Over-investment of free cash flow

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ABSTRACT

This paper examines the extent of firm level over-investment of free cash flow. I develop a new accounting based framework to measure over-investment and free cash flow. Consistent with agency cost explanations for the relation between investment expenditure and cash flow, I find that over-investment is concentrated in firms with free cash flow. I then examine whether firms' governance structures are associated with over-investment of free cash flow. I find only weak evidence that governance structures are ex ante designed in response to these agency costs. However, I find evidence that certain governance structures mitigate over-investment ex post. Overall, my results suggest that over-investment of free cash flow is a pervasive phenomenon, and that managers of large firms with independent boards are less likely to over-invest.

Keywords: free cash flow, over-investment, agency costs.

Data availability: Data are available from the sources defined in the text.

1. Introduction

This paper examines firm investing decisions in the presence of free cash flow. It is well established in the finance and economics literature that there is a positive relation between investment expenditure and cash flow. There are two primary explanations for this positive relation. First, the positive relation is a manifestation of an agency problem, where managers in firms with free cash flow engage in wasteful expenditure (e.g., Jensen 1986 and Stulz 1990). When managers' objectives differ from those of shareholders, the presence of internally generated cash flow in excess of that required to maintain existing assets in place and finance new positive NPV projects creates the potential for those funds to be squandered. Second, the positive relation reflects capital market imperfections, where costly external financing creates the potential for internally generated cash flows to expand the feasible investment opportunity set (e.g., Fazzari, Hubbard and Petersen 1988 and Hubbard, 1998). In this paper I attempt to distinguish between these alternatives by measuring the underlying constructs of free cash flow and over-investment more directly using detailed financial statement analysis. I view this as one of the main contributions of this paper - accountants harnessing their knowledge of the financial reporting system to address fundamental issues in financial economics.

The paper proceeds in two distinct stages. First, I develop an accounting based framework to measure both free cash flow and over-investment. I define free cash flow as cash flow beyond what is necessary to maintain assets in place and to finance expected new investments. Over-investment is defined as investment expenditure beyond that required to maintain assets in place and to finance expected new investments in positive NPV projects. To measure over-investment, I first decompose total investment expenditure into two components:

(i) required investment expenditure to maintain assets in place, and (ii) new investment expenditure. I then decompose new investment expenditure into over-investment in negative NPV projects and expected investment expenditure, where the latter varies with the firm's growth opportunities, financing constraints, industry affiliation and other factors.

To distinguish between the agency cost and financing constraint explanations I condition the relation of over-investment and free cash flow based on the sign of the free cash flow. Under the agency cost explanation it is the presence of free cash flow (i.e., where free cash flow is positive) that creates the *potential* for management to squander that free cash flow. At the other end of the spectrum, firms with a free cash flow shortfall have a lower probability for over-investment problems, because these firms would have to place themselves under the scrutiny of external markets to raise additional funds to finance any over-investment (Jensen, 1986 and DeAngelo, DeAngelo and Stulz, 2004). The financing constraint explanation, on the other hand, would suggest that firms with negative free cash flow (positive free cash flow) would invest less (more) than expected due to binding (non-binding) financing constraints. That is, under the financing constraint explanation I would expect to see a monotonic relation between over-investment and free cash flow, whereas with the agency cost explanation I expect only to see a positive relation between over-investment and free cash flow for firms with positive free cash flow. Consistent with the agency cost explanation, I find a stronger positive association for firms with positive free cash flow.

For non-financial firms during the period 1988-2002, I find that the average firm over-invests 25 percent of its free cash flow. Furthermore, I document that the majority of free cash flow is retained in the form of financial assets. The average firm in my sample retains 43 percent

of its free cash flow as either cash or marketable securities. There is little evidence that free cash flow is distributed to external debt holders or shareholders.

In the second stage of the paper, I examine the role that governance mechanisms play in mitigating over-investment. First, I examine whether governance mechanisms arise endogenously to mitigate over-investment in the presence of free cash flow. Given the potential for management to undertake non-value maximizing decisions when faced with free cash flow, shareholders employ a variety of contracting mechanisms to protect their interests (Jensen and Meckling, 1976). Examples of these mechanisms include placing independent outsiders on the board of directors and concentrated stock-holdings by large investors who have the financial incentive to take an active role in monitoring management (Shleifer and Vishny, 1997). I find that firms with free cash flow do not have more outsiders on the board, nor are they more likely to have separated the CEO and chair positions. There is, however, some evidence that institutional holdings are higher for firms with free cash flow. Overall, for the governance characteristics that I consider, I find little systematic evidence that governance mechanisms are designed in anticipation of over-investment related agency costs.

Second, I examine whether governance mechanisms that are frequently hypothesized to mitigate over-investment of free cash flow have the hypothesized effect. I find evidence that governance mechanisms play an ex post role in monitoring management. Specifically, firms with free cash flow where the fraction of independent outsiders on the board is equal to the lower quartile (0.56) over-invest 46 cents for each dollar of free cash flow. In contrast, firms with free cash flow where the fraction of independent outsiders on the board is equal to the upper quartile (0.80) over-invest only 26 cents for each dollar of free cash flow.

This paper makes contributions to several areas of research. First, I document pervasive evidence of over-investment of free cash flow. This finding complements Blanchard, Lopez-di-Silanes and Vishny (1994), who document excessive investment and acquisition activity for eleven firms that experience a large cash windfall due to a legal settlement, and the Harford (1999) finding that cash rich firms are more likely to make acquisitions that subsequently experience abnormal declines in operating performance. I extend these findings by showing over-investment of free cash flow is a pervasive phenomenon across all types of investment expenditure. My results also complement Opler, Pinkowitz, Stulz and Williamson (1999) who document only modest evidence of greater spending on new projects and acquisitions for firms with high *levels* of excess cash. I examine the sensitivity of investment to cash flow as opposed to the level of cash and find that over-investment is a function of free cash flow consistent with the agency cost explanation. Moreover, I also find results consistent with Opler, Pinkowitz, Stulz and Williamson (1999) that internally generated funds is a key source of increasing stocks of financial assets.

Second, I develop a new framework to measure both free cash flow and over-investment. I show how a detailed analysis of the information in financial statements can be used to calculate empirical proxies for constructs described in the financial economics literature. My study is the first to make comprehensive use of information in income statements, balance sheets and statement of cash flows to construct measures for expected investment, free cash flow and over-investment.

Third, I contribute to the literature that examines the effectiveness of governance structures. Prior research focuses on the impact of governance mechanisms, in particular the board of directors, on firm performance (e.g., Hermalin and Weisbach, 1991 and Bhagat and

Black, 2002), CEO hiring and firing (Weisbach, 1988), CEO compensation (e.g., Lambert, Larcker and Weigelt, 1993 and Core, Holthausen and Larcker, 1999), acquisition activity (Byrd and Hickman, 1992) and accounting quality (e.g., Beasley, 1996 and Dechow, Sloan and Sweeney 1996). Adding to these findings, I document that the presence of outsiders is associated with lower levels of over-investment.

Section 2 develops testable hypotheses concerning the relation between free cash flow and over-investment and the role of governance mechanisms in mitigating this relation. Section 3 describes sample selection and variable measurement. Section 4 discusses empirical results, while section 5 concludes.

2. Free cash flow and over-investment

In this section I first describe in detail the agency cost and financing constraint explanations for the positive relation between investment expenditure and cash flow. I then develop my hypotheses for the relation between over-investment and free cash flow, and identify the role of governance mechanisms in mitigating over-investment of free cash flow. Finally, I develop measures of the underlying constructs of free cash flow and over-investment and discuss the potential uses of free cash flow.

2.1 Explanations for a positive relation between investment expenditure and cash flow

There are two primary explanations for the positive relation between investment expenditure and cash flow – agency costs and financing constraints. The agency cost explanation introduced by Jensen (1986) and Stulz (1990) suggests that monitoring difficulty creates the potential for management to spend internally generated cash flow on projects that are

beneficial from a management perspective but costly from a shareholder perspective (the free cash flow hypothesis). Consistent with this, Lamont (1997) and Berger and Hann (2003) find evidence consistent with cash rich segments cross-subsidizing more poorly performing segments in diversified firms. Related evidence can also be found in Harford (1999) and Opler, Pinkowitz, Stulz and Williamson (1999 and 2001). Harford finds that cash rich firms are more likely to make acquisitions and these "cash rich" acquisitions are followed by abnormal declines in operating performance. Opler et al. find some evidence that companies with excess cash (measured as level of cash relative to industry) have higher capital expenditures, and spend more on acquisitions, even when they appear to have poor investment opportunities.

Perhaps the most direct evidence on over-investment of free cash flow is the analysis in Blanchard, Lopez-di-Silanes and Vishny (1994). They find that eleven firms with windfall legal settlements appear to engage in wasteful expenditure. Collectively, this set of research is consistent with an over-investment (agency cost) explanation for the relation between cash flow and investment expenditure.

On the other hand, there is a stream of research dedicated to examining the role that financing constraints play in the relation between investment expenditure and cash flow (e.g., Fazzari, Hubbard and Petersen (1988), Hoshi, Kashyap and Scharfstein (1991), Fazzari and Petersen (1993), Whited (1992) and Hubbard (1998)). Specifically, firms facing financing constraints should exhibit higher investment to cash flow sensitivities. The pecking order theory proposed by Myers and Majluf (1984) is related to this financing constraint hypothesis. The argument is that firms forced to raise external finance to undertake investment projects reduce the feasible investment set as they incur a higher cost of capital. Thus, in the presence of internally generate cash flow, firms will invest more in response to the lower cost of capital.

The earlier papers in this area examine the sensitivity of investment to cash flow for high versus low dividend paying firms (Fazzari, Hubbard and Petersen, 1988), comparing differing organizational structures where the ability to raise external finance was easier/harder (Hoshi, Kashyap and Scharfstein, 1991, with Japanese keiretsu firms) and debt constraints (Whited, 1992). These papers find evidence of greater sensitivity of investment to cash flow for sets of firms which appeared to be financially constrained (e.g., low dividend paying firms, high debt firms and firms with limited access to banks). More recent research, however, casts doubt on the earlier results. Specifically, Kaplan and Zingales (1997, 2000), find that the sensitivity of investment to cash flow persists even for firms who do not face financing constraints. They construct a metric that is linear in variables expected to vary with ex ante financing constraints and they find that the sensitivity of investment to cash flow for firms where ex ante financing constraints are low is strong, thereby casting doubt on the financing constraint hypothesis. Alti (2003) and others also cast doubt on the interpretation by showing that the relation between investment expenditure and cash flow could persist in the absence of financing constraints, so the observed empirical relation may merely reflect measurement error in growth opportunities.

More generally, a criticism of the literature examining the relation between investment and cash flow is that finding a positive association may merely indicate that cash flows proxy for investment opportunities, not necessarily financing constraints. As discussed below, this is where my research design has the greatest potential to differentiate these alternative explanations since I study the association between measures of *free cash* flow and *over*-investment.

In summary, the interpretation of the relation between investment and cash flow is an open empirical question. By measuring the constructs of over-investment and free cash flow directly, rather than just cash flow and investment expenditure, I am able to make stronger

statements as to whether the free cash flow (agency cost) hypothesis is a reasonable explanation for the observed relation between investment expenditure and cash flow. Furthermore, the agency cost explanation predicts that the relation between free cash flow and over-investment is concentrated in firms with positive free cash flow. This is because firms with a cash short fall (i.e., negative free cash flow) place themselves at the scrutiny of the market (either debt or equity) to raise additional finance to fund investment expenditure. In contrast, the financing constraint argument would suggest a positive relation for all levels of free cash flow. This argument predicts that firms with insufficient (negative) free cash flow will exhibit under-investment due to the impact of financing constraints, and that firms with positive free cash flow will exhibit greater than "expected" investment as the hurdle rate for positive NPV projects is lower for internally generated funds. Partitioning the sample based on the sign of free cash flow provides a powerful setting to distinguish the two explanations.

2.2 Primary hypothesis

If management is serving the interests of shareholders, then there should be no relation between free cash flow and over-investment. However, in the absence of monitoring devices management can engage in sub-optimal use of firm resources. Specifically, when faced with free cash flow, management can engage in additional investment on self-serving projects rather than distribute the cash to shareholders. Such decisions can include: (i) empire building (see e.g., Shleifer and Vishny, 1997), (ii) perquisite consumption (Jensen and Meckling, 1976), (iii) diversifying acquisitions (e.g., Morck, Shleifer and Vishny, 1990), and (iv) subsidizing poorly performing divisions using the cash generated from successful ones instead of returning the cash to shareholders (e.g., Jensen and Meckling, 1976).

Over-investment is an outcome of the conflict of interest between management and shareholders when firms have free cash flow. When firms have a cash shortfall (i.e., $FCF < 0$) the possibility of over-investment is mitigated as the firm is forced to access external markets to raise funds necessary for any additional investment (e.g., Jensen, 1986). Capital markets serve an additional monitoring role in disciplining managerial use of funds. Thus, over-investment is most likely to occur in firms where my estimate of free cash flow is positive. The existence of free cash flow creates the potential for over-investment. The potential for over-investment increases as free cash flow increases. This leads to my first hypothesis, stated in alternative form:

H1: Over-investment is an increasing function of free cash flow for firms with positive free cash flow.

The power in this hypothesis comes from the non-linear relation between over-investment and free cash flow. As outlined in section 2.1 the financing constraint explanation suggests a positive relation for all levels of free cash flow, whereas the agency cost explanation suggests a positive relation only firm for firms with positive free cash flow.

2.3 Secondary hypotheses

In this section I develop hypotheses about the role of corporate governance in mitigating over-investment. I am interested in governance mechanisms that help mitigate the over-investment problem and argue that the key mechanisms for this agency problem are the board of directors and the presence of large stockholders.

The board is the primary vehicle to protect the interests of shareholders. The directors have a fiduciary duty to exercise care in monitoring management on behalf of shareholders

(Fama and Jensen 1983). In particular it is the presence of independent outsiders on the board who can play a major role in monitoring management. The board is supposed to meet regularly to discuss investing and financing policies (National Association of Corporate Directors, 2001). While outsiders do not possess the same knowledge of firm operations as management, they are in a position to ask questions of management and hire outside consultants where necessary to ascertain whether investment expenditure is consistent with firm strategy and growth opportunities. It is therefore reasonable to expect that outsiders on the board are able to identify situations where there is the potential for over-investment. Outsiders have the ability and incentives to take an active role in curtailing potential managerial misuse of free cash flow.

In addition to board composition, there are other governance mechanisms that are likely to be effective in mitigating agency costs associated with over-investment. First, prior research argues that the presence of a dual CEO-chairperson weakens the role of the board to act as an effective monitor of management (Yermack, 1996). Second, it has also been noted that large shareholders, such as institutions, have stronger financial incentives to monitor management (Shleifer and Vishny, 1997).

Governance can play both an ex ante and ex post role in mitigating over-investment. From an ex ante perspective, governance structures may endogenously arise to help mitigate over-investment in the presence of free cash flow. Specifically, shareholders of firms who are more likely to generate free cash flow may structure the board in such a way to include more independent outsiders to monitor management. In addition, institutional investors who have a large financial stake in the firm may take a more active role in monitoring management. This leads to my second hypothesis, stated in alternative form:

H2a: Firms with free cash flow are more likely to have a greater proportion of outside directors on the board.

H2b: Firms with free cash flow are less likely to have the same individual serving as CEO and chairperson of the board.

H2c: Firms with free cash flow are more likely to have a greater proportion of stock held by institutional investors.

A finding in support of H2 would suggest that governance structures are designed in response to specific agency costs. Failing to find results consistent with H2 would suggest that governance structures do not respond to over-investment related agency costs on average. Failing to reject H2 is also consistent with a finding that rejects H1. If the average firm is over-investing its free cash flow this result can be interpreted as prima facie evidence that governance structures are not designed ex ante with this agency cost in mind. However, this is not to say that governance mechanisms do not play a role in mitigating over-investment. Governance mechanisms can play an ex post role in monitoring management. Specifically, I expect cross-sectional variation in governance structures to be related to the degree of over-investment. I argue that firms with stronger governance mechanisms will experience less over-investment. This leads to my third and final hypothesis, stated in alternative form:

H3a: Ceteris paribus, over-investment is decreasing in the proportion of outside directors for firms with positive free cash flow.

H3b: Ceteris paribus, over-investment is increasing in the presence of a dual CEO-Chairperson (or retired CEO) for firms with positive free cash flow.

H3c: Ceteris paribus, over-investment is decreasing in the proportion of stock held by institutional investors for firms with positive free cash flow.

In addition to examining specific governance mechanisms I also examine the impact of firm size on the over-investment of free cash flow. Large firms are subject to closer scrutiny from the analyst and investment community (e.g. Bhushan 1989). Larger firms also disclose more detailed information (Lang and Lundholm, 1996). Together this suggests that firm size will proxy for a variety of governance mechanisms which are expected to mitigate agency costs such as the over-investment of free cash flow. This leads to my final hypothesis:

H3d: Ceteris paribus, over-investment is decreasing in firm size for firms with positive free cash flow.

The cross-sectional tests described above also offer an additional way to differentiate the agency cost and financing constraint hypotheses. Documenting that the sensitivity of over-investment to free cash flow varies as a function of the strength of existing governance structures lends additional support to the agency cost explanation.

2.4 A framework to measure the constructs free cash flow and over-investment

Free cash flow is cash flow beyond what is necessary to maintain assets in place (including servicing existing debt) and to finance expected (optimal) new investments. To measure free cash flow, I need estimates of three components. First, I need a measure of cash flow generated from assets in place. Second, I need a measure of investment expenditure necessary to maintain assets in place. Third, I require an estimate of the expected level of new investment expenditure. Together this allows me to simultaneously estimate free cash flow and over-investment.

I define total investment, I_{TOTAL}, as the sum of all outlays on capital expenditure, acquisitions and research and development less receipts from the sale of property, plant and equipment. Total investment expenditure can then be broken down into two main components: (i) required investment expenditure to maintain assets in place, $I_{MAINTENANCE}$, and (ii) investment expenditure on new projects, I_{NEW} (see Strong and Meyer, 1990 for a similar breakdown). This decomposition of investment expenditure is shown in panels A and B of figure 1. My proxy for investment to maintain existing assets in place is amortization and depreciation. Amortization and depreciation is an estimate of the portion of total investment expenditure that is necessary to maintain plant, equipment and other operating assets.

The more important distinction in figure 1 is the breakdown of investment on new projects. I decompose I_{NEW} into expected investment expenditure in new positive NPV projects, I^*_{NEW}, and over-investment (unexpected or sub-optimal investment), I^{ε}_{NEW}. There is an extensive literature in economics and finance that has examined firm level investment decisions (e.g., Hubbard 1998). I use this literature to estimate expected investment according to the following regression specification:

$$I_{NEW,t} = \alpha + \beta Growth\ Opportunities_{t-1} + Controls_{t-1} + \Sigma Year\ Indicators + \Sigma Industry\ Indicators \quad (1)$$

Expected investment expenditure on new projects will be an increasing function of growth opportunities. The underlying construct of growth opportunities refers to the present value of the firm's options to make future investments (Myers, 1977). As researchers we are at a disadvantage when we try to measure this construct. This is because managers have access to the information pertaining to prospective investment activity and people outside the firm do not. The standard approach in the literature has been to use market price relative to some measure of

fundamental value to determine growth opportunities. Tobin's *Q* (the ratio of the market value of assets to the current replacement cost of those assets) is probably the most widely used measure of growth opportunities. I use the reciprocal of Tobin's *Q* (the book-to-market of assets, labeled as *BM*) as my measure of growth opportunities.[1]

I include additional control variables that have been shown in prior research to be determinants of investment decisions (e.g., Hubbard, 1998). I include leverage, firm size, firm age and the level of cash as measures of financing constraints. Previous research has documented a sensitivity of firm level investment to financing constraints. Firm level investment is lessened when it is more difficult to raise additional cash to finance the new investment (e.g., Fazzari, Hubbard and Petersen, 1988 and Hubbard, 1998). I also include indicator variables for industry membership and temporal effects to capture additional variation in investment expenditure that are not explained by my measures of growth opportunities and financing constraints.[2] It is important to note that including these additional variables may reduce the power of my tests to identify a relation between over-investment and free cash flow. For example, if over-investment is concentrated in industry groups or in particular time periods then this reduced form model will be unable to identify such over-investment. The fitted value from regression (1) is my estimate of the expected level of new investment, I^*_{NEW}. The unexplained portion (or residual) is my estimate of over-investment, I^{ε}_{NEW}.[3]

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[1] The reciprocal is preferred for two reasons. First, the distribution of the reciprocal is less skewed leading to more desirable properties for statistical tests. Second, the measure is continuous through zero such that firms with negative book values are ranked similar to high growth firms.

[2] In unreported tests I also include a measure of the volatility of past cash flows as an additional control variable. I do not include the cash flow volatility variable in the main tests as it greatly reduces the sample size (to 34,112 firm-year observations from my primary sample of 53,871 firm-year observations) because I require a sufficient time series for each firm to be able to estimate operating cash flow volatility. As expected this variable is negatively related to investment expenditure. More importantly, including this variable does not affect the positive relation between over-investment and free cash flow.

[3] I estimate regression equation (1) across all firms which implies that the average over-investment across firms is equal to zero. My interest is in identifying deviations from an "expected" level of investment expenditure as a

Recall that free cash flow is cash flow beyond what is necessary to maintain assets in place (including servicing existing debt) and finance expected new investments. So far I have described only the last component, expected investment on new projects, I^*_{NEW}. To obtain an estimate of cash flow beyond what is necessary to maintain assets in place, I start with the measure of operating cash flows that is reported on the statement of cash flows. I then add back research and development expenditure because accounting standards require companies to expense research and development expenditure. As such this amount is included as a deduction to operating cash flows. Financial economists, however, usually consider R&D as discretionary investment expenditure, so I add it back to operating cash flows. I also deduct maintenance expenditure to reflect the fact that this investment expenditure is not a discretionary use of funds. Thus, my estimate of the free cash flow from assets in place, CF_{AIP}, is operating cash flows less $I_{MAINTENANCE}$ plus research and development expenditure. This is depicted in panel D of figure 1. I then subtract expected new investment, I^*_{NEW}, from free cash flow from assets in place, CF_{AIP}, to generate an estimate of free cash flow, FCF, as follows:

$$FCF = CF_{AIP} - I^*_{NEW} \tag{2}$$

The estimation of expected new investment expenditure has thus facilitated the joint determination of free cash flow and over-investment. The critical point of this analysis is that, in the presence of limited growth opportunities, cash flow can give rise to potential agency costs. The potential for over-investment is greatest when free cash flow from assets in place exceeds expected investment in new projects. However, free cash flow need not be over-invested, it can

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function of free cash flow. Obviously this analysis is subject to the standard criticism of mis-specification in the investment expectation model (with respect to both functional form and the set of included independent variables). To address these concerns I consider different sets of independent variables in the investment model (see section 4) and perform analysis using raw and ranked data as well as a portfolio approach that assumes measurement error is uncorrelated across portfolios (discussed in section 4.2). My results are robust to all of these specifications.

also be used to make payments to external stakeholders or retained in the form of financial assets. The following section examines these alternative uses of free cash flow.

My empirical analysis focuses on the relation between free cash *flow* and over-investment. As noted earlier, some prior research (e.g., Harford, 1999 and Opler et al. 1999) has found a positive relation between excess cash *levels* and investment expenditure. I focus on free cash flow as this is the primitive construct described in the literature (e.g., Jensen 1986). Furthermore, a firm's cash balance is the result of accumulated free cash flow (net of transactions with external capital providers). For this reason it is useful to examine the role that free cash flow plays on over-investment. Moreover, my framework implicitly considers the level of cash in two ways. First, the investment model includes a measure of cash balance, so the over-investment that I measure already includes the impact of the level of cash.[4] Second, existing balances of financial assets can also be drawn down by the firm to finance over-investment. If this is the case it will reduce the power of my tests that focus on free cash flow.

2.5 Uses of free cash flow

Panel D of figure 1 depicts the sources and uses of free cash flow. This analysis characterizes all possible uses of the free cash flow derived in section 2.4 above. Using information obtained from the statement of cash flows, I am able to allocate free cash flow flows into six categories. These six categories are: (i) over-investment, I^{ϵ}_{NEW}, (ii) net payments to shareholders, $\Delta Equity$, (iii) net principal payments to debt-holders, $\Delta Debt$, (iv) net change in financial assets, $\Delta Financial\ Asset$, (v) *Other Investments* and (vi) miscellaneous cash flows, *Other*. This is represented by the following identity:

[4] Excluding the level of cash from the investment model does not change the results. I examine this alternative specification in sensitivity tests described in section 4.2.

$$FCF_t \equiv I^{e}_{NEW,t} + \Delta Equity_t + \Delta Debt_t + \Delta Financial\ Asset_t + Other\ Investments_t + Other_t \quad (3)$$

The final two categories contain miscellaneous reconciling items that are of little overall economic significance. The main concern from the perspective of shareholders is the first category, over-investment, because this imposes substantial agency costs on shareholders. However, it is less clear what the best use of free cash flow is beyond avoiding over-investment. Payments to shareholders will be affected by the tax status of the firms' investor base (Allen and Michaely, 2003). In addition payments to both shareholders and debt-holders will impact the capital structure of the firm. To the extent that management have an optimal capital structure in mind it is not clear what the optimal distribution of free cash flow will be. Retention of free cash flow in the form of financial assets is also an option available to management. The optimal level of free cash flow to be retained will be a function of firm specific characteristics such as variability of cash flow and ability to access external capital markets (e.g., Harford, 1999). Firms with more volatile cash flows will want to retain cash for the periods when cash flow is low, and firms who find it more difficult to raise external capital will desire larger cash holdings (e.g., Opler et al., 1999). My primary focus is on the extent of over-investment and the role that governance structures can play in mitigating over-investment. I leave detailed examination of alternative uses of free cash flow to future research.

3. Data and sample selection

My empirical tests employ data from three sources. Financial statement data are obtained from the *Compustat* annual database. Governance data are obtained from the *Institutional Shareholder Services* (*ISS*) and *WorldScope*. The empirical analysis proceeds in two distinct sections. First, I provide evidence of over-investment for firms with positive free cash flow. For

this analysis I use all firm years with statement of cash flow availability. This sample period covers the fiscal years 1988-2002 with 53,871 firm-year observations.

Second, I analyze the role of governance structures in mitigating over-investment. I confine my analysis to 1997-2000 because my governance data spans this period. I average all financial variables across this four-year period for each firm. I average in this way for two reasons. First, governance characteristics are relatively stable so there will be little temporal variation in these measures. Second, the discussion in section 2 argued for a steady-state relation between governance and over-investment. Hence, the impact of governance structures is likely to manifest itself over longer windows. Thus, in the empirical tests examining governance structures, there is only one observation *per* firm.

I limit my analysis of governance mechanisms on over-investment to larger firms that are part of the S&P 500, S&P MidCap 400, or S&P SmallCap 600 indices. This creates a deliberate sample bias toward large, widely held firms. The fundamental characteristic of agency costs related to over-investment is the separation of ownership and control. This is most likely in large publicly traded firms where it is relatively more costly for individual shareholders to monitor management. I exclude financial institutions from my analysis (SIC codes between 6000 and 6999) because the demarcation between operating, investing, and financing activities is ambiguous for these firms. Finally, I require the firms to be covered by *ISS* and *WorldScope*. These data requirements leave a sample of 809 firms for the period 1997-2000.

The primary board variable is the fraction of outsiders on the board. *ISS* classify each director on the board as either (i) insider, (ii) affiliated, or (iii) independent outsider. A full description of this classification scheme is outlined in the appendix. The SEC requires all institutional fund managers who hold at least $100 million in exchange listed or NASDAQ

quoted securities at the end of the year to file a Form 13F. This form describes the number of shares and market value of each security held. This data is obtained from *WorldScope*.

In the empirical analysis that follows I scale all financial variables by average total assets (results are similar using sales as an alternative deflator). To minimize the influence of outliers I delete firms where the deflated value of free cash flow or any of the potential uses of free cash flow exceeds one in absolute value. The measure of growth opportunities, *BM* (the inverse of Tobin's *Q*), is winsorized by re-coding observations less (greater) than the 1st (99th) percentile to the 1st (99th) percentile. In unreported tests I re-perform all analyses using rank regressions according to the procedure outlined in Iman and Conover (1979). Results from this analysis are similar to those reported in the text.

4. Results

4.1. Analysis of investment expenditure and free cash flow

Table 1 reports details on investment expenditure and the determination of free cash flow. The average firm undertakes investment activity equal to 13 percent of its asset base. The major component of investment is capital expenditure, followed by research and development expenditure. Of the total investment expenditure 46 percent is spent maintaining existing assets in place and the remaining 54 percent is spent on new investments.[5]

Panel B gives some sense of the economic magnitude of the relation between growth opportunities (the book to market of assets, labeled as *BM*) and I_{NEW}. I perform this analysis for the entire pooled sample, by industry and industry-year groupings (using Fama and French, 1997 industry definitions). For the pooled regression I report results using Huber-White robust

[5] The mean firm in my sample undertakes investment expenditure equal to 13 percent of its asset base. Maintenance expenditure for the average firm is equal to six percent of the asset base. This constitutes 46 percent of total investment expenditure (0.06/0.13=0.46).

standard errors, which are a generalization of the White (1980) standard errors that are robust to both serial correlation and heteroskedasticity (Rogers, 1993). The parameter estimates and adjusted R^2 for the 44 (610) industry (industry-year) groups are the mean coefficients and adjusted R^2 from the 44 (610) regressions weighted by the square root of the number of observations in each industry (industry-year) group. Tests of significance for these group regressions are computed using variation in the parameters across the groups. Across all regression specifications the coefficient on *BM* is about 0.07. To give some economic interpretation to the strength of this relation, an inter-quartile change in *BM* of 0.533 [the first (third) quartile of the *BM* distribution is 0.395 (0.928)] corresponds to an additional 0.037 (0.533 * 0.07) in new investment expenditure. Alternatively stated, an inter-quartile change in growth opportunities translates to additional investment equal to four percent of the asset base of the firm. While this number appears small it is important to remember that *BM* captures the expected benefit from current and expected investment expenditure in *all* future periods.

The model of investment expenditure in panel B of table 1 includes only growth opportunities as an explanatory variable. In table 2 I expand the set of independent variables to include other variables that have been shown to be related to firm level investment decisions. These variables include measures of financing constraints (such as cash balance, firm size and leverage), firm age, industry fixed effects and time fixed effects (Hubbard, 1998). Measures of financing constraints capture the relation between cash levels and investment (see Fazzari, Hubbard and Petersen, 1988, Fazzari and Petersen, 1993 and Hubbard, 1998). I do not include a measure of cash flows as an additional explanatory variable as this is the very relation that I am trying to capture. Previous research has interpreted the positive association between *total* investment expenditures and *total* operating cash flows (after controlling for growth

opportunities using Tobin's Q) as evidence of capital rationing impacting firm's investment decisions. Specifically, when firms are faced with greater cash flows they will invest more as they now have internally generated funds to finance the investment (e.g., Meyer and Kuh, 1957 and Hoshi, Kashyap and Scharfstein, 1991). The firm is not forced to raise external (more costly) finance, increasing the set of positive NPV projects. Note, however that while this is consistent with an adverse selection theory, such an interpretation does not necessarily apply if the research design adequately controls for growth opportunities. Finding a positive relation between cash flow and investment after controlling for growth options (and hence optimal investment) suggests the possibility of over-investment. This alternative has not been explored in the capital rationing literature.

In table 2 I report the adjusted R^2 for five models of investment expenditure with various combinations of independent variables. As with the regression in table 1, I report results using Huber-White robust standard errors. The first model (column) is the same model in panel B of table 2 and is included for comparative purposes with the remaining four models (columns) that examine the explanatory power from the additional explanatory variables. Model II shows that including industry and annual fixed effects explains 10.8 percent of the variation in I_{NEW}, this compares with 8.5 percent explanatory power from *BM* alone. The control variables firm size, cash balance, firm age and leverage explain 11.4 percent of the variation (model III). Including all of the variables increases the explanatory power to 20.3 percent (model V). I also show the model without the prior cash balance (model IV) and the explanatory power from this model is 18.5%. All control variables load as expected - new investment expenditure is increasing in firm size, prior cash holdings and decreasing in firm age and leverage. In subsequent analyses decomposing I_{NEW} into expected investment (I^*_{NEW}) and over-investment (I^{ε}_{NEW}) I use model V.

Later results examining the relation between over-investment and free cash flow are similar if I instead use any of the models in table 2.

Table 3 panel A provides descriptive statistics for the free cash flow measure. The mean firm in my sample has cash flow from assets in place equal to 4 percent of its asset base. After subtracting expected investment on new projects (8 percent of asset base for the average firm), the average firm has a cash shortfall (i.e., negative free cash flow) equal to 4 percent of its asset base. 41 percent of sample firms have positive values of free cash flow.

Panel B of table 3 contains the key result that over-investment is a function of free cash flow. I run the following regression:

$$I^{\varepsilon}_{NEW,t} = \alpha + \delta_1 FCF_t + \delta_2 FCF_t * POS\_FCF + \varepsilon \quad (4)$$

In particular, allowing the slope coefficient to vary based on the sign of free cash flow (*POS_FCF* is an indicator variable equal to one for firms with positive values for *FCF*, and zero otherwise, and therefore measures the incremental relation between I^{ε}_{NEW} and *FCF* for firms with positive free cash flow) reveals that over-investment is concentrated in firms with positive free cash flow. Panel B reports both pooled regression estimates (using robust standard errors) as well as average estimates from annual regressions. For the fifteen annual regressions the estimate for δ_2 is positive in fourteen years and is significantly different from zero in twelve out of the fifteen years.[6] When firms have do not have free cash flow, (i.e., $FCF < 0$) the possibility

[6] There is the possibility that market price has already incorporated the likelihood of over-investment and the strength of governance mechanisms. This will impact the use of price-based measures to identify over-investment. The bias that this introduces into my empirical analysis is not immediately clear. However, I have replicated my analysis of over-investment and free cash flow using *only* a price-free estimate of growth opportunities. I compare I_{NEW} for each firm to the industry median level of I_{NEW}, denoted as $I^{IND}{}_{NEW}$. My measure of over-investment (I^{ε}_{NEW}) is then the difference between I_{NEW} and $I^{IND}{}_{NEW}$ and my estimate of expected investment (I^{*}_{NEW}) is equal to $I^{IND}{}_{NEW}$. Using this price-free estimation I still find over-investment concentrated in firms with positive values of free cash flow. Estimating the regression equation in panel B of table 2 I find that δ_1 is equal to 0.054 and δ_2 is equal to 0.295. For annual regressions I find that δ_2 is positive in all fifteen years and is significantly different from zero in

of over-investment is mitigated as the firm is forced to access external markets to raise funds necessary for any additional investment. Capital markets serve an additional monitoring role in disciplining managerial use of funds. The regression results in table 3 support H1 by showing that firms with positive free cash flow are more likely to over-invest on average and then for each additional dollar of free cash flow they over-invest more.

Panel A of table 4 reports the distributional properties of the free cash flow measure and the various uses of free cash flow. There is little variation in other investments and miscellaneous other category – I ignore these uses in subsequent empirical analyses. While the focus of the paper is on the relation between over-investment and free cash flow I also report the relation between free cash flow and alternative uses of free cash flow. The breakdown of each additional dollar of free cash flow is shown in panel B of table 4. I examine firm-year observations with positive free cash flow separately from negative free cash flow observations. For each sample I average the different uses of free cash flow and express each use as a percentage of available free cash flow. This partition on the sample emphasizes how the use of free cash flow varies based on the sign of free cash flow. For firms with positive free cash flow (41 percent of the sample) the average use of a dollar of free cash flow is as follows: 25 percent is over-invested, 10 percent is paid out to shareholders, 12 percent is paid out to debt-holders, 43 percent is retained in financial assets, and the remaining 10 percent is spread across the other categories. For firms with negative free cash flow the breakdown is quite different. The free cash flow shortfall is financed as follows: 11 percent is under-invested, 37 percent is received from shareholders, 33 percent is received from to debt-holders, 15 percent is financed from existing financial assets, and the remaining 4 percent is spread across the other categories. It is

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fourteen out of the fifteen years. Note, however, that using the industry median as a benchmark may understate over-investment if all firms are over-investing within the industry.

clear that firms with cash shortfalls raise additional funds through equity and debt offerings and also by running down existing cash balances. For firms with positive free cash flow, the two main uses are over-investment and retention in the form of financial assets. Consistent with the regression results in table 3 the positive relation between over-investment and free cash flow is concentrated in those observations where free cash flow is positive, consistent with the agency cost explanation for the relation.

4.2 Robustness tests and limitations for the primary hypothesis

To address concerns about the robustness of the primary finding of a positive relation between over-investment and free cash flow I perform several additional tests (all unreported in tables). My finding that over-investment is concentrated in firms with positive free cash flow is supported by all of these additional tests. First, I examine the strength of the relation between over-investment and free cash flow for alternative measures of growth opportunities. Alternate measures for growth opportunities include book-to-market of equity and earnings-to-price ratios. I examine these variables (along with a factor score combination of the two variables) instead of *BM* and I continue to find a strong positive relation between over-investment and free cash flow with these alternate measures of growth opportunities. Most importantly, the relation continues to be concentrated in firms with positive free cash flow consistent with the predictions of the agency cost explanation.[7]

[7] Even after controlling for determinants of investment expenditure, including various measures of growth opportunities, cash flows may be capturing residual growth opportunities. Therefore, the relation between over-investment and free cash flow may be indicative of free cash flow as an alternative measure of growth opportunities. Rebutting this alternative explanation is difficult and ultimately the interpretation of the results will depend on the priors of the reader as to the quality of the included independent variables in the investment model. However, this criticism does not predict a kink in the relation between over-investment and free cash flow as predicted by the agency cost explanation.

Second, the reduced form investment model I examine can also be criticized for measurement error. To mitigate this concern I utilize a portfolio approach to re-estimate the relation between over-investment and free cash flow. I randomly sort firms into 200 portfolios and then calculate the mean value for over-investment and free cash for each portfolio. I then perform a regression of mean over-investment on mean free cash flow for these 200 portfolios. The resulting regression has an adjusted R^2 of 0.045 and a coefficient of 0.195 on free cash flow. Similar results are obtained using median values. To the extent that measurement error is uncorrelated across these "averaged" random portfolios the positive relation between over-investment and free cash flow is not attributable to measurement error.[8]

Finally, a criticism of any research methodology using an expectations model is the quality of that model. Specifically, the inferences I can draw are conditional on the quality of the investment expectation model. I have based my expectations model on existing research but nonetheless it is still subject to this criticism that non-linearities and correlated omitted variables outside my model may drive the positive relation between my measures of over-investment and free cash flow. However, in the absence of theory there is little guidance as to alternative functional forms for the investment model.

4.3 Are governance structures designed based on free cash flow related agency costs?

To examine whether governance structures are designed in response to free cash flow related agency costs, I average annual measures of free cash flow for non-financial firms in the

[8] It is not critical for my analysis that my investment model is free from error. I only need to be able to identify a measure of unexpected (under/over) investment that is correlated with true unexpected (under/over) investment. This is likely to be achieved given that my model of expected investment expenditure is drawn from prior research. Even despite the theoretical foundation for the reduced form model, the robustness of the relation (between over-investment and free cash flow) to alternative specifications, the concentration of the relation in firms with positive free cash flow and cross-sectional variation in the relation based on the strength of governance structures (see section 4.4) speaks to an economic result and not merely a spurious correlation.

S&P1500 with available data from Compustat and Institutional Shareholder Services for the period 1997-2002. This leaves a sample of 809 firms (i.e., each firm appears only once in this analysis). Panel A of table 5 reports descriptive statistics for the governance variables that I examine: board composition, presence of a dual (or retired) CEO-chairperson and institutional ownership. The average firm has 65 percent of its board comprised of independent outside directors. There is considerable variation in this fraction with an inter-quartile range of about 25 percent. These sample characteristics are very similar to prior research (e.g., Bhagat and Black, 2002). 64 percent of firms have the CEO as chairman of the board and 20 percent of firms have a retired CEO serving on the board. It continues to be quite common for firms to have a dual CEO and chairman (Baliga, Moyer and Rao, 1996). The average firm has 61 percent of its stock held by institutional investors. Panel B of table 5 reports correlations between the governance measures and free cash flow. There is only weak evidence of a positive association between the governance measures and free cash flow (for institutional holdings).

Panel C examines the interaction between free cash flow and governance structures in more detail. I form deciles based on the magnitude of free cash flow and then examine variation in governance structures across these portfolios. If governance structures are designed to minimize the agency costs associated with free cash flow in the manner described in section 2, I would expect an increasing pattern going down each column (decreasing for the CEO variables). Such a pattern is not evident, except weakly for institutional holdings.

The final set of tests in table 5 examine whether governance structures vary based on the sign of free cash flow. Again there is only evidence that institutional holdings vary in response to free cash flow. The absence of a relation between free cash flow and contemporaneous governance structures results may not be surprising given that governance structures do not

change frequently, especially if free cash flow is not very persistent. To address this issue I have examined whether governance structures vary based on the *level* of cash (industry-adjusted) reported on the balance sheet. I still find no systematic evidence that governance structures vary in response to levels of cash. For these tests I look at the average cash balance (1997-2000) reported for each firm and examine the contemporaneous governance structures. Results are very similar to those reported in table 5. There is no strong evidence of governance structures varying based on the level of cash.

The tests in table 5 and those based on the level of cash discussed in the preceding paragraph, may lack power as they examine a contemporaneous association between the existence of surplus cash and governance structures. An alternative way to see whether governance structures are designed with agency costs of free cash flow in mind is to examine the free cash flow in an earlier period and examine the governance structures in a later period. For these tests I keep only firms that have at least ten years worth of free cash flow data and available governance data (675 firms). I then look at the free cash flow measure for the years prior to 1997. I calculate three summary measures of the existence of surplus cash for each firm for this period. First, I take the average of free cash flow across all available pre 1997 years. Second, I calculate the fraction of years for which free cash flow was positive. Third, I calculate the serial correlation in free cash flow for each firm for this period. I then test whether governance structures vary in the 1998-2000 period based on each of these three measures. Across all three measures there is only a significant correlation between the first measure (average of free cash flow in the pre 1997 period) and board composition. The Pearson (Spearman) correlation coefficient is 0.075 (0.068). While this achieves statistical significance the economic significance of these correlations is weak at best. The mean fraction of outsiders

on the board for firms in the lowest (highest) quintile based on average free cash flow is 58 (63) percent.

In summary, there is no systematic evidence in support of H2. The evidence suggests that despite the presence of substantial over-investment for firms with free cash flow there is little evidence that governance structures are designed with these agency costs in mind. There are two possible explanations for this result. First, it is possible that financial theory describing how governance affects free cash flow is incorrect. Second, the theory is correct but governance structures are not optimally designed. The tests I undertake in the next section are designed to help distinguish between these alternatives. Specifically, I test whether governance structures are effective in mitigating over-investment, as theory would predict. Evidence in support of this would suggest that governance structures are not optimally designed.

4.4 Do governance mechanisms affect over-investment?

In this section I examine whether governance structures mitigate the agency costs associated with over-investment. For the empirical analysis in this section, I start with the 809 firms that were examined in section 4.3 and limit the analysis to those 431 firms with positive average free cash flow in the 1997-2002 period. Section 4.1 showed that over-investment was concentrated in firms with free cash flow. Thus, if governance structures are to matter in mitigating over-investment it is firms with positive free cash flow where they should matter the most.

To test H3, I run the following regression specification:

$$I^{\varepsilon}_{NEW} = \alpha + \beta_1 FCF + \beta_2 GOV + \beta_3 GOV*FCF + \varepsilon \qquad (5)$$

I examine each governance variable individually and also collectively. *GOV* simply identifies the governance variable of interest. All other variables are as defined earlier. This specification has both a main and interaction effect for each governance measure. Care is required to interpret the coefficients in regressions with multiplicative terms. This is because the impact of an additional dollar of free cash flow on over-investment is also a function of the governance variable (i.e., $\partial I^{\varepsilon}_{NEW}/\partial FCF = \beta_1 + \beta_3 GOV$). I expect over-investment to be a positive function of free cash flow (i.e., $\beta_1 > 0$). I also expect the governance variables to mitigate the extent of over-investment (i.e., $\beta_3 < 0$). Note for the CEO variables the sign of the interaction term is expected to be positive as these variables are increasing in CEO dominance.

The regression results are presented in table 6. Consistent with the earlier analysis there is a strong positive relation between over-investment and free cash flow. The key result in this table is the strong negative relation between the interaction term and over-investment for both board composition and firm size. Board composition is examined in column 2. The –0.678 coefficient on the interaction term is interpreted as follows. A standard deviation change in board composition (0.17) corresponds to a differential coefficient on free cash flow of -0.12 (–0.678 x 0.17 = -0.12). This means that a one standard deviation change in board composition will result in 12 cents *less* over-investment per dollar of additional free cash flow. If we use the mean firm as the benchmark (mean fraction of independent outsiders is 0.66 for the sample of 431 firms used in this analysis) a one standard deviation change would increase board composition to 0.83 (0.66 + 0.17). A firm with 66 percent of its board comprised of independent outsiders will over-invest 36 cents for each dollar of free cash flow (0.805 – 0.66 x 0.678 = 0.36). A firm with 83 percent of its board comprised of independent outsiders will over-invest only 24 cents per dollar of free cash flow (0.805 – 0.83 x 0.678 = 0.24). An alternative way to

interpret this is to think in terms of numbers of directors. The average board size for my sample of firms is 9. Changing the fraction of outsiders from 0.66 to 0.83 is equivalent to swapping two insiders or affiliated directors with two outside directors. This would reduce the over-investment problem by over a third. I interpret this as evidence in support of H3.

The results for firm size are similar to board composition. Larger firms over-invest less. Results for institutional ownership do not achieve statistical significance in table 6 and the results for the CEO variables are statistically significant in the wrong direction. This suggests that firms where the CEO is also the chairperson or where a retired CEO serves on the board are less likely to over-invest free cash flows. The presence of a current or retired CEO seems to be a desirable feature for mitigating agency related costs from over-investment. Collectively, the results in table 6 suggest that firm size and board composition play a role in mitigating the over-investment of free cash flow.

5. Conclusion

This paper presents evidence on firm level over-investment of free cash flow. I develop a new accounting based framework to measure the constructs free cash flow and over-investment. A comparative advantage of the accountant is in measuring critical constructs from the financial economics literature. The analysis of over-investment and free cash is but one example of how accounting information can be better utilized in academic research. The evidence in the paper suggests that over-investment is a common problem for large, publicly traded US firms. For non-financial firms during the period 1988-2000, I find that the average firm over-invests 25 percent of its available free cash flow.

I find little evidence that governance mechanisms are designed in response to the agency costs that arise from free cash flow (at least for the set of governance variables examined in the paper). However, I find evidence that governance structures play an ex post role in monitoring management. Specifically, an inter-quartile change in board composition is associated with a reduction from 43 cents (upper quartile) over-investment per dollar of free cash flow to 26 cents (lower quartile) over-investment per dollar of free cash flow.

Furthermore, I document that the majority of free cash flow is retained in the form of financial assets. For each additional dollar of free cash flow the average firm in the sample retains 43 cents as either cash or marketable securities. There is little evidence that free cash flow is distributed to external stakeholders, thereby creating the potential for retained free cash flow to be over-invested in the future. My findings corroborate recent work that has found significant negative future stock returns from capital investment and significant growth in net operating assets (e.g., Titman, Wei and Xie 2003 and Fairfield, Whisenant and Yohn, 2003). A natural explanation for this poor future performance is free cash flow related agency costs.

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APPENDIX

Institutional Shareholder Service (*ISS*) board data classification scheme.

ISS makes the classifications into the three director categories as follows:

Inside Director

- Employee of the company
- Officer of the company if she is among the five most highly compensated individuals
- Beneficial ownership of more than 50% of the company's voting power (this may be aggregated if voting power is distributed among more than one member of a defined group; e.g. members of a family beneficially own less than 50% individually, but combined own more than 50%)

Affiliated Director

- Former employee of company or its affiliates
- Relative of current employee of company or its affiliates
- Provides professional services to company or its affiliates or to its officers*
- Has any transactional relationship with company or its affiliates*
- Interlocking relationships as defined by the SEC involving members of the Board of Directors or its Compensation and Stock Option Committee
- Founder of company but not currently an employee
- Employed by a significant customer or supplier*
- Employed by a foundation or university that received grants or endowments from the company or its affiliates

  *If significant enough to be disclosed in the proxy statement.

Independent Director

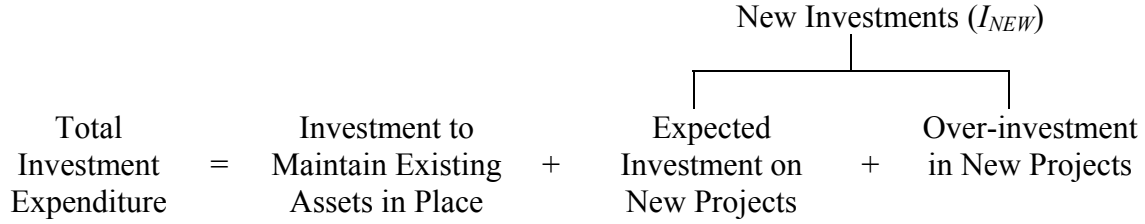
- No connection to company other than board seat or connection not significant enough to be reported in the proxy statement

Figure 1
Framework for examining investment expenditure and free cash flow.

Panel A: Definition of Investment Expenditures

		Acronym	Data Item
	Total Investment Expenditure	I_{TOTAL}	
+	Capital Expenditures	*CAPEX*	128
+	Research and Development Expenditure	*RD*	46
+	Acquisitions	*ACQ*	129
-	Sale of Property, Plant and Equipment	*SalePPE*	107
	Investment to Maintain Existing Assets in Place		
+	Amortization and Depreciation	$I_{MAINTENANCE}$	125

Panel B: Decomposition of Investment Expenditures



$$I_{TOTAL,t} = I_{MAINTENANCE,t} + I_{NEW,t} \quad (0)$$

$I^{*}_{NEW,t}$ $I^{\varepsilon}_{NEW,t}$

$$I_{NEW,t} = \hat{\alpha} + \hat{\beta} BM_{t-1} + \hat{\varphi} Z_{t-1} + I^{\varepsilon}_{NEW,t} \quad (1)$$

$I^{*}_{NEW,t}$

Panel C: Definition of Growth Opportunities

BM (the book to market of assets or the inverse of the Tobin's Q ratio) is a measure of growth opportunities calculated as the book value of debt (Compustat annual data item 34 and item 9) and equity (item 60) divided by the sum of market value of equity (item 25 * item199) and the book value of debt. In unreported results I use alternative measures of growth opportunities including book-to-market, earnings-price and combinations of these two variables with similar results.

Z is a vector of additional determinants of investment expenditure. This vector includes leverage, firm size, firm age, stock of cash, annual fixed effects and industry fixed effects.

Panel D: Reconciliation of the Sources and Uses of Free cash flow

		Acronym	Data Item	Totals
SOURCES:				
Free cash flow from Existing Assets in Place		CF_{AIP}		
+	Net Cash flow from Operating Activities	*CFO*	308	
-	Maintenance Investment Expenditure	$I_{MAINTENANCE}$	125	
+	Research and Development Expenditure	*RD*	46	1
Free cash flow from Growth Opportunities		I^*_{NEW}		
-	Expected Investment on New Projects			2
Net Sources of Free cash flow		$FCF = CF_{AIP} - I^*_{NEW}$ (2)		1-2
USES:				
Over-Investment		I^{ε}_{NEW}		3
Net Cash Flow to Equity Holders		*ΔEquity*		
+	Purchase of Common and Preferred Stock		115	
+	Cash Dividends		127	
-	Sales of Common and Preferred Stock		108	4
Net Cash Flow to Debt Holders		*ΔDebt*		
+	Long-term Debt Reduction		114	
-	Long-term Debt Issuance		111	
-	Changes in Current Debt		301	5
Change in Financial Assets		*ΔFin. Asset*		
+	Increase in Cash and Cash Equivalents		274	
-	Change in Short Term Investments		309	6
Other Investments		*Other Inv.*		
+	Increase in Investments		113	
-	Sale of Investments		109	7
Miscellaneous Cash Flows		*Other*		
-	Other Investing Activities		310	
-	Other Financing Activities		312	
-	Exchange Rate Effect		314	8
Net Uses of Free cash flow				3+4+5+6+7+8

The following equality will always hold:

$$FCF_t = I^{\varepsilon}_{NEW,t} + \Delta Equity_t + \Delta Debt_t + \Delta Financial\ Asset_t + Other\ Inv._t + Other_t \quad (3)$$

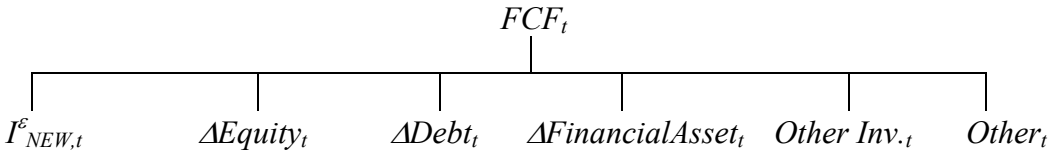


Table 1

Analysis of investment expenditure.

This table examines the properties of investing cash flows as a function of growth opportunities. The sample covers 53,871 firm years with available data on *Compustat* for the period 1988-2002.

Panel A: Descriptive statistics for investment expenditure

$$I_{TOTAL,t} = CAPEX_t + Acquisitions_t + RD_t - SalePPE_t$$
$$I_{NEW,t} = I_{TOTAL,t} - I_{MAINTENANCE,t}$$

	Mean	Std Dev	P1	Q1	Median	Q3	P99
I_{TOTAL}	0.13	0.14	-0.03	0.04	0.09	0.18	0.65
CAPEX	0.07	0.08	0	0.02	0.05	0.09	0.41
Acquistions	0.03	0.08	0	0	0	0.01	0.42
RD	0.04	0.09	0	0	0	0.04	0.41
SalePPE	0.01	0.03	0	0	0	0.00	0.11
$I_{MAINTENANCE}$	0.06	0.05	0	0.03	0.05	0.07	0.23
I_{NEW}	0.08	0.13	-0.17	0.00	0.04	0.12	0.58

Panel B: Simple model of investment expenditure

$$I_{NEW,t} = \alpha + \beta BM_{t-1} + \varepsilon \quad (1)$$

Model	α	β	*Adjusted* R^2	Model F-test
Pooled	0.142 (71.45)	-0.094 (-45.59)	0.0854	2078.77
Industry (44 groups)	0.127 (18.06)	-0.070 (-19.86)	0.0703	N/A
Industry-Year (610 groups)	0.123 (44.66)	-0.079 (-32.57)	0.0631	N/A

T-statistics are reported in parentheses underneath coefficient estimates.
For the pooled regression I report t-values based on Huber-White robust standard errors.
For the industry and industry-year group regressions the parameter estimates and are the weighted average (using the square root of the number of observations in each group as the weight) of individual group regression parameters. Test statistics are based on the across group variation in these parameters.
P1 (P99) is the 1st (99th) percentile of the respective distribution.
Q1 (Q3) is the lower (upper) quartile of the respective distribution.
I_{TOTAL} is total investment expenditure. It is calculated as research and development expenditure, *RD* (item 46) plus capital expenditure, *CAPEX* (item 128) plus acquisition expenditure, *Acquisitions* (item 129) less cash receipts from sale of property, plant and equipment, *SalePPE* (item 107).
$I_{MAINTENANCE}$ is investment expenditure necessary to maintain assets in place. I proxy for this construct using reported depreciation and amortization (item 125).
I_{NEW} is the difference between I_{TOTAL} and $I_{MANINTENANCE}$.

BM (book to market of assets or inverse of the Tobin's Q ratio) is a measure of growth opportunities calculated as the book value of debt (item 34 and item 9) and equity (item 60) divided by the sum of market value of equity (item 25 * item199) and the book value of debt (item 34 and item 9).
All investment expenditure variables are scaled by average total assets (item 6).

Table 2

Extended analysis of investment expenditure.

This table develops a model of investment expenditure. The determinants of investment include measures of growth opportunities, leverage, firm age, firm size, cash balance, industry fixed effects and annual fixed effects. The sample covers 53,871 firm years with available data on *Compustat* for the period 1988-2002.

$$I_{NEW,t} = \alpha + \beta Growth\ Opportunities_{t-1} + Controls_{t-1} + \Sigma Year\ Indicator + \Sigma Industry\ Indicator \quad (1)$$

Variable	Model I	II	III	IV	V
BM	-0.094 (-45.59)			-0.068 (-36.45)	-0.063 (-34.24)
Leverage			-0.060 (-14.93)	-0.078 (-21.42)	-0.043 (-11.11)
Cash			0.178 (24.38)		0.119 (19.21)
Age			-0.014 (-15.84)	-0.014 (-17.11)	-0.012 (-14.55)
Size			0.005 (10.49)	0.002 (4.47)	0.003 (6.65)
Year Indicators	No	Yes	No	Yes	Yes
Industry Indicators	No	Yes	No	Yes	Yes
Adjusted R^2	0.0854	0.1077	0.1135	0.1847	0.2026

T-statistics are reported in parentheses underneath coefficient estimates based on Huber-White robust standard errors.

I_{NEW} is the difference between I_{TOTAL} and $I_{MANINTENANCE}$.

I_{TOTAL} is total investment expenditure. It is calculated as research and development expenditure, *RD* (item 46) plus capital expenditure, *CAPEX* (item 128) plus acquisition expenditure, *Acquisitions* (item 129) less cash receipts from sale of property, plant and equipment, *SalePPE* (item 107).

$I_{MAINTENANCE}$ is investment expenditure necessary to maintain assets in place. I proxy for this construct using reported depreciation and amortization (item 125).

BM (book to market of assets or inverse of the Tobin's Q ratio) is a measure of growth opportunities calculated as the book value of debt (item 34 and item 9) and equity (item 60) divided by the sum of market value of equity (item 25 * item199) and the book value of debt (item 34 and item 9).

Age is the log of the number of years the firm has been listed on CRSP as of the start of the year.

Size is the log of total assets (item 6) measured at the start of the year.

Leverage is the sum of the book value of short term (item 34) and long term debt (item 9) deflated by the sum of the book value of total debt and the book value of equity (item 60).

Cash is the balance of cash and short term investments (item 1) deflated by total assets measured at the start of the year.

Year Indicators is a vector of indicator variables to capture annual fixed effects.

Industry Indicators is a vector of indicator variables to capture industry fixed effects. There are 43 industry indicator variables (using Fama-French 1997 groupings) in this regression.

All investment expenditure variables are scaled by average total assets (item 6).

Table 3

Analysis of free cash flow and over-investment.

The table examines the properties of free cash flow and how it relates to over-investment. All variables are scaled by average total assets. The sample covers 53,871 firm years with available data on *Compustat* for the period 1988-2002.

Panel A: Descriptive statistics for free cash flow

$$FCF_t = CF_{AIP,t} - I^*_{NEW,t} \quad (2)$$

I^*_{NEW} is the fitted value from:

$$I_{NEW,t} = \alpha + \beta Growth\ Opportunities_{t-1} + Controls_{t-1} + \Sigma Year\ Indicator + \Sigma Industry\ Indicator \quad (1)$$

	Mean	Std Dev	P1	Q1	Median	Q3	P99
CF_{AIP}	0.04	0.14	-0.44	-0.02	0.04	0.10	0.42
I^*_{NEW}	0.08	0.06	-0.04	0.03	0.07	0.11	0.26
I^{ε}_{NEW}	0	0.12	-0.23	-0.06	-0.02	0.04	0.45
FCF	-0.04	0.15	-0.57	-0.09	-0.02	0.04	0.29

Panel B: Relation between over-investment (I^{ε}_{NEW}) and free cash flow (FCF)

$$I^{\varepsilon}_{NEW,t} = \alpha + \delta_1 FCF_t + \delta_2 FCF_t * POS\_FCF + \varepsilon \quad (4)$$

Model	α	δ_1	δ_2	*Adjusted* R^2
Pooled	0.006	0.156		0.037
	(7.33)	(21.65)		
Pooled	0.001	0.117	0.144	0.041
	(0.08)	(11.84)	(6.37)	
Fama-MacBeth	0.005	0.163		0.044
(15 years)	(7.92)	(18.37)		
Fama-MacBeth	0.001	0.127	0.133	0.047
(15 years)	(0.21)	(9.50)	(5.19)	

T-statistics are reported in parentheses underneath coefficient estimates.
For the pooled regressions I report t-values based on Huber-White robust standard errors.
For the industry and industry-year group regressions the parameter estimates and are the weighted average (using the square root of the number of observations in each group as the weight) of individual group regression parameters. Test statistics are based on the across group variation in these parameters.
P1 (P99) is the 1st (99th) percentile of the respective distribution.
Q1 (Q3) is the lower (upper) quartile of the respective distribution.
I_{NEW} is the difference between I_{TOTAL} and $I_{MANINTENANCE}$.

I_{TOTAL} is total investment expenditure. It is calculated as research and development expenditure, *RD* (item 46) plus capital expenditure, *CAPEX* (item 128) plus acquisition expenditure, *Acquisitions* (item 129) less cash receipts from sale of property, plant and equipment, *SalePPE* (item 107).
$I_{MAINTENANCE}$ is investment expenditure necessary to maintain assets in place. I proxy for this construct using reported depreciation and amortization (item 125).
I^{*}_{NEW} is the fitted value from regression model V in table 2. It is an estimate of the expected level of investment.
I^{ε}_{NEW} is the residual from regression model V in table 2. It is an estimate of over-investment.
CF_{AIP} is cash flow from operating activities after maintenance investment expenditure. It is calculated as cash from operations (item 308) less $I_{MAINTENANCE}$ plus research and development expenditure (item 46).
FCF is CF_{AIP} less I^{*}_{NEW}. *FCF* is cash flow beyond that necessary to maintain assets in place (including servicing existing debt obligations) and finance expected new investments (i.e., free cash flow).
POS_FCF is an indicator variable equal to one if *FCF* is greater then zero, and zero otherwise.
All investment and cash flow variables are scaled by average total assets (item 6).
Fama-MacBeth regressions report the mean coefficient estimates and mean R^2 from the annual regressions.

Table 4

Analysis of alternative uses of free cash flow.
The sample covers 53,871 firm years with available data on *Compustat* for the period 1988-2002.

Panel A: Descriptive statistics for how free cash flow is used

	Mean	Std Dev	P1	Q1	Median	Q3	P99
FCF	-0.04	0.15	-0.57	-0.09	-0.02	0.04	0.29
I^{ε}_{NEW}	0	0.12	-0.23	-0.06	-0.02	0.04	0.45
ΔEquity	-0.02	0.13	-0.68	-0.01	0	0.02	0.19
ΔDebt	-0.02	0.12	-0.47	-0.04	0	0.02	0.25
ΔFinancialAsset	0.00	0.13	-0.40	-0.02	0.00	0.03	0.45
Other Inv.	0.00	0.06	-0.16	0	0	0	0.18
Other	0.00	0.08	-0.30	0.00	0	0.01	0.19

Panel B: How free cash flow is used

Sources and Uses	FCF > 0 Firm-years (n=22,139)		FCF < 0 Firm-years (n=31,732)	
	Average	Percent	Average	Percent
Sources				
FCF	0.074	100%	-0.117	100%
Uses				
I^{ε}_{NEW}	0.018	25%	-0.013	11%
ΔEquity	0.007	10%	-0.043	37%
ΔDebt	0.009	12%	-0.038	33%
ΔFinancialAsset	0.032	43%	-0.018	15%
Other Inv.	0.004	5%	0.001	-1%
Other	0.003	5%	-0.005	5%

P1 (P99) is the 1st (99th) percentile of the respective distribution.
Q1 (Q3) is the lower (upper) quartile of the respective distribution.

ΔEquity is the net cash returned to shareholders for the period. It is calculated as the sum of repurchases, (item 115) and dividends (item 127) less cash raised from stock issuance (item 108).
ΔDebt is the net cash returned to debtholders for the period. It is calculated as long term debt reduction (item 114) less long term debt issuance (item 111) less changes in current debt (item 301).
ΔFinancial Assets is the change in cash holdings. It is calculated as change in cash (item274) less change in short term investments (item 309).
Other Investments is other investments made. It is calculated as increase in investments (item113) less sale of investments (item 109).
Other includes all other categories on the statement of cash flows not included in *ΔEquity*, *ΔDebt*, *ΔFinancial Assets*, I^{ε}_{NEW} and *Other Investments*. It is calculated as the negative of the sum of exchange rate effects (item 314), other investing activities (item 310) and other financing activities (item 312).

FCF is CF_{AIP} less I^{*}_{NEW}. *FCF* is cash flow beyond that necessary to maintain assets in place (including servicing existing debt obligations) and finance expected new investments.

CF_{AIP} is cash flow from operating activities after maintenance investment expenditure. It is calculated as cash from operations (item 308) less $I_{MAINTENANCE}$ plus research and development expenditure (item 46).
I_{NEW} is the difference between I_{TOTAL} and $I_{MANINTENANCE}$. I_{NEW} represents investment expenditure after maintenance of existing assets in place. I_{TOTAL} is total investment expenditure. It is calculated as research and development expenditure, *RD* (item 46) plus capital expenditure, *CAPEX* (item 128) plus acquisition expenditure, *Acquisitions* (item 129) less cash receipts from sale of property, plant and equipment, *SalePPE* (item 107). $I_{MAINTENANCE}$ is investment expenditure necessary to maintain assets in place. I proxy for this construct using reported depreciation and amortization (item 125).
I^{*}_{NEW} is the fitted value from regression model V in table 2. It is an estimate of the expected level of investment.
I^{ε}_{NEW} is the residual from regression model V in table 2. It is an estimate of over-investment.

All cash flow and investment variables are scaled by average total assets.

Table 5

Governance mechanisms and over-investment of free cash flow.
The table documents the relation between board variables and the presence of free cash flow. The sample covers all non-financial Standard and Poor's 1,500 firms with data available on *Compustat* and *Institutional Shareholder Services* (809 firms).

Panel A: Descriptive statistics for governance mechanisms

	Mean	Std Dev	P1	Q1	Median	Q3	P99
Frac	0.65	0.17	0.20	0.55	0.67	0.80	0.91
Dual	0.64	0.48					
Retired CEO	0.20	0.40					
IO	0.61	0.18	0.17	0.49	0.62	0.74	0.96

Panel B: Correlation between free cash flow and board variables (Pearson lower half)

	FCF	*Frac*	*Dual*	*Retired CEO*	*IO*
FCF		0.058*	0.004	0.013	0.153**
Frac	0.052		0.097**	-0.098**	0.138**
Dual	0.007	0.098**		-0.222**	0.099**
Retired CEO	0.023	-0.062*	-0.222**		-0.067*
IO	0.160**	0.130**	0.104**	-0.076*	

Panel C: How do board characteristics vary across free cash flow portfolios

FCF Decile	*FCF*	*Size*	*Frac*	*Dual*	*Retired CEO*	*IO*
LOW	-0.11	6.27	0.63	0.64	0.15	0.58
2	-0.05	6.96	0.64	0.62	0.26	0.58
3	-0.03	7.32	0.65	0.68	0.19	0.58
4	-0.01	7.34	0.67	0.62	0.22	0.57
5	0.00	7.04	0.62	0.63	0.19	0.59
6	0.01	7.07	0.65	0.68	0.18	0.61
7	0.02	6.88	0.65	0.67	0.16	0.63
8	0.04	6.89	0.67	0.59	0.25	0.62
9	0.06	6.88	0.68	0.69	0.16	0.66
HIGH	0.15	6.73	0.67	0.62	0.25	0.66

Panel D: How do board characteristics vary based on sign of free cash flow

	FCF ≤ 0	*FCF > 0*	*Test statistic*	*P-value*
Frac	0.65	0.66	1.20	(0.232)
Dual	0.63	0.65	0.54	(0.463)
Retired CEO	0.20	0.20	0.02	(0.890)
IO	0.58	0.64	4.70	(0.001)

** Indicates significance at the 1% level.
* Indicates significance at the 5% level.

Frac is the fraction of outsiders on the board (see Appendix for definition of outsider).
Dual is an indicator variable equal to one if the CEO is also the chairperson of the board and zero otherwise.
Retired CEO is an indicator variable equal to one if a retired CEO serves on the board.
IO is the fraction of common shares outstanding held by institutional investors as reported on SEC Form 13F as at the end of the fiscal year. Any institutional investment manager which holds at least $100 million in exchange listed or NASDAQ quoted securities at the end of the year must file Form 13F describing the number of shares and market value of each security held.
Size is the log of total assets measured at the start of the fiscal period (item 6).

FCF is CF_{AIP} less I^{*}_{NEW}. *FCF* is cash flow beyond that necessary to maintain assets in place (including servicing existing debt obligations) and finance expected new investments (i.e., free cash flow).
CF_{AIP} is free cash flow from operating activities after maintenance investment expenditure. It is calculated as cash from operations (item 308) less $I_{MAINTENANCE}$ plus research and development expenditure (item 46).
I_{NEW} is the difference between I_{TOTAL} and $I_{MANINTENANCE}$. I_{NEW} represents investment expenditure after maintenance of existing assets in place. I_{TOTAL} is total investment expenditure. It is calculated as research and development expenditure, *RD* (item 46) plus capital expenditure, *CAPEX* (item 128) plus acquisition expenditure, *Acquisitions* (item 129) less cash receipts from sale of property, plant and equipment, *SalePPE* (item 107).
$I_{MAINTENANCE}$ is investment expenditure necessary to maintain assets in place. I proxy for this construct using reported depreciation and amortization (item 125).
I^{*}_{NEW} is the fitted value from regression model V in table 2. It is an estimate of the expected level of investment.
I^{ε}_{NEW} is the residual from regression model V in table 2. It is an estimate of over-investment.

All investment and cash flow variables are scaled by average total assets (item 6).

Table 6

Board of directors, free cash flow and over-investment.

The table documents the relation between board characteristics and the over-investment of free cash flow. The sample covers all non-financial Standard and Poor's 1,500 firms with positive free cash flow and data available on *Compustat*, *Institutional Shareholder Services* and *World Scope* (431 firms).

$$I^{\varepsilon}_{NEW,t} = \alpha + \beta_1 FCF_t + \beta_2 GOV_t + \beta_3 GOV_t * FCF_t + \varepsilon \quad (5)$$

	Predicted Sign	1	2	3	4	5	6
Intercept	?	-0.038 (-1.74)	-0.018 (-1.12)	-0.008 (-1.09)	-0.004 (-0.81)	-0.016 (-1.01)	-0.080** (-2.79)
FCF	+	1.095** (4.28)	0.805** (3.70)	0.479** (5.49)	0.376** (6.92)	0.541** (2.42)	2.237** (5.19)
Size	?	0.005 (1.64)					0.008* (2.40)
*Size*FCF*	-	-0.113** (-2.96)					-0.159** (-3.98)
Frac	?		0.022 (0.90)				0.029 (1.15)
*Frac*FCF*	-		-0.678* (-2.12)				-0.989** (-2.68)
Dual	?			0.005 (062)			0.004 (0.46)
*Dual*FCF*	+			-0.186* (-1.77)			-0.198* (-1.71)
Retired CEO	?				-0.001 (-0.09)		0.002 (0.15)
*Retired CEO * FCF*	+				-0.116 (-0.94)		-0.247* (-1.96)
IO	?					0.018 (0.79)	0.003 (0.13)
*IO * FCF*	-					-0.291 (-0.87)	0.009 (0.02)
Adjusted R^2		0.121	0.113	0.110	0.106	0.104	0.143

T-statistics are reported in parentheses underneath coefficient estimates.

** Indicates significance at the 1% level or better.

* Indicates significance at the 5% level or better.

Frac is the fraction of outsiders on the board (see Appendix for definition of outsider).
Dual is an indicator variable equal to one if the CEO is also the chairperson of the board and zero otherwise.
Retired CEO is an indicator variable equal to one if a retired CEO serves on the board.
Size is the log of total assets (item 6) measured at the start of the year.
IO is the fraction of common shares outstanding held by institutional investors as reported on SEC Form 13F as at the end of the fiscal year. Any institutional investment manager which holds at least $100 million in exchange listed or NASDAQ quoted securities at the end of the year must file Form 13F describing the number of shares and market value of each security held.

FCF is CF_{AIP} less I^{*}_{NEW}. *FCF* is cash flow beyond that necessary to maintain assets in place (including servicing existing debt obligations) and finance expected new investments (i.e., free cash flow).
CF_{AIP} is free cash flow from operating activities after maintenance investment expenditure. It is calculated as cash from operations (item 308) less $I_{MAINTENANCE}$ plus research and development expenditure (item 46).
I_{NEW} is the difference between I_{TOTAL} and $I_{MANINTENANCE}$. I_{NEW} represents investment expenditure after maintenance of existing assets in place. I_{TOTAL} is total investment expenditure. It is calculated as research and development expenditure, *RD* (item 46) plus capital expenditure, *CAPEX* (item 128) plus acquisition expenditure, *Acquisitions* (item 129) less cash receipts from sale of property, plant and equipment, *SalePPE* (item 107).
$I_{MAINTENANCE}$ is investment expenditure necessary to maintain assets in place. I proxy for this construct using reported depreciation and amortization (item 125).
I^{*}_{NEW} is the fitted value from regression model V in table 2. It is an estimate of the expected level of investment.
I^{ε}_{NEW} is the residual from regression model V in table 2. It is an estimate of over-investment.

All investment and cash flow variables are scaled by average total assets (item 6).