

# ***Financial Constraints and Company Investment***

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## **I. INTRODUCTION**

The question we address in this paper is whether the investment spending of at least some firms is affected by the *availability* of internally generated finance (retained earnings), reflecting some constraint on the ability of these firms to raise external finance (debt or new equity) for investment. The opposing view is that the *cost* at which investment funds can be obtained, taken to be independent of the amount invested, is the *only* financial consideration that matters in the determination of investment.

This is an old question in economics, which has been the subject of several official inquiries<sup>2</sup> as well as a large body of academic research. The answer to this question has a number of important implications. Profits are highly cyclical, so if investment depends directly on the availability of profits then investment spending will be more sensitive to fluctuations in economic activity than would otherwise be the case. This could be an important factor in the propagation of business cycles. If post-tax profits help to determine investment spending then

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<sup>2</sup> In the UK these include the Macmillan Committee on Finance and Industry (1931), the Radcliffe Committee on the Working of the Monetary System (1959) and the Wilson Committee to Review the Functioning of Financial Institutions (1980).

the impact of company taxes on investment will be more complicated than is often assumed. In particular, the average tax rate will influence the level of investment spending, in addition to the impact of taxes on the cost of capital, and any increase in the total revenue raised from corporation tax could have a directly adverse impact on business investment.<sup>3</sup> There may also be an incentive for firms with available internal funds to take over firms whose investment spending is constrained, resulting in take-over activity that would otherwise be inefficient. To the extent that financial constraints on investment spending are attributable to imperfections in capital markets or to market failures, there may also be some motivation for policy measures designed to reduce these impacts, if financial constraints are found to be pervasive.<sup>4</sup>

Twenty years ago the mainstream answer to this question in the economics literature was that the availability of internal finance did not matter for investment. As a matter of theory, the level of investment was determined in a well-functioning capital market. The price at which firms could obtain funds for investment was therefore the only relevant financial consideration. In particular, companies with opportunities for profitable investment spending that exceeded their available cash flow would not be expected to invest any less than firms with the same opportunities and higher cash flow — any shortfall would easily attract funding in the capital market as investors sought to exploit the opportunity for profit. It was recognised that the model of a ‘well-functioning’ capital market neglected any taxes or transaction costs that might make one source of finance more expensive than another, and also neglected any differences in the information available to decision-makers within the firm and to potential outside investors. But departures from this model were not considered to be important.

Most of the empirical evidence available at the time did not seem to contradict this view. Most econometric studies used time-series data on the aggregate investment spending of the manufacturing sector or of the company sector as a whole. This evidence appeared to indicate that the level of output, proxying for the level of demand, was the key determinant of the capital stock desired by firms, and hence of investment spending. Surveying this literature in 1971, Dale Jorgenson concluded that ‘variables associated with internal finance do not appear as significant determinants of desired capital in any model that

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<sup>3</sup> This concern was highlighted in the recent report, *Saving for Sustained Economic Growth*, produced by the CBI (1993).

<sup>4</sup> Though as we discuss further below, the finding that financial constraints matter is not by itself a rationale for intervention. First, these constraints may reflect unavoidable asymmetries in the information available to firms and investors which the Government is in no position to reduce. Second, intervention in the allocation of investment finance would bring with it the danger that government policy produces a worse allocation of resources than would otherwise have occurred.

also includes output as a significant determinant' (Jorgenson, 1971).<sup>5</sup> Moreover, any influence found from profits or other financial indicators could also be dismissed as merely helping to proxy better for the influence of (expected) demand.

Over the last twenty years, and particularly during the last decade, there has been a breakdown in this consensus view. This is related to both theoretical and empirical developments. On the theoretical side, research into the behaviour of markets characterised by imperfect information restored respectability to the idea that investment finance may only be available on less favourable terms in the external capital market, or indeed may not be available at all in some cases. This idea that external sources of finance may be more expensive than internal sources underpins the hierarchy of finance (or 'pecking order') approach to corporate finance. An implication of this model is that the investment spending of some firms may be constrained by a shortage of internal funds, in a sense which will be made more precise below.<sup>6</sup>

More recent empirical evidence from microeconomic studies, using data on individual firms, has also suggested that cash flow has a significant impact on company investment spending. This research has made a more serious attempt to distinguish the effect of high current profits in relaxing financial constraints from the effect of high current profits on expectations of future profitability than was possible in the earlier work. Moreover, the evidence for cash-flow effects on investment has been found to be concentrated among sub-samples of firms where the hierarchy of finance approach predicts the incidence of financial constraints to be more likely. Although not wholly convincing, these results have cast doubt on the earlier consensus view. They are also consistent with the results of surveys such as the CBI Industrial Trends Survey, which consistently indicates that a shortage of internal finance is perceived to be a significant factor limiting the capital expenditure of many firms.<sup>7</sup>

This paper will briefly review the implications for investment of this hierarchy of finance model and some of the recent empirical evidence that appears to support it. We will also describe our own econometric research, using data for some 626 large UK firms over the period 1971–86, which indicates the

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<sup>5</sup> Although it is worth noting that Coen (1971) allowed the speed with which investment responds to changes in desired capital to depend on cash flow, and found a significantly faster response when cash flow was high.

<sup>6</sup> Note that investment spending may be constrained by cash flow even though the firm has *access* to finance from debt or new share issues. All that is required is a significant *cost differential* between external and internal finance. Thus evidence of financial constraints on investment spending does not necessarily indicate the presence of credit rationing or of 'gaps' in the capital market.

<sup>7</sup> CBI (1993) reports that on average between April 1991 and January 1993 about 24 per cent of firms surveyed reported that investment was limited by a shortage of internal finance. This fraction tends to rise in periods when profits are low and fall in periods when profits are high. See Devereux and Schiantarelli (1990) for more discussion of this survey evidence.

presence of significant financial constraints on investment in the UK corporate sector.

## II. FINANCIAL CONSTRAINTS IN THE HIERARCHY OF FINANCE MODEL

The hierarchy of finance approach to corporate finance starts from the assumption that external finance, from either debt or new share issues, may be more expensive than internal finance from retained profits. In the US, this assumption can be motivated by differences in the tax treatment of dividend income and of capital gains. For most taxpayers, dividend income is taxed more heavily than capital gains, so that shareholders pay less tax when dividend payments are kept to a minimum. This makes retained earnings (i.e. lower dividends) the tax-efficient source of investment finance.

In the UK, this appeal to tax distortions alone to explain the lower cost of internal finance would be less convincing, since different groups of shareholders face different tax incentives. Under the imputation relationship between personal and corporate taxes that has operated since 1973, only higher-rate taxpayers would have a tax preference for retained profits over new share issues; and tax-exempt institutions like pension funds would find it tax-efficient for profits to be paid out as dividends.<sup>8</sup>

Nevertheless it has been noted that patterns of corporate finance in the UK are similar to those found in the US. Around two-thirds of investment is financed from retained earnings and under 10 per cent is financed from new share issues.<sup>9</sup> One possibility is that high transaction costs associated with placing new shares are sufficient to outweigh the tax advantage for most companies. Another possibility is that asymmetric information between insiders in the firm and potential outside investors results in a higher cost for external sources of funds. The basic idea is similar to that used to explain the rapid depreciation in the second-hand value of cars once they leave the dealer's showroom. Less well-informed subscribers to new issues of equity or debt (cf. used car buyers) demand a discount to compensate for the risk that the firm seeking finance (cf. used car sellers) knows that it is currently overvalued. The result is that firms raising external finance have to pay this premium, making external funds more costly than internal funds. In some cases the investors may be unwilling to lend to the firm on any terms, resulting in credit rationing.<sup>10</sup>

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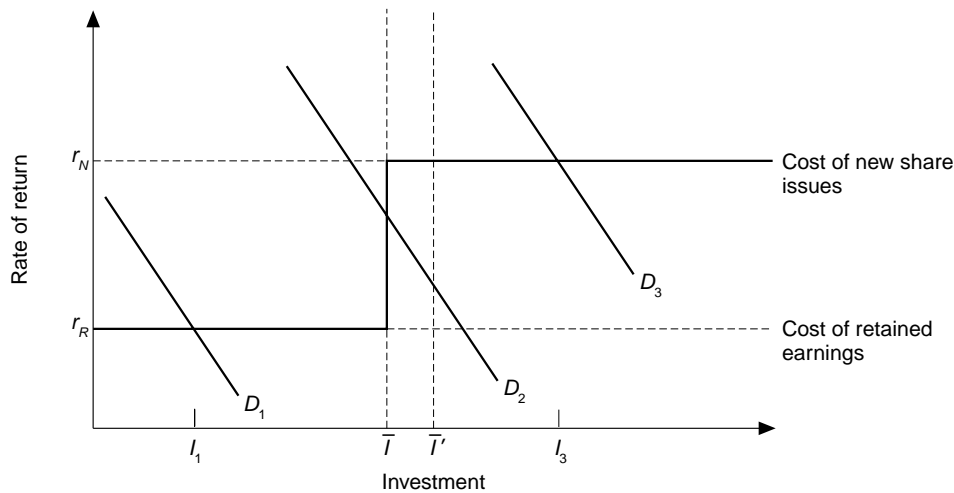
<sup>8</sup> Pension funds pay no income tax on dividend income, but can reclaim credits on company dividend payments subject to advance corporation tax.

<sup>9</sup> See Mayer (1988), for example.

<sup>10</sup> See Myers and Majluf (1984) for a model where new equity is more expensive than retained profits as a result of asymmetric information, and Stiglitz and Weiss (1981) for a model where credit rationing may occur.

For one or more of these reasons, the hierarchy of finance approach assumes that internal finance is significantly cheaper than external finance, and is therefore used in preference to the extent that it is available. To see the consequences for investment spending, it is simplest to consider a firm that has no access to debt finance and is thus choosing between retained profits and new shares only. This situation is illustrated in Figure 1. The required rate of return  $r_R$  shows the cost of finance from retained earnings, whilst the higher required rate of return  $r_N$  shows the cost of finance from new share issues. The downward-sloping lines labelled  $D_1$ ,  $D_2$  and  $D_3$  illustrate three possible positions for a line describing the investment opportunities available to the firm (i.e. the rate of return on investment projects that can be earned). The level of investment spending  $\bar{I}$  shows the maximum level of investment that the firm can finance from its internal sources. It should be noted that this level need not correspond to the point at which dividend payments have been reduced to zero. It is often suggested that dividend payments are ‘sticky’, at least downwards.<sup>11</sup> The investment level  $\bar{I}$  can be thought of as the point where the firm is unwilling to cut its dividend payments any further. Note that this level will be positively related to the cash flow generated from the firm’s existing activities.

FIGURE 1  
The Hierarchy of Finance Model with No Debt Finance



For a firm whose profitable investment opportunities are low relative to its cash flow, the position of the investment demand curve will be like that

<sup>11</sup> In only 7 per cent of the observations in our sample do we find companies paying zero dividends. See Edwards (1984a) for a good discussion of company dividend policies.

illustrated as  $D_1$ . Such a firm can finance all its desired investment from retained profits and still pay out relatively high dividends. Investment spending would be at the level  $I_1$ , and is not affected by fluctuations in cash flow around the level corresponding to  $\bar{I}$ . We call this position Regime 1.

A similar result is found for firms whose profitable investment opportunities are very high relative to their cash flow. This position is illustrated by the investment demand curve  $D_3$ . Such firms have sufficiently attractive investment projects that they find it worthwhile issuing new shares, despite the extra cost. Their investment would be at the level  $I_3$ , and is again unaffected by fluctuations in cash flow around the level corresponding to  $\bar{I}$ . We call this Regime 3, which is characterised by relatively low or zero dividends and the issue of new shares.

Financial constraints affect the investment spending of firms in the intermediate position, illustrated by the investment opportunities line  $D_2$ . These firms have sufficiently attractive investment opportunities that they exhaust all their internal sources of funds available for investment. However, their remaining projects are not so attractive that they would choose to issue new shares, given the higher rate of return required. Their investment spending is thus constrained to the level  $\bar{I}$  that can be financed from retained profits. We call this Regime 2, characterised by relatively low or zero dividends but no issue of new shares.

The investment of firms in Regime 2 can be described as financially constrained in the following sense. A windfall increase in cash flow that conveys no new information about the firm's investment opportunities would produce an increase in investment spending. This is illustrated in Figure 1 by the outward shift in the level of investment that can be financed internally, from  $\bar{I}$  to  $\bar{I}'$ . For firms in Regime 2, this results in a corresponding increase in investment, as the firm moves down the demand curve  $D_2$ . Note that the investment spending of these firms is limited by the availability of internal finance, even though they have access to new equity finance at the cost  $r_N$ .<sup>12</sup> The investment of firms in Regimes 1 and 3 is not constrained in this sense. Nor would any firms be subject to financial constraints if there was no difference between the cost of external and internal funds — this is the assumption that underlies the traditional consensus view described in the introduction.

These implications for investment are not greatly affected by the possibility of using debt rather than new equity as a source of external finance, provided that the *effective* cost of borrowing rises as the firm borrows more. This does not merely mean that the interest rate charged on loans to the firm goes up with the level of borrowing: the rate of interest charged to the firm will generally go up as the probability of default increases, to compensate lenders for the risk of

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<sup>12</sup> Clearly a similar result would hold if these firms had no access to external finance, and in this case there would be no firms in Regime 3. In the context of Figure 1, this corresponds to the case where the cost of new equity finance ( $r_N$ ) is infinitely high.

receiving less than the contracted repayment in the event that the firm does default. But the fact that the firm pays out less in this case shows that the expected cost of repaying the loan, averaged across outcomes where the firm defaults as well as those where it does not, is not necessarily higher. An increasing *effective* cost of borrowing requires that this expected cost of repaying the debt goes up as the firm borrows more.

There are several reasons why the effective cost of borrowing will increase with the risk of default and therefore with the level of borrowing. Most straightforwardly, there are direct costs associated with bankruptcy proceedings that are only paid in the event that a default occurs. These costs will fall on borrowers rather than lenders, in the form of an interest rate schedule that gives a rising effective cost of borrowing, since lenders have alternative investment opportunities that involve no (or lower) bankruptcy risk. There are also indirect costs of bankruptcy, such as the loss of value of intangible assets including goodwill, brand names and reputation for quality, which may be quantitatively more significant. There may also be a risk premium reflecting asymmetric information between lenders and borrowers that becomes more important as the probability of default increases.

The situation where the firm has access to debt finance with an increasing effective cost of borrowing is illustrated in Figure 2. Here the level of investment  $\bar{I}$  shows the maximum level that can be financed before internal funds are exhausted, given that the optimal borrowing policy is used.<sup>13</sup> For firms in Regimes 1 and 3, the implications are unchanged from the no-debt case, except that firms in Regime 1 may use some debt as well as retentions to finance their investment and firms in Regime 3 may issue debt as well as new shares.

For firms that exhaust their internal funds but do not issue new shares, the position is somewhat more complex although the implications remain similar. These firms are no longer constrained to the level of investment spending given by  $\bar{I}$ . They can finance higher investment by (further) borrowing to the extent that they find it worthwhile to bear the increasing cost.<sup>14</sup> In this case, their investment is determined by the rising cost of debt that they face, giving the level  $I_2$ . Nevertheless they are still financially constrained in the sense defined above. A windfall increase in cash flow allows levels of investment above  $\bar{I}$  to be financed at lower levels of borrowing. This reduces the effective cost of debt at each investment level, resulting in higher investment at  $I_2$ . As before, the capital expenditure of firms in this position is limited by the availability of internal finance, even though they have access to external capital markets.

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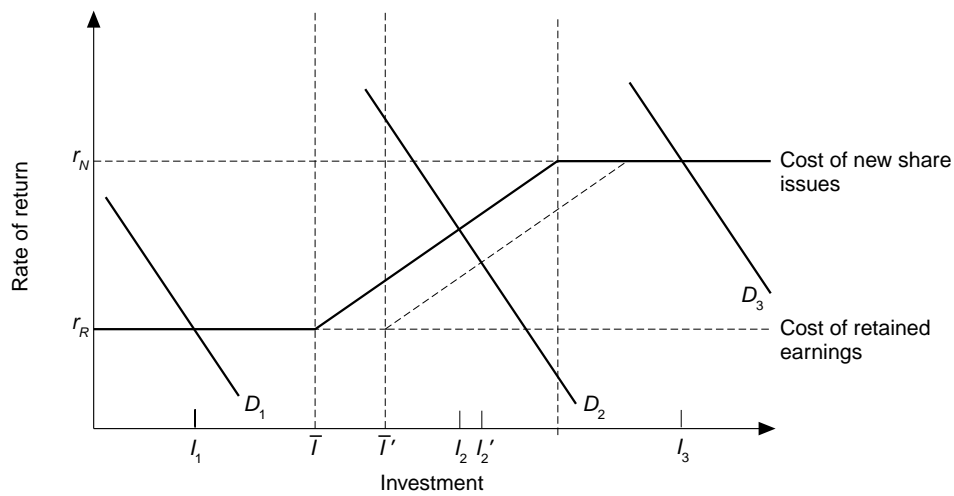
<sup>13</sup> Debt may of course be cheaper than finance from retained earnings at low levels of borrowing, as a result of the tax advantage associated with interest deductibility against corporation tax. Firms in Regime 1 may use a combination of retentions and debt, with the optimal borrowing policy reflecting a trade-off between the tax advantage and the dead-weight costs of bankruptcy.

<sup>14</sup> The situation illustrated in Figure 2 assumes that these firms do not encounter credit rationing, although this is not crucial.

This conclusion would apply *a fortiori* if these firms did in fact also face credit rationing. The only case where debt finance would eliminate financial constraints on investment is that where debt provides a perfect substitute for

FIGURE 2

The Hierarchy of Finance Model with Debt Finance



retained profits. This only occurs when the firm has access to unlimited levels of debt finance at the same effective cost as the required rate of return on retentions. In this case, investment spending would again be independent of any financial consideration other than this cost, as in the classic Modigliani–Miller theorem (see Modigliani and Miller (1958)).

The possibility that financially constrained firms in Regime 2, facing a hierarchy of costs for different sources of finance, could account for empirical evidence that company investment tends to be excessively sensitive to cash flow was suggested by Hayashi (1985a). Econometric studies that investigate this idea further are described in Section IV. We first review the problem of distinguishing the influence of high cash flow on firms' expectations of future profitability from its effect in relaxing financial constraints on investment. In the context of Figures 1 and 2, this corresponds to identifying the effect of financial constraints separately from shifts in the position of the investment demand curve induced by new information about current profits.



### **III. THE ROLE OF CASH FLOW IN DIFFERENT ECONOMETRIC MODELS OF INVESTMENT**

Traditional econometric models of investment were not really able to distinguish between these two possible influences of cash flow on investment. However, the distinction is crucial for answering the question posed at the start of this paper. A correlation between investment and cash flow does not establish that investment spending is constrained by the availability of internal funds: a rise in current cash flow may just signal higher future profitability.

The optimal capital stock at some point in time can be thought of as the level where the marginal product of capital is equal to the user cost of capital.<sup>15</sup> If the capital stock were lower then further investment would be profitable, but increasing the capital stock beyond this level would not be profitable. This optimal stock of capital can generally be related to the current level of output and the user cost of capital.

Investment is likely to depend not only on the current level of the optimal capital stock, but also on the levels of the capital stock that the firm expects will be optimal in the future. In particular, the short-run response of capital to fluctuations in demand or costs is likely to be incomplete and dependent on how permanent the change in output or user cost is perceived to be.

This dependence of investment decisions on expected future levels of output and the user cost of capital presents a major problem for econometric investment models, since data on firms' expectations are not generally available. Traditional econometric models typically related investment to both current and lagged values of output and the user cost. Models of this type do not distinguish between those factors that directly influence the optimal capital stock and other variables that help to forecast the future values of these factors. Financial variables could appear to be significant merely if they helped to forecast future output, for example. Thus the addition of profits or cash flow to these econometric models does not properly test the idea that financial *constraints* affect investment spending. Significant coefficients on cash-flow terms could reflect either financial constraints or expectations formation.

In the last decade, more structural investment models have been proposed which attempt to get around this identification problem, and these models have generally been adopted in the literature that tests for financial constraints.<sup>16</sup> The best-known model is the Q model, which develops the idea that firms face (strictly convex) costs of adjustment when changing the level of the capital stock. Costs of adjustment could reflect planning or installation costs, or

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<sup>15</sup> The concept of the user cost of capital was developed by Jorgenson (1963). This can be thought of as the minimum rate of return an investment project must earn before the firm considers it to be attractive. This depends on rates of interest, inflation and depreciation, as well as on taxes. See Bond, Denny and Devereux (1993) for a recent non-technical discussion.

<sup>16</sup> See Blundell, Bond and Meghir (1992) and Chirinko (1993) for surveys of this recent literature.

disruptions to the normal production process as new capital equipment is incorporated.

The resulting model relates investment to the ratio between the market value of the firm's existing capital stock and the current cost of replacing that capital stock. This ratio is known as the Q ratio. The basic intuition is that an investment project that adds more to the firm's market value than it costs to undertake will be profitable, and profitable investment opportunities will be higher when the firm's actual capital stock is below its optimal capital stock. Investment is therefore likely to be higher when the market valuation of the firm's capital is high relative to its replacement cost.

Although this model assumes that investment decisions are forward-looking and dependent on expectations of future profitability, the theory implies that there should be a simple relationship between the current rate of investment and the Q ratio. The market value of the firm's capital stock can in principle be estimated by combining the stock-market value of the company with estimates of the market value of the firm's debt liabilities and other assets. Expectations of future profitability are therefore 'measured' in this model by the forward-looking stock-market valuation. Under certain rather stringent conditions, it can be shown that the Q variable summarises *all* expectations that are relevant for investment behaviour.<sup>17</sup>

The advantage of this approach is that if these conditions are satisfied then the effect of cash-flow or profitability variables on expectations of future demand or costs should already be captured by the Q ratio. If it is found that such financial variables are significant determinants of investment in addition to the measure of Q, then it may be more reasonable to infer that these terms are really picking up the influence of financial constraints.

Unfortunately the problem remains of not really being sure that these conditions are satisfied in practice. For example, it is often suggested that stock-market prices are 'too noisy' or that they display excessive volatility relative to the fundamental value of companies.<sup>18</sup> If this were the case then measures of Q would be subject to error, and current financial variables like cash flow may provide additional information about the true value of this ratio. In this case, we are back to the problem of disentangling expectational effects from the effects of financial constraints.

An alternative approach exploits a relationship between investment rates in successive periods that is implied by the costs of adjustment model. In particular, it can be shown that the current rate of investment will be positively related to the rate of investment that is expected for the next period and to the deviation of

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<sup>17</sup> These requirements include perfect competition, constant returns to scale and, crucially, that the stock-market value correctly measures the 'fundamental' expected present value of the firm's future net cash flows. The formal development of the model was due to Hayashi (1982).

<sup>18</sup> See Shiller (1981), for example.

the current optimal capital stock (that the firm would choose in the absence of adjustment costs) from the current actual capital stock. These two terms therefore reflect the same information as that contained in the true value of the Q ratio. In this ‘Euler equation’, all relevant expectations are summarised by the one-period-ahead forecast of the investment rate itself.

This expected investment rate cannot be directly measured, but because only the one-period-ahead forecast is required, this expected value can be replaced by the actual investment rate in the next period and a term that reflects the error made in forecasting next period’s investment rate using the information available in the current period. Under the conditions of perfect competition and constant returns to scale used to obtain the Q model, the Euler equation can then be rearranged to give an econometric model of investment which does not depend on the assumption that share prices reflect only fundamentals. Letting  $I_t$  denote the level of gross investment in period  $t$ ,  $K_t$  denote the level of the actual capital stock in period  $t$ ,  $\Pi_t$  denote the level of gross operating profits in period  $t$ ,  $J_t$  denote the user cost of capital in period  $t$  and  $v_{t+1}$  denote the forecast error, the resulting investment model can be written as<sup>19</sup>

$$(1) \quad \frac{I}{K}_{t+1} = \beta_0 + \beta_1 \frac{I}{K}_t - \frac{I}{K}_t^2 - \frac{\Pi}{K}_t - J_t + v_{t+1}$$

Under constant returns to scale, the marginal product of capital can be measured by the average profit term in equation (1). The term in square brackets therefore measures the difference between the marginal product and the user cost of capital, reflecting the deviation of the optimal capital stock from the current actual level. The model is best interpreted as relating the *current* rate of investment  $(I/K)_t$  positively to next period’s rate of investment  $(I/K)_{t+1}$  and to this average profit term.<sup>20</sup> The *future* investment term is taken to the left-hand side purely for convenience in estimation, which accounts for the otherwise puzzling negative sign on the average profit term.

This model has the advantage of controlling for the influence of expected future profitability on investment spending, whilst not requiring an explicit measure of expected demand or expected costs. In particular, there is no appeal to the use of share prices to ‘measure’ these expectations. In our view, the Euler equation approach, which imposes the weakest auxiliary assumptions to derive a structural investment model from the adjustment costs framework, provides

<sup>19</sup> See Bond and Meghir (1994) for details. The restrictive assumptions of perfect competition and constant returns to scale can be relaxed. This approach to modelling investment was developed by Abel (1980) and is closely related to the ‘random walk’ consumption model developed by Hall (1978).

<sup>20</sup> The presence of the squared investment term reflects the assumed quadratic form of the adjustment cost function, which is common to this and to the Q model.

possibly the most convincing model currently available for testing the importance of financial constraints on investment.

The model also suggests restrictions on the estimated parameters which are useful in testing for financial constraints. In the absence of financial constraints, it can be shown that the coefficient on the level of the current investment rate ( $I/K$ ), should be positive and greater than one; the coefficient on the square of the current investment rate should be negative and less than minus one; and the coefficient on the gross operating profit term should be negative. If financial constraints are important then the high correlation between gross operating profit and measures of cash flow might be expected to reverse the predicted negative coefficient on this last term.<sup>21</sup> More generally, other financial variables that may help to predict which financial regime a firm is in, such as dividends and new share issues, would then be expected to appear significant if added to the right-hand side of equation (1). More fundamentally, if no firms are affected by financial constraints then the investment behaviour of firms pursuing different financial policies should be similar and characterised by the same estimated coefficients in a model like equation (1). But if some firms do face financial constraints then their investment behaviour will be different, and different coefficients should be estimated for these firms.

#### IV. EMPIRICAL EVIDENCE

Several recent studies have estimated Q models of investment using panel data for individual companies (i.e. repeated observations over time on the same sample of firms). Two leading examples are the study by Hayashi and Inoue (1991), which used data for 687 quoted Japanese manufacturing firms over the period 1977–86, and that by Blundell, Bond, Devereux and Schiantarelli (1992), which used data for 532 quoted UK manufacturing firms over the period 1971–86. Both these studies found that a measure of cash flow had a positive and highly significant effect on company investment, in addition to measured Q. This finding is consistent with the hierarchy of finance approach, but does not test that explanation for financial constraints directly. In particular, it might be objected that measured Q provides a poor proxy for the firm's investment opportunities, and that these cash-flow terms simply provide additional information about the expected profitability of investment.

Fazzari, Hubbard and Petersen (1988) provide a more direct test of the hierarchy of finance explanation. They divide their sample of 422 US manufacturing firms into sub-samples of those that tend to pay high dividends and those that tend to pay low dividends, and estimate a separate Q investment

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<sup>21</sup> In particular, this will result when there are important financial constraints on investment in period  $t + 1$ , given the high correlation between cash flow in period  $t + 1$  and cash flow in period  $t$ .

equation for each sub-sample.<sup>22</sup> This reflects the idea that firms in Regime 1 of the hierarchy of finance model, with sufficient internal funds to finance their desired investment and therefore not subject to financial constraints, will tend to pay relatively high dividends. Fazzari et al. find that cash flow is more significant, and measured Q less significant, in the sub-sample that pays low dividends, which is consistent with the prediction that financial constraints should be more important for firms where internal funds are in short supply. However, they also find that cash flow remains significant in addition to Q even in the sub-sample paying high dividends.

Hoshi, Kashyap and Scharfstein (1991) use a similar approach, but they divide a sample of Japanese companies into two groups according to whether the firm has a close institutional relationship with a bank or not. The idea here is that differences in the cost of internal and external finance resulting from asymmetric information may be less important where the bank maintains a long-term relationship with the firm. If this is so then financial constraints on investment would be less important for these firms. Hoshi et al. find that cash flow is less significant, and measured Q more significant, for the sub-sample of companies that are closely related to a bank. However, they also reject the prediction that cash flow contains no additional information for investment not summarised by Q, even in this sub-sample of firms.

These findings provide some support for the hierarchy of finance model, but do not completely overcome the objection that the Q ratio provides an inadequate measure of expected profitability. If one is concerned that share prices do not always provide an accurate measure of the fundamental value of a firm, one might think that this problem is more likely to be important for firms about which information is relatively scarce. This could also explain why Q performs especially poorly, and other variables appear more important, in the sub-sample of relatively young and small companies in the low-dividend group of Fazzari et al. (1988) and in the group of firms not connected to banks in Hoshi et al. (1991).

## **V. SOME NEW EVIDENCE FOR THE UK**

In recent work using data for 626 quoted UK manufacturing firms over the period 1971–86, we depart from this previous literature in two important respects. First, we use the Euler equation model outlined above in preference to the Q model of investment. Second, we test more directly the implications of the hierarchy of finance model. Both the investment opportunities and the level of

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<sup>22</sup> This approach parallels that used in the microeconomic literature testing for liquidity constraints on consumption, where samples are divided into high-wealth and low-wealth households. See Hayashi (1985b) and Zeldes (1989). Fazzari et al. (1988) also estimate some traditional investment models on their sub-samples, with similar findings to those from the Q model.

profits for a given firm can fluctuate significantly over time. Thus the same firm may be in Regime 1 in some periods, but in Regime 2 and subject to a financial constraint on investment spending in other periods. Consequently we test whether financial constraints appear to be more important in periods when a given firm pays low dividends compared with its normal payout policy, rather than in all periods for those firms that pay low dividends on average. This approach allows for the possibility that more firms may be subject to financial constraints in recessions, when internal funds are likely to be in short supply, than in more prosperous periods.

The Euler equation is an intertemporal condition relating investment in two successive periods. The model would only be unaffected by financial constraints if the firm's investment was unconstrained in both periods. We therefore estimate a version of equation (1) in which the coefficients are allowed to take different values for two groups of observations: those where the dividend payout is high compared with the firm's normal payout policy and no new shares are issued, in both period  $t$  and period  $t + 1$  (i.e. observations where the firm is likely to be in Regime 1 in both periods);<sup>23</sup> and the group comprising all other potentially constrained observations. Only one-third of the total observations are allocated to the Regime 1 group by this criterion. If financial constraints on investment are not important then we would expect similar coefficients to be estimated for both groups of observations. Otherwise we would expect to find different coefficients for the two groups, especially on the gross operating profits term which is highly correlated with cash flow; and we would also expect that other financial variables such as dividends and new share issues would contain additional information about investment in the potentially constrained subgroup but not in the Regime 1 observations.

Details of our sample, estimation method and results are reported in Bond and Meghir (1994). Some of the key empirical results are presented here in Table 1. Note that the estimated equations omit the user-cost-of-capital variable that appears in equation (1), but include year dummies and firm-specific effects which control for some of the variation in the user cost. They also contain additional measures of real sales and debt, which control for monopolistic product markets and an increasing effective cost of borrowing respectively.

The first column of Table 1 reports the results of estimating this model using the full sample, with no allowance for different financial regimes. The estimated coefficients on the level and the square of the current investment rate,  $(I/K)_t$ , are correctly signed, but the coefficient on the former is lower than would be expected in the absence of financial constraints on investment. Moreover, the estimated coefficient on the gross operating profits variable is incorrectly signed.

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<sup>23</sup> More precisely, we consider current dividends to be low when the ratio of dividends to capital stock falls below three-quarters of the mean value of this ratio for the firm over the whole period. Alternative criteria for 'low' dividends gave similar results.

TABLE 1  
Econometric Results

Dependent variable is  $(I/K)_{t+1}$ .

Sample of 626 quoted UK manufacturing companies, 1971–86.

<i>Variable</i>	<i>(1)</i> <i>Full sample</i>	<i>(2)</i> <i>Regime 1 observations</i>	<i>(3)</i> <i>Other observations</i>
$(I/K)_t$	0.8564 (0.1015)	1.0346 (0.3144)	0.6886 (0.1551)
$(I/K)_t^2$	-1.2200 (0.2073)	-1.6192 (0.8377)	-0.9830 (0.2669)
$(\Pi/K)_t$	0.0723 (0.0248)	-0.0128 (0.0512)	0.1883 (0.0483)
	Probability that all coefficients are equal for the sub-samples = 0.009.		
	Probability that $(\Pi/K)_t$ coefficients are equal for the sub-samples = 0.003.		

Notes: Standard errors are given in parentheses.

The equations estimated are based on equation (1), as described in the text. Additional variables included are year dummies, an output term and a debt term. The estimation allows for unobserved firm-specific effects.

Any bias due to the neglect of financial regimes is most likely to be manifested in this coefficient. We also considered including additional financial variables in the model, and found that both dividends and new share issues were significant when the model was estimated using the full sample.

Columns 2 and 3 of Table 1 report the coefficient estimates for the two sub-samples of observations described above. Those in column 2 are for observations with high dividends and no share issues in both periods, whilst those in column 3 are for the potentially constrained observations. The hypothesis that these two sets of parameter estimates are equal is strongly rejected, and the difference is most significant for the gross operating profits term. The coefficient on this term is found to be significantly positive only for the observations where financial constraints are likely to influence the results. The estimated coefficients on the investment terms are also more reasonable for the Regime 1 sub-sample. When we add dividends and new issues to the equation, they are found to be highly significant for the potentially constrained observations but not for the Regime 1 observations.

These findings are inconsistent with the traditional consensus view that the availability of internal finance is irrelevant for company investment. They are consistent with the hierarchy of finance approach, and suggest that the investment spending of a significant fraction of large UK corporations is likely to be affected by the availability of internal finance.

## VI. CONCLUSIONS

Taking our findings together with the existing empirical results summarised in Section IV, it is clear that microeconomic evidence now casts considerable doubt on the validity of the view that financial constraints on company investment are unimportant.

We emphasise that it does not follow from this conclusion that there is a case for government intervention in the allocation of investment finance. Financial constraints on investment may be an unavoidable consequence of asymmetric information between investors and firms. Any case for policy intervention, or for reform of the financial system, would have to demonstrate not merely that financial constraints have an adverse impact on investment under the current system, but that their impact would be reduced by the proposed policy measure or reform. A useful step in this direction would be to examine whether differences in the characteristics of financial systems found in different countries, or international differences in the pattern of investment finance used by firms, are associated with any measurable differences in the impact of financial constraints on company investment.

Serious consideration should, however, be given to the implications of financial constraints for the impact of taxes on investment. There are at least two further ways in which taxes may affect investment spending, over and above the effect of taxes on the user cost of capital that is normally the focus of attention.

First, an increase in the effective average rate of tax on corporate profits<sup>24</sup> will reduce the investment spending of firms whose investment is limited by the availability of internal finance, even if the user cost of capital is left unchanged. For a given level of pre-tax profits, higher corporate taxes will shift the position of  $\bar{I}$  to the left in the context of Figures 1 and 2, and so may reduce investment, even if they do not increase the required rates of return. The number of companies affected, and hence the importance of this effect in aggregate, may well vary over the cycle with the overall level of profitability.

Second, a tax regime that encourages high dividend payments could also reduce the availability of internal finance for investment. A tax policy that favours dividends but leaves the cost of capital unchanged has no implications for investment according to the traditional view, since any investment that is not financed from retained profits can equally well be financed from external sources. However, encouraging dividend payments may be less benign when external finance is not a perfect substitute for internal funds. For a given level of profits and tax payments, this will also shift  $\bar{I}$  to the left and reduce the investment of some firms, if the more favourable tax treatment obliges firms to pay out a higher share of profits as dividends to shareholders.

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<sup>24</sup> i.e. the share of profits paid to the Government in the form of corporate taxes.



Both these effects may be relevant in the UK context. They suggest that the increase in the effective average tax rate on companies associated with the reform of corporation tax in 1984,<sup>25</sup> and the favourable tax treatment of dividends under the imputation system introduced in 1973, may both have had adverse implications for the level of UK company investment.

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<sup>25</sup> See Edwards (1984b) and Devereux (1987).

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