26,680	26,337	5,713	8,611	7,890	7,423	6,885	7,865
R-squared	0.0638	0.0806	0.1627	0.1052	0.1192	0.0820	0.0947	0.1608	0.1384	0.1722

This table report results from the OLS estimation of the baseline regression model (2). All data are from COMPUSTAT annual, and the sample period is from 1989 to 2020. My choice of control variables follows that of Almeida et al. (2004). All specifications are estimated using OLS with industry-by-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level are shown in italics underneath the coefficient estimates. I use ***, **, * to denote significance at 1%, 5% and 10% levels respectively.

Table A1.12

Cash holdings sensitivity to cash flow by constraints measure 1st and 10th (10%)

Dep. Var.: Change in Cash holdings

	Dividend		KZ Index		HP Index		WW Index		OCF Index	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Nondiv. payer	Dividend payer	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
CashFlow	0.0033***	-0.0904***	0.0037	-0.0307***	0.0014	-0.0634***	-0.0013	-0.1349**	0.0018*	-0.0777**
	(2.8140)	(-5.9648)	(1.4662)	(-3.9196)	(1.5439)	(-5.2157)	(-0.3693)	(-2.4381)	(1.7187)	(-2.3949)
Q	0.0006***	-0.0021**	0.0009***	-0.0022*	0.0004*	-0.0031**	0.0002	0.0018	-0.0001	-0.0056***
	(3.5677)	(-2.1338)	(2.6929)	(-1.9582)	(1.9359)	(-2.5804)	(0.5719)	(0.8261)	(-0.3631)	(-4.4347)
Size	-0.0003	-0.0051***	0.0010	-0.0126***	0.0270***	-0.0003	0.0073**	-0.0002	0.0223***	-0.0038
	(-0.2550)	(-4.5296)	(0.7127)	(-4.2292)	(3.5140)	(-0.1919)	(2.0452)	(-0.0535)	(4.6533)	(-1.3728)
Expenditures	-0.4701***	-0.2071***	-0.2229***	-0.8328***	-0.6078***	-0.1617***	-0.7295***	-0.2635***	-0.8038***	-0.1665***
	(-17.3186)	(-13.3125)	(-15.2709)	(-11.5056)	(-7.6018)	(-7.5055)	(-8.3626)	(-6.6329)	(-6.7543)	(-8.8076)
Acquisitions	-0.4681***	-0.2719***	-0.2169***	-0.5637***	-0.2930**	-0.2067***	-0.4687***	-0.2684***	-0.2503*	-0.2000***
	(-18.9868)	(-20.1104)	(-19.4377)	(-11.3553)	(-2.0501)	(-13.9611)	(-9.9795)	(-11.3126)	(-1.8045)	(-7.5078)
ΔNWC	0.0010**	0.4312***	0.0032***	0.1207***	0.0007***	0.4150***	0.0005***	0.1181***	0.0008***	0.5757***
	(2.3455)	(18.1491)	(3.6884)	(5.3036)	(4.3974)	(12.8800)	(2.8214)	(3.3779)	(3.5954)	(14.6563)
ΔShortDebt	-0.0108	0.3258***	0.0149*	0.1380***	-0.0093	0.3738***	-0.0106	0.1072***	-0.0115	0.5238***
	(-1.5718)	(7.9829)	(1.7460)	(6.1184)	(-1.1283)	(14.8813)	(-1.1851)	(3.4041)	(-0.6539)	(13.7749)
Observations	53,069	23,613	24,805	24,720	5,573	7,501	7,564	6,252	6,717	7,390
R-squared	0.1403	0.4259	0.2503	0.3038	0.1647	0.4178	0.1669	0.3141	0.1935	0.6091

This table report results from the OLS estimation of the extended regression model (3). All data are from COMPUSTAT annual, and the sample period is from 1989 to 2020. My choice of control variables follows that of Almeida et al. (2004). All specifications are estimated using OLS with industry-by-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level are shown in italics underneath the coefficient estimates. I use ***, **, * to denote significance at 1%, 5% and 10% levels respectively.

Table A1.13

R&D sensitivity to asset sales proceeds by financial constraints measure 1st and 10th (10%)

Dep. Var.: $R\&D_t$ expenditure

	Dividend		KZ Index		HP Index		WW Index		OCF Index	
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
	Nondiv. payer	Dividend payer	Constrained	Unconstrained	Constrained	Nondiv. payer	Dividend payer	Constrained	Unconstrained	Constrained
$AssetSales_t$	0.0824	-0.0179	0.0228	0.5071	0.2707	-0.0981	0.1875	-0.0203	0.2240	-0.0902
	(1.5012)	(-0.7403)	(1.0923)	(1.0748)	(0.9786)	(-1.1455)	(0.7028)	(-0.2648)	(1.0789)	(-0.5560)
$R\&D_{t-1}$	0.0158	0.2401	0.8208***	-0.0051	0.0281	0.5999***	0.0151	-0.0267	-0.0318	-0.1913
	(0.4620)	(1.3005)	(3.0166)	(-0.1239)	(0.3847)	(5.0873)	(0.4389)	(-0.1218)	(-1.3315)	(-0.8213)
$R\&D^2_{t-1}$	0.0000	-0.3219	-0.5264	0.0003	-0.0000	-0.6635***	-0.0002	0.1317**	0.0000*	0.0183
	(0.1201)	(-1.4115)	(-1.5622)	(0.4200)	(-0.1230)	(-6.5877)	(-0.5816)	(2.3142)	(1.7935)	(0.4791)
Q_{t-1}	-0.0001**	-0.0073**	-0.0042*	0.0003	-0.0001**	-0.0007	-0.0002	-0.0003	-0.0000	0.0000
	(-2.0070)	(-2.3885)	(-1.8648)	(1.0330)	(-2.2395)	(-1.2811)	(-0.3240)	(-0.8588)	(-1.3111)	(0.0291)
$CashFlow_t$	-0.0054	0.4373**	0.0004	-0.0048***	-0.0037	0.0968***	-0.0603**	0.0132	0.0130	0.5013**
	(-0.7201)	(2.0734)	(0.2412)	(-3.0119)	(-0.4934)	(5.4561)	(-2.5746)	(0.2492)	(0.4730)	(2.2822)
$StkIssues_t$	0.1524***	0.1090**	0.0871***	0.2131***	0.1426***	0.0048	0.1543***	0.0925	0.1659***	0.0679*
	(5.9771)	(2.2358)	(3.5826)	(6.1455)	(5.0549)	(1.0631)	(7.7158)	(1.3642)	(4.7427)	(1.7887)
$DbtIssues_t$	0.1532***	0.0123	0.0130	0.1252**	0.2141***	0.0076**	0.0465	0.0857**	0.2185**	0.0406***
	(3.4176)	(1.2063)	(1.6027)	(2.5804)	(2.7655)	(2.5249)	(1.6220)	(2.3754)	(2.2134)	(2.7974)
ΔNWC_t	-0.0031***	-0.0395*	0.0159	-0.0933**	-0.0029***	0.0045	-0.0087***	-0.0060	-0.0018	-0.0921*
	(-4.0108)	(-1.7337)	(0.8632)	(-2.2827)	(-3.6799)	(0.6309)	(-3.9125)	(-0.2335)	(-0.8138)	(-1.7363)
Observations	23,929	7,812	1,821	3,607	2,885	2,414	3,989	2,015	3,638	2,186
R-squared	0.6747	0.7183	0.8637	0.5398	0.6709	0.9228	0.4945	0.8903	0.5737	0.6705

This table report results from the OLS estimation of the extended regression model (5). All data are from COMPUSTAT annual, and the sample period is from 1989 to 2020. My choice of control variables follows that of Borisova and Brown (2013). All specifications are estimated using OLS with firm-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level are shown in italics underneath the coefficient estimates. I use ***, **, * to denote significance at 1%, 5% and 10% levels respectively.

Table A1.14

Equity recycling by financial constraints measure 1st and 5th (20%)

Panel A. Baseline results

Dep. Var.: Change in dividends and repurchases

	Dividend		KZ Index		HP Index		WW Index		OCF Index	
	(1) Nondiv. payer	(2) Dividend payer	(3) Constrained	(4) Unconstrained	(5) Constrained	(6) Unconstrained	(7) Constrained	(8) Unconstrained	(9) Constrained	(10) Unconstrained
Change in Equity issuance proceeds	0.0240**	0.1994***	0.0608**	0.0123**	0.0238**	0.1787***	0.0044	0.1647***	0.0125	0.1507***
	(2.1875)	(5.3663)	(2.3690)	(2.2525)	(1.9830)	(3.5648)	(1.1406)	(3.7496)	(1.0987)	(4.1553)
Change other sources of funds	0.0019**	0.1023**	0.0006	0.0023	0.0020**	0.0308*	0.0007	0.0228	0.0011	0.1830***
	(2.3890)	(2.3314)	(1.1712)	(1.1877)	(2.2402)	(1.7260)	(1.1272)	(1.5322)	(1.1146)	(5.3073)
Change in log total assets	-0.0026***	-0.0103***	-0.0033***	-0.0059***	-0.0021	-0.0055***	-0.0021*	-0.0064***	0.0009	-0.0158***
	(-4.6425)	(-7.3506)	(-3.3614)	(-2.8253)	(-1.0293)	(-6.3190)	(-1.7585)	(-5.4495)	(0.6872)	(-7.6954)
Observations	24,679	10,692	4,851	4,745	7,438	5,936	5,450	4,980	4,776	7,770
R-squared	0.1537	0.3673	0.2666	0.2776	0.2190	0.1276	0.1691	0.1854	0.2223	0.4002

Panel B. Focusing on share repurchases only

Dep. Var.: Change in repurchases

	Dividend		KZ Index		HP Index		WW Index		OCF Index	
	(1) Nondiv. payer	(2) Dividend payer	(3) Constrained	(4) Unconstrained	(5) Constrained	(6) Unconstrained	(7) Constrained	(8) Unconstrained	(9) Constrained	(10) Unconstrained
Change in Equity issuance proceeds	0.0225**	0.0723**	0.0518**	0.0090**	0.0205*	0.1640***	0.0065*	0.1202***	0.0133	0.1065***
	(2.1253)	(2.4421)	(2.1290)	(2.2466)	(1.7950)	(3.5518)	(1.7866)	(3.0053)	(1.1779)	(3.1564)
Change other sources of funds	0.0016**	0.0343**	0.0009	0.0010	0.0014*	0.0277*	0.0002	0.0166	0.0011	0.0641***
	(2.2291)	(2.2620)	(1.1408)	(0.9785)	(1.7717)	(1.7102)	(0.9883)	(1.5845)	(1.1689)	(2.7445)
Change in log total assets	-0.0029***	-0.0040***	-0.0028***	-0.0025*	-0.0023*	-0.0043***	-0.0022**	-0.0042***	-0.0003	-0.0087***
	(-5.7132)	(-5.0725)	(-3.1365)	(-1.8669)	(-1.9394)	(-5.2253)	(-2.2361)	(-4.7728)	(-0.2045)	(-6.2296)
Observations	25,177	10,813	4,941	4,821	7,667	6,000	5,567	5,059	4,959	7,892
R-squared	0.1476	0.1369	0.2197	0.1993	0.2311	0.1231	0.1851	0.1961	0.2412	0.3016

I compare the extent to which "constrained" and "unconstrained" firms use the proceeds of firm-initiated equity issues to increase their payouts to shareholders. In panel A, the payout is measured as the sum of dividends and share repurchases. Panel B focuses on share repurchases only. In panels A and B, firms are categorized as "constrained" and "unconstrained" according to the five measures of financial constraints introduced in Table 2. My choice of control variables follows that of Kim and Weisbach (2008). All specifications are estimated using OLS with industry-by-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level are shown in italics underneath the coefficient estimates. I use ***, **, * to denote significance at 1%, 5% and 10% levels respectively.

Table A1.15

Cash holdings sensitivity to cash flow by financial constraints measure 1st and 5th (20%)

Dep. Var.: Change in Cash holdings

	Dividend		KZ Index		HP Index		WW Index		OCF Index	
	(1) Nondiv. payer	(2) Dividend payer	(3) Constrained	(4) Unconstrained	(5) Constrained	(6) Unconstrained	(7) Constrained	(8) Unconstrained	(9) Constrained	(10) Unconstrained
CashFlow	0.0035***	0.0204	0.0018	0.0093**	0.0021**	-0.0128	-0.0002	0.0158*	0.0028**	0.0022
	(2.9252)	(1.3176)	(0.5131)	(2.1230)	(2.0384)	(-1.0155)	(-0.0445)	(1.8716)	(2.2571)	(0.1849)
Q	0.0005***	0.0003	0.0006*	0.0006	0.0004*	0.0021*	0.0002	0.0032***	0.0003	0.0019*
	(3.9040)	(0.3699)	(1.7423)	(1.1727)	(1.8974)	(1.7848)	(0.5468)	(3.3417)	(1.1704)	(1.7464)
Size	-0.0064***	-0.0040***	-0.0026	-0.0128***	0.0145***	-0.0026**	0.0037	-0.0024	0.0057*	-0.0123***
	(-5.1284)	(-3.7292)	(-1.1055)	(-4.1343)	(3.1028)	(-2.4001)	(1.5653)	(-1.1105)	(1.6639)	(-6.6161)
Observations	56,108	25,952	15,674	15,300	13,190	17,311	15,689	15,236	14,177	16,425
R-squared	0.0638	0.0806	0.2124	0.1393	0.1032	0.0687	0.0952	0.1323	0.1095	0.1592

This table report results from the OLS estimation of the baseline regression model (3). All data are from COMPUSTAT annual, and the sample period is from 1989 to 2020. My choice of control variables follows that of Almeida et al. (2004). All specifications are estimated using OLS with industry-by-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level are shown in italics underneath the coefficient estimates. I use ***, **, * to denote significance at 1%, 5% and 10% levels respectively.

Table A1.16

Cash holdings sensitivity to cash flow by constraints measure 1st and 5th (20%)

Dep. Var.: Change in Cash holdings

	Dividend		KZ Index		HP Index		WW Index		OCF Index	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Nondiv. payer	Dividend payer	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
CashFlow	0.0033***	-0.0904***	0.0032	-0.0275***	0.0018*	-0.0759***	0.0011	-0.1359***	0.0024**	-0.0657***
	(2.8140)	(-5.9648)	(1.5900)	(-3.4859)	(1.9191)	(-5.3053)	(0.3081)	(-3.1462)	(2.2806)	(-3.4308)
Q	0.0006***	-0.0021**	0.0009***	-0.0024**	0.0005**	-0.0023**	0.0005	0.0032*	0.0005**	-0.0046***
	(3.5677)	(-2.1338)	(3.2575)	(-2.0399)	(2.3813)	(-2.3512)	(1.1436)	(1.9059)	(2.3766)	(-5.5512)
Size	-0.0003	-0.0051***	0.0016	-0.0191***	0.0202***	-0.0017	0.0088***	-0.0013	0.0091***	-0.0037**
	(-0.2550)	(-4.5296)	(0.6888)	(-4.4408)	(4.4883)	(-1.4638)	(3.7318)	(-0.5512)	(2.7171)	(-2.1063)
Expenditures	-0.4701***	-0.2071***	-0.1914***	-1.0989***	-0.6406***	-0.1676***	-0.6432***	-0.2770***	-0.6322***	-0.1881***
	(-17.3186)	(-13.3125)	(-11.0818)	(-10.4880)	(-10.3244)	(-11.6301)	(-13.1035)	(-9.7223)	(-7.3873)	(-13.1050)
Acquisitions	-0.4681***	-0.2719***	-0.1949***	-0.6330***	-0.5058***	-0.2587***	-0.5167***	-0.2554***	-0.4475***	-0.2535***
	(-18.9868)	(-20.1104)	(-14.5824)	(-12.6582)	(-3.8663)	(-20.3227)	(-15.2081)	(-17.6436)	(-3.5495)	(-13.7982)
ΔNWC	0.0010**	0.4312***	0.0026***	0.1174***	0.0008***	0.4207***	0.0007***	0.1514***	0.0008***	0.5885***
	(2.3455)	(18.1491)	(3.5922)	(4.4018)	(3.4091)	(19.4800)	(2.7874)	(3.2446)	(3.2111)	(23.8395)
ΔShortDebt	-0.0108	0.3258***	0.0162*	0.1362***	-0.0098	0.3703***	-0.0211**	0.1217**	-0.0147*	0.5256***
	(-1.5718)	(7.9829)	(1.7972)	(5.4515)	(-1.2866)	(16.9253)	(-2.0663)	(2.4268)	(-1.9093)	(18.4467)
Observations	53,069	23,613	14,452	14,359	12,866	15,253	15,010	13,331	13,559	15,461
R-squared	0.1403	0.4259	0.2959	0.3359	0.1646	0.4345	0.1678	0.3059	0.1621	0.6071

This table report results from the OLS estimation of the extended regression model (3). All data are from COMPUSTAT annual, and the sample period is from 1989 to 2020. My choice of control variables follows that of Almeida et al. (2004). All specifications are estimated using OLS with industry-by-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level are shown in italics underneath the coefficient estimates. I use ***, **, * to denote significance at 1%, 5% and 10% levels respectively.

Table A1.17

R&D sensitivity to asset sales proceeds by financial constraints measure 1st and 5th (20%)

Dep. Var.: R&D$_t$ expenditure

	Dividend		KZ Index		HP Index		WW Index		OCF Index	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Nondiv. payer	Dividend payer	Constrained	Unconstrained	Constrained	Nondiv. payer	Dividend payer	Constrained	Unconstrained	Constrained
AssetSales$_t$	0.0824	-0.0179	-0.0251	0.5032	0.0884	-0.0122	0.1495	0.0028	0.1749	-0.1614
	(1.5012)	(-0.7403)	(-1.5137)	(1.5007)	(1.0702)	(-0.4415)	(1.4160)	(0.1794)	(1.5349)	(-1.2930)
R&D$_{t-1}$	0.0158	0.2401	0.7057***	0.0303	0.0122	0.5814***	0.0304	-0.0296	-0.0112	-0.0324
	(0.4620)	(1.3005)	(3.6722)	(1.0470)	(0.2920)	(7.7518)	(1.1943)	(-0.2950)	(-0.4863)	(-0.2873)
R&D$^2_{t-1}$	0.0000	-0.3219	-0.2052	-0.0001	0.0000	-0.7222***	-0.0006	0.1324**	0.0000	-0.0090
	(0.1201)	(-1.4115)	(-0.8710)	(-0.1866)	(0.1974)	(-8.7906)	(-1.2746)	(2.5287)	(1.2080)	(-0.4510)
Q$_{t-1}$	-0.0001**	-0.0073**	-0.0038***	-0.0001	-0.0001**	-0.0006	-0.0001**	-0.0003	-0.0000**	-0.0004
	(-2.0070)	(-2.3885)	(-2.8642)	(-1.3481)	(-2.2851)	(-1.4609)	(-2.5609)	(-1.4031)	(-2.4707)	(-1.1925)
CashFlow$_t$	-0.0054	0.4373**	0.0016	-0.0043***	-0.0037	0.1025***	-0.0470	0.0322	-0.0101	0.3479*
	(-0.7201)	(2.0734)	(0.8195)	(-3.0212)	(-0.5043)	(6.8838)	(-1.6159)	(0.9946)	(-1.1348)	(1.9381)
StkIssues$_t$	0.1524***	0.1090**	0.0442*	0.2149***	0.1455***	0.0239**	0.1219***	0.0443	0.1429***	0.0493**
	(5.9771)	(2.2358)	(1.9097)	(6.6905)	(5.4415)	(2.3919)	(7.5397)	(1.5254)	(4.8249)	(2.2022)
DbtIssues$_t$	0.1532***	0.0123	0.0132*	0.0884***	0.1851***	0.0333**	0.0632***	0.0554***	0.1874***	0.0363***
	(3.4176)	(1.2063)	(1.7211)	(2.9227)	(2.9299)	(2.5757)	(2.9464)	(2.6818)	(3.1682)	(3.8901)
ΔNWC$_t$	-0.0031***	-0.0395*	0.0227	-0.0902**	-0.0029***	-0.0074	-0.0069**	-0.0077	-0.0035***	-0.0631
	(-4.0108)	(-1.7337)	(1.1442)	(-2.3548)	(-3.7468)	(-0.8673)	(-2.4413)	(-0.5174)	(-5.1906)	(-1.5861)
Observations	23,929	7,812	3,986	7,764	6,619	5,056	7,490	4,167	7,017	5,058
R-squared	0.6747	0.7183	0.8587	0.5643	0.6596	0.8533	0.4906	0.8854	0.6600	0.6680

This table report results from the OLS estimation of the extended regression model (##). All data are from COMPUSTAT annual, and the sample period is from 1989 to 2020. My choice of control variables follows that of Borisova and Brown (2013). All specifications are estimated using OLS with firm-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level are shown in italics underneath the coefficient estimates. I use ***, **, * to denote significance at 1%, 5% and 10% levels respectively.

Table A1.18

Equity recycling by financial constraints measure 1st and 2nd (50%)

Panel A. Baseline results

Dep. Var.: Change in dividends and repurchases

	Dividend		KZ Index		HP Index		WW Index		OCF Index	
	(1) Nondiv. payer	(2) Dividend payer	(3) Constrained	(4) Unconstrained	(5) Constrained	(6) Unconstrained	(7) Constrained	(8) Unconstrained	(9) Constrained	(10) Unconstrained
Change in Equity issuance proceeds	0.0240**	0.1994***	0.0634***	0.0159**	0.0307***	0.0775***	0.0337***	0.1603***	0.0164	0.1819***
	(2.1875)	(5.3663)	(2.7336)	(2.5057)	(2.5934)	(5.3566)	(3.3954)	(5.7033)	(1.5376)	(5.7884)
Change other sources of funds	0.0019**	0.1023**	0.0010	0.0043	0.0028***	0.0218*	0.0028	0.0317**	0.0012	0.0749**
	(2.3890)	(2.3314)	(1.0711)	(1.3526)	(2.8948)	(1.9465)	(1.2999)	(2.5465)	(1.6242)	(1.9812)
Change in log total assets	-0.0026***	-0.0103***	-0.0033***	-0.0049***	-0.0035***	-0.0050***	-0.0044***	-0.0059***	-0.0015***	-0.0097***
	(-4.6425)	(-7.3506)	(-5.6886)	(-5.8828)	(-3.4687)	(-7.0635)	(-5.2615)	(-8.0118)	(-2.6466)	(-6.2973)
Observations	24,679	10,692	13,774	13,630	19,030	16,439	15,684	14,529	15,447	19,234
R-squared	0.1537	0.3673	0.1700	0.2035	0.1963	0.1523	0.1564	0.2129	0.1962	0.2748

Panel B. Focusing on share repurchases only

Dep. Var.: Change in repurchases

	Dividend		KZ Index		HP Index		WW Index		OCF Index	
	(1) Nondiv. payer	(2) Dividend payer	(3) Constrained	(4) Unconstrained	(5) Constrained	(6) Unconstrained	(7) Constrained	(8) Unconstrained	(9) Constrained	(10) Unconstrained
Change in Equity issuance proceeds	0.0225**	0.0723**	0.0574**	0.0097***	0.0244**	0.0491***	0.0268***	0.0682***	0.0161	0.1293***
	(2.1253)	(2.4421)	(2.5278)	(2.5808)	(2.2670)	(3.8445)	(3.2443)	(4.0498)	(1.5350)	(4.7010)
Change other sources of funds	0.0016**	0.0343**	0.0012	0.0017	0.0016**	0.0156*	0.0011	0.0225**	0.0011	0.0292*
	(2.2291)	(2.2620)	(1.0730)	(1.2822)	(2.3279)	(1.9559)	(1.2819)	(2.5180)	(1.5494)	(1.9462)
Change in log total assets	-0.0029***	-0.0040***	-0.0027***	-0.0033***	-0.0029***	-0.0039***	-0.0033***	-0.0042***	-0.0018***	-0.0062***
	(-5.7132)	(-5.0725)	(-5.0186)	(-5.9054)	(-4.4430)	(-7.0226)	(-5.1002)	(-7.2832)	(-3.6959)	(-6.7931)
Observations	25,177	10,813	13,954	13,810	19,454	16,640	15,929	14,748	15,810	19,490
R-squared	0.1476	0.1369	0.1415	0.1708	0.1721	0.1036	0.1597	0.1119	0.1948	0.2228

I compare the extent to which "constrained" and "unconstrained" firms use the proceeds of firm-initiated equity issues to increase their payouts to shareholders. In panel A, the payout is measured as the sum of dividends and share repurchases. Panel B focuses on share repurchases only. In panels A and B, firms are categorized as "constrained" and "unconstrained" according to the five measures of financial constraints introduced in Table 2. My choice of control variables follows that of Kim and Weisbach (2008). All specifications are estimated using OLS with industry-by-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level are shown in italics underneath the coefficient estimates. I use ***, **, * to denote significance at 1%, 5% and 10% levels respectively.

Table A1.19

Cash holdings sensitivity to cash flow by financial constraints measure 1st and 2nd (50%)

Dep. Var.: Change in Cash holdings

	Dividend		KZ Index		HP Index		WW Index		OCF Index	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Nondiv. payer	Dividend payer	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
CashFlow	0.0035***	0.0204	0.0016	0.0117***	0.0034***	0.0034	0.0036	0.0168**	0.0035***	0.0076*
	(2.9252)	(1.3176)	(0.4318)	(2.6010)	(2.8038)	(0.6722)	(0.9460)	(2.2632)	(2.8253)	(1.8667)
Q	0.0005***	0.0003	0.0005	0.0012*	0.0004***	0.0018**	0.0006	0.0054***	0.0004*	0.0034***
	(3.9040)	(0.3699)	(1.2740)	(1.8267)	(3.9647)	(2.3769)	(1.3620)	(6.0179)	(1.7707)	(5.4705)
Size	-0.0064***	-0.0040***	-0.0034***	-0.0101***	-0.0048**	-0.0046***	-0.0051***	-0.0053***	-0.0046**	-0.0107***
	(-5.1284)	(-3.7292)	(-3.2200)	(-6.0314)	(-2.2692)	(-5.3517)	(-3.5870)	(-4.3312)	(-2.5680)	(-9.8116)
Observations	56,108	25,952	40,445	40,124	38,548	43,677	40,178	39,314	38,933	42,568
R-squared	0.0638	0.0806	0.1276	0.0868	0.0752	0.0745	0.0724	0.1079	0.0845	0.1124

This table report results from the OLS estimation of the baseline regression model (4). All data are from COMPUSTAT annual, and the sample period is from 1989 to 2020. My choice of control variables follows that of Almeida et al. (2004). All specifications are estimated using OLS with industry-by-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level are shown in italics underneath the coefficient estimates. I use ***, **, * to denote significance at 1%, 5% and 10% levels respectively.

Table A1.20

Cash holdings sensitivity to cash flow by constraints measure 1st and 2nd (50%)

Dep. Var.: Change in Cash holdings

		Dividend		KZ Index		HP Index		WW Index		OCF Index
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Nondiv. payer	Dividend payer	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
CashFlow	0.0033***	-0.0904***	0.0048	-0.0341***	0.0027**	-0.0455**	0.0053	-0.1492***	0.0030***	-0.0356*
	(2.8140)	(-5.9648)	(1.5408)	(-4.1300)	(2.4645)	(-2.2360)	(1.3057)	(-3.7775)	(2.8428)	(-1.9317)
Q	0.0006***	-0.0021**	0.0010***	-0.0022*	0.0005***	-0.0034***	0.0009*	0.0034**	0.0006***	-0.0040***
	(3.5677)	(-2.1338)	(2.6680)	(-1.8741)	(2.6950)	(-4.6003)	(1.9411)	(2.0646)	(3.0878)	(-5.4536)
Size	-0.0003	-0.0051***	0.0012	-0.0103***	0.0034	-0.0045***	0.0025*	-0.0011	0.0016	-0.0014
	(-0.2550)	(-4.5296)	(1.1569)	(-4.3924)	(1.5702)	(-4.6065)	(1.6857)	(-0.8929)	(0.8696)	(-1.4380)
Expenditures	-0.4701***	-0.2071***	-0.2726***	-0.7146***	-0.5692***	-0.1943***	-0.5356***	-0.2540***	-0.5393***	-0.1964***
	(-17.3186)	(-13.3125)	(-16.8638)	(-14.0859)	(-19.0212)	(-12.3980)	(-20.3445)	(-8.3313)	(-10.5676)	(-17.8717)
Acquisitions	-0.4681***	-0.2719***	-0.2692***	-0.5268***	-0.5266***	-0.2949***	-0.5484***	-0.2901***	-0.4896***	-0.2805***
	(-18.9868)	(-20.1104)	(-26.5749)	(-16.2461)	(-11.9266)	(-29.4982)	(-25.3579)	(-23.2896)	(-11.1402)	(-27.5763)
ΔNWC	0.0010**	0.4312***	0.0043***	0.1334***	0.0009**	0.3835***	0.0009**	0.2807***	0.0009***	0.5498***
	(2.3455)	(18.1491)	(3.4505)	(5.5704)	(2.5655)	(23.1657)	(2.4803)	(3.4914)	(2.6982)	(41.1865)
ΔShortDebt	-0.0108	0.3258***	-0.0069	0.1489***	-0.0107	0.3078***	-0.0176*	0.2117***	-0.0100	0.4628***
	(-1.5718)	(7.9829)	(-0.4943)	(6.4411)	(-1.5992)	(9.9224)	(-1.7574)	(2.6713)	(-1.4533)	(22.9909)
Observations	53,069	23,613	37,702	37,650	37,140	39,654	38,412	35,746	36,278	39,818
R-squared	0.1403	0.4259	0.2188	0.2976	0.1499	0.4147	0.1574	0.3683	0.1496	0.5616

This table report results from the OLS estimation of the extended regression model (4). All data are from COMPUSTAT annual, and the sample period is from 1989 to 2020. My choice of control variables follows that of Almeida et al. (2004). All specifications are estimated using OLS with industry-by-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level are shown in italics underneath the coefficient estimates. I use ***, **, * to denote significance at 1%, 5% and 10% levels respectively.

Table A1.21

R&D sensitivity to asset sales proceeds by financial constraints measure 1st and 2nd (50%)

Dep. Var.: $R\&D_t$ expenditure

	(1) Nondiv. payer	(2) Dividend payer	(3) Constrained	(4) Unconstrained	(5) Constrained	(6) Unconstrained	(7) Constrained	(8) Unconstrained	(9) Constrained	(10) Unconstrained
$AssetSales_t$	0.0824	-0.0179	-0.0089	0.1729*	0.0717	-0.0102	0.0637	-0.0040	0.1355**	-0.0038
	(1.5012)	(-0.7403)	(-0.5084)	(1.7033)	(1.1517)	(-0.6581)	(1.1747)	(-0.2412)	(2.1909)	(-0.1974)
$R\&D_{t-1}$	0.0158	0.2401	0.7679***	0.0520*	0.0092	0.2146***	0.0536*	0.0824	0.0107	0.1807***
	(0.4620)	(1.3005)	(10.9098)	(1.7549)	(0.2586)	(6.0221)	(1.9222)	(0.9012)	(0.3089)	(3.6232)
$R\&D^2_{t-1}$	0.0000	-0.3219	-0.4077***	-0.0005	0.0000	-0.0293***	-0.0010**	0.0554	0.0000	-0.0610**
	(0.1201)	(-1.4115)	(-2.7592)	(-0.7812)	(0.3014)	(-5.8016)	(-2.0517)	(0.8332)	(0.2623)	(-2.4079)
Q_{t-1}	-0.0001**	-0.0073**	-0.0014**	-0.0001	-0.0000**	-0.0004***	-0.0001**	-0.0001	-0.0000**	-0.0003*
	(-2.0070)	(-2.3885)	(-2.2240)	(-1.6257)	(-2.1993)	(-3.4169)	(-2.2721)	(-1.0489)	(-2.1001)	(-1.6796)
$CashFlow_t$	-0.0054	0.4373**	0.0014	-0.0047**	-0.0052	0.0086	-0.0442	0.0023	-0.0049	0.0227
	(-0.7201)	(2.0734)	(1.1058)	(-2.4180)	(-0.7023)	(1.0827)	(-1.5060)	(0.9633)	(-0.6539)	(0.9980)
$StkIssues_t$	0.1524***	0.1090**	0.0503***	0.1891***	0.1530***	0.0489***	0.1132***	0.0145	0.1544***	0.0173*
	(5.9771)	(2.2358)	(3.0189)	(6.8702)	(5.9814)	(4.6256)	(8.0049)	(1.1789)	(6.0060)	(1.7519)
$DbtIssues_t$	0.1532***	0.0123	0.0407***	0.0775***	0.1673***	0.0348***	0.0587***	0.0443***	0.1741***	0.0316***
	(3.4176)	(1.2063)	(2.6715)	(3.6576)	(3.2701)	(5.7599)	(3.4223)	(4.4147)	(3.2330)	(5.1909)
ΔNWC_t	-0.0031***	-0.0395*	0.0150	-0.0785***	-0.0031***	0.0093	-0.0065**	0.0218***	-0.0031***	0.0257***
	(-4.0108)	(-1.7337)	(0.8834)	(-2.6486)	(-4.0668)	(1.2822)	(-2.2629)	(2.9370)	(-4.1001)	(2.6355)
Observations	23,929	7,812	12,528	18,525	17,515	14,201	18,492	11,907	16,614	14,689
R-squared	0.6747	0.7183	0.8539	0.5768	0.6547	0.8200	0.5290	0.8294	0.6544	0.6685

This table report results from the OLS estimation of the extended regression model (5). All data are from COMPUSTAT annual, and the sample period is from 1989 to 2020. My choice of control variables follows that of Borisova and Brown (2013). All specifications are estimated using OLS with firm-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level are shown in italics underneath the coefficient estimates. I use ***, **, * to denote significance at 1%, 5% and 10% levels respectively.

Table A1.22

Cash holding sensitivity to cash flow and R&D.

Dep. Var.: Change in Cash flow

	Dividend		KZ Index		WW Index		HP Index		OCF Index	
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
	Nondiv. payer	Dividend payer	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
CshHolding	0.4350***	0.0370*	-0.2058	0.4727***	0.4382**	-0.0221	0.1569	0.0363*	0.5129***	0.0111
	(3.5662)	(1.6884)	(-0.5095)	(6.6101)	(2.4302)	(-0.7271)	(1.4436)	(1.7169)	(2.6839)	(0.8175)
R&D exp.	-0.0114	-0.0503	1.1738***	-0.1289*	-0.0099	-0.0662	-0.0104	-0.1628	-0.0130	-0.0072
	(-0.8171)	(-0.4977)	(3.0171)	(-1.9584)	(-0.6720)	(-0.4662)	(-0.9674)	(-1.5531)	(-0.9807)	(-0.1748)
Q	-0.1227***	0.0146***	-0.0970***	-0.0897***	-0.1207***	-0.0003	-0.0947***	0.0046**	-0.1181***	0.0061***
	(-4.9774)	(5.6634)	(-39.0179)	(-8.0559)	(-4.7135)	(-0.0143)	(-38.5161)	(2.5650)	(-5.0797)	(4.5075)
Size	0.2781***	0.0067**	0.1648	0.2723***	0.7766***	-0.0092	0.3180***	-0.0075**	0.3998***	-0.0211***
	(3.8758)	(1.9887)	(0.8374)	(8.0009)	(4.3178)	(-0.9400)	(3.2685)	(-2.3424)	(4.5180)	(-3.6966)
Observation	38,224	13,853	12,956	20,340	18,010	16,666	19,750	14,156	18,627	14,962
R-squared	0.5991	0.4674	0.8335	0.6437	0.6156	0.3286	0.7013	0.3999	0.6252	0.3946

This table report results from the OLS estimation of the extended regression model (3) All data are from COMPUSTAT annual, and the sample period is from 1989 to 2020. My choice of control variables follows that of Borisova and Brown (2013). All specifications are estimated using OLS with firm-year fixed effects. Heteroscedasticity consistent standard errors clustered at the firm level are shown in italics underneath the coefficient estimates. I use ***, **, * to denote significance at 1%, 5% and 10% levels respectively.

Appendix 2

Variable Definitions

A. Leverage Measures

Total debt/market value of assets (TDMV) is the ratio of total debt to the market value of assets (MVA). MVA is the sum of the market value of equity + debt in current liabilities + long-term debt + preferred-liquidation value – deferred taxes and investment tax credit.

Total debt/assets (TDBV) is the ratio of total debt (debt in current liabilities + long-term debt) to assets.

Long-term debt/market value of assets (LTDMV) is the ratio of long-term debt to MVA.

Long-term debt/assets (LTDBV) is the ratio of long-term debt to assets.

B. Factors

1. Profitability

Profitability—operating income before depreciation (Profit) is the ratio of operating income before depreciation to assets.

2. Firm Size

Log of assets (Assets) is the log of assets deflated to 2012 dollars using the GDP deflator.

Mature firms (Mature) is a dummy variable that takes a value of one if the firm has been listed on the Compustat database for longer than five years.

3. Growth

Market-to-book ratio (Mktbk) is the ratio of MVA to Compustat assets. MVA is obtained as the sum of the market value of equity (price-close × shares outstanding) + short-term debt + long-term debt + preferred-liquidation value − deferred taxes and investment tax credit.

Change in log assets (ChgAsset) is change in log of assets.

Capital expenditure/assets (Capex) is the ratio of capital expenditure to assets.

4. Industry

Median industry leverage (IndustLev) is the median of total debt to market value of assets by SIC code and by year. The industry is defined at the four-digit SIC code level in the main results. Robustness is examined by redefining the industry at the three-digit SIC level.

Median industry growth (IndustGr) is the median of change in the assets by 4-digit SIC code and by year.

Regulated dummy (Regultd) is a dummy variable equal to one for firms in regulated industries and zero otherwise. Regulated industries include railroads (SIC code 4011) through 1980, trucking (between 4210 and 4213) through 1980, airlines (4512) through 1978, telecommunications (4812 and 4813) through 1982, and gas and electric utilities (between 4900 and 4939).

5. Nature of Assets

Tangibility (Tang) is the ratio of net property, plant, and equipment to assets.

RND expense/sales (RnD) is the ratio of R&D expenditure to sales.

Uniqueness dummy (Unique) is a dummy variable that takes a value of one if the SIC code of the firm is between 3400 and 4000 (firms producing computers, semiconductors, chemicals, and allied, aircraft, guided missiles, and space vehicles and other sensitive industries), and zero otherwise.

SGA expense/sales (SGA) is the ratio of selling, general, and administration expenses, to sales.

6. Taxes

Depreciation/assets (Depr) is the ratio of depreciation expense to assets.

Investment tax credit/assets (InvTaxCr) is the ratio of investment tax credit-balance sheet to assets.

7. Debt Market Conditions

Term spread (TermSprd) is the difference between the 10-year and one-year interest series. (Source: https://fred.stlouisfed.org/.)

8. Macroeconomic Conditions

Expected inflation rate (Inflation) is the expected change in the consumer price index over the coming year using data from (Source: https://fred.stlouisfed.org/)

Growth in profit after tax–macro (MacroProf) is the differences in the log of aggregate annual corporate profits after tax for nonfinancial firms. (Source: https://fred.stlouisfed.org/)

Growth in GDP (MacroGr) is the difference in the log of real gross domestic product in 2012 dollars. (Source: https://fred.stlouisfed.org/)

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