THE INFLUENCE OF FINANCIAL FACTORS ON CORPORATE INVESTMENT

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ABSTRACT

Recent theoretical developments have shown that cash flows and the structure of a firm's balance sheet may have an important influence on investment. Establishing a link between cash flows, leverage and investment provides insights into the way that monetary policy and cyclical factors more generally influence the corporate sector. If cash flows are an important determinant of investment, then changes in monetary policy (by changing interest rates) will influence investment through a cash flow effect as well as through altering the rate at which the returns to investment are discounted. If this is the case, the higher leverage of the corporate sector implies, other things being equal, that monetary policy may have a larger impact on investment than in the past. Furthermore, it suggests that the effects of monetary policy will be felt unevenly across the corporate sector. The cash flows of highly geared firms will be more sensitive to changes in interest rates than cash flows of firms with minimal leverage.

In this paper we use panel-data analysis to examine the impact of financial factors on investment decisions of firms in the Australian corporate sector. We find strong support for the influence of financial factors on investment decisions. Leverage, internally-generated cash flows, and the stock of cash and liquid financial assets are all important influences on investment behaviour, particularly for smaller firms, highly leveraged firms, and firms with high retention ratios.

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1. INTRODUCTION

In the past few years there has been a re-emergence of interest in the role that financial factors play in corporate investment decisions. This interest stems from the effect that financial factors such as asset prices, gearing and cash flow have had on shaping the most recent economic cycle. Recent theoretical developments have also shown that cash flows and the structure of a firm's balance sheet may have an important influence on investment.

The potential link between investment and finance implies that some of the changes in the structure of corporate balance sheets in the past decade could have significantly altered the dynamics of the economic cycle in Australia. During the 1980s, the indebtedness of the corporate sector increased sharply. This could have made firms more sensitive to the cycle. They may now adjust their expenditures more quickly in the face of a change in demand to meet their debt obligations.[1]

Establishing a link between cash flows, leverage and investment also provides insights into the way in which monetary policy and cyclical factors more generally influence the corporate sector. If cash flows are an important determinant of investment, changes in monetary policy (by changing some interest rates) will influence investment of indebted firms through a cash flow effect as well as through altering the rate at which the returns to investment are discounted. If this is the case, the higher leverage of the corporate sector implies, other things being equal, that monetary policy may have a larger impact on investment than in the past. Moreover, it implies that changes in monetary policy may not be transmitted evenly across the corporate sector. The cash flows of more highly geared firms will be more sensitive to changes in interest rates than cash flows of firms with minimal leverage.

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[1] A discussion of these issues can be found in Bernanke and Campbell (1988), Cantor (1990) and Friedman (1990).

Smaller firms are generally considered to be more sensitive to changes in financial conditions. External funding tends to be relatively more expensive for them because providers of finance have less information about their creditworthiness. Smaller firms also have limited access to securities or equity markets and are thus more reliant on intermediated funding as a source of external finance. Cash flows are a significant source of funding for them. Economic shocks that alter cash flows or change the lending behaviour of intermediaries are thus likely to have a more significant influence on the investment decisions of smaller firms.

This paper will explore the link between financial factors and investment in a sample of listed non-financial Australian firms.[2] First, it will attempt to see if these factors are important generally. Next, it will consider whether the importance varies across firms depending on their financial structure, size or dividend payout policies. The paper finds evidence that financial factors do have a significant influence on investment. Investment is positively related to cash flows and the stock of financial assets and negatively related to leverage. Moreover, it appears that investment of firms with higher leverage and smaller firms is more sensitive to financial factors than that of other firms. This implies that they could be more sensitive to economic conditions and changes in monetary policy than other firms.

The paper is organised as follows. Section 2 outlines the theoretical links between finance and investment. In Section 3 we present empirical results based on the estimation of a panel-data model. Section 4 concludes the paper.

2. FINANCE AND INVESTMENT THEORY

Financial factors play a limited role in traditional models of investment. For example, in the neoclassical model, firms choose inputs of capital (and labour) so as to maximise the present discounted value of their income streams. Financial factors enter only through the cost of capital which, in turn, is independent of the way the firm finances itself. This independence arises because capital markets are assumed to be perfect. Thus, firms are able to secure external finance for a project if its expected marginal return exceeds its cost of capital. There is no shortage of

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[2] McKibbin and Siegloff (1987) incorporate financial factors in a study of aggregate investment in Australia.

funds for firms with value-increasing projects and the marginal costs of debt, equity and internal funds are equal. In this world, the availability of adequate cash flows is not a constraint on investment and the financial characteristics of the firm do not influence its cost of capital. Thus, "interactions between real and financial variables can be reduced to interactions between real variables and interest rates" (Mauskopf (1990)).

There are a number of reasons to believe that this separation of real and financial factors would not occur in practice. Some firms (particularly small firms) have limited access to external sources of funding.[3] Cash flows will be their primary, and in some cases, only source of funds.

Even companies with access to external funding will rely more heavily on cash flows as a source of finance. There are direct costs involved in raising external funding, such as underwriting and administrative fees.[4] There are also potential financial distress costs associated with using external finance. For example, as leverage increases, other things being equal, there may be a higher probability of the firm facing financial distress. In this case, the firm may incur direct bankruptcy costs such as legal expenses and trustee fees and indirect costs such as the disruption of operations, loss of suppliers or customers and the imposition of financial constraints. The present value of these expected costs should be reflected in current financing costs (whether or not the firm actually enters bankruptcy). Finally, there are issues of taxation, shareholder dilution, control of information, the need to maintain flexibility and liquidity that may also have an impact on a firm's financing choices. Financial factors may therefore affect the cost and availability of capital and so influence the investment decision.

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[3] Smaller firms have difficulty raising funds from capital markets for a variety of reasons. For example, Woo and Lange (1992), note that "limited access may arise as a result of prohibitions or barriers to entry that specifically preclude small firms from gaining funds, either through regulation or in terms of the costs involved".

[4] Oliner and Rudebusch (1989) find that transaction costs associated with external finance are significant in the US. For example, they report that transaction costs account for up to one-quarter of the gross proceeds of small stock issues and one-seventh of the proceeds of small debt issues. Although current costs are likely to be considerably lower than this as a result of financial deregulation and innovation, these costs still remain important (see Allen (1991)).

Financial factors are generally introduced to standard investment models through information asymmetries or through agency costs. The introduction of these assumptions helps explain how a given level of investment will be funded and how a firm's financial position will influence its investment.

Informational asymmetries, where managers have more information about a firm than potential debt or equity holders, make it difficult for potential creditors and equity holders to evaluate the prospects of different firms. If creditors cannot distinguish between good quality and poor quality potential borrowers then the market interest rate is likely to incorporate a premium - good quality borrowers would be charged more than they would in a perfectly-informed market.[5] Similarly, new equity issues may trade at a discount to their value implied by the underlying prospects of a firm.[6] The firm may also incur agency costs - costs borne by owners of the firm resulting from potential conflicts between managers, debtholders and equityholders.[7] For example, the nature of the debt contract may provide an incentive for managers, acting on behalf of equity holders, to pursue riskier investment projects than would be pursued under a different financial structure. If the investment is successful, equity holders capture most of the excess gain; if the venture is unsuccessful, both equity holders and debt holders share the burden. Because debtholders anticipate this type of behaviour, they price debt contracts accordingly.

The effect of these information problems is to boost the cost of external finance relative to internal finance. These cost differentials provide some insight into how a given level of investment will be funded - cash flows will be preferred to debt which, in turn, will be preferred to new equity issues.[8] Recent Australian evidence

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5 Akerlof (1970) and Stiglitz and Weiss (1981).

6 Myers and Majluf (1984).

7 There are many types of agency costs discussed in the literature (see Harris and Raviv (1991)).

8 This financing hierarchy results because cash flows will be the cheapest source of funds, followed by debt and then by new equity. Debt will be cheaper than new equity financing because the debt contract can be structured in such a way as to minimise the consequences of the informational problems. A number of studies confirm the existence of financing hierarchies. Chaplinsky and Niehaus (1990) and Amihud et al. (1990), for example, find evidence that firms prefer internally sourced funds to external securities. Direct management surveys such as Allen (1991) and Pinegar and Wilbricht (1989) confirm these findings.

(Shuetrim, Lowe, and Morling (1993)) shows that the capital structure of the firm can be explained in part by these types of informational problems.

The theoretical extent of asymmetric information problems and agency costs can be shown to be a function of the structure of a firm's balance sheet. Accordingly, the structure of a firm's balance sheet will influence its investment decision and shocks to the balance sheet will alter the evolution of investment over time.[9] Firms can alter the cost of funding investment in a number of ways. Higher cash flows directly reduce the cost of funds because firms will be less reliant on more costly external funding. They also help reduce the costs of external funds by increasing the collateral backing of external finance.[10] Recent evidence from the United States suggests that firms often "reliquify", that is, build up their stock of financial assets before undertaking large investments (Whited (1991) and Eckstein and Sinai (1986)). They do this either because they have limited access to external finance or because it provides them with collateral to obtain external funding at lower cost. Shifts in cash flows, financial assets and leverage may thus influence the dynamics of investment. Indeed, Bernanke and Gertler (1989) show that shocks to balance sheets can increase the amplitude of the investment cycle in a simple neoclassical model.

Because the degree of asymmetric information and agency costs depends on firm characteristics, certain firms may be more sensitive to financial factors than others. For example, investors are likely to be less well-informed about smaller companies. This may hinder their ability to raise funds and boost the costs of external funding. Changes in cash flows may thus be a more important determinant of investment for smaller companies.[11] Also, the investment of firms with higher leverage may be more sensitive to cash flows than that of firms with lower leverage. The increased debt servicing obligations resulting from higher leverage mean that the available

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9 Mills, Morling and Tease (1993) provide an analysis of the recent Australian experience.

10 Bernanke and Gertler (1989) develop a model in which fluctuations in a firm's balance sheet change the agency costs of external funding and induce fluctuations in investment. Agency costs are assumed to be positively related to collateralisable net worth. This results in a cyclical relationship between balance sheets and investment. During an upturn, for example, net worth increases, agency costs are thus reduced and thus investment picks up. Similarly, shocks to net worth independent of the cycle will alter investment. See Lowe and Rohling (1993) for Australian evidence.

11 Gertler (1988) and Fazzari, Hubbard and Peterson (1988).

cash flows of higher-geared firms are smaller and thus they have less of a buffer against disturbances.

Consideration of these links between investment and the balance sheet position of the corporate sector enriches the theoretical representation of the way that monetary policy is transmitted. In simple models, monetary policy affects corporate investment directly by altering the rate at which the expected returns to investment are discounted and indirectly through its effects on demand in the economy generally. Adding financial factors into the analysis means that monetary policy will also affect investment through its effect on the financial position of the corporate sector. A tightening in policy, for example, will increase interest payments and reduce cash flow. This will reduce the availability of relatively cheap internal funds and also increase the cost of external funds. Additionally, asset prices will fall, reducing the collateral that firms can provide to outside financiers, raising the cost of external funding. Investment may be affected through these channels in addition to the intertemporal substitution effects of standard theory. Because the importance of these factors will vary across firms depending on their size and financial structure, changes in monetary policy will be transmitted unevenly across the corporate sector.

3. EMPIRICS

3.1 An Empirical Model

In this section we present some empirical results on the influence of financial factors on investment. Fazzari et al. (1988) and Devereux and Schiantarelli (1989) derive empirically tractable investment equations that encompass both standard investment models and the effects of financial constraints.[12] Firms are assumed to maximise

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[12] Fazzari et al. (1988) use a 'q' framework extended to include a premium for issuing new shares. The premium results in a cost differential between internally generated funds and new equity finance. They show that, for certain classes of firms, internal funds may be important, but other firms may behave as if there were only limited capital market imperfections. Devereux and Schiantarelli (1989) use a 'q' model extended to include informational asymmetries and the risk of bankruptcy. The Devereux and Schiantarelli model is a more general form than the Fazzari model. A wider range of financial factors are explicitly incorporated in the model and it also allows capital market imperfections and the availability of internally generated cash flows to possibly influence investment decisions of all companies.

the present value of the post-tax dividend stream, adjusted for new share issues, subject to a number of constraints. The expression is modified to include a premium demanded by potential equity investors when information problems exist. Agency/financial distress costs are assumed to be a positive function of leverage and a negative function of cash flows, the capital stock and the stock of liquid assets for reasons discussed earlier.[13] In these models, investment is therefore a positive function of Tobin's 'q', cash flows and the stock of liquid assets and a negative function of leverage. Several authors have also argued for the inclusion of sales in this equation (Fazzari et al. (1988)). This controls for demand effects that are not adequately reflected in 'q' and that may be otherwise captured by the cash flow term.

The estimating equation is[14]:

$$\frac{I_{it}}{K_{it-1}} = a + b_1 q_{it-1} + b_2\left(\frac{C_{it}}{K_{it-1}}\right) + b_3\left(\frac{L_{it-1}}{K_{it-2}}\right) + b_4\left(\frac{D_{it-1}}{K_{it-2}}\right) + b_5\left(\frac{S_{it}}{K_{it-1}}\right) \quad (1)$$

where:

I = investment

K = capital stock

q = Tobin's 'q'

C = cash flows

L = stock of liquid financial assets

D = stock of outstanding debt

S = sales

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[13] In the Devereux and Schiantarelli (1989) model, agency/financial distress costs are modelled by adding an additional cost term in the sources and uses of funds constraint. Agency costs are assumed to be an increasing function of debt and a decreasing function of cash flow and liquid (collateralisable) assets. In the Fazzari model, the reduced form equation is similar, although the financial variables play a slightly different role; retained earnings provide a low cost source of funds, debt finance also provides a low cost source of funds but the cost advantage over external equity finance declines with increasing leverage, and liquid assets provide a low cost source of funds for investment and a cushion between investment and cash flow fluctuations.

[14] For the full derivation of equation (1) see Devereux and Schiantarelli (1989).

All variables are expressed in nominal terms and, with the exception of 'q', are standardised by the capital stock. A full description of data sources and construction is given in the Appendix.

The cash flow and sales terms in equation (1) are contemporaneous - like investment, these are flows. They reflect current availability of internal funds and current demand pressures. The other terms in equation (1) are lagged one period - these terms are stocks and are measured at the end of the period. Because of this, the lagged value (or starting period value) more accurately reflects the information set available to firms when the investment decision is made. It also avoids some of the problems associated with possible simultaneity in investment and capital structure decisions.

3.2 Estimation

Panel-data models are usually estimated using either fixed or random effects techniques. These two techniques have been developed to handle the systematic tendency of individual specific components to be higher for some units than for others - the random effects estimator is used if the individual specific component is assumed to be random with respect to the explanatory variables. The fixed effects estimator is used if the individual specific component is not independent with respect to the explanatory variables.[15]

Hausman (1978) provides a test for discriminating between the fixed effects and random effects estimators. The test is based on comparing the difference between the two estimates of the coefficient vectors, where the random effects estimator is efficient and consistent under the null hypothesis and inconsistent under the alternative hypothesis, and the fixed effects estimator is consistent under both the null and the alternative hypothesis. If the null is true, the difference between the estimators should be close to zero. The calculation of the test statistic (distributed χ^2) requires the computation of the covariance matrix of $\beta_1 - \beta_2$. In the limit the covariance matrix simplifies to $\text{Var}(\beta_1) - \text{Var}(\beta_2)$, where β_1 is the fixed effects estimator. The computed Hausman statistic in our model, however, was negative, reflecting the finite-sample problems in calculating the covariance matrix. The choice of estimator is therefore somewhat arbitrary. Our priors are that there is

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[15] See Keane and Runkle (1992) for a review of the estimation of panel-data models.

likely to be correlation between the error term and the regressors in this type of data - in this case the random effects model is efficient but inconsistent and the fixed effects estimator should be used.[16] The fixed effect model is estimated in the form:

$$Y_{it} - \overline{Y}_i = B(X_{it} - \overline{X}_i) + (e_{it} - \bar{e}_i) \qquad (2)$$

where e_{it} is a mean-zero time-varying error and variables without time subscripts are the individual means. Subtracting individual means removes the need to estimate each of the individual effects.

A RESET test was performed to test for functional form misspecification and/or omitted variables.[17] The $F_{(3,590)}$ statistic of 2.165 indicated that the null hypothesis of no functional misspecification could not be rejected at the 5 per cent level of significance.

Heteroskedasticity is likely to be a significant problem with company data. In the estimation, corrections were made to the covariance matrix to allow for conditional heteroskedasticity (White (1980)).

3.3 General Results

The results of estimating equation (1) are reported in Table 1. The results provide support for the standard investment models such as Tobin's 'q', and accelerator-type models.[18] The coefficients on both Tobin's 'q' and sales have the expected signs and they are significant at the five per cent and one per cent levels

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[16] We also used the procedure suggested in Griliches and Hausman (1986) to check for errors in variables problems before proceeding with the final estimation.

[17] The form of the RESET test was:

$$u_t = a_o + a_1\left(\frac{\hat{I}_{it}}{K_{it-1}}\right) + a_2\left(\frac{\hat{I}_{it}}{K_{it-1}}\right)^2 + a_3\left(\frac{\hat{I}_{it}}{K_{it-1}}\right)^3$$

where u_t are the residuals from equation (1) and $\left(\hat{I}_{it}/K_{it-1}\right)$ are the predicted values of investment.

[18] Hayashi (1982) shows that the Tobin's 'q' model of investment is equivalent to the neoclassical model under certain conditions.

respectively. Interpreted in conjunction with the scale of the variables (reported as a memo item in Table 1), the results suggest that sales has the greater economic importance of the two terms. The finding that both terms are significant suggests that neither model in itself provides a complete explanation of investment behaviour.

The results support the hypothesis that financial variables also influence investment. The coefficients on cash flow and on the stock of liquid assets have the expected signs and are each significant at the one per cent level.[19] These coefficients, when interpreted in conjunction with the scale of the variables, indicate that cash flow has an important influence on investment and that the stock of cash and liquid assets, although significant, are probably a less important influence. Note that cash flows (and the stock of liquid assets) are not merely proxies for current or expected profitability - these are effectively controlled for by including both 'q' and sales in the equation. Cash flow provides the only source of finance for those firms that are liquidity constrained, and for those firms that do have access to external capital markets, cash flows provide a relatively cheaper form of finance. These findings are consistent with McKibbin and Siegloff (1987) who find a significant role for cash flow in a study of aggregate investment in Australia.

The debt term is also correctly signed and significant at the five per cent level. This result suggests that capital structure does effect investment behaviour. Higher levels of debt result in an increased probability of financial distress and the demand for higher returns by potential suppliers of funds. Although the effect is not large, it is potentially important for many firms.

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[19] Equation (1) was also estimated using a working capital variable in the place of the cash and liquid financial assets variable. Whited (1991) argues that reliquification can be tested by including this financial distress variable directly in the regression equation. The coefficient on this variable had the correct sign and was significant at the 10 per cent level. The variable was not significant, however, when the cash and liquid financial assets term was also included in the equation. These variables perform a similar role in the equation and the working capital variable was excluded from the final estimating equation.

Table 1: Estimation Results (Full Sample)

Estimated Equation:[20]

$$\frac{I_{it}}{K_{it-1}} = a + b_1 q_{it-1} + b_2\left(\frac{C_{it}}{K_{it-1}}\right) + b_3\left(\frac{L_{it-1}}{K_{it-2}}\right) + b_4\left(\frac{D_{it-1}}{K_{it-2}}\right) + b_5\left(\frac{S_{it}}{K_{it-1}}\right)$$

Estimation Period: 1982-1992; 66 Companies		Memo item: Median[21]
Tobin's 'q' (-1)	0.018* (2.430)	1.23
Cash flow	0.221** (3.149)	0.18
Liquid Assets (-1)	0.148** (2.678)	0.06
Debt (-1)	-0.044* (-2.497)	0.38
Sales	0.039** (5.334)	2.47

*(**) Significantly different from zero at the 5(1) per cent level respectively.
t-statistics in brackets.

[20] Estimated using the fixed estimation technique described above.

[21] The median provides a better indication of the scale of the variable than the mean which, for some companies, is distorted by large values in some years.

3.4 Other Disaggregated Results[22]

3.4.1 Higher-Leveraged v Lower-Leveraged Companies

Corporate leverage increased during the 1980s. This, coupled with higher nominal interest rates, resulted in a sharp decline in interest cover. This may have made firms' investment decisions more sensitive to economic conditions. Higher leverage means that a greater portion of firms' cash flows must be used to meet interest payments on debt. Should cash flows fall, firms may not be easily able to meet these obligations. To do so, they may need to curtail investment and employment. Recent empirical evidence from the United States shows that the variability of investment increases with higher leverage.[23]

To test for this possibility indirectly, the sample was split into two equal subsamples based on firms' median leverage over the period and the behaviour of higher-leveraged firms relative to those with lower leverage was examined. The results are presented in Table 2. Higher-geared companies might be expected to be more sensitive to leverage and the availability of cash flows (and the stock of financial assets) to service the debt. The results tend to support these priors. For companies with the lower leverage, fundamentals represented by 'q' and by the sales term are significant; the financial factors are not. This would suggest that financial factors are not a constraint on firms with low leverage. For the companies with higher leverage, sales and 'q' are important, but so too are the financial factors. The coefficients on each of the financial factors are significant and of the right sign. The coefficients are also larger than those for firms with lower leverage. Financial factors, therefore, seem to be more economically as well as statistically more important an influence on investment for firms with higher leverage.

These results suggest that investment is more sensitive to financial conditions when leverage is higher. An examination of the behaviour of investment during the most recent cycle supports this conclusion. Business fixed investment has been much weaker in the past few years than in earlier cycles, even though many of its

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[22] The full sample is divided into a number of overlapping subsamples. One possible alternative procedure would be to use the full sample and introduce various dummies to control for firm characteristics. However, the latter procedure would not yield the direct comparisons available using the subsamples.

[23] Bernanke and Gertler (1989).

determinants have not behaved atypically. This unusual weakness can be partly attributed to the effects of balance sheet restructuring. In an attempt to reduce leverage and meet debt repayments the corporate sector has reduced investment and generally attempted to reduce costs. (Mills, Morling and Tease (1993) consider this in more detail). As a result of this restructuring, the financial health of the corporate sector has improved considerably. This suggests that the extent to which financial disturbances may affect investment in the future may be reduced.

Table 2: Estimation Results (Leverage Groupings)†

Estimated Equation:

$$\frac{I_{it}}{K_{it-1}} = a + b_1 q_{it-1} + b_2\left(\frac{C_{it}}{K_{it-1}}\right) + b_3\left(\frac{L_{it-1}}{K_{it-2}}\right) + b_4\left(\frac{D_{it-1}}{K_{it-2}}\right) + b_5\left(\frac{S_{it}}{K_{it-1}}\right)$$

Estimation Period: 1982-1992; 66 Companies		
	Higher-Leveraged Companies	Lower-Leveraged Companies
Tobin's 'q' (-1)	0.193**	0.014*
	(5.299)	(1.951)
Cash flow	0.247*	0.013
	(2.493)	(0.115)
Liquid Assets (-1)	0.390**	0.088
	(4.358)	(1.893)
Debt (-1)	-0.275**	-0.026
	(-4.629)	(-1.509)
Sales	0.036**	0.052**
	(4.115)	(4.781)

*(**) Significantly different from zero at the 5(1) per cent level respectively.

t-statistics in brackets.

† The median debt/equity ratio of companies in the higher-leverage sub-sample was 71 per cent compared with a median ratio of 19 per cent for companies in the lower-leverage sub-sample.

3.4.2 Smaller v Larger Companies

To look at the results a little more closely, we split the original sample of companies into a number of other subsamples. In Table 3, we present the results of the estimation of equation (1) on two equal-sized subsamples of companies. The first sample is comprised of the larger companies (based on average market capitalisation over the period). The second sample is comprised of the smaller companies in the sample. Larger companies might be expected to have greater access to external capital markets because of the size of their collateralisable assets, access to alternative sources of finance and lower risk through diversification, stability of cash flows, established operating history and commercial relationships and through their recognition in capital markets and credit history. They will be less reliant on internal funding than smaller firms.

The results presented in Table 3 provide some support for this idea. Although sales are important for both groups, internal cash flow is only significant for the smaller firms. For smaller firms the coefficient on cash flow is large and significant at the one per cent level. This implies that smaller firms may be more reliant on internal sources of funding than larger firms. Any disruption to cash flow will thus have a larger impact on investment. Debt is significant for larger companies, but not for the smaller companies. In both cases, however, the coefficient is small. 'q' is also significant for smaller companies, but again the coefficient is relatively small.

It is worth noting that the "smaller" companies in our sub-sample are medium-sized, publicly listed companies. They are less likely to be liquidity constrained than the majority of smaller unlisted companies in the economy not included in our sample, and are likely to face lower costs for external funds, lower potential agency costs and also to benefit from market recognition. If cash flows are more important for this group of companies (compared with the very large companies in our sample) it is likely that the results also apply strongly to smaller companies that are not in our sample.

Table 3: Estimation Results (Size Groupings)†

Estimated Equation:

$$\frac{I_{it}}{K_{it-1}} = a + b_1 q_{it-1} + b_2\left(\frac{C_{it}}{K_{it-1}}\right) + b_3\left(\frac{L_{it-1}}{K_{it-2}}\right) + b_4\left(\frac{D_{it-1}}{K_{it-2}}\right) + b_5\left(\frac{S_{it}}{K_{it-1}}\right)$$

Estimation Period: 1982-1992; 66 Companies		
	Larger Companies	Smaller Companies
Tobin's 'q' (-1)	0.010 (1.106)	0.057** (2.623)
Cash flow	0.155 (0.852)	0.238* (2.561)
Liquid Assets (-1)	0.092 (1.441)	0.124 (1.118)
Debt (-1)	-0.065* (-2.327)	-0.038 (-0.815)
Sales	0.075** (2.786)	0.028** (3.993)

*(**) Significantly different from zero at the 5(1) per cent level respectively.

t-statistics in brackets.

† The average market capitalisation of the larger companies in the sample was 12 times that of the smaller companies.

3.4.3 Higher v Lower Retention

In Table 4, we present the results of the estimation of equation (1) on two equal-sized subsamples of companies grouped according to retention ratios.[24] The first is comprised of companies with higher retention ratios. The second is comprised of the companies that have lower retention ratios. Fazzari et al. (1988) argue that the availability of internal finance may constrain investment spending by firms with higher retention ratios. One reason for this is that firms may pay low dividends if their demand for investment finance exceeds the amount of internal funds available. In the financing hierarchy described by Fazzari, the "lemons premium" will increase the cost of external funds and, for particular levels of investment demand, internal finance will constrain firms' investment. Where debt is used as the marginal source of finance, the slope of the debt supply schedule determines the extent to which firms will offset reductions in internal finance with higher debt and the extent to which internal funds will constrain investment. Oliner and Rudebusch (1989) argue a more general point that a high retention ratio is more a signal that, for whatever reasons, a firm may face liquidity constraints. Investment by firms with high retention ratios would be expected to be more sensitive to cash flows under this hypothesis. Higher cash flows would facilitate increased investment without recourse to expensive external funds; lower cash flows would constrain investment.

The results support this assertion. For firms with higher retention ratios, cash flows and the stock of debt are significant at the 1 and 5 per cent levels respectively. Sales and ‘q’ are also significant at the 1 per cent level. For firms with lower retention, cash flow and sales are both significant. Although not too much should be made of the individual coefficients, it can be noted that the coefficient on cash flows of firms with higher retention ratios is much larger than the coefficient on cash flows for firms with lower retention ratios.

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[24] The retention ratio is defined as the ratio of retained earnings to after-tax profit. The full sample of companies was split evenly according to the median retention ratio over the period. The mean was distorted by large values for some companies in years where profits were very small.

Table 4: Estimation Results (Retention Groupings)†

Estimated Equation:

$$\frac{I_{it}}{K_{it-1}} = a + b_1 q_{it-1} + b_2\left(\frac{C_{it}}{K_{it-1}}\right) + b_3\left(\frac{L_{it-1}}{K_{it-2}}\right) + b_4\left(\frac{D_{it-1}}{K_{it-2}}\right) + b_5\left(\frac{S_{it}}{K_{it-1}}\right)$$

Estimation Period: 1982-1992; 66 Companies		
	Higher-Retention Companies	Lower-Retention Companies
Tobin's 'q' (-1)	0.067**	0.003
	(3.523)	(0.460)
Cash flow	0.317**	0.181*
	(3.922)	(2.088)
Liquid Assets (-1)	0.042	0.089
	(0.484)	(1.088)
Debt (-1)	-0.033*	-0.087
	(-2.241)	(-1.884)
Sales	0.030**	0.060**
	(3.891)	(3.845)

*(**) Significantly different from zero at the 5(1) per cent level respectively.

t-statistics in brackets.

† The average retention ratio of companies in the higher retention sub-sample was 58 per cent compared with an average ratio of 34 per cent for companies in the lower retention sub-sample.

4. CONCLUSION

These results provide useful insights into business investment decisions and also on how monetary policy will affect those decisions.

The structure of a firm's balance sheet and the availability of adequate internal sources of funds can influence investment. Higher leverage can discourage investment by, for example, raising the cost of obtaining further external finance. Higher cash flows will boost investment by providing more, relatively cheap, internal funds and increasing the collateral backing of the firm. While both factors are statistically significant it appears that the cash flow effect is the more economically important. The extent to which these factors influence investment does, however, appear to vary between firms. The results suggest that internal sources of funding are more important for small firms, highly leveraged firms and firms that have high retention ratios.

These results have a number of important implications for monetary policy. First, the importance of cash flows as a determinant of investment suggests that monetary policy will influence investment through cash flow as well as through influencing the discount rate applied to investment projects and to overall economic conditions. Second, the impact of monetary policy will fall unevenly across the corporate sector. Smaller firms, firms with higher leverage and firms more reliant on cash flows as a source of funding are likely to be more sensitive to changes in monetary policy than others. The results in Tables 2 to 4 show that financial variables in general, and cash flows in particular, are a significant influence on investment of these firms. Financial factors appear to be less (if at all) important for larger firms or for firms with lower gearing.

APPENDIX: DATA SOURCES AND CONSTRUCTION

Company data are from the Australian Stock Exchange STATEX database and are for a sample of 66 non-financial companies for which data are available for the 11 year period 1982 to 1992.

Gross Cash Flow is group net profit after tax, plus depreciation.

Sales are sales or trading revenue (excluding other income).

Debt is calculated as the sum of both short and long-term securities and loans, and bank overdrafts. Short-term and long-term debt includes secured and unsecured loans, mortgages, leases, bills payable but excludes trading debts. Bank overdraft includes both secured and unsecured overdrafts.

Cash and Liquids are cash and its equivalent, including cash on hand, cash at bank, and short-term deposits.

Tobin's 'q' is calculated as:

$$'q' = \frac{(V + B - F)}{(K + N)}$$

where:

V = market value of equity
B = market value of debt
F = market value of financial assets
N = market value of inventories
K = replacement value of the capital stock

The components of 'q' are:

(i) Market Value of Equity

The market value of common equity, V, is the number of Equivalent Fully Paid Shares multiplied by the end of month price for the month in which the financial year ends. Equivalent Fully Paid Shares are the number of shares on issue at year end plus the number of potential fully paid shares (including contributing, new and deferred shares, and options and convertible notes).[25]

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[25] See *The STATEX Guide to Ratios*, Australian Stock Exchange.

(ii) Value of Debt

Debt, B, is defined as the sum of bank overdrafts, debt due in one year and long-term debt. Bank overdrafts include both secured and unsecured overdrafts. Debt due in one year and long-term debt includes secured and unsecured loans, mortgages, leases and bills payable but does not include trading balances. The book value of debt is taken as a proxy for market value.

(iii) Financial Assets and Inventories

Balance sheet items such as inventories and cash and short-term investments are included in the market valuation of the firm, but not in the replacement costs of the fixed capital stock. The value of cash and liquid assets are deducted from the numerator and inventories are added to the denominator.[26]

(iv) Replacement Value of the Capital Stock

A recursive formula is used to calculate the replacement value of the capital stock, K:

$$K_t = \left[I_t + K_{t-1}\left(P_t^I / P_{t-1}^I \right) \right](1-d)$$

where I is gross capital accumulation, P^I is the implicit price deflator for gross fixed private non-dwelling investment, and δ is the depreciation rate. The price deflator is from the *Australian National Accounts*, (Table 11), Cat. No. 5206.0, Australian Bureau of Statistics. The initial value of the capital stock is adjusted by multiplying the firm's book value of net capital stock by the aggregate ratio of net capital stock at replacement cost to net capital stock at historical cost for the economy as a whole. The aggregate ratio is calculated using data from *Australian National Accounts*, *Capital Stock*, (Table 6), Cat. No. 5221.0, Australian Bureau of Statistics and from historical capital stock data supplied by the Australian Bureau of Statistics. Depreciation rates were calculated by taking the weighted ratio of depreciation to capital stock for non-dwelling construction and plant and equipment. Data are from *Australian National Accounts*, *Capital Stock*, (Table 6), Cat. No. 5221.0, Australian Bureau of Statistics.

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[26] See Schaller (1990), Hoshi and Kashyap (1987) and Hayashi and Inoue (1987).

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