Mispricing, Costly External Finance, and the Use of Cash Flow *

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ABSTRACT

We investigate the interplay between firm mispricing, costly external finance, and the allocation of cash flow across various uses, including investment, cash holdings, and financing activities. We outline a model to study how mispricing affects the allocation of cash flow. The model predicts that when firms are undervalued (overvalued), they allocate more (less) cash flow to investment and cash holdings, and use less (more) cash flow to replace costly external finance. Our empirical results confirm these predictions. In addition, consistent with the premise that debt is less likely to be mispriced than equity, we find that the substitution between debt financing and cash flow is weaker than that between equity financing and cash flow.

***JEL classification*:** G31, G32

***Keywords*:** Cash flow, misvaluation, financial constraints, investment, cash holdings, external finance

I. Introduction

Traditional financial theory assumes perfect capital markets in which rational corporate investment decision-making is determined by the economic profitability of projects, irrespective of the sources of financing used (Modigliani and Miller, 1958). In other words, the availability of internal funds is irrelevant to corporate managers when making investment decisions. However, in a world where financing frictions may force firms to pass up profitable opportunities, the sources of financing become relevant.[1] Recognizing the internal and external funds cost differential can create a potential relevance of the availability of internal funds for corporate decisions, numerous studies document that firms make use of the availability of internal funds for various corporate policies – i.e. the cash flow sensitivity of various corporate policies.[2]

There is also a growing literature documenting that capital market is not merely a sideshow for real economic activity. Rather, firms' financing and investment activities are affected by firm valuations, especially if these valuations are perceived as misvaluations.[3] A firm misvaluation, to the extent that it relates to the wedge between the cost of internal and external finance, should not only influence a firm's external financing decision but also affect its reliance of internal funds for various uses.

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[1] See e.g., Myers and Majluf (1984), Jensen and Meckling (1976), and Myers (1977).

[2] Among others, firms are found to rely on their internal cash flow for corporate investment (Fazzari, Hubbard, and Petersen, 1988; Kaplan and Zingales, 1997; and Cleary, 1999 and 2006), for corporate liquidity (Almeida, Campello and Weisbach, 2004), and for reducing external financing (Myers and Majluf, 1984; Almeida and Campello, 2010; and Shyam-Sunder and Myers, 1999), suggesting cash flow sensitivities of various corporate policies.

[3] Among others, Baker, Stein, and Wurgler (2003), Barro (1990), Chirinko and Schaller (2001), Gilchrist, Himmelberg, and Huberman (2005), Hau and Lai (2012), Polk and Sapienza (2009), and Stein (1996) document that stock overvaluation is positively associated with corporate investment, suggesting a positive investment–misvaluation sensitivity. Baker, Stein, and Wurgler (2003), Baker and Wurgler (2002), Dong, Hirshleifer, and Teoh (2012), Graham and Harvey (2001), Hovakimian, Opler, and Titman (2001), Loughran and Ritter (1995), and Jung, Kim, and Stulz (1996) find that equity overvaluation is positively related to the use of external finance, implying a positive external finance–misvaluation sensitivity. Campello and Graham (2013) shows that constrained non-tech firms save more cash in response to misvaluation during the tech bubble, suggesting a positive cash-misvaluation sensitivity. Baker, Ruback, and Wurgler (2007) provide a comprehensive survey on how firm misvaluation affects corporate policies. Baker and Wurgler (2011) provide an updated survey.

This paper attempts to explore how the allocation of internal cash flow across various uses responds to capital market misvaluation. We present a model to illustrate the interdependence of a firm's corporate policies subject to the cash flow identity, namely, that the uses of cash must equal to the sources of cash.[4] The model assumes that there are deadweight costs of both current and future external financing. Misvaluation affects the wedge between the cost of internal and current external financing and firms can take advantage of misvaluation through market timing. The model predicts that investment and cash holdings respond positively to positive cash flow shocks, but current external financing responds negatively. Moreover, as firms become more undervalued (overvalued), firms decrease (increase) current external financing, investment, and cash holdings. Importantly, misvaluation affects the allocation of cash flow among its various uses. We show that under plausible conditions, undervalued firms substitute a smaller amount of external financing with an additional dollar of cash flow, and plough more into investment and cash holdings.

At first glance, the weaker (stronger) substitution between internal and external funds for an undervalued (overvalued) firm may appear counter-intuitive because the pecking order and the market timing theories of capital structure suggest that an undervalued (overvalued) firm will take advantage through market timing by repurchasing underpriced (issuing overpriced) equity (Dittmar 2000; Loughran and Ritter, 1995, 1997; and Baker and Wurgler, 2002). An undervalued (overvalued) firm should have a stronger (weaker) incentive to reduce its

[4] In our model, the uses of funds include investment and cash holding, whereas the sources of funds include the internal cash flow and externally raised funds. In other words, our model allows interdependence between investment, cash holdings, and financing decisions and requires that these decisions be simultaneously made by a manager who maximizes a shareholder objective function. By doing so, our paper addresses the concern of Tobin (1988) who argues "*... 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.*"

dependence on external funds, leading to a stronger (weaker) substitution, or equivalently, more (less) negative relation between internal and external funds.

However, although corporate managers time the market when making financing decision (Graham and Harvey, 2001), market timing may not be managers' primary objective. Rather, firms may utilize their financial flexibility to make interdependence financial decisions in response to capital market misvaluation to ensure funding is available when profitable opportunities arise. Our model predictions are consistent with this firm's objective: firms adjust simultaneously the allocation of their internal liquidity across various uses in response to capital market misvaluation to ensure investments can be made when profitable opportunities arise. In periods of undervaluation (overvaluation) when external funds are more costly (cheaper), firms would rely more (less) on internal funds for current investment and for cash carry forward to safeguard their future investment opportunity. Therefore, more (less) internal cash flow is allocated to these uses and less (more) is left for the reduction of external finance, leading to a weaker (stronger) cash flow sensitivity of external finance.

We test our model empirical implications by examining the effect of misvaluation on cash flow sensitivities and find that the allocation of cash flow significantly differs between overvalued and undervalued firms. After we partition firm-years into three groups using the market-to-book ratio, we find that firms with low market-to-book ratios, which are likely to be undervalued, on average spend about 21 cents out of each additional dollar of cash flow on investment and add about 33 cents to cash balances. In contrast, firms with high market-to-book ratios (overvalued firms) invest 10 cents and increase cash holdings by 16 cents in response to a one-dollar increase in cash flow. For undervalued firms, cash flow is allocated away from another use, namely, reducing equity financing. Undervalued firms use only 10 cents out of every additional dollar of cash flow to reduce equity financing, compared to 49 cents for overvalued firms. This last result is consistent with the implications of our model. Interestingly, overvalued firms reduce debt financing less than undervalued firms with extra dollar of cash flow; we show that such a result is consistent with our model if debt is less mispriced than equity.

Overall, our results suggest that firms can flexibly adjust the allocation of their internal liquidity across various uses in response to changes in capital market misvaluation to ensure profitable investments can be made. We draw similar inferences based on alternative proxies for misvaluation, such as future realized stock returns (Baker, Taliaferro, and Wurgler, 2006) and nonfundamental components of the market-to-book ratio employed by Rhodes-Kropf, Robinson, and Viswanathan (2005) and Dong et al. (2006).

Finally, our findings also contribute to the literature on the effect of financial constraints on the cash flow sensitivities of corporate policies. One of the criticisms of this literature is that the measures of financial constraints in the literature are not very reliable, since firms labeled as "financially constrained" often seem to have adequate access to external finance (Kaplan and Zingales, 1997, 2000). Equity misvaluation, to the extent that it relates to the wedge between the cost of internal and external finance, is arguably a less controversial measure of a (time-varying) financial constraint. All our results are consistent with this interpretation.

The rest of this paper is organized as follows. Section II presents a model that illustrates how mispricing and costly external finance jointly impact the allocation of internally generated cash flow. Our sample and empirical methodology are described in Section III. Empirical results are reported Section IV. Robustness checks are performed in Section V. Section VI concludes the paper.

II. Model

The model we outline below is similar to the reduced form models of Froot, Scharfstein, and Stein (1993), Kaplan and Zingales (1997), and Stein (2003). We extend their models in three ways. First, we allow for firm misvaluation, which also affects the deadweight cost of external financing. Firms can take advantage of misvaluation through market timing. Second, we extend their models to two periods in order to accommodate firms' need to carry cash forward to safeguard future investment when they face uncertain future cash flows and costly external financing. Third, in Section II.D we distinguish between debt and equity financing by assuming while both debt and equity can be misvalued, misvaluation influences the cost of debt issuances to a lesser extent.

We assume that a firm needs to allocate cash flow to three major uses: investment, addition to cash holdings, and reduction of external financing.[5] We derive how the allocation of cash flow changes in response to misvaluation. It is worth highlighting that the propositions are derived under the constraint that sources of cash equal uses of cash constraint and that all corporate policies (i.e., investment, cash holdings, and external financing) are determined jointly and simultaneously.

A. Structure

We consider a two-dated model where the dates are indexed by time 0 and 1. A firm is endowed with assets in place that generate cash flows c_0 and c_1 net of dividend at time 0 and 1, respectively. c_0 is known at time 0 and the value of c_1 reveals at time 1. Specifically, $c_1 = c_H$, with probability p, and $c_1 = c_L < c_H$, with probability $1 - p$.

[5] For simplicity, our model does not include dividend payouts and assumes cash flow to be after dividend payment. Our results are unaffected if we assume dividends to be a fixed fraction of cash flows. Our empirical analysis does not find dividends to be very sensitive to cash flows or misvaluation measures.

The firm can choose a level of investment I_0 at time 0. The present value of cash flow from the time 0 investment is given by $f(I_0)$, where f is an increasing and concave function of I_0.[6] We assume that any profits from investment at time 0 are realized after time 1, so that the investment made at time 0 does not affect the internally generated cash flow at time 1.[7] In addition to the time 0 investment opportunity, the firm also has an investment opportunity at time 1 with probability q. Upon its arrival, the time 1 investment opportunity requires a fixed level of investment I_1 and generates a present value of cash flow $g(I_1)$. We assume $c_L < I_1 < c_H$ so that, there is at least one state of the world, the firm cannot finance its time 1 investment opportunity solely by its internally generated cash flow at time 1 (c_1). We also assume that the firm invests in the time 1 investment opportunity upon its arrival.

The firm has access to external capital markets. It can raise external financing by issuing securities or it can repurchase securities from capital markets at time 0. The dollar amount of net external financing at time 0 is given by X_0, where $X_0 > 0$ ($X_0 < 0$) denotes the amount of net external financing raised (reduced). For brevity, we do not distinguish here between debt and equity financing so that X_0 can be considered as the sum of debt and equity financing. In Section II.D we consider debt and equity financing separately and allow equity to be more mispriced than debt.

Raising (reducing) external financing imposes (alleviates) deadweight costs, which include agency costs caused by information asymmetry and transaction costs in issuances.[8] The deadweight costs of external finance at time 0 is represented by the function $h(\theta, X_0)$. We

[6] Net working capital investment can be easily accommodated by assuming that it is proportional to capital investment. Moreover, without loss of generality and for notational simplicity, we assume the risk-adjusted discount rate to be equal to zero, so that f represents the present value of the project.
[7] Almeida, Campello, and Weisbach (2004) make the similar assumption in their model to ensure exogeneity of cash flow at time 1.
[8] See among others, Myers and Majluf (1984), Myers (1984), Krasker (1986), and Greenwald, Stiglitz and Weiss (1984) for the deadweight cost of equity and Myers (1977) for the deadweight cost of debt.

assume h is increasing and convex in X (i.e. $h_X > 0$ and $h_{XX} > 0$).[9] The value of external capital can be mispriced by the capital markets at time 0. Yet, such mispricing will be corrected at time 1. We denote by θ the net per dollar unit of mispricing at time 0, with positive (negative) values of θ corresponding to overvaluation (undervaluation).[10] θ can influence the firm's financial policy in two ways. First, the firm can take advantage of market timing by issuing overpriced (repurchasing underpriced) external capital (e.g., Stein 1996; and Baker, Stein, and Wurgler 2003). The benefit of market timing is captured by θX_0. Second, θ can affect the deadweight cost of external finance, $h(\theta, X_0)$. Intuitively, overvaluation (undervaluation) may alleviate (aggravate) the deadweight cost of external capital (Baker and Wurgler 2002). Therefore, we assume $h_\theta < 0$, $h_{\theta X} < 0$, and $h_{\theta XX} < 0$.[11] Note that a firm would not always issue (repurchase) external capital when it is overpriced (underpriced) in this setting. A firm with good projects but insufficient cash flow may issue securities even when it is undervalued, just as a firm with high deadweight costs may decide to retire overvalued external capital in the absence of good projects.

The firm also has access to external capital markets at time 1. We denote X_1 and $h_1(X_1)$ as the amount of external financing at time 1 and its corresponding deadweight cost function, which

[9] Following the convention, we use a function x with subscript y to represent the partial derivative of x with respect to y. For notational simplicity, we use the subscript X to represent the partial derivative of X_0. A convex cost function is widely used in the literature (e.g. Froot, Scharstein, and Stein 1993; Froot and Stein 1998; Kaplan and Zingales 1997; Stein 1997; and Stein 2003). Altinkilic and Hansen (2000) show that external costs of financing consist of both a fixed cost and a convex variable cost. Leary and Roberts (2005) show that the observed dynamics of the leverage ratio is consistent with a cost function of external finance that has both a fixed and an increasing and weakly convex component.

[10] θ is net of the price-pressure effect (Stein 1996) caused by the issuance or retirement of external funds. In other words, we can denote Θ as the gross per dollar unit of mispricing and δ as the per dollar price pressure. $\delta > 0$ ($\delta < 0$) for $X > 0$ ($X < 0$). The net per dollar unit of mispricing is given by $\theta = \Theta - \delta$.

[11] This assumption implies that overvaluation can alleviate the deadweight costs of external financing by "flattening" the deadweight cost curve – i.e. holding other things constant, the increase in deadweight costs caused by an increase in external financing of overvalued firms is always lower than that of undervalued firms.

is increasing and convex in X_1, respectively. Since mispricing is resolved at time 1, θ does not have any direct impact on h_1.

In order to facilitate the time 1 investment, I_1, the firm can carry a cash balance C forward from time 0 to 1. However, carrying a cash balance is costly because it could induce agency problems which reduce firm's value (e.g., Jensen and Meckling 1976 and Jensen, 1986). Moreover, the fact that the corporate tax rate is generally higher than the personal tax rate paid on income tax further reduces firm's value of holding cash (Faulkender and Wang, 2006). The cost of carrying cash balance is represented by a cost function $\pi(C)$. We assume that π is an increasing and convex function of C. Moreover, we assume that the firm will distribute all the unused cash to its shareholders at time 1.[12]

B. Analysis

At time 0, the firm's manager, acting in the interest of the existing shareholders, chooses the level of investment I_0, the amount of external financing X_0, and the cash balance C to carry forward from time 0 to 1. At time 1, if the investment opportunity does not arrive, the firm will distribute all the unused cash to its shareholders. If the investment opportunity arrives at time 1 and if $c_1 = c_L$, given the cash balance C carried forward from time 0, the manager will raise external financing $X_1 = I_1 - c_L - C$ to finance the investment.[13] On the other hand, if $c_1 = c_H$, the manager will invest and distribute all the unused cash $c_H + C - I_1$ to the shareholders.

[12] This assumption is merely for simplicity. Our results will not change if we allow the firm to reduce its external financing at time 1 using the unused cash.

[13] There are two points worth noting. First, since carrying cash forward from time 0 to time 1 is costly and the value of c_L is known by the manager, the manager will not carry a cash balance more than what the firm actually needs (i.e. $C \leq \bar{I} - c_L$). Second, it is assumed that the firm will invest in the time 1 investment opportunity upon its arrival. This assumption implies $g(I_1) \geq h_1(I_1 - c_L)$.

The manager makes optimal investment and financing decisions (I_0, X_0, C, X_1) that maximize the following objective function:

$$\max_{I_0,X_0,C,X_1} f(I_0) - h(\theta, X_0) + \theta X_0 - I_0 + E[\hat{g}(I_1)] - E[\hat{h}_1(X_1)] - \pi(C), \tag{1a}$$

s.t.,

$$I_0 + C = c_0 + X_0, \tag{1b}$$

and,

$$X_1 = I_1 - c_L - C \qquad \text{for } c_1 = c_L, \tag{1c}$$

$$X_1 = 0 \qquad \text{for } c_1 = c_H, \tag{1d}$$

where,

$$E[\hat{h}_1(X_1)] = q\big((1-p)h_1(X_1) + p(I_1 - c_H - C)\big), \tag{1e}$$

$$E[\hat{g}(I_1)] = (1-q)(\bar{c}_1 + C) + q(g(I_1) - I_1), \tag{1f}$$

$$\bar{c}_1 = pc_H + (1-p)c_L. \tag{1g}$$

Equation (1a) represents the expected total (both time 0 and 1) payoffs of the firm. Equation (1b) is the cash flow identity that uses of cash equal sources of cash at time 0. Note that a one-dollar increase in cash flow c_0 can be used to increase the current investment I_0, add to cash carried over to the next period C, or reduce external finance X_0. Equations (1c) and (1d) indicate the optimal amount of external financing at time 1 in different states of the world. Equations (1e)-(1g) are, respectively, the expected time 1 values of the deadweight cost of external financing, shareholders' total payoff, and cash flow.[14]

[14] If the time 1 investment opportunity arises (with probability q), the firm will need to seek for external financing if the state of time 1 cash flow is low (with probability $1-p$), otherwise the firm can self-finance the time 1 investment. The expected net cost of external financing is therefore represented by equation (1e). The expected time

The first-order conditions (*FOCs*) of equation (1) are:

$$f'(I_0^*) = h_X(\theta, X_0^*) + 1 - \theta, \tag{2}$$

and

$$h_X(\theta, X_0^*) - \theta = -\pi'(C^*) + q(1-p)h_1{}'(X_1^*) + 1 - q(1-p). \tag{3}$$

Equation (2) states that the marginal benefit (the left-hand side term) from a one-dollar increase in time 0 investment is equal to the net marginal cost (the right-hand side terms) of external finance.[15] Using equations (2) and (3), we have:

$$f'(I_0^*) - 1 + \pi'(C^*) = q(1-p)h_1{}'(X_1^*) + 1 - q(1-p), \tag{4}$$

Equation (4) indicates that the firm allocates funds across time by choosing the optimal level of cash holdings C, which equates the marginal costs (the left-hand side terms) of cash savings at time 0 and the expected marginal benefits (the right-hand side terms) at time 1. The marginal costs of cash savings include the marginal time 0 investment profits foregone and the cost of carrying cash forward from time 0. The expected marginal benefits include the reduction in the marginal cost of external financing at time 1 when both the investment opportunity and the unfavorable financial condition (i.e. $c_1 = c_L$) arise, and the expected marginal value of cash returned to shareholders at time 1.

C. Misvaluation, Corporate Policies, and Cash Flow Sensitivity

In this section, we derive a proposition illustrates how a firm allocates its internal cash flow among various uses in response to capital market mispricing. For simplicity and tractability, we approximate the functions $f(I_0)$, $h(\theta, X_0)$, $\pi(C)$, and $h_1(X_1)$ using a second order Taylor series

1 total payoffs of shareholders is given by equation (1f), that is, with probability q the firm will invest I_1 and get $g(I_1)$, and with probability $1-q$ the firm will keep the cash which has the expected value of $\bar{c}_1 + C$.

[15] For $X_0 < 0$, the right-hand side terms of equation (2) represent the marginal benefit of security repurchases, while the left-hand side term represents the foregone marginal profits. To facilitate discussion of the subsequent results, we focus on the case of $X_0 > 0$, but analogous arguments apply for $X_0 < 0$.

expansion near the optimal corporate policies $(I_0^*, X_0^*, C^*, X_1^*)$ for a given set of values: $(\theta, c_0, c_1, q, p$ and $I_1)$. This assumption essentially assumes away the third order effects caused by the change in optimal policies.[16]

Prior studies document external financing costs resulting from capital market frictions create potential relevance of internal funds for various corporate policies. Using *FOCs* (2) and (3), we can derive the following properties of cash flow sensitivities (see Appendix A.1 for proofs):

$$\text{(a) } \frac{dX_0^*}{dc_0} < 0, \text{ (b) } \frac{dI_0^*}{dc_0} > 0, \text{ and (c) } \frac{dC^*}{dc_0} > 0. \qquad (5)$$

In the presence of deadweight costs of external financing, a firm would respond to an increase in cash flow by substituting for external finance (Result 5(a)), increasing investment (Result 5(b)), and saving more cash out of cash flow (Result 5(c)). These results are derived because the firm optimally allocates cash flow to equate the marginal returns across different uses.

Previous studies also document that firm misvaluation has significant effects on various corporate policies. The following properties of mispricing sensitivities can be derived using *FOCs* (2) and (3) (see Appendix A.2 for proofs):

$$\text{(a) } \frac{dX_0^*}{d\theta} > 0, \text{ (b) } \frac{dI_0^*}{d\theta} > 0, \text{ and (c) } \frac{dC^*}{d\theta} > 0. \qquad (6)$$

Result 6(a) suggests that a firm would raise additional external financing when it is more overvalued. Firm overvaluation also increases investment through the external financing channel (Result 6(b)). A firm would also hoard more cash when it is more overvalued (Result 6(c)).

Firm misvaluation affects the cost of external finance, and thus influences the wedge between the cost of internal and external finance. As a result, misvaluation should not only impact corporate policies directly as described in results 6(a)-6(c), but also affect corporate

[16] Alternatively, we can think of the production and costs functions are in quadratic form.

policies indirectly through influencing firms' reliance on internal funds across different uses. We now illustrate how misvaluation affects the allocation of internal cash flow across its various uses as follows

Proposition 1. *Suppose the functions* $f(I_0)$, $h(\theta, X_0)$, $\pi(C)$ *and* $h_1(X_1)$ *are approximated by a second order Taylor series expansion near the optimal corporate policies* $(I_0^*, X_0^*, C^*, X_1^*)$. *Then the impact of mispricing on the cash flow sensitivities has the following properties*:

$$\text{(a) } \frac{d}{d\theta}\left(\frac{dX_0^*}{dc_0}\right) < 0, \text{ (b) } \frac{d}{d\theta}\left(\frac{dI_0^*}{dc_0}\right) < 0, \text{ and (c) } \frac{d}{d\theta}\left(\frac{dC^*}{dc_0}\right) < 0.$$

Proof: See Appendix A.3.

Proposition 1 suggests that in periods of undervaluation (overvaluation) when external funds are more costly (cheaper), firms would rely more (less) on internal funds for current investment and for cash carry forward to safeguard their future investment opportunity (Proposition 1(b) and (c)). Therefore, more (less) internal cash flow is allocated to these uses and less is left for the reduction of external finance, leading to a weaker (stronger) cash flow sensitivity of external finance (Proposition 1(a)).

Intuition suggests that when a firm is perceived to be undervalued (overvalued), it should have a stronger (weaker) incentive to reduce its dependence on external funds, leading to a stronger (weaker) substitution, or equivalently, more (less) negative relation between internal and external funds. However, Proposition 1 shows that a more undervalued firm will allocate more to investment and cash holding (the latter representing the allocation to investment in the next period) than to the substitution of external finance. In other words, an increase in liquidity will have a stronger effect on investment when the firm is undervalued - i.e. firms may utilize their financial flexibility to make interdependence financial decisions in response to capital market misvaluation to ensure funding is available when profitable opportunities arise.

D. Separating Debt and Equity Financing

So far, we have ignored the difference between debt and equity as external capital and assumed that both debt and equity can be mispriced. There is extensive literature on equity misvaluation, but the research on debt misvaluation is rather limited. Previous studies (e.g., Flannery, 1986; and Wittenberg-Moerman, 2009) have suggested that long-term debt is subject to information asymmetry, which leaves the possibility that debt can be mispriced. However, it can be argued that debt is less likely to be mispriced than equity, because debt is generally easier to price than equity (i.e., the main uncertainty regarding the future cash flows is the probability of default) and because participants in the debt markets are usually sophisticated institutional investors.[17] We now distinguish between debt and equity and assume that mispricing affects equity more than debt.

We denote E_i and D_i, for $i = 0$ or 1, as the level of time i equity and debt finance, and $h(\theta, E_0)$, $h_1(E_1)$, $r(\theta, D_0)$, and $r_1(D_1)$ as the time 0 and 1 equity and debt deadweight cost functions, respectively. Similar to the equity cost functions, r and r_1 are assumed to be increasing and convex in D.[18] In this subsection, θ is the net per dollar unit of time 0 equity mispricing. To the extent that θ influences a firm's value, it also affects the cost of debt issuance.

[17] Consistent with this prediction, Chang, Chen, and Hilary (2010) find that the benefits of timing equity issuance are more pronounced than the benefits of timing debt issuance.

[18] The increasing and convex features of r and r_1 capture the idea that the marginal effect of the expected cost of default increases with the level of debt. Moreover, Altinkilic and Hansen (2000) show that debt and equity issuance costs consist of both a fixed cost and a convex variable cost, though the convexity of debt issuance cost is much weaker than that of equity issuance cost.

Consistent with the shape of the equity deadweight cost function, we assume $r_\theta < 0, r_{\theta D} < 0$, and $r_{\theta DD} < 0$. Under these assumptions, we derive the following proposition.

Proposition 2. *Suppose all production and cost functions are approximated by a second order Taylor series expansion near the optimal corporate policies. Then the impact of mispricing on the cash flow sensitivity of investment and cash has the following properties*:

$$\text{(a) } \frac{d}{d\theta}\left(\frac{dI_0^*}{dc_0}\right) < 0, \text{ and (b) } \frac{d}{d\theta}\left(\frac{dC^*}{dc_0}\right) < 0.$$

If the influence of equity mispricing on the marginal cost of debt is sufficiently small (i.e., *if* $r_{\theta DD}$ *approaches zero*), *then the impact of mispricing on the cash flow sensitivity of equity and debt issuances has the following properties*:

$$\text{(c) } \frac{d}{d\theta}\left(\frac{dE_0^*}{dc_0}\right) < 0, \text{ and (d) } \frac{d}{d\theta}\left(\frac{dD_0^*}{dc_0}\right) > \frac{d}{d\theta}\left(\frac{dE_0^*}{dc_0}\right).$$

Proof: See Appendix A.4.

Intuition suggests that the cost of debt is less likely to be influenced by mispricing because debt is generally easier to price than equity and participants in the debt market are generally sophisticated institutional investors. Proposition 2 suggests that to the extent that debt is less mispriced than equity, the substitution between debt financing and cash flow is weaker than that between equity financing and cash flow as equity becomes more overvalued.

III. Data, Variables, Summary Statistics, and Empirical Methodology

A. Data

Our sample consists of firms listed in the Compustat Industrial Annual files over a four-decade period from 1971 to 2011. We start the sample in 1971 because the flow-of-funds (the cash flow statement) data is available in Compustat only beginning in 1971. We follow Frank and Goyal (2003) and Almeida and Campello (2010) and use the flow-of-funds data to define variables in the cash flow identity.[19] Data on stock prices and returns are retrieved from the Center for Research on Security Prices (CRSP) files. Dollar values are converted into 2000 constant dollars using the GDP deflator.

We discard observations from financial institutions (SIC codes 6000-6999), utilities (SIC codes 4900-4999), not-for-profit organizations, and government enterprises (SIC codes greater than 8000).[20] We require firms to provide valid information on their total assets, sales growth, market capitalization, changes in cash holdings, investment, cash dividends, cash flow, and external financing. Also excluded are firm-years for which the market value of assets is less than $1 million, those displaying asset growth exceeding 100%, and those with annual sales lower than $1 million to minimize the sampling of financially distressed firms.[21] Furthermore, to ensure that the cash flow identity (defined in Section III.B) holds in our data, we exclude observations with the absolute value of the difference between the left-hand and right-hand sides of the cash flow identity greater than 0.01.[22] These screens leave us with an unbalanced sample panel that consists of 73,366 firm-year observations (11,818 firms).

[19]As a result, we only consider security issuance activities that generate actual cash flow from the capital markets into the firm and vice versa. As suggested by Fama and French (2005), the issuance activities generating no cash flow to the firm, such as granting shares to employees or financing acquisitions with stock, are excluded from our analysis.

[20] Utility firms, not-for-profit organizations, and government enterprises are excluded because they are heavily regulated. We discard financial firms because their financing decisions are likely affected by different factors (e.g., capital adequacy regulations) than nonfinancial firms.

[21] Very small firms (with the market value of assets or sales less than $1 million) are removed because they have severely limited access to public markets. Our results are essentially unchanged if we increase the cutoff for defining very small firms from $1 million to $5 million. Firms experiencing extremely high growth are eliminated because they are typically involved in major corporate events, such as mergers and acquisitions.

[22] For around 1% of our observations, the absolute value of the difference between the left-hand and right-hand sides of equation (1) exceeds 0.01. This is mainly due to rounding errors, misrecorded data, and winsorization. In particular, winsorization leads to a mild violation of the cash flow identity because not all flow-of-funds variables are winsorized at the same time in a given firm–year.

B. Variables in the Cash Flow Identity

Our empirical analysis critically hinges upon the following cash flow identity defined using flow-of-funds data of Compustat:

$$Inv_t + \Delta Cash_t + Div_t - \Delta X_t = CF_t, \tag{7}$$

where the uses of funds include investment (*Inv*), the change in cash holdings ($\Delta Cash$), and cash dividends (*Div*). The sources of funds comprise the internally generated cash flows (*CF*) and external financing (ΔX). -ΔX can be regarded as reduction in external financing or a use of funds. External financing can be further decomposed into the net debt issuance (ΔD) and the net equity issuance (ΔE):

$$\Delta X_t = \Delta D_t + \Delta E_t .$$

According to Compustat data manuals, the definitions of variables in the cash flow identity vary depending on which format code a firm follows in reporting the flow-of-funds data. Effective for fiscal years ending July 15, 1988, Statement of Financial Accounting Standards (SFAS) #95 requires U.S. companies to report the Statement of Cash Flows (format code = 7). Prior to the adoption of SFAS #95, companies may have reported one of the following statements: Working Capital Statement (format code = 1), Cash Statement by Source and Use of Funds (format code = 2), and Cash Statement by Activity (format code = 3). Appendix B details the construction of variables in equation (7) based on different format codes of flow-of-funds data.

Following recent studies on cash flow sensitivities (e.g., Bushman, Smith, and Zhang, 2011; Gatchev, Pulvino, and Tarhan, 2010), we define cash flow (*CF*) as the operating cash flows, net of the change in working capital. Bushman, Smith, and Zhang (2011) argue that the cash flow measure used almost universally in the investment-cash flow literature is actually earnings before depreciation, which contains a true cash component (operating cash flows) and a non-cash component in the form of working capital accruals. They find that the investment-cash flow sensitivity documented in previous studies is mainly due to the naturally positive correlation between investment and working capital accruals.[23] By removing the effect of the change in working capital and focusing on cash flows from operations, we mitigate the concern that our cash flow sensitivity results are driven by the correlations between the uses of funds (investment in particular) and working capital accruals.

C. *Measures of Misvaluation*

A challenging part of our analysis is to find a good proxy for firm misvaluation, especially the mispricing component or the nonfundamental component of stock prices. Following Baker, Stein, and Wurgler (2003), we start by using Q to capture mispricing. We measure Q using the market-to-book assets ratio (*MB*), defined as

$$MB = \frac{E^m - E^b + A^b}{A^b},$$

where E and A stand for equity and assets, respectively, and superscripts b and m denote book and market values.

As pointed out by Baker, Stein, and Wurgler (2003), *MB* potentially contains three sources of variation: (1) mispricing, (2) information about the profitability of investment, and (3) measurement errors arising from accounting discrepancies between book capital and economic replacement costs. Our focus is on the first of these components, but the other two can color our inferences.

[23] Since fixed assets investments normally increase firm scale, it is natural to expect corresponding increases in non-cash working capital items such as accounts receivables and inventories. However, as pointed out by Bushman, Smith, and Zhang (2011), this relation has little to do with financing constraints caused by capital market imperfections, but rather is a manifestation of increasing scale.

To mitigate the abovementioned concerns, we follow Baker, Stein, and Wurgler (2003) and Baker, Taliaferro, and Wurgler (2006) by using future realized stock returns (*FRet*), which is defined as stock returns over the next three years multiplied by -1, as an alternative proxy for stock misvaluation. The motivation behind the use of this measure is that future realized returns, as noisy estimates of future expected returns, should be at least partly determined by the extent to which stock prices currently deviate from intrinsic stock values. We multiply the return by -1 to ease the interpretation. As a result, a high (low) value of *FRet* suggests that a stock is currently overvalued (undervalued), similar to the interpretation of the market-to-book ratio (*MB*).

In addition, we decompose *MB* into the nonfundamental and fundamental components using two empirical methodologies developed by Rhodes-Kropf, Robinson, and Viswanathan (2005) and Dong et al. (2006), respectively. We then use the nonfundamental components of *MB* as direct proxies for misvaluation and document the results that are consistent with our model predictions. To save space, we outline the decomposition in Appendix C and describe the results in Section V.

D. Empirical Methodology

Our goal is to investigate the effect of misvaluation on how firms allocate cash flow across various uses. To this end, we regress various uses of cash flow on cash flow (*CF*), the mispricing proxy (*MP*), the interaction term between cash flow and the mispricing proxy, and control variables (*Y*). All the explanatory variables except cash flow are lagged one period. The regression equations are estimated with firm (f_i) and year fixed effects (y_t).

$$Inv_{it} = \alpha^{Inv} CF_{it} + \beta^{Inv} MP_{it-1} + \delta^{Inv} CF_{it} \times MP_{it-1} + \gamma^{Inv} Y_{it-1} + f_i + y_t + \varepsilon_{it}^{Inv}, \quad (8)$$

$$\Delta Cash_{it} = \alpha^{\Delta Cash} CF_{it} + \beta^{\Delta Cash} MP_{it-1} + \delta^{\Delta Cash} CF_{it} \times MP_{it-1} + \gamma^{\Delta Cash} Y_{it-1} + f_i + y_t + \varepsilon_{it}^{\Delta Cash}, \quad (9)$$

$$Div_{it} = \alpha^{Div} CF_{it} + \beta^{Div} MP_{it-1} + \delta^{Div} CF_{it} \times MP_{it-1} + \gamma^{Div} Y_{it-1} + f_i + y_t + \varepsilon_{it}^{Div}, \quad (10)$$

$$\Delta X_{it} = \alpha^{\Delta X} CF_{it} + \beta^{\Delta X} MP_{it-1} + \delta^{\Delta X} CF_{it} \times MP_{it-1} + \gamma^{\Delta X} Y_{it-1} + f_i + y_t + \varepsilon_{it}^{\Delta X}, \quad (11)$$

where the superscripts of the coefficients (α, β, δ, and γ) denote different equations.

We also decompose external finance (ΔX) into ΔD and ΔE and estimate the impact of cash flow and firm misvaluation on net debt and equity issued separately:

$$\Delta D_{it} = \alpha^{\Delta D} CF_{it} + \beta^{\Delta D} MP_{it-1} + \delta^{\Delta D} CF_{it} \times MP_{it-1} + \gamma^{\Delta D} Y_{it-1} + f_i + y_t + \varepsilon_{it}^{\Delta D}, \quad (12)$$

$$\Delta E_{it} = \alpha^{\Delta E} CF_{it} + \beta^{\Delta E} MP_{it-1} + \delta^{\Delta E} CF_{it} \times MP_{it-1} + \gamma^{\Delta E} Y_{it-1} + f_i + y_t + \varepsilon_{it}^{\Delta E}. \quad (13)$$

With a few exceptions, the literature mainly examines the response of a particular use of cash flow to cash flow innovations (for example, the sensitivity of investment or additions to cash holdings to cash flow) in isolation. Gatchev, Pulvino, and Tarhan (2010) take issue with this approach and argue that since investment and financing decisions are made jointly, subject to the constraint that cash flow must equal the uses of cash flow, the cash flow sensitivities of various uses of cash flow must add up to unity.[24] That is,

$$\alpha^{Inv} + \alpha^{\Delta Cash} + \alpha^{Div} - \alpha^{\Delta D} - \alpha^{\Delta E} = 1 \quad (14)$$

Failure to impose the constraint when estimating all the cash flow sensitivities simultaneously leads to erroneous coefficient estimates. Gatchev, Pulvino, and Tarhan (2010) show that forcing the constraint to hold leads to substantially different coefficient estimates than those obtained if the equations for various uses of cash flow are estimated as standalone equations.

Chang et al. (2013), however, show that Gatchev, Pulvino, and Tarhan (2010)'s claim is false from both theoretical and empirical perspectives. Chang et al. (2013) test models both with

[24] In other words, if internal cash flows increase by one dollar, then the change in all uses of cash flow (e.g., investment, additions to cash holdings, dividends, and equity and debt reductions) must sum to one dollar.

the constraint (14) and without. In contrast to Gatchev, Pulvino, and Tarhan (2010), Chang et al. (2013) find that imposing the constraint makes no difference. The reason is simple: When variables are consistently defined and satisfy the cash flow identity that cash flow must equal the sum of all uses of cash flow, the constraint is redundant under ordinary least squares (OLS) estimation, as long as the specifications incorporate the same set of independent variables.[25] The crucial difference between these two studies is their data sources to define the uses and sources of cash flow. Chang et al. (2013) define the uses and sources of cash flow solely from cash flow statement (flow-of-funds) data and thus cash flow identity automatically holds. However, Gatchev, Pulvino, and Tarhan (2010) define cash flow and various uses of cash flow using data from different sources, including the balance sheet, the income statements, and the cash flow statement. As a result, their sources-equal-uses identity is severely violated in the data.

Following Chang et al. (2013), we use OLS to estimate how cash flow is allocated across its various uses and how this allocation is affected by misvaluation using the single-equation framework without linear constraint that cash flow must equal the sum of all uses of cash flow.

For control variables (*Y*), we incorporate the following variables (lagged one period) in regressions. Gatchev, Pulvino, and Tarhan (2010) argue that it is indispensible to take into account the intertemporal dependencies within and across corporate decision variables. Thus we include lagged dependent variables (Inv_{t-1}, $\Delta Cash_{t-1}$, Div_{t-1}, ΔD_{t-1}, and ΔE_{t-1}) in all the equations to account for the interdependent nature of corporate policies. Additionally, the log of the book value of assets, *Ln*(*Assets*), is included as a proxy for firm size. The sales growth (*SalesG*) is included to capture a firm growth prospects. Companies with more tangible assets are expected to invest more in fixed assets and support more debt, since tangible assets can be pledged as collateral. The net PPE-to-asset ratio (*Tangibility*) is used to measure the tangibility of the firm's

[25] See Chang et al. (2013) for a detailed discussion.

assets. We also include the leverage ratio (*Leverage*), defined as total debt (the sum of short-term and long-term debt) divided by total assets. The importance of controlling for firm leverage is suggested by Lang, Ofek, and Stulz (1996), who find that investment is negatively related to leverage, particularly for highly leveraged firms and firms with low Tobin's *Q*.

E. Summary Statistics

Panel A of Table I reports summary statistics for the variables in the cash flow identity (equation (7)). The variables are deflated by the beginning-of-period total assets. Panel B of Table I reports the descriptive statistics for control variables and our main proxies for misvaluation (*MB* and *FRet*). All variables are winsorized at the top and bottom 1% of their distributions. The reported figures closely resemble those tabulated in previous studies (e.g., Frank and Goyal 2003). For brevity, we omit the discussion of these descriptive statistics

[Insert Table I here]

Table II reports the correlation coefficients between our key variables of interest. Univariate correlations indicate that investment is positively correlated with cash flow (*CF*) and external financing (ΔD and ΔE). In addition, Table II indicates a significant positive correlation between our two main proxies for misvaluation, *MB* and *FRet* (the correlation coefficient = 0.12). Both proxies are positively correlated with the uses of funds (*Inv*, $\Delta Cash$, and *Div*) and the amount of external financing (ΔX), and negatively related to internal cash flow.

[Insert Table II here]

IV. Empirical Results

A. Nonparametric Analysis

Table III illustrates how misvaluation affects the allocation of cash flow across various uses. In Panel A of Table III, firms are sorted into five groups according to *MB* and *CF*, respectively (independent sorts). The average values of the variables are reported for each *MB*–*CF* group. In Panel B, firms are sorted into five groups according to *FRet* and *CF*, respectively (independent sorts). The average values of the variables are reported for each *FRet*–*CF* group.

[Insert Table III here]

Table III suggests that investment and cash holdings increase with both misvaluation and cash flow, whereas external financing increases with misvaluation and decreases as cash flow increases. These findings are consistent with the first-order effects implied by our model (inequalities (5) and (6)). More importantly, we find that the impact of cash flow on investment (external financing) is more (less) pronounced for firms with low equity valuation. Specifically, on average investment experiences a 13-fold increase (from 1% to 13% of the beginning-of-period assets) when we move from the lowest *CF* group to the highest when firms are most undervalued (*MB* group = 1), while the increase is roughly 100% when firms are most overvalued (*MB* group = 5). External financing decreases by 10% of the beginning-of-period assets from the lowest *CF* group to the highest for *MB* group = 1, whereas it decreases by 34% of the beginning-of-period assets for *MB* group = 5. These findings are consistent with Proposition 1, which predicts that firms rely more on their internal cash flow to finance investment and the substitution between internal funds and external financing is weaker for undervalued firms.

However, the impact of cash flow on cash holdings does not display a stark difference between firms with low and high equity valuation in this nonparametric analysis.[26]

B. Independent Effects of Cash Flow and Stock Valuation on Corporate Policies

Table IV reports the results obtained by estimating standalone equations without the linear constraint that sources equal uses of cash to study the independent effects of cash flow and stock valuation on corporate policies.

[Insert Table IV here]

We document in Table IV positive investment-cash flow and cash-cash flow sensitivities and a negative external finance-cash flow sensitivity. More specifically, in response to a one-dollar increase in cash flow, investment increases by 16 cents, cash holdings increases by 22 cents, the use of debt reduces by 28 cents and the use of equity lowers by 33 cents. We also find that investment, cash holdings, and external financing increase with misvaluation. These findings are implied by first order effects in our model (inequalities (5) and (6)).

It is important to highlight that these results are obtained without simultaneously estimating the equations and without imposing any linear constraints on the estimation. As pointed out by Chang et al. (2013), as long as the cash flow identity holds (equation (7)) in the data, simultaneous-equation and single-equation estimates are identical, even for dynamic models, if the right-hand-side exogenous (e.g., *CF*) or predetermined variables (e.g., *MB* and lagged dependent variables) in all equations are the same. Thus, for the following regressions, we only reports the results using standalone equations without the linear constraint that sources

[26] For both undervalued (*MB* group = 1) and overvalued (*MB* group = 5) firms, cash holdings roughly increase by 9% of the beginning-of-period assets when we move from the lowest *CF* group to the highest.

equal uses of cash. Untabulated results show that estimating equations (8)-(13) *simultaneously* while forcing constraints (14) to hold generate the same coefficient estimates.

C. Joint Impact of Cash Flow and Stock Valuation on Corporate Policies

This section presents the results concerning the impact of misvaluation on the allocation of cash flow. We interact internal cash flows (*CF*) with our first proxy for misvaluation, the market-to-book ratio (*MB*), and add this interaction term to all the equations.

[Insert Table V here]

Consistent with Proposition 1 developed in Section II, we find that the coefficient of $CF \times MB$ is negative and significant in the investment equation (column (1) of Table V), suggesting that the investment-cash flow sensitivity increases as firms become more undervalued. This result indicates that when firm valuation decreases (increases), firms tend to rely more (less) on internal funds to finance their investment. The negative coefficient of $CF \times MB$ in column (2) of Table V reveals that when firm valuation decreases (increases), firms save more (less) cash out of internal cash flows.

In addition, we document in column (4) of Table V that the substitution between internal funds and external financing becomes weaker (stronger) as firms are more undervalued (overvalued). Intuitively, undervaluation makes external financing more costly, and thus should strengthen firms' incentive to substitute internal funds for external finance. In other words, the negative relation between internal funds and external finance are expected to become more pronounced as firms become more undervalued. However, the results in column (4) of Table V suggest that internal funds and external finance may display a weaker negative relation as firms become more undervalued.

When we break up external finance into net debt issues and net equity issues in columns (5) and (6) of Table V, an interesting result emerges. The coefficient of *CF* (-0.36) is negative and significant, while that of *CF*×*MB* (0.02) is positive and statistically significant for debt financing, implying that firms substitute internal funds for debt financing when stock valuation is low and issue debt when overvaluation and cash flows are high. In contrast, firms are found to substitute internal funds for equity financing mainly when overvaluation is high. This is consistent with Proposition 2.

To better interpret the coefficients corresponding to the impact of misvaluation on the allocation of cash flow, in Table VI we partition all firm-years into three groups (low, intermediate, and high) using *MB* and define, accordingly, three indicator variables for the level of misvaluation. The indicator for intermediate-level *MB* values represents the base case, and we introduce interactions of cash flow with a *High MB* indicator and a *Low MB* indicator. When misvaluation is low, firms allocate 21 cents (coefficient of *CF* + coefficient of *CF*×*Low* MB = 0.22 - 0.01 = 0.21) out of each additional dollar of cash flow to investment, 33 cents to additional cash holdings, 35 cents to reducing debt financing, and only 10 cents to reducing equity financing.

[Insert Table VI here]

To address the concern that *MB* is a noisy measure of misvaluation, we employ another proxy for mispricing, namely, future stock returns (*FRet*). Table VII examines the joint impact of cash flow and future stock returns on corporate policies.[27] Note that apart from *FRet*, we also control for *MB* as an additional control in all regression equations.[28] To the extent that *MB*

[27] The number of observations is reduced to 50,202, since this test requires firms to have non-missing stock returns for the next three years.
[28] As a robustness check, we also tried to include *CF*×*MB* in all regression equations reported in Table VII and found that the coefficients of *FRet* and *CF*×*FRet* are essentially unaffected by the inclusion of *CF*×*MB*.

contains a component of misvaluation, this design works against us finding any independent effect of *FRet* on corporate financial decisions.

[Insert Table VII here]

The results in Table VII are generally consistent with those in Table V. The cash flow sensitivities of investment, cash, and external finance decrease with the extent of misvaluation. In other words, in response to a decrease in misvaluation, firms rely more on internal cash flow to finance their investment and cash holdings, so that the substitution between internal fund and external finance becomes weaker.

V. Robustness Checks

Our analysis hinges critically upon identifying situations where firms are mispriced. Baker, Stein, and Wurgler (2003) suggest that *Q* (*MB*) contains both a nonfundamental component and a fundamental component. Our interest is the former, but the latter can create problems for our inferences. This section carries out a more focused test of the hypotheses derived from our model by extracting the nonfundamental component from Tobin's *Q* following two empirical methodologies, developed by Rhodes-Kropf, Robinson, and Viswanathan (2005) and Dong et al. (2006). Generally, the market-to-book ratio can be decomposed as

$$\begin{aligned} MB &= \frac{E^m - E^b + A^b}{A^b} = \frac{(E^m - v) + (v - E^b + A^b)}{A^b} = \frac{(E^m - v)}{A^b} + \frac{(v - E^b + A^b)}{A^b} \\ &= MP + VA, \end{aligned}$$

where v stands for the fundamental value of equity, E and A stand for equity and assets, respectively, and the superscripts b and m denote book and market values. Here $MP = \frac{(E^m - v)}{A^b}$ stands for the firm-level mispricing deflated by the book value of total assets, and

$VA = \frac{(v - E^b + A^b)}{A^b}$ denotes the fundamental-value-to-assets ratio, which can be viewed as a proxy for investment opportunities.

To obtain the fundamental value of equity (v), we first follow the methodology proposed by Rhodes-Kropf, Robinson, and Viswanathan (2005) and regress the logarithm of the market value of equity on the logarithm of the book value of equity, the absolute value of net income, an indicator function for negative net income observations, and the book leverage ratio. We group the firms according to the 12 Fama and French industries and run annual cross-sectional regressions for each industry. The fundamental value of equity is then the exponential of the fitted value from the regression equation. The resulting measures of mispricing and the fundamental-value-to-assets ratio are denoted MP_{RKRV} and VA_{RKRV}, respectively. Appendix C1 describes Rhodes-Kropf, Robinson, and Viswanathan's (2005) decomposition in detail.

Alternatively, we use the residual income model as in Dong et al. (2006) to compute the fundamental value of equity. In particular, we employ the Edwards-Bell-Ohlson valuation model, which calculates the fundamental value of equity by anchoring its price at the current book value of equity and adding a premium to the book value based on future residual earnings.[29] Penman and Sougiannis (1998) show that the valuation error using the residual income model is lower than both the discounted cash flow and dividend discount models. Appendix C2 details the residual income model we use. The resulting measures of misvaluation and the fundamental-value-to-assets ratio obtained using the residual income model are denoted MP_{RIM} and VA_{RIM},

[29] Frankel and Lee (1998) attribute the term Edwards-Bell-Ohlson to Bernard (1994). This technique has been used extensively to calculate fundamental values in previous studies (e.g., Frankel and Lee ,1998; Lee, Myers and Swaminathan, 1999; and Ritter and Warr, 2002). In addition, Feltham and Ohlson (1995) show that the model is equivalent to the theoretically sound dividend discount model under clean surplus accounting, which describes the situation where the change in book value is equal simply to earnings minus dividends for the given period.

respectively. The following identity holds according to the two decomposition methods described above:

$$MB = MP_{RKRV} + VA_{RKRV} = MP_{RIM} + VA_{RIM}$$

Panel A of Table VIII presents the results obtained using the decomposition proposed by Rhodes-Kropf, Robinson, and Viswanathan (2005). In Panel B of Table VIII, we consider the measures constructed based on the methodology of Dong et al. (2006). Apart from the key explanatory variables reported in Table VIII, in both panels we have also included in all regressions the same control variables as those reported in Table V. However, for brevity, the coefficients of the control variables are not tabulated, since they are very similar to those reported in Table V.

[Insert Table VIII here]

We find that the fundamental value-to-assets ratios (VA_{RKRV} and VA_{RIM}) are positive and statistically significant in all regressions, suggesting that external finance and various uses of cash are positively associated with companies' investment opportunities. Two proxies for mispricing, MP_{RKRV} and MP_{RIM}, are found to be positively related to investment, the change in cash holdings, and net debt and equity issuances. The signs of the coefficients of the interaction terms between cash flow and mispricing proxies are in line with those in Table V. Our results indicate that overvaluation mitigates the impact of financial constraints, resulting in lower investment-cash flow and cash-cash flow sensitivities. In addition, the negative relation between internal funds and external finance is weaker for firms that are more likely to be undervalued.

Finally, Polk and Sapienza (2009) and use discretionary accruals as a proxy for mispricing in examining the catering channel through which stock mispricing affects investment.[30] As a robustness check, we define discretionary accruals based on the methodology of Polk and Sapienza (2009). Untabulated results indicate that coefficients of discretionary accruals and the interaction of discretionary accruals with cash flow are generally consistent with those reported in Tables V and VII.

VI. Conclusions

We examine how firm misvaluation affects corporate policies directly as well as via its interactions with cash flow shocks. A model is presented to study the independent and joint impacts of cash flow and firm valuation on corporate policies. We find that firms use additional cash flows to substitute for external finance and increase investment and cash holdings. Overvalued firms increase investment, cash holdings, and external finance. In addition, misvaluation has important effects on the allocation of cash flow to its various uses. Our results suggest that firms allocate a higher fraction of their incremental cash flows to investment when they are more undervalued. This, in turn, implies that the balance sheet effects of monetary policy are likely to be more important under depressed stock market conditions. In contrast, undervalued firms are found to use less cash flow to replace external finance compared to overvalued firms.

[30] Accruals are defined as the difference between a firm's accounting earnings and its underlying cash flows. Discretionary accruals capture the unusual part of accruals given the underlying timing of cash flows, and so are deemed to be under managerial discretions. A large body of empirical evidence (e.g., Teoh, Welch, and Wong, 1998; and Chan et al., 2006) documents a negative relation between discretionary accruals and subsequent stock returns, suggesting that firms with high discretionary accruals are overpriced relative to otherwise similar firms.

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Appendix A. Proofs of inequalities and propositions in Section II

A.1. Proof of inequality (5)

Differentiating *FOCs* (2) and (3) with respect to c_0 yields:

$$f"\frac{dI_0^*}{dc_0} = h_{XX}\frac{dX_0^*}{dc_0} = \hat{f}"\frac{dC^*}{dc_0}, \tag{A1}$$

where, $\hat{f}" = -\pi" - q(1-p)h_1"$.

Since $f" < 0, h_{XX} > 0$, and $\hat{f}" < 0$, equation (A1) implies that $\frac{dI_0^*}{dc_0}$ and $\frac{dC^*}{dc_0}$ have the same sign, whereas, $\frac{dI_0^*}{dc_0}$ and $\frac{dX_0^*}{dc_0}$ have opposite signs. Substituting $X_0^* = I_0^* + C^* - c_0$ into *FOC* (2), differentiating it with respect to c_0 and substituting $\frac{dC^*}{dc_0}$ with $\frac{dI_0^*}{dc_0}$ using equation (A1) yield:

$$f"\frac{dI_0^*}{dc_0} = h_{XX}\left(\frac{dI_0^*}{dc_0} + \frac{f"}{\hat{f}"}\frac{dI_0^*}{dc_0} - 1\right). \tag{A2}$$

Rearranging equation (A2) yields:

$$\frac{dI_0^*}{dc_0} = \frac{-h_{XX}}{f" - h_{XX} - \frac{f"h_{XX}}{\hat{f}"}} > 0. \tag{A3}$$

Equations (A1) and (A3) imply *inequality* (5).■

A.2. Proof of inequality (6)

Differentiating *FOCs* (2) and (3) with respect to θ yields:

$$f"\frac{dI_0^*}{d\theta} = h_{\theta X} - 1 + h_{XX}\frac{dX_0^*}{d\theta} = \hat{f}"\frac{dC^*}{d\theta}. \tag{A4}$$

Equation (A4) implies that $\frac{dI_0^*}{d\theta}$ and $\frac{dC^*}{d\theta}$ have the same sign. Substituting $X_0^* = I_0^* + C^* - c_0$ into *FOC* (2), differentiating it with respect to θ, substituting $\frac{dC^*}{d\theta}$ with $\frac{dI_0^*}{d\theta}$ using equation (A4), and rearranging the terms yield:

$$\frac{dI_0^*}{d\theta} = \frac{h_{\theta X} - 1}{f" - h_{XX} - \frac{f"h_{XX}}{\hat{f}"}} > 0, \text{ since } h_{\theta X} < 0. \tag{A5}$$

Equations (A4) and (A5) imply $\frac{dC^*}{d\theta} > 0$. Based on equations (A4) and (A5), we have:

$$\frac{f"(h_{\theta X} - 1)}{f" - h_{XX} - \frac{f"h_{XX}}{\hat{f}"}} = h_{\theta X} - 1 + h_{XX}\frac{dX_0^*}{d\theta}. \tag{A6}$$

Rearranging and simplifying equation (A6) yield:

$$\frac{dX_0^*}{d\theta} = \frac{(h_{\theta X} - 1)\left(h_{XX} + \frac{f"h_{XX}}{\hat{f}"}\right)}{h_{XX}\left(f" - h_{XX} - \frac{f"h_{XX}}{\hat{f}"}\right)} > 0.■$$

A.3. Proof of proposition 1

Differentiating equation (A3) with respect to θ yields:

$$\frac{d}{d\theta}\left(\frac{dI_0^*}{dc_0}\right) = \frac{-h_{\theta XX}f"}{\left(f" - h_{XX} - \frac{f"h_{XX}}{\hat{f}"}\right)^2} < 0, \text{ since } h_{\theta XX} < 0. \tag{A7}$$

By differentiating (A1) with respect to θ, one can show that $f"\frac{d}{d\theta}\left(\frac{dI_0^*}{dc_0}\right) = \hat{f}"\frac{d}{d\theta}\left(\frac{dC^*}{dc_0}\right)$, $\frac{d}{d\theta}\left(\frac{dI_0^*}{dc_0}\right)$ and $\frac{d}{d\theta}\left(\frac{dC^*}{dc_0}\right)$ have the same sign. Using equations (A1) and (A3), we can write:

$$\frac{dX_0^*}{dc_0} = \frac{-f"}{f" - h_{XX} - \frac{f"h_{XX}}{\hat{f}"}}. \tag{A8}$$

Differentiating equation (A8) with respect to θ yields:

$$\frac{d}{d\theta}\left(\frac{dX_0^*}{dc_0}\right) = \frac{\left(-h_{\theta XX} - \frac{f"h_{\theta XX}}{\hat{f}"}\right)f"}{\left(f" - h_{XX} - \frac{f"h_{XX}}{\hat{f}"}\right)^2} < 0. ■$$

A.4. Proof of proposition 2

The manager makes optimal investment and financial decisions $(I_0, E_0, D_0, C, E_1, D_1)$ that maximize the following objective function:

$$\max_{I_0,E_0,D_0,C,D_1,E_1} f(I_0) - h(\theta, E_0) + \theta E_0 - r(\theta, D_0) - I_0 + E[\hat{g}(I_1)] - E\left[\hat{h}_1(E_1, D_1)\right] - \pi(C), \tag{A9a}$$

$$\text{s.t.,} \quad I_0 + C = c_0 + E_0 + D_0, \tag{A9b}$$

$$E_1 + D_1 = \bar{I} - c_L - C \quad \text{for } c_1 = c_L, \tag{A9c}$$

$$E_1 = D_1 = 0 \qquad \text{for } c_1 = c_H, \tag{A9d}$$

where,

$$\bar{c}_1 = pc_H + (1-p)c_L, \tag{A9e}$$

$$E\left[\hat{h}_1(E_1, D_1)\right] = q\left((1-p)\left(h_1(E_1) + r_1(D_1)\right) + p(c_H + C - I_1)\right), \tag{A9f}$$

$$E[\hat{g}(I_1)] = (1-q)(\bar{c}_1 + C) + q(g(I_1) - I_1). \tag{A9g}$$

We can interpret equations (A9a)-(A9g) in the same way as equations (1a)-(1g). The only difference between problems (1) and (A9) is that problem (A9) includes the choice of both equity and debt financing. At time 1, if the investment opportunity arrives and the cash flow is low, the firm needs to raise external capital. The optimal level of E_1^* and D_1^* are given by:

$$h_1{}'(E_1^*) = r_1{}'(D_1^*), \tag{A10}$$

$$\text{s.t. } \bar{I} = c_L + C + E_1^* + D_1^*. \tag{A11}$$

The first-order conditions (*FOCs*) of problem (A9) are:

$$f'(I_0^*) = h_E(\theta, E_0^*) + 1 - \theta, \tag{A12}$$

$$h_E(\theta, E_0^*) - \theta = r_D(\theta, D_0^*), \tag{A13}$$

$$h_E(\theta, E_0^*) - \theta = -\pi'(C^*) + q(1-p)\left(h_1{}'(E_1^*)\frac{dE_1^*}{dC^*} + r_1{}'(D_1^*)\frac{dD_1^*}{dC^*}\right) + 1 - q(1-p). \tag{A14}$$

For notational simplicity, we use the subscript E to represent the partial derivative of E_0. Using equations (A10) and (A11) and the implicit function theorem, we have:

$$\frac{dE_1^*}{dC^*} = -\frac{r_1''}{h_1''+r_1''}, \text{ and } \frac{dD_1^*}{dC^*} = -\frac{h_1''}{h_1''+r_1''}. \tag{A15}$$

Differentiating *FOCs* (A12) and (A14) with respect to c_0 yields:

$$f''\frac{dI_0^*}{dc_0} = h_{EE}\frac{dE_0^*}{dc_0} = r_{DD}\frac{dD_0^*}{dc_0} = \bar{\bar{f}}''\frac{dC^*}{dc_0}, \tag{A16}$$

Where $\bar{\bar{f}}'' = -\pi'' - q(1-p)\left(h_1''\left(\frac{dE_1^*}{dC^*}\right)^2 + r_1''\left(\frac{dD_1^*}{dC^*}\right)^2\right)$.

Substituting $E_0^* = I_0^* + C^* - c_0 - D_0^*$ into *FOC* (A12), differentiating it with respect to c_0 and substituting $\frac{dC^*}{dc_0}$ and $\frac{dD_1^*}{dc_0}$ with $\frac{dI_0^*}{dc_0}$ using equation (A16) yield:

$$f''\frac{dI_0^*}{dc_0} = h_{EE}\left(\frac{dI_0^*}{dc_0} + \frac{f''}{\bar{\bar{f}}''}\frac{dI_0^*}{dc_0} - 1 - \frac{f''}{r_{DD}}\frac{dI_0^*}{dc_0}\right). \tag{A17}$$

Rearranging equation (A17) yields:

$$\frac{dI_0^*}{dc_0} = \frac{-h_{EE}}{f''-h_{EE}-\frac{f''h_{EE}}{\bar{\bar{f}}''}+\frac{f''h_{EE}}{r_{DD}}}. \tag{A18}$$

Using equations (A16) and (A18), we have the followings:

$$\frac{dE_0^*}{dc_0} = \frac{-f''}{f''-h_{EE}-\frac{f''h_{EE}}{\bar{\bar{f}}''}+\frac{f''h_{EE}}{r_{DD}}} \tag{A19}$$

$$\frac{dD_0^*}{dc_0} = \frac{-\frac{f''h_{EE}}{r_{DD}}}{f''-h_{XX}-\frac{f''h_{EE}}{\bar{\bar{f}}''}+\frac{f''h_{EE}}{r_{DD}}}. \tag{A20}$$

Differentiating equations (A18)-(A20) with respect to θ yields:

$$\frac{d}{d\theta}\left(\frac{dI_0^*}{dc_0}\right) = \frac{-h_{\theta EE}f''-\frac{r_{\theta DD}f''h_{EE}^2}{r_{DD}^2}}{\left(f''-h_{EE}-\frac{f''h_{EE}}{\bar{\bar{f}}''}+\frac{f''h_{EE}}{r_{DD}}\right)^2}, \tag{A21}$$

$$\frac{d}{d\theta}\left(\frac{dE_0^*}{dc_0}\right) = \frac{\left(-h_{\theta EE}-\frac{f''h_{\theta EE}}{\bar{\bar{f}}''}+\frac{f''h_{\theta EE}r_{DD}-f''r_{\theta DD}h_{EE}}{(r_{DD})^2}\right)f''}{\left(f''-h_{EE}-\frac{f''h_{EE}}{\bar{\bar{f}}''}+\frac{f''h_{EE}}{r_{DD}}\right)^2}, \tag{A22}$$

$$\frac{d}{d\theta}\left(\frac{dD_0^*}{dc_0}\right) = \frac{-\frac{f''^2h_{\theta EE}}{r_{DD}}+\frac{r_{\theta DD}f''h_{EE}}{(r_{DD})^2}\left(f''-h_{EE}-\frac{f''h_{EE}}{\bar{\bar{f}}''}\right)}{\left(f''-h_{EE}-\frac{f''h_{EE}}{\bar{\bar{f}}''}+\frac{f''h_{EE}}{r_{DD}}\right)^2}. \tag{A23}$$

Note that equation (A21) is positive. By differentiating (A16) with respect to θ, one can show that $f\frac{\mathrm{d}}{\mathrm{d}\theta}\left(\frac{\mathrm{dI}_0^*}{\mathrm{dc}_0}\right) = \bar{\bar{\mathrm{f}}}\frac{d}{d\theta}\left(\frac{dC^*}{dc_0}\right)$. Therefore, $\frac{d}{d\theta}\left(\frac{dC^*}{dc_0}\right)$ is also positive. Moreover, equation (A22) is negative and equation (A23) can be positive if $r_{\theta DD}$ is sufficiently small. ■

Appendix B. Variables defined using the flow-of-funds data

Variables are defined using flow-of-funds data of Compustat. The variable definitions vary according to the format code (*scf*) a firm follows in reporting flow-of-funds data. Effective for fiscal years ending July 15, 1988, SFAS #95 requires U.S. companies to report the Statement of Cash Flows (*scf* = 7). Prior to adoption of SFAS #95, companies may have reported one of the following statements: Working Capital Statement (*scf* = 1), Cash Statement by Source and Use of Funds (*scf* = 2), and Cash Statement by Activity (*scf* = 3). Variables include the change in cash holdings ($\Delta Cash$), investment (*Inv*), the change in working capital (ΔWC), cash dividends (*Div*), cash flows (*CF*), net debt issued (ΔD), and net equity issued (ΔE). We include in parentheses the Compustat XPF variable names in italics. PPE denotes property, plant, and equipment.

Variables	*scf* = 1	*scf* = 2	*scf* = 3	*scf* = 7
Inv	capital expenditure(*capx*) + increase in investment(*ivch*) + acquisition(*aqc*) + other uses of funds(*fuseo*) - sale of PPE(*sppe*) - sale of investment(*siv*)	same as *scf* = 1	same as *scf* = 1	capital expenditure (*capx*) + increase in investment(*ivch*) + acquisition(*aqc*) - sale of PPE(*sppe*) - sale of investment(*siv*) - change in short-term investment(*ivstch*) - other investing activities(*ivaco*)
$\Delta Cash$	cash and cash equivalents increase /decrease (*chech*)	same as *scf* = 1	same as *scf* = 1	same as *scf* = 1
Div	cash dividends (*dv*)	same as *scf* = 1	same as *scf* =1	same as *scf* = 1
ΔD	long-term debt issuance(*dltis*) - long-term debt reduction(*dltr*) - changes in current debt(*dlcch*)	long-term debt issuance(*dltis*) - long-term debt reduction(*dltr*) + changes in current debt(*dlcch*)	same as *scf* = 2	same as *scf* = 2
ΔE	sale of common and preferred stock(*sstk*) - purchase of common and preferred stock(*prstkc*)	same as *scf* = 1	same as *scf* = 1	same as *scf* = 1
ΔWC	change in working capital(*wcapc*)	- change in working capital (*wcapc*)	same as *scf* = 2	-change in account receivable(*recch*) - change in inventory(*invch*) - change in account payable(*apalch*) - accrued income taxes(*txach*) - other changes in assets and liabilities (*aoloch*) - other financing activities(*fiao*)
CF	income before extra items(*ibc*) + extra items & discontinued operation(*xidoc*) + depreciation & amortization(*dpc*)+ deferred taxes(*txdc*) + equity in net loss(*esubc*) + gains in sale of PPE & investment(*sppiv*) + other funds from operation(*fopo*) + other sources of funds(*fsrco*) - ΔWC	same as *scf* = 1	same as *scf* = 1	income before extra items(*ibc*) + extra items & discontinued operation(*xidoc*) + depreciation & amortization(*dpc*) + deferred taxes(*txdc*) + equity in net loss(*esubc*) + gains in sale of PPE & investment(*sppiv*) + other funds from operation(*fopo*) + exchange rate effect(*exre*) - ΔWC

Appendix C. Decomposition of the market-to-book ratio

C.1. The decomposition of Rhodes-Kropf, Robinson, and Viswanathan (2005)

We follow Rhodes-Kropf, Robinson, and Viswanathan (2005) and decompose the logarithm of the market-to-book *equity* ratio (E^m/E^b) as follows:

$$\begin{aligned} Ln(E^m / E^B)_{it} &= Ln(E^m_{it}) - Ln(E^b_{it}) \\ &= \underbrace{Ln(E^m_{it}) - v(\theta_{it}, \alpha_{jt})}_{FSE} + \underbrace{v(\theta_{it}, \alpha_{jt}) - v(\theta_{it}, \alpha_j)}_{TSE} + \underbrace{v(\theta_{it}, \alpha_j) - Ln(E^b_{it})}_{LRV} \end{aligned} \qquad \text{(C1)}$$

where *Ln* stands for the natural logarithm function. The first term, firm-specific error (*FSE*), is the difference between the market value and the fundamental value as implied by its accounting multiples θ_{jt} and its sector *j* multiple α_{jt} measured at the valuation year *t*. If the market is overheated at time *t*, this will show up in α_{jt} and therefore $v(\theta_{jt}, \alpha_{jt})$. Similarly, if industry *j* is overvalued relative to other industries at time *t*, this too will appear in α_{jt}. Thus *FSE* captures purely firm-specific deviations from fundamental values, because the *v* term captures all deviations common to a sector at a point in time. The second term, the time series sector error (*TSE*), measures the difference between the firm's fundamental value conditional on contemporaneous accounting principles and its value implied by its accounting information and long-run multiples. This term captures the misvaluation of the whole sector at time *t* since $v(\theta_{jt}, \alpha_j)$ measures sector-specific valuation that does not vary over time. The third term, *LRV*, concerns the difference between the firm's valuation based on long-run multiples and its book value. This term captures the firm's set of investment prospect at time *t*. To obtain $v(\theta_{jt}, \alpha_{jt})$ and $v(\theta_{jt}, \alpha_j)$, Rhodes-Kropf, Robinson, and Viswanathan (2005) estimate the following model:

$$Ln(E^m_{it}) = \alpha_{0jt} + \alpha_{1jt} Ln(E^b_{it}) + \alpha_{2jt} Ln(NI)^+ + \alpha_{3jt} I_{(<0)} Ln(NI)^+_{it} + \alpha_{4jt} (D/A)_{it} + \varepsilon_{it},$$

where NI^+ stands for the absolute value of net income and $I_{(<0)}Ln(NI^+)$ is an indicator function for negative operating income observations. Because the equation is estimated in logarithms and operating income can be negative, this specification allows for operating income to enter into the estimation without discarding all the firms with negative operating income at a point in time. The leverage ratio, *D/A*, is included to allow for the fact that firms with leverage higher or lower than the industry average have a different value of the multiple. Firms are grouped according to the 12 Fama and French industries. We then run annual cross-sectional regressions for each industry. Here $v(\theta_{jt}, \alpha_{jt})$ is the fitted value from the regression equation, which proxies for the fundamental value for a firm *i* in a sector *j* and at time *t*. The fundamental value of equity in equation (C1) is then equal to the exponential value of $v(\theta_{jt}, \alpha_{jt})$. Since our focus is on firm-level equity mispricing only, we do not decompose $v(\theta_{jt}, \alpha_{jt})$ - $Ln(E^b_{it})$ further into *TSE* and *LRV* in this paper.

C.2. The decomposition using the residual income model

Residual earnings are essentially earnings in excess of what would be generated if book equity were to earn the investors' required rate of return. We follow the method used by Frankel and Lee (1998) whereby the fundament value (*v*) is calculated by estimating a two-period version of the residual income model as follows:

$$v = BPS_t + \frac{FROE_t - r_e}{1 + r_e} BPS_t + \frac{FROE_{t+1} - r_e}{(1 + r_e)^2} BPS_{t+1} + \frac{FROE_{t+2} - r_e}{(1 + r_e)^2 r_e} BPS_{t+2}, \qquad \text{(C2)}$$

where BPS_{t+i} is the book value per share for fiscal year-end *t + i*, $FROE_{t+i}$ is the forecast return on equity for year *t + i*, and r_e is the firm's estimated cost of equity, the difference between these two measures being the firm's forecast residual earnings. All residual earnings from *t + 2* onward are assumed to be constant in perpetuity and are captured in the final term of model (C2). The value of $FROE_{t+2}$ for this terminal value is estimated using I/B/E/S consensus long-term growth forecasts (*LTG*), while $FROE_t$ and $FROE_{t+1}$ utilize I/B/E/S consensus earnings per share forecasts over one- and two-year forecast horizons, respectively. For missing observations of *LTG*, $FROE_{t+2}$ is replaced with $FROE_{t+1}$. Book values of equity per share (BPS_{t-1} and BPS_{t-2}) are calculated using the most recent book value of common equity from Compustat prior to the announcement month and adjusting for the number of shares outstanding. Future fiscal year-end book values (BPS_{t+i}) are calculated by applying clean surplus accounting to the previous year's *BPS* values. This is done by deflating future earnings by dividends paid using an estimate of the dividend payout ratio (*k*).

The cost of equity, r_e is measured using the Fama and French three-factor model. This model segregates firms into 48 industry classifications and creates replicating portfolios based on size and book-to-market characteristics. Explicitly, the risk premiums reported for each industry on a monthly basis are combined with the effective annual risk-free rate, based on the current monthly risk-free rate, to generate an industry cost of equity for that given month. Specifically, Cost of equity = (Fama–French risk premium + 12 $\times$monthly risk-free rate)/100.

The payout ratio, *k*, is calculated using Compustat items as dividends divided by net income. For negative observations of net income, *k* is approximated as dividends divided by 6% of total assets. Thus we can calculate *FROE* and future values of *BPS* as follows:

$$FROE_t = \frac{2 \times EPS_{t+1}}{BPS_{t-1} + BPS_{t-2}},$$

$$BPS_t = BPS_{t-1} \times [1 + FROE_t(1 - k)],$$

$$FROE_{t+1} = \frac{2 \times EPS_{t+2}}{BPS_t + BPS_{t-1}},$$

$$BPS_{t+1} = BPS_t \times [1 + FROE_{t+1}(1 - k)],$$

$$FROE_{t+2} = \frac{2 \times EPS_{t+2} \times (1 + LTG)}{BPS_{t+1} + BPS_t},$$

$$BPS_{t+2} = BPS_{t+1} \times [1 + FROE_{t+2}(1 - k)].$$

Table I. Summary statistics

The data for Panels A and B are from Compustat and CRSP for 1971–2011. Panel A reports summary statistics for variables in equation (7), including the change in cash holdings (Δ*Cash*), investment (*Inv*), cash dividends (*Div*), cash flows (*CF*), and external financing (Δ*X*), which equals the sum of net debt issued (Δ*D*) and net equity issued (Δ*E*). $DIF^{Equation\ 7}$ is the difference between the left-hand and right-hand sides of equation (7). In Panel B, *MB* is defined as the market value of assets divided by the book value of assets. Future realized stock returns (*FRet*) are defined as returns over the next three years multiplied by -1. The variable *Tangibility* is the net PPE over total assets; *Sales Growth* is the change in net sales scaled by lagged net sales; *Leverage* is defined as total debt (the sum of short-term and long-term debt) divided by total assets; and *Ln*(*Assets*) is the natural log of the total book value of assets. Dollar values are adjusted to the 2000 dollar value using the gross domestic product (GDP) deflator.

Variables	N	Mean	SD	Min	Q1	Median	Q3	Max
Panel A: Cash flow statement variables in equation (7) *for 1971–2011*								
Inv	73,366	0.099	0.163	-0.373	0.022	0.064	0.135	2.313
Δ*Cash*	73,366	0.010	0.124	-0.478	-0.021	0.001	0.029	2.215
Div	73,366	0.010	0.020	0	0	0	0.014	0.175
Δ*X*	73,366	0.053	0.222	-0.391	-0.027	0.001	0.056	4.628
Δ*D*	73,366	0.021	0.130	-0.550	-0.021	0	0.032	1.730
Δ*E*	73,366	0.032	0.179	-0.146	0	0	0.008	4.638
CF	73,366	0.066	0.165	-2.727	0.014	0.082	0.145	0.705
$DIF^{Equation\ 7}$	73,366	0	0.003	-0.010	0	0	0	0.010
Panel B: Key explanatory variables for 1971–2011								
MB	73,366	1.782	1.309	0.549	1.031	1.353	1.995	8.471
FRet	50,202	-0.479	1.267	-6.672	-0.824	-0.175	0.310	0.952
Ln(*Assets*)	73,366	5.233	2.176	0.980	3.624	5.079	6.669	10.745
SaleG	73,366	0.176	0.442	-0.542	-0.017	0.094	0.243	2.855
Leverage	73,366	0.215	0.196	0	0.028	0.185	0.338	0.797
Tangibility	73,366	0.298	0.227	0.009	0.115	0.241	0.428	0.896

Table II. Correlation coefficients among key variables

The data are from Compustat and CRSP for 1971–2011. Variables in equation (7) include the change in cash holdings (Δ*Cash*), investment (*Inv*), cash dividends (*Div*), cash flows (*CF*), and external financing (Δ*X*), which equals the sum of net debt issued (Δ*D*) and net equity issued (Δ*E*). *MB* is defined as the market value of assets divided by the book value of assets. Future realized stock returns (*FRet*) are defined as stock returns over the next three years multiplied by -1. *Tangibility* is the net PPE over total assets; *Sales Growth* is the change in net sales scaled by lagged net sales; *Leverage* is defined as total debt (the sum of short-term and long-term debt) divided by total assets; and *Ln*(*Assets*) is the natural log of the total book value of assets. The pairwise Pearson correlation coefficients between variables are reported. Correlation coefficients that are significant at the 1% level are marked with a superscript *a*.

	Inv	Δ*Cash*	*Div*	Δ*X*	Δ*D*	Δ*E*	*CF*	*MB*	*FRet*	*Ln(Assets)*	*SaleG*	*Leverage*
Δ*Cash*	-0.02[a]											
Div	0.02[a]	0										
Δ*X*	0.57[a]	0.42[a]	-0.07[a]									
Δ*D*	0.51[a]	0.06[a]	0	0.59[a]								
Δ*E*	0.34[a]	0.47[a]	-0.09[a]	0.81[a]	0							
CF	0.21[a]	0.17[a]	0.23[a]	-0.48[a]	-0.25[a]	-0.41[a]						
MB	0.11[a]	0.12[a]	0.03[a]	0.23[a]	0.02[a]	0.27[a]	-0.11[a]					
FRet	0.05[a]	0.02[a]	0	0.09[a]	0.06[a]	0.07[a]	-0.06[a]	0.12[a]				
Ln(Assets)	0.09[a]	0.02[a]	0.29[a]	-0.11[a]	0.02[a]	-0.15[a]	0.28[a]	-0.12[a]	0.01			
SaleG	0.30[a]	0.11[a]	0	0.20[a]	0.17[a]	0.12[a]	0.11[a]	0.15[a]	0.04[a]	0.07[a]		
Leverage	0.07[a]	-0.06[a]	-0.09[a]	0.08[a]	0.25[a]	-0.08[a]	-0.10[a]	-0.17[a]	-0.01	0.15[a]	-0.04[a]	
Tangibility	0.20[a]	-0.07[a]	0.13[a]	-0.04[a]	0.04[a]	-0.08[a]	0.21[a]	-0.13[a]	-0.02[a]	0.22[a]	0.01	0.31[a]

Table III. Misvaluation, cash flows, and corporate policies

The data are from Compustat and CRSP for 1971–2011. In Panel A, firms are sorted into five groups according to the market-to-book ratio (*MB*) and *CF*, respectively (independent sorts). Average values of variables are reported for each *MB*–*CF* group. In Panel B, firms are sorted into five groups according to *FRet* and *CF*, respectively (independent sorts). The average values of variables are reported for each *FRet*–*CF* group. Future realized stock returns (*FRet*) are defined as returns over the next three years multiplied by -1.

	MB groups	Panel A: *MB*–*CF* grouping Cash flow groups 1 (low)	2	3	4	5 (high)	*FRet* groups	Panel B: *FRet*–*CF* grouping Cash flow groups 1 (low)	2	3	4	5 (high)
Inv	1 (undervalued)	0.01	0.04	0.06	0.08	0.13	1(undervalued)	0.04	0.06	0.08	0.11	0.19
	2	0.03	0.05	0.07	0.10	0.16	2	0.06	0.06	0.08	0.11	0.18
	3	0.04	0.07	0.08	0.11	0.19	3	0.05	0.06	0.08	0.11	0.19
	4	0.06	0.08	0.09	0.13	0.20	4	0.07	0.07	0.09	0.12	0.20
	5 (overvalued)	0.10	0.12	0.13	0.14	0.21	5(overvalued)	0.08	0.09	0.12	0.15	0.24
Δ*Cash*	1 (undervalued)	-0.04	-0.01	0.00	0.02	0.06	1(undervalued)	-0.02	0.00	0.01	0.02	0.06
	2	-0.03	-0.01	0.01	0.01	0.05	2	-0.03	0.00	0.01	0.01	0.05
	3	-0.03	-0.01	0.00	0.01	0.05	3	-0.03	0.00	0.00	0.01	0.05
	4	-0.04	-0.01	0.00	0.01	0.05	4	-0.02	0.00	0.01	0.02	0.06
	5 (overvalued)	-0.01	0.01	0.02	0.03	0.08	5(overvalued)	-0.01	0.00	0.01	0.03	0.09
Div	1 (undervalued)	0.00	0.00	0.01	0.01	0.01	1(undervalued)	0.00	0.01	0.01	0.01	0.02
	2	0.00	0.01	0.01	0.01	0.01	2	0.00	0.01	0.02	0.02	0.02
	3	0.00	0.01	0.01	0.02	0.01	3	0.00	0.01	0.01	0.02	0.02
	4	0.00	0.01	0.01	0.02	0.02	4	0.00	0.01	0.01	0.01	0.02
	5 (overvalued)	0.00	0.00	0.01	0.02	0.02	5(overvalued)	0.00	0.00	0.01	0.01	0.01
Δ*X*	1 (undervalued)	0.06	0.01	-0.01	-0.02	-0.04	1(undervalued)	0.12	0.02	0.00	0.00	0.01
	2	0.09	0.02	0.00	0.00	-0.02	2	0.13	0.02	0.01	0.00	0.01
	3	0.12	0.04	0.02	0.01	0.02	3	0.13	0.02	0.01	0.01	0.02
	4	0.18	0.06	0.03	0.03	0.03	4	0.16	0.03	0.02	0.02	0.03
	5 (overvalued)	0.37	0.10	0.07	0.05	0.05	5(overvalued)	0.23	0.06	0.05	0.05	0.07
Δ*D*	1 (undervalued)	0.04	0.00	-0.01	-0.02	-0.04	1(undervalued)	0.05	0.01	0.00	0.00	0.00
	2	0.07	0.01	0.00	-0.01	-0.02	2	0.06	0.01	0.01	0.00	0.00
	3	0.07	0.02	0.01	0.01	0.00	3	0.06	0.02	0.01	0.01	0.01
	4	0.08	0.03	0.02	0.02	0.02	4	0.07	0.02	0.01	0.01	0.01
	5 (overvalued)	0.08	0.04	0.02	0.02	0.01	5(overvalued)	0.07	0.03	0.02	0.02	0.02
Δ*E*	1 (undervalued)	0.02	0.00	0.00	0.00	0.00	1(undervalued)	0.07	0.01	0.01	0.00	0.01
	2	0.03	0.01	0.00	0.00	0.01	2	0.07	0.01	0.00	0.00	0.01
	3	0.05	0.01	0.00	0.00	0.01	3	0.07	0.01	0.00	0.00	0.01
	4	0.09	0.02	0.01	0.00	0.01	4	0.09	0.01	0.01	0.01	0.02
	5 (overvalued)	0.28	0.06	0.05	0.03	0.03	5(overvalued)	0.15	0.03	0.03	0.04	0.05

Table IV. Independent effects of cash flow and misvaluation (measured by *MB*) on corporate policies

The data are from Compustat and CRSP for 1971–2011. The dependent variables and cash flow (*CF*) are included in the equation (7). *MB* is defined as the market value of assets divided by the book value of assets; *SalesG* is the change in net sales scaled by lagged net sales; *Ln*(*Assets*) is the natural log of the total book value of assets; *Leverage* is defined as total debt (the sum of short-term and long-term debt) divided by total assets; and *Tangibility* is the net PPE over total assets. All explanatory variables except cash flow (*CF*) are lagged one period. The regression equations are estimated with firm and year fixed effects. For brevity, constant term and year dummies are not reported. The t-statistics are presented in parentheses. Coefficients significant at the 10%, 5%, and 1% levels are indicated by *, **, and ***, respectively. All equations are estimated using the single-equation model without the linear constraint that sources equal uses of cash.

VARIABLES	(1) Inv_t	(2) $\Delta Cash_t$	(3) Div_t	(4) ΔX_t	(5) ΔD_t	(6) ΔE_t
CF_t	0.16***	0.22***	0.00***	-0.62***	-0.28***	-0.33***
	(16.8)	(21.6)	(15.1)	(-40.6)	(-32.8)	(-19.6)
MB_{t-1}	0.03***	0.02***	0.00***	0.04***	0.01***	0.04***
	(23.7)	(14.9)	(11.5)	(26.4)	(9.0)	(22.1)
$SaleG_{t-1}$	0.02***	0.01***	-0.00***	0.03***	0.01***	0.01***
	(6.7)	(4.8)	(-4.1)	(7.7)	(6.6)	(4.5)
$Ln(Assets)_{t-1}$	-0.02***	-0.03***	0.00***	-0.05***	-0.01***	-0.04***
	(-18.5)	(-21.6)	(8.1)	(-28.1)	(-8.3)	(-26.1)
$Leverage_{t-1}$	-0.16***	0.02***	-0.01***	-0.15***	-0.24***	0.08***
	(-26.3)	(3.5)	(-30.4)	(-18.8)	(-38.3)	(11.6)
$Tangibility_{t-1}$	0.05***	0.08***	0.00	0.13***	0.07***	0.06***
	(5.5)	(11.6)	(0.1)	(11.7)	(9.3)	(6.5)
Inv_{t-1}	0.04***	-0.01**	0.00	0.03***	0.05***	-0.02**
	(5.9)	(-2.4)	(0.5)	(3.0)	(9.0)	(-2.3)
$\Delta Cash_{t-1}$	0.11***	-0.15***	0.00*	-0.03***	0.01	-0.04***
	(16.2)	(-19.3)	(1.9)	(-3.8)	(1.1)	(-4.5)
Div_{t-1}	0.06	-0.22***	0.28***	0.15***	0.15***	-0.00
	(1.5)	(-6.0)	(32.7)	(3.2)	(5.1)	(-0.0)
ΔD_{t-1}	-0.02**	0.01	-0.00	-0.01	-0.03***	0.02**
	(-2.4)	(1.0)	(-0.6)	(-1.1)	(-5.5)	(2.5)
ΔE_{t-1}	-0.05***	0.02***	-0.00***	-0.03***	-0.02***	-0.01
	(-10.8)	(4.1)	(-8.9)	(-5.0)	(-6.3)	(-1.4)
Observations	73,366	73,366	73,366	73,366	73,366	73,366
R-squared	0.40	0.30	0.79	0.52	0.37	0.48

Table V. Joint impact of cash flow and misvaluation (measured by *MB*) on corporate policies

The data are from Compustat and CRSP for 1971–2011. The dependent variables and cash flow (*CF*) are included in the equation (7). *MB* is defined as the market value of assets divided by the book value of assets; *SalesG* is the change in net sales scaled by lagged net sales; *Ln*(*Assets*) is the natural log of the total book value of assets; *Leverage* is defined as total debt (the sum of short-term and long-term debt) divided by total assets; and *Tangibility* is the net PPE over total assets. All explanatory variables except cash flow (*CF*) are lagged one period. The regression equations are estimated with firm and year fixed effects. For brevity, constant term and year dummies are not reported. The t-statistics are presented in parentheses. Coefficients significant at the 10%, 5%, and 1% levels are indicated by *, **, and ***, respectively. All equations are estimated using the single-equation model without the linear constraint that sources equal uses of cash.

VARIABLES	(1) Inv_t	(2) $\Delta Cash_t$	(3) Div_t	(4) ΔX_t	(5) ΔD_t	(6) ΔE_t
CF_t	0.26***	0.35***	0.01***	-0.38***	-0.36***	-0.02
	(20.8)	(25.9)	(14.6)	(-19.2)	(-30.4)	(-0.9)
MB_{t-1}	0.03***	0.02***	0.00***	0.04***	0.01***	0.04***
	(24.1)	(15.1)	(11.4)	(27.1)	(9.2)	(22.9)
$CF_t \times MB_{t-1}$	-0.03***	-0.04***	-0.00***	-0.08***	0.02***	-0.10***
	(-8.9)	(-8.8)	(-6.1)	(-12.0)	(6.6)	(-12.8)
$SaleG_{t-1}$	0.02***	0.01***	-0.00***	0.03***	0.01***	0.01***
	(6.7)	(4.8)	(-4.1)	(7.8)	(6.6)	(4.6)
$Ln(Assets)_{t-1}$	-0.02***	-0.03***	0.00***	-0.05***	-0.01***	-0.04***
	(-18.3)	(-21.3)	(8.2)	(-27.9)	(-8.5)	(-25.7)
$Leverage_{t-1}$	-0.16***	0.02***	-0.01***	-0.16***	-0.24***	0.08***
	(-26.8)	(2.9)	(-30.5)	(-19.9)	(-38.0)	(10.8)
$Tangibility_{t-1}$	0.05***	0.08***	0.00	0.12***	0.07***	0.05***
	(5.1)	(11.1)	(0.0)	(11.2)	(9.7)	(5.5)
Inv_{t-1}	0.05***	-0.01	0.00	0.04***	0.04***	-0.00
	(6.8)	(-1.2)	(0.8)	(4.5)	(8.2)	(-0.3)
$\Delta Cash_{t-1}$	0.12***	-0.14***	0.00**	-0.02**	0.00	-0.02**
	(17.3)	(-18.3)	(2.3)	(-2.2)	(0.2)	(-2.4)
Div_{t-1}	0.08*	-0.19***	0.28***	0.19***	0.14***	0.05
	(1.9)	(-5.4)	(32.7)	(4.0)	(4.6)	(1.2)
ΔD_{t-1}	-0.02***	0.00	-0.00	-0.02**	-0.03***	0.01
	(-3.1)	(0.2)	(-0.8)	(-2.2)	(-5.0)	(1.1)
ΔE_{t-1}	-0.06***	0.02***	-0.00***	-0.05***	-0.02***	-0.03***
	(-12.0)	(2.9)	(-9.3)	(-6.9)	(-5.3)	(-3.7)
Observations	73,366	73,366	73,366	73,366	73,366	73,366
R-squared	0.40	0.31	0.79	0.53	0.37	0.51

Table VI. Joint impact of cash flow and misvaluation (measured by *MB* indicator variables) on corporate policies

The data are from Compustat and CRSP for 1971–2011. The dependent variables and cash flow (*CF*) are included in the equation (7). *MB* is defined as the market value of assets divided by the book value of assets. Firms are evenly divided into three groups according to *MB*. Here *Low* (*High*) *MB* is a dummy variable that is equal to one if a firm's *MB* is in the group with the lowest (highest) MB, and zero otherwise; *SalesG* is the change in net sales scaled by lagged net sales; *Ln*(*Assets*) is the natural log of the total book value of assets; *Leverage* is defined as total debt (the sum of short-term and long-term debt) divided by total assets; and *Tangibility* is the net PPE over total assets. All explanatory variables except cash flow (*CF*) are lagged one period. The regression equations are estimated with firm and year fixed effects. For brevity, constant term and year dummies are not reported. The t-statistics are presented in parentheses. Coefficients significant at the 10%, 5%, and 1% levels are indicated by *, **, and ***, respectively. All equations are estimated using the single-equation model without the linear constraint that sources equal uses of cash.

VARIABLES	(1) Inv_t	(2) $\Delta Cash_t$	(3) Div_t	(4) ΔX_t	(5) ΔD_t	(6) ΔE_t
CF_t	0.22***	0.27***	0.01***	-0.50***	-0.34***	-0.16***
	(13.8)	(21.2)	(9.1)	(-21.8)	(-25.6)	(-6.9)
Low MB	-0.03***	-0.01***	-0.00***	-0.03***	-0.02***	-0.01***
	(-14.0)	(-3.1)	(-12.5)	(-12.6)	(-12.4)	(-5.4)
$CF_t \times$ *Low MB*	-0.01	0.06***	-0.00	0.05	-0.01	0.06**
	(-0.5)	(2.9)	(-0.5)	(1.6)	(-0.9)	(2.2)
High MB	0.05***	0.02***	0.00***	0.07***	0.01***	0.06***
	(19.6)	(10.1)	(12.7)	(20.7)	(4.8)	(17.6)
$CF_t \times$ *High MB*	-0.12***	-0.11***	-0.00	-0.23***	0.09***	-0.33***
	(-6.3)	(-6.5)	(-0.8)	(-8.2)	(5.7)	(-10.7)
$SaleG_{t-1}$	0.02***	0.02***	-0.00***	0.03***	0.01***	0.02***
	(7.9)	(6.6)	(-4.6)	(9.8)	(6.3)	(7.0)
$Ln(Assets)_{t-1}$	-0.03***	-0.03***	0.00***	-0.05***	-0.01***	-0.04***
	(-19.9)	(-22.7)	(8.1)	(-29.7)	(-8.6)	(-27.4)
$Leverage_{t-1}$	-0.16***	0.01**	-0.01***	-0.16***	-0.23***	0.07***
	(-26.7)	(2.3)	(-30.1)	(-19.9)	(-37.8)	(9.8)
$Tangibility_{t-1}$	0.05***	0.08***	0.00	0.13***	0.08***	0.05***
	(5.6)	(11.0)	(0.6)	(11.5)	(10.1)	(5.6)
Inv_{t-1}	0.05***	-0.00	-0.00	0.04***	0.04***	0.00
	(6.6)	(-0.7)	(-0.0)	(4.5)	(7.9)	(0.1)
$\Delta Cash_{t-1}$	0.12***	-0.14***	0.00	-0.02**	0.00	-0.02**
	(17.1)	(-18.0)	(1.6)	(-2.1)	(0.2)	(-2.3)
Div_{t-1}	0.08**	-0.15***	0.27***	0.24***	0.11***	0.13***
	(2.0)	(-4.1)	(32.5)	(4.9)	(3.5)	(3.1)
ΔD_{t-1}	-0.02***	-0.00	-0.00	-0.03***	-0.03***	0.00
	(-3.6)	(-0.5)	(-0.5)	(-3.0)	(-5.0)	(0.2)
ΔE_{t-1}	-0.05***	0.02***	-0.00***	-0.04***	-0.02***	-0.02***
	(-10.8)	(3.3)	(-8.4)	(-5.5)	(-4.9)	(-2.7)
Observations	73,366	73,366	73,366	73,366	73,366	73,366
R-squared	0.39	0.30	0.79	0.51	0.37	0.47

Table VII. Joint impact of cash flow and future stock returns on corporate policies

The data are from Compustat and CRSP for 1971–2011. The dependent variables and cash flow (*CF*) are included in the equation (7). *MB* is defined as the market value of assets divided by the book value of assets; *SalesG* is the change in net sales scaled by lagged net sales; *Ln*(*Assets*) is the natural log of the total book value of assets; *Leverage* is defined as total debt (the sum of short-term and long-term debt) divided by total assets; and *Tangibility* is the net PPE over total assets. Future realized stock returns (*FRet*) are defined as stock returns over the next three years multiplied by -1. The regression equations are estimated with firm and year fixed effects. For brevity, constant term and year dummies are not reported. The t-statistics are presented in parentheses. Coefficients significant at the 10%, 5%, and 1% levels are indicated by *, **, and ***, respectively. All equations are estimated using the single-equation model without the linear constraint that sources equal uses of cash.

VARIABLES	(1) Inv_t	(2) $\Delta Cash_t$	(3) Div_t	(4) ΔX_t	(5) ΔD_t	(6) ΔE_t
CF_t	0.18***	0.24***	0.01***	-0.58***	-0.27***	-0.31***
	(12.1)	(17.4)	(12.9)	(-26.1)	(-26.2)	(-13.1)
MB_{t-1}	0.02***	0.01***	0.00***	0.04***	0.01***	0.03***
	(17.0)	(10.1)	(8.6)	(18.7)	(5.8)	(16.3)
$FRet_t$	0.01***	0.01***	0.00***	0.02***	0.00***	0.01***
	(12.5)	(8.8)	(6.3)	(14.8)	(6.8)	(11.1)
$CF_t \times FRet_t$	-0.02***	-0.03***	0.00	-0.05***	0.00	-0.05***
	(-3.6)	(-3.9)	(1.1)	(-4.8)	(0.3)	(-4.7)
$SaleG_{t-1}$	0.01***	0.01***	-0.00***	0.03***	0.01***	0.02***
	(4.9)	(3.6)	(-4.0)	(5.8)	(4.9)	(3.6)
$Ln(Assets)_{t-1}$	-0.04***	-0.03***	0.00***	-0.07***	-0.01***	-0.06***
	(-18.1)	(-19.5)	(5.5)	(-26.3)	(-8.0)	(-24.2)
$Leverage_{t-1}$	-0.17***	0.03***	-0.01***	-0.15***	-0.27***	0.12***
	(-20.6)	(4.1)	(-27.1)	(-14.4)	(-35.8)	(12.7)
$Tangibility_{t-1}$	0.06***	0.09***	0.00	0.15***	0.07***	0.07***
	(5.3)	(10.3)	(0.9)	(11.0)	(8.4)	(6.5)
Inv_{t-1}	0.04***	-0.02***	0.00	0.02*	0.05***	-0.02**
	(4.6)	(-2.6)	(0.5)	(1.9)	(7.5)	(-2.3)
$\Delta Cash_{t-1}$	0.13***	-0.15***	0.00	-0.02*	0.01**	-0.04***
	(14.6)	(-14.8)	(0.1)	(-1.8)	(2.5)	(-3.3)
Div_{t-1}	-0.01	-0.23***	0.27***	0.05	0.08**	-0.02
	(-0.2)	(-4.6)	(26.3)	(0.9)	(2.3)	(-0.4)
ΔD_{t-1}	-0.02**	0.01	-0.00	-0.01	-0.04***	0.03**
	(-2.2)	(1.3)	(-0.2)	(-0.8)	(-5.2)	(2.5)
ΔE_{t-1}	-0.06***	0.02***	-0.00***	-0.04***	-0.03***	-0.02**
	(-10.2)	(3.3)	(-6.3)	(-5.3)	(-5.7)	(-2.3)
Observations	50,202	50,202	50,202	50,202	50,202	50,202
R-squared	0.44	0.33	0.82	0.53	0.37	0.51

Table VIII. Decomposition of the market-to-book ratio and the joint impact of cash flow and misvaluation on corporate policies

The data are from Compustat and CRSP for 1971–2011. The dependent variables and cash flow (CF) are included in the equation (7). In Panel A, we use the methodology proposed by Rhodes-Kropf, Robinson, and Viswanathan (2005) to decompose the market-to-book ratio. The resulting measures of misvaluation and the fundamental-value-to-assets ratio are denoted MPRKRV and VARKRV, respectively. Appendix B describes RKRV's decomposition in detail. In Panel B, we use the residual income model as in Dong et al. (2006) to compute the fundamental value of equity. The resulting measures of misevaluation and the fundamental-value-to-assets ratio are denoted MPRIM and VARIM, respectively. Appendix C describes the residual income model in detail. Apart from key explanatory variables reported here, we also include in all regressions the same control variables as those reported in Table V. For brevity, the coefficients of the control variables are not tabulated. The regression equations are estimated with firm and year fixed effects. For brevity, constant term and year dummies are not reported. The t-statistics are presented in parentheses. Coefficients significant at the 10%, 5%, and 1% levels are indicated by *, **, and ***, respectively. All equations are estimated using the single-equation model without the linear constraint that sources equal uses of cash.

VARIABLES	(1) Inv_t	(2) $\Delta Cash_t$	(3) Div_t	(4) ΔX_t	(5) ΔD_t	(6) ΔE_t
	Panel A: MP_{RKRV} as the proxy for misvaluation					
CF_t	0.21***	0.28***	0.01***	-0.50***	-0.29***	-0.21***
	(22.6)	(29.0)	(16.1)	(-34.3)	(-36.9)	(-14.2)
VA_{RKRV}	0.03***	0.02***	0.00***	0.05***	0.01***	0.04***
	(16.8)	(9.8)	(12.7)	(20.0)	(7.3)	(17.0)
MP_{RKRV}	0.03***	0.02***	0.00***	0.04***	0.01***	0.04***
	(21.3)	(13.2)	(7.4)	(24.0)	(7.0)	(21.2)
$CF \times MP_{RKRV}$	-0.03***	-0.04***	-0.00***	-0.08***	0.02***	-0.10***
	(-6.6)	(-7.2)	(-4.3)	(-9.3)	(5.3)	(-10.1)
Observations	71,113	71,113	71,113	71,113	71,113	71,113
R-squared	0.41	0.32	0.80	0.51	0.37	0.49
	Panel B: MP_{RIM} as the proxy for misvaluation					
CF	0.24***	0.28***	0.01***	-0.48***	-0.26***	-0.22***
	(13.8)	(15.9)	(9.9)	(-17.1)	(-20.1)	(-7.5)
VA_{RIM}	0.02***	0.01***	0.00***	0.04***	0.01***	0.03***
	(14.9)	(8.8)	(8.9)	(16.2)	(8.6)	(13.5)
MP_{RIM}	0.02***	0.01***	0.00***	0.03***	0.00***	0.03***
	(13.6)	(5.6)	(6.5)	(12.7)	(4.9)	(10.7)
$CF \times MP_{RIM}$	-0.01*	0.00	-0.00***	-0.01	-0.00	-0.01
	(-1.8)	(0.1)	(-3.5)	(-0.7)	(-0.2)	(-0.6)
Observations	38,469	38,469	38,469	38,469	38,469	38,469
R-squared	0.45	0.37	0.83	0.48	0.38	0.47