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OPERATING LOSSES AND CASH HOLDINGS

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Operating Losses and Cash Holdings

Abstract

Among U.S. firms, operating losses have become substantially more prevalent, persistent, and greater in magnitude since 1970. Such losses create immediate and ongoing liquidity needs that are strongly associated with the rise in cash balances over the same period. Firms exhibiting operating losses comprise an increasing proportion of equity issuers. Moreover, these issuers stockpile the majority of the funds raised in the issue and use these funds to cover subsequent operating losses. We conclude that the growth in cash balances among U.S. firms is not solely a reflection of increased precautionary demands. Instead, such balances reflect near-term operational needs under an expectation of negative cash flows.

1. Introduction

Bates, Kahle and Stulz (2009) document a substantial rise in the proportion of firm assets held in cash during recent decades and an active strand of literature seeks to understand the motives behind this observation. Although chief financial officers (CFOs) believe that most of their firm's cash is held for operational purposes (Lins, Servaes, and Tufano, 2010), Lins et al. note that "the theory behind holding liquidity in the form of cash is, fundamentally, based on non-operational (i.e. excess) cash holdings, not operational cash holdings." Consistent with this view, the empirical literature that tests explanations for the rise in corporate cash holdings largely focuses on reasons that excess cash has increased. Examples include agency costs (Gao, Harford, and Li, 2013), tax costs associated with repatriating foreign income (Foley et al., 2007), and precautionary motives (Han and Qiu, 2007) such as firm specialization (Duchin, 2010) and increased refinancing risk (Harford, Klasa, and Maxwell, 2014).

We show, however, that the operational cash needs of U.S. firms have grown dramatically in recent years and are strongly linked with the rise in cash holdings over the same period. In the 1950's about 2% of public firms listed in Compustat reported operating losses (defined as negative cash flow from operations on the firm's Statement of Cash Flow). In contrast, the period since 1980 has been characterized by an explosion in the proportion of public firms with negative cash flow (CF), rising from 9% in 1979 to over 30% in several recent years. Moreover, for most firms in recent years, operating losses are not a transitory phenomenon. Firms that lose money on operations this period are likely to lose money next period as well. For example, fewer than 14% of the firms that reported negative CF in 2014 subsequently reported positive CF in 2015. This persistence in operating losses is also a recent phenomenon; up until

approximately 1990, firms that reported an operating loss in one year had a greater than 50% chance of reporting positive operating earnings in the following year.

Persistent operating losses create immediate and ongoing liquidity needs that must be met by existing internal resources or external finance (or both). We show that firms expecting such losses behave differently than firms with positive cash flow on several dimensions of corporate financial policy such as cash holdings, equity issuance frequency, and cash savings from issuance. For example, between 1970 and 2015, average cash holdings as a percentage of total assets roughly double for firms in the top 8 deciles of cash flow, where cash flow is typically positive. More strikingly, however, average cash holdings increase by over 800% for firms in the lowest decile of cash flow, where cash flow is negative.

We argue that such cash holdings go well beyond the levels required to meet precautionary needs. According to the precautionary savings theory of Keynes (1936), firms stockpile cash to protect themselves against adverse cash flow shocks, because these shocks could lead to underinvestment, particularly in firms with high and volatile investment (e.g. high R&D firms). Consequently, firms with high R&D expenditures and volatile cash flows tend to hold large precautionary cash balances [see, for example, Bates, Kahle and Stulz (2009)]. Although increasing precautionary needs undoubtedly contribute to the recent growth in cash balances, we show that neither changes in cash flow volatility nor increases in R&D expenditures are sufficient to capture the additional amount of cash held by negative cash flow firms for planned operational purposes. For example, we analyze cash policies for very high R&D firms and find that cash holdings for high CF/high R&D firms have grown 54%, while cash holdings at low CF/high R&D firms has grown 868%. These results imply that there is more to the story than R&D. Because an increasing number of firms exhibit persistent

operational deficits, cash stockpiling is less about guarding against the possibility of a shock to financing needs or costs, and more about the fact that cash flow is negative *right now* and is likely to remain that way. In other words, the stockpile is not solely a precaution against the possibility of underinvestment induced by unexpected financing needs. It is a deliberate plan to finance near term operational needs under an expectation of negative cash flows.

To explore the source of cash stockpiles in firms with negative operating flows, we analyze debt and equity issuance activity and find that the relative proportions of each have flipped over time. In the 1970's high CF firms mostly issued equity and low CF firms relied predominantly on debt. By contrast, in the most recent period (2010-2015), low CF firms raise 15 times more equity capital than debt capital. Consistent with Ritter and Welch's (2002) and Fama and French's (2004) evidence on new lists, we find that over the past four decades, negative cash flow firms represent an increasing proportion of firm-initiated equity issuances (IPOs, SEOs, and private placements).[1] In every year but one since 1989, the majority of firms issuing equity reported negative operating cash flows (CF). In the last year of our sample, 2015, negative CF issuers outnumbered positive CF issuers by a factor of 2 to 1.

Firm-initiated equity issues typically represent a substantial cash inflow to the firm and McLean (2011) finds that cash savings from equity issuance has been increasing over time. During our sample period, over 1/3 of firms initiating equity issues hold all of the proceeds as cash at year end. Although such behavior is consistent with precautionary motives, we illustrate the importance of operating losses by scaling each equity issuer's post-issue cash balances by the

[1] Firm-initiated equity issues are defined as stock issuances that exceed 3% of market equity. This definition captures the vast majority of IPOs, SEOs, and private placements while excluding most employee-initiated issuances such as ESPPs and the exercise of stock options (McKeon, 2015).

magnitude of the company's cash burn rate.[2] This scaled measure, commonly called "runway" within the venture capital industry, represents an estimate of how many months a firm with negative cash flows can continue to operate at the same rate without an infusion of external capital. Ceteris paribus, equity issuers could increase runway by increasing issuance size and saving more cash. Presumably, firms with higher levels of precautionary motives would desire longer runways. Contrary to this view, however, we find that the median runway after issuance has stayed within the same range for decades, typically between 6 and 18 months, and, most notably, exhibits no time trend over the past two decades, a period during which average cash balances have exploded. In other words, cash savings from issuance have increased substantially, but burn rates have also risen concomitantly. The takeaway is that for equity issuers with negative cash flows, the increase in cash holdings is driven in large part by elevated operating needs in the sense that the number of months of operations covered by cash on hand has not changed substantially over time. Large cash holdings to cover commensurately large burn rates are not excess cash holdings; rather, they represent an expansion of the operating component.

Our study contributes to three related strands of the literature. The first seeks to understand the magnitude of cash balances among U.S. firms and why average balances have grown so dramatically in recent years. Our findings complement and extend those from studies that ascribe a role for increased precautionary demands due to uncertainty in future financing needs and for increased costs of repatriating foreign earnings in explaining high cash balances. We show that, in addition to these factors, an increased demand for operational cash to fund predictable immediate and ongoing liquidity needs is an important determinant of observed cash

[2] We define monthly burn rate as –[Operating CF-Dividends-Capital Expenditures] divided by twelve. For example, a firm that reports negative CF of $100MM and capital expenditures of $20MM annually has a monthly burn rate of $10MM. Firms generating positive free cash flows do not have a burn rate.

balances. Our findings also provide a potential explanation for the finding in Pinkowitz, Stulz, and Williamson (2016) that differences in average cash balances between U.S. firms and their foreign counterparts are driven by a small set of U.S. firms with very high R&D expenditures. We show that high cash balances of high R&D firms are concentrated among those firms with persistent operating losses.

Second, our findings extend those of Kim and Weisbach (2008), DeAngelo, DeAngelo, and Stulz (2010) and McLean (2011) on the motives for equity issuance. Kim and Weisbach (2008) report that additions to cash holdings are the primary use of equity issue proceeds in a large international sample of IPOs and SEOs. Moreover, McLean (2011) reports that the percentage of equity issue proceeds held as cash at the end of the year of issuance has increased substantially over time. These studies imply that cash stockpiling is an important motive for equity issuance. DeAngelo, DeAngelo, and Stulz (2010) report that most SEO issuers would have been unable to fund current operating plans in the absence of the equity issue. They thus attribute the issuance decision to the need to fund near-term investment. Our findings imply that equity issues are motivated simultaneously by both cash stockpiling and the funding of near-term investment. Equity issuers in recent years are increasingly characterized by ongoing operating losses and, therefore, high cash burn rates. Thus, they not only have immediate funding needs, but also a need to stockpile cash to fund expected future funding shortfalls.

Finally, our findings have implications for the empirical literature that models cash balances as a linear function of firm, country and institutional characteristics. These studies typically include contemporaneous cash flow among the set of variables that capture the firm's sources and uses of funds and, therefore, its operating cash needs. Our findings imply that such models have become increasingly misspecified in recent years as the distribution of firms has

shifted towards firms with persistent operating losses. Because these firms exhibit unusually high cash balances, existing models that ignore this nonlinearity systematically underestimate 'normal' cash holdings for firms with persistent negative cash flows.

The rest of the study progresses as follows: Section 2 documents the rise in operating loss firms. Section 3 reports results explaining how the rise in corporate cash holdings is related to operating losses. Section 4 reports results on the relation between operating loss firms and cash savings from equity issuance. Section 5 discusses implications of our findings, and Section 6 concludes.

2. Descriptive evidence on operating losses

The main sample consists of all U.S firms with total assets greater than $5 million (in 2014 dollars) between 1970 and 2014. The data are obtained from the Compustat database, Industrial Annual file. Historically regulated firms such as financial firms (SIC codes 6000 – 6999) and utilities (SIC codes 4900 – 4999) are excluded, as are firms missing data necessary for the calculation of cash ratios. Within this sample, we identify firm-initiated equity issues such as IPOs, SEOs, and private placements, using the method detailed in McKeon (2015), specifically, those issues in which proceeds from common stock issuance are greater than 3% of market equity.

We begin by documenting the prevalence of operating losses over time. We define an operating loss as a negative cash flow from operations as reported on the statement of cash flows. Figure 1 charts the percentage of the sample that reports negative operating cash flows each year since 1950. The rise is striking. In the early part of the sample, negative operating cash flows were almost non-existent. Despite five recessions between 1950 and 1980 (as defined

by the National Bureau of Economic Research (NBER)), the percentage of firms with negative cash flow only exceeds 10% three times. Since the mid-1990's, it has rarely been less than 25%. In 2015, the final year in the sample, nearly 1/3 of the sample firms report negative operating cash flows.

One firm characteristic that has changed substantially over time is R&D expenditures (Brown et al., 2009). To investigate whether the rise in negative cash flow firms is driven primarily by high R&D expenditures, we measure OCFRD, which is operating cash flow with R&D added back. As it turns out, there is more to the story than R&D. The proportion of firms with negative OCFRD has also experienced a substantial rise over the same period and by 2015 nearly 1 in 4 firms reported negative operating cash flows *even before subtracting R&D expense*.

Figure 1 shows that negative cash flow are prevalent; however, a related question is whether negative cash flows are transitory. We find that it is increasingly the case that firms are experiencing persistent negative cash flows rather than negative cash flows that occur due to a temporary shock. Figure 2 illustrates that in recent years, firms reporting negative cash flows typically did so in the year prior (2A), as well as the year after (2B). This suggests that the occurrence of negative cash flows is not necessarily surprising or unexpected for most firms. Rather, they are operating with the intention and expectation of extended cash flow deficits. Thus, corporate policies such as cash holdings may be driven more by a plan to manage expected operating deficits rather than solely by factors that induce excess holdings such as precaution against the possibility of a negative shock.

The final characteristic to note is that the magnitude of negative cash flow has grown substantially over time. Table 1, panel A reports average CF/assets for the ten deciles during four subperiods: 1970-1979, 1980-1989, 1990-1999, and 2000-2015. All deciles report lower

cash flows over time, but within the lowest decile the change is most dramatic. In the 1970's the average firm in the lowest decile of earnings reported EBITDA of (11%) of assets. During the 2000-2015 subperiod, the average was (58%) of assets. Put another way, firms in this decile burn an average of about 5% of assets *per month* even before accounting for capital expenditures.

Taken together, Figures 1 and 2, and Table 1 highlight three stylized facts about the evolution of firms reporting negative cash flows: They are vastly more prevalent, more persistent, and the magnitude of average negative earnings within the lowest decile has grown fivefold. These findings motivate the inquiry into implications of these transformative shifts in the distribution of cash flows for corporate policy.

3. Operating losses and cash holdings

Numerous studies have documented and offered explanations for the rise of corporate cash holdings. Bates, Kahle, and Stulz (2009) measure the rise in cash holdings from 1980 to 2006 and attribute the increase to precautionary motives rather than agency explanations. Specifically, they point to changing firm characteristics including declines in working capital and capital expenditures, and increases in cash flow volatility and R&D. Younger firms exhibit these characteristics more strongly, and as they enter the economy, the optimal level of cash rises. In Table 2 of their study, they report that the rise in cash holdings for firms with negative earnings has been particularly large. However, it is not obvious a priori that negative cash flows will be associated empirically with higher excess cash. For example, Opler et al. (1999) find that operating losses are the primary explanation for large *decreases* in excess cash for their sample

firm over the period 1971-1994. Taken together, these findings motivate a closer examination of the relation between cash and cash flow.

As the prevalence, persistence, and magnitude of negative earnings has strengthened, cash savings have grown dramatically. As Figure 3 illustrates and Table 2 reports, the most dramatic increase is within the lowest deciles of operating cash flow, and the point of divergence in the mid 1980's roughly corresponds with the beginning of rapid growth of negative earnings firms in general in Figure 1. In 1970, cash holdings across the cash flow continuum are similar. The lowest decile held 6.6% of assets in cash, while the highest 8 deciles held an average of 8.4% of assets in cash. During the final year of the sample, 2015, average cash holdings within the lowest decile has grown to over 63% of assets, an increase of 865% over 1970 levels. Cash holdings within the highest eight deciles has also grown, but much more modestly, increasing by 97% over the sample period. Overall, these figures are consistent with Bates et al. (2009), who document a tripling of cash ratios for negative net income firms over 1980-2006. The results in Table 2 indicate that the growth has not retreated in the years since 2006. The takeaway is that in order to understand the rise in average cash holdings generally, more attention needs to be paid to the left side of the cash flow distribution where the rise is most evident.

Three traditional explanations for holding excess cash include repatriation taxes, agency problems, and precautionary motivations. While the uptick on the right end of the cash flow distribution could be caused by tax considerations, the massive rise on the left is within firms that are not likely to be subject to an offshore cash holdup due to repatriation taxes, because they have negative earnings to offset the tax burden. Similarly, firms on the left side of the distribution are less prone to agency problems. In their study of the effect of agency problems and cash holdings, Nikolev and Whited (2014) cite three factors commonly associated with

agency concerns: size, perquisite consumption, and limited managerial ownership. Negative cash flow firms are the least susceptible on all three counts. They are, on average, the smallest firms in the economy, they are subject to equity capital raising on a regular basis (as we later show), and are monitored more closely than mature high cash flow firms. Finally, in unreported analysis we find that negative cash flow firms have the highest levels of managerial ownership.

Since tax motives and agency concerns are mitigated for these firms, we are left solely with precaution as an explanation for the 865% rise in cash holdings between 1970 and 2015. In recent years, there has been an increased focus on R&D expenditures in the literature. Falato and Sim (2015) use state-level changes in R&D tax credits to show that firms increase their cash-to-asset ratios when their home state increases R&D tax credits. Begenau and Palazzo (2016) link the rise in cross-sectional cash holdings with the propensity of newly public firms to hold more cash at entry, particularly those with high R&D intensity. High R&D intensity could impact cash holdings through two mechanisms. First, disrupting R&D programs is particularly costly (Brown and Peterson, 2011), so the firm may hold extra cash as a precaution. However, many R&D intensive firms also report negative cash flow. R&D represents a cash expense that needs to be covered regardless of the fact that it is R&D, and this is more accurately described as operating cash rather than precautionary excess.

To determine whether the operating cash flow effect is simply an overlap with R&D intensive firms, we analyze R&D and cash flow jointly in Table 3. Panel A reports the joint distribution by decile for each measure. Not surprisingly, the largest mass is in the lowest cash flow decile and highest R&D decile, but it only represents 5.5% of the sample. Extending to the three lowest deciles of Cash Flow and the three highest deciles of R&D only comprises 16.1% of

the sample. Thus, although there is some overlap, we contend that the cash flow effect we study is not simply a proxy for the R&D effect studied by others.

Panel B takes a step further to examine cash holdings at high R&D firms, defined as those within the top two deciles. The results indicate that growth in cash holdings for high R&D firms is heavily dependent on the cash flow position. Specifically, for high R&D firms in cash flow deciles 3-10, where cash flow is typically positive, cash holdings have grown an average of 59%. In contrast, average cash holdings for high R&D firms in the lowest cash flow decile have grown 868%.

Figure 4 charts the relation between cash holdings and operating cash flow in each of four subperiods. Similar to Figure 3, the most striking increase is observed within firms at the low end of cash flow. However, Figure 4 reveals a more interesting observation, which is that the relation between cash holdings and cash flow deciles has become increasingly nonlinear over time. While the relation between cash holdings and cash flow was roughly flat in the 1970's, each subsequent decade has increased in convexity.

Nonlinearity in the cash holdings to cash flow relation suggests that models of cash holdings that control for the observed level of cash flow are misspecified due to incorrect functional form. One econometric option to deal with convexity is to add a squared term to the specification. However, it is primarily nonlinearity on the left side of the cash flow distribution that is the focus of this study. For this reason, we employ an indicator for negative values of cash flow, and an interaction term between this indicator and the value of cash flow/assets to capture the magnitude of the losses. These variables allow for inference of differential effects for negative and positive cash flow firms.

Table 4 reports results from OLS regressions of cash holdings on standard determinants used in the literature (equation 1) plus the new variables we describe above to capture the effects of negative cash flow on cash policy (equation 2). Specifically,

$$\frac{Cash}{Assets}_{i,j,t} = \alpha + \beta_1 \frac{CF}{Assets}_{i,t} + \beta_2 \ln(ME)_{i,t} + \beta_3 \overline{CF\ Vol}_{j,t} + \beta_4 I(R\&D\ Intense)_{i,t} + \beta_5 \frac{M}{B}_{i,t} + \beta_6 \frac{CapEx}{Assets}_{i,t} + \beta_7 \frac{Debt}{Assets}_{i,t} + \varepsilon_{i,t} \quad (1)$$

$$\frac{Cash}{Assets}_{i,j,t} = \alpha + \beta_1 \frac{CF}{Assets}_{i,t} + \beta_2 I(CF<0)_{i,t} + \beta_3 \left[I(CF<0) * \frac{CF}{Assets} \right]_{i,t} + \beta_4 \ln(ME)_{i,t} + \beta_5 \overline{CF\ Vol}_{j,t} + \beta_6 I(R\&D\ Intense)_{i,t} + \beta_7 \frac{M}{B}_{i,t} + \beta_8 \frac{CapEx}{Assets}_{i,t} + \beta_9 \frac{Debt}{Assets}_{i,t} + \varepsilon_{i,t} \quad (2)$$

Both specifications control for factors related to precaution. Specifically, *Size* to capture financing constraints, *Industry Cash Flow Volatility* to capture probability of a negative shock to cash flow, an indicator of *high R&D intensity* and *market-to-book* ratio, both of which are related to growth opportunities. To isolate the effect of precaution related to R&D from the cash flow effect of R&D, we control for the existence of an R&D intensive investment agenda, but not the level of R&D, which is an operating expense.

In column 1 of Table 4, Cash Flow carries a large negative coefficient, consistent with several prior studies, but challenging to interpret in light of the nonlinearity between cash flow and cash. Column 2 reveals the importance of including variables that capture operating needs.

Both the negative earnings indicator and the interaction term are highly significant determinants of corporate cash holdings. Moreover, after controlling for operating losses, the coefficient on Cash Flow reverses and is highly significant in the opposite direction. One implication is that the model with the negative earnings variables should also improve model fit at the other end of the cash flow distribution, where large positive cash flows are otherwise penalized in predictions of cash holdings if cash flow is forced into a linear specification. All of the precautionary variables carry the same sign and significance as the first model, suggesting that the role of negative earnings is not simply an alternative mechanism to capture precaution.

A common variation of Equation (1) adds fixed effects to capture variation through time and/or across industries. Columns 3 and 4 add year fixed effects to the models and columns 5 and 6 add year and industry fixed effects. Neither fixed effects specification picks up the impact of negative cash flow firms. In both cases, the sign of the coefficient on Cash Flow in the linear specification is negative and significant, whereas the specification with indicators for negative cash flow flips the sign on the Cash Flow variable, implying that the relation between cash flow and cash holdings depends greatly on the sign of the cash flows.

In Table 5, we provide a numerical example of the relative contribution of the cash flow variables versus precautionary motive variables to predicted cash holdings for low cash flow firms. The first two columns report coefficients from estimating Equation (2) over subperiods at the beginning and end of the sample period: The first five years of the sample (1970-74), and the last five years of the sample (2011-2015). The third and fourth columns report the subperiod median values of each variable for firms in the lowest cash flow decile, where the growth in cash holdings has been the most extreme. The predicted contribution to cash holdings, reported in the final two columns, is the product of the coefficients and median observed values.

The predicted cash holdings for this group rises from 0.062 to 0.588, an 843% increase, very similar to observed figures in Table 1. The effect of operating cash flow is most clearly revealed by the increase in predicted cash of the cash flow variables. In this example, the cash flow variables contribute nearly as much to the increase in predicted cash as the precautionary motive variables. Predicted cash holdings rise .196 due to cash flow variables versus .213 due to Industry CF Volatility and R&D Intensity.

Standard models, where cash flow is specified to have a linear relation with cash holdings, obscure this effect. The marginal effect of negative earnings on cash that is otherwise captured by our indicator and interaction terms is pushed partly into the constant and the remainder is prediction error.

4. Equity Issuance, Cash Savings, and Runway

"In the early Eighties, the major underwriters insisted on three years of profitability. Then it was one year, then it was a quarter. By the time of the Internet bubble, they were not even requiring profitability in the foreseeable future."

-Jay Ritter, *Rolling Stone*, April 5, 2010

As Prof. Ritter's quote indicates, anecdotal evidence suggests it has become easier for negative cash flow firms to raise equity capital in recent years. In Table 6, we compare the relative amounts raised through net debt and equity issues for each cash flow decile at the beginning of the sample and the end of the sample. In the 1970's, low cash flow firms raised little equity relative to high cash flow firms. On average, a firm in the highest decile of cash flow raised over 10 times as much equity as a percentage of assets compared to a firm in the lowest cash flow decile. For debt, the story is different. Very low cash flow firms raised, on average, three times as much debt capital compared to equity, and firms in all deciles other than

the highest raised more debt than equity on average. The highest cash flow firms raise four times more equity capital than debt in the 1970's.

Almost the exact opposite is true in recent years. Now, low cash flow firms raise far more equity than debt, about 15 times as much, on average, in the lowest decile of cash flow. Meanwhile, firms in the highest cash flow decile are now repurchasing both debt and equity on average. These stylized facts have had a marked impact on capital structure for negative cash flow firms. In untabulated results, we find that average book leverage for firms in the lowest decile of cash flow falls from .42 to .25 from 1970 to 2015.

Figure 5 illustrates that over the same time period as the rise in cash holdings and overall prevalence of operating loss firms, the characteristics of equity issuers have changed, particularly with regards to cash flow. In the 70's and 80's, firms issuing equity are cash flow positive on average, but in every year since 1989, the average equity issuer is burning cash. These results are consistent with the evidence on earnings in Fama and French (2004) showing that earnings become progressively left skewed through time for newly listed firms, and that as these firms integrate into the economy we observe profitability overall becoming left skewed as well.

To further analyze the relation between cash flow and issuance frequencies, we calculate the mean number of firm-initiated issuances per year for each cash flow decile based on quarterly data. Table 7 reports the results of this analysis. While Figure 5 suggests that a large portion of equity issuances are conducted by low cash flow firms, Table 7 demonstrates the inverse: a large portion of low cash flow firms are equity issuers. In fact, between 2010 and 2015 the lowest decile of cash flow recorded 0.92 firm-initiated issuances *per firm per year*! The high frequency of issuance activity suggests that the observed high rate of savings from

equity issuance in recent years could be driven by near term operating needs in addition to precautionary motives.

To investigate the size of the cash stockpile relative to the needs of the firm, we borrow a metric from the venture capital industry, where negative cash flows are commonplace. Within venture-backed firms, a figure that often underlies decisions about cash holdings and equity issuance is "burn rate," which we define as operating cash flow minus dividends and capital expenditures, divided by 12. Table 8 reports the median burn rate as a percentage of total assets over time for equity issuers with negative cash flow. It is monotonically increasing, rising from about 8% in the 1970's to over 25% in the most recent period. In the 1970's the median level of cash holdings for negative cash flow equity issuers was less than 5% of assets at year end. At 2015 burn rates, a stockpile of that size would be depleted before the ides of March. We conjecture that operational cash holdings are proportional to burn rates.

Cash holdings divided by the monthly burn rate is often referred to as "runway," or in other words, how many months a company could sustain current operations without an infusion of external capital. Investors can limit runway by staging investment to mitigate overinvestment problems. Hertzel et al. (2012) find that public market staging is particularly strong for firms with high R&D and intangible assets. Additionally, they report that the median length of time before returning to the capital market is 12 months. We extend their findings by analyzing runway length over time to detect whether it has changed in ways similar to average cash holdings. Figure 6 charts the median runway at the time of issuance for negative earnings firms over the sample period, and shows that it has stayed within the same range for the last 30 years: between 6 and 18 months. Many other firm characteristics have changed, such as R&D intensity

and cash flow volatility, but these factors have not altered the median runway of equity issuers in meaningful ways.

For negative cash flow firms, having about a year's supply of cash is the norm. These firms aren't saving more relative to their needs; their operational needs have grown. This is most clearly seen in Table 10, which reports median burn rate across all issuers that are burning cash at the time of issuance. The time series rise mimics that of negative cash flows generally. In the 1970's the average annual burn rate was about 8% of assets. By the 2011-15 period, the figure had risen to 25.9% of assets.

5. Implications and Discussion

In this section, we discuss the implications of the findings presented in this study, focusing on (i) motivations for equity issuance, (ii) cash flow sensitivity of cash, and (iii) model misspecification.

5.1 Motivations for Equity Issuance

Our findings have implications for the literature on motivations for equity issuance. Kim and Weisbach (2008) show that cash holdings are the largest use of equity issuance proceeds for an international sample of over 30,000 IPOs and SEOs between 1990 and 2003. McLean (2011) extends this result by documenting that the percentage of equity issuance proceeds held as cash at the end of the year of issuance has been increasing substantially over time. Specifically, he reports that in the 1970's firms retained an average of $0.23 in cash for each dollar of issuance, but that this figure rises to $0.60 for the period 2000-2007. In a separate study, DeAngelo, DeAngelo and Stulz (2010) report that 62% of the SEO issuers in their sample would run out of

cash by the end of the following year without the issuance. They attribute SEO decisions primarily to a "lifecycle theory that predicts young firms with high market-to-book (M/B) ratios and low operating cash flows sell stock to fund investment." Overall, our findings suggest that cash savings and lifecycle motives are not mutually exclusive.

For example, under the lifecycle explanation we should observe a disproportionate number of equity issuances at the low end of the cash flow spectrum, and this is exactly what we see in recent years. Table 9 reports the distribution of firm-initiated equity issues for the first ten years and last ten years of the sample period to compare how the joint distribution of equity issues and cash flow has changed over time. In the first ten years of the sample, equity issuance frequency was skewed towards high cash flow firms. However, during the most recent period, from 2006-2015, equity issuances are dominated by negative CF firms: the lowest decile of CF accounts for 31% of all equity issues and the lowest two deciles comprise 52% of all equity issues. Consistent with the lifecycle theory, these two deciles have the youngest average age and high average M/B ratios.

These results, coupled with the results on burn rates, reconcile the findings in previous studies. For firms with positive burn rates, which make up the majority of equity issuers in recent years, it is possible to observe both a high savings rate in the year of issuance (McLean), as well as a full depletion of pre-issuance cash (DDS) during the following year. The issuances are topping up the stockpile on a regular basis, but the firms are burning through the stockpile rapidly. A portion of the stockpile is undoubtedly related to precaution, but the savings from issuance are also driven by near term operating needs.

5.2 Cash Flow Sensitivity of Cash

Our findings speak primarily to cash *levels*, but a related facet of corporate policy is how cash *changes* with cash flow. Almeida, et al. (2004) measure the cash flow sensitivity of cash holdings using a sample of manufacturing firms over 1971-2000. They find that cash is sensitive to cash flow for financially constrained firms, but not for financially unconstrained firms. In light of the high prevalence of negative cash flows in recent years, there are implications for the cash flow sensitivity of cash.

If cash flow is negative and we observe cash holdings decreasing concurrently, then cash will exhibit a positive sensitivity to cash flow. Without an infusion of external capital, this relation is mechanical. It is not the case that the firm saved cash out of cash flow, since there was no cash generated to save. Rather, the firm spent cash out of cash flow, drawing down on cash savings to fund operations, inducing a positive relation between the two variables. This type of sensitivity is documented by Opler et al. (1999), who find that operating losses are the primary explanation for large *decreases* in excess cash for their sample firm over the period 1971-1994. Thus, there are two channels through which cash could be sensitive to cash flows, spending by negative cash flow firms or saving by positive cash flow firms.

This relation is noted by Almeida et al. and they show that the sensitivity they document is robust to exclusion of negative cash flow firms. Since the cash to cash flow relation has become increasingly convex over time, we extend their results by testing whether cash flow sensitivities have changed through time as well, and use our negative cash flow variables to separate the two sources of sensitivity.

Table 10 reports the results of the empirical tests. We begin by estimating equations 3 and 4 on the 1970-79 subperiod. During this period, negative cash flow firms were less common (Figure 1), and cash had an approximately linear relationship with cash flow (Figure 4). The coefficients on Cash Flow rises between columns 1 and 2, but only by .038 suggest that negative earnings firms had limited impact on observed sensitivities during this period.

In Columns 3 and 4 we estimate the models on the 2006-2015 subperiod. Column 3 reports a similar sized coefficient on Cash Flow to the 1970-79 subperiod, meaning that sensitivities appear to be unchanged over time. However, Column 4 reveals that sensitivities for positive cash flow firms are substantially higher once negative cash flow sensitivities are estimated separately. Specifically, the coefficient on Cash Flow doubles between columns 3 and 4.

Almeida et al. estimate variations of equation (3) on constrained firms and unconstrained firms separately, to test the difference in cash flow sensitivity between the two groups. Hadlock and Pierce (2009) find that size is a valid measure of constraints, and this is one of the sorting variables used by Almeida et al., who define constrained firms as the lowest three deciles of assets, constructed annually. We repeat this exercise but estimate the model on cash flow positive and cash flow negative firms separately to disentangle sensitivities from saving versus spending.

Columns 5 and 6 report results from estimating the baseline model on constrained firms that have negative and positive cash flow, respectively. The samples are approximately balanced, with 5,354 negative cash flow firms and 4,062 positive cash flow firms. The positive and significant coefficient on Cash Flow in column 5 indicates that there is some evidence of negative cash flow firms drawing down on savings to cover operating losses, but only 5 cents for

every dollar of losses. However, the coefficient on Cash Flow in column 6 is over four times higher than column 5. Taken together, these results are consistent with the interpretation that the cash flow sensitivity of cash has increased in recent years for firms with positive cash flows, particularly those that face financing constraints.

5.3 Modelling Cash Holdings when Cash Flow is Non-linear

Our results have implications for models of cash holdings. The relation between cash holdings and cash flow is increasingly convex through time, resulting in functional form misspecification when a linear relation is assumed. In Figures 7A and 7B we detail the effects of functional form misspecification on prediction error. Figure 7A compares average prediction error within each decile in the full sample panel regressions. The comparison is between the standard model and the model that captures nonlinearity by adding the negative indicator and interaction term from Table 3. The improvement is most evident in the tails of the distribution, which is not surprising due to the convexity of the relation. Overall, improvement is noted in seven of the ten deciles. These results are consistent with the finding in Table 3 that the linear specification does not do a good job of characterizing the relation between cash and cash flow.

Figure 7B compares three prediction models designed to account for time varying changes in cash holdings. The first is the standard model with year fixed effects added, the second adds both year and industry fixed effects. The third is the nonlinear model estimated in annual cross-sections for each year of the sample to allow the coefficients to vary through time, similar to the technique used in Harford et al. (2009) to predict leverage targets.

Both fixed effects models create larger prediction errors in most deciles, again particularly in the tails. In the case of year fixed effects, the annual cross sections perform better

in 8 of the 10 deciles, and when compared to the model with year and industry fixed effects the annual cross sections perform better in every decile. The reason is intuitive: the lion's share of the increase in cash holdings has occurred in the tails of cash flow, but year fixed effects impact the predicted value uniformly across the distribution. Overall, the results support the use of our indicator and interaction terms and suggest caution in estimating fixed effects models when movement in the dependent variable is driven in part by an unspecified nonlinear component of one of the explanatory variables.

6. Conclusion

In this study, we find that the operational component of cash balances has increased substantially in recent decades for many firms. This offers an additional explanation for the rise in corporate cash holdings that is distinct from explanations that focus on factors related to excess cash, such as precautionary, agency, and tax motives. We find that equity issuance activity is increasingly dominated by firms with negative cash flows. Although firms are savings a higher proportion of equity issuance proceeds in cash, they are also burning cash at an unprecedented rate, reconciling the observation of high cash savings rates (McLean, 2010) with the observation that most issuers would run out of cash by the end of the following year (DeAngelo, DeAngelo, Stulz, 2010). We confirm the Almeida et al. result that cash holdings within constrained firms have a positive sensitivity to cash flow, and add to their findings by showing that this sensitivity is four times higher for positive cash flow firms than negative cash flow firms in recent years. Finally, we show that cash flow has become highly nonlinear not only with cash holdings, but also with size, industry CF volatility, research and development,

market-to-book, and leverage. These nonlinearities should be considered in future studies that control for cash flow in linear regressions.

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Appendix A: Variable Descriptions

Cash Holdings	CHE/AT
EBITDA	EBITDA/AT
EBITDARD	[EBITDA+XRD]/AT. XRD is coded to 0 if missing.
Operating Cash Flow	OANCF. If missing, replaced by NI+DPC+TXDC+ESUBC+SPPIV+FOPO+FSRCO+WCAPC+APALCH+INVCH+RECCH
I(CF<0)	Indicator that takes a value of 1 when Cash Flow<0, and 0 otherwise
Cash Flow x I(CF<0)	Interaction that takes the value of Cash Flow when Cash Flow<0, and 0 otherwise
Size	Natural Log of AT
Industry CF Vol	Standard deviation of cash flows is measured for each firm over up to 10 years (minimum 3). Values are averaged based on Fama French 48 industries annually.
I(R&D Intense)	Indicator that takes a value of 1 when [XRD/AT]>0.02, and 0 otherwise
M/B	(AT+MKTVAL-SEQ)/AT. MKTVAL is replaced by CSHO*PRCC_C if missing.
Capital Expenditures	CAPX. Coded to 0 if missing.
Leverage	[DLTT+DLC]/AT
Firm-initiated Equity Issuance	SSTK when [SSTK/MKTVAL]>0.03
Employee-initiated Equity Issuance	SSTK when [SSTK/MKTVAL]<0.02
Net Equity Issuance	SSTK-PRSTK
Net Debt Issuance	$[DLTT+DLC]_t$-$[DLTT+DLC]_{t-1}$
Burn Rate	-[Operating Cash Flow-DVC-CAPX]. Divided by 12 for monthly burn rate.
Runway	CHE/Monthly Burn Rate

All variable mnemonics are from Compustat, Industrial Annual File
All ratios are winsorized at the 1st and 99th percentiles.

Table 1

Evolution of cash flow by decile

This table reports mean values of CF/assets for deciles formed annually. The full sample is 227,745 firm year observations over the period 1970-2015. Values are averaged over all firm year observations within the decile during the specified subperiod.

CF decile	1970-79	1980-89	1990-99	2000-15
1	(0.11)	(0.24)	(0.41)	(0.58)
2	0.04	(0.01)	(0.11)	(0.15)
3	0.07	0.04	(0.03)	(0.03)
4	0.10	0.08	0.01	0.02
5	0.12	0.11	0.04	0.05
6	0.14	0.13	0.07	0.07
7	0.16	0.16	0.09	0.10
8	0.19	0.20	0.12	0.12
9	0.24	0.25	0.16	0.16
10	0.36	0.44	0.25	0.25

Table 2

Evolution of average cash holdings by cash flow decile

This table reports mean values of cash/assets for cash flow deciles formed annually. The full sample is 227,745 firm year observations over the period 1970-2015. Values are averaged over all firm year observations within each decile each year.

	Deciles		
	1	2	3-10
1970	0.066	0.061	0.084
1971	0.068	0.070	0.092
1972	0.069	0.068	0.093
1973	0.064	0.062	0.083
1974	0.053	0.054	0.074
1975	0.059	0.058	0.093
1976	0.057	0.064	0.096
1977	0.058	0.058	0.090
1978	0.055	0.055	0.086
1979	0.056	0.059	0.081
1980	0.058	0.057	0.095
1981	0.063	0.060	0.108
1982	0.088	0.072	0.111
1983	0.083	0.099	0.142
1984	0.132	0.118	0.110
1985	0.148	0.113	0.115
1986	0.149	0.142	0.126
1987	0.182	0.130	0.121
1988	0.162	0.095	0.114
1989	0.170	0.105	0.112
1990	0.222	0.106	0.107
1991	0.266	0.132	0.121
1992	0.320	0.143	0.122
1993	0.367	0.176	0.128
1994	0.342	0.151	0.123
1995	0.365	0.179	0.133
1996	0.418	0.266	0.144
1997	0.409	0.249	0.147
1998	0.456	0.297	0.139
1999	0.465	0.355	0.150
2000	0.414	0.344	0.148
2001	0.442	0.335	0.150
2002	0.468	0.332	0.155
2003	0.519	0.292	0.173
2004	0.529	0.324	0.182
2005	0.533	0.320	0.186
2006	0.533	0.328	0.186
2007	0.551	0.309	0.184
2008	0.508	0.265	0.169
2009	0.491	0.280	0.184
2010	0.552	0.254	0.186
2011	0.586	0.273	0.175
2012	0.598	0.315	0.166
2013	0.576	0.432	0.171
2014	0.612	0.454	0.172
2015	0.633	0.476	0.165
Growth: 1970 to 2015	865%	679%	97%

Table 3

Cash Flow and R&D

Panel A reports the joint distribution of cash flow and R&D deciles over the sample period. The full sample is 227,745 firm year observations over the period 1970-2015. Panel B reports average cash holdings by cash flow decile for the top two deciles of R&D.

Panel A: Joint Distribution of Cash Flow and R&D Deciles

		Lowest CF									Highest CF
		1	2	3	4	5	6	7	8	9	10
	1	0.5%	0.8%	1.1%	1.3%	1.4%	1.2%	1.0%	1.1%	0.9%	0.7%
	2	0.4%	0.7%	0.9%	1.2%	1.3%	1.3%	1.3%	1.2%	1.0%	0.7%
	3	0.6%	0.8%	0.9%	1.0%	1.1%	1.2%	1.3%	1.3%	1.0%	0.8%
R&D	4	0.6%	0.9%	1.0%	1.0%	1.0%	1.2%	1.2%	1.2%	1.1%	0.9%
Decile	5	0.7%	0.9%	1.0%	0.9%	1.0%	1.1%	1.1%	1.1%	1.1%	1.0%
	6	0.8%	1.1%	1.0%	0.9%	0.9%	0.9%	1.0%	1.1%	1.1%	1.1%
	7	1.0%	1.3%	1.0%	0.8%	0.8%	0.9%	1.0%	0.9%	1.1%	1.2%
	8	1.4%	1.5%	1.0%	0.7%	0.7%	0.7%	0.8%	0.8%	1.0%	1.2%
	9	2.8%	1.6%	0.9%	0.6%	0.6%	0.5%	0.6%	0.7%	0.8%	1.1%
	10	5.5%	0.9%	0.4%	0.3%	0.3%	0.3%	0.3%	0.4%	0.5%	1.0%

Panel B: Average Cash Holdings for High R&D Firms

		1970-1979	2006-2015	Growth
	1	0.06	0.60	868%
	2	0.06	0.30	377%
	3	0.07	0.17	167%
Cash Flow	4	0.07	0.12	77%
Decile	5	0.07	0.11	50%
	6	0.08	0.10	31%
	7	0.09	0.11	32%
	8	0.10	0.12	27%
	9	0.11	0.15	32%
	10	0.14	0.22	54%

Table 4

Determinants of cash holdings

This table reports results from OLS regressions of cash holdings (cash/assets) on various determinants. The full sample is 227,745 firm year observations over the period 1970-2015. Columns 1, 3, and 5 use a linear specification for cash flow while columns 2, 4, and 6 allow for non-linearity when earnings are negative by adding an indicator of negative earnings and an interaction that takes the value of CF/assets when it is negative and zero otherwise. Variables are defined in the appendix. Standard errors are clustered by firm and year. *, **, and *** indicate significance at the 10%, 5% and 1% levels respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Cash Flow	-0.129 ***	0.110 ***	-0.127 ***	0.122 ***	-0.113 ***	0.114 ***
	(<0.001)	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*
I(CF<0)		0.039 ***		0.037 ***		0.034 ***
		(<0.001)		*(<0.001)*		*(<0.001)*
CF x I(CF<0)		-0.315 ***		-0.325 ***		-0.296 ***
		(<0.001)		*(<0.001)*		*(<0.001)*
Size	-0.007 ***	-0.005 ***	-0.008 ***	-0.006 ***	-0.008 ***	-0.006 ***
	(<0.001)	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*
Industry CF Vol	0.548 ***	0.533 ***	0.551 ***	0.515 ***	0.23 ***	0.215 ***
	(<0.001)	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*
I(R&D Intense)	0.068 ***	0.063 ***	0.066 ***	0.062 ***	0.063 ***	0.06 ***
	(<0.001)	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*
M/B	0.037 ***	0.032 ***	0.037 ***	0.032 ***	0.034 ***	0.029 ***
	(<0.001)	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*
Cap Ex	-0.206 ***	-0.246 ***	-0.202 ***	-0.235 ***	-0.235 ***	-0.266 ***
	(<0.001)	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*
Leverage	-0.260 ***	-0.254 ***	-0.261 ***	-0.255 ***	-0.265 ***	-0.259 ***
	(<0.001)	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*
Constant	0.147 ***	0.111 ***	0.148 ***	0.116 ***	0.159 ***	0.143 ***
	(<0.001)	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*
Fixed Effects	*None*	*None*	*Year*	*Year*	*Year, Industry*	*Year, Industry*
N	174,231	174,231	174,231	174,231	174,231	174,231
R2	0.409	0.416	0.410	0.418	0.434	0.441

Table 5

Numerical example: What drives growth in cash holdings in low cash flow firms?

This table reports predicted cash holdings for the median firm characteristics from the lowest decile of CF/assets during the periods (i) 1970-74 and (ii) 2011-2015 using coefficients from OLS regressions of cash holdings (cash/assets) on various determinants defined in the appendix. The full sample is 227,745 firm year observations over the period 1970-2015. Predicted cash is the product of the coefficients and median values for each respective subperiod.

	Coefficients		Median Values CF dec=1		Predicted Cash			
	1970-1979	2006-2015	1970-1979	2006-2015	(1)	(2)		
Cash Flow	0.120	0.285	-0.061	-0.544	(0.007)	(0.155)		
I(CF<0)	0.012	0.070	1	1	0.012	0.070		
Cash Flow x I(CF<0)	-0.160	-0.543	-0.061	-0.544	0.010	0.295		
Size	-0.004	-0.002	2.072	4.158	(0.009)	(0.010)		
Industry CF Vol	0.253	0.299	0.028	0.294	0.007	0.088		
I(R&D Intense)	-0.018	0.132	0	1	-	0.132		
M/B	0.024	0.027	0.914	3.213	0.021	0.086		
Cap Ex	-0.079	-0.387	0.041	0.011	(0.003)	(0.004)		
Leverage	-0.140	-0.219	0.401	0.057	(0.056)	(0.013)		
Constant	0.087	0.099			0.087	0.099		
							Increase	%
Predicted cash					0.062	0.588	0.526	
Contribution from operating cash flow variables					0.015	0.211	0.196	37%
Contribution from precautionary variables (CF Vol, R&D)					0.007	0.220	0.213	40%
Contribution from other factors					0.040	0.157	0.117	22%

Table 6

Net Debt and Net Equity Issuance Proceeds

This table reports the average annual proceeds scaled by total assets from net debt and net equity issuance for firms in each cash flow decile. The full sample is 227,745 firm year observations over the period 1970-2015. The first ten years and last ten years of the sample are reported for comparison.

		1970-79		2006-15	
		Net Equity /Assets	Net Debt /Assets	Net Equity /Assets	Net Debt /Assets
Cash Flow Decile	1	0.003	0.010	0.392	0.026
	2	0.002	0.025	0.152	0.024
	3	0.002	0.025	0.055	0.025
	4	0.002	0.023	0.025	0.027
	5	0.003	0.025	0.012	0.022
	6	0.004	0.021	0.008	0.015
	7	0.005	0.020	0.002	0.011
	8	0.007	0.019	(0.004)	0.007
	9	0.011	0.021	(0.013)	0.002
	10	0.033	0.007	(0.022)	(0.014)

Table 7

Equity Issuance Frequency

This table reports the average number of firm-initiated equity issuances per firm per year, compiled from quarterly data. Quarterly issuance data is available over the period 1985-2015.

		1985-1989	1990-1999	2000-2009	2010-2015
Cash Flow Decile	1	0.33	0.75	0.70	0.92
	2	0.24	0.49	0.39	0.56
	3	0.21	0.34	0.23	0.25
	4	0.20	0.27	0.18	0.15
	5	0.18	0.23	0.14	0.12
	6	0.17	0.18	0.12	0.12
	7	0.16	0.15	0.10	0.08
	8	0.17	0.13	0.08	0.07
	9	0.23	0.12	0.08	0.06
	10	0.29	0.13	0.08	0.06

Table 8

Annual Burn Rate for Equity Issuers

This table reports the percentage of assets depleted annually by equity issuers with positive burn rates. Burn rate is defined as [-Operating Cash Flow+dividends+capital expenditures]. The full sample is 227,745 firm year observations over the period 1970-2015.

Period	% burned
1971-75	8.2%
1976-80	7.8%
1981-85	13.1%
1986-90	12.5%
1991-95	13.6%
1996-2000	18.8%
2001-05	21.5%
2006-10	23.2%
2011-15	25.9%

Table 9

Distribution and Characteristics of Firm-initiated Equity Issues by Cash Flow decile

This table reports the distribution of equity issuers by cash flow decile over the period 1971-1980 and 2006-2015. Mean market-to-book asset ratios and mean firm age is reported for the period 2006-15.

			Lowest CF									Highest CF
Year		N	1	2	3	4	5	6	7	8	9	10
1971-1980	Eq Iss Distribution	3,492	8%	7%	7%	8%	9%	9%	9%	10%	12%	21%
	Cumulative		8%	15%	22%	31%	40%	49%	58%	67%	79%	100%
2006-2015	Eq Iss Distribution	6,864	31%	21%	12%	8%	6%	5%	5%	4%	4%	4%
	Cumulative		31%	52%	63%	71%	77%	82%	87%	92%	96%	100%
	Mean M/B		3.64	2.34	1.68	1.49	1.47	1.54	1.66	1.86	2.20	2.99
	Mean Age		9.9	13.3	16.3	19.5	21.1	22.4	22.9	23.0	21.8	17.1

Table 10

Cash Flow Sensitivity of Cash

This table reports results from OLS regressions estimated over the 1st 10 years and last 10 years of the sample (1970-79 and 2006-2015). Columns 1 and 3 report change in cash/assets regressed on cash flow and a constant. Columns 2 and 4 allow for non-linearity when cash flow are negative by adding an indicator of negative earnings and an interaction that takes the value of CF/assets when it is negative and zero otherwise. Columns 5 and 6 constrain the sample to the lowest three deciles of size (constrained firms) and estimate the model separately for positive and negative cash flow firms. Variables are defined in the appendix. Standard errors are clustered by firm and year. *, **, and *** indicate significance at the 10%, 5% and 1% levels respectively.

	1970-79		2006-2015			
	1	2	3	4	5	6
	All	All	All	All	Size Dec<=3 CF<0	Size Dec<=3 CF>0
Cash Flow	0.081 ***	0.119 ***	0.078 ***	0.161 ***	0.055 ***	0.278 ***
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
I(CF<0)		0.004 ***		0.000		
		(0.009)		*(0.943)*		
CF x I(CF<0)		-0.139 ***		-0.112 ***		
		0.000		*0.000*		
M/B	-0.004 ***	-0.006 ***	0.004 ***	0.002 ***	0.006 ***	-0.001
	(0.008)	*(0.003)*	*0.000*	*(0.004)*	*0.000*	*(0.759)*
ln(Assets)	0.001	0.001 *	-0.002 ***	-0.003 ***	0.010 ***	(0.007) ***
	(0.429)	*(0.095)*	*0.000*	*0.000*	*0.000*	*(0.001)*
Constant	-0.01 **	-0.018 ***	0.002	-0.003	-0.052 ***	0.009
	(0.035)	*0.000*	*(0.652)*	*(0.511)*	*0.000*	*(0.334)*
N	28,243	28,243	33,955	33,955	5,354	4,062
R2	0.036	0.047	0.025	0.029	0.021	0.069

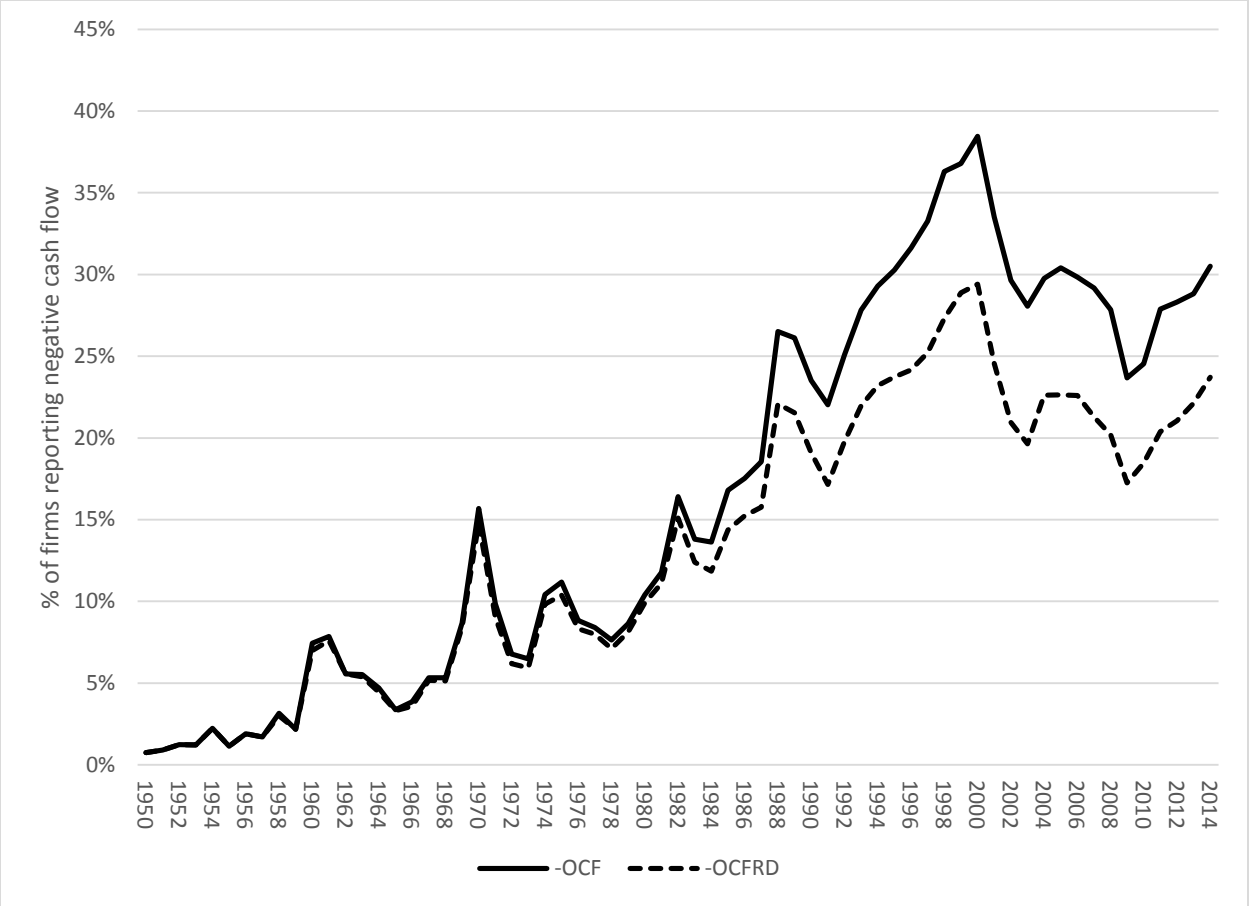
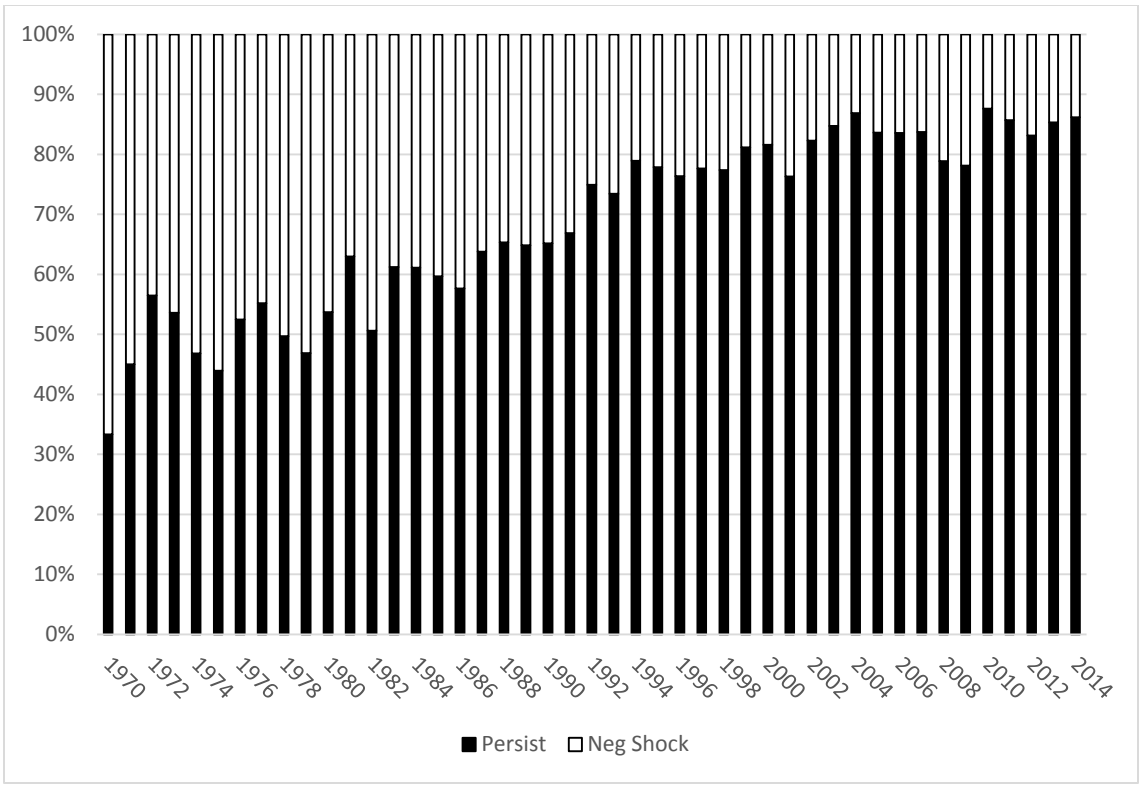


Figure 1. Prevalence of Public Firms with Negative Operating Income



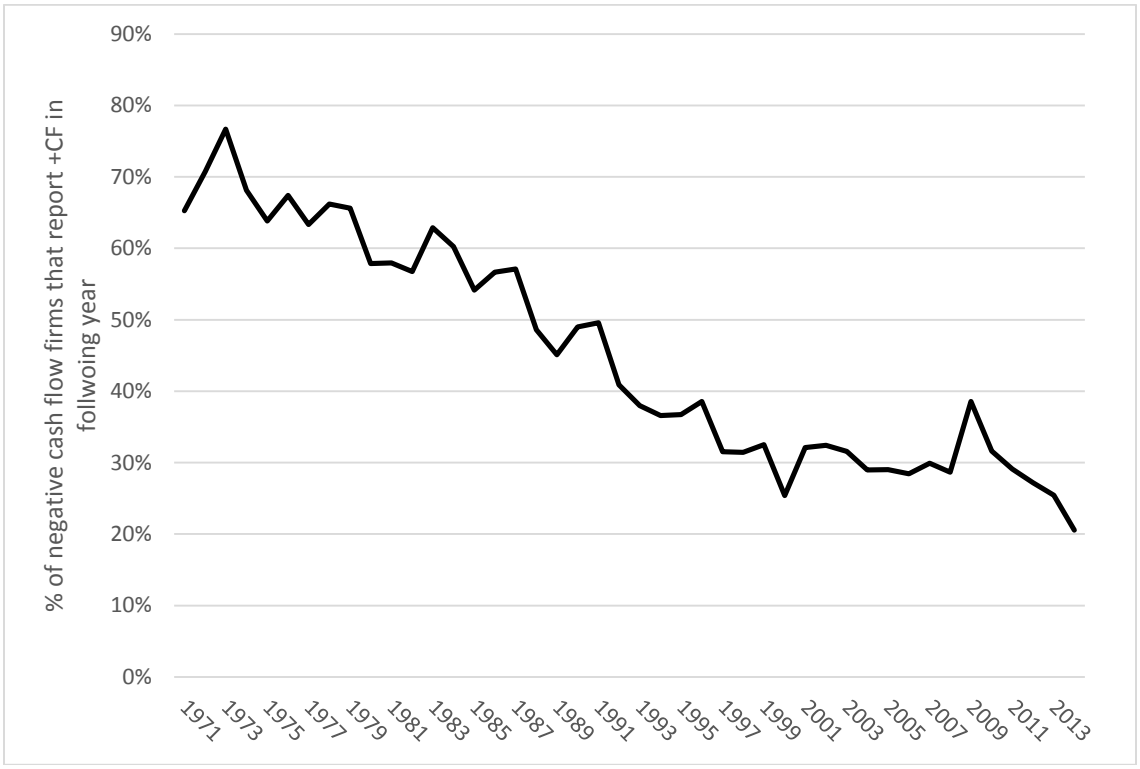


Figure 2. Panel A: Antecedents of Negative EBITDA. Panel B: Proportion of Negative EBITDA firms that report positive EBITDA in the following year.

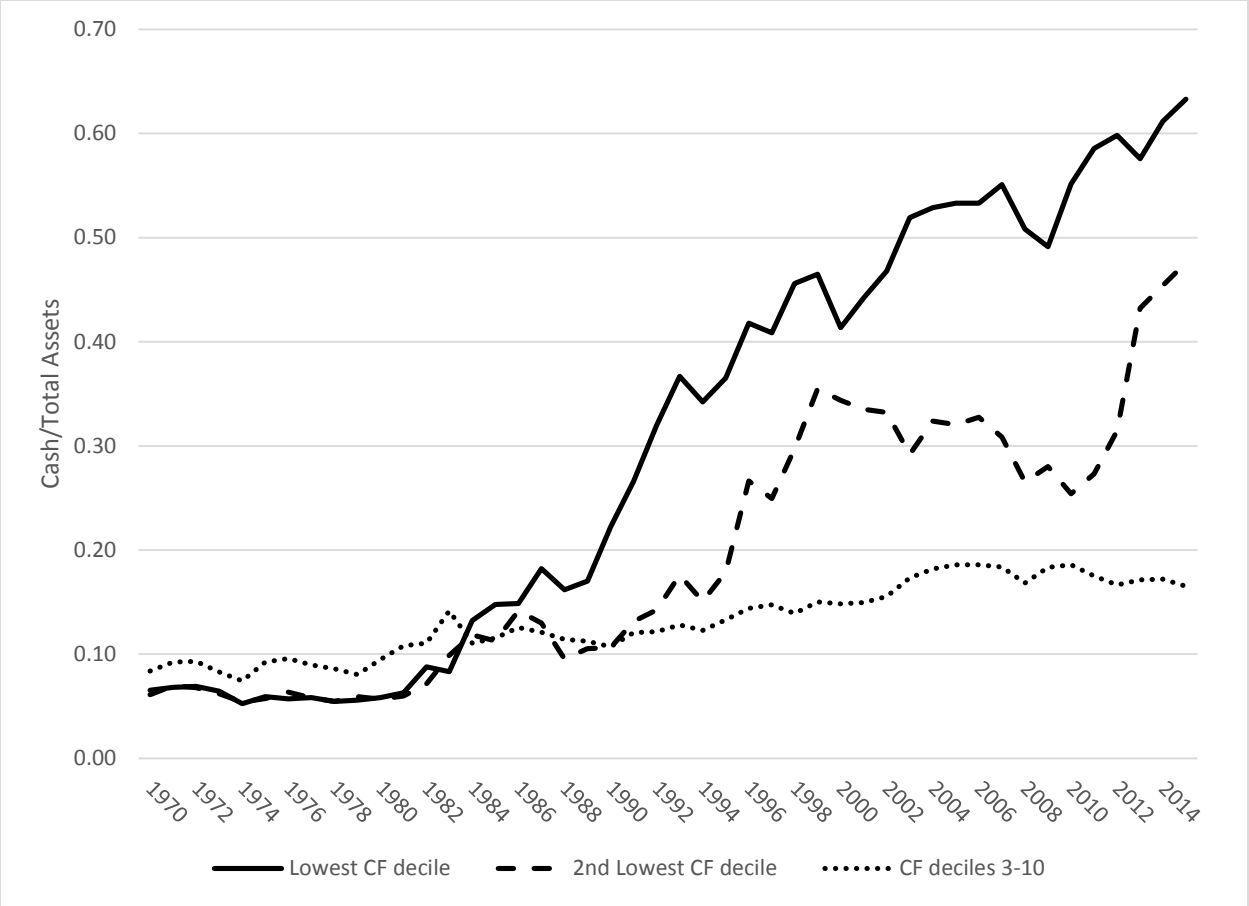


Figure 3. Evolution of Cash Holdings by Cash Flow decile

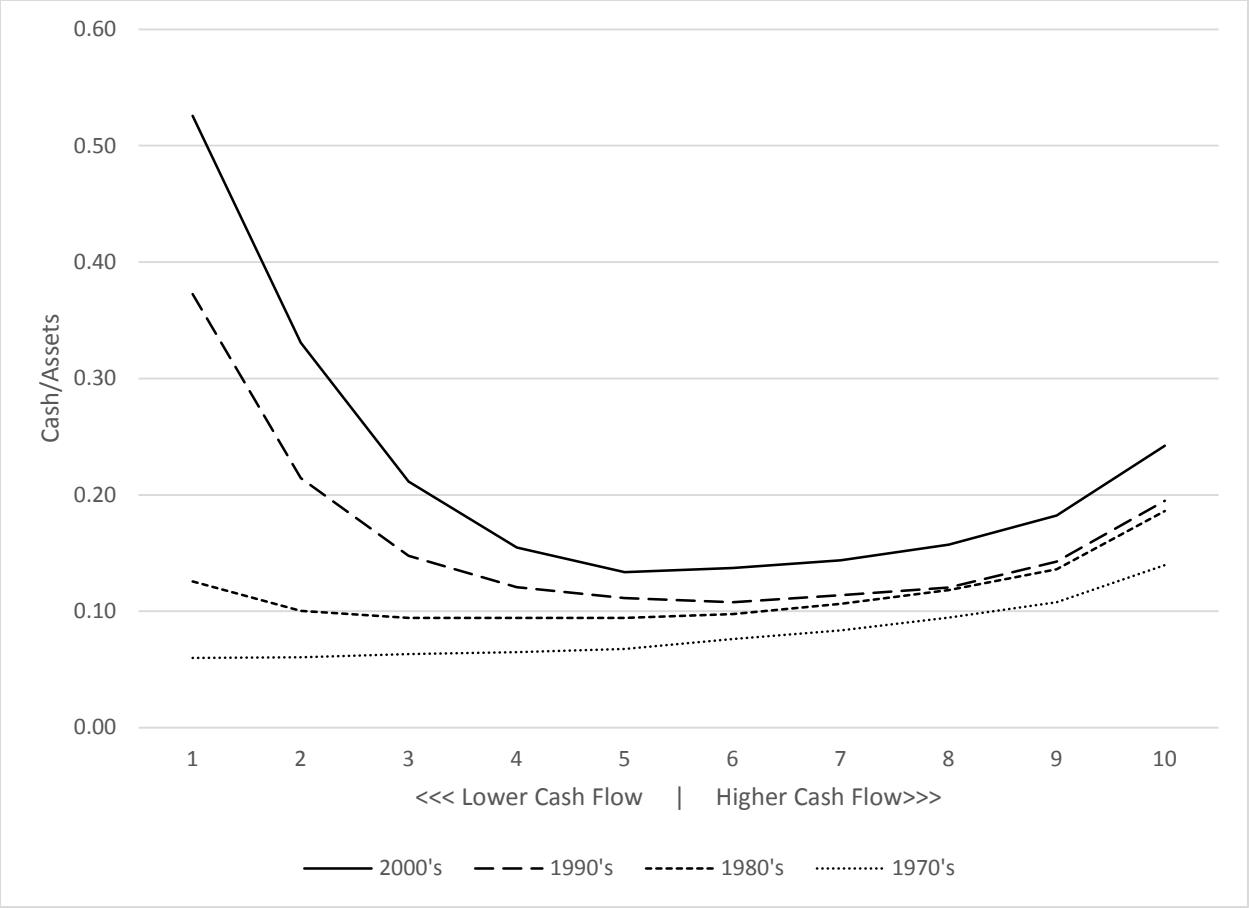


Figure 4. Convexity in the relation between cash holdings and cash flow deciles.

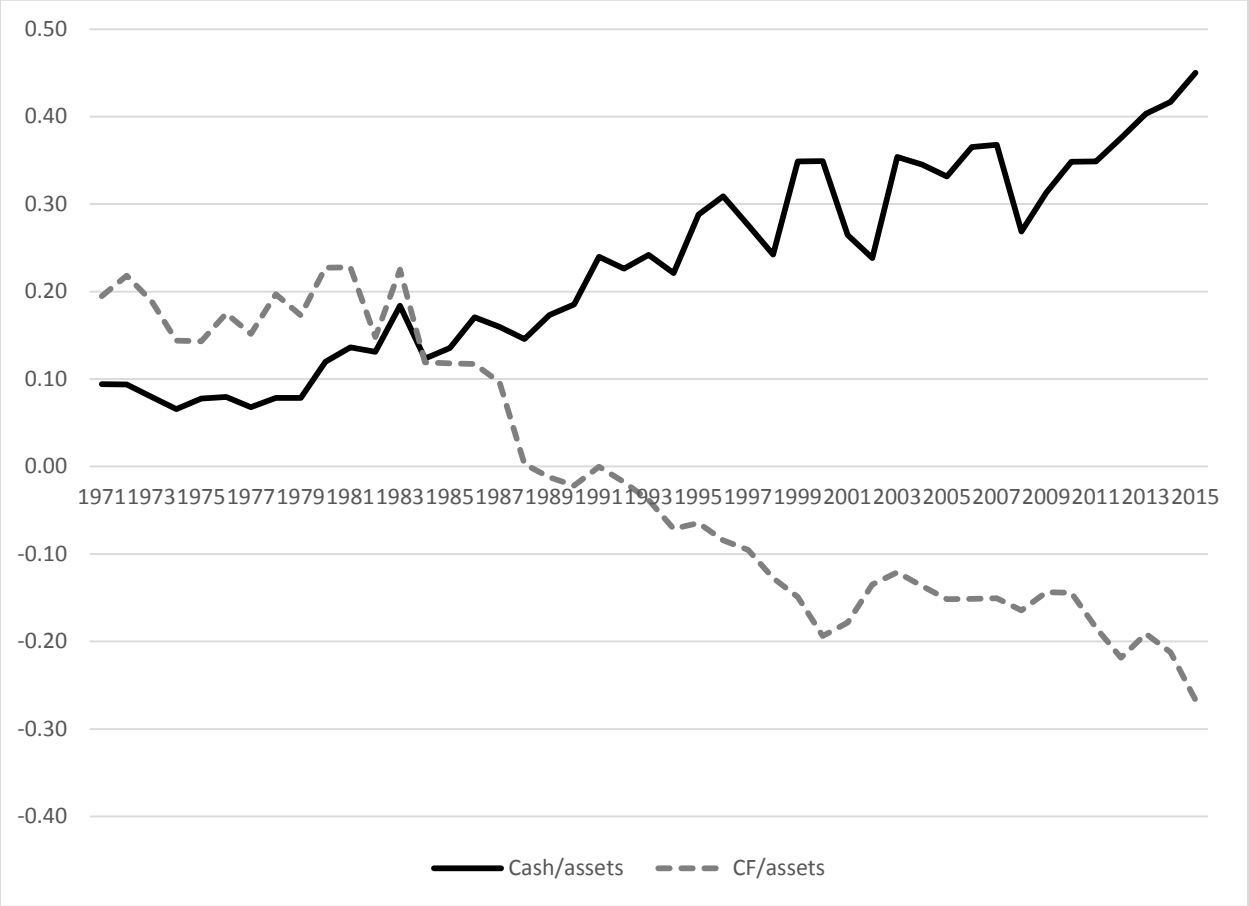


Figure 5. Equity issuer characteristics

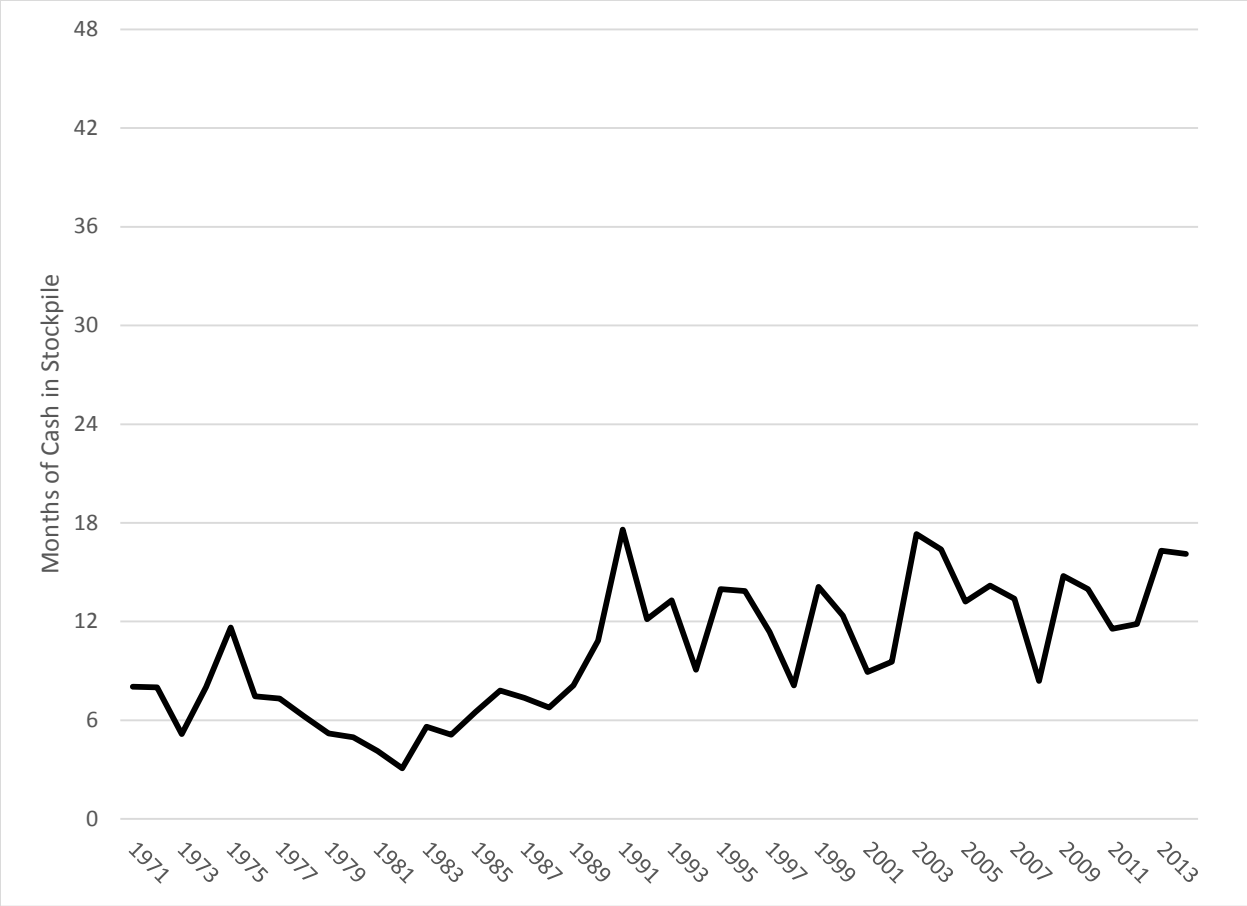
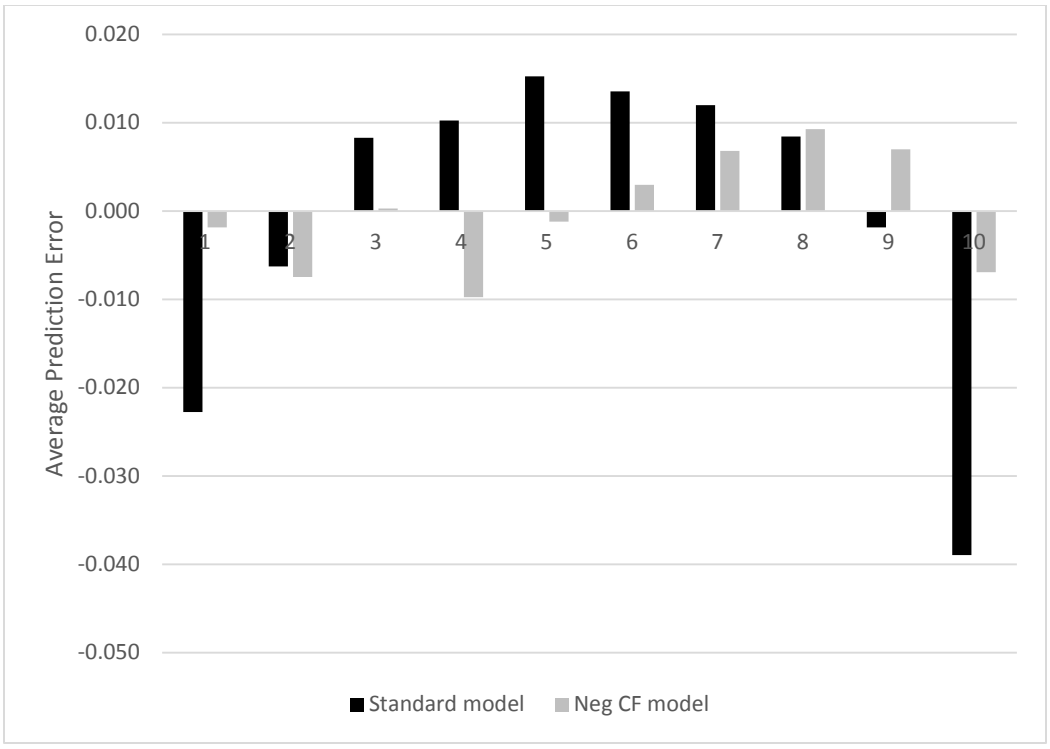
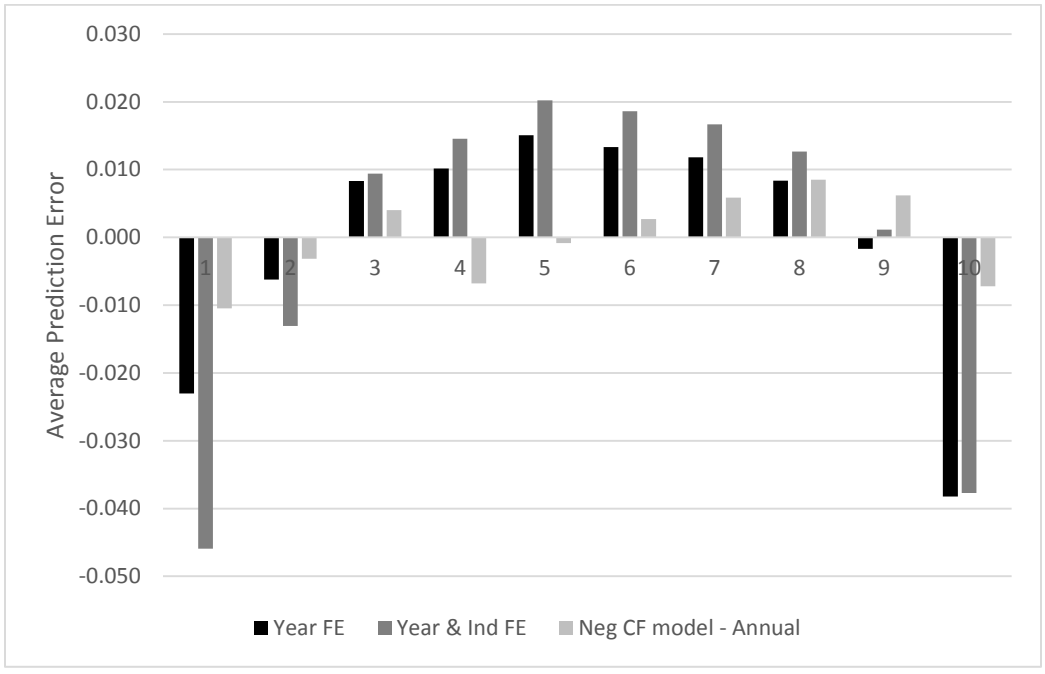


Figure 6. Median runway for equity issuers with negative cash flow





Figures 7A and 7B. Panel A report average prediction error from a standard model of cash/assets including cash flow, size, leverage, R&D intensity, industry cash flow volatility, capital expenditures and market-to-book ratio. The second series in panel A adds an indicator variable for negative cash flow and an interaction between negative cash flow and level of cash flow. Panel B reports prediction error from estimates using (i) the standard model with year fixed effects, (ii) year and industry fixed effects, and (iii) the negative earnings model from panel A estimated on annual cross sections. Both panels report average error sorted by EBITDA decile where 1 is the lowest level of EBITDA and 10 is the highest.