

The Interdependent and Intertemporal Nature of Financial Decisions: an Application to Cash Flow Sensitivities

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ABSTRACT

Empirical studies of firms' financing, investment, and payout policies routinely examine these policies in isolation. In this paper we develop a dynamic multi-equation model where firms make their financing and investment decisions jointly subject to the constraint that sources of cash must equal uses of cash. We argue that models that do not acknowledge the interdependent nature of financial decisions are likely to produce inconsistent and inefficient estimates and provide an incomplete and potentially misleading view of firms' financial behavior. We apply our model to examine the relation between investment and cash flow. Unlike static single-equation studies that conclude that firms react to cash flow shocks by changing investments, we find that regardless of financial health, firms react by changing leverage.

1. Introduction

Empirical studies in corporate finance routinely examine firms' financial policy decisions in isolation. In particular, they use a single-equation framework wherein the relevant policy variable is regressed on a set of explanatory variables. For example, tests of payout policy often regress payout measures on a variety of financial variables without explicitly accounting for the interdependence of payout policy and other corporate policies. Similar approaches are used to study capital structure decisions, management compensation, and various investment decisions.

In practice, however, investment and financing decisions are tied together by accounting identities and so financial decisions are interdependent by definition. In adjusting any one policy variable firms are constrained by the fact that sources of cash must equal uses of cash, implying that other policy variables must also adjust. Because of the interdependent nature of financial variables, the intertemporal behavior of any one financial variable has implications for all other variables. For example, if firms smooth dividends then this dividend smoothing decision has potential implications for financing and investment decisions. A single-equation framework, by focusing on individual financial variables, implicitly assumes that there are no intertemporal relations in financial variables. This assumption is difficult to justify, especially given that in many cases hypotheses are derived based on the existence of frictions that typically lead to intertemporal relations among the variables. Overall, a single-equation framework has several shortcomings. First, by ignoring the interdependence of financial decisions, a single-equation framework may produce inconsistent coefficient estimates. Second, by not incorporating the fact that sources of cash equal uses of cash, a single-equation framework produces inefficient estimates. And third, a single-equation framework provides an incomplete view of firms' financial behavior with potentially difficult economic interpretation.

In this paper we develop a model that reflects the interdependent nature of financial policies while accounting for the intertemporal behavior of financial variables. The model allows firms to determine their investment and financing decisions jointly subject to the constraint that sources of cash equal uses of cash. As an illustration of this empirical framework and the biases that may result from examining financial policies in isolation, we study the relation between firms' investment spending and cash flow. We examine the investment/cash flow relation because the literature is mature in the sense that there have been numerous studies using various samples, all of which use a static single-equation approach. Our analysis is further motivated by James Tobin's suggestion in his discussion of the Fazzari, Hubbard, Petersen (1988) article, that "... the firm jointly determines investment, dividend payments, and other ways of allocating its cash flow. Therefore, ...the authors (should) model investment and dividends as depending on the same set of explanatory variables."¹ Put differently, a firm's investment, financing, and distribution decisions are necessarily interrelated by the identity that sources of cash equal uses of cash. A firm that experiences a one dollar increase in operating cash flow could increase capital expenditures, say, by one dollar. However, it could also use the incremental cash flow to pay down debt, increase shareholder distributions, or make any combination of investment and financing decisions that result in a net response of one dollar. Furthermore, because of the "sources equal uses" identity, frictions in any of the firm's decision variables would affect other decision variables in the system.²

Specifically, our model contains nine equations describing the investment (capital expenditure, acquisitions, and asset sales), financing (short-term debt issues, long-term debt

¹ Tobin makes this comment in the "General Discussion" section following the presentation of Fazzari, Hubbard, Petersen (1988), page 201.

² Spindt and Tarhan (1980) develop a system-of-equations model where each equation has the same set of exogenous and lagged-dependent variables. They use this model to examine the liquidity adjustment decisions of money-center banks.

issues, and changes in cash balances), and distribution (equity issues, dividends, and share repurchases) decisions that firms make. We estimate the model using a Compustat sample that covers 1950-2003.

Differences between the results generated by earlier studies and our model are striking. Static single-equation analyses consistently find a positive relationship between cash flow and investment, counter to what would be expected under Modigliani-Miller where investment decisions are based on the investment's value, and are financed with debt or equity if cash flows are lacking. Using the static single-equation empirical specification commonly used in prior studies, we confirm that capital expenditures decrease (increase) by a statistically significant \$0.36 for every one dollar decrease (increase) in cash flow. Estimates obtained using the system-of-equations model are significantly smaller and, in some specifications, indistinguishable from zero. We find that persistence in investments (possibly a result of adjustment costs in investments) is in large part responsible for the higher investment/cash flow sensitivities in single-equation models. We also find that the cash flow sensitivity of financing are affected significantly when we account for the interdependent nature of policy variables.

Results from the investigation of the investment/cash flow relationship presented in this paper suggest that conclusions from all of the static-single-equation models of financial decisions may be biased relative to the conclusions obtained using a more realistic dynamic-multiple-equation approach. Examining corporate policies simultaneously using a sources/uses constraint has a significant effect on estimates of financing/cash flow sensitivities. Including lagged dependent variables, on the other hand, has a significant effect on investment/cash flow and payout/cash flow sensitivities, where policy decisions are more likely to display persistence.

Previous studies investigate firms' ability to raise external funds indirectly -- by estimating the sensitivity of investments to cash flow changes. However, this indirect approach may lead to misleading conclusions regarding firms' ability to access capital markets. Our model enables us to examine the issue both indirectly (investment/cash flow sensitivities) and directly (financing/cash flow sensitivities). Not only does our model produce a substantially smaller estimate of the investment/cash flow sensitivity than the static single-equation methodology, but it also shows that financing/cash flow sensitivities dominate investment/cash flow sensitivities, revealing that firms absorb cash flow fluctuations primarily by altering net debt, not by changing real assets. For example, using changes in variables we find that for every \$1.00 of cash flow firms pay back \$0.92 of debt and equity while at the same time increase capital expenditures by \$0.01 (statistically insignificant).

We are able to perform even sharper tests of investment/cash flow sensitivities by examining whether firms respond to negative changes in cash flow by cutting investment and maintaining leverage (consistent with an inability to access external capital) or by maintaining investment and increasing leverage (consistent with an absence of capital constraints). Our findings are inconsistent with the presence of capital constraints.

When we examine portfolios based on the firms' financial health, we find that firms of different financial health respond to cash flow shocks primarily by changing external financing or cash holdings. These results are what one would expect in a Modigliani/Miller world.

The remainder of the paper proceeds as follows. Section 2 discusses the cash flow sensitivity literature and the main shortcomings of a single-equation approach. Section 3 introduces our model. Section 4 presents the sample and summary statistics. Section 5 compares the results from a single-equation approach to the results from our model and examines to what

extent different characteristics of the estimated model affect the cash flow sensitivity estimates. In Section 6 we present results from different specifications of our model. Section 7 concludes.

2. Cash Flow Sensitivities: Static Single-Equation Models

2.1. Prior Studies

To examine the effect of capital constraints on investment earlier studies typically estimate the following model:

$$\frac{CAPX_t}{K_t} = \beta_1 \frac{CF_t}{K_t} + \beta_2 MB_t + \varepsilon_t \quad (1)$$

where $CAPX$ is capital expenditures, K is fixed assets, CF is cash flow, and MB is the ratio of the market value of assets to the book value of assets. A common interpretation of the cash flow coefficient in equation (1) is that a relatively small coefficient implies that firms can immunize capital expenditures against adverse cash flow realizations. Conversely, a relatively large positive coefficient is interpreted as evidence that firms respond to adverse cash flow realizations by decreasing capital expenditures, a response consistent with costly access to external capital.

Prior studies that estimate equation (1) consistently find a positive relation between capital expenditures and cash flow. As shown in Table 1, coefficient estimates between 0.10 and 0.25 are common. We replicate these findings. Using our sample of firms to estimate equation (1), and after matching the sample period and selection criterion in Cleary (1999), we obtain a coefficient estimate of 0.09 (p-value of 0.01). Based on the conventional interpretation, this implies that a one dollar decrease in cash flow results in a \$0.09 decrease in capital expenditures.

The presence/absence of capital markets access constraints is then examined by testing whether the estimate for the cash flow sensitivity coefficient is larger for the sub-sample of firms

that are *ex-ante* likely to be financially distressed compared to the estimates obtained from subsamples of financially healthier firms. Using this approach, in their 1988 Brookings paper, Fazzari, Hubbard, and Petersen (hereafter FHP) document a positive relation between internally generated cash flow and investment (capital expenditures) and also find that this relation is strongest for firms that are most likely to have difficulty accessing external capital markets. FHP interpret their findings as evidence of a difference between the internal and external costs of capital and conclude that capital market frictions may make some firms forego investments.

Because this finding has serious implications regarding the efficiency with which capital is allocated in the economy, it provoked a number of additional studies examining the relationship between cash flow and investment. Many of these studies support the original FHP findings that financial constraints positively affect the cash flow sensitivity of investments (e.g., FHP (1996, 2000), Boyle and Guthrie (2003), Calomiris and Hubbard (1989, 1990), and Hoshi, Kashyap, and Scharfstein (1991)).^{3, 4} Others find the opposite result. For example, Kaplan and Zingales (1997, 2000) conclude that a monotonic relation between the degree of external market constraints and investment/cash-flow sensitivity does not exist.⁵ They find that firms with the easiest access to capital markets display the largest sensitivity of investment to cash flow. Firms that are financially constrained have the next largest sensitivity and firms that are partially constrained are least sensitive. Their findings imply that investment/cash flow sensitivities are

³In addition to cash flow/investment sensitivity, there is evidence that constraints in accessing external capital affect other corporate decisions. For example, Korajczyk and Levy (2002) examine the connection between firms' financial health and the timing of their financing decisions. They find that, unlike constrained firms, unconstrained firms are able to issue securities at economically favorable times.

⁴Minton and Schrand (1999) find that higher cash flow volatility increases the cost of external capital and hence results in higher investment cash flow sensitivity. In particular they find that higher volatility is correlated with lower capital expenditures, R&D, and advertising expenses.

⁵Others such as Moyen (2004) and Alti (2003) find support for both camps. For example, Moyen (2004) uses generated data and finds that the results obtained from her unconstrained model support Kaplan and Zingales. However, she also finds that cash flow sensitivity is higher for low dividend paying firms than it is for high dividend paying firms, supporting the results of FHP.

uncorrelated with ease of access to capital markets. Using a larger sample of firms, Cleary (1999) confirms Kaplan and Zingales' conclusion. In fact, Cleary finds that investment-cash flow sensitivities are actually inversely related to constraints -- the most constrained firms have the lowest sensitivities and the least constrained firms have the highest sensitivities.

Regardless of disagreements on the relative size of investment/cash flow sensitivities across sub-samples, the consensus of prior studies is that investment/cash flow sensitivity is positive and statistically significant in virtually all the sub-samples considered. Interpreting this finding, one would therefore conclude that all firms face difficulties in accessing capital markets -- a conclusion inconsistent with the Modigliani/Miller world where investment and financing decisions are separable and where firms experiencing cash flow shortfalls finance positive NPV investments by raising external funds.

2.2. Potential Problems with Single-Equation Estimates

There are several potential problems with single-equation estimates. First, if any of the firm's financial decisions are subject to frictions (e.g., adjustment costs, nontrivial fixed costs with resulting economies of scale) then estimating (1) may lead to an omitted variable bias in the investment/cash flow sensitivity coefficient. For example, if frequent stopping and restarting of investment projects is costly (i.e., there are investment frictions) then contemporaneous and lagged investments are likely to be positively correlated. Ignoring that persistence may lead to a bias in the estimated investment/cash flow sensitivity. Persistence in capital expenditure may result from firms replacing a portion of their assets every year or from the possibility that many new projects take more than a year to complete.⁶ It may appear that simply controlling for persistence in capital expenditure would be sufficient to obtain consistent estimates of the

⁶ The serial correlation of capital expenditures for the sample period is 0.69.

investment/cash flow sensitivity. The problem is more general, however. For example, financing frictions in the face of fixed costs in long-term debt issues (and the resulting economies of scale) may make firms issue debt in excess of their immediate needs and lead to reversals and thus negative correlation in long-term debt issues over time. Because the aggregate effect of past long-term debt issues on present financial decisions is zero (sources of cash equal uses of cash contemporaneously) past debt issues would also necessarily affect other financial variables (e.g., cash, payout, investments, etc.). The specification of the static investment/cash flow equation, therefore, implicitly assumes not only that there are no frictions in the investment variable but also that there are no frictions in any of the other financial variables. This assumption directly contradicts the premise of the investment/cash flow sensitivity hypothesis that there are frictions in obtaining external financing. An internally consistent model, and a model attempting to obtain consistent coefficient estimates, needs to account for the interdependencies of all financial variables as well as for the interdependent nature of their adjustments to optimal levels.

Second, the precision of the cash flow sensitivity estimates is important in the literature because conclusions regarding the presence or absence of external financing constraints are reached on the basis of the relative size of the estimated coefficients across sub-samples. If the model is correctly specified, then asymptotically one should be able to obtain consistent coefficient estimates even without explicitly imposing the “sources equal uses” of cash constraint. However, imposing the necessary constraint produces a more efficient estimator whose value could differ substantially in any given sample from the value of the estimator that does not impose that constraint.⁷

Finally, single-equation models produce coefficient estimates that are difficult to interpret from an economic perspective. For example, observing that capital expenditures and cash flows

⁷ We thank Rob Stambaugh (the editor) for pointing this out to us.

are uncorrelated is consistent with the absence of financing constraints. However, it is also consistent with the existence of financing constraints if firms insulate capital expenditures by increasing asset sales to compensate for cash flow shortfalls. The problem arises due to the implicit “all else equal” assumption of single-equation models -- i.e., firms do not systematically adjust to cash flow revelations by altering other sources and uses of cash. For example, one direct effect of a negative cash flow shock may be a reduction in capital expenditures. However, another indirect effect may be an increase in debt financing and a commensurate increase in capital expenditures. To determine the total effect of a negative cash flow shock on capital expenditures, both the direct and indirect effects must be considered. We provide two examples to highlight how inferences regarding capital market frictions made on the basis of single-equation investment/cash flow sensitivity estimates are incomplete and potentially misleading.

In the first example we consider two firms, one of which is financially unconstrained and the other is financially constrained. Each firm faces a one dollar decrease in cash flow. The unconstrained firm reacts by cutting capital expenditures by \$0.20 and by issuing debt worth \$0.80. The constrained firm is unable to access external capital and instead responds by cutting capital expenditures by \$0.20 and by selling \$0.80 worth of assets.⁸ In this example, a single-equation model would show identical investment/cash flow sensitivities even though one firm is unconstrained and the other is constrained. The presence of financial constraints is evident not in the investment/cash flow sensitivity, but in the debt/cash flow and asset sale/cash flow sensitivities neither of which are specified in the standard single-equation model.

In the second example we consider a firm that responds to a one dollar decrease in cash flow by a qualitative shift in its strategy from one of organic growth to one of debt-financed

⁸ The asset sales do not affect the scaling factor used in some of the studies because they use beginning of period assets or capital stock.

acquisitions. Because organic growth is reduced, capital expenditures will decrease leading to a positive investment/cash flow sensitivity coefficient and the inference that the firm must be constrained from accessing capital markets. However, in this example, the firm is not actually financially constrained as it was able to access debt markets to obtain financing for acquisitions. Furthermore, it would also be incorrect to conclude that the firm cuts back on its investments since the decline in capital expenditures is offset by an increase in acquisitions. Examining capital expenditure/cash flow relationship in isolation may lead to incorrect conclusions both about firms' investment decisions and their financing opportunities.

These two examples demonstrate that to make correct inferences about firms' ability to raise external funds it is necessary to examine models that incorporate all the investment and financing variables subject to the constraint that sources of funds equal uses of funds..

3. Model

The manager's task is to select optimal values for investment and financing decision variables, given the expected values for exogenous and predetermined variables. Table 2 describes the variables that enter the optimization problem. In solving this problem, the manager faces the *ex-post* constraint that sources of funds must equal uses of funds:

$$\Delta\tilde{CASH}_t + \tilde{RP}_t + \tilde{DIV}_t + \tilde{CAPX}_t + \tilde{ACQUIS}_t - \Delta\tilde{LTD}_t - \Delta\tilde{STD}_t - \tilde{EQUISS}_t - \tilde{ASALES}_t \equiv \tilde{CF}_t. \quad (2)$$

In equation (2), decision variables have been collected on the left-hand side of the identity for convenience.

Our measure of cash flow (CF_t) is defined in equation (3):

$$CF_t = EBITDA_t - INTEXP_t - TAX_t - \Delta NWC_t, \quad (3)$$

where $EBITDA_t$ is earnings before interest, taxes, and depreciation. Because $EBITDA_t$ is jointly determined by the firm's past investments and by consumers' current behavior, it is assumed to be exogenous to the firm in the current period. $INTEXP_t$ is interest expense and TAX_t is cash taxes. Both of these variables are assumed to be determined by financing and investment decisions in prior years and are therefore taken as exogenous in the current period. Similarly, ΔNWC_t which equals change in net working capital from $t-1$ to t , is assumed to depend on past investment decisions and current sales projections. Thus, CF_t is assumed to be exogenous and represents internally generated funds that are available for undertaking investments or for making payments to shareholders and principal payments to debt-holders.

Because, as a simple matter of accounting, the sources/uses identity specified by equation (2) is always satisfied for *ex-post* quantities, it conveys little economic content. What is important from an economic standpoint is that the constraint affects the decisions of managers and also holds for *ex-ante* values, conditional on forecasts of end-of-period exogenous variables. This *ex-ante* budget constraint is expressed as:

$$\Delta CASH_t + RP_t + DIV_t + CAPX_t + ACQUIS_t - \Delta LTD_t - \Delta STD_t - EQUISS_t - ASALES_t = \widehat{CF}_t, (4)$$

where \widehat{CF}_t represents the exogenous variable that must be forecasted. Equation (4) states that at the beginning of period t , when firms make their investment and financing decisions, the planned values of decision variables are selected such that the expected end-of-period sources/uses constraint is satisfied. This implies that a firm cannot plan to allocate funds in excess or deficit of the amount it expects to generate, either through operations or financing, during the current period.

For choice variables, *ex-ante* quantities are planned values, determined based on beginning-of-period known quantities. While the firm has precise control over *ex-ante* planned levels, *ex-post* quantities depart stochastically from their *ex-ante* counterparts as follows:

$$\begin{bmatrix} -\tilde{C}APX_t \\ -\tilde{A}C\tilde{Q}UIS_t \\ \vdots \\ \Delta\tilde{L}\tilde{T}D_t \\ -\Delta\tilde{C}ASH_t \end{bmatrix} = \begin{bmatrix} -CAPX_t \\ -ACQUIS_t \\ \vdots \\ \Delta LTD_t \\ -\Delta CASH_t \end{bmatrix} + \begin{bmatrix} e_{CAPX,t} \\ e_{ACQUIS,t} \\ \vdots \\ e_{\Delta LTD,t} \\ e_{\Delta CASH,t} \end{bmatrix} . \quad (5)$$

In equation (5) $e_{CAPX,t} \dots e_{\Delta CASH,t}$ are error terms associated with the nine financing and investment decision variables, and represent deviations of actual quantities from planned quantities. Similarly, the *ex-post* exogenous source variable $\tilde{C}F_t$ equals the forecast of this variable made at the beginning of the period ($\widehat{C}F_t$) plus a forecast error ($e_{CF,t}$):

$$\tilde{C}F_t = \widehat{C}F_t + e_{CF,t} . \quad (6)$$

Taken together, equations (2), (4), (5), and (6) imply that the error terms are related in the following manner:

$$e_{\Delta Cash,t} + e_{RP,t} + e_{DIV,t} + e_{CAPX,t} + e_{ACQUIS,t} - e_{\Delta LTD,t} - e_{\Delta STD,t} - e_{EQUISS,t} - e_{ASALES,t} \equiv e_{CF,t} \quad (7)$$

We assume that when making investment and financing decisions, firms attempt to achieve desired levels of the variables subject to available investment opportunities. The proxy variable used for investment opportunities is the ratio of market value of equity to book value of equity (MB_t). In addition, firm size is included as an explanatory variable to control for the possibility that investment opportunities and access to external capital depend on firm size. Firm

size ($SIZE_t$) is measured as the natural logarithm of the book value of assets. Desired variables are described by:

$$\begin{bmatrix} -CAPX_t^* \\ -ACQUIS_t^* \\ \vdots \\ \Delta LTD_t^* \\ -\Delta CASH_t^* \end{bmatrix} = \mathbf{L} \left[\widehat{CF}_t \right] + \mathbf{M} \begin{bmatrix} MB_t \\ SIZE_t \end{bmatrix} \quad (8)$$

Our model assumes that firms attempt to minimize a penalty function that depends on deviations of planned variables from their desired levels and on the speed of adjustment from past levels. If the penalty function is additive and quadratic in these two penalties, then minimizing the penalty function with respect to the planned levels of the variables subject to the constraint that sources of funds must equal uses of funds produces the linear equations that we estimate in the empirical section of the paper.⁹ If the true penalty function has a more complicated form, the equations that we estimate should be interpreted as a reduced form.

By making investment and financing decisions to minimize the penalty of deviating from desired levels, subject to the constraint specified by equation (4), the following system of nine equations for planned variables is obtained:

⁹ For the nine planned endogenous variables, \mathbf{Y}_t , we assume that the penalty function is of the form

$(\mathbf{Y}_t - \mathbf{Y}_t^*)' \mathbf{D} (\mathbf{Y}_t - \mathbf{Y}_t^*) + (\mathbf{Y}_t - \mathbf{Y}_{t-1})' \mathbf{C} (\mathbf{Y}_t - \mathbf{Y}_{t-1})$, where \mathbf{Y}_t^* is a 9×1 vector with the desired levels of the variables, \mathbf{Y}_{t-1} is a 9×1 vector with the realizations of the variables in the previous period, and \mathbf{D} and \mathbf{C} are matrices that represent the penalties associated with deviations from desired levels and with the speed of adjustment. Minimizing the penalty function with respect to \mathbf{Y}_t , we obtain the model in (9). See also Spindt and Tarhan (1980).

$$\begin{bmatrix} -CAPX_t \\ -ACQUIS_t \\ \vdots \\ \Delta LTD_t \\ -\Delta CASH_t \end{bmatrix} = \mathbf{L} \left[\widehat{CF}_t \right] + \mathbf{K} \begin{bmatrix} -CAPX_{t-1} \\ -ACQUIS_{t-1} \\ \vdots \\ \Delta LTD_{t-1} \\ -\Delta CASH_{t-1} \end{bmatrix} + \mathbf{M} \begin{bmatrix} MB_t \\ SIZE_t \end{bmatrix} \quad (9)$$

Where, \mathbf{L} , \mathbf{K} , and \mathbf{M} are matrices of response coefficients of size 9×1 , 9×9 , and 9×2 respectively.

Substituting equation (9) into equation (5) gives the system of equations to be estimated:

$$\begin{bmatrix} -\tilde{CAPX}_t \\ -\tilde{ACQUIS}_t \\ \vdots \\ \Delta \tilde{TLD}_t \\ -\Delta \tilde{CASH}_t \end{bmatrix} = \mathbf{L} \left[\widehat{CF}_t \right] + \mathbf{K} \begin{bmatrix} -CAPX_{t-1} \\ -ACQUIS_{t-1} \\ \vdots \\ \Delta LTD_{t-1} \\ -\Delta CASH_{t-1} \end{bmatrix} + \mathbf{M} \begin{bmatrix} MB_t \\ SIZE_t \end{bmatrix} + \begin{bmatrix} e_{CAPX,t} \\ e_{ACQUIS,t} \\ \vdots \\ e_{\Delta LTD,t} \\ e_{\Delta CASH,t} \end{bmatrix} \quad (10)$$

As we prove in the Appendix, the sources and uses constraint requires that the parameter matrices satisfy:

$$\mathbf{i}'\mathbf{L} = -1, \quad \mathbf{i}'\mathbf{K} = \mathbf{0}_{1 \times 9}, \quad \mathbf{i}'\mathbf{M} = \mathbf{0}_{1 \times 2}. \quad (11)$$

Where \mathbf{i}' is a unit vector of appropriate order and $\mathbf{0}$ is a vector of zeros with the specified dimensions. The interpretation of equation (11) is that when there is a one dollar shock in a source or use variable, the total response of the investment and financing variables is opposite in sign to the shock and adds up to one dollar. For example, if the source variable, CF_t , increases by one dollar while all else remains the same, other source variables must decline by a dollar, use variables must increase by one dollar, or some combination of the response of source and use variables must add up to one dollar. If, instead of cash flow, the shock originates from a variable that represents neither a source nor a use of funds in the current period, the total

response across the system of equations must sum to zero. These non-source/non-use variables are the lagged dependent variables and the exogenous variables, MB_t and $SIZE_t$. For example, consider the case where the estimated coefficient for the $SIZE_t$ variable in the capital expenditures equation is 0.30, implying that capital expenditures go up by 30 cents when the natural log of book assets increases by one. Since capital expenditures is a use variable, and because sources of funds must equal uses of funds, either other use variables must decrease by 30 cents, net source variables must increase by 30 cents, or some combination of these responses must sum to 30 cents. As a result, the coefficients on $SIZE_t$ will sum to zero. Similar constraints hold for MB_t and lagged dependent variables.

For ease of interpretation of the coefficient estimates, in our empirical estimation we do not multiply the uses variables by minus one. Instead, when imposing the restrictions in (11) we equivalently multiply the elements of the unit vector \mathbf{i}' by minus one for coefficients related to the uses variables.

4. Data

The annual data we use covers Compustat firms from 1950 to 2003, excluding financial institutions and utilities. Because the model contains lagged variables and because we use changes rather levels of variables in some of the models, the nine equation system specified in equation (10) is estimated over the period 1952-2003.

Table 2 describes the variables used in the model in terms of their sources/uses characteristics, and also in terms of whether they act as endogenous or exogenous variables in

the model. Table 3 describes how the variables used in the model are constructed from Compustat definitions.¹⁰

[Insert Tables 2 and 3 around here]

Means and standard deviations for each of the variables as a percentage of mean assets (except for *SIZE* and *MB*) are presented in Table 4. In addition to the full sample, summary statistics are provided for three sub-samples of firm-years segmented based on Shumway (2001) bankruptcy probabilities which are used to proxy for financial constraints.¹¹ Firm-years with predicted bankruptcy probabilities below the 25th percentile constitute the unconstrained sub-sample, firm-years with predicted bankruptcy probabilities above the 75th percentile constitute the constrained sub-sample, and firm-years that fall between the above two percentiles constitute the partially constrained sub-sample. Splitting the sample in this way results in an uneven number of firms in each sub-sample so that the partially constrained sub-sample contains approximately twice the number of firm-years of the constrained or the unconstrained sub-samples. The benefit of this method of segmentation over a simple trifurcation of the sample is that the identification of constrained and unconstrained firm-years is more accurate.

Table 4 shows that mean cash flow (as a percent of mean assets) increases monotonically with financial health. The mean cash flow for the financially unconstrained sub-sample is around 8.6% of assets and is twice as large as the mean cash flow for the partially constrained sub-sample of 4.1% of assets. Furthermore, mean cash flow is even lower for the financially constrained sub-sample at 2.9% of assets. There is a similarly monotonic relationship between

¹⁰ To avoid dropping observations with missing Compustat variables, we replace missing data with zero. We have also estimated the model after dropping observations with missing data. Results are not significantly affected by how missing data are treated.

¹¹ In addition to segmenting the data using Shumway (2001) bankruptcy probabilities, we repeat the analysis using two additional financial health segmentation methodologies. The first is based on Kaplan and Zingales (1997) as described in the appendix of Lamont et al. (2001). The second is based on Altman's Z-Scores. As is evident from Table 8, results do not depend on the exact segmentation methodology employed.

financial health and dividends as well as between financial health and changes in cash balances. Unconstrained firms pay higher dividends and increase cash balances by more than constrained firms. Additionally, reliance on asset sales also increases monotonically, as financial health deteriorates. Reliance on short- and long-term borrowings is highest for the partially constrained firms whereas equity issues are highest for the sample of constrained firms.

Market-to-book ratio is used in the regressions as a proxy for investment opportunities. Based on this proxy, unconstrained firms have the richest investment opportunities, while the investment opportunities of partially constrained and constrained firms are comparable. Acquisitions are similar across the three sub-samples. Finally, firm size exhibits a monotonic relation with financial health so that unconstrained firms tend to be larger whereas financially constrained firms tend to be smaller.

[Insert Table 4 around here]

5. Static Single-Equation versus Dynamic System of Equations Models

The finding of earlier studies that cash flow and capital expenditure is positively correlated irrespective of firms' financial health implies that all firms face frictions in accessing capital markets. The results obtained from our model (discussed in Section 6), however, lead us to conclude that firms are not constrained from raising external capital. Since the two primary differences between our model and the models used in the literature is that our model acknowledges both the intertemporal nature of financial decisions and the interdependence between decision variables while earlier studies ignore these two issues, the diametrically opposed conclusions of this paper and earlier studies may stem from either (or both) of these two model specification issues.

In examining the effect of these two methodological issues on the empirical estimates, we first isolate whether and how incorporating the intertemporal aspect of financial decisions influence cash flow sensitivity estimates. To this end, in Section 5.1 we adopt the single-equation framework of earlier studies and estimate single equation models for each of our decision variables with and without own lagged dependent variables and compare the two sets of results. To make results comparable to the literature we use the same set of independent variables earlier studies use in estimating capital expenditures (cash flow, market-to-book ratio, and size).

We then focus on the issue of single equation versus constrained system of equations issue in Section 5.2. In doing this, we control for the intertemporal relations of choice variables by including lagged dependent variables in the two sets of specifications. Because the single equation approach by construction ignores the interdependencies across variables, in the single equation models we include only the own-lagged dependent variable in each equation, while in estimating the constrained system of equation we include the lagged dependent variables of all the variables that make-up the system. We then compare the cash flow sensitivity estimates obtained from the two models. Since the potential persistence in the decision variables are accounted for in both sets of regressions, the difference in cash flow coefficients shows whether and how the interdependent nature of investment and financing decisions (bound together by the sources/uses constraint) influence cash flow sensitivity estimates. In Section 5.2 we also examine the effect of the sources/uses constraint by comparing the results obtained from estimating our systems-of-equations model with and without the adding-up constraint. Examining the intertemporal and interdependent aspects of corporate financial decisions in isolation enables us to see to what extent each of these two modeling issues account for our conclusion that firms do not appear to face frictions in accessing capital markets.

To estimate the different models we use pooled weighted least squares (WLS) where we weight each cross-section equally by deflating each observation by the number of firms in that year. This approach is similar to the Fama-MacBeth procedure which also equally weights each cross-section. The main conclusions of the paper are similar if we use pooled OLS regressions with unit weights (no weighting) or if we use the Fama-MacBeth procedure. To account for year fixed effects, from each variable we subtract its annual mean. When we estimate the model for sub-samples then we calculate weights and annual means based on the sub-sample.

Petersen (2008) presents evidence of a significant clustering of residuals across firms in finance panel data sets. Failure to control for this firm-level clustering may lead to biased standard errors and therefore biased significance tests. The significance tests of the coefficient estimates control for firm-level clustering using Rogers' (1983, 1993) method. Furthermore, when comparing the coefficients across the different models we estimate the standard errors of differences in coefficients using the robust jackknife method of Shao and Rao (1993).¹²

[Insert Table 5 around here]

5.1. Lagged Dependent Variables and the Estimates of Cash Flow Sensitivities

Column (1) of Table 5 displays the estimates for the cash flow coefficient obtained from the single equation regression models without lagged dependent variables. Next, we re-estimate the same models this time by including their lagged dependent variables. These results are shown in column (2). In both cases the equations are estimated for the full sample and variables are

¹² To estimate the standard errors of the differences in coefficients across the different models we use the delete-cross-section jackknife method of Shao and Rao (1993). For a sample with T cross-sections, the jackknife procedure first creates T sub-samples where each sub-sample deletes one cross-section of data at a time. We then estimate the coefficients for each model and then compute the delete-cross-section differences in coefficients across models for each of the T sub-samples. In the next step we create $T - 1$ pseudo-differences that are equal to T times the actual difference less $T - 1$ times the delete-cross-section difference. The standard deviation of the actual difference is then estimated as the standard deviation of the pseudo-differences. See also Vuolteenaho (2002) and Cohen, Gompers, and Vuolteenaho (2002).

measured in levels. We compare the cash flow sensitivity estimates of the two approaches in column (5). Because both sets of estimates are obtained from single-equation models that do not take into consideration the interdependencies for firms' financial decision, and they include the same traditional explanatory variables (cash flow, market-to-book, and size), the differences reported in column (5) (column (2) minus column (1)) shows how including the own lagged dependent variables affect cash flow sensitivities.

The results reported in columns (1), (2), and (5) are revealing in several ways. First, there appears to be an omitted (own lagged dependent) variable bias in the investment and payout equations (capital expenditures, acquisitions, asset sales, equity issues, dividends, and share repurchases). While statistically the bias is present in all of these models, economically, it appears to be most pronounced in the capital expenditure equation -- the very equation that previous studies rely on to determine whether or not firms are capital market constrained. The cash flow sensitivity of capital expenditures becomes 3.5 times smaller when lagged capital expenditures are included as an explanatory variable (0.36 versus 0.10).¹³ This indicates that, faced with a cash flow shortfall of \$1.00 firms reduce their capital expenditures by \$0.10 and not by \$0.36 once the persistence in this variable is taken into consideration. This intuition is supported when we examine the coefficients of the lagged dependent variables in model (2) (not tabulated for brevity). The coefficient for lagged capital expenditure is 0.7174 with a *p*-value of 0.01 indicating a significant persistence in capital expenditure. Similarly high persistence is exhibited by dividends (0.8634, *p*-value of 0.01), asset sales (0.6883, *p*-value of 0.01), and share

¹³ While the cash flow coefficient is marginally significant (*p*-value of 0.057), as we show in Table 7, when the model is estimated in first differences to better account for firm level effects, the estimated coefficient becomes smaller even more dramatically (0.01, i.e. by a factor of 10) and ceases to be statistically significant (*p*-value of 0.30).

repurchases (0.5184, p -value of 0.01). Acquisitions also exhibit persistence albeit to a lower degree -- coefficient of 0.114 significant at the 0.01 level.

Second, the presence of omitted own lagged dependent variable bias in investment variables (capital expenditures, acquisitions, and asset sales) raises questions about the interpretation that earlier studies attach to investment/cash flow sensitivity estimates. While previous studies interpret investment cash flow sensitivities as an indicator of financial market frictions, given that investment decisions are about real assets, interpreting investment sensitivity coefficients in the context of real-side frictions may be much closer to the mark. This strongly suggests that if financing frictions are to be examined indirectly through the prism of real asset decisions, it becomes essential that model specifications include lagged dependent variables to account for the potential frictions associated with real-asset decisions.

Third, earlier studies provide an incomplete and potentially misleading picture of firms' decisions by ignoring the effects that cash flows have on the financing side. Given that earlier studies are interested in the presence/absence of capital market frictions, it is reasonable to directly examine how financing decisions respond to cash flows. In the presence of capital market access constraints, firms' financing decisions would be affected by such constraints so that financing decisions would not respond appropriately to cash flows. In the case of financing, it is again important to examine the sensitivity of the coefficient estimates to inclusions of lagged dependent variables. Results displayed in column (5) show that cash flow sensitivities of debt-issues, cash holdings, and equity issues (the traditional financing sources) are largely unaffected when their lagged dependent variables are included from the specifications. The only statistically significant difference is in the sensitivity of equity issues to cash flows. However, the magnitude of the difference is quite small (only 0.0043). Financing variables continue to be highly sensitive

to innovations in cash flows independent of presence/absence of lagged financing variables in the specifications. From an econometric point of view this result is not surprising *ex-post* given that the own effect of the financing related lagged dependent variables is relatively small. The coefficient on lagged long-term debt is -0.0245 (p -value of 0.53), the coefficient on lagged short-term debt is -0.0153 (p -value of 0.76), the coefficient on lagged change in cash is -0.1044 (p -value of 0.05), and the coefficient on lagged equity issues is 0.1518 (p -value of 0.01). From an economic *ex-ante* perspective, if firms are able to access capital markets then it is less likely that the financing variables will display persistence because managers can adjust their financing decisions faster than they can adjust their investments in real assets.

While unconditional financing cash flow sensitivity estimates do not appear to be affected when we control for persistence, as we discuss in the next section, they may suffer from a different problem -- a problem induced by ignoring the interdependent nature of firms' financial decisions.

5.2. Single-Equation versus Constrained System of Equations Estimates

In this section we conduct tests to isolate how estimating a constrained system of equations rather than a single-equation model affects estimated coefficients. To this end, we estimate the 9 equation model where each equation has the same 12 explanatory variables -- cash flow, market-to-book ratio, size, and the 9 lagged dependent variables. Including all the lagged dependent variables in each equation controls for the full array of system-dynamics effects. For example, to the extent that financing variables act as shock absorbers in the system they are likely to respond to not only contemporaneous cash flow shocks but also to lagged investment variables. Similarly, current investments may be related to past investment decisions as well as to past financing decisions.

The model is estimated subject to the constraint that the cash flow coefficients add-up to one and all the other coefficients add-up to zero across the system. The cash flow sensitivity coefficients obtained from this procedure are reported in column (4). We then compare these results with the cash flow sensitivity coefficients obtained from the single-equation models displayed in column (2). The differences are reported in column (6). In both cases we control for potential persistence of the dependent variables. Because column (2) results are obtained from single-equation models the explanatory variables include only the own lagged-dependent variable, while the systems model includes all of the 9 lagged dependent variables of the system. Since persistence is accounted for in both cases, and both models include the same 3 non lagged-dependent explanatory variables, the differences reported in column (6) measures the effect of acknowledging the interdependent nature of investment and financing decisions as well as the their intertemporal behavior.

We find that the total response of the sources/uses variables to a dollar change in cash flow adds-up to \$0.45 when single equations are estimated with own lagged dependent variables (column (2)). Imposing the constraint produces a total response of \$1.00 in the system and therefore the incremental \$0.55 would need to be absorbed somewhere in the system. Our conjecture, based on the likelihood that financing-related adjustment costs are low relative to investment and payout-related adjustment costs, is that financing variables are likely to pick-up this slack.¹⁴ Estimated cash flow coefficients reported in columns (2) and (4) support this conjecture. Single-equation estimates of both columns (1) and (2) show that when the average firm in the sample experiences a \$1 shortfall in cash flow, it increases its short-term borrowings by \$0.16, (surprisingly) reduces its long-term debt by \$0.05, and taps into its cash balances for

¹⁴ The size of the lagged dependent coefficient estimates reported in column 6 is consistent with the assertion that adjustment costs may be lower for the financing variables than they are for the investment and payout variables.

\$0.17. As expected, estimates obtained from the constrained system-of-equations (column (4)) indicate that financing response to a dollar shortfall in cash flow is larger: short and long-term borrowings increase by \$0.37 and \$0.14, respectively, and cash balances generate an additional \$0.32 of financing. Results reported in column (6) indicate that the response of the leverage variables is \$0.54 higher when the estimates are obtained from the constrained system-of-equations model compared to the estimates of the single-equation models. Put differently, leverage variables pick up \$0.54 of the \$0.55 difference in total response between the case when policy decisions are examined in isolation and the case when the constrained interdependent nature of the decision variables is taken into account. These results also suggest that financing variables act as shock-absorbers in the system against cash flow changes.

Finally, the effect of imposing the sources/uses constraint can be seen by comparing restricted estimates (column (4)) and unrestricted estimates (column (3)) of Table 5. The differences between the two sets of estimates are reported in column (7) and indicate that in general imposing the constraint produces larger coefficients in both source and use variables. The effect of the constraint is most pronounced in the leverage variables (changes in short-term debt, long-term debt, and cash) followed by acquisitions and capital expenditures.

While a separate examination of the intertemporal and the interdependent nature of financial decisions reveals the role of each specification issue in explaining cash flow sensitivities, the results also suggest that there is a connection between these two modeling issues. Including lagged dependent variables may alleviate the omitted (lagged-dependent) variable bias in the estimates involving investment and payout decisions. However, due to the positive sign of the omitted variables bias, including lagged dependent variables increases the discrepancy between the total response obtained from single-equation estimates and the \$1

adding-up constraint which is dictated by the “sources equal uses” identity. In other words, even if one controls for the persistence in the investment variables, the “sources equal uses” constraint imposes restrictions on the adjustments that these variables undergo. Thus, accounting for the persistence in policy variables makes it all the more necessary to take into account the “sources equal uses” identity.

In sum, these findings strongly suggest that to alleviate misspecification problems, models of financial decisions need to account both for the intertemporal and the interdependent nature of corporate decisions.

6. Estimation of the Model

The system specified in equation (10) is estimated using two methods for forecasting the exogenous variables. The first forecast model, which we refer to as the perfect foresight model, assumes that internally generated cash flow forecasts equal end-of-period (*ex-post*) realizations of cash flows. The second forecast model uses I/B/E/S analysts' forecasts to construct estimates of internally generated cash flows.¹⁵ Because both approaches generate similar estimates, results from only the perfect foresight model are reported.

We present the results using the full sample of Compustat data from 1952-2003. The full-sample estimation is done first in levels and then, to better control for firm effects, in first differences. To facilitate comparisons with prior studies that use the single-equation approach, we also estimate the multi-equation model using the time period and selection criteria of Cleary

¹⁵ Forecasted cash flow is measured using $\tilde{CF} = CF + [(IBFIMD)(CSHO) - NI] - XIDO$, where *IBFIMD* is the median earnings per share estimate for the current fiscal year provided by I/B/E/S, *CSHO* is common shares outstanding, *NI* is net income, and *XIDO* is extraordinary items and discontinued operations (all are Compustat annual items). The first term in the above equation is the realized cash flow. The second term adjusts realized cash flow to reflect differences between expected and actual net income. Finally, extraordinary items are subtracted to reflect the fact that had they been expected, they would be unlikely to be extraordinary.

(1999). Finally, the multi-equation system is estimated for sub-samples of firms classified according to their degrees of financial constraints. All models provide significance levels that control for firm clustering (see Petersen, 2008).

6.1. Model Estimation Using Levels

Results from estimating equation (10) subject to the restriction specified by equation (11) are shown in Table 6, Panels A and B. The estimation uses the full sample of 222,371 firm-years with 18,175 firm clusters.

The estimated responses of each of the endogenous financing and investment variables to changes in cash flow, market-to-book ratio, and firm size are reported in Table 6, Panel A. As expected, a one dollar increase in cash flow results in an increase in “use” variables and a decrease in “source” variables. In the case of use variables, the coefficients in the first column of Table 6, Panel A show that a one dollar increase in cash flow causes a \$0.09 increase in capital expenditures, a \$0.05 increase in acquisitions, a \$0.03 increase in share repurchases, a \$0.02 increase in dividends, and a \$0.32 increase in cash balances (all highly significant).

The first column of Table 6, Panel A also shows that positive cash flow innovations cause other source variables to decline. Firms react to a \$1 cash flow shock by retiring \$0.14 of long-term debt, \$0.37 of short-term debt, and by reducing asset sales and equity issues (each by about 0.003). The first three coefficient estimates are statistically different from zero at the 0.01 level, while the equity response is not statistically significant. In sum, all 9 coefficients in the estimated system have the expected sign, and 8 of the coefficients are highly significant (the p -values are 0.04 for asset sales and below 0.01 for the remaining variables). An important conclusion that emerges from the first column of Table 6, Panel A is that while the cash flow coefficients in the

investment equations are statistically significant, economically the leverage equations are the primary buffers to cash flow shocks.

Because of the constraint specified in equation (11), a one dollar increase in cash flow must result in a one dollar decrease in other sources of funds, a one dollar increase in uses of funds, or some combination of a reduction in sources or increase in uses to exactly offset the one dollar cash flow increase. The coefficients reported in the first column of Table 6, Panel A show that this indeed is the case -- use variables increase by \$0.495, while source variables decrease by \$0.505. While the sign of both total uses and total sources are as expected, the primary conclusion that emerges from these results is that financing/cash flow sensitivities dominate investment/cash flow sensitivities. When cash flow increases by \$1 increase net debt (long-term debt plus short-term debt minus cash balance) decreases by \$0.82 and net investments (capital expenditures, acquisitions, and asset sales) increase by less \$0.14.

The other variables in Table 6, Panel A are market-to-book ratio and firm size. Because these variables represent neither sources nor uses of funds, the response of the system to innovations in these variables adds up to zero. Results suggest that firms with higher market-to-book ratios are more likely to have high capital expenditures and are more active in capital markets (both debt and equity). Finally, in distributing cash to shareholders, high market-to-book ratio firms rely more on share repurchases and less on dividends. These results are generally consistent with what one would expect of firms with significant growth opportunities. Size is also related to firms' investment, financing, and payout decisions. In general, larger firms seem to have more pronounced investment programs, having higher levels of capital expenditures and acquisitions. Judging by the estimates in the equations for equity issues, share repurchases, and

both long- and short-term debt issues, larger firms also seem to be more active in financial markets.

Coefficients for the lagged endogenous variables (estimates of matrix \mathbf{K} in equation (10)) are displayed in Table 6, Panel B. The estimated coefficients of the matrix describe how current investment and financing variables depend on lagged investment and financing variables. The diagonal elements of \mathbf{K} can be loosely interpreted as “own” adjustment rates -- the smaller the j^{th} diagonal coefficient the less inertia is displayed in the adjustment of the j^{th} variable. Dividends, capital expenditures, asset sales, and share repurchases display the most inertia, with lagged coefficients of 0.82, 0.69, 0.66, and 0.48, respectively. The payout coefficients reflect the sticky nature of dividends and, to a lower extent, share repurchases. The investment coefficients reflect the annual replacement stream of existing investments and possibly the multi-year nature of new projects. The persistence in share repurchases may appear to be surprising because typically they are considered to be episodic in nature. However, based on casual observation, it seems that some firms are serial repurchasers. These firms tend to frequently renew and/or amend their repurchase programs. Moreover, a very high proportion of these programs represent open market share repurchases which are typically executed over a number of years. Thus, it is not surprising that share repurchases display positive serial correlation.

Borrowings (both long- and short-term) show very little inertia, indicating that these variables adjust quickly to shocks. In addition, leverage variables respond strongly in the current period to lagged capital expenditures (both in terms of magnitude and statistical significance) reflecting the use of debt and cash balances to finance capital expenditure programs.

Off-diagonal elements provide evidence that changes in cash balances and both long- and short-term debt issues act as “shock absorbers” in the system. In general, the largest off-diagonal

elements (in absolute value) are found in the rows associated with these three leverage variables, implying that current-period cash holdings and debt issues respond strongly to prior changes in other system variables.¹⁶ Conversely, columns associated with leverage variables typically have the smallest off-diagonal coefficients indicating that lagged changes in these variables do not influence the rest of the system in the current period. In sum, the relative sizes (in absolute value) of the off-diagonal rows and columns, along with small diagonal coefficients, suggest that leverage variables absorb, but do not transmit shocks to the rest of the system.

[Insert Table 6 around here]

6.2. Model Estimation Using First Differences

Persistence in the levels of the variables at the firm level may affect the estimated coefficients. To provide a more robust view of the interdependence of firms' financial decisions we transform all variables from levels to first differences. We again control for firm clustering and demean our observations at the yearly level. The model in first differences must satisfy the constraint that changes in sources of funds equal changes in uses of funds.¹⁷

The first model in Table 7 presents results when using first differences for the entire sample of Compustat firms. For brevity, only cash flow coefficients and the R^2 of each of the nine equations are presented. To facilitate comparisons, the second model in Table 7 is the model using levels for the whole sample estimated in Table 6. The last model reported in the table uses a sample based on Cleary (1999) selection criteria.

The estimates from the first model of Table 7 show that using first differences provides even stronger evidence that firms respond to cash flow shocks by altering financing rather than

¹⁶ Additionally, lagged asset sales, equity issues, and dividends have relatively large coefficients in the capital expenditures equation.

¹⁷ Cleary (1999) does not use first differences, but instead transforms variables by subtracting firm and year means. We also performed the analysis by subtracting firm means rather than changes with similar results (unreported).

investment variables. The cash flow coefficient in the capital expenditures equation is 0.01 using first differences versus 0.09 when variables are measured in levels.¹⁸ Given the smaller investment response and the adding-up constraint, as expected, leverage response becomes even more dominant when first differences rather than levels are used (\$0.92 versus \$0.82). A one dollar decrease in cash flow causes short-term debt and long-term debt to increase by \$0.41 and \$0.18, respectively and cash balances to decrease by \$0.33. Additionally, as was the case with levels-based estimates, acquisitions and share repurchases increase while asset sales decline. Overall, the results presented in Table 7 again indicate that firms do not cut capital expenditures in response to negative cash flow shocks but instead react by increasing net debt.¹⁹

Finally, comparing the results across the three models leads to the conclusion that results are robust with respect to how data is measured (levels versus differences), and the sample period used (1987-1994 period used by Cleary (1999) versus the 1952-2003 period used in this paper). These findings strongly suggest that conclusions of earlier studies that capital market frictions restrict the investment decisions of firms are misleading because they do not examine the intertemporal and interdependent nature of financing and investment decisions and not because of data measurement and sample period considerations.

¹⁸ In addition to capital expenditures, we also examined a broader definition of “investment” by including research and development expense and advertising expense in the system of equations. The reactions of R&D and advertising to changes in cash flow are economically small and statistically insignificant.

¹⁹ To test whether firms’ response to cash flow shocks differ on the basis of growth opportunities, we sorted firms based on their market-to-book ratios. The estimated cash flow/investment sensitivity coefficients were 0.0088, 0.0111, and -0.0247 , for the low M/B, medium M/B, and high M/B sub-samples, respectively. Furthermore, the large and highly significant sensitivity of financing variables is evident for all three M/B portfolios and in all of the M/B sub-samples, the financing response continued to dominate the investment response. To test whether investment and financing decisions are industry-specific, we have also estimated our model including 3-digit SIC dummies. Results not reported here showed that our findings hold when industry-adjusted data are used.

6.3. Effects of Capital Constraints

Prior investment/cash flow studies focus on whether constraints in accessing external capital affect firms' investment levels. Based on results presented in Tables 6 and 7, there is little evidence that financing constraints alter investment levels for the broad sample. However, the effect could be absent for the majority of firms, but might still exist for financially unhealthy firms. The approach taken in prior studies is to segment the sample based on some measure of financial health and then determine whether there is a relationship between financial health and investment/cash flow sensitivity. In their original paper, FHP (1988) segmented firms according to dividend payout ratios. Firms that paid no dividends were deemed to be financially constrained, firms that paid small dividends relative to net income were deemed to be partially financially constrained, and firms that paid moderate-to-large dividends relative to net income were deemed to be unconstrained. Subsequent papers questioned the legitimacy of simply using dividend levels as a determinant of financial health and instead used a range of financial variables to classify firms' financial health. For example, Kaplan and Zingales (1997) classify firms by their perceived levels of financial constraints, and then build an ordered logit model to relate accounting variables to their financial constraint classifications.

The primary classification model used in this paper is based on bankruptcy probability. There are a number of ways to calculate bankruptcy probability. Perhaps the best approach would be to use a Merton-type model that accounts for the volatility of the firm's assets as well as the firm's capital structure (Merton, 1974). Yet, because of problems in estimating asset volatility and in gathering detailed capital structure data for individual firms, this approach is cumbersome to implement over a large sample. An alternative approach is to use bankruptcy probabilities calculated using reduced-form models such as the Altman Z-score model or the

Shumway (2001) hazard model. Both of these models are easy to implement and provide reasonably accurate rankings of financial health. Shumway's hazard model in particular has been shown to produce results that are similar to those produced using the Merton asset-based model (Bharath and Shumway, 2004). Shumway (2001) calculates bankruptcy probabilities using the following model (Shumway, 2001, Table 6B, p. 122):

$$Pr = e^{\left[-13.303 - 1.982(NI/TA) + 3.593(TL/TA) - 0.467 \ln(\text{RelativeSize}) - 1.809(\text{Ret}_{t-1} - \text{Ret Market}_{t-1}) + 5.791(\text{Sigma})\right]}, \quad (12)$$

where NI/TA is net income divided by total assets, TL/TA is total liabilities divided by total assets, Relative Size is the natural log of firm market capitalization divided by the total market capitalization of the NYSE and AMEX, $\text{Ret}_{t-1} - \text{Ret Market}_{t-1}$ is the firm's equity return over the prior year minus the market return over the prior year, and Sigma is the standard deviation of the residual from a regression of firm returns on market returns over the prior year.

To classify firms according to bankruptcy probability, we calculate the 25th and 75th percentiles of the predicted bankruptcy probability across the entire sample. Firm-years with probabilities below the 25th percentile are classified as financially unconstrained (FUC), firm-years with bankruptcy probabilities above the 75th percentile are classified as financially constrained (FC), and all other firm-years are classified as partially financially constrained (PFC). Because of the ordinal nature of this categorization scheme, the precise level of bankruptcy probability produced by Shumway's model is not important for our purposes.

To determine if firms' investment/cash flow sensitivities depend on whether or not they are constrained from accessing external capital, we estimate the system specified by equation (10), subject to the constraint in equation (11) for each of the three groups (FC, FUC, and PFC). Equation (10) is estimated using first differences.

Rather than presenting coefficient estimates for all variables, we focus on the sensitivities of each of the investment and financing variables to changes in cash flow. Panel A of Table 8 presents results for each of the sub-samples. In addition, results for the full sample from Table 7 are reported again for ease of comparison. Results displayed in Panel A of Table 8 show that over the full sample and the three sub-samples, 35 of the 36 coefficients have the expected sign (i.e. use variables increase and source variables decrease in response to positive cash flow changes) and 28 of the 35 coefficients in question are statistically significant at the 0.10 level and 22 are significant at the 0.01 level.

Consistent with the full sample results, firms react to a one dollar change in cash flow by altering financial leverage, regardless of financial health. In fact, the capital expenditures coefficient is less than 0.02 in all the sub-samples. In determining whether capital market constraints induce underinvestment, we argue that the relative magnitudes of investment/cash flow and financing/cash flow sensitivities, rather than just the magnitude of the investment/cash flow sensitivity, should be considered. Results in Panel A of Table 8 show that financing/cash flow sensitivities (\$0.89, \$0.95, and \$0.92 for the FUC, PFC, and FC sub-samples, respectively) dominate investment/cash flow sensitivities for firms in all categories. Thus, there is little evidence that firms are forced to forgo positive NPV projects because they are unable to access external capital. If firms were prevented from investing in valuable projects due to capital market frictions, we would expect a more apparent change in investments and a much lower change in financial leverage in response to cash flow changes.

Panel B of Table 8 examines differences between coefficients for the sub-samples presented in Panel A. These results show a strong similarity between firms in all sub-samples. Of the 27 differences considered, only 7 are statistically different from zero at the 0.05 level.

Furthermore, some of the statistically significant pair-wise differences, such as the unconstrained versus the partially constrained in the capital expenditures equation and the unconstrained versus constrained and partially constrained versus constrained in the asset sales equation, are inconsistent with the notion that unhealthier firms have greater difficulties in raising funds relative to financially healthier firms.

6.4. Sensitivity of Results to Sub-sample Segmentation Criteria

To ensure that our results are not an artifact of the Shumway-based segmentation methodology, we repeat the analysis after segmenting the sample using both the Kaplan and Zingales (1997, 2000) ordered logit procedure and Altman Z-scores.²⁰ To implement the Kaplan and Zingales procedure, we follow the approach outlined in the appendix of Lamont et. al. (2001). Results are presented in Table 9, along with the Shumway-based results. Regardless of the classification method, there is no evidence of economically significant investment/cash flow sensitivities. In all cases, the primary response to a one dollar change in cash flow occurs in the financing variables: firms are able to borrow and this ability is robust with respect to the classification methodology used. Furthermore, by and larger there is no monotonic relationship between ability to borrow and the degree of financial health.²¹

²⁰ In addition to segmenting the data using the Shumway (2001) bankruptcy probability model, the Kaplan and Zingales ordered logit model, and Altman Z-Scores, we also formed sub-samples replicated Cleary's (1999) discriminant analysis with bootstrapped standard errors (table available upon request.) All approaches produce similar results indicating that the analysis is robust to sub-sample formation and standard error estimation.

²¹ The estimates based on the Kaplan-Zingales classification methodology show that the composition of borrowing is monotonically related to financial health. As firm financial health deteriorates, reliance on short-term debt increases and while use of long-term debt declines. This result is consistent with Diamond (1991) who argues that borrowers with lower credit rating can issue only short-term debt in spite of the fact that they prefer long-term borrowings.

6.5. Positive and Negative Cash Flow Shocks

A potential problem with results presented thus far is that they assume symmetry: the way in which a firm reacts to a cash flow increase is assumed to be equal and opposite of the reaction to a cash flow decrease. However, the effect of capital constraints on investment is really about being able to raise external funds when faced with negative innovations in cash flows, not retiring capital in response to positive innovations. In fact, one may expect that financially constrained firms will not be likely to retire debt or equity even if positive cash flow innovations occur. Therefore, in this section we examine the symmetry of investment/cash flow and financing/cash flow sensitivities. To this end, we estimate equation (10) by including an interaction variable equal to change in cash flow multiplied by a dummy variable that takes the value of one when the change in cash flow is positive and zero otherwise.

Firms' reactions to positive and negative cash flow shocks are displayed in Table 10. Our most important finding is that firms are able to raise funds in the financial markets when they face cash flow shortfalls. Furthermore their response with respect to negative and positive cash flow changes is symmetric, meaning that the amount of debt and equity they issue when faced with a \$1 shortfall in cash flow is similar to the amount of debt and equity they retire when they experience a \$1 increase in cash flow. For example, for the full sample (Panel A), in the short-term debt equation, the estimated coefficients for the positive cash flow variable and negative cash flow variable are -0.3848 and -0.4290 respectively. This implies that when there is a negative one dollar change in cash flow, firms borrow an additional \$0.43 of short-term debt. Conversely, when there is a positive one dollar change in cash flow, firms pay down \$0.39 of short-term debt. The p-value of 0.37 on the difference indicates that the 0.0442 difference between the negative and positive short-term-debt/cash flow sensitivities is not statistically

significant. In the long-term debt markets firms are able to borrow \$0.16 when there is a \$1 of cash flow shortfall and pay down \$0.20 when cash flow increases by \$1 where again the two numbers are not significantly different from each other.

Of the nine variables studied, in the full-sample there is statistical evidence of asymmetry in four of them: capital expenditures, the two payout variables, and changes in cash balances. However, the asymmetry in capital expenditures and cash balances is not economically meaningful. In fact, statistical significance aside firms do not decrease their capital expenditures independent of whether cash flow changes are positive or negative. The estimates indicate that firms increase capital expenditures by \$0.022 (p -value of 0.0826) when cash flow increases by one dollar and again increase capital expenditures by an insignificant \$0.001 when cash flow decreases by one dollar. Thus, while there is a statistically significant difference between investment cash flow coefficients depending on whether the cash flow change is positive or negative (p -value of 0.0133), the economic implication is that capital expenditures appear to be almost completely insulated from short-term cash flows. The significant asymmetry regarding dividends suggests that firms, on average, increase dividends following cash flow increases and (statistically) leave dividends unchanged when they experience cash flow shortfalls. The asymmetric response in share repurchases, on the other hand indicates that positive cash flow shocks increase repurchases by more than negative shocks decrease repurchases.

Results for sub-samples of firms segmented based on financial health confirm that, in general, firms respond symmetrically to negative and positive changes in cash flow. Overall, only seven out of the 27 tests of symmetry indicate an asymmetric response in the sub-samples (at the 0.05 level). Regarding capital market access, there is virtually no evidence that firms react differently to positive versus negative changes in cash flow. Of the 12 coefficients that represent

firms' equity issues, changes in long-term debt, and changes in short-term debt, for the full-sample and sub-samples only two coefficients display asymmetry (both in the equity issues equation) at the 0.05 level of significance. The evidence presented in Table 10 shows that, when there are cash flow shortfalls, even firms that presumably face most difficulties in accessing capital markets are able to borrow funds both in the short-term and long-term debt markets. Furthermore, the financing activities of constrained firms are symmetric with respect to the sign of the cash flow changes. The sub-sample results of Table 10 provide strong evidence that investment variables (capital expenditures, acquisitions, and asset sales) are immune to the sign of cash flow changes. Taken altogether, these results do not support the notion that capital market constraints cause firms to forgo investments.

7. Conclusion

Typically, corporate investment, distribution, and financing policies are examined in isolation using a static single-equation methodology. As illustrated in this paper, models that do not account for the intertemporal nature of financial policies and the interdependence of policy instruments are incomplete and potentially misleading. Coefficient estimates that do not take into account the intertemporal and interdependent nature of financial variables can suffer from econometric problems in the form of omitted variables bias and inefficient standard errors. The estimates can also lead to incorrect inferences regarding the determinants of corporate policies.

To demonstrate these problems, we examine whether firms face difficulties in accessing capital markets and suffer from an under-investment problem as a result. Using a static framework, this issue has been examined in an indirect manner and in isolation by focusing on the sensitivity of investment to cash flow. The investment/cash flow literature is well-developed and has generally produced conflicting results. Virtually all studies agree that for the typical firm

the investment/cash flow sensitivity is statistically positive but studies disagree as to whether this effect is correlated with the degree of financial health. The result of positive overall investment/cash flow sensitivity is counter to what would be predicted in a frictionless Modigliani-Miller world where positive NPV investments are financed with debt or equity if current cash flows are lacking.

We show that ignoring the dynamic nature of corporate decisions is likely to result in omitted variables bias in investment and payout variables. Ignoring the accounting identities that tie financial policy decisions, on the other hand, is likely to lead to inefficiently estimated standard errors in all variables that make up the system. Investment/cash flow sensitivities from prior studies range between 0.10 and 0.25, suggesting that firms increase investment when cash flow rises and decrease investment when cash flow falls. Furthermore, the findings of the earlier studies imply that to some extent all firms suffer from an underinvestment problem independent of their financial health. Using the static single-equation methodology followed in prior studies, we obtain similar results (investment/cash flow sensitivities between 0.09 and 0.36).

However, when we examine the capital market access issue in a larger context, by developing a model that accounts for both the interdependence of policy variables, and allows for the relationship between lagged and current decision variables, we find that the positive relationship between investment and cash flow disappears. Regardless of the firm's degree of financial constraints, there is, on average, no relationship between investment and cash flow. Rather, firms in all the sub-samples we consider insulate capital expenditures from cash flow fluctuations by changing net debt. When cash flows are low, firms increase debt and reduce cash balances. When cash flows are high, firms reduce debt and also increase cash balances. Our

results indicate that firms in general are free of capital market access constraints both in the relative sense that is portrayed in the literature, and also in an absolute sense.

These results are consistent with the seminal insight of Modigliani and Miller (1958) who established that in perfect capital market investment decisions are independent from financing decisions. In our empirical model, when cash flows (a financing source) provide insufficient capital firms respond by using other financing alternatives (primarily debt) but leave investments largely unchanged.

In addition, our results, while considerably different from prior studies, are intuitive when the relative adjustment costs of investments and financing decisions are accounted for. Capital expenditures typically reflect long-term investment programs and, absent severe financial market frictions, are unlikely to be affected by short-term cash flow fluctuations. Financing decisions, in comparison, are much less costly to change and therefore provide a cheaper alternative to accommodate fluctuations in cash flows. The investment/cash flow and financing/cash flow sensitivities documented in this paper provide strong support for this intuition. The higher sensitivity of financing responses as compared to investment responses is consistent with the view that financing variables (debt and equity) are less costly to adjust than investment variables (capital expenditures, acquisitions, and asset sales).

An interesting insight from our empirical results is that firms facing cash flow shortfalls increase financial leverage in two respects. First, to the extent that cash flow shortfalls cause a decrease in equity value, financial leverage increases. Second, firms respond to cash flow shortfalls by increasing leverage (both by increasing debt and by reducing cash balances). While it is possible that these two trends result in a capital structure that has more debt than is optimal, it is also possible that these trends bring the debt/equity mix closer to the optimal level. This is

because firms may preserve borrowing capacity in anticipation of cash flow shortfalls. Modigliani and Miller (1963) refer to this phenomenon as “precautionary motive” for borrowing. Fama and French (2002) further argue that to avoid an unpleasant choice between foregoing profitable projects and issuing a security with high information costs (equity), firms may set capital structure targets below their no-adjustment-cost optimal values.²²

While our results have implications for the investment/cash flow literature, the more important point demonstrated in this paper is that examining corporate policies (i.e. investment, distribution, financing) in isolation and in static framework can generate misleading results. Rather than modeling corporate decisions in a static framework, the models need to acknowledge that presence of adjustment costs induces an intertemporal element to these decisions. Furthermore, instead of modeling financial decisions independently, they should be modeled jointly, subject to the constraint faced by every firm at all times -- sources and uses of cash must be equal.

²² Whether negative cash flow shocks lead to over-leverage can be examined by looking at the subsequent reversal in capital structure. While studies such as Baker and Wurgler (2002) and Welch (2004) find that firms’ capital structures display inertia, Leary and Roberts (2005) provide evidence that, when adjustment costs are accounted for, corporate financial policy is consistent with dynamic rebalancing of capital structure.

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Appendix: Deriving the Constraints

The appendix shows that the constraints in (11) are necessary and sufficient, and therefore unique, for the “sources equal uses” identity to hold.

Let,

$$\mathbf{Y}' = \begin{bmatrix} -\tilde{C}APX_t \\ -AC\tilde{Q}UIS_t \\ \vdots \\ \Delta\tilde{S}TD_t \\ -\Delta\tilde{C}ASH_t \end{bmatrix}, \mathbf{X}' = \left[\widehat{CF}_t \right], \mathbf{Z}' = \begin{bmatrix} -CAPX_{t-1} \\ -ACQUIS_{t-1} \\ \vdots \\ \Delta STD_{t-1} \\ -\Delta CASH_{t-1} \\ MB_t \\ SIZE_t \end{bmatrix}, \mathbf{W}' = \begin{bmatrix} \mathbf{X}' \\ \mathbf{Z}' \end{bmatrix}, \text{ and } \mathbf{e}' = \begin{bmatrix} e_{CAPX_t} \\ e_{ACQUIS_t} \\ \vdots \\ e_{\Delta STD_t} \\ e_{\Delta CASH_t} \end{bmatrix}. \quad (A1)$$

The “sources equal uses” identity could be written as $\mathbf{i}'\mathbf{Y}' = -\mathbf{X}'$ where \mathbf{i}' is a 1×9 vector of ones. This is rewritten as:

$$\mathbf{i}'\mathbf{Y}' = -\mathbf{X}' + \mathbf{0}_{1 \times 1} \mathbf{Z}' = \begin{bmatrix} -1 & \mathbf{0}_{1 \times 1} \end{bmatrix} \mathbf{W}', \quad (A2)$$

where $\mathbf{0}$ is a vector of zeros with the specified dimensions. More generally, let the “sources equal uses” identity be $\mathbf{i}'\mathbf{Y}' = \mathbf{a}\mathbf{X}' + \mathbf{b}\mathbf{Z}' + \mathbf{c}\mathbf{e}' = [\mathbf{a} \ \mathbf{b}]\mathbf{W}' + \mathbf{c}\mathbf{e}'$. We now have that

$\begin{bmatrix} -1 & \mathbf{0}_{1 \times 1} \end{bmatrix} \mathbf{W}' = [\mathbf{a} \ \mathbf{b}]\mathbf{W}' + \mathbf{c}\mathbf{e}'$. Post-multiplying both sides by \mathbf{W} we get:

$$\begin{bmatrix} -1 & \mathbf{0}_{1 \times 1} \end{bmatrix} \mathbf{W}'\mathbf{W} = [\mathbf{a} \ \mathbf{b}]\mathbf{W}'\mathbf{W} + \mathbf{c}\mathbf{e}'\mathbf{W} \quad (A3)$$

As long as $\mathbf{W}'\mathbf{W}$ is invertible (i.e., none of the explanatory variables in \mathbf{W} is a linear combination of the other variables) and $\mathbf{e}'\mathbf{W}(\mathbf{W}'\mathbf{W})^{-1} = \mathbf{0}_{9 \times 12}$ (stochastic residuals are independent from the explanatory variables in expectation) there is a unique solution, $[\mathbf{a} \ \mathbf{b}] = \begin{bmatrix} -1 & \mathbf{0}_{1 \times 1} \end{bmatrix}$,

satisfying the “sources equal uses” identity. Therefore, the “sources equal uses” identity is uniquely written as:

$$\mathbf{i}'\mathbf{Y}' = \begin{bmatrix} -1 & \mathbf{0} \\ & \mathbf{1} \times \mathbf{11} \end{bmatrix} \mathbf{W}' \quad (\text{A4})$$

The equation in (10) estimates the following model:

$$\mathbf{Y}' = [\mathbf{L} \quad \mathbf{K} \quad \mathbf{M}] \mathbf{W}' + \mathbf{e}', \quad (\text{A5})$$

where \mathbf{L} , \mathbf{K} , and \mathbf{M} are the respective coefficient matrices. Pre-multiplying (A5) by \mathbf{i}'

throughout and equating to (A4), we get:

$$[\mathbf{i}'\mathbf{L} \quad \mathbf{i}'\mathbf{K} \quad \mathbf{i}'\mathbf{M}] \mathbf{W}' + \mathbf{i}'\mathbf{e}' = \begin{bmatrix} -1 & \mathbf{0} \\ & \mathbf{1} \times \mathbf{11} \end{bmatrix} \mathbf{W}' \quad (\text{A6})$$

Post-multiplying both sides by \mathbf{W} and using that $\mathbf{W}'\mathbf{W}$ is invertible and that $\mathbf{e}'\mathbf{W}(\mathbf{W}'\mathbf{W})^{-1} = \mathbf{0}$ we get that:

$$[\mathbf{i}'\mathbf{L} \quad \mathbf{i}'\mathbf{K} \quad \mathbf{i}'\mathbf{M}] = \begin{bmatrix} -1 & \mathbf{0} \\ & \mathbf{1} \times \mathbf{11} \end{bmatrix} \quad (\text{A7})$$

Decomposing equation (A7), we retrieve the constraints in (11) that:

$$\mathbf{i}'\mathbf{L} = -1, \quad \mathbf{i}'\mathbf{K} = \mathbf{0}, \quad \mathbf{i}'\mathbf{M} = \mathbf{0}. \quad (\text{A8})$$

QED.

Table 1
Single-Equation Cash Flow Sensitivities

The table presents results from Fazzari, Hubbard, and Petersen (1988) and Cleary (1999). For comparison, we present similar analyses labeled “Our estimates” where we use the sample period of 1987-1994 and selection criteria used by Cleary (1999). The following equation is estimated:

$$\frac{CAPX_t}{K_t} = \beta_1 \frac{CF_t}{K_t} + \beta_2 MB_t + \varepsilon_t$$

Where $CAPX_t$ is capital expenditures for year t , K_t is beginning of period fixed assets, CF_t is year t cash flow, and MB_t is the ratio of the market value of assets to the book value of assets. The t -stats of our estimates control for firm-level clustering.

	β_1	β_2	Adj. R ²	Sample size (firm-years)	Sample period	Data source
Fazzari, Hubbard, and Petersen (1988) ^a	0.23 (23.0)	0.00 (6.7)	0.19	5,010	1970-1984	Value Line
Cleary (1999)	0.10 (29.7)	0.02 (12.3)	0.12	9,219	1987-1994	SEC Worldscope Disclosure
Our results using Cleary (1999) selection criteria	0.09 (6.14)	0.06 (8.56)	0.16	10,329	1987-1994	Compustat

^a Fazzari, Hubbard, and Petersen (1988) report results for sub-samples of firms based on degree of financial constraints. They do not present results for the full sample. Therefore, entries in this table correspond to their unconstrained sub-sample, which represents 79% of the full sample.

Table 2
Sources and Uses of Investment and Financing Variables

The table describes the variables used to estimate the system described by equation (10). Compustat definitions used to construct the variables are presented in Table 3.

	Variable Name	Description	Type of Variable
Sources	Cash Flow (CF)	Internally available cash flow for investment and financing	Exogenous/financing
	Δ Long-term Debt (Δ LTD)	Change in long -term debt	Endogenous/financing
	Δ Short-term Debt (Δ STD)	Change in short-term debt	Endogenous/financing
	Equity Issues (EQUISS)	Dollar value of equity issues	Endogenous/financing
	Asset Sales (ASALES)	Dollar value of assets sold	Endogenous/investment
Uses	Share Repurchases (RP)	Dollar value of shares repurchased	Endogenous/financing
	Dividends (DIV)	Dollar value of dividends paid	Endogenous/financing
	Capital Expenditures (CAPX)	Dollar value of capital expenditures	Endogenous/investment
	Acquisitions (ACQUIS)	Dollar value of acquisitions	Endogenous/investment
	Δ CASH	Change in cash balance	Endogenous/financing
Other variables	Market-to-Book Ratio (MB)	Ratio of market value of equity to book value of equity	Exogenous
	Size (SIZE)	Logarithm of total book assets	Exogenous

Table 3
Variable Definitions

The table presents the Compustat variable definitions used to construct the variables.

Variable	Description	Compustat Item (Item #)
CASH	Cash and equivalents	CHE (1)
LTD	Long-term debt	DLTT (9)
STD	Short-term debt	DLC (34)
EQUISS	Sale of common and preferred stock	SSTK (108)
ASALES	Sale of assets and investments	SPPE (107)
CAPX	Net capital expenditures	CAPX (128)
ACQUIS	Acquisitions	AQC (129)
RP	Purchase of common and preferred stock	PRSTKC (115)
DIV	Cash dividends	DV (127)
SIZE	Log of total assets	Log of AT (6)
MB	Market-to-book value of assets = (Market value of equity – Book value of equity + Book value of total assets) / Book value of total assets	(MKVALF – CEQ + AT)/AT or ((25*199) – 60 + 6) / 6
NWC	Net working capital = (Total current assets – Cash and equivalents) – (Total current liabilities – Debt in current liabilities)	(ACT – CHE) – (LCT – DLC) or (4 – 1) – (5 – 34)
Cash Flow	Operating income before depreciation – Net interest expense – Cash taxes – Change in net working capital	OIBDP – (XINT – IINT) – (TXT – TXDC) – ΔNWC or 13 – (15 – 62) – (16 – 50) – ΔNWC

Table 4
Data Summary

The table presents a summary of the 1952 to 2003 Compustat data used in the empirical analyses. All numbers, except for Market-to-Book and Firm Size, are a proportion of firm assets. Firm Size is measured as the natural logarithm of book assets measured in millions of dollars. Sub-samples are formed based on Shumway's (2001) hazard model, which uses market and accounting variables to calculate bankruptcy probabilities. We consider firm-years with bankruptcy probabilities below the 25th percentile to be unconstrained, and firm-years with bankruptcy probabilities above the 75th percentile to be constrained. The remaining firms are partially constrained.

	Full Sample		Unconstrained Sample		Partially Constrained Sample		Constrained Sample	
	222,371 Firm-Years		55,592 Firm-Years		111,186 Firm-Years		55,593 Firm-Years	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Cash Flow	0.063	0.428	0.086	0.321	0.041	0.423	0.029	0.605
Δ Long-term Debt	0.017	0.271	0.017	0.187	0.021	0.274	-0.002	0.805
Δ Short-term Debt	0.007	0.248	0.005	0.146	0.010	0.306	0.006	0.568
Equity Issues	0.009	0.069	0.010	0.053	0.008	0.063	0.015	0.131
Asset Sales	0.004	0.049	0.003	0.028	0.004	0.060	0.007	0.149
Share Repurchases	0.007	0.073	0.009	0.061	0.005	0.059	0.004	0.077
Dividends	0.014	0.084	0.019	0.073	0.008	0.053	0.006	0.097
Capital Expenditures	0.051	0.261	0.065	0.222	0.035	0.180	0.047	0.421
Acquisitions	0.013	0.159	0.014	0.128	0.012	0.136	0.016	0.318
Δ Cash Balances	0.008	0.199	0.009	0.126	0.008	0.242	-0.002	0.323
Market-to-Book	1.704	1.727	2.020	1.961	1.575	1.435	1.645	1.958
Firm Size	4.495	2.448	5.602	2.728	4.614	2.189	3.150	1.972

Table 5

Cash Flow Sensitivities: Effects of Lagged Dependent Variables and Constraints

The table presents coefficient estimates of firm cash flow from different models and differences in coefficient estimates. The sample has 222,371 firm-year observations between 1952 and 2003. As explanatory variables, model (1) uses cash flow, model (2) uses cash flow and own lagged dependent variable, model (3) uses cash flow and all lagged dependent variables, and model (4) extends model (3) by adding the “sources of funds equal uses of funds” identity. Each regression also controls for firm size and market-to-book. The *p*-values of the estimates are reported in parentheses. Coefficient estimates’ *p*-values control for firm-level clustering (18,175 clusters) by using Rogers’ (1983, 1993) method. The *p*-values of the differences are computed using a jackknife method outlined by Shao and Rao (1993).

Dependent Variable	Cash Flow _t (unconstrained; no lagged dependent variables)	Cash Flow _t (unconstrained; own lagged dependent variable only)	Cash Flow _t (unconstrained; all lagged dependent variables)	Cash Flow _t (constrained; all lagged dependent variables)	Difference in Cash Flow _t (2) – (1)	Difference in Cash Flow _t (4) – (2)	Difference in Cash Flow _t (4) – (3)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Capital Expenditures _t	0.3627 (0.0001)	0.1048 (0.0573)	0.0634 (0.0135)	0.0885 (0.0006)	- 0.2579 (0.0006)	- 0.0163 (0.5750)	0.0251 (0.0252)
Acquisitions _t	0.0494 (0.0001)	0.0416 (0.0001)	0.0032 (0.7726)	0.0453 (0.0014)	- 0.0079 (0.0010)	0.0037 (0.8153)	0.0421 (0.0011)
Asset Sales _t	0.0149 (0.0001)	0.0051 (0.0027)	0.0001 (0.9685)	- 0.0026 (0.0395)	- 0.0098 (0.0001)	- 0.0077 (0.0002)	- 0.0027 (0.0011)
Equity Issues _t	0.0242 (0.0001)	0.0199 (0.0001)	0.0050 (0.0382)	- 0.0024 (0.4246)	- 0.0043 (0.0001)	- 0.0223 (0.0008)	- 0.0074 (0.0012)
Share Repurchases _t	0.0441 (0.0001)	0.0264 (0.0001)	0.0201 (0.0001)	0.0265 (0.0001)	- 0.0177 (0.0001)	0.0001 (0.8424)	0.0064 (0.0001)
Dividends _t	0.1007 (0.0001)	0.0221 (0.0001)	0.0159 (0.0001)	0.0183 (0.0001)	- 0.0786 (0.0001)	- 0.0038 (0.0955)	0.0024 (0.0019)
Δ Long-term Debt _t	0.0534 (0.0109)	0.0548 (0.0115)	- 0.0063 (0.8544)	- 0.1351 (0.0002)	0.0014 (0.5140)	- 0.1899 (0.0001)	- 0.1288 (0.0003)
Δ Short-term Debt _t	- 0.1615 (0.0002)	- 0.1611 (0.0003)	- 0.2718 (0.0001)	- 0.3645 (0.0001)	0.0004 (0.8411)	- 0.2034 (0.0001)	- 0.0927 (0.0001)
Δ Cash Balances _t	0.1685 (0.0001)	0.1691 (0.0001)	0.2553 (0.0001)	0.3168 (0.0001)	0.0006 (0.6911)	0.1477 (0.0001)	0.0615 (0.0001)
Δ Uses _t + Δ Sources _t	0.7944	0.4454	0.6309	1.0000			

Table 6
Full Sample Estimates

The table presents results from estimating the system of equations specified by equation (10) subject to constraints specified by equation (11). Panel A reports the coefficients for cash flow, size, and market-to-book and the R-square of each model. Panel B reports the estimates of all lagged dependent variables (the system dynamics matrix). These estimates describe the internal dynamics of the sources and uses variables by specifying how the current state of the sources/uses portfolio depends on its lagged state in the absence of external pressure. In particular, the j^{th} row shows how the current j^{th} sources/uses item is affected by changes in the sources/uses structure last period and the j^{th} column shows the rearrangement of the current sources/uses portfolio induced by a partial change in the j^{th} item last period. The diagonal elements can be interpreted as “own” adjustment rates. The smaller the j^{th} diagonal element, the less inertia is exhibited in the adjustment of the j^{th} sources/uses variable. Since lagged dependent variables are neither sources nor uses in the current period, the constraints require that the net reaction of the sources and uses variables to each lagged dependent variables is zero. The sample consists of 222,371 firm-years between 1952 and 2003. The p -values of the estimated coefficients (in parentheses) control for firm-level clustering (18,175 clusters) by using Rogers’ (1983, 1993) method.

Panel A: Cash Flow, M/B, and Size Coefficients

Dependent Variable	Cash Flow	Size	Market-to-Book	R ²
Capital Expenditures _t	0.0885 (0.0006)	3.1746 (0.0008)	1.1238 (0.0018)	0.81
Acquisitions _t	0.0453 (0.0014)	0.9979 (0.0001)	-0.2268 (0.1896)	0.06
Asset Sales _t	-0.0026 (0.0395)	0.0169 (0.6977)	-0.0971 (0.0003)	0.38
Equity Issues _t	-0.0024 (0.4246)	0.5681 (0.0001)	0.4857 (0.0001)	0.11
Share Repurchases _t	0.0265 (0.0001)	0.1284 (0.0362)	0.1717 (0.0001)	0.32
Dividends _t	0.0183 (0.0001)	0.0677 (0.3628)	-0.0740 (0.2021)	0.80
Δ Long-term Debt _t	-0.1351 (0.0002)	1.5778 (0.0048)	-0.9504 (0.0060)	0.03
Δ Short-term Debt _t	-0.3645 (0.0001)	3.1010 (0.0001)	1.1497 (0.0024)	0.14
Δ Cash Balances _t	0.3168 (0.0001)	0.8953 (0.0947)	-0.4068 (0.3442)	0.17

Table 6 (contd.)

Panel B: Coefficient Estimates for the System Dynamics Matrix

Dependent Variable	Capital Expenditure _{t-1}	Acquisitions _{t-1}	Asset Sales _{t-1}	Equity Issues _{t-1}	Share Repurchases _{t-1}	Dividends _{t-1}	Δ Long-term Debt _{t-1}	Δ Short-term Debt _{t-1}	Δ Cash Balances _{t-1}
Capital Expenditures _t	0.6853 (0.0001)	0.0826 (0.0501)	0.3854 (0.0402)	-0.4637 (0.0802)	0.0045 (0.9286)	0.4877 (0.0132)	-0.0130 (0.4810)	-0.0032 (0.7453)	0.0421 (0.0155)
Acquisitions _t	-0.0200 (0.3227)	0.0897 (0.0016)	0.0619 (0.1672)	0.0248 (0.6069)	0.2421 (0.0234)	0.2134 (0.0012)	-0.0161 (0.1137)	0.0045 (0.5861)	0.0306 (0.0071)
Asset Sales _t	0.0174 (0.0045)	0.0005 (0.9176)	0.6612 (0.0001)	-0.0006 (0.9711)	0.0062 (0.3626)	0.0002 (0.9847)	0.0044 (0.2561)	-0.0026 (0.3963)	-0.0026 (0.2350)
Equity Issues _t	0.0093 (0.4312)	0.0670 (0.0064)	0.0874 (0.1123)	0.0958 (0.0059)	0.0544 (0.0087)	0.0943 (0.0009)	0.0049 (0.4773)	-0.0035 (0.4734)	-0.0033 (0.6692)
Share Repurchases _t	-0.0230 (0.0076)	0.0021 (0.7571)	0.0350 (0.0439)	0.0731 (0.0149)	0.4749 (0.0001)	0.1215 (0.0016)	-0.0065 (0.0864)	-0.0053 (0.1185)	0.0135 (0.0027)
Dividends _t	0.0207 (0.0050)	0.0070 (0.1376)	-0.0172 (0.2944)	0.0078 (0.5642)	0.0396 (0.0110)	0.8204 (0.0001)	-0.0039 (0.1888)	-0.0005 (0.7769)	0.0097 (0.0017)
Δ Long-term Debt _t	0.2078 (0.0003)	-0.0538 (0.2305)	-0.0297 (0.7979)	-0.0606 (0.6221)	0.3107 (0.0011)	0.4103 (0.0008)	-0.0458 (0.1160)	0.0959 (0.0004)	-0.0328 (0.1970)
Δ Short-term Debt _t	0.2378 (0.0001)	0.0144 (0.6406)	-0.1622 (0.1337)	-0.2099 (0.0422)	0.2229 (0.0014)	0.6901 (0.0001)	0.0815 (0.0003)	-0.0632 (0.1137)	0.0197 (0.4788)
Δ Cash Balances _t	-0.1907 (0.0001)	-0.1532 (0.0001)	0.0915 (0.2351)	0.1826 (0.0324)	-0.1669 (0.0003)	-0.4481 (0.0001)	0.0846 (0.0001)	0.0311 (0.0698)	-0.1148 (0.0062)

Table 7
Cash Flow Sensitivities: First Differences versus Levels

The table presents results from estimating the system of equations specified by equation (10) subject to constraints specified by equation (11). The first column presents results using first differences. The second column presents the estimates from the full sample of Compustat firms from 1952 to 2003 using levels. The third column presents the estimates using a sample of firms selected using the criteria in Cleary (1999). The *p*-values of the estimated coefficients (in parentheses) control for firm-level clustering by using Rogers' (1983, 1993) method. There are 18,175 clusters in the full sample and 1,314 clusters in the Cleary sample.

Dependent Variable	Cash Flow Coefficients Using First Differences (Full Sample)	R^2	Cash Flow Coefficients Using Levels (Full Sample)	R^2	Cash Flow Coefficients Using Levels (Cleary's sample)	R^2
Capital Expenditures $_t$	0.0104 (0.2985)	0.44	0.0885 (0.0006)	0.81	0.0284 (0.0080)	0.92
Acquisitions $_t$	0.0408 (0.0192)	0.23	0.0453 (0.0014)	0.06	0.0321 (0.4823)	0.05
Asset Sales $_t$	-0.0015 (0.0938)	0.17	-0.0026 (0.0395)	0.38	-0.0046 (0.1474)	0.35
Equity Issues $_t$	-0.0049 (0.1988)	0.39	-0.0024 (0.4246)	0.11	-0.0078 (0.1575)	0.14
Share Repurchases $_t$	0.0161 (0.0001)	0.15	0.0265 (0.0001)	0.32	0.0251 (0.0004)	0.22
Dividends $_t$	0.0058 (0.0001)	0.14	0.0183 (0.0001)	0.80	0.0348 (0.0001)	0.70
Δ Long-term Debt $_t$	-0.1789 (0.0002)	0.21	-0.1351 (0.0002)	0.03	-0.1194 (0.0662)	0.04
Δ Short-term Debt $_t$	-0.4073 (0.0001)	0.40	-0.3645 (0.0001)	0.14	-0.3965 (0.0001)	0.14
Δ Cash Balances $_t$	0.3343 (0.0001)	0.42	0.3168 (0.0001)	0.17	0.3513 (0.0001)	0.24
Observations	222,371		222,371		10,442	

Table 8**Reactions to Cash Flow Changes and the Effects of Financial Constraints**

The table reports coefficients for the Cash Flow variable specified by equation (10), subject to the constraint specified by equation (11). Results are presented for the full sample, and for sub-samples constructed on the basis of Shumway's hazard model, which uses market and accounting variables to predict bankruptcy probabilities. We consider firm years with predicted bankruptcy probabilities below the 25th percentile to be financially unconstrained, and firm years above the 75th percentile to be financially constrained. Firms in between these two benchmarks are considered to be partially financially constrained. Regressions are estimated using first differences. Panel A reports the coefficient estimates, the number of firm-years, and the number of firm clusters for each sub-sample. The *p*-values of the estimated coefficients (in parentheses) control for firm-level clustering by using Rogers' (1983, 1993) method. Panel B reports differences in coefficients across sub-samples. The *p*-values of the differences are computed using a jackknife method outlined by Shao and Rao (1993).

Panel A: Coefficient Estimates

Dependent Variable	Full Sample	Financially Unconstrained	Partially Constrained	Financially Constrained
Capital Expenditures $_t$	0.0104 (0.2985)	0.0203 (0.0684)	-0.0018 (0.8902)	0.0021 (0.9088)
Acquisitions $_t$	0.0408 (0.0192)	0.0641 (0.0560)	0.0264 (0.0301)	0.0526 (0.0137)
Asset Sales $_t$	-0.0015 (0.0938)	-0.0001 (0.9460)	-0.0031 (0.0041)	-0.0130 (0.0903)
<i>Net Change in Investments</i>	<i>0.0527</i>	<i>0.0845</i>	<i>0.0277</i>	<i>0.0677</i>
Equity Issues $_t$	-0.0049 (0.1988)	-0.0038 (0.5698)	-0.0063 (0.1051)	0.0013 (0.7644)
Share Repurchases $_t$	0.0161 (0.0001)	0.0195 (0.0108)	0.0099 (0.0066)	0.0082 (0.0009)
Dividends $_t$	0.0058 (0.0001)	0.0073 (0.0074)	0.0024 (0.0281)	0.0061 (0.0319)
<i>Net Shareholder Distributions</i>	<i>0.0268</i>	<i>0.0306</i>	<i>0.0186</i>	<i>0.0130</i>
Δ Long-term Debt $_t$	-0.1789 (0.0002)	-0.2255 (0.0011)	-0.1070 (0.0401)	-0.3064 (0.0020)
Δ Short-term Debt $_t$	-0.4073 (0.0001)	-0.2893 (0.0001)	-0.5194 (0.0001)	-0.2920 (0.0005)
Δ Cash Balances $_t$	0.3343 (0.0001)	0.3702 (0.0001)	0.3273 (0.0001)	0.3211 (0.0001)
<i>Change in Leverage</i>	<i>0.9205</i>	<i>0.8850</i>	<i>0.9537</i>	<i>0.9195</i>
Firm-Years	222,371	55,592	111,186	55,593
Firm Clusters	18,175	8,645	15,532	13,105

Table 8 (contd.)

Panel B: Differences in Coefficient Estimates

Dependent Variable	Unconstrained – Constrained	Unconstrained – Partially Constrained	Partially Constrained – Constrained
Capital Expenditures $_t$	0.0182 (0.4631)	0.0221 (0.0194)	– 0.0039 (0.7714)
Acquisitions $_t$	0.0115 (0.8727)	0.0376 (0.0932)	– 0.0262 (0.2361)
Asset Sales $_t$	0.0129 (0.0111)	0.0030 (0.2825)	0.0099 (0.0083)
Equity Issues $_t$	– 0.0051 (0.5508)	0.0024 (0.6163)	– 0.0076 (0.1001)
Share Repurchases $_t$	0.0113 (0.0082)	0.0095 (0.0279)	0.0017 (0.5257)
Dividends $_t$	0.0012 (0.9139)	0.0049 (0.1359)	– 0.0037 (0.4327)
Δ Long-term Debt $_t$	0.0808 (0.7579)	– 0.1185 (0.0234)	0.1994 (0.1102)
Δ Short-term Debt $_t$	0.0027 (0.8180)	0.2302 (0.0049)	– 0.2275 (0.1715)
Δ Cash Balances $_t$	0.0491 (0.7662)	0.0429 (0.4677)	0.0062 (0.8866)

Table 9
Determination of Financial Constraint Category

This table presents coefficients for the Cash Flow variable specified by equation (10), subject to the constraint specified by equation (11) using three different methods for categorizing firm-years according to their degrees of financial constraints. The regressions are estimated using first differences. The first three columns use Shumway's hazard model to define breakpoints between financially unconstrained, partially financially constrained, and financially constrained firms. The second set of three columns presents results using a variant of the Kaplan-Zingales method for assessing financial constraints. The last three columns present results using category breakpoints based on Altman's Z-score methodology. The *p*-values of the estimated coefficients (in parentheses) control for firm-level clustering by using Rogers' (1983, 1993) method.

Dependent Variable	Shumway-based Breakpoints			Kaplan-Zingales-based Breakpoints			Z-score-based Breakpoints		
	Un-constrained	Partially Constrained	Constrained	Un-constrained	Partially Constrained	Constrained	Un-constrained	Partially Constrained	Constrained
Capital Expenditures $_t$	0.0203 (0.0684)	-0.0018 (0.8902)	0.0021 (0.9088)	-0.0032 (0.2786)	0.0085 (0.6549)	0.0581 (0.0073)	-0.0418 (0.1371)	0.0041 (0.8265)	0.0115 (0.1177)
Acquisitions $_t$	0.0641 (0.0560)	0.0264 (0.0301)	0.0526 (0.0137)	0.0214 (0.0795)	0.0704 (0.0240)	-0.0275 (0.7597)	0.0718 (0.1412)	0.0753 (0.1441)	0.0258 (0.0769)
Asset Sales $_t$	-0.0001 (0.9460)	-0.0031 (0.0041)	-0.0130 (0.0903)	0.0007 (0.0290)	-0.0001 (0.9640)	-0.0413 (0.0795)	0.0003 (0.7548)	-0.0040 (0.0116)	-0.0014 (0.1880)
Equity Issues $_t$	-0.0038 (0.5698)	-0.0063 (0.1051)	0.0013 (0.7644)	0.0042 (0.3210)	-0.0087 (0.1333)	-0.0544 (0.0031)	-0.0013 (0.9096)	0.0022 (0.8874)	-0.0050 (0.0767)
Share Repurchases $_t$	0.0195 (0.0108)	0.0099 (0.0066)	0.0082 (0.0009)	0.0068 (0.0004)	0.0261 (0.0052)	0.0065 (0.3488)	0.0413 (0.0352)	0.0420 (0.0005)	0.0044 (0.0056)
Dividends $_t$	0.0073 (0.0074)	0.0024 (0.0281)	0.0061 (0.0319)	0.0062 (0.1357)	0.0073 (0.0008)	0.0052 (0.1565)	0.0138 (0.0043)	0.0090 (0.0188)	0.0024 (0.0090)
Δ Long-term Debt $_t$	-0.2255 (0.0011)	-0.1070 (0.0401)	-0.3064 (0.0020)	0.0030 (0.9364)	-0.2903 (0.0005)	-0.4957 (0.0002)	-0.0961 (0.1275)	-0.4110 (0.0001)	-0.1300 (0.0091)
Δ Short-term Debt $_t$	-0.2893 (0.0001)	-0.5194 (0.0001)	-0.2920 (0.0005)	-0.5547 (0.0001)	-0.2912 (0.0001)	-0.1675 (0.0585)	-0.1096 (0.0432)	-0.2209 (0.0001)	-0.5020 (0.0001)
Δ Cash Balances $_t$	0.3702 (0.0001)	0.3273 (0.0001)	0.3211 (0.0001)	0.4221 (0.0001)	0.2972 (0.0001)	0.1988 (0.0001)	0.7082 (0.0001)	0.2358 (0.0001)	0.3176 (0.0001)
Firm-Years	55,592	111,186	55,593	55,594	111,193	55,596	100,726	41,413	79,848
Firm Clusters	8,645	15,532	13,105	10,209	13,141	10,743	12,398	8,794	12,699

Table 10
Testing for Symmetry of Positive and Negative Cash Flow Shocks

This table presents coefficients for the Cash Flow variable in model specified by equation (10), subject to the constraint specified by equation (11). The regressions are estimated using first differences. The system (10) is estimated where the right-hand-side includes an interaction variable equal to change in Cash Flow*DUMMY, where DUMMY is 1 when change in cash flow is positive and zero when change in cash flow is negative. The DUMMY variable is also included in the model. Panel A reports the results for the full sample. Panel B reports the results for the financially unconstrained, partially constrained, and the constrained sub-samples. The *p*-values of the estimated coefficients (in parentheses) control for firm-level clustering by using Rogers' (1983, 1993) method. The full sample contains 222,371 firm-years and 18,175 firm clusters.

Panel A: Full Sample				
Dependent Variable	Positive Cash Flow Shocks Δ	Negative Cash Flow Shocks Δ	Positive – Negative Cash Flow Shocks	R^2
Capital Expenditures Δ	0.0220 (0.0826)	– 0.0010 (0.9125)	0.0230 (0.0133)	0.44
Acquisitions Δ	0.0382 (0.0350)	0.0433 (0.0291)	– 0.0051 (0.7388)	0.23
Asset Sales Δ	0.0005 (0.7745)	– 0.0034 (0.0006)	0.0039 (0.0553)	0.17
Equity Issues Δ	0.0004 (0.9428)	– 0.0101 (0.0190)	0.0105 (0.1203)	0.39
Share Repurchases Δ	0.0227 (0.0001)	0.0098 (0.0046)	0.0129 (0.0339)	0.15
Dividends Δ	0.0127 (0.0001)	– 0.0009 (0.5121)	0.0136 (0.0001)	0.15
Δ Long-term Debt Δ	– 0.2000 (0.0001)	– 0.1588 (0.0033)	– 0.0412 (0.2858)	0.21
Δ Short-term Debt Δ	– 0.3848 (0.0001)	– 0.4290 (0.0001)	0.0442 (0.3692)	0.40
Δ Cash Balances Δ	0.3205 (0.0001)	0.3474 (0.0001)	– 0.0269 (0.0001)	0.42

Table 10 (contd.)

Dependent Variable	Positive Cash Flow Shocks t			Negative Cash Flow Shocks t			Positive – Negative Cash Flow Shocks t		
	Un-constrained	Partially Constrained	Constrained	Un-constrained	Partially Constrained	Constrained	Un-constrained	Partially Constrained	Constrained
Capital Expenditures t	0.0305 (0.0805)	0.0020 (0.9048)	-0.0025 (0.9111)	0.0084 (0.5169)	-0.0048 (0.6534)	0.0062 (0.8505)	0.0221 (0.3201)	0.0068 (0.4629)	-0.0087 (0.8460)
Acquisitions t	0.0744 (0.0584)	0.0196 (0.2165)	0.0122 (0.5848)	0.0527 (0.1400)	0.0318 (0.0428)	0.0860 (0.0195)	0.0217 (0.5289)	-0.0122 (0.5395)	-0.0738 (0.0990)
Asset Sales t	-0.0010 (0.6193)	-0.0008 (0.6329)	-0.0034 (0.1795)	0.0009 (0.7633)	-0.0049 (0.0099)	-0.0206 (0.1034)	-0.0020 (0.6211)	0.0041 (0.1522)	0.0172 (0.1578)
Equity Issues t	0.0015 (0.8960)	-0.0011 (0.7832)	-0.0081 (0.0526)	-0.0101 (0.1448)	-0.0103 (0.0330)	0.0086 (0.1924)	0.0116 (0.3993)	0.0091 (0.0439)	-0.0167 (0.0287)
Share Repurchases t	0.0305 (0.0031)	0.0109 (0.0784)	0.0044 (0.0713)	0.0066 (0.3103)	0.0092 (0.0013)	0.0113 (0.0046)	0.0239 (0.0152)	0.0017 (0.7688)	-0.0069 (0.1316)
Dividends t	0.0152 (0.0011)	0.0066 (0.0035)	0.0059 (0.0742)	-0.0019 (0.4431)	-0.0010 (0.4121)	0.0063 (0.1329)	0.0171 (0.0020)	0.0076 (0.0071)	-0.0005 (0.9272)
Δ Long-term Debt t	-0.1673 (0.0410)	-0.1337 (0.0047)	-0.4396 (0.0001)	-0.2910 (0.0001)	-0.0861 (0.1774)	-0.1952 (0.2221)	0.1238 (0.0802)	-0.0476 (0.3229)	-0.2445 (0.1585)
Δ Short-term Debt t	-0.3179 (0.0001)	-0.4801 (0.0001)	-0.3517 (0.0001)	-0.2573 (0.0001)	-0.5501 (0.0001)	-0.2461 (0.0554)	-0.0606 (0.1992)	0.0700 (0.3087)	-0.1056 (0.4369)
Δ Cash Balances t	0.3648 (0.0001)	0.3452 (0.0001)	0.1772 (0.0001)	0.3768 (0.0001)	0.3134 (0.0001)	0.4369 (0.0001)	-0.0120 (0.0043)	0.0318 (0.0001)	-0.2597 (0.0001)
Firm-Years	55,592	111,186	55,593						
Firm Clusters	8,645	15,532	13,105						