The Impact of Capital Market Imperfections on Investment-Cash Flow Sensitivity*

Şenay Ağca
George Washington University

Abon Mozumdar
Virginia Tech

First version: August 19, 2003
This version: January 5, 2005

Abstract

We examine the investment-cash flow sensitivity of U.S. manufacturing firms as a function of five factors associated with capital market imperfections – fund flows, institutional ownership, analyst following, bond ratings, and corporate governance. We analyze the relationship using both the traditional OLS and the more recently proposed measurement-error consistent GMM approaches. We find a steady decline in the estimated sensitivity over time. The evidence on the impact of the factors on investment-cash flow sensitivity is strong for fund flows and institutional ownership, moderate for analyst following, mixed for bond ratings, and weak for corporate governance. The overall evidence suggests that investment-cash flow sensitivity provides information about the financial constraints imposed on firms by capital markets.

Keywords: Investment-cash flow sensitivity, capital market imperfections, fund flows, institutional ownership, analyst following, bond ratings, corporate governance

JEL Classification: G14, G31, G32

---

* Şenay Ağca, School of Business, George Washington University, 2023 G Street, Lisner Hall 540G, Washington, D.C. 20052, Tel: (202) 994-9209, Fax: (202) 994-5014, Email: sagca@gwu.edu; Abon Mozumdar, Pamplin College of Business, Virginia Tech, 7054 Haycock Road, Room 352, Falls Church, VA 22043, Tel.:703-538-8414, Fax: 703-538-8415, Email: abon@vt.edu. We are grateful to Andrew Metrick for kindly providing us with the corporate governance data. We thank Gonul Colak, David Dobofsky, Erlend Nier, Florian Heider, Saiyid Islam, Mark Klock, Amnon Levy, Oguzhan Ozbas, Bernell Stone, and the seminar participants at the 2004 European Finance Association meeting and the 2004 Washington Area Finance Conference for helpful comments. Ağca acknowledges a summer research grant from the School of Business, George Washington University. Mozumdar likewise acknowledges a summer research grant from the Pamplin College of Business, Virginia Tech.

Introduction

As argued by Modigliani and Miller (1958), the investment decisions of firms are not affected by their financing decisions in perfect capital markets. Capital markets, however, are not perfect, and existing imperfections introduce a wedge between the costs of external and internal funds. Firms facing higher informational imperfections experience a wider wedge, and therefore are more financially constrained. A measure that has been used in the literature to assess the degree of financial constraints experienced by firms is the sensitivity of investments to the availability of internal funds, controlling for investment opportunities as measured by Tobin's Q. A number of studies, starting with Fazzari, Hubbard, and Petersen (1988), show that investment is more sensitive to cash flow for firms that have a high degree of financial constraints.[1] On the other hand, Kaplan and Zingales (1997) and Cleary (1999) show that investment-cash flow sensitivity can be higher for unconstrained firms.[2] Additionally, Gilchrist and Himmelberg (1995), Erickson and Whited (2000), and Alti (2003) argue that measurement problems associated with Tobin's Q affect the sensitivity of investments to the availability of internal funds. According to Gomes (2001) and Alti (2003), investment-cash flow sensitivity can be positive even without any financial frictions. As shown by Alti (2003), in the absence of financial frictions, small and young firms can have higher investment-cash flow sensitivities since cash flow captures near-term investment opportunities that are not captured by Tobin's Q.

[1] See Hubbard (1998) for a detailed review of this literature.

[2] Allayannis and Mozumdar (2004) show that including firms with negative cash flows can lead to these findings, since these firms are financially distressed and therefore their investments are not sensitive to cash flow. Moyen (2004) shows that the criteria used to differentiate between financially constrained and unconstrained firms can lead to results consistent both with Fazzari, Hubbard, and Petersen (1988) and Kaplan and Zingales (1997). When dividend payout is used as the criterion, the simulation results of Moyen supports the findings of Fazzari, Hubbard and Petersen.

If investment-cash flow sensitivity is indeed linked with financial constraints, then it should decrease with the factors that reduce capital market imperfections. There is some international cross-sectional evidence to support this hypothesis. Wurgler (2000) examines cross-sectional data from 65 countries, and shows that capital allocation is more efficient in financially developed markets. Using an Euler-equation based model and cross-sectional data for 40 countries, Love (2003) shows that the sensitivity of investment to cash decreases with financial market development. Love attributes this finding to the lower financial constraints of financially developed markets. Surprisingly however, there has been little investigation of the evolution of investment-cash flow sensitivities over time. The little evidence that exists suggests that it has decreased over time in the US: while earlier papers in the area (Fazzari, Hubbard, and Petersen (1988), and Kaplan and Zingales (1997)), using data from the seventies and early eighties, have reported sensitivities in the (0.4, 0.7) range, studies employing data from the late eighties and nineties (Cleary (1999), and Erickson and Whited (2000)) have found sensitivities in the (0.1, 0.2) range. None of these studies, however, have examined the factors underlying this decline. The wedge between the internal and external funds should reduce with reducing capital market imperfections. Therefore, observing a decrease in investment-cash flow sensitivity in response to decreasing capital market imperfections would be consistent with investment-cash flow sensitivity providing information about financial constraints.

As a remedy for the measurement error problem highlighted in their critique, Erickson and Whited (2000) propose a class of GMM estimators that exploit the information in the higher order moments of the regression variables. Using these estimators and their sample of U.S. manufacturing firms over the 1992-1995 period, they find that the explanatory power of Q improves dramatically relative to traditional OLS estimates, while cash flow loses significance as a determinant of investment. Naturally then, the first question that needs to be settled is whether the investment-cash flow sensitivity estimates reported by the earlier papers and their apparent decline over time really represent anything, or whether they are purely artifactual. Applying the Erickson-Whited estimators to U.S. manufacturing firm data over a much longer sample period (1970-2001), we find that while the role of Q improves and that of cash flow reduces in explaining investment, cash flow continues to be a significant factor, indicating that financial constraints do play an important role in determining firm investments.[3] Of particular interest is the finding that the declining pattern of estimated cash flow effects is robust to the application of the Erickson-Whited estimators.

We next examine the relation between investment-cash flow sensitivity and five factors related to capital market imperfections—aggregate fund flows, institutional ownership, analyst coverage, bond ratings, and corporate governance. Again, to control for the measurement problems related to Tobin's Q, we apply the GMM estimators of Erickson and Whited (2000) in addition to OLS. Moreover, we use dividend payout ratios to divide firms into three categories: low payout (LP), medium payout (MP), and high payout (HP), and examine the change in investment-cash flow sensitivity through time and the impact of capital market-related factors on this sensitivity for each group. Dividend payout ratio has been used in the literature to categorize firms according to their degrees of financial constraints. Therefore, by analyzing different dividend payout groups, we can observe whether the decline in the sensitivity and the impact of capital market related factors on this sensitivity is particular to a specific level of financial constraints, assuming that dividend payout ratio is a valid proxy for financial constraints.

[3] Polk and Sapienza (2004) also find that cash flow effects remain significant when Erickson and Whited's (2000) estimators are used. Additionally, using Erickson and Whited's (2000) sample and estimators, Hennessy (2004) finds cash flow to be significant for firms with junk-rated debt, and insignificant for those with investment-grade debt.

Over the last fifty years, there has been a steady increase in investments through institutions such as mutual funds and pension funds. This increase in fund flows can be seen as a proxy for the increase in market liquidity. Institutions trade more actively than individual investors due to their portfolio rebalancing needs. Moreover, institutional investors reduce information asymmetries in the market since they have better information acquisition and processing skills than individual investors. Additionally, as documented by Chordia, Roll and Subrahmanyam (2000), Hasbrouck and Seppi (2001), and Huberman and Halka (2001), there is commonality in liquidity across assets, and the liquidity of an asset is positively related to market liquidity. All these factors suggest that increasing fund flows should increase liquidity across all assets. The literature examining the existence of a market liquidity risk premium is quite extensive. For example, Amihud (2002) and Pastor and Stambaugh (2003) find a positive market liquidity premium. The existence of such a premium suggests a smaller wedge between the costs of external and internal funds for increased liquidity. As a result, increasing fund flows should result in improved market liquidity and reduced external financing constraints. If this is reflected in investment-cash flow sensitivity, then one should observe a decrease in this sensitivity with increased liquidity. Consistent with this hypothesis, we find a negative relation between fund flows and investment-cash flow sensitivity for the overall sample as well as for each dividend payout group.

Although an overall increase in fund flows reduces the liquidity-related imperfections for all firms, the impact is the largest for those firms with large institutional shareholdings. Using aggregate funds data, Friedman (1996) analyzes the impact of institutional ownership on the external financing of small growth firms. He presents two opposing views, but no clear-cut conclusion.[4] Falkenstein (1996) and Gompers and Metrick (2001) find that mutual funds prefer stocks with high liquidity and high information flow. Therefore, the stock preferences of institutions have important implications for the financing decisions of firms. Since firms with large institutional ownership are more liquid, it should be easier for them to get external funds, which in turn should reduce the wedge between external and internal funding costs for them. If this reduction in financial constraints is reflected in the sensitivity of investments to the availability of internal funds, one should observe a decrease in their investment-cash flow sensitivities. Our evidence supports this hypothesis ─ institutional ownership does decrease investment-cash flow sensitivity. Moreover, if institutional investments were beneficial only to those firms whose stocks are held by institutions, then the level of fund flows would not have any additional explanatory power beyond that reflected in institutional ownership. Yet we find that both are significant factors in reducing the sensitivity of investments to the availability of internal funds. Fund flows, therefore, are beneficial for all firms in the market, not only for those with institutional ownership.

Analyst coverage is a third important factor related to capital market imperfections. There is an extensive body of literature linking analyst coverage with the flow of information to prices. The incomplete information theory of Merton (1987) suggests that firms that are covered by a large number of analysts should have lower costs of capital.[5] Easley, Hvidjkaer and O'Hara (2002), and Easley and O'Hara (2004) examine complete markets where information is

[4] One of the arguments is that if institutions have short time horizons, and therefore have to rely on research reports for purchasing stocks, they will choose large and liquid assets. This will make it harder for small firms to raise external funds. On the other hand, as documented by Bennet, Sias and Starks (2003), institutions act on information. Additionally, over time, many funds, in an effort to outperform standard benchmarks like S&P500, become specialized in small stocks. These factors lead to an increase in the trading of small-growth stocks. Furthermore, reports on new and smaller firms are available from smaller brokerage firms. For these reasons, increasing institutional ownership over time should make it easier for smaller firms to raise external funds.

[5] See page 22. " If exogenous events cause investor base of the firm to expand, then firm's cost of capital will fall and it will be optimal for the firm to increase its investment."

asymmetric. They show that information is priced such that the greater the level of information incorporated into the price formation of a firm's stock, the less the firm's cost of capital. Moreover, according to Jensen and Meckling (1976), increased analyst coverage should reduce agency costs between managers and shareholders by providing passive monitoring. For these reasons, as the number of analysts following a firm's stock increases, that firm's cost of capital should decrease. This should in turn make it easier for the firm to raise external funds. Therefore, firms whose stocks are followed by a large number of analysts should have a narrower cost wedge between internal and external funds, which would again translate into lower investment-cash flow sensitivity if this sensitivity is indicative of financial constraints. Supporting this hypothesis, when we control for measurement errors in Tobin's Q, the relation between investment-cash flow sensitivity and analyst following is always negative, although it is not significant in some sub-samples.[6]

Bond ratings also have an impact on the cost wedge between external and internal funds. The cost of debt financing decreases as the bond rating increases. It is easier for firms with investment grade bond ratings to raise external funds through bond markets. Additionally, the junk bond market, which started in the early 1980s, has created an opportunity for firms without investment grade bond ratings to raise capital through bond markets. The cost wedge between external and internal funds should be lower for firms with bond ratings. If investment-cash flow sensitivity is informative about financial constraints, then the reduction of capital market imperfections through bond ratings should reduce this sensitivity. Consistent with this hypothesis, we find that firms with investment grade bond ratings have lower investment-cash flow sensitivities for the overall sample. This negative relation is also observed for the dividend

[6] When we use OLS regressions, however, the number of analysts following a firm proxies for its size, and it does not have any additional explanatory power when size is controlled for.

payout samples when GMM estimation is used[7], although it is not always statistically significant. The impact of junk bond ratings on investment-cash flow sensitivity, however, is mostly insignificant.

The final factor that we examine is corporate governance. As highlighted by Shleifer and Vishny (1997), suppliers of finance to companies want to assure themselves of a return on their investment. Firms with better corporate governance are better able to provide this assurance, and hence reduce their costs of external funds. If investment-cash flow sensitivity is indeed a manifestation of financial constraints, better governance should reduce this sensitivity.

Corporate governance mechanisms can broadly be categorized as internal and external. An important external control mechanism is the takeover market.[8] The corporate governance index developed by Gompers, Ishii and Metrick (2003) (GIM, henceforth), in the context of antitakeover amendments, provides us a composite measure of corporate governance. The GIM index is formed by adding one point for each antitakeover provision that increases managerial power (reduces takeover vulnerability). Therefore, a high value for this index corresponds to strong managerial rights (low takeover vulnerability) and weak shareholder rights. While GIM find that operating performance is better for firms with strong shareholder rights, they fail to find a significant relation between the governance index and returns on equity. Klock, Mansi and Maxwell (2004) analyze the impact of antitakeover amendments on the cost of debt financing using the same index. They find that high managerial rights reduce the cost of debt financing. Similarly, by examining bank loan rates in relation to GIM index, Chava, Dierker and Livdan (2004) find that loan rates decrease with increasing managerial rights. Cremers, Nair and Wei

---

[7] OLS results also mostly agree with GMM results.

[8] See Shleifer and Vishny (1997) and Denis and McConnell (2003) for surveys on corporate governance. See Holmstrom and Kaplan (2001) and Agrawal and Jaffe (2003) for a review of corporate governance and merger activities.

(2004) use the same index as a measure of antitakeover vulnerability and consider institutional ownership as a measure of shareholder control. They show that the cost of debt financing decreases with decreasing takeover vulnerability, in an environment of high shareholder control.

Several potential explanations for this finding are available in the literature: takeover related wealth changes of bond holders and wealth transfer from bondholders to shareholders (Warga and Welch (1993), and Billet, King and Mauer (2004)), managers having the opportunity to engage in longer term projects when shielded from takeover risks (DeAngelo and Rice (1983) and Stein (1988)), reduction in firm risk due to reduced job protection activities of managers when there are takeover defenses (Jensen and Ruback (1983)), and increased cash flow risk for debt holders in the presence of takeover vulnerability (Chava, Dierker and Livdan (2004)).

When we examine antitakeover amendments as a mechanism of corporate governance, we find that firms with higher managerial rights (lower takeover vulnerability) have lower investment-cash flow sensitivities. The firms with available GIM index data are generally large firms. Debt is the major source of external funds for these firms. Therefore, we would expect to find changes in investment-cash flow sensitivity to be in the same direction as the cost of debt financing. Since Klock, Mansi, and Maxwell (2004) and Chava, Dierker, and Livdan (2004) find a reduced cost of debt financing for firms with a higher number of antitakeover amendments, the decrease in investment-cash flow sensitivity for firms with a higher GIM index suggests that investment-cash flow sensitivity is informative about financial constraints. Additionally, we find a negative relation between institutional ownership and investment-cash flow sensitivity. Following Cremers, Nair and Wei (2004) then, if institutional ownership proxies for shareholder control and a large number of antitakeover amendments represents a reduced takeover vulnerability, our results show that investment-cash flow sensitivity is lower for reduced takeover vulnerability, when the level of shareholder control is high. Thus, our evidence suggests that investment-cash flow sensitivity reflects financial constraints, since it changes in the same direction as the cost of debt financing.

The overall evidence suggests that investment-cash flow sensitivity reduces with declining capital market imperfections, and hence this sensitivity provides information related to financial constraints. At the same time, however, using dividend payout ratios, we find that investment-cash flow sensitivity does not necessarily increase monotonically for lower dividend payout samples.[9] We also find that the relation between firm size and investment-cash flow sensitivity is largely insignificant, although it is significant in certain samples, especially with the OLS estimation. Therefore, when size and dividend payout ratio are used to categorize firms into different financial constraint groups, investment-cash flow sensitivity does not monotonically increase with the degree of financial constraints.[10] However, the investment-cash flow sensitivity of firms in the overall sample as well as in the dividend payout groups decreases along with most of the factors that reduce capital market imperfections. Thus, our evidence suggests that the sensitivity of investments to the availability of internal funds does reflect financial constraints imposed on firms by capital markets.

The rest of the paper is organized as follows. Section 1 provides a brief summary of the basic q model of investments and the measurement error problem in estimating it. Section 2 describes the data. Section 3 analyzes the time series characteristics of investment-cash flow sensitivity. Section 4 examines the relation between investment-cash flow sensitivity and the

---

[9] This non-monotonicity is more dramatic when OLS estimates are used. With GMM estimates, the monotonicity is violated only in the 1990-2001 sample.

[10] See Kaplan and Zingales (1997). Also, Cleary, Povel, and Raith (2004) develop a model that predicts a U-shape for the sensitivity of investment to internal funds. Additionally, Lyandres (2003) documents a non-monotonic relation between investment-cash flow sensitivity and external financing costs.

factors associated with capital market imperfections—fund flows, institutional ownership, analyst following, bond ratings, and corporate governance index. Section 5 concludes the paper.

1. The q Model of Investments and Measurement Error

Consider the simplified version of the standard q investment model presented by Erickson and Whited (2000). The firm chooses an investment policy I_t to maximize the expected discounted value of cash flow

$$V_t = \max_{\{I_{t+s}\}_{s=0}^{\infty}} E\left\{\sum_{s=0}^{\infty} \rho^s \left[\pi_{t+s}(K_{t+s-1}) - C_{t+s}(K_{t+s-1}, I_{t+s})\right]\right\} \quad (1)$$

subject to the law of motion for capital

$$K_t = (1-\delta)K_{t-1} + I_t \quad (2)$$

where I_t denotes gross investment; K_{t-1}: beginning-of-period capital stock; π_t: profits (gross of investments); C_t: cost of investment; ρ: the single period discount factor; and δ: the single period depreciation rate. The price of capital is chosen to be the numeraire. The cost of investment $C_t = I_t + \psi_t(K_{t-1}, I_t)$ includes the price of new capital assets (I_t), as well as capital adjustment costs, $\psi_t(K_{t-1}, I_t)$. Substituting (2) repeatedly into (1) and differentiating with respect to I_t yields the first order condition

$$1 + \psi_I(K_{t-1}, I_t^*) = E\left\{\sum_{s=1}^{\infty} \rho^s (1-\delta)^{s-1} \left[\pi_K(K_{t+s-1}) - \psi_K(K_{t+s-1}, I_{t+s})\right]\right\} = q_t \quad (3)$$

where q_t is the marginal cost of capital, and I_t^* solves (3). Assuming a linearly homogeneous quadratic adjustment cost function $\psi_t(K_{t-1}, I_t) = c_0 K_{t-1}(c_1 + I_t / K_{t-1})^2$, substituting into (3), and casting in a regression framework yields

$$\frac{I_t}{K_{t-1}} = a + \beta_1 q_t + u_t \quad (4)$$

which implies that investments are determined solely by the shadow price of capital, or marginal q. In particular, considerations of the availability of internal funds should play no role in the process. On the other hand, significant deviations from the perfect market paradigm would result in such considerations playing an important role, i.e., a significant coefficient **B** in the regression

$$\frac{I_t}{K_{t-1}} = a + \beta_1 q_t + \mathbf{z}_t \mathbf{B} + u_t \tag{5}$$

where **z** represents some measure(s) of internal funds. In empirical work, marginal q (q_t) is typically approximated by Tobin's average q (Q_t), while the most commonly used measure of internal funds is cash flow. Given the severity of the assumptions required, the strict structural interpretation of the model may not hold exactly, but equation (5) still has a natural interpretation: are investments determined exclusively by the attractiveness of investment opportunities as measured by marginal q (or Tobin's q), or do capital market imperfections impose financial constraints that make cash flow an important determinant?

Unfortunately, estimation of (5) is hindered by the problem of measurement error in q. Erickson and Whited (2000) list the several layers of approximation that lie between the marginal q of theory and the various versions of Tobin's q used in practice. Let Q_t be the mismeasured empirical proxy of the true marginal q_t, i.e.,

$$Q_t = a_0 + q_t + v_t \tag{6}$$

Substituting (3) into (2), we get

$$\begin{aligned} \frac{I_t}{K_{t-1}} &= \left(a - \beta_1 a_0\right) + \beta_1 Q_t + \mathbf{z}_t \mathbf{B} + (u_t - \beta_1 v_t) \\ &= \alpha + \beta_1 Q_t + \mathbf{z}_t \mathbf{B} + \varepsilon_t \end{aligned} \tag{7}$$

Clearly, $Cov(Q_t\ ,\ \varepsilon_t) = -\beta_1 \sigma_v^2 \neq 0$, so the usual OLS condition of independence between errors and regressors is violated and the estimates of $[\beta_1, \mathbf{B}]$ are inconsistent. In particular, the probability limit of the estimate of β_1 equals $\beta_1/(1+\sigma_v^2\Sigma_{11})$ where Σ = plim $\mathbf{X'X}/n$, and $\mathbf{X}=[q, \mathbf{z}]$, i.e., the estimate is biased toward 0. For the estimate of the i-th element of **B**, the probability limit is $\mathbf{B}_i - (\beta_1\sigma_v^2\Sigma_{i+1,1}) / (1+\sigma_v^2\Sigma_{11})$, which may be either greater or smaller than $\mathbf{B}_i$. (See Greene (2003), p. 83-86 for details.)

Erickson and Whited (2000) show that these biases may be substantial and may be responsible for the estimated coefficients on *Q* being low and those on cash flow being high, as reported in earlier papers. They propose a class of measurement error-consistent GMM estimators that utilize the information in the higher order moments of the data. The details of the Erickson and Whited (2000) estimators are described in Appendix A. We use their GMM estimators in addition to OLS estimators to address problems related to measurement errors. In addition to the usual assumption of independence between the errors (u,v) and the (true) regressors $(\mathbf{z}, q)$, Erickson and Whited's (2000) approach also requires two conditions to be satisfied for the model to be identified. These two conditions are notoriously difficult to satisfy in the data (Erickson and Whited (2000), Hennessy (2004), Polk and Sapienza (2004), Almeida and Campello (2004)). We encounter the problem in some of our tests as well; we report GMM results only for those sub-samples for which the conditions are met.

2. Data and Sample Description

Our data come from five sources: COMPUSTAT, the Federal Reserve's Flow of Funds Account of the United States, I/B/E/S, CDA/Spectrum, and the Investors Research Responsibility Center.

We use annual COMPUSTAT industrial files covering the years 1970 through 2001 as our primary source for U.S. manufacturing firm data. We measure investment, cash flow, Tobin's Q, and capital in the same manner as Kaplan and Zingales (1997). As in Kaplan and Zingales (1997), we deflate cash flow and investment by capital stock at the beginning of each year. The dividend payout ratio is obtained by dividing share repurchases (Data 115) plus cash dividends (Data 127) by net income (Data 172).

Aggregate fund flow data are taken from the Flow of Funds Accounts of the United States, which is published by the Federal Reserve Board. The publication contains quarterly data on sector holdings for each major asset class, starting with 1951. For the years 1970 through 2001, annual net fund flows are obtained by adding up the corresponding quarterly data on the net equity purchased by insurance companies, pension funds, mutual funds and closed-end funds. Net fund flow values for each year are converted to 2001 values using the CPI index of the Bureau of Labor Statistics. Figure 1 shows that, over the years, there has been a dramatic increase in net fund flows. During the 1970s, net fund flows amounted to about 18 billion dollars, while in 2000, they topped 200 billion dollars.[11]

Figure 1. Net Fund Flows.

The data on analyst following are obtained from I/B/E/S for the period 1976-2001. To get annual figures for the number of analysts following a firm, the last available quarterly data at or before that firm's fiscal year end are used. If no data exist for a firm, the number of analysts following that firm is taken to be zero.

Institutional ownership data for 1980 through 2001 are from the CDA/Spectrum database. This database provides quarterly reports on institutional holdings derived from the SEC's 13(f) filings. Spectrum classifies each institution as one of five types: bank, insurance company, investment company, independent investment advisor or other. The institutional holdings of

[11] Discontinuities in this increase over the years correspond to three major crises—the October 1987 stock market crash, the 1994-1995 Mexican debt crisis, and the 1997 Asian/Russian crisis.

insurance companies, investment companies and independent investment advisors are added up in order to determine the institutional ownership of each stock. If a stock has no reported institutional ownership, we assume the institutional holdings of the stock to be zero. [12]

Bond ratings data from 1985 to 2001 are taken from the annual COMPUSTAT industrial files. On the basis of bond ratings data, firms are divided into three categories—investment grade, junk, and no rating. Dummies are assigned for each category. Bonds with a BBB or above rating are considered as investment grade and those below as junk bonds. Firms without any bond rating are considered as having no rating.[13]

Annual data on antitakeover amendments for the period 1990-2001 are taken from the Investors Research Responsibility Center. GIM created an annual corporate governance index for U.S. firms based on five governance rules and twenty-four antitakeover provisions. The value of the index varies between 2 and 18. A high governance index value (that is, a large number of antitakeover amendments) corresponds to strong managerial rights and weak shareholder rights. The annual index values are used as a measure of corporate governance. If the governance index of a firm is missing for a year, the index value of the previous year is used.

Since all the data are not available for the overall sample period 1970-2001, the period is divided into four sub-periods (1976-, 1980-, 1985-, and 1990-2001) within which the effects of the above factors on investment-cash flow sensitivity are analyzed. We report the results only for the 1985-2001 and 1990-2001 sub-periods. The results are comparable in earlier periods, for the variables available for those periods. We also examine the time series pattern of investment-cash

[12] All institutions with more than $100 million in securities have to file quarterly 13(f) reports to the SEC disclosing their holdings. Additionally, institutions are required to report equity positions greater than 10,000 shares or $200,000. The "other" category in Spectrum covers foundations, employee stock ownership plans, university endowments, and pension funds. As with analyst following, annual data for the institutional ownership of a firm are derived using the last quarterly data at or before that firm's fiscal year end.

[13] We carry out the analyses using all junk bonds as well as by removing those that have a below-CCC rating. The latter is carried out to remove the impact of financial distress. Since the results are comparable, we report only the later ones.

flow sensitivity by running ten year rolling regressions of investment on cash flow and Tobin's Q from 1970 to 2001. These analyses are carried out for the overall sample as well as for each dividend payout group. For each sample period, firms are divided into three groups on the basis of dividend payout ratio. Firms among the lowest one third are considered as low payout (LP), while those among the highest one third are designated as high payout (HP). Those in between make up the medium payout (MP) category. Firms that have a negative net income and thus a negative payout ratio are considered as HP.

We omit firm-years with negative cash flows on account of their potential distortionary impact on investment-cash flow sensitivity estimates.[14] Additionally, in order to reduce the effects of extreme observations, for each sub-period, the top and bottom one percentile of the data with respect to investment, cash flow, and Tobin's Q are removed. We require a firm to have at least three years of data to be in the sample. Since investment and cash flow are deflated by capital stock, and Tobin's Q is a ratio, we convert all variables to ratios. With respect to fund flows, the net fund flow value for 1970 serves as a base and is assigned a value of one. The fund flow values for subsequent years are calculated relative to this base. We divide the number of analysts following a firm each year by the mean number of analysts following stocks for that year. This ratio thus gives us a relative figure for analyst following. Also, for each year, the institutional ownership of a firm is divided by the total institutional holdings for that year, depending on the fiscal year end of the firm. The first quarterly report on institutional holdings at or after the firm's fiscal year end is used to calculate the ratio. This figure gives us the institutional ownership of a firm relative to that of all firms whose fiscal year ends correspond to the same quarter. For the corporate governance index, each firm's annual governance index value is divided by the mean governance index for that year to get a relative figure.

[14] See Allayannis and Mozumdar (2004).

Table 1 reports descriptive statistics for these variables for the overall period as well as for the sub-periods. We report analyst following and the governance index values before their adjustment into ratios, since the mean values would equal one if we used the ratios. As can be observed in Table 1, investment, cash flow, and bond ratings are fairly stable throughout the sub-periods. Firm size and fund flows, on the other hand, increase through time. The increase in fund flows throughout the period and the increase in the number of analysts after the 1980s are supportive of a possible concurrent reduction in the informational asymmetries in the market. The governance index values are similar to those reported in GIM. Also, as expected, when we require firms to have governance index values, the sample size is reduced. The proportion of large firms with large institutional ownership and number of analysts following increases for this sample.

Table 1

3. The Time Series Pattern of Investment-Cash Flow Sensitivity

Using data from the late eighties and early nineties, Cleary (1999) and Erickson and Whited (2000) report investment-cash flow sensitivities that are much lower than those estimated by Fazzari, Hubbard, and Petersen (1988) and Kaplan and Zingales (1997), who used data from the 1970-1984 period. To examine if a decline is observed in our sample, we run rolling regressions from 1970 to 2001 for overlapping periods of ten years. This allows us to analyze the time series pattern of investment-cash flow sensitivity. Our first regression is for the period 1970-1979, the second for the period 1971-1980, and so forth. We estimate the following regression:

$$I_t / K_{t-1} = \alpha + \beta_1 Q_t + \beta_2 CF_t / K_{t-1} + \varepsilon_t \, , \qquad (8)$$

where I_t, and CF_t represent investment and cash flow during period t, respectively; K_{t-1} is the amount of fixed capital at the beginning of period t; and Q_t is Tobin's Q, calculated at the beginning of period t.[15] β_2 measures investment-cash flow sensitivity for the period t. The data are transformed into their mean deviation form by taking the differences between the raw data and the firm-level means. This allows us to eliminate fixed firm effects. We include year dummies to control for year effects. Heteroscedasticity correction is used for estimating standard errors.

We carry out this analysis for the overall sample as well as for each dividend payout group. We report the results based on OLS estimation as well as the measurement error-consistent GMM estimation of Erickson and Whited (2000).[16] GMM estimates based on product moments up to third and fourth orders (GMM3 and GMM4, respectively) are reported for the identified models.[17] For each model, p-values of the identification tests are given in Table 7 in the Appendix B. Since most GMM models of the medium payout group are not identified, GMM estimates are reported only for the low and high payout groups.

Table 2 and Figure 2 present the results of the above regressions for the overall sample. The results for each dividend payout group are in Table 3 and Figure 3. In line with the results of Erickson and Whited (2000), the application of GMM estimators results in the coefficient on Tobin's Q being more than three times higher and the coefficient on cash flow being lower than those obtained with OLS estimation. Nevertheless, there is a clear and steady decrease in estimated investment-cash flow sensitivity, β_2, over time. These results hold for the overall

[15] These variables are measured in the same manner as in Kaplan and Zingales (1997).
[16] We are grateful to Toni Whited for kindly making available on her web page her GAUSS programs for implementing these tests and estimators.
[17] Erickson and Whited (2000), Polk and Sapienza (2004), and Almeida and Campello (2004) mention the difficulty in finding samples for which GMM models are identified. We too lose some parts of our data due to the failure of identification tests, and report results only for the identified models. Data are available upon request.

sample as well as for the dividend payout groups. GMM results for the dividend payout groups also show that investment-cash flow sensitivities of financially constrained firms are larger than those of not financially constrained firms, but a similar pattern is not always evident with OLS estimates.[18]

Interestingly, the decrease in investment-cash flow sensitivity β_2 is not associated with any corresponding pattern in β_1, the sensitivity to Tobin's Q. A possible alternative explanation for the decline in β_2 is that Tobin's q became a less noisy proxy for marginal q over time, such that the incorrectly inflated role of cash flow also reduced. However, since the measurement-error consistent estimators also yield a declining pattern for β_2, and the pattern for β_1 remains stable, the decline in β_2 cannot be explained by a reduction in measurement error alone. Thus, the evidence lends support to the hypothesis that the decline in the estimated sensitivity β_2 is due to decreasing capital market imperfections over time.

Table 2, Table 3, Figure 2 and Figure 3

4. An Empirical Analysis of the Decline in Investment-Cash Flow Sensitivity

In theory, as markets become more efficient, it becomes easier for firms to raise external funds. If the reduction in financial constraints is reflected in investment cash-flow sensitivity, we should observe a decline in this sensitivity with decreasing capital market imperfections. We consider factors that prior research has identified as being related to capital market imperfections, and examine the impact of these factors on investment-cash flow sensitivity. Our regression model is as follows:

$$I_t / K_{t-1} = \alpha + \beta_1 Q_t + \beta_2 CF_t / K_{t-1} + \gamma_i (CF_t \times Factor_i) + \varepsilon_t \, . \tag{9}$$

[18] However, as reported in the next section, for the 1985 to 2001 period, the high payout group has higher sensitivity than the medium payout group with GMM4 estimates.

The factors considered in the regression are fund flows, analyst following, institutional ownership, bond ratings, and the corporate governance index. Table 4 presents the cross-sectional correlations between each pair of regression variables for the different sample periods. We observe that the correlations of variables with one another remain stable across the sample periods.

Table 4

We analyze the interaction of cash flow with these factors, and report the results for the 1985-2001 and 1990-2001 periods.[19] For these periods, we examine net fund flows, analyst following, institutional ownership, and bond ratings. For the period 1990 to 2001, we also include corporate governance index in the analysis. When the interaction of cash flow with the corporate governance index is considered, the sample size is reduced due to unavailability of the index value for many small firms. For each of these periods, we also analyze investment-cash flow sensitivity without including any capital market related factor. We include the interaction of cash flow with the natural logarithm of size as an additional control variable to isolate the impact of other factors on investment-cash flow sensitivity.[20] Different combinations of these factors are also examined, the results for which are not reported here since they are comparable to those that are. The results for the overall sample and for the dividend payout groups are given in Table 5 and Table 6, respectively. We run the regressions in the mean deviation form with year dummies, and use heteroscedasticity adjusted standard errors. OLS estimates as well as the GMM estimates

[19] We also examine 1970-2001, 1976-2001 and 1980-2001 periods. The results are comparable to those reported for the 1985-2001 and 1990-2001 periods.

[20] We control for firm size since Gilchrist and Himmelberg (1995), Kadapakkam, Kumar and Riddick (1998), Erickson and Whited (2000), and Allayannis and Mozumdar (2004) find a significant relation between firm size and financing constraints. Alti (2003) shows that investment-cash flow sensitivity captures near-term investment opportunities, especially for small and young firms. Other studies document a strong correlation between firm size and institutional ownership (Gompers and Metrick (2001)), analyst following (Bhushan (1989), and Brennan and Hughes (1991)) and strong managerial rights (Gompers, Ishii and Metrick (2003)). We also include size in addition to the interaction of cash flow and size. The results are similar to those reported.

based on Erickson and Whited (2000) are reported. GMM estimates based on the product moments of up to third and fourth order (GMM3 and GMM4, respectively) are reported for the identified models and the p-values of the identification tests of these models are given in Table 8 in the Appendix B.

Tables 5 and 6

4.1. The Cross-Sectional Pattern of Investment Cash Flow Sensitivity

In Table 5, we observe that investment-cash flows sensitivity decreases for each successive sample period. Table 6 shows that this result holds for different dividend payout groups as well, except for the low payout group with GMM4 estimates. However, GMM4 model does not satisfy the overidentifying restrictions for this sample, and thus the corresponding estimates are not reliable. Overall, the observed cross-sectional pattern in investment-cash flow sensitivity supports the time series pattern analyzed in the previous section. The impact of Tobin's Q on investment, however, is mainly stable throughout the sample periods. Thus, the decrease in investment-cash flow sensitivity is not accompanied by a changing pattern in the relation between investment and growth opportunities as measured by Tobin's Q. Additionally, investment-cash flow sensitivities for the lower payout groups are generally higher than those for higher payout groups, although this pattern is violated for the 1985-2001 period: for this period, medium payout group has lower sensitivity than the high payout group with GMM4 estimates.

4.2. Fund Flows

In recent years, there has been a rapid increase in investments made through institutionally managed funds (Figure 1). An increase in fund flows can reduce capital market imperfections in several ways. Since institutions trade more frequently, they increase liquidity in the market. Additionally, institutions have better information processing skills, and therefore, reduce informational asymmetries. Thus, increased fund flows should reduce the external financing costs for all firms.[21] If this reduction in financial constraints is reflected in the sensitivity of investments to the availability of internal funds, increasing fund flows should reduce this sensitivity.

In Table 5, we observe a negative and significant coefficient on the interaction of cash flow with fund flows for all periods. Table 6 shows that this relation holds for different payout groups as well. These results support the hypothesis that the sensitivity of investments to internal funds decreases with decreasing capital market imperfections. The coefficient on the interaction of cash flow with firm size is positive whenever it is significant, although it is largely insignificant with GMM estimates. This supports the empirical evidence of Kadapakkam, Kumar and Riddick (1998), Erickson and Whited (2000), and Allayannis and Mozumdar (2004), who find that investment-cash flow sensitivity increases with firm size. The finding that the coefficient is largely insignificant with the GMM estimates but not with the OLS estimates may be indicative of size capturing some unobserved factors related to Tobin's Q that are not captured by OLS estimates due to measurement error. Overall results show that investment-cash flow sensitivity decreases with increased fund flows irrespective of firm size and the dividend payout ratio.[22] Therefore, increasing fund flows are beneficial to all firms in raising external funds.

---

[21] A counter-argument can be made based on the types of firms institutions invest in. If institutions prefer large and liquid firms, then we should observe a decline in investment-cash flow sensitivity for only those firms. In fact, as demonstrated by Friedman (1996), in this case, fund flows can even be harmful as they increase the external financing costs of small firms. Friedman (1996) provides inconclusive evidence for this hypothesis. There are several possible reasons for his findings: the number of funds specializing in small growth firms has increased through time; correspondingly, funds increase their investment in small firms in order to outperform major market indices. To eliminate the impact of firm size, we also include an interaction term for firm size and cash flow in the regressions. Also, in Section 4.3, we analyze in detail the impact of institutional ownership on investment-cash flow sensitivity using data on institutional holdings.

[22] Firm size and dividend payout ratio are used in the literature to measure the degree of financing constraints. Whether the reduction in the cost wedge between external and internal funds should be higher for firms that have a

4.3. Institutional Ownership

As discussed above, increasing fund flows increase market liquidity and reduce informational asymmetries. Although these factors have an impact on the overall market, we would expect the largest effect to be on firms with higher levels of institutional ownership. These firms should be able to raise external funds more easily, since increased liquidity and reduced informational asymmetries through monitoring should reduce their cost of capital to a greater extent, thus decreasing the cost wedge between external and internal funding. If this is reflected in the sensitivity of investments to the availability of internal funds, the sensitivities of these firms should also reduce as a result.

The findings reported in Section 4.2 indicate that the relation between investment-cash flow sensitivity and fund flows is negative. If this negative relation is driven mainly by the firms in which institutions invest, fund flows should not have any additional explanatory power when considered together with institutional ownership. On the other hand, if institutional investments benefit the overall market—for instance, by increasing market liquidity and reducing information asymmetries—then we should still find a significant relation between fund flows and investment-cash flow sensitivity. Therefore, we examine the impact of institutional ownership on investment-cash flow sensitivity in Table 5 for the overall sample, and in Table 6 for the three dividend payout groups.

We find that the coefficient on the interaction of cash flow with institutional ownership is largely negative and significant for the overall sample as well as for the dividend payout groups.

---

higher degree of financial constraints cannot be tested since this question assumes a monotonically increasing relation between the degree of financial constraints and investment-cash flow sensitivity as well as firm size and dividend payout ratio as valid measures of financial constraints. There is not a clear agreement in the literature on these two issues. Our results also do not suggest a clear answer on these issues. Although we largely find that higher dividend payout groups have lower sensitivities than lower dividend payout groups, this is violated at certain times. For example, in Table 6, for the 1985-2001 period, GMM4 estimation results show that medium dividend payout group has higher investment-cash flow sensitivity than the high dividend payout group.

Thus investment-cash flow sensitivity decreases with decreasing capital market imperfections, irrespective of firm size and dividend payout ratios. This sensitivity, therefore, is informative about financial constraints. Moreover, the coefficient on the interaction of cash flow with aggregate fund flows is negative even when institutional ownership is controlled for. This result shows that fund flows are important not only to the firms in which institutions invest, but to other firms in the market as well, lending support to the 'commonality in liquidity' argument of Chordia, Roll, and Subrahmanyam (2000).

4.4. Analyst Following

According to Merton (1987), Easley, Hvidjkaer, and O'Hara (2002), and Easley and O'Hara (2004), if the number of analysts following a firm increases the incorporation of information into prices, it should reduce the firm's cost of capital and the wedge between internal and external financing costs. If the reduced financial constraints are reflected in investment-cash flow sensitivity, this sensitivity should decrease as the number of analysts following a firm increases.

Consistent with this hypothesis, in Table 5 and Table 6, GMM estimates of the coefficient on the interaction of cash flow with the number of analysts following is always negative (although not always significant) for the overall sample, as well as for the different dividend payout samples. Unreported results show that this coefficient is positive for the OLS estimates when size is not controlled and loses its significance when size is controlled for.[23] GMM estimation results, on the other hand, constitute evidence that investment-cash flow sensitivity is informative about financial constraints since this sensitivity decreases with increased analyst following.

4.5. Bond Ratings

[23] Results are available from the authors upon request.

Debt markets play a major role in the external financing of corporations. Cost of debt financing decreases as bond rating increases. Therefore, firms that have investment grade bond ratings should have a lower cost wedge between internal and external funds. If this is reflected in investment-cash flow sensitivity, then a lower sensitivity should be observed for firms with investment grade bond ratings. In Table 5 and Table 6, we observe that the interaction of cash flow and the investment grade bond rating dummy is always negative and mostly significant for the overall sample as well as for the dividend payout samples.[24] These results are supportive of an association between a decreasing investment-cash flow sensitivity and a decreasing cost wedge between internal and external funds.

The introduction of the junk bond market in the early 1980s created a way for firms without investment grade bond ratings to raise public debt capital. Raising external funds through junk bond markets should reduce the cost wedge between external and internal funds for such firms. If this is reflected in the sensitivity of investments to internal funds, we should observe a decrease in this sensitivity for firms with junk bond ratings. However, the impact of junk bond markets on the cost of capital is not clear. As documented by Holmstrom and Kaplan (2001), almost 50 percent of the junk bond issues during the 1980s were related to takeover activities; this percentage went down to 30 percent during the 1990s. Kaplan and Stein (1993) show that the takeover market overheated during the mid- to late-1980s, such that one third of the firms involved in these activities defaulted. Therefore, the financial distress of firms involved in takeover activities through junk bond markets during the mid- to late-1980s may have affected

[24] Although the results with the combination of all capital market related factors are not reported here, we should note that we generally observe an increase in the significance in this coefficient when the investment grade bond rating variable is used without institutional ownership or the GIM index. Using institutional ownership and the GIM index as corporate governance mechanisms, Bhojraj and Sengupta (2003) and Cremers, Nair and Wei (2004) find a positive relation between bond ratings and these corporate governance mechanisms. Our results are supportive of this evidence, i.e., bond ratings are somewhat informative about corporate governance mechanisms.

the relation between the junk bond ratings and the cost wedge between internal and external funds for this period.

When we examine the relation between the junk bond rating and investment-cash flow sensitivity for the overall sample and for the dividend payout samples in Table 5 and Table 6, the coefficient on the interaction of cash flow with the junk bond rating dummy is mainly insignificant, except for the high dividend payout sample for the 1990-2001 period where it is negative and significant. Thus, the results on junk bond ratings do not allow any conclusive inferences about the impact of market imperfections on investment-cash flow sensitivity.

4.6. Corporate Governance

Better corporate governance should reduce agency problems and lead to a decrease in the cost of capital. If the decrease in the wedge between internal and external funding costs is reflected in the investment-cash flow sensitivity, better governance should reduce this sensitivity. GIM have developed a corporate governance index based on antitakeover amendments. Klock, Mansi and Maxwell (2004) and Chava, Dierker, and Livdan (2004) find that the cost of debt financing decreases with an increase in the number of antitakeover amendments. Using institutional ownership as a proxy for shareholder control, Cremers, Nair and Wei (2004) show that antitakeover amendments lead to a decrease in the cost of debt financing when there is strong shareholder control. Possible explanations for this finding include wealth transfers from bond holders to shareholders and increase in cash flow risk of debt holders in the presence of takeover vulnerability, as well as managers taking up positive NPV long term projects or not indulging in job protection activities when they are shielded from takeover risk.[25]

[25] See Billet, King and Mauer (2004), Chava, Dierker and Livdan (2004), DeAngelo and Rice (1983), Jensen and Ruback (1983), Stein (1988) and Warga and Welch (1993).

We examine the relation between investment-cash flow sensitivity and the GIM index for the sample period 1990-2001. In this index, a high value corresponds to a large number of antitakeover amendments, and hence, is indicative of strong managerial rights (low takeover vulnerability) and weak shareholder rights. Most of the firms in this sample are large firms. As presented in Table 1, when we examine the firms that have GIM index values for the period 1990-2001, the median of total assets increases from $203.21 million to $993.5 million. Debt financing is the major source of external financing for large firms. Therefore, the cost of debt financing should have a larger impact on the cost wedge between internal and external funds for these firms. If investment-cash flow sensitivity is informative about financial constraints, then the relation between this sensitivity and the GIM index should be in the same direction as that between the cost of debt financing and the index.

We report OLS estimates in Table 5 for the overall sample and in Table 6 for the dividend payout groups. GMM estimates are not reported since the corresponding GMM models are not identified. The coefficient on the corporate governance index is negative and significant for the overall sample. For the dividend payout groups, it is always negative, but significant only for the high payout sample. The evidence thus indicates a negative relation between investment-cash flow sensitivity and the number of antitakeover amendments as well as the level of institutional ownership. In view of the reasoning above, changes in investment-cash flow sensitivity in the same direction as the cost of debt financing in relation to GIM index suggest that this sensitivity is informative about financial constraints.

These results support the findings of Klock, Mansi and Maxwell (2004), Chava, Dierker, and Livdan (2004), and Cremers, Nair and Wei (2004) in the sense that the impact of GIM index on investment-cash flow sensitivity is in the same direction as the impact of this index on the cost of debt financing. However, since OLS estimates may not be reliable due to measurement error problems related to Tobin's Q, this evidence can at best be seen as weak support for the hypothesized negative relation between investment-cash flow sensitivity and the GIM index.

5. Conclusion

This paper examines the sensitivity of investments to internal funds in relation to capital market imperfections from 1970 to 2001 using U.S. manufacturing firm data. The paper first shows that there has been a steady decrease in investment cash flow sensitivity over time, and that this decline cannot be explained on the basis of measurement error alone. Next, investment-cash flow sensitivity is examined as a function of five capital market-related factors: fund flows, institutional ownership, analyst following, bond ratings, and antitakeover amendments. If investment-cash flow sensitivity reflects financial constraints, then it should reduce as capital market imperfections as measured by these factors are mitigated and thus, financial constraints are eased.

Consistent with this hypothesis, we find that increased fund flows and institutional ownership decrease this sensitivity. Furthermore, increased fund flows decrease it not only for the firms held by institutions, but for all firms in the market, by increasing liquidity, information flow to the markets, and the level of monitoring.

As the number of analysts following a firm increases, more information is incorporated into prices. Since information is priced, increased analyst following should reduce the firm's cost of capital. We find some evidence supporting this hypothesis, i.e., investment-cash flow sensitivity decreases with increased analyst following.

Firms with investment-grade bond ratings are able to access debt markets at lower costs. The cost wedge between internal and external funds, therefore, should be lower for these firms.

We find that investment-cash flow sensitivity is lower for firms with investment-grade bond ratings. However, we fail to find a similar effect for junk bonds. Junk bond markets allow firms without investment-grade bond ratings to issue public debt. Our findings do not provide evidence about the relation between junk bond ratings and investment-cash flow sensitivity.

When antitakeover amendments are considered as a mechanism of corporate governance, OLS estimates indicate that firms with a large number of antitakeover amendments have a lower sensitivity of investments to internal funds. Previous work has shown that the cost of debt financing is lower for firms with stronger managerial rights (low takeover vulnerability). Since the sample for this part of our study consists mainly of large firms, and such firms rely primarily on debt for external financing, our finding is consistent with the relaxation of financial constraints through antitakeover measures being reflected in lower investment-cash flow sensitivity. However, this finding should be treated with some caution as it is based on OLS estimation alone, and measurement error concerns cannot be ruled out.

The impact of size on investment cash flow sensitivity is supportive of the previous empirical evidence, inasmuch as larger firms have higher sensitivities. Yet, there is also some evidence that size captures some unobserved factors in Tobin's Q that are not captured by the OLS estimates of Tobin's Q due to measurement errors. Further, when dividend payout ratio is used to group firms, higher payout firms mostly have higher sensitivities than lower payout firms, but this is violated for certain sub-samples. These results suggest that when size and dividend payout ratio are used to categorize firms into different financial constraint samples, the magnitude of the investment-cash flow sensitivity may not necessarily measure the degree of financial constraints.

In summary, our findings indicate that investment-cash flow sensitivity decreases when there is a reduction in capital market imperfections. This holds for the overall sample, as well as for most of the samples with different dividend payout ratios. The overall evidence suggests that investment cash flow sensitivity provides information about financial constraints imposed on firms by capital market imperfections.

References

Agrawal, Anup and Jeffrey F. Jaffe, 2003, Do Takeover Targets Underperform? Evidence from Operating and Stock Returns, Journal of Financial and Quantitative Analysis, 34, 721-746.

Allayannis, George, and Abon Mozumdar, 2004, The Investment-cash flow sensitivity puzzle: Can negative cash flow observations explain it?, Journal of Banking and Finance, 28, 901-930.

Almeida, Heitor, and Murillo Campello, 2004, Financial Constraints, Asset Tangibility, and Corporate Investment, Working Paper, New York University.

Almeida, Heitor, Murillo Campello and Michael Weisbach, 2004, The Cash Flow Sensitivity of Cash, Journal of Finance 59, 1777 - 1804.

Alti, Aydogan, 2003, How Sensitive Is Investment to Cash Flow When Financing Is Frictionless? Journal of Finance, 58, 707–722.

Amihud, Yakov, 2002, Illiquidity and stock returns: Cross-section and time-series effects, Journal of Financial Markets 5, 31-56.

Bhojraj, Sanjeev, and Partha Sengupta, 2003, Effect of corporate governance on bond ratings and yields: The role of institutional investors and outside directors, Journal of Business, 76, 455-475.

Bhushan, Ravi, 1989, Firm characteristics and analyst following, Journal of Accounting and Economics 11, 255-274.

Billett, Matthew T., Dolly King, and David C. Mauer, 2004, Bondholders Wealth Effects in Mergers and Acquisitions: New Evidence from the 1980s and 1990s, Journal of Finance 59, 107-135.

Brennan, Michael J., and Patricia J. Hughes, 1991, Stock prices and the supply of information, Journal of Finance 46, 1665-1691.

Chava, Sudheer, Martin Dierker, and Dmitry Livdan, 2004, Do Shareholder Rights Affect the Cost of Bank Loans?, Working Paper, University of Houston.

Chordia, Tarun, Richard Roll, Avanidhar Subrahmanyam, 2000, Commonality in liquidity, Journal of Financial Economics 56, 3-28.

Cleary, Sean, 1999, The relationship between firm investment and financial status, Journal of Finance 54, 673-692.

Cleary, Sean, Paul Povel, and Michael Raith, 2004, The U-Shaped investment curve: theory and evidence, Working Paper, University of Minnesota.

Cremers, Martijn, Vinay Nair, and Chenyang Wei, 2004, The impact of shareholder control on bondholders, Working Paper, New York University.

DeAngelo, Harry, and Edward Rice, 1983, Antitakeover Charter Amendments and Stockholder Wealth, Journal of Financial Economics 11, 329-359.

Denis, Diane K., and John J. McConnell, 2003, International corporate governance, Journal of Financial and Quantitative Analysis 38, 1-36.

Easley, David, Soeren Hvidjkaer and Maureen O'Hara, 2002, Is information risk a determinant of asset returns, Journal of Finance 57, 2185-2222.

Easley, David, and Maureen O'Hara, 2004, Information and the cost of capital, Journal of Finance 59, 1553 - 1583.

Erickson, Timothy, and Toni M. Whited, 2000, Measurement error and the relationship between investment and q, Journal of Political Economy 108, 1027-1057.

Erickson, Timothy, and Toni M. Whited, 2002, Two-Step GMM estimation of the errors-in-variables model using high-order moments, Econometric Theory 18, 776-799.

Falkenstein, Eric, 1996, Preferences for stock characteristics as revealed by mutual fund portfolio holdings, Journal of Finance 51, 111-136.

Fazzari, Steven M., R. Glenn Hubbard, and Bruce P. Petersen, 1988, Financing constraints and corporate investment, Brookings Papers on Economic Activity, 141-195.

Friedman, Benjamin, 1996, Economic implications of changing share ownership, Journal of Portfolio Management 2, 59-70.

Gilchrist, Simon, and Charles P. Himmelberg, 1995, Evidence on the role of cash flow for investment, Journal of Monetary Economics 36, 541-572.

Gomes, Joao, 2001, Financing Investment, American Economic Review 91, 1263-1285.

Gompers, Paul A., Joy L. Ishii, and Andrew Metrick, 2003, Corporate governance and equity prices, Quarterly Journal of Economics 118, 107-155.

Gompers, Paul A., and Andrew Metrick, 2001, Institutional investors and equity prices, Quarterly Journal of Economics 116, 229-259.

Hasbrouck, Joel, and Duane Seppi, 2001, Common factors in prices, order flows, and liquidity, Journal of Financial Economics 59, 383-411.

Hennessy, Christopher A., 2004, Tobin's Q, debt overhang, and investment, Journal of Finance 59, 1717-1742.

Holmstrom, Bengt, and Steven N. Kaplan, 2001, Corporate governance and merger activity in the U.S.: Making sense of the 1980's and 1990's, Journal of Economic Perspectives 15, 121-144.

Hubbard, Glenn R., 1998, Capital market imperfections and investment, Journal of Economic Literature 36, 193-225.

Huberman, Gur, and Dominic Halka, 2001, Systemic liquidity, Journal of Financial Research 24, 161-178.

Jensen, Michael C., William H. Meckling, 1976, Theory of the firm: Managerial behavior, agency costs and ownership structure, Journal of Financial Economics 3, 305-360.

Jensen, Michael C., and Richard S. Ruback, 1983, The Market for Corporate Control: The Scientific Evidence, Journal of Financial Economics 11, 5-50.

Kadapakkam, Palani-Rajan, P. C. Kumar, and Leigh A. Riddick, 1998, The impact of cash flows and firm size on investment: The international evidence, Journal of Banking and Finance 22, 293-320.

Kaplan, Steven, and Jeremy Stein, 1993, The evolution of buyout pricing and financial structure in the 1980s, Quarterly Journal of Economics, 108, 313-357.

Kaplan, Steven N., and Luigi Zingales, 1997, Do investment-cash flow sensitivities provide useful measures of financing constraints?, Quarterly Journal of Economics, 169-215.

Klock, Mark, Sattar A. Mansi, and William F. Maxwell, 2004, Does corporate governance matter to bondholders? Journal of Financial and Quantitative Analysis, forthcoming.

Love, Inessa, 2003, Financial development and Financing Constraints: International Evidence from the Structural Investment Model, Review of Financial Studies, 16, 765-791.

Lyandres, Evgeny, 2003, The Effects of Financial Constraints on Investment Timing, Working Paper, University of Rochester.

Modigliani, Franco, and Merton Howard Miller, 1958, The Cost of Capital Corporation Finance, and the Theory of Investment, American Economic Review, 48, 261-297.

Moyen, Nathalie, 2004, Investment-cash Flow Sensitivities: Constrained versus Unconstrained Firms. Journal of Finance, forthcoming.

Merton, Robert, 1987, A simple model of capital market equilibrium with incomplete information, Journal of Finance 42, 483-510.

Pastor, Lubos and Robert Stambaugh, 2003, Liquidity risk and expected stock returns, Journal of Political Economy 111, 642-685.

Polk, Christopher K., and Paola Sapienza, 2004, Real Effects of Investor Sentiment, Working Paper, Northwestern University.

Shleifer, Andrei, and Robert W. Vishny, 1997, A survey of corporate governance, Journal of Finance 52, 737-784.

Stein, Jeremy C., 1988, Takeover threats and managerial myopia, Journal of Political Economy 96, 61-80.

Warga, Arthur, and Ivo Welch, 1993, Bondholder Losses in Leveraged Buyouts, Review of Financial Studies 6, 959-982.

White, Halbert, 1980, A heteroscedasticity-consistent covariance matrix estimator and a direct test for heteroscedasticity, Econometrica 48, 817-838.

Wurgler, Jeffrey, 2000, Financial Markets and the Allocation of Capital, Journal of Financial Economics, 58, 187-214.

Table 1
Descriptive Statistics

This table reports the mean and median values of the variables over four sample periods: 1970-2001, 1976-2001, 1980-2001, 1985-2001, and 1990-2001. The Obs column shows the sample size for each period. For the period 1990-2001, there are two samples. When we require a firm to have a corporate governance index, the sample size reduces to the one reported at the bottom of the table. I, CF, and Q represent investment, cash flow, and Tobin's Q, respectively. These are calculated in the same manner as in Kaplan and Zingales (1997). Fund flows are calculated taking the 1970 values as a base of one and then calculating subsequent values accordingly. Fund flows are converted to 2001 values using the CPI index of the Bureau of Labor Statistics. The analysts column shows the analyst following for the sample firms. The number of analysts following a firm is divided by the mean number of analysts following for each year. The IO column gives the proportion of the institutional ownership of the sample firms relative to the institutional ownership of all firms with fiscal years corresponding to the same quarter. The Inv rate (Junk rate) column gives the proportion of firms that have investment grade (junk) bonds. The Govn column gives the corporate governance index, and is taken from GIM. The corporate governance index value of each firm is divided by the mean corporate governance index for that year. For each period, except for the Inv rate and Junk rate columns, the first row gives the mean values and the second row the median values.

	Obs	Total Assets	I	CF	Q	Fund flows	Analysts	IO	Inv rate	Junk rate	Governance Index
1970-2001	41728	1511.99	0.28	0.56	1.43	3.49					
		118.14	0.22	0.39	1.17	1.80					
1976-2001	35083	1711.02	0.28	0.58	1.45	3.93	4.84				
		133.31	0.22	0.40	1.19	2.16	2.16				
1980-2001	29398	1916.94	0.28	0.60	1.53	4.48	5.27	0.032			
		147.27	0.22	0.39	1.26	2.98	2.00	0.003			
1985-2001	21944	2245.77	0.27	0.62	1.61	5.44	5.62	0.031	0.160	0.080	
		169.29	0.21	0.40	1.32	5.29	2.00	0.002			
1990-2001	14935	2651.88	0.27	0.66	1.68	7.12	5.57	0.030	0.170	0.090	
		203.21	0.20	0.41	1.36	8.50	2.00	0.002			
1990-2001**	5848	3606.33	0.23	0.49	1.79	7.34	10.48	0.06	0.35	0.15	9.47
		993.51	0.20	0.38	1.49	8.88	8.00	0.014			10.00

** The reduced sample from 1990 to 2001, where all firms in the sample have a governance index.

Table 2
Time Series Pattern of Investment-Cash Flow and -Tobin's Q Sensitivities

This table presents the sensitivity of investment to internal funds and Tobin's Q. We run rolling regressions from 1970 to 2001 for overlapping periods of ten years according to the following regression model:

$$I_t / K_{t-1} = \alpha + \beta_1 Q_t + \beta_2 CF_t / K_{t-1} + \varepsilon_t ,$$

where I_t and CF_t represent investment and cash flow during period t, respectively; K_{t-1} is the amount of capital at the beginning of period t; and Q_t is Tobin's Q, calculated at the beginning period t in the same manner as in Kaplan and Zingales (1997). The first regression is from 1970 to 1979, and is reported below as 1979. The second is from 1971 to 1980, and is reported as 1980, and so forth. In the regressions, the data are transformed into their mean deviation form by taking the differences between the raw data and the firm-level means so as to eliminate the fixed-firm effects. We keep the year dummies to control for the year effects. OLS and GMM results are reported. In the columns below, Obs gives the number of observations, CF gives the coefficient on cash flow, and Q gives the coefficient on Tobin's Q. Heteroscedasticity adjusted standard errors are in the parentheses.

		OLS			GMM3			GMM4			
	Obs	R^2	CF	Q	R^2	CF	Q	R^2	CF	Q	J-stat
1979	12347	0.187	**0.28**	**0.053**	0.251	**0.157**	**0.352**	0.233	**0.177**	**0.271**	1.356
			(0.013)	**(0.005)**		**(0.03)**	**(0.113)**		**(0.015)**	**(0.032)**	(0.508)
1980	13376	0.168	**0.259**	**0.057**	0.231	**0.149**	**0.314**	0.223	**0.159**	**0.278**	0.469
			(0.011)	**(0.004)**		**(0.024)**	**(0.083)**		**(0.015)**	**(0.036)**	(0.791)
1981	13803	0.158	**0.243**	**0.06**	0.22	**0.152**	**0.294**	0.22	**0.153**	**0.291**	0.054
			(0.011)	**(0.004)**		**(0.02)**	**(0.072)**		**(0.015)**	**(0.04)**	(0.973)
1982	14072	0.151	**0.234**	**0.057**	0.214	**0.150**	**0.316**	0.221	**0.147**	**0.331**	0.84
			(0.01)	**(0.005)**		**(0.024)**	**(0.107)**		**(0.015)**	**(0.05)**	(0.657)
1983	14237	0.16	**0.238**	**0.055**	0.193	**0.155**	**0.204**	0.23	**0.147**	**0.354**	3.23
			(0.01)	**(0.006)**		**(0.021)**	**(0.098)**		**(0.014)**	**(0.049)**	(0.198)
1984	14398	0.168	**0.241**	**0.055**	0.208	**0.156**	**0.297**	0.26	0.119	0.484	8.61
			(0.01)	**(0.006)**		**(0.047)**	**(0.13)**		(0.018)	(0.068)	(0.014)
1985	14474	0.17	**0.236**	**0.067**	0.228	**0.135**	**0.364**	0.259	0.117	0.447	7.00
			(0.01)	**(0.006)**		**(0.056)**	**(0.145)**		(0.017)	(0.054)	(0.03)
1986	14476	0.163	**0.228**	**0.073**	0.211	**0.145**	**0.284**	0.27	0.106	0.448	13.49
			(0.01)	**(0.007)**		**(0.054)**	**(0.128)**		(0.017)	(0.052)	(0.001)
1987	14495	0.165	**0.216**	**0.072**	0.207	**0.138**	**0.245**	0.271	0.093	0.414	14.67
			(0.011)	**(0.007)**		**(0.058)**	**(0.102)**		(0.019)	(0.054)	(0.001)
1988	14497	0.168	**0.2**	**0.074**	0.202	**0.133**	**0.207**	0.281	0.079	0.398	18.14
			(0.01)	**(0.006)**		**(0.049)**	**(0.098)**		(0.017)	(0.044)	(0.00)
1989	14399	0.168	**0.185**	**0.081**	0.217	**0.112**	**0.230**	0.29	0.067	0.378	15.59
			(0.01)	**(0.006)**		**(0.038)**	**(0.101)**		(0.015)	(0.036)	(0.00)
1990	14248	0.159	**0.167**	**0.077**	0.232	**0.083**	**0.266**	0.285	0.055	0.352	11.38
			(0.009)	**(0.006)**		**(0.034)**	**(0.102)**		(0.014)	(0.033)	(0.003)

Table 2 - *Continued*

		OLS			GMM3			GMM4			
	R^2	Obs	CF	Q	R^2	CF	Q	R^2	CF	Q	J-stat
1991	0.162	14099	**0.155**	**0.080**	0.250	**0.067**	**0.294**	0.291	0.050	0.350	9.193
			(0.009)	**(0.005)**		**(0.032)**	**(0.097)**		(0.014)	(0.034)	(0.01)
1992	0.165	14017	**0.144**	**0.071**	0.263	**0.074**	**0.283**	0.308	0.056	0.342	9.770
			(0.008)	**(0.005)**		**(0.028)**	**(0.087)**		(0.014)	(0.035)	(0.008)
1993	0.17	13939	**0.138**	**0.068**	0.287	**0.055**	**0.341**	0.320	0.043	0.381	6.350
			(0.008)	**(0.005)**		**(0.031)**	**(0.101)**		(0.016)	(0.042)	(0.042)
1994	0.166	13876	**0.128**	**0.067**	0.313	**0.037**	**0.429**	0.306	0.040	0.376	8.220
			(0.007)	**(0.005)**		**(0.022)**	**(0.122)**		(0.015)	(0.041)	(0.016)
1995	0.159	13834	**0.121**	**0.065**	0.315	0.038	**0.450**	0.287	0.043	0.357	6.670
			(0.006)	**(0.005)**		(0.028)	**(0.129)**		(0.013)	(0.037)	(0.036)
1996	0.152	13825	**0.110**	**0.065**	0.294	0.037	**0.383**	0.283	0.041	0.333	6.260
			(0.006)	**(0.004)**		(0.026)	**(0.124)**		(0.013)	(0.037)	(0.044)
1997	0.149	13702	**0.102**	**0.064**	0.262	**0.045**	**0.308**	0.272	**0.043**	**0.315**	0.263
			(0.006)	**(0.004)**		**(0.024)**	**(0.083)**		**(0.012)**	**(0.038)**	(0.278)
1998	0.14	13460	**0.098**	**0.060**	0.256	0.031	**0.324**	0.277	0.026	0.341	5.973
			(0.005)	**(0.004)**		(0.033)	**(0.12)**		(0.013)	(0.039)	(0.05)
1999	0.146	13178	**0.097**	**0.057**	0.250	**0.038**	**0.295**	0.278	0.029	0.325	6.490
			(0.005)	**(0.004)**		**(0.022)**	**(0.11)**		(0.013)	(0.038)	(0.04)
2000	0.148	12846	**0.091**	**0.054**	0.223	**0.053**	**0.223**	0.267	0.032	0.293	3.610
			(0.005)	**(0.004)**		**(0.026)**	**(0.084)**		(0.014)	(0.038)	(0.165)
2001	0.146	12310	**0.085**	**0.052**	0.215	**0.062**	**0.195**	0.284	0.028	0.309	3.810
			(0.005)	**(0.003)**		**(0.022)**	**(0.07)**		(0.014)	(0.041)	(0.149)

Table 3
Time Series Pattern of the Investment-Cash Flow and –Tobin's Q Sensitivities for Firms in Different Payout Groups

This table presents the sensitivity of investment to internal funds and Tobin's Q. We run rolling regressions from 1970 to 2001 for overlapping periods of ten years according to the following regression model:

$$I_t / K_{t-1} = \alpha + \beta_1 Q_t + \beta_2 CF_t / K_{t-1} + \varepsilon_t ,$$

where I_t and CF_t represent investment and cash flow during period t, respectively; K_{t-1} is the amount of capital at the beginning of period t; and Q_t is Tobin's Q, calculated at the beginning period t in the same manner as in Kaplan and Zingales (1997). The firms are divided into three groups using dividend payout ratios. Break points of the dividend payout ratio are in Break columns. Firms with payout ratios below p1 are considered as low payout (LP), above p2 as high payout (HP), and between p1 and p2 as medium payout (MP). The first regression is from 1970 to 1979, and is reported below as 1979. The second is from 1971 to 1980, and is reported below as 1980, and so forth. In the regressions, the data are transformed into their mean deviation form by taking the differences between the raw data and the firm-level means so as to eliminate the fixed-firm effects. We keep the year dummies to control for the year effects. OLS and GMM results are reported. GMM results are reported only for identified models. Since almost all MP models are unidentified, corresponding GMM results are not reported. In the columns below, Obs gives the number of observations, the R^2 values are given next. CF gives the coefficient on cash flow and Q gives the coefficient on Tobin's Q. Heteroscedasticity adjusted standard errors are in the parentheses.

Panel A: OLS

	Breakpoints		LP				MP				HP			
	p33	p67	Obs	R^2	CF	Q	Obs	R^2	CF	Q	Obs	R^2	CF	Q
1979	0.174	0.388	4563	0.274	**0.332**	**0.047**	3727	0.196	**0.381**	**0.035**	3971	0.139	**0.237**	**0.027**
					(0.034)	**(0.023)**			**(0.02)**	**(0.005)**			**(0.019)**	**(0.005)**
1980	0.172	0.387	4670	0.156	**0.245**	**0.077**	4200	0.198	**0.38**	**0.037**	4487	0.124	**0.214**	**0.027**
					(0.017)	**(0.009)**			**(0.019)**	**(0.006)**			**(0.018)**	**(0.005)**
1981	0.167	0.38	4818	0.146	**0.228**	**0.072**	4331	0.188	**0.367**	**0.04**	4638	0.122	**0.2**	**0.041**
					(0.015)	**(0.01)**			**(0.019)**	**(0.007)**			**(0.017)**	**(0.006)**
1982	0.165	0.382	4902	0.157	**0.242**	**0.074**	4394	0.195	**0.362**	**0.05**	4768	0.111	**0.196**	**0.051**
					(0.015)	**(0.01)**			**(0.019)**	**(0.008)**			**(0.017)**	**(0.007)**
1983	0.158	0.385	4964	0.15	**0.242**	**0.067**	4421	0.195	**0.368**	**0.031**	4846	0.121	**0.202**	**0.058**
					(0.017)	**(0.012)**			**(0.018)**	**(0.009)**			**(0.016)**	**(0.008)**
1984	0.152	0.387	5019	0.143	**0.23**	**0.055**	4462	0.2	**0.375**	**0.041**	4914	0.138	**0.198**	**0.059**
					(0.017)	**(0.012)**			**(0.019)**	**(0.013)**			**(0.016)**	**(0.009)**
1985	0.145	0.39	5052	0.154	**0.239**	**0.059**	4470	0.195	**0.377**	**0.045**	4949	0.130	**0.193**	**0.062**
					(0.016)	**(0.012)**			**(0.02)**	**(0.012)**			**(0.015)**	**(0.009)**
1986	0.134	0.396	5070	0.147	**0.225**	**0.066**	4446	0.187	**0.383**	**0.059**	4966	0.128	**0.209**	**0.049**
					(0.016)	**(0.012)**			**(0.02)**	**(0.011)**			**(0.015)**	**(0.008)**

Table 3 –Continued

Panel A: OLS														
	Breakpoints		LP				MP				HP			
	p33	p67	Obs	R^2	CF	Q	Obs	R^2	CF	Q	Obs	R^2	CF	Q
1987	0.121	0.403	5110	0.158	**0.205**	**0.085**	4432	0.186	**0.348**	**0.04**	4974	0.132	**0.193**	**0.052**
					(0.016)	**(0.012)**			**(0.022)**	**(0.01)**			**(0.015)**	**(0.008)**
1988	0.103	0.41	5128	0.161	**0.203**	**0.086**	4399	0.192	**0.264**	**0.032**	4978	0.132	**0.177**	**0.054**
					(0.015)	**(0.011)**			**(0.019)**	**(0.01)**			**(0.015)**	**(0.008)**
1989	0.083	0.419	5115	0.178	**0.193**	**0.106**	4340	0.174	**0.28**	**0.054**	4952	0.133	**0.169**	**0.054**
					(0.014)	**(0.012)**			**(0.019)**	**(0.009)**			**(0.013)**	**(0.008)**
1990	0.062	0.431	5088	0.173	**0.175**	**0.101**	4262	0.156	**0.228**	**0.06**	4912	0.135	**0.174**	**0.043**
					(0.015)	**(0.01)**			**(0.019)**	**(0.009)**			**(0.014)**	**(0.008)**
1991	0.034	0.439	5059	0.2	**0.182**	**0.1**	4179	0.126	**0.181**	**0.063**	4864	0.119	**0.168**	**0.035**
					(0.014)	**(0.01)**			**(0.016)**	**(0.008)**			**(0.013)**	**(0.007)**
1992	0.01	0.429	5102	0.206	**0.168**	**0.089**	4135	0.126	**0.179**	**0.058**	4825	0.123	**0.152**	**0.039**
					(0.013)	**(0.009)**			**(0.019)**	**(0.007)**			**(0.013)**	**(0.006)**
1993	0.001	0.429	5077	0.18	**0.134**	**0.083**	4083	0.146	**0.187**	**0.048**	4805	0.109	**0.122**	**0.043**
					(0.012)	**(0.008)**			**(0.016)**	**(0.007)**			**(0.013)**	**(0.006)**
1994	0	0.425	5124	0.168	**0.132**	**0.07**	3976	0.154	**0.193**	**0.045**	4761	0.104	**0.103**	**0.047**
					(0.011)	**(0.008)**			**(0.017)**	**(0.007)**			**(0.012)**	**(0.006)**
1995	0	0.416	5217	0.178	**0.128**	**0.076**	3882	0.167	**0.194**	**0.038**	4731	0.088	**0.093**	**0.043**
					(0.01)	**(0.008)**			**(0.016)**	**(0.007)**			**(0.012)**	**(0.005)**
1996	0	0.416	5262	0.172	**0.114**	**0.073**	3865	0.174	**0.188**	**0.044**	4690	0.09	**0.093**	**0.036**
					(0.009)	**(0.008)**			**(0.016)**	**(0.008)**			**(0.01)**	**(0.005)**
1997	0	0.413	5271	0.152	**0.098**	**0.067**	3788	0.179	**0.182**	**0.046**	4636	0.09	**0.093**	**0.031**
					(0.008)	**(0.008)**			**(0.015)**	**(0.008)**			**(0.01)**	**(0.005)**
1998	0	0.434	5129	0.125	**0.089**	**0.059**	3762	0.168	**0.172**	**0.049**	4563	0.094	**0.09**	**0.034**
					(0.008)	**(0.008)**			**(0.016)**	**(0.008)**			**(0.012)**	**(0.005)**
1999	0	0.451	5015	0.132	**0.087**	**0.056**	3739	0.16	**0.154**	**0.05**	4457	0.082	**0.08**	**0.029**
					(0.007)	**(0.007)**			**(0.015)**	**(0.008)**			**(0.012)**	**(0.005)**
2000	0	0.451	4851	0.146	**0.09**	**0.049**	3661	0.169	**0.138**	**0.046**	4338	0.089	**0.082**	**0.03**
					(0.007)	**(0.006)**			**(0.013)**	**(0.007)**			**(0.013)**	**(0.005)**
2001	0.002	0.453	4624	0.151	**0.088**	**0.054**	3531	0.146	**0.112**	**0.047**	4169	0.108	**0.088**	**0.031**
					(0.008)	**(0.006)**			**(0.012)**	**(0.007)**			**(0.012)**	**(0.004)**

Table 3 –Continued

Panel B: GMM3						
	LP			HP		
	R^2	CF	Q	R^2	CF	Q
1979	0.218	**0.177**	**0.307**			
		(0.028)	**(0.121)**			
1980	0.207	**0.164**	**0.304**			
		(0.025)	**(0.111)**			
1981	0.219	**0.150**	**0.347**	0.183	**0.098**	**0.292**
		(0.023)	**(0.118)**		**(0.058)**	**(0.2)**
1982	0.223	**0.146**	**0.410**	0.180	**0.085**	**0.306**
		(0.031)	**(0.195)**		**(0.049)**	**(0.17)**
1983	0.210	**0.163**	**0.389**	0.184	**0.119**	**0.301**
		(0.03)	**(0.213)**		**(0.041)**	**(0.168)**
1984				0.205	**0.085**	**0.435**
					(0.049)	**(0.249)**
1985				0.252	-0.038	0.770
					(0.184)	(0.689)
1988	0.287	0.088	0.507			
		(0.062)	(0.408)			
1989	0.307	**0.074**	**0.459**			
		(0.042)	**(0.211)**			
1990	0.280	**0.087**	**0.337**			
		(0.051)	**(0.173)**			
1991	0.391	**0.059**	**0.523**			
		(0.027)	**(0.2)**			
1992	0.365	**0.056**	**0.449**	0.380	-0.301	1.038
		(0.032)	**(0.173)**		(1.069)	(2.5)
1993	0.350	0.052	**0.436**	0.336	-0.169	0.817
		(0.034)	**(0.159)**		(0.649)	(1.737)
1994	0.371	**0.055**	**0.548**	0.433	-0.213	0.975
		(0.032)	**(0.262)**		(0.82)	(2.036)
1995	0.419	0.004	**0.653**	0.314	-0.075	0.607
		(0.073)	**(0.305)**		(0.33)	(0.998)
1996	0.379	0.001	**0.570**	0.174	**0.048**	**0.216**
		(0.083)	**(0.324)**		**(0.02)**	**(0.102)**
1997	0.321	**0.028**	**0.430**	0.188	0.027	0.271
		(0.012)	**(0.248)**		(0.02)	(0.179)
1998	0.307	**0.015**	**0.424**	0.184	0.025	0.266
		(0.006)	**(0.252)**		(0.021)	(0.171)
1999				0.187	0.010	**0.284**
					(0.02)	**(0.129)**
2000				0.202	**0.041**	**0.233**
					(0.024)	**(0.096)**
2001	0.168	**0.067**	0.114	0.243	**0.049**	**0.241**
		(0.032)	(0.104)		**(0.021)**	**(0.091)**

Table 3 –Continued

Panel B: GMM4								
	LP				HP			
	R^2	J-stat	CF	Q	R^2	J-stat	CF	Q
1979	0.214	0.448	**0.182**	**0.282**				
		(0.799)	**(0.019)**	**(0.041)**				
1980	0.205	0.219	**0.167**	**0.289**				
		(0.896)	**(0.018)**	**(0.052)**				
1981	0.210	0.195	**0.156**	**0.310**	0.131	1.170	**0.149**	**0.128**
		(0.907)	**(0.018)**	**(0.053)**		(0.558)	**(0.032)**	**(0.058)**
1982	0.203	1.280	**0.160**	**0.308**	0.156	1.220	**0.103**	**0.236**
		(0.528)	**(0.017)**	**(0.058)**		(0.543)	**(0.039)**	**(0.121)**
1983	0.218	2.970	**0.165**	**0.369**	0.149	1.250	**0.145**	**0.177**
		(0.222)	**(0.018)**	**(0.072)**		(0.534)	**(0.031)**	**(0.087)**
1984					0.187	0.762	**0.080**	**0.372**
						(0.683)	**(0.032)**	**(0.104)**
1985					0.215	0.132	**0.011**	**0.588**
						(0.936)	**(0.065)**	**(0.223)**
1988	0.276	9.350	0.114	0.390				
		(0.009)	(0.02)	(0.063)				
1989	0.292	10.910	0.101	0.358				
		(0.004)	(0.019)	(0.048)				
1990	0.290	8.320	0.092	0.320				
		(0.016)	(0.019)	(0.044)				
1991	0.300	5.410	0.085	0.318				
		(0.067)	(0.018)	(0.041)				
1992	0.333	8.420	0.086	0.337	0.179	1.600	0.035	**0.265**
		(0.015)	(0.019)	(0.047)		(0.449)	(0.036)	**(0.154)**
1993	0.339	4.930	0.069	0.373	0.192	1.980	0.028	**0.299**
		(0.085)	(0.021)	(0.057)		(0.373)	(0.032)	**(0.176)**
1994	0.321	7.280	0.059	0.379	0.285	1.060	-0.050	**0.514**
		(0.026)	(0.02)	(0.06)		(0.588)	(0.085)	**(0.218)**
1995	0.298	5.710	0.066	0.355	0.291	1.110	-0.039	**0.501**
		(0.058)	(0.017)	(0.055)		(0.524)	(0.076)	**(0.203)**
1996	0.299	2.150	**0.051**	**0.370**	0.266	0.790	-0.028	**0.423**
		(0.341)	**(0.022)**	**(0.075)**		(0.673)	(0.021)	**(0.184)**
1997	0.262	2.140	**0.060**	**0.293**	0.251	0.710	-0.031	**0.422**
		(0.342)	**(0.017)**	**(0.062)**		(0.701)	(0.057)	**(0.136)**
1998	0.267	1.930	**0.038**	**0.324**	0.208	0.299	0.008	**0.313**
		(0.38)	**(0.019)**	**(0.072)**		(0.861)	(0.031)	**(0.068)**
1999					0.212	2.050	-0.001	**0.310**
						(0.359)	(0.029)	**(0.048)**
2000					0.231	2.360	**0.031**	**0.257**
						(0.308)	**(0.017)**	**(0.047)**
2001	0.239	1.050	**0.056**	**0.246**	0.268	0.935	**0.039**	**0.263**
		(0.592)	**(0.018)**	**(0.065)**		(0.627)	**(0.021)**	**(0.05)**

Table 4
Correlations

This table gives the pair wise correlations of the major variables over two different sample periods: 1985-2001, and 1990-2001, given in Panels A and B, respectively. Following data availability corporate governance index is given only for 1990-2001 period. All values are significant at the 1 percent level. I, CF, and Q represent investment, cash flow, and Tobin's Q, respectively. All are calculated in the same manner as in Kaplan and Zingales (1997). CF*Size is the interaction of the natural logarithm of firm size with cash flow. CF*Fund is the interaction of cash flow and fund flows. Fund flows are calculated taking the 1970 values as a base of one, and then calculating subsequent values accordingly. Fund flows are converted to 2001 values using the CPI index of the Bureau of Labor Statistics. CF*Analyst is the interaction of cash flow with the number of analysts following. The number of analysts following a firm is divided by the mean number of analysts following for each year; the resulting ratio is then used. CF*IO is the interaction of cash flow with institutional ownership. IO is the proportion of the sample firms' institutional ownership relative to institutional ownership for all firms with fiscal years corresponding to the same quarter. CF*Invrate (CF*Junkrate) is the interaction of cash flow with the proportion of firms with investment grade (junk) bonds. CF*Govn is the interaction of cash flow with the corporate governance index. The corporate governance index value of each firm is divided by the mean corporate governance index for that year; the resulting ratio is then used.

Panel A: 1985-2001

	I	CF	Q	CF* Size	CF* Fund	CF* Analyst	CF*IO	CF* Invrate
CF	0.320							
Q	0.248	0.249						
CF*Size	0.312	0.869	0.301					
CF*Fund	0.222	0.796	0.241	0.759				
CF*Analyst	0.203	0.420	0.218	0.653	0.382			
CF*IO	0.062	0.129	0.309	0.246	0.116	0.415		
CF*Invrate	0.041	0.139	0.106	0.287	0.165	0.160	0.193	
CF*Junkrate	0.039	0.122	0.025	0.215	0.140	0.254	0.039	-0.141

Panel B: 1990-2001

	I	CF	Q	CF* Size	CF* Fund	CF* Analyst	CF*IO	CF* Invrate	CF* Junkrate
CF	0.313								
Q	0.237	0.271							
CF*Size	0.306	0.868	0.279						
CF*Fund	0.208	0.781	0.274	0.766					
CF*Analyst	0.116	0.254	0.318	0.646	0.216				
CF*IO	0.281	0.643	0.356	0.238	0.587	0.457			
CF*Invrate	0.038	0.114	0.078	0.245	0.141	0.223	0.172		
CF*Junkrate	0.037	0.109	0.018	0.193	0.124	0.146	0.034	-0.120	
CF*Govn	0.305	0.930	0.273	0.923	0.722	0.273	0.655	0.209	0.239

Table 5
Capital Market Imperfections and Investment Cash Flow Sensitivity

This table shows the impact of capital market imperfections on investment-cash flow sensitivity over four sample periods when firm size is controlled for. The periods are 1970-2001, 1976-2001, 1980-2001, and 1990-2001. Following data availability, fund flows are given for all subperiods, analyst following only after 1976, institutional ownership only after 1980, bond ratings only after 1985, and the corporate governance index only after 1990. We run the following regression:

$$I_t / K_{t-1} = \alpha + \beta_1 Q_t + \beta_2 CF_t / K_{t-1} + \gamma_i (CF_t \times Factor_i) + \varepsilon_t ,$$

where I_t and CF_t represent investment and cash flow during period t, respectively; K_{t-1} is the amount of capital at the beginning of period t; and Q_t is Tobin's Q, calculated at the beginning period t in the same manner as in Kaplan and Zingales (1997). We control for size by interacting cash flow with the natural logarithm of size (CF*Size). CF_t*$Factor_t$ are the interactions of cash flow with the factors related to capital market imperfections. The factors considered are: fund flows (CF*Fund), analyst following (CF*Analyst), institutional ownership (CF*IO), the proportion of firms with investment grade bonds (CF*Invrate), the proportion of firms with junk bonds (CF*Junkrate), and the corporate governance index (CF*Govn). In the regressions, the data are transformed into their mean deviation form by taking the differences between the raw data and the firm-level means so as to eliminate the fixed-firm effects. We keep the year dummies to control for the year effects. OLS and GMM results are reported. Heteroscedasticity adjusted standard errors are in parenthesis.

	Obs	J-stat	R^2	CF	Q	CF* Size	CF* Fund	CF* Analyst	CF*IO	CF* Invrate	CF* Junkrate	CF* Govn
1985-2001	21944											
OLS			0.154	**0.107**	**0.057**							
				(0.005)	**(0.003)**							
			0.161	**0.089**	**0.055**	**0.010**	**-0.004**	0.005	**-0.122**	**-0.041**	0.024	
				(0.01)	**(0.003)**	**(0.003)**	**(0.001)**	(0.004)	**(0.035)**	**(0.13)**	(0.017)	
GMM3			0.282	**0.034**	**0.295**							
				(0.015)	**(0.048)**							
			0.289	**0.050**	**0.320**	**0.007**	**-0.004**	**-0.040**	**-0.572**	**-0.052**	0.051	
				(0.015)	**(0.052)**	**(0.003)**	**(0.001)**	**(0.011)**	**(0.12)**	**(0.017)**	(0.049)	
GMM4		4.974	0.287	0.036	0.289							
		(0.083)		(0.008)	(0.023)							
		7.150	0.282	0.054	0.290	0.007	-0.004	-0.035	-0.521	-0.050	0.048	
		(0.028)		(0.013)	(0.023)	(0.003)	(0.001)	(0.008)	(0.086)	(0.016)	(0.038)	

Table 5 –Continued

	Obs	J-stat	R^2	CF	Q	CF* Size	CF* Fund	CF* Analyst	CF*IO	CF* Invrate	CF* Junkrate	CF* Govn
1990-2001	14935											
OLS			0.142	**0.088**	**0.051**							
				(0.005)	**(0.003)**							
			0.147	**0.093**	**0.051**	**0.010**	**-0.005**	**0.011**	**-0.146**	**-0.047**	-0.021	
				(0.012)	**(0.004)**	**(0.003)**	**(0.001)**	**(0.005)**	**(0.038)**	**(0.015)**	(0.018)	
GMM3			0.247	**0.030**	**0.270**							
				(0.018)	**(0.08)**							
			0.252	**0.091**	**0.280**	0.003	**-0.008**	-0.021	**-0.572**	**-0.042**	0.016	
				(0.015)	**(0.082)**	(0.005)	**(0.002)**	(0.014)	**(0.175)**	**(0.019)**	(0.024)	
GMM4		3.811	0.274	**0.026**	**0.300**							
		(0.149)		**(0.011)**	**(0.032)**							
		5.210	0.262	0.091	0.281	0.003	-0.008	-0.021	-0.573	-0.042	0.016	
		(0.074)		(0.015)	(0.032)	(0.004)	(0.001)	(0.009)	(0.104)	(0.019)	(0.020)	
1990-2001*	5848											
OLS			0.161	**0.087**	**0.037**	**0.015**	**-0.006**	0.012	**-0.099**	-0.028	-0.002	**-0.051**
				(0.033)	**(0.004)**	**(0.008)**	**(0.002)**	(0.066)	**(0.037)**	(0.017)	(0.022)	**(0.023)**

* Sample size is reduced from 14,935 to 5,848 due to firms that do not have GIM index data available.

Table 6
Capital Market Imperfections and Investment Cash Flow Sensitivity for Firms in Different Payout Groups

This table shows the impact of capital market imperfections on investment-cash flow sensitivity for firms in three different payout groups over two sample periods when firm size is controlled for. The periods are 1985-2001, and 1990-2001. Firms are divided into three groups as low payout (LP), medium payout (MP) and high payout (HP) according to payout ratio. For 1985-2001 (1990-2001) period, the firms with payout ratio less than 0.004 (0.012) are LP firms, more than 0.444 (0.464) are HP firms and the ones in between are MP firms. The results for the LP, MP and HP samples are given in Panels A, B, and C, respectively. Following data availability, fund flows, analyst following, institutional ownership and bond ratings after 1985, and the corporate governance index only after 1990. We run the following regression:

$$I_t / K_{t-1} = \alpha + \beta_1 Q_t + \beta_2 CF_t / K_{t-1} + \gamma_i (CF_t \times Factor_i) + \varepsilon_t ,$$

where I_t, and CF_t represent investment and cash flow during period t, respectively; K_{t-1} is the amount of capital at the beginning of period t; and Q_t is Tobin's Q, calculated at the beginning period t in the same manner as in Kaplan and Zingales (1997). We control for size by interacting cash flow with the natural logarithm of size (CF*Size). CF_t*$Factor_t$ are the interactions of cash flow with the factors related to capital market imperfections. The factors considered are: fund flows (CF*Fund), analyst following (CF*Analyst), institutional ownership (CF*IO), the proportion of firms with investment grade bonds (CF*Invrate), the proportion of firms with junk bonds (CF*Junkrate), and the corporate governance index (CF*Govn). In the regressions, the data are transformed into their mean deviation form to eliminate the fixed-firm effects. We keep the year dummies to control for the year effects. OLS and GMM results are reported. GMM results are reported only for identified models. Heteroscedasticity adjusted standard errors are in parenthesis.

	Obs	J-stat	R^2	CF	Q	CF* Size	CF* Fund	CF* Analyst	CF* IO	CF* Invrate	CF* Junkrate	CF* Govn
Panel A: LP (Low Payout)												
1985-2001												
OLS	6938	0.112	0.166	**0.112**	**0.056**							
		(0.007)		**(0.007)**	**(0.006)**							
			0.177	**0.109**	**0.061**	**0.012**	**-0.007**	0.003	**-0.107**	**-0.045**	0.042	
				(0.018)	**(0.006)**	**(0.005)**	**(0.001)**	(0.008)	**(0.063)**	**(0.024)**	(0.032)	
GMM3	6938		0.264	**0.048**	**0.301**							
				0.028	**0.108**							
			0.291	**0.099**	**0.343**	0.004	**-0.009**	**-0.038**	**-0.827**	-0.021	0.075	
				(0.025)	**(0.132)**	(0.008)	**(0.002)**	**(0.021)**	**(0.364)**	(0.017)	(0.073)	
GMM4	6938	10.627	0.281	0.052	0.286							
		(0.005)		(0.013)	(0.033)							
		9.732	0.282	0.101	0.285	0.005	-0.008	-0.031	-0.696	-0.026	0.068	
		(0.008)		(0.023)	(0.036)	(0.007)	(0.002)	(0.016)	(0.206)	(0.021)	(0.048)	

Table 6 –Continued

	Obs	J-stat	R^2	CF	Q	CF* Size	CF* Fund	CF* Analyst	CF* IO	CF* Invrate	CF* Junkrate	CF* Govn
Panel A: LP (Low Payout) -Continued												
1990-2001												
OLS	4734		0.129	**0.093**	**0.051**							
				(0.008)	**(0.006)**							
			0.144	**0.096**	**0.049**	0.005	**-0.004**	0.017	**-0.121**	**-0.054**	0.018	
				(0.02)	**(0.006)**	(0.004)	**(0.002)**	(0.018)	**(0.081)**	**(0.023)**	(0.028)	
	1829*		0.138	0.089	**0.029**	0.002	**-0.006**	0.029	-0.031	**-0.043**	0.05	-0.01
				(0.058)	**(0.008)**	(0.012)	**(0.003)**	(0.028)	(0.108)	**(0.022)**	(0.035)	(0.025)
GMM3	4734		0.268	**0.038**	**0.277**							
				(0.02)	**(0.153)**							
			0.282	**0.099**	**0.302**	-0.002	**-0.007**	-0.003	**-0.393**	**-0.07**	0.03	
				(0.029)	**(0.154)**	(0.01)	**(0.004)**	(0.002)	**(0.147)**	**(0.042)**	(0.031)	
GMM4	4734	2.127	0.233	**0.058**	**0.201**							
		(0.345)		**(0.014)**	**(0.036)**							
		1.806	0.232	**0.98**	**0.196**	0.001	**-0.006**	-0.005	**-0.279**	**-0.064**	0.025	
		(0.405)		**(0.023)**	**(0.03)**	(0.006)	**(0.002)**	(0.009)	**(0.136)**	**(0.029)**	(0.027)	
Panel B:MP (Medium Payout)												
1985-2001												
OLS	6936		0.112	**0.118**	**0.053**							
				(0.01)	**(0.006)**							
			0.129	**0.103**	**0.052**	0.004	**-0.007**	0.028	**-0.249**	**-0.031**	0.062	
				(0.019)	**(0.005)**	(0.003)	**(0.001)**	(0.027)	**(0.065)**	**(0.018)**	(0.075)	
GMM3	6936		0.247	**0.024**	**0.304**							
				(0.014)	**(0.111)**							
			0.261	**0.107**	**0.309**	-0.007	**-0.009**	-0.011	**-0.619**	-0.019	0.103	
				(0.023)	**(0.107)**	(0.008)	**(0.002)**	(0.019)	**(0.207)**	(0.015)	(0.132)	
GMM4	6936	0.703	0.275	**0.023**	**0.342**							
		(0.704)		**(0.014)**	**(0.047)**							
		0.427	0.265	**0.107**	**0.308**	-0.007	**-0.009**	-0.010	**-0.617**	-0.019	0.103	
		(0.808)		**(0.023)**	**(0.044)**	(0.006)	**(0.001)**	(0.013)	**(0.143)**	(0.015)	(0.109)	
1990-2001												
OLS	4659		0.115	**0.112**	**0.055**							
				(0.008)	**(0.005)**							
			0.123	**0.114**	**0.056**	0.003	**-0.006**	0.009	**-0.208**	0.044	0.035	
				(0.02)	**(0.006)**	(0.005)	**(0.002)**	(0.008)	**(0.066)**	0.041	(0.066)	
	1828*		0.108	0.029	**0.034**	**0.018**	**-0.004**	0.003	**-0.202**	0.039	0.045	-0.031
				(0.025)	**(0.007)**	**(0.009)**	**(0.002)**	(0.008)	**(0.07)**	(0.049)	(0.056)	(0.022)

Table 6 –Continued

	Obs	J-stat	R^2	CF	Q	CF* Size	CF* Fund	CF* Analyst	CF* IO	CF* Invrate	CF* Junkrate	CF* Govn
Panel C:HP (High Payout)												
1985-2001												
OLS	8070		0.139	**0.105**	**0.06**							
				(0.007)	**(0.005)**							
			0.173	**0.116**	**0.054**	**0.008**	**-0.007**	0.008	**-0.083**	**-0.03**	-0.018	
				(0.015)	**(0.005)**	**(0.004)**	**(0.001)**	(0.007)	**(0.041)**	**(0.016)**	(0.022)	
GMM3	8070		0.351	0.035	**0.428**							
				(0.022)	**(0.211)**							
			0.366	**0.09**	**0.444**	0.002	**-0.013**	**-0.038**	**-0.722**	-0.072	-0.001	
				(0.028)	**(0.189)**	(0.007)	**(0.004)**	**(0.025)**	**(0.34)**	(0.046)	(0.03)	
GMM4	8070	2.039	0.284	**0.038**	**0.283**							
		(0.361)		**(0.013)**	**(0.035)**							
		3.233	0.295	**0.101**	**0.283**	0.004	**-0.011**	**-0.019**	**-0.459**	**-0.055**	-0.007	
		(0.199)		**(0.02)**	**(0.036)**	(0.005)	**(0.001)**	**(0.01)**	**(0.108)**	**(0.028)**	(0.023)	
1990-2001												
OLS	5542		0.144	**0.086**	**0.053**							
				(0.008)	**(0.006)**							
			0.158	**0.089**	**0.053**	0.008	**-0.003**	0.01	**-0.151**	**-0.078**	**-0.055**	
				(0.019)	**(0.006)**	(0.005)	**(0.001)**	(0.01)	**(0.049)**	**(0.032)**	**(0.025)**	
	2151*		0.228	0.063	**0.032**	**0.034**	**-0.009**	0.004	**-0.141**	**-0.084**	-0.046	-0.079
				(0.051)	**(0.008)**	**(0.014)**	**(0.003)**	(0.011)	**(0.047)**	**(0.037)**	(0.029)	(0.041)
GMM3	5542		0.299	**0.027**	**0.304**							
				0.016	**0.131**							
			0.31	**0.093**	**0.29**	0.003	**-0.006**	**-0.038**	**-0.634**	-0.008	**-0.018**	
				(0.024)	**(0.107)**	(0.007)	**(0.002)**	**(0.022)**	**(0.253)**	(0.005)	**(0.003)**	
GMM4	5542	3.259	0.327	**0.027**	**0.305**							
		(0.196)		**(0.013)**	**(0.034)**							
		3.104	0.318	**0.093**	**0.294**	0.003	**-0.007**	**-0.039**	**-0.643**	**-0.017**	-0.007	
		(0.212)		**(0.024)**	**(0.035)**	(0.006)	**(0.002)**	**(0.015)**	**(0.146)**	**(0.030)**	(0.034)	

* Sample size is reduced due to firms that do not have corporate governance index data available.

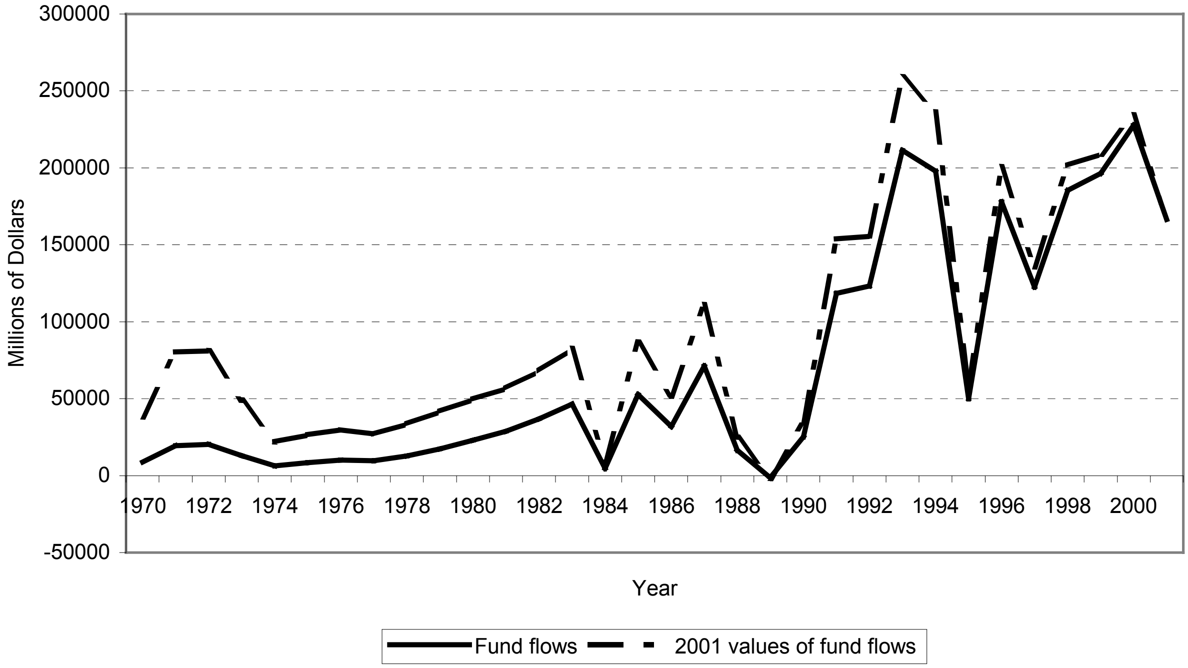

Figure 1. Annual net fund flows from 1970 to 2001. Annual net fund flows are shown as nominal values and as 2001 values. CPI index is used to convert annual net fund flows to 2001 values.

Figure 2A
Regression Coefficients on Cash Flow (CF)

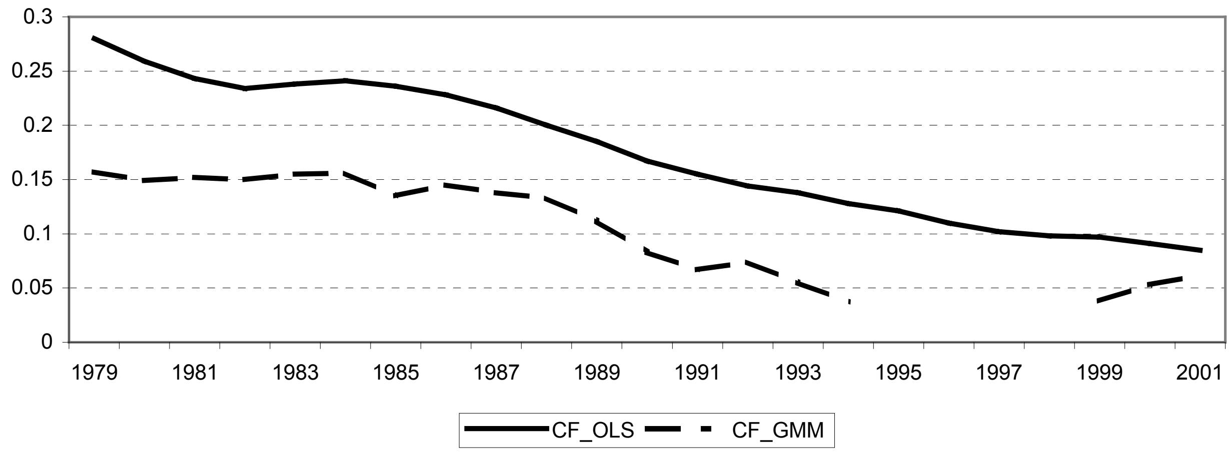

Figure 2B
Regression Coefficients on Tobin's Q (Q)

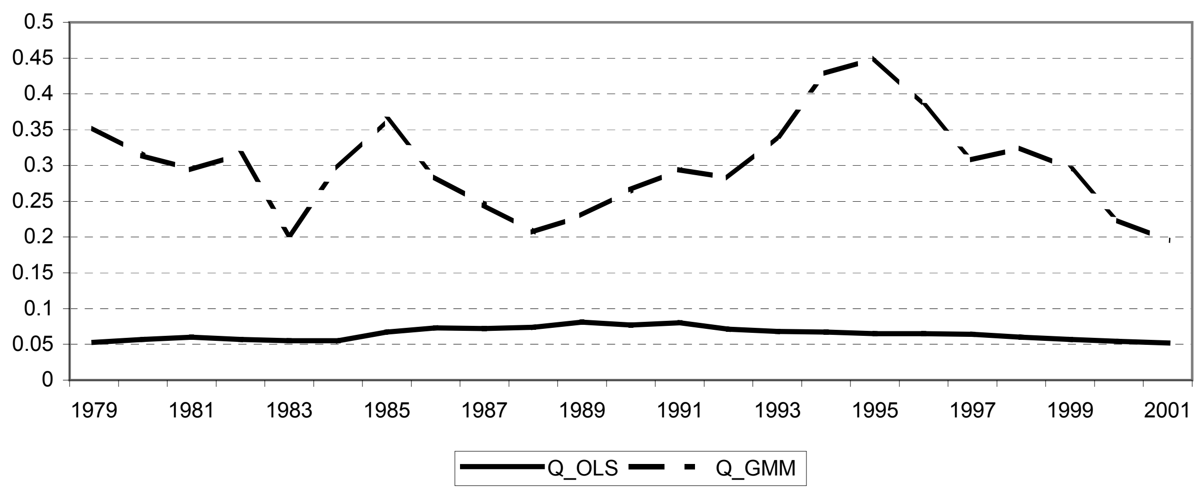

Figure 2. Regression Coefficients on Cash Flow (CF) and Tobin's Q for the Overall Sample. Investment is regressed on CF and Q over ten year periods from 1970 to 1992, i.e. 1970-1979, 1971-1980, and so forth. In above figure, years correspond to the last years in the rolling regression. For example the period 1970-1979 is shown as 1979. Both OLS (CF_OLS and Q_OLS) and GMM3 (CF_GMM and Q_GMM) estimates are shown.

Figure 3A
Regression Coefficients on CF for Different Payout Groups

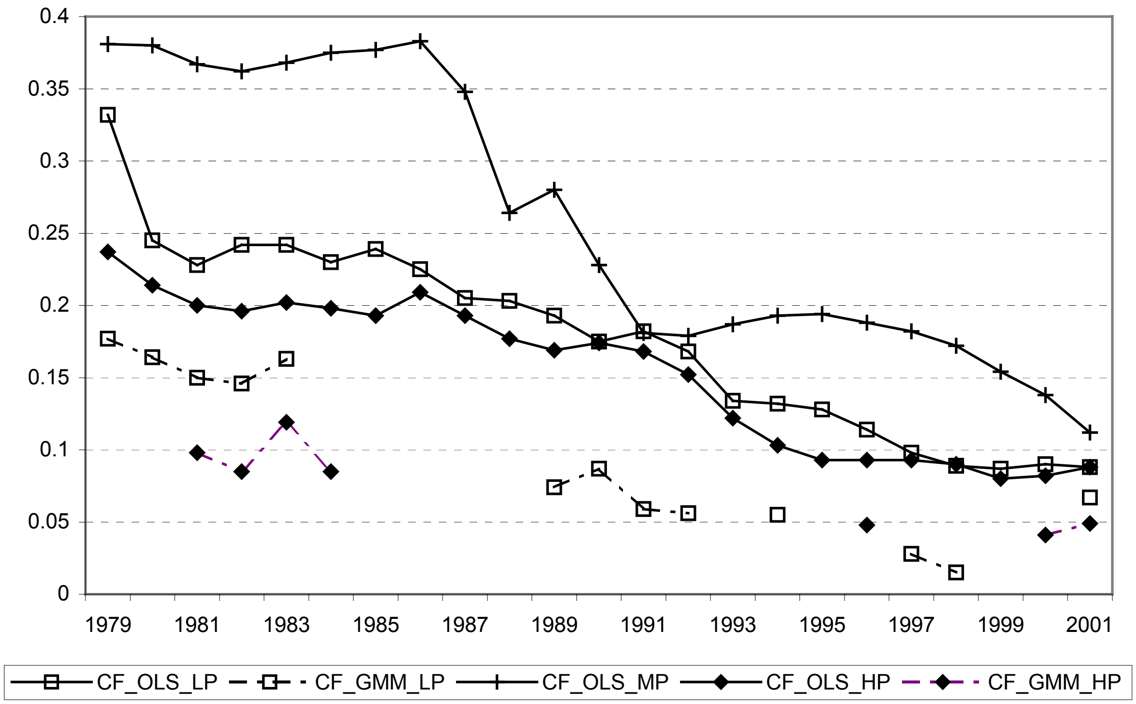

Figure 3B
Regression Coefficients on Tobin's Q for Different Payout Groups

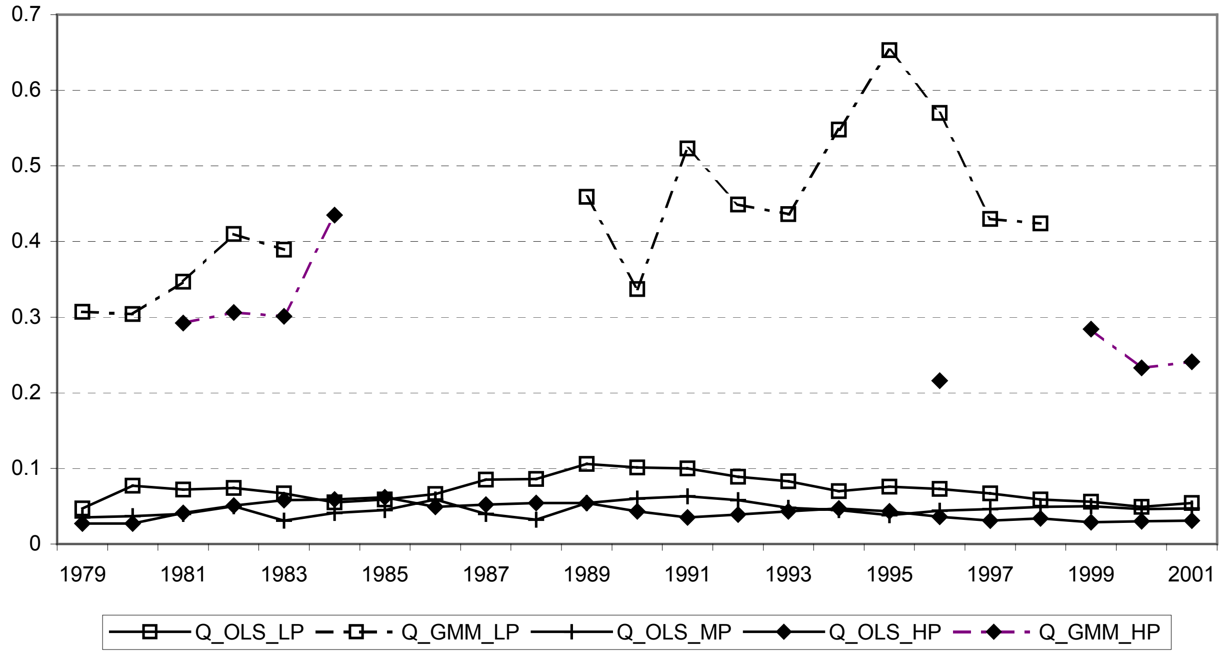

Figure 3. Regression Coefficients on Cash Flow and Tobin's Q for Firms in Different Payout Groups. Firms are categorized in payout groups using dividend payout ratios. These groups are low payout (LP), medium payout (MP) and high payout (HP). For each of these groups, investment is regressed on CF and Q over ten year periods from 1970 to 1992, i.e. 1970-1979, 1971-1980, and so forth. In above figure, years correspond to the last years in the rolling regression. For example the period 1970-1979 is shown as 1979. Both OLS and GMM3 estimates are shown. GMM estimates for the identified models are given. CF_, Q_ give the coefficient on cash flow and Tobin's Q, respectively. *_OLS_*, *_GMM_* give the OLS and GMM3 estimates. *_LP, *_MP, and *_HP are the coefficients for low, medium and high payout groups. CF_OLS_LP, for example, is the OLS estimate of the cash flow coefficient for the low payout sample.

Appendix A: Erickson and Whited's (2000) measurement error consistent estimators

The first step in their approach is to obtain the residuals from projecting *I/K, Q*, and *q* on **z** (suppressing the time subscript)

$$(\omega,\gamma,\eta) = (\frac{I}{K}, Q, q) - \mathbf{z}P(\frac{I}{K}, Q, q) \qquad \text{(A1)}$$

where $\mathbf{z}P(\mathbf{a})$ projects *a* on **z,** i.e., $P(a)= [E(\mathbf{z'z})]^{-1}E(\mathbf{z'}a)$. The moments of ω and γ can be estimated from their sample counterparts and can in turn be used to estimate $[\beta_1, \mathbf{B}]$. (Note that $\mathbf{B} = P(I/K) - \beta_1 P(Q)$.) Erickson and Whited (2000) use three second order moments,

$$E(\omega^2) = \beta_1^2 E(\eta^2) + E(u^2) \qquad \text{(A2)}$$

$$E(\omega\gamma) = \beta_1 E(\eta^2) \qquad \text{(A3)}$$

$$E(\gamma^2) = E(\eta^2) + E(v^2) \qquad \text{(A4)}$$

two third order moments,

$$E(\omega^2\gamma) = \beta_1^2 E(\eta^3) \qquad \text{(A5)}$$

$$E(\omega\gamma^2) = \beta_1 E(\eta^3) \qquad \text{(A6)}$$

and three fourth order moments

$$E(\omega^3\gamma) = \beta_1^3 E(\eta^4) + 3\beta_1 E(\eta^2)E(u^2) \qquad \text{(A7)}$$

$$E(\omega^2\gamma^2) = \beta_1^2 E(\eta^4) + E(\eta^2)\left[E(u^2) + E(v^2)\right] + E(u^{2)} E(v^2) \qquad \text{(A8)}$$

$$E(\omega\gamma^3) = \beta_1 \left[E(\eta^4) + 3E(\eta^2)E(v^2)\right] . \qquad \text{(A9)}$$

Equations (A2-A6) constitute an exactly identified system of five equations in five unknowns (β_1, $E(\eta^2)$, $E(u^2)$, $E(v^2)$, $E(\eta^3)$). The full set of equations (A2-A9) represents an overidentified system of eight equations in six unknowns ($E(\eta^4)$ is the sixth unknown) which are estimated using Hansen's (1982) Generalized Method of Moments, with the inverse of the modified asymptotic covariance matrix as the weighting matrix of the quadratic form.

In addition to the usual assumption of independence between the errors (*u,v*) and the (true) regressors (**z**, *q*), Erickson and Whited's (2000) approach also requires the two following conditions to be satisfied for the model to be identified:

$$\beta_1 \neq 0 \tag{17}$$

$$E(\eta^3) \neq 0 \tag{18}$$

.

Appendix B: Identification tests

Table 7
Identification Tests of the GMM Models used in the
Time Series Analysis of Investment-Cash Flow Sensitivity

This table reports the p values of the identification tests of the GMM models reported in Table 2 for the overall sample and reported in Table 3 for low payout (LP), medium payout (MP) and high payout (HP) samples.

	Overall	LP	MP	HP
1979	0.026	0.006	0.519	0.44
1980	0.005	0.029	0.319	0.334
1981	0.001	0.01	0.432	0.141
1982	0.007	0.083	0.435	0.039
1983	0.008	0.21	0.019	0.015
1984	0.12	0.335	0.82	0.014
1985	0.112	0.516	0.988	0.17
1986	0.097	0.568	0.866	0.378
1987	0.114	0.374	0.968	0.572
1988	0.048	0.234	0.998	0.745
1989	0.006	0.106	0.963	0.647
1990	0.001	0.075	0.842	0.446
1991	0.00	0.024	0.827	0.499
1992	0.00	0.013	0.911	0.087
1993	0.00	0.01	0.752	0.172
1994	0.00	0.028	0.443	0.235
1995	0.001	0.011	0.328	0.227
1996	0.002	0.04	0.973	0.104
1997	0.00	0.082	0.687	0.061
1998	0.006	0.108	0.599	0.176
1999	0.014	0.387	0.634	0.214
2000	0.003	0.325	0.097	0.128
2001	0.00	0.055	0.236	0.083

Table 8
Identification Tests of the GMM Models used in the
Cross Sectional Analysis of Investment-Cash Flow Sensitivity

This table reports the p values of the identification tests of the GMM models reported in Table 5 for the overall sample and in Table 6 for low payout (LP), medium payout (MP) and high payout (HP) samples. Panel A reports the p values for the models where cash flow and Tobin's Q are the only independent variables. Panel B gives the p values for the models where all capital markets available in that period are included in the regressions. Panel C gives the p values for the model that includes only analyst following and fund flows as capital market factors.

	Overall	LP	MP	HP
Panel A: (No Factors)				
1970-2001	0.00	0.00	0.005	0.091
1976-2001	0.00	0.001	0.001	0.018
1980-2001	0.00	0.059	0.069	0.004
1985-2001	0.00	0.031	0.027	0.038
1990-2001	0.004	0.230	0.505	0.21
1990-2001*	0.867	0.670	0.513	0.876
Panel B: (All Factors and Size)				
1970-2001	0.00	0.00	0.050	0.029
1976-2001	0.00	0.001	0.00	0.004
1980-2001	0.00	0.111	0.027	0.001
1985-2001	0.00	0.055	0.023	0.012
1990-2001	0.004	0.238	0.346	0.117
1990-2001*	0.619	0.472	0.418	0.593

* Sample size is reduced from 14,935 to 5,848 for the overall sample, from 4734 to 1829 for the LP sample, from 4659 to 1828 for the MP sample, and from 5542 to 2151 for the HP sample due to firms that do not have GIM index data available.