FEELING THE BURN: IMPLICATIONS OF PERSISTENT OPERATING LOSSES FOR CORPORATE POLICIES

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Abstract

Operating losses have become substantially more prevalent, persistent, and greater in magnitude since 1970. These trends cause the operational component of cash holdings to increase in tandem, herein described as the *operating loss motive*. Much of the rise in average cash/asset ratios within low cash flow firms is driven by increased burn rates and is not excess. Additionally, cash flow now has a nonlinear relation with the following firm characteristics: cash, size, industry cash flow volatility, research and development, market-to-book, and leverage. I suggest variables to capture the differential effects of negative cash flow firms in linear specifications.

"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

1. Introduction

In 2014, nearly one third of all US public companies lost money on operations, the highest proportion in modern history. This was not the result of a negative macroeconomic shock; most US stock indices closed near record highs. It used to be the case that almost all public firms generated operating profits. For example, 60 years ago in 1955 a total of *one* out of 633 public firms reported negative earnings before interest, taxes, depreciation, and amortization (EBITDA). But the period since 1980 has been characterized by an explosion in the proportion of public firms with operating losses, rising from 4% in 1979 to over 31% recently.

For most firms in recent years, operating losses are not transitory over short periods, they are persistent. Firms that lose money on operations this period are likely to lose money next period as well. For example, only 12% of the firms that reported negative EBITDA in 2013 subsequently reported positive EBITDA in 2014. Firms that expect operating 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, because they have immediate and ongoing liquidity needs.

Between 1970 and 2014, average cash holdings roughly double for firms in the top 8 deciles of cash flow, where cash flow is typically positive. However, consistent with Bates, Kahle and Stulz (2009), I find that the more striking rise occurs within the lowest decile of cash flow, in other words, those firms that are burning cash, where average cash holdings by rose by nearly 600% over the same period.

As stated by Lins, Servaes, and Tufano (2010, p.161): "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." Indeed, much of the empirical literature that seeks to explain the rise in corporate cash holdings in recent decades focuses on reasons that excess cash has increased. Examples are 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). However, the Lins et al. survey evidence suggests that most cash is held for operational purposes, rather than non-operational purposes. Thus, to explain the observed increase in cash holdings it is important to take into account factors that impact the size of operational needs, in addition to factors that induce excess stockpiles. I address this gap in the literature.

Firms with operating losses are likely to be financially constrained, and large cash holdings within constrained firms are often attributed to precautionary motives. In this study, I suggest an additional motive for the observed rise in cash holdings that is related but distinct from precaution: expected losses from operations have increased markedly in breadth and scale, causing the operational component of cash savings to increase in tandem.

Operational losses induce cash holdings above and beyond those related to precaution. The literature interprets precautionary motives as actions intended to mitigate negative outcomes if bad states of the world occur unexpectedly in the future. Keynes (1936) develops the precautionary savings theory where firms stockpile cash to protect themselves against adverse cash flow shocks, because these shocks could lead to underinvestment. However, an increasing number of firms run operational deficits regularly quarter after quarter for years. For these firms, cash stockpiling is less about guarding against a potential negative shock to cash flow and more about the fact that cash flow is negative *right now* and is likely to remain that way. The stockpile is not solely a precaution against negative shocks to cash flow, much of it is used to manage near term operational needs under an expectation of negative cash flows.

Consider precautionary motives outside of finance: The probability that the Pacific Northwest US experiences a large scale earthquake is positive and increasing, so homeowners are advised to store water as a precaution. As a thought experiment, I extend this concept to a two household economy:

The first household is located in a city, so they have a tap that typically supplies water. Their water stockpile is motivated by the fact that an earthquake creates states of the world where the tap shuts off temporarily. This water storage is precautionary.

The second household is identical to the first, except that it is a rural household that stores water because it has no well. This too is water storage, but it's not a precaution against an unexpected supply shock. Their household needs to draw water from the stockpile in *all* states of the world because they lack a source of inflow, so a large portion of their water storage is motivated by an expected deficit.

To the econometrician, both homeowners appear to be stockpiling water, but the primary motivation is different. The size of the stockpile is also different. The urban homeowner only needs to store enough to get through a temporary disruption that may or may not occur at some point in the future. The rural homeowner needs to get through tomorrow, and days after, with no expectation of access to tap water in the near future. Both households maintain an equivalent stockpile related to precaution as an insurance policy, but the rural household's total stockpile is much larger due to the addition of an operating component, not because they possess stronger precautionary motives.

The average amount of household water storage observed by the econometrician could increase through two channels in this setting. First, if the rural homeowner's daily water usage were to grow, a larger stockpile would be required to be to cover household operations for the same length of time. Second, if we added more rural households to the economy so that the proportion of rural to urban households increased, we would observe an increase in the economy's average water stockpile, due to the extra operational component required by the new entrants.

Stepping back into corporate finance, we can replace "water" with "cash," and "rural homeowners" with "operating loss firms" in this exemplum. Firms that expect operating losses have no operating cash flow "tap" from which to draw cash, so they stockpile cash from external capital to consume it in the near term. Precautionary motives remain in place, for example, we would expect to observe that firms with high research and development (R&D) and/or volatile cash flows hold more cash, but these variables do not capture the additional amount of cash held by negative cash flow firms for planned operational purposes. The proportion of firms with operating losses has grown substantially, and the magnitude of the losses has also grown substantially. The combined effect is an increase in average cash holdings due to near term operational needs.

Most empirical studies of cash holdings model predicted cash holdings as a linear function of variables that can be broadly classified as (i) sources and uses of cash such as cash flow, leverage, and capital expenditures, and (ii) motives for holding excess cash such precaution, agency, and repatriation taxes. Cash required for operational needs is captured by the constant as well as variables in category (i). Controlling for cash flow in models of cash makes intuitive sense, however, what is not widely recognized is that the relation between cash flow and cash holdings has become highly nonlinear. In this study I articulate why accounting for this nonlinearity is important for understanding the evolution of cash holdings firms on the left side of the cash flow distribution, where operating losses are greatest and cash/asset ratios are highest. Correcting the functional form in models of cash holdings reduces prediction error that otherwise varies systematically with cash flow, and reveals the importance of negative cash flows in boosting the operational component of cash holdings.

A related question is where the cash stockpiles come from in the absence of savings from positive cash flows. Consistent with Fama and French (2004) I find that over the past four decades negative cash flow firms represent an increasing proportion of firm-initiated equity issuances. In every year but one since 1992, the majority of firms issuing equity reported negative operating cash flows (CF). In the last year of the sample, 2014, negative CF issuers outnumbered positive CF issuers almost 2 to 1. High market to book ratios, credit constraints, and diminished adverse selection costs (Walker et al., 2015), lead operating loss firms to raise the majority of their external capital in the form of equity.

Equity issues typically represent a substantial cash inflow to the firm and McLean (2011) documents that cash savings from equity issuance has been increasing over time. In many cases, the issuing firm holds all or most of the proceeds as cash. Concurrently, many firm characteristics have changed such as industry composition, average R&D expenditure, cash flow volatility, and sales growth rates. All of these variables could prompt higher levels of precaution for reasons articulated by McLean and others.

The importance of the operating loss motive is illuminated when scaling cash holdings by the magnitude of the cash burn rate.[1] This scaled measure, commonly called "runway," is defined as how many months a firm with negative cash flows can continue to operate at the same rate without an infusion of external capital. Specifically, current cash holdings divided by burn rate. 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. However, the median runway after issuance has stayed within the same range for decades, typically between 6 and 18 months. 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, time trends in cash policies are driven in large part by elevated operating needs in the sense that the number of months of cash that firms have on hand has not changed substantially. The operational loss motive is consistent with large cash holdings to cover commensurately large burn rates.

In the final section of results, I show that the cash flow sensitivities of cash are much stronger for positive cash flow firms than negative cash flow firms. Conditioning on constrained firms, I find that cash holdings within firms with positive cash flows are four times more sensitive than firms with negative cash flows. Additionally, I show that many characteristics are now nonlinear with respect to cash flow.

[1] I define monthly burn rate as –[EBITDA-Capital Expenditures] divided by twelve. For example, a firm that reports an EBITDA loss of $100MM and capital expenditures of $20MM annually has a monthly burn rate of $10MM. Firms generating positive free cash flows have a burn rate of zero.

Specifically, in addition to cash, I find that size, R&D, industry cash flow volatility, market-to-book and leverage all vary nonlinearly with cash flow. Thus, adding variables to capture this nonlinear variation is important for studies in numerous lines of literature that use cash flow as an independent variable in a linear specification.

The rest of the study progresses as follows: Section II documents the rise in operating loss firms. Section III reports results explaining how the rise in corporate cash holdings is related to the operating loss motive. Section IV reports results on the relation between operating loss firms and cash savings from equity issuance. Section V analyzes cash flows sensitivities of cash and nonlinearity in the relation between cash flow and various firm characteristics, and Section IV concludes.

2. Descriptive evidence on operating losses

The main sample consists of all U.S firms with total assets greater than $5 million (in 2014$) 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, I 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.

I begin by documenting the prevalence of operating losses over time. Figure 1 charts the proportion of the sample that reports negative earnings each year since 1950. The rise is striking. In the early part of the sample, negative earnings were almost non-existent. Despite five recessions between 1950 and 1980, the proportion of firms with negative EBITDA never exceeds 1 in 15. Since 1998, it's rarely been less than 1 in 4. In 2014, the final year in the sample, 31.5% of all firms reported negative EBITDA.

One firm characteristic that has changed substantially over time is R&D expenditures (Brown et al., 2009). To investigate whether the rise in negative EBITDA firms is driven primarily by high R&D expenditures, I measure EBITDARD, defined as EBITDA with R&D added back. As it turns out, there is more to the story than R&D. The proportion of firms with negative EBITDARD has also experienced a substantial rise over the same period and by 2014 more than 1 in 4 firms reported a loss *even before subtracting R&D expense*.

The finding that 1 in 4 firms burn cash prior to accounting for any traditional measure of investment such as capital expenditures or R&D has implications for how we think about and measure investment. One interpretation is that these firms are investing in market share. In other words, sustaining operational losses due to underpricing products in the short term, hoping to extract rents from market power in the long run. Fresard (2010) reports evidence consistent with the interpretation that cash holdings have a causal impact on product market performance. For firms with operating losses, one could make the argument that they are both constrained *and* engaging in predatory pricing behavior, by selling product for below cost.

For example, the rise in the proportion of negative earnings firms charted in Figure 1 is pro-cyclical. The peaks correspond to years in which the S&P opened at record highs. It could be the case that during market expansions, firms find investing in market share more attractive, leading to the expansion of negative earnings firms in the economy. Additionally, investors may find firms that are investing in market share more attractive during expansions as well, leading to a surge of new entrants pursuing this strategy. In this study, I limit the scope of analysis to the impact of negative earnings on cash and equity issuance, but note that questions around investment and cash flow-investment sensitivities for negative earnings firms represent interesting avenues for future research.

A question related to prevalence is whether negative cash flows are transitory. I 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 EBITDA 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 operating income has grown substantially over time. Table 1, panel A reports average EBITDA/assets for the ten deciles during four subperiods: 1970-1979, 1980-1989, 1990-1999, and 2000-2014. Within the decile of high income firms, there has been little change. In the 1970's, the 10^{th} decile of earnings reported EBITDA of 33% of assets. In the most recent subperiod, the average fell slightly to 30%. However, on the other side of the spectrum, the change is dramatic. In the 1970's the average firm in the lowest decile of earnings reported EBITDA of (3%) of assets. During the 2000-2014 subperiod, the average was (60%) of assets. Put another way, firms in this decile burn an average of 5% of assets *per month* even before accounting for capital expenditures, taxes, or interest.

Panel B of Table 1 repeats the exercise for the variable used in the remainder of this study: operating cash flow. This variable is defined as operating income before depreciation, minus taxes paid. I do not subtract dividends or interest since these are related to financing decisions and my focus is on operating decisions. For the low cash flow deciles, the values are very similar, which is not surprising since firms without positive income do not face income tax liabilities. Within the high cash flow deciles, the figures are lower than panel A due to taxes, but the trend is the same. Whether measured as EBITDA or operating cash flow, the highest decile has increased slightly over time, while the rest have stayed the same or declined. The lower the cash flow decile, the more precipitous the drop. These findings are consistent with Deangelo, DeAngelo, and Skinner who report that earnings have consolidated within the top decile in recent years. Although their evidence is on aggregate earnings, Table 1 shows some evidence of consolidation even when scaled by assets.

Taken together, Figures 1 and 2, and Table 1 highlight three stylized facts about the evolution of firms reporting negative EBITDA: They are vastly more prevalent, more persistent, and the magnitude of average negative earnings within the lowest decile has grown by twentyfold. 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 very similar. The lowest decile held 8.4% of assets in cash, while the highest 8 deciles held an average of 8.0% of assets in cash. During the final year of the sample, 2014, average cash holdings within the lowest decile has grown to over 58% of assets, and increase of 598% over 1970 levels. Cash holdings within the highest eight deciles has also grown, but much more modestly, increasing by 110% 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 began prior to 1980 and has not retreated in the years since 2006. The takeaway is that in order to understand the rise in average cash holdings generally, attention needs to be paid to the left side of the cash flow distribution where the rise is most evident.

Figure 4 displays the relation between cash holdings and operating income for the full range of cash flow deciles. 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, suggesting there wasn't a strong relation, in each subsequent decade has increased in convexity. While the uptick on the right end of the distribution could be caused by tax consideration, the massive rise on the left is within firms that are not likely subject to an offshore cash holdup due to repatriation taxes, because they have negative earnings to offset the tax burden.

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 that is the focus of this study. For this reason, I 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 3 reports results from OLS regressions of cash holdings on standard determinants used in the literature (equation 1) plus the new variables I 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.

In recent years, there has been an increased focus on R&D expenditures. 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 related to the operating loss motive rather than precaution. For this reason, I 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 3, Cash Flow carries a large negative coefficient, consistent with several prior studies, but challenging to interpret in light of nonlinearity in cash flow. Column 2 reveals the importance of including variables that capture the operating loss motive. Both the negative earnings indicator and the interaction term are highly significant determinants of corporate cash holdings. Moreover, after controlling for operating losses, the economic magnitude of the coefficient on earnings is greatly reduced. 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 size of the coefficient on Cash Flow in the linear specification is over four times higher than the alternative specification, implying that the relation between cash flow and cash holdings depends greatly on the sign of the cash flows.

In Table 4, I provide a numerical example of the relative contribution of the cash flow variables versus precautionary motive variables on predicted cash holdings for firms with negative earnings. The first two columns report coefficients from estimating Equation (2) over subperiods at the beginning and end of the sample period: The first decade of the sample (1970-79), and the period since 2000. 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 operating loss motive is most clearly revealed by the increase in predicted cash of each category. In this example, the earnings variables contribute as much to the increase in predicted cash as the precautionary motive variables. Each category contributes 46% of the increase in total predicted cash.

I note that the contribution of negative cash flow to the growth in cash holdings is partially obscured in the standard model, where cash flow is specified to have a linear relation with cash holdings. The residual effect of negative earnings on cash that is otherwise captured by the nonlinear terms is pushed partly into the constant and the remainder is prediction error.

In Figures 5A and 5B I detail the effects of model misspecification on prediction error. Figure 5A 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 (1, 2, and 10) and the center (4 through 7) of the distribution. In the shoulders (3, 8, and 9) the prediction error is similar or slightly worse. 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.

As demonstrated in Figure 4, the convexity between earnings and cash has increased over time, so Figure 5B 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 also adds 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. 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 suggest the use of caution in fixed effects models when movement in the dependent variable is driven in part by an unspecified nonlinear component of one of the explanatory variables.

4. Equity Issuance, Cash Savings, and Runway

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 and earnings. Figure 6 illustrates that in the 70's and 80's, firms issuing equity are cash flow positive on average, but in every year since 1996, the average equity issuer is burning cash. The chart shows that R&D has also increased, but that issuing firms are holdings far more cash on average than their annual R&D expenditures. 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.

Turning to use of proceeds, 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 evaluating cash savings from equity issuance, it is instructive to consider what factors motivate the issuance. DeAngelo, DeAngelo, and Stulz (2010) 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." Under this explanation, we should observe a disproportionate number of equity issuances at the low end of the cash flow spectrum.

Table 5 reports the distribution of firm-initiated equity issues each year sorted by deciles of operating cash flow scaled by total assets. Firm-initiated equity issues are defined as issuances of common stock that exceed 3% of market equity and capture the majority of IPOs, SEOs, and private placements and exclude the majority of employee-initiated issuances such as exercise of stock options (McKeon, 2015). In general, an upward trend is observed in the low cash flow deciles and a downward trend is observed in the higher cash flow deciles.

Table 6 aggregates the figures in Table 5 for the first five years and last five years of the sample period to more concisely compare how the joint distribution of equity issues and cash flow has changed over time. In the first five years of the sample, equity issuance frequency was nearly unconditional on cash flow decile; close to 10% of issues are observed in each decile. However, during the most recent five years, from 2010-2014, 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 53% of all equity issues. Consistent with the lifecycle theory, these two deciles have the youngest average age and high average M/B ratios. The lowest decile of CF has the highest average M/B ratio and the second lowest CF decile has the third highest average M/B.

To further analyze the relation between cash flow and issuance frequencies, I calculate the mean number of firm-initiated issuances per year for each cash flow decile based on quarterly data. Table 8 reports the results of this analysis. While Tables 5 and 6 demonstrate that a large portion of equity issuances are conducted by low cash flow firms, Table 7 panel A demonstrates the inverse: a large portion of low cash flow firms are equity issuers. In fact, between 2010 and 2014 the lowest decile of cash flow recorded 0.92 firm-initiated issuances *per firm per year*! Employee-initiated issues, reported in panel B, are even more frequent. This high frequency of issuance activity raises two questions. First, why are firms issuing so frequently if savings rates from issuance have increased substantially, and second, what are the implications for measuring use of proceeds over subsequent years?

To investigate the size of the stockpile relative to the needs of the firm, I borrow a metric from the venture capital industry, where negative cash flows are commonplace. Within the startup community, a figure that often underlies decisions about cash holdings and equity issuance is "monthly burn-rate," which I define as annual operating income before depreciation minus interest, taxes paid, dividends, and capital expenditures, divided by 12. Cash holdings divided by the burn rate is referred to as "runway," or in other words, how many months a company could sustain current operations without additional 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. I extend their findings by analyzing runway length over time to detect whether it has changed in ways similar to average cash holdings. Figure 5 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 45 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 8, which reports median burn rate across all issuers each year 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 6% of assets. By the 2010-14 period the figure had risen to 32.7% of assets.

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. Initially, this appears at odds with McLean's finding that savings rates from issuance are at historic highs. Taken together, my results on equity issuance frequency, burn rates, and runway help to reconcile the two findings. 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, as well as a full depletion as of the following year. The issuances are topping up the stockpile, but the firms are burning through the stockpile rapidly.

5. Cash Flow Sensitivity of Cash

The preceding sections focus on 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 within constrained firms, but not within unconstrained firms. In light of the high prevalence of negative cash flows in recent years, it is worthwhile revisiting the interpretation of the cash flow sensitivity of cash when cash flow is negative.

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. So 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. in a robustness check, 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, I build on their results by testing whether cash flow sensitivities have changed through time as well. The previous sections of this study show that negative cash flow firms replenish cash reserves through frequent equity issues in recent years, suggesting that their cash holdings will not be as sensitive to cash flow when compared to constrained positive cash flow firms. Starting from Almeida et al.'s baseline regression (equation 3), I add variables to isolate the effect of negative earnings firms (equation 4):

$$\Delta \frac{Cash}{Assets}_{i,j,t} = \alpha + \beta_1 \frac{Cash\ Flow}{Assets}_{i,t} + \beta_2 \ln(Assets)_{i,t} + \beta_3 \frac{M}{B}_{i,t} + \varepsilon_{i,t} \qquad (3)$$

$$\Delta \frac{Cash}{Assets}_{i,j,t} = \alpha + \beta_1 \frac{Cash\ Flow}{Assets}_{i,t} + \beta_2 I(EBITDA < 0)_{i,t} \qquad (4)$$

$$+ \beta_3 \left[I(EBITDA < 0) * \frac{EBITDA}{Assets} \right]_{i,t} + \beta_3 \ln(Assets)_{i,t-1} + \beta_4 \frac{M}{B}_{i,t-1} + \varepsilon_{i,t}$$

Table 9 reports the results of the empirical tests. I begin by estimating equations 3 and 4 on the 1970-79 subperiod. During this period, negative cash flow firms were relatively rare (Figure 1), and cash had an approximately linear relationship with cash flow (Figure 4). The similar coefficients on Cash Flow in columns 1 and 2 suggest that negative earnings firms had little impact on observed sensitivities during this period. Moreover, the coefficients are only weakly significant.

In Columns 3 and 4 I estimate the models on the 2010-2014 subperiod. Column 3 reports a similar sized coefficient on Cash Flow to the 1970-79 subperiod. However, Column 4 demonstrates that sensitivities are twice as high for positive cash flow firms compared to negative cash flow firms, and also more than twice as high as the 1970's subperiod. Once the interaction variable is introduced, it carries a highly significant negative coefficient, indicating that cash has a significantly lower sensitivity to cash flow when cash flows are negative.

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. I 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 8,887 negative cash flow firms and 7,175 positive cash flow firms. The positive and significant coefficient on Cash Flow in column 5 indicates that there is evidence of negative cash flow firms drawing down on savings to cover operating losses. However, the coefficient on Cash Flow in column 6 is over four times higher than column 5 and two to three times higher than the coefficients reported by Almeida et al. These results are consistent with the interpretation that the cash flow sensitivity of cash has increased in recent years, conditional on positive cash flows.

Cash is not the only variable for which the relation with cash flow has changed over time. Figure 8 shows that in the early 1970's size was not systematically related to cash flows but by the end of the sample (2010 to 2014), firms in the smallest size deciles had a markedly different cash flow profile than larger firms. Cash flow and size are now strongly positively correlated. To the extent that cash flow correlated with financial constraints, it is possible that this has implications for the use of size as a measure of financial constraints in panel data.

In the final table of empirical results, I investigate the unconditional relation between cash flow and several other firm variables in recent years (2010-2014). As reported in Table 10, the relation between cash flow and various firm characteristics indicates different interpretations depending on whether a linear specification is used or one that accounts for nonlinearity on the left side of the cash flow distribution. I do not include control variables in these tests because I am not attempting to explain or draw conclusions about the dependent variables, the purpose is solely to demonstrate nonlinearity with cash flow to guide future research that employs cash flow in linear specifications.

In the first two columns, I report the results for cash. As analyzed in detail in this study, the relation is highly negative and significant in a linear specification, but the result is driven by negative cash flow firms. Column 3 and 4 report results with industry cash flow volatility as the dependent variable. Column 3 suggests that volatility is strongly declining with cash flow, however column 4 shows that the result is driven by negative cash flow firms. The interaction is highly negative and significant indicating that firms with very low cash flows tend to be characterized by high volatility. However, when controlling for this relation, the Cash Flow variable carries a significantly positive coefficient, indicating that cash flow levels and cash flow volatility are positively related, conditional on positive cash flows.

Similar results obtain for R&D and Market-to-Book. In both cases, the linear specification indicate a negative and significant relation between these firm characteristics and cash flow, a counter-intuitive result for M/B. Once the interaction term is included, the coefficient on R&D drops by an order of magnitude and is only weakly negatively related to cash flow. Additionally, M/B carries the expected positive relation with cash flow once the interaction is included.

Finally, I test the relation between cash flow and leverage. In the linear specification, leverage is positively related to cash flow, as expected, but the economic magnitude is low. Once negative cash flow firms are identified separately, the relation between cash flow and leverage increases substantially. For positive cash flow firms, an extra dollar of cash flow is associated with $0.18 more debt.

6. Conclusion

In this study, I 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. I 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). I 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, I 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.
Cash Flow	[OIBDP-TXPD]/AT. TXPD is replaced by TXT when missing.
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	MKTVAL/SEQ. MKTVAL is replaced by CSHO*PRCC_C if missing.
Cap Ex	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
Burn Rate	-[OIBDP-TXPD-XINT-DVC-CAPX]. Divided by 12 for monthly burn rate.
Runway	CHE/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 earnings and cash flow by decile

This table reports mean values of EBITDA/assets and CF/assets for deciles formed annually on each measure. The full sample is 174,231 firm year observations over the period 1970-2014. Values are averaged over all firm year observations within the decile during the specified subperiod.

Panel A: EBITDA/assets

EBITDA decile	1970-79	1980-89	1990-99	2000-14
1	(0.03)	(0.17)	(0.43)	(0.60)
2	0.07	0.01	(0.09)	(0.17)
3	0.10	0.06	0.02	(0.02)
4	0.12	0.09	0.07	0.04
5	0.14	0.12	0.10	0.08
6	0.16	0.14	0.12	0.10
7	0.18	0.16	0.15	0.13
8	0.20	0.19	0.18	0.15
9	0.24	0.22	0.21	0.19
10	0.33	0.31	0.31	0.30

Panel B: CF/assets

CF decile	1970-79	1980-89	1990-99	2000-14
1	(0.02)	(0.16)	(0.43)	(0.60)
2	0.05	0.01	(0.09)	(0.18)
3	0.07	0.05	0.01	(0.03)
4	0.09	0.07	0.06	0.04
5	0.10	0.09	0.09	0.07
6	0.11	0.11	0.11	0.09
7	0.12	0.12	0.13	0.11
8	0.14	0.14	0.15	0.13
9	0.16	0.16	0.18	0.17
10	0.21	0.23	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 174,231 firm year observations over the period 1970-2014. Values are averaged over all firm year observations within each decile each year.

	Deciles		
	1	2	3-10
1970	0.084	0.081	0.080
1971	0.090	0.075	0.088
1972	0.099	0.075	0.088
1973	0.095	0.066	0.079
1974	0.078	0.066	0.070
1975	0.083	0.084	0.087
1976	0.093	0.078	0.091
1977	0.085	0.083	0.084
1978	0.088	0.078	0.080
1979	0.104	0.083	0.073
1980	0.142	0.101	0.080
1981	0.164	0.130	0.088
1982	0.157	0.119	0.097
1983	0.201	0.158	0.120
1984	0.177	0.143	0.103
1985	0.200	0.139	0.107
1986	0.203	0.172	0.116
1987	0.240	0.161	0.111
1988	0.216	0.146	0.103
1989	0.235	0.133	0.102
1990	0.259	0.136	0.100
1991	0.303	0.169	0.112
1992	0.370	0.162	0.113
1993	0.402	0.203	0.121
1994	0.375	0.185	0.115
1995	0.406	0.202	0.125
1996	0.457	0.303	0.135
1997	0.440	0.293	0.138
1998	0.464	0.337	0.134
1999	0.487	0.403	0.142
2000	0.422	0.399	0.140
2001	0.431	0.383	0.145
2002	0.459	0.370	0.152
2003	0.488	0.367	0.167
2004	0.532	0.381	0.174
2005	0.545	0.383	0.176
2006	0.550	0.378	0.177
2007	0.543	0.378	0.174
2008	0.490	0.315	0.163
2009	0.468	0.323	0.181
2010	0.538	0.321	0.178
2011	0.573	0.325	0.169
2012	0.557	0.367	0.164
2013	0.573	0.438	0.169
2014	0.588	0.487	0.168
Growth: 1970 to 2014	598%	504%	110%

Table 3

Determinants of cash holdings

This table reports results from OLS regressions of cash holdings (cash/assets) on various determinants. The full sample is 174,231 firm year observations over the period 1970-2014. 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	-0.270 ***	-0.044 *	-0.272 ***	-0.040 ***	-0.260 ***	-0.055 ***
	(<0.001)	*(0.098)*	*(<0.001)*	*(0.098)*	*(<0.001)*	*(<0.001)*
I(CF<0)		0.072 ***		0.073 ***		0.069 ***
		(<0.001)		*(<0.001)*		*(<0.001)*
CF x I(CF<0)		-0.169 ***		-0.173 ***		-0.146 ***
		(<0.001)		*(<0.001)*		*(<0.001)*
Size	0.000	0.001	0.001 **	0.002 ***	0.000	0.001 ***
	(0.993)	*(0.250)*	*(0.012)*	*(<0.001)*	*(0.226)*	*(<0.001)*
Industry CF Vol	0.886 ***	0.828 ***	0.937 ***	0.897 ***	0.508 ***	0.496 ***
	(<0.001)	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*
I(R&D Intense)	0.060 ***	0.058 ***	0.059 ***	0.056 ***	0.062 ***	0.059 ***
	(<0.001)	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*
M/B	0.006 ***	0.005 ***	0.006 ***	0.005 ***	0.005 ***	0.004 ***
	(<0.001)	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*
Cap Ex	-0.153 ***	-0.183 ***	-0.158 ***	-0.191 ***	-0.187 ***	-0.211 ***
	(<0.001)	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*
Leverage	-0.270 ***	-0.268 ***	-0.270 ***	-0.267 ***	-0.275 ***	-0.271 ***
	(<0.001)	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*
Constant	0.151 ***	0.124 ***	0.146 ***	0.115 ***	0.178 ***	0.154 ***
	(<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 4

Numerical example: What drives growth in cash holdings?

This table reports predicted cash holdings for the median firm characteristics from the lowest decile of CF/assets during the periods (i) 1970-79 and (ii) 2000-2014 using coefficients from OLS regressions of cash holdings (cash/assets) on various determinants defined in the appendix. The full sample is 174,231 firm year observations over the period 1970-2014. 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	2000-2014	1970-1979	2000-2014	(1)	(2)		
Cash Flow	0.120	0.080	0.003	-0.572	0.000	(0.046)		
I(CF<0)	0.029	0.099	0	1	-	0.099		
Cash Flow x I(CF<0)	-0.229	-0.283	0	-0.572	-	0.162		
Size	-0.002	0.005	2.014	3.963	(0.005)	0.019		
Industry CF Vol	0.188	0.739	0.029	0.159	0.005	0.118		
I(R&D Intense)	-0.016	0.103	0	1	-	0.103		
M/B	0.009	0.003	0.613	2.941	0.005	0.009		
Cap Ex	-0.107	-0.342	0.026	0.020	(0.003)	(0.007)		
Leverage	-0.181	-0.251	0.341	0.050	(0.062)	(0.013)		
Constant	0.119	0.084			0.119	0.084		
							Increase	%
Predicted cash					0.061	0.529	0.467	
Contribution from operating cash flow variables					0.000	0.215	0.215	46%
Contribution from precautionary variables (CF Vol, R&D)					0.005	0.221	0.215	46%
Contribution from other factors					0.055	0.092	0.037	8%

Table 5

Distribution of Firm-initiated Equity Issues by Cash Flow decile by year

This table reports the distribution of equity issuers by cash flow decile. The full sample is 174,231 firm year observations over the period 1970-2014.

		Lowest CF									Highest CF
Year	N	1	2	3	4	5	6	7	8	9	10
1971	410	8%	7%	12%	14%	11%	11%	9%	11%	10%	7%
1972	491	7%	10%	10%	11%	10%	11%	11%	11%	10%	9%
1973	275	11%	11%	13%	10%	6%	10%	12%	8%	11%	9%
1974	249	12%	8%	13%	8%	11%	9%	12%	10%	9%	8%
1975	220	13%	7%	8%	12%	12%	10%	10%	9%	9%	9%
1976	295	7%	7%	9%	9%	9%	14%	10%	8%	12%	14%
1977	269	10%	8%	13%	11%	9%	12%	13%	7%	11%	7%
1978	351	8%	9%	10%	10%	11%	13%	9%	11%	9%	10%
1979	380	12%	10%	8%	11%	10%	14%	12%	9%	6%	8%
1980	551	15%	9%	11%	11%	9%	9%	10%	8%	10%	7%
1981	766	15%	12%	11%	10%	11%	10%	9%	7%	7%	8%
1982	551	17%	10%	11%	10%	9%	10%	11%	11%	6%	6%
1983	1,209	15%	12%	10%	9%	11%	10%	10%	9%	7%	7%
1984	738	18%	11%	12%	11%	9%	10%	8%	5%	9%	7%
1985	768	16%	12%	11%	11%	10%	9%	7%	9%	8%	7%
1986	1,056	16%	12%	10%	10%	10%	10%	9%	8%	8%	7%
1987	994	17%	11%	10%	10%	10%	11%	9%	8%	8%	7%
1988	498	18%	13%	10%	10%	10%	9%	8%	5%	8%	8%
1989	572	20%	11%	8%	8%	9%	10%	9%	7%	10%	7%
1990	534	22%	10%	10%	8%	9%	7%	10%	10%	9%	6%
1991	794	20%	10%	7%	9%	8%	8%	11%	10%	10%	8%
1992	1,010	20%	10%	8%	9%	9%	10%	8%	7%	9%	9%
1993	1,278	20%	13%	8%	10%	9%	8%	9%	7%	9%	7%
1994	1,176	23%	15%	10%	8%	8%	7%	8%	8%	7%	7%
1995	1,296	22%	14%	11%	10%	8%	9%	8%	8%	5%	6%
1996	1,745	22%	17%	12%	10%	9%	7%	7%	5%	5%	6%
1997	1,444	20%	17%	11%	11%	8%	8%	8%	6%	7%	5%
1998	1,205	16%	18%	14%	11%	11%	7%	6%	5%	5%	5%
1999	1,290	21%	23%	15%	10%	7%	7%	5%	4%	4%	4%
2000	1,739	26%	22%	18%	9%	6%	5%	4%	4%	3%	4%
2001	910	27%	17%	12%	9%	7%	6%	8%	5%	4%	5%
2002	799	26%	13%	11%	10%	9%	8%	7%	6%	5%	6%
2003	753	30%	17%	10%	8%	6%	7%	6%	5%	6%	4%
2004	1,034	29%	18%	11%	7%	9%	6%	6%	6%	5%	5%
2005	857	29%	18%	10%	8%	7%	6%	6%	7%	5%	5%
2006	896	27%	19%	9%	8%	6%	8%	5%	6%	4%	6%
2007	883	28%	19%	14%	8%	7%	5%	6%	4%	5%	3%
2008	584	29%	15%	13%	9%	8%	5%	4%	5%	7%	7%
2009	607	31%	14%	8%	9%	7%	9%	6%	5%	5%	8%
2010	612	33%	17%	9%	6%	7%	5%	5%	6%	6%	6%
2011	624	33%	19%	11%	8%	6%	4%	6%	4%	3%	6%
2012	555	32%	22%	12%	8%	5%	4%	5%	6%	4%	3%
2013	703	29%	25%	13%	8%	7%	5%	5%	3%	4%	2%
2014	748	28%	28%	13%	8%	6%	5%	3%	3%	3%	3%

Table 6

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 1971-1975 and 2010-2014. Mean Market-to-Book ratios and mean firm age is reported for the period 2010-14.

			Lowest CF									Highest CF
Year		N	1	2	3	4	5	6	7	8	9	10
1971-1975	Eq Iss Distribution	1,645	10%	9%	11%	11%	10%	10%	11%	10%	10%	8%
	Cumulative		10%	19%	30%	41%	51%	61%	72%	82%	92%	100%
2010-2014	Eq Iss Distribution	3,242	31%	22%	12%	8%	6%	5%	5%	4%	4%	4%
	Cumulative		31%	53%	65%	72%	78%	83%	88%	92%	96%	100%
	Mean M/B		4.77	3.65	2.57	2.17	2.08	2.36	2.69	2.89	3.63	4.67
	Mean Age		9.6	12.1	16.3	19.9	21.9	23.0	24.6	25.4	22.5	17.5

Table 7

Equity Issuance Frequency

This table reports the average number of issuances per firm per year, compiled from quarterly data. Panel A reports the average number of firm-initiated equity issuers per firm per year. Panel B reports the average number of employee-initiated equity issuers per firm per year. The full sample is 174,231 firm year observations over the period 1970-2014. Quarterly issuance data is available over the period 1985-2014.

Panel A: Average number of quarters with firm-initiated issuances per year

		1985-1989	1990-1999	2000-2009	2010-2014
	1	0.38	0.69	0.70	0.92
	2	0.26	0.44	0.36	0.57
	3	0.22	0.28	0.21	0.26
	4	0.22	0.26	0.15	0.17
Cash Flow	5	0.21	0.22	0.13	0.12
Decile	6	0.20	0.20	0.12	0.10
	7	0.16	0.19	0.11	0.10
	8	0.16	0.17	0.10	0.07
	9	0.18	0.16	0.10	0.07
	10	0.18	0.18	0.10	0.07

Panel B: Average qtrs with emp-initiated issuances per year

		1985-1989	1990-1999	2000-2009	2010-2014
	1	1.03	1.56	1.79	1.51
	2	0.96	1.37	1.95	1.60
	3	1.10	1.43	1.94	1.64
	4	1.20	1.59	2.16	1.91
Cash Flow	5	1.30	1.75	2.38	2.20
Decile	6	1.46	1.88	2.45	2.48
	7	1.47	1.98	2.65	2.53
	8	1.64	2.19	2.79	2.62
	9	1.63	2.29	2.89	2.72
	10	1.53	2.21	2.74	2.36

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 [-EBITDA+interest+taxes+capital expenditures]. The full sample is 174,231 firm year observations over the period 1970-2014.

Year	% burned	N
1971	5.3%	182
1972	6.5%	253
1973	7.0%	162
1974	6.5%	136
1975	5.9%	117
1976	4.6%	127
1977	4.8%	141
1978	6.6%	173
1979	7.4%	234
1980	8.9%	360
1981	9.8%	533
1982	8.9%	395
1983	9.0%	720
1984	9.4%	499
1985	7.6%	537
1986	10.2%	643
1987	10.0%	581
1988	10.7%	289
1989	11.8%	321
1990	12.7%	321
1991	12.2%	382
1992	13.1%	522
1993	14.9%	707
1994	19.4%	677
1995	17.9%	740
1996	21.4%	1091
1997	22.1%	901
1998	21.9%	822
1999	25.1%	988
2000	28.3%	1404
2001	29.4%	677
2002	27.0%	507
2003	25.9%	498
2004	27.0%	675
2005	30.6%	585
2006	32.7%	636
2007	29.5%	677
2008	32.6%	417
2009	28.5%	405
2010	31.7%	410
2011	31.5%	451
2012	36.8%	434
2013	31.1%	557
2014	32.6%	613

Table 9

Cash Flow Sensitivity of Cash

This table reports results from OLS regressions estimated over the subperiods 1970-79 and 2000-2014. 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 seperately 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		2000-2014			
	1	2	3	4	5	6
	All	All	All	All	Size Dec<=3 CF<0	Size Dec<=3 CF>0
Cash Flow	0.027 *	0.032	0.046 ***	0.082 ***	0.042 ***	0.166 ***
	(0.066)	*(0.100)*	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*
I(CF<0)		0.003		0.006 ***		
		(0.115)		*(0.001)*		
CF x I(CF<0)		0.000		-0.038 ***		
		(0.996)		*(0.002)*		
M/B	-0.001	-0.001	0.001 ***	0.001 ***	0.001	0.000
	(0.264)	*(0.271)*	*(<0.001)*	*(0.002)*	*(0.208)*	*(0.707)*
ln(Assets)	0.000	0.001	-0.002 ***	-0.002 ***	0.007 ***	(0.003) **
	(0.449)	*(0.421)*	*(<0.001)*	*(<0.001)*	*(0.003)*	*(<0.001)*
Constant	-0.006	-0.007 *	0.007 ***	0.001	-0.021 ***	0.001
	(0.104)	*(0.063)*	*(0.003)*	*(0.645)*	*(0.003)*	*(0.923)*
N	29,284	29,284	57,118	57,118	8,887	7,175
R2	0.001	0.001	0.009	0.009	0.010	0.020

Table 10

Cash Flow Relation to Various Firm Characteristics

This table reports results from OLS regressions of various firm characteristics, estimated over the period 2010-2014. The first column in each section reports the firm characteristic regressed on cash flow and a constant. The second column allows 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.

	Cash		Ind CF Vol		R&D		M/B		Leverage	
Cash Flow	-0.505 ***	0.169 ***	-0.177 ***	0.059 ***	-0.348 ***	-0.031 *	-1.421 ***	12.956 ***	0.039 **	0.183 ***
	(<0.001)	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(0.063)*	*(0.002)*	*(<0.001)*	*(0.011)*	*(0.003)*
I(CF<0)		0.16 ***		0.046 ***		0.021 ***		1.652 ***		-0.087 ***
		(<0.001)		*(<0.001)*		*(<0.001)*		*(<0.001)*		*(<0.001)*
CF x I(CF<0)		-0.578 ***		-0.219 ***		-0.365 ***		-15.436 ***		-0.331 ***
		(<0.001)		*(<0.001)*		*(<0.001)*		*(<0.001)*		*(<0.001)*
Constant	0.231 ***	0.137 ***	0.125 ***	0.094 ***	0.069 ***	0.031 ***	3.196 ***	1.432 ***	0.24 ***	0.235 ***
	(<0.001)	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*	*(<0.001)*
N	14,781	14,781	14,781	14,781	14,781	14,781	13,139	13,139	14,714	14,714
R2	0.256	0.290	0.242	0.269	0.462	0.484	0.006	0.038	0.002	0.020

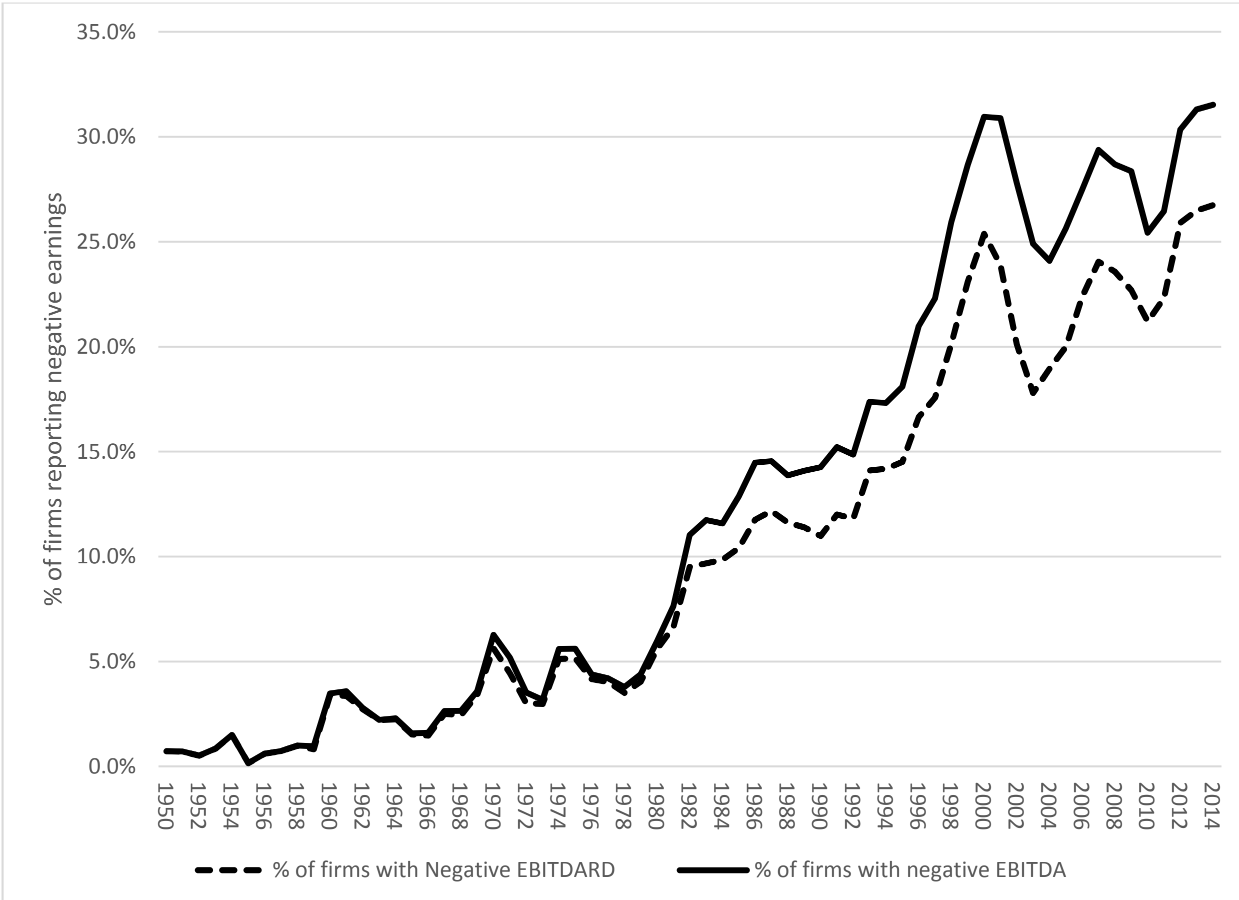


Figure 1. Prevalence of Public Firms with Negative Operating Income

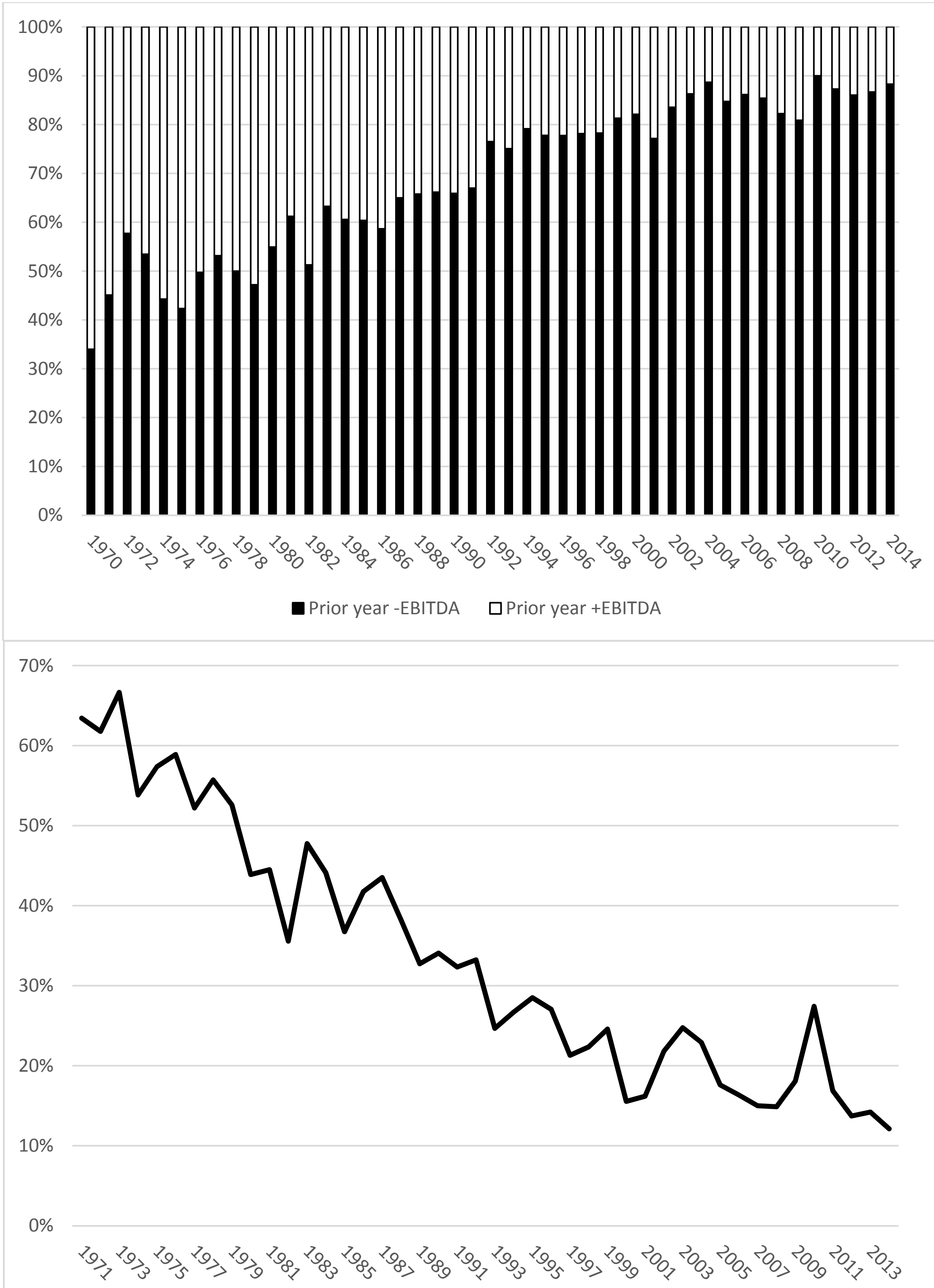


Figure 2. Panel A: Antecedents of Negative EBITDA. Panel B: Proportion of Negative EBITDA firms that report positive EBITDA in the following year.

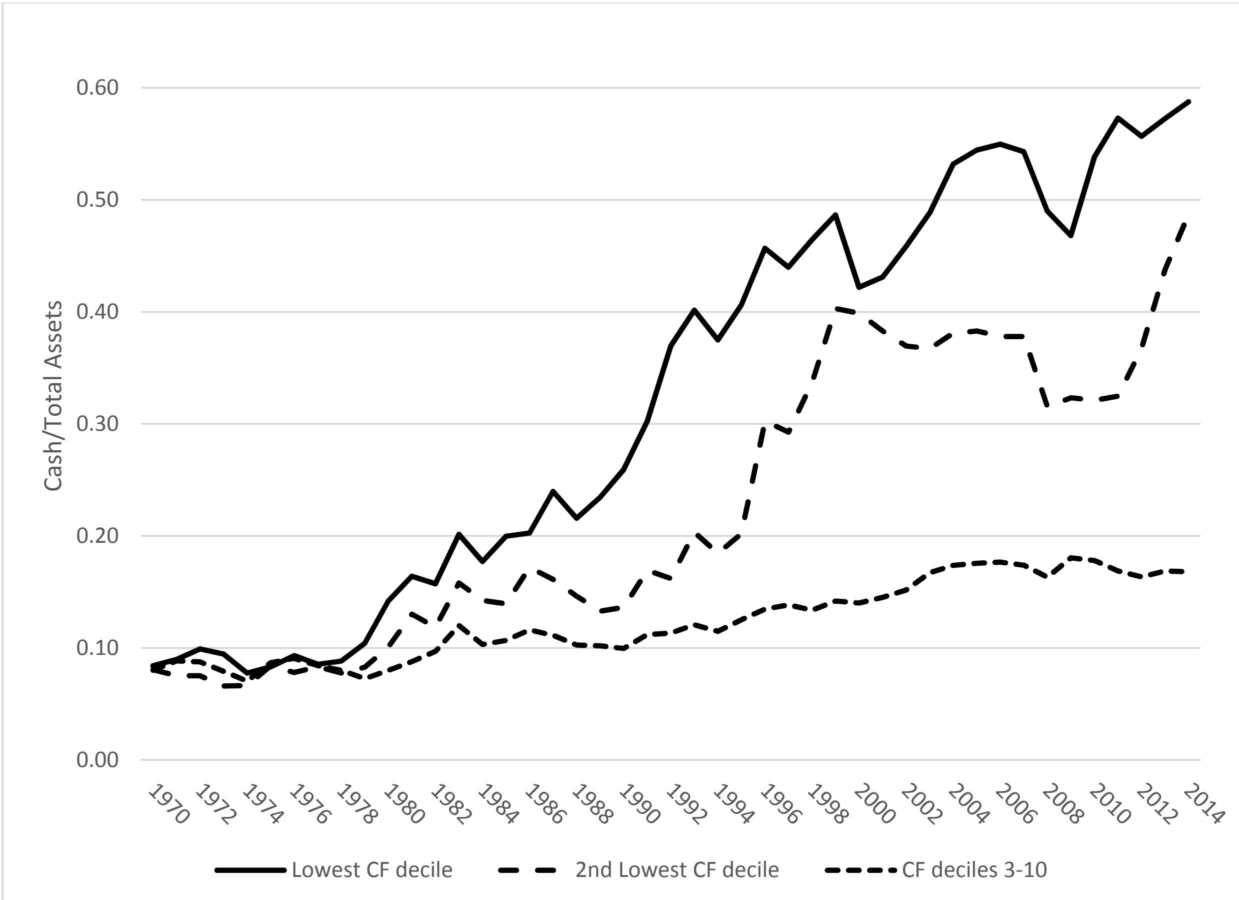


Figure 3. Evolution of Cash Holdings by Cash Flow decile

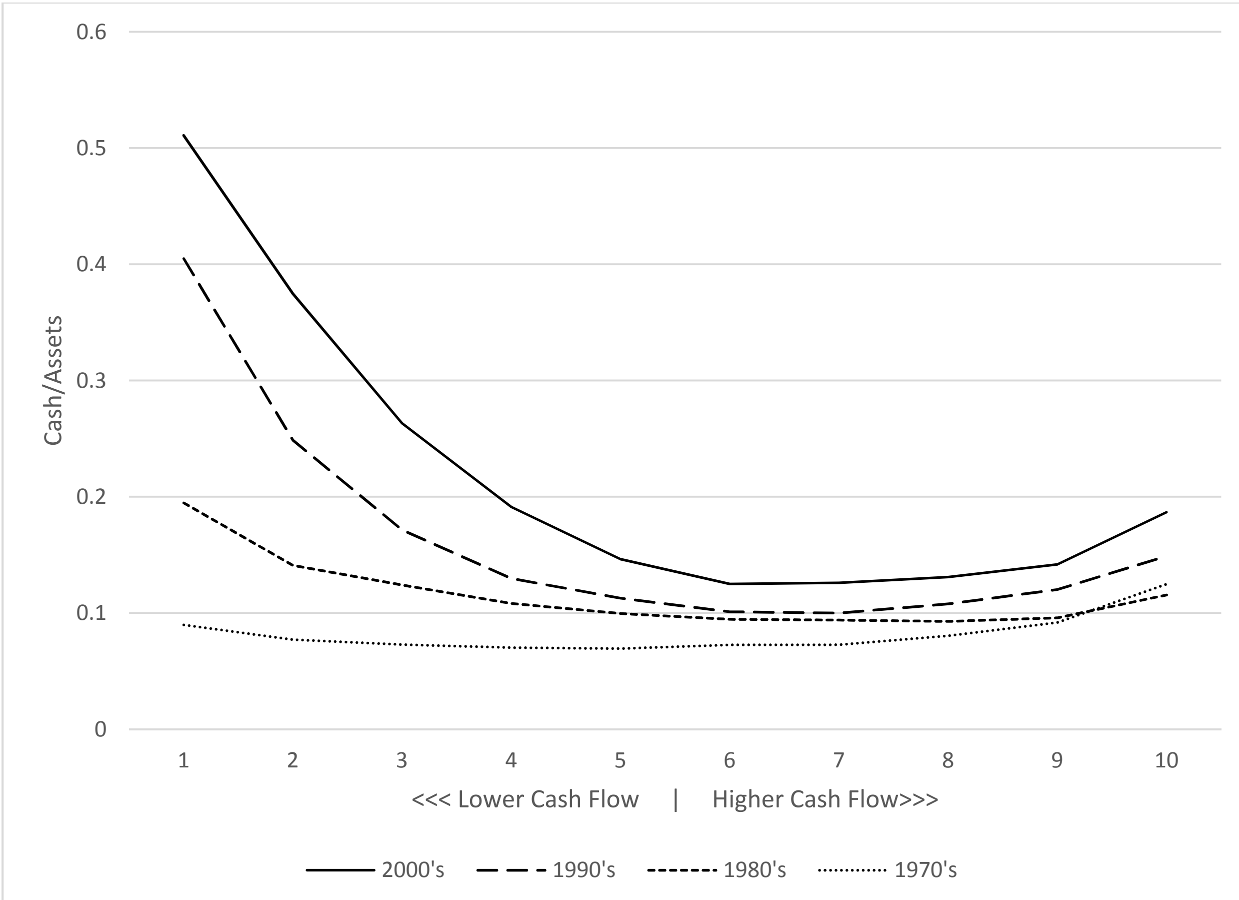
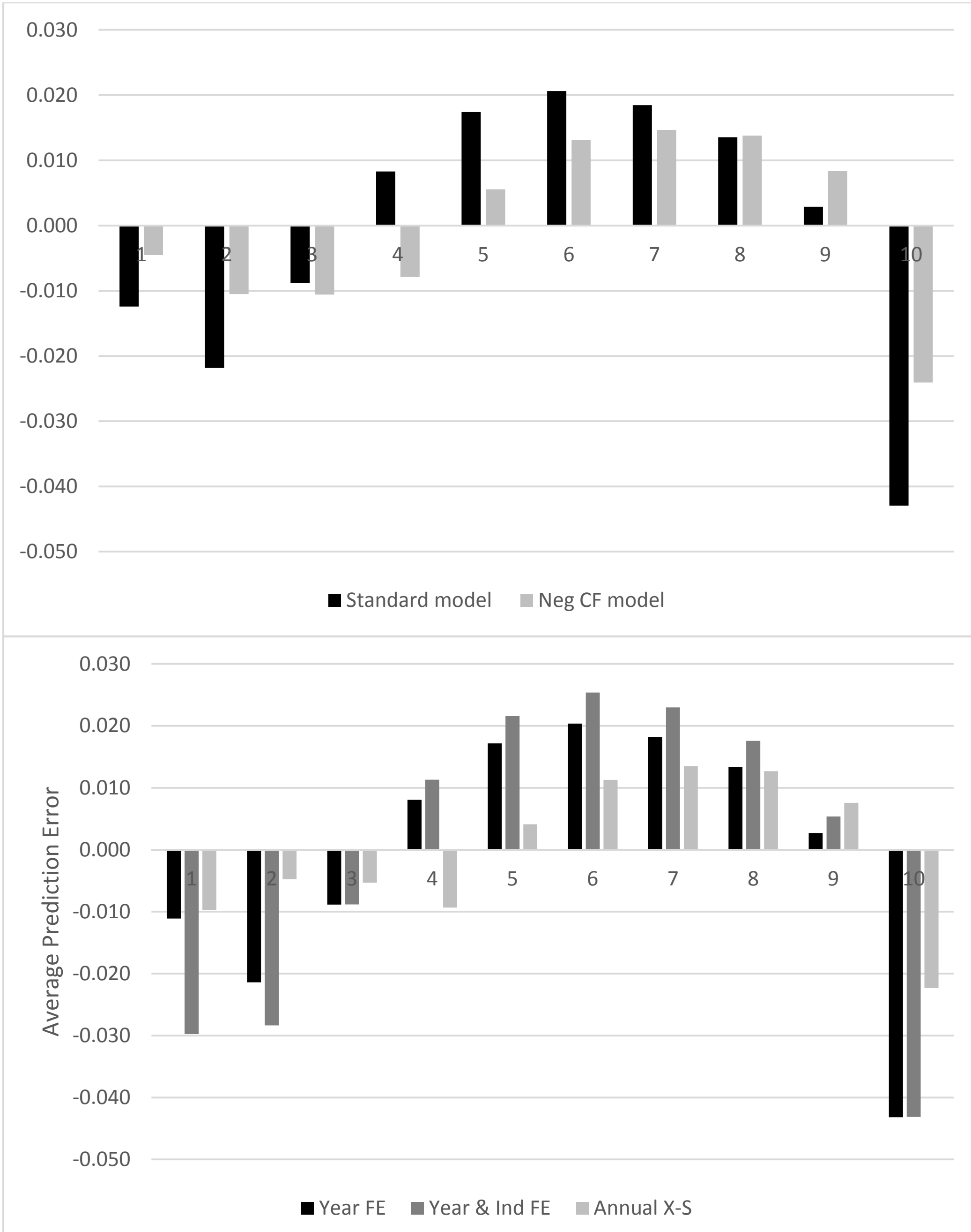


Figure 4. Convexity in the relation between cash holdings and cash flow deciles.



Figures 5A and 5B. 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.

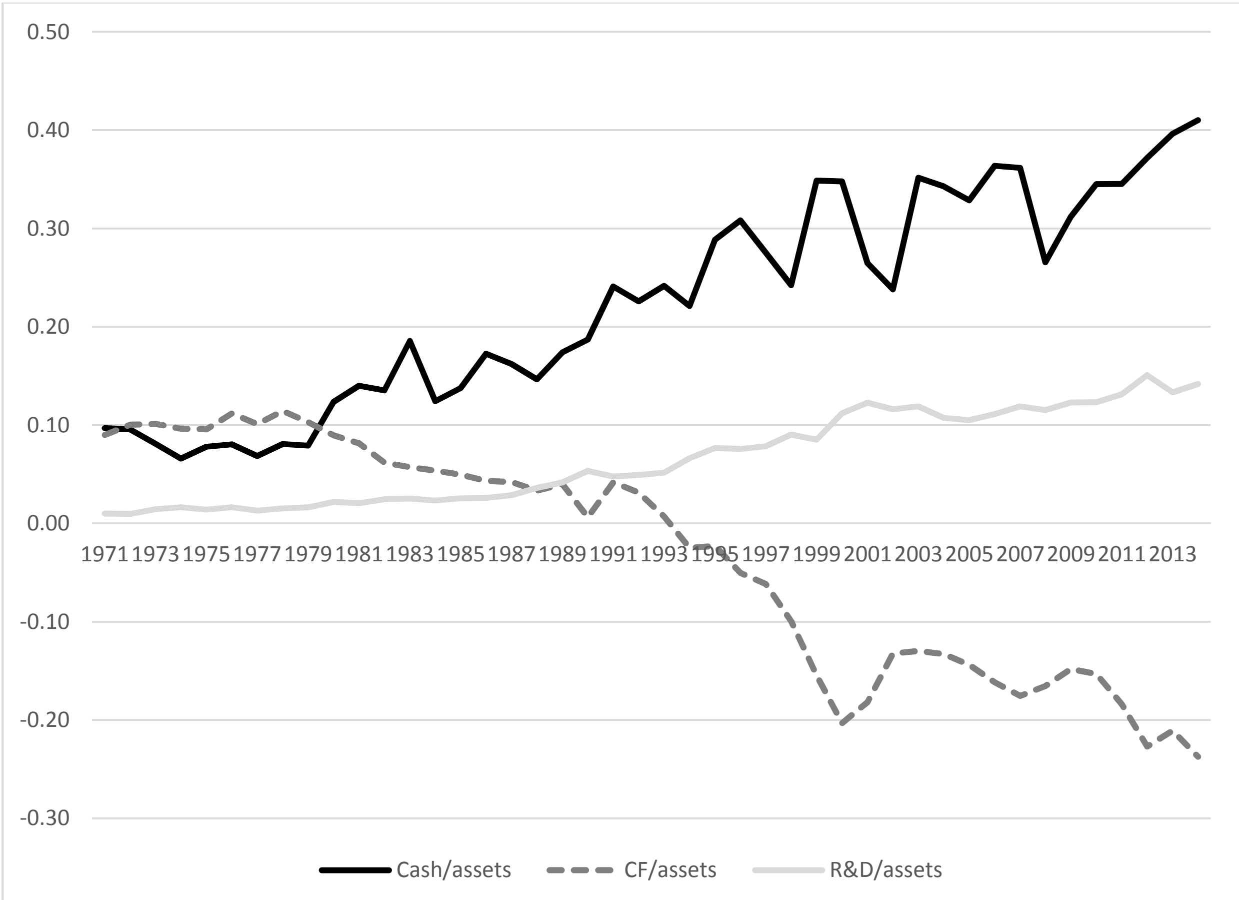


Figure 6. Equity issuer characteristics

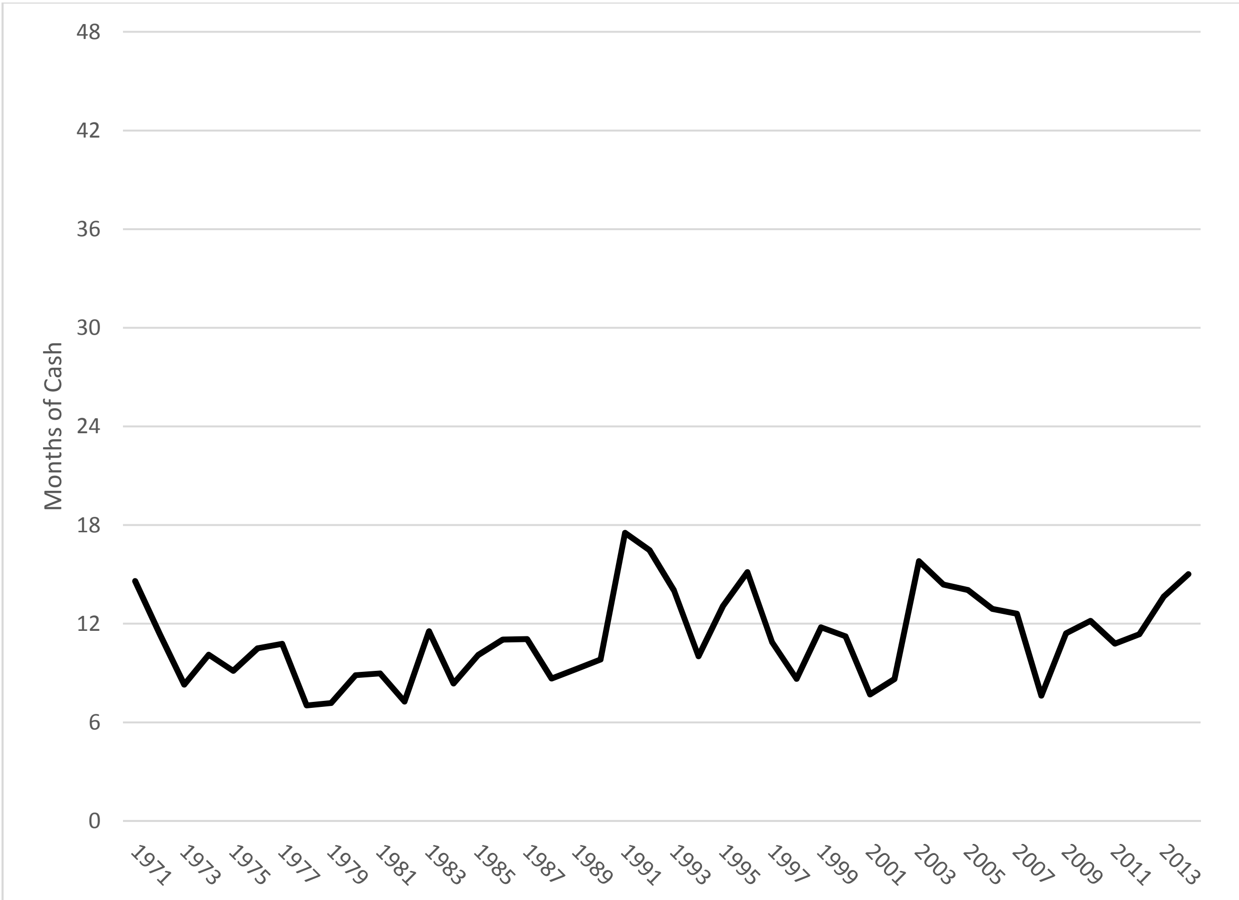


Figure 7. Median runway for equity issuers with negative cash flow

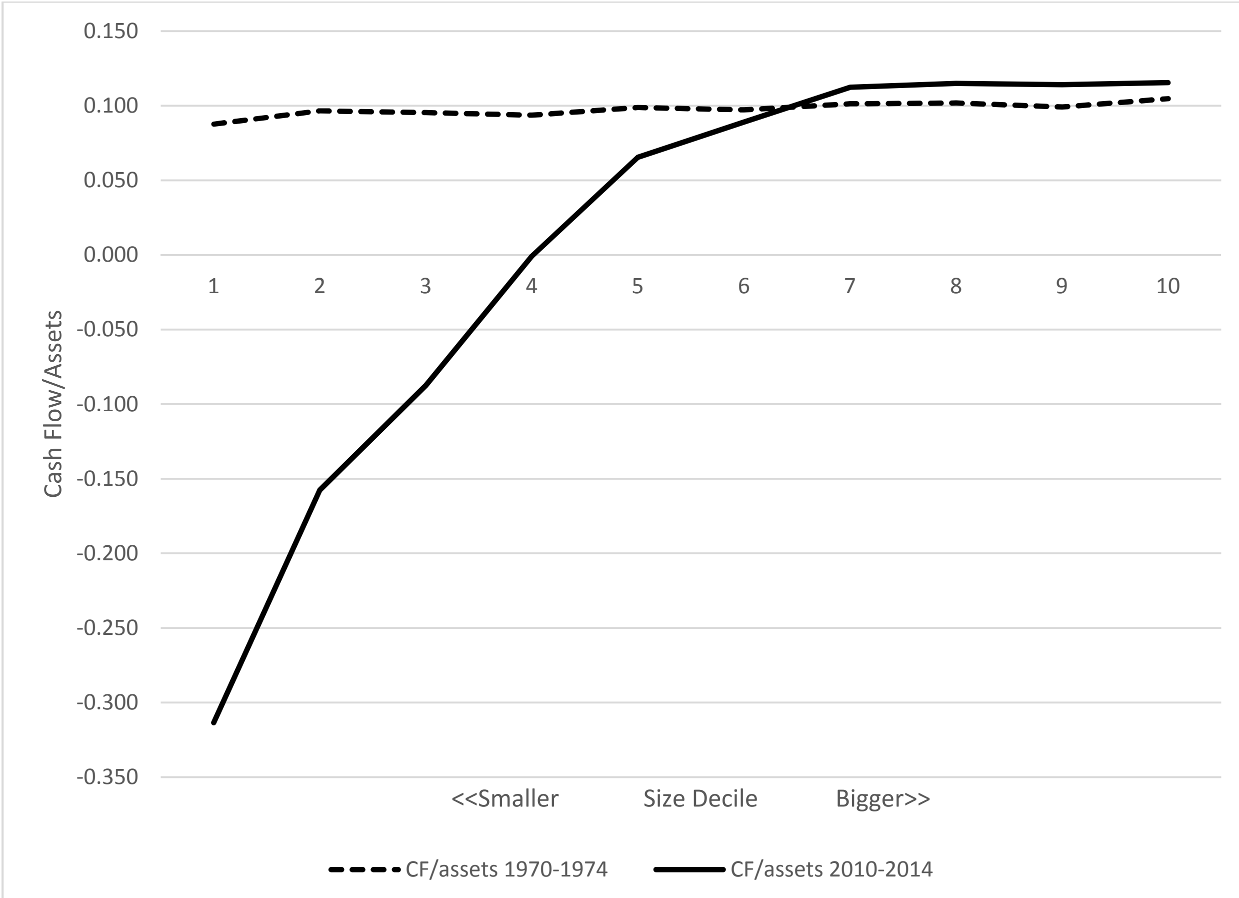


Figure 8. Evolution in average cash flow/assets by firm size decile