Corporate Investment, Asymmetric Information and Agency Costs in the UK

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Summary

This paper investigates whether investment spending of firms is sensitive to the availability of internal funds. Imperfect capital markets create a hierarchy for the different sources of funds such that investment and financial decisions are not independent. The relation between corporate investment and free cash flow is investigated using the Bond and Meghir (1994a) Euler-equation model for a panel of 240 companies listed on the London Stock Exchange over a 6-year period. This method allows for a direct test of the first-order condition of an intertemporal maximisation problem. It does not require the use of Tobin's q, which is subject to mis-measurement problems. Apart from past investment levels and generated cash flow, the model also includes a leverage factor which captures potential bankruptcy costs and the tax advantages of debt. More importantly, we investigate whether ownership concentration by class of shareholder creates or mitigates liquidity constraints.

Control is expected to influence the investment financing relation for two reasons. First, due to asymmetric information, the link between liquidity and investment could be a symptom of underinvestment. Firms pass up some projects with positive net present values because of the inflated cost of external funds. Second, from an agency perspective, external funds may not be too expensive but internal funds (free cash flow) may be too inexpensive from the manager's perspective. Whereas high insider ownership concentration reduces the liquidity constraints induced by agency costs, high insider shareholding concentration increases the liquidity constraints in the case of asymmetric information. It is expected that the induced liquidity constraints due to insider ownership are substantially reduced when outside investors control a substantial share stake and have therefore an increased propensity to monitor management. When industrial companies control large shareholdings, there is evidence of increased overinvestment. This suggests that industrial companies are able to influence investment spending. In contrast, large institutional holdings reduce the positive link between investment spending and cash flow relation and hence suboptimal investing. Whereas there is no evidence of over- or underinvesting at low levels of insider shareholding, a high concentration of control in the hands of executive directors creates a positive investment-cash flow relation.

1. Introduction

The seminal paper by Modigliani and Miller (1958) states that under perfect capital markets financing decisions and investment decisions are independent of each other. Therefore, a firm's investment policy depends only on the availability of investment projects with positive net present values (NPV). Under perfect capital markets, the availability of cash flow should have no impact on the firm's investment level as outside financing acts as a perfect substitute for internal funds.

However, a vast body of empirical research suggests that capital markets are imperfect, as they suffer from asymmetric information or from agency problems. Asym-

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metric information will cause firms to underinvest. This is due to the now classic lemons problem (Akerlof, 1970). As investors are unable to determine a firm's quality, they will invariably charge each firm, given its risk, the same rate for finance. As a result, outside financing may be excessively expensive and certain projects with a positive NPV may not be undertaken. Hence, there may be a positive link between investment and cash flow.

In firms where the interests of the management are badly misaligned with those of the shareholders, managers may be tempted to invest internal funds — even into projects with a negative NPV — rather than to pay these internal funds out as dividends. In other words, the agency problem of free cash flows (Jensen, 1986) may be another reason why there may be a positive relation between investment and cash flow.

The question whether or not firms are subject to liquidity constraints is one of the classic issues in finance. Interest in the issue was rekindled by the seminal paper by Fazzari, Hubbard and Petersen (1988). However, only few papers test the impact of agency problems on the investment-liquidity relation.[1] This paper tests the empirical specification of the Bond and Meghir (1994a) Euler-equation model on a sample of UK firms. The basic Euler-equation model is extended by including variables measuring the concentration of ownership. We test whether specific classes of shareholders mitigate the under-investment problem caused by asymmetric information and/or the over-investment problem due to agency problems.

The paper is organised as follows. Section 2 presents the hypotheses. Section 3 describes the data and methodology. Section 4 discusses the results and section 5 concludes.

2. Models on Liquidity Constraints and Hypotheses

2.1 Types of investment models

In the literature, empirically testable models of company investment can be categorised into four broad classes. The four classes are the neoclassical models, the sales accelerator models, the Tobin's q models and the Euler-equation models. In the neoclassical model, the relative cost of capital is the main determinant of corporate investment.[2] Although today's investment generates tomorrow's output, the model does not include any forward-looking variables. Similarly, the sales accelerator model (Abel, Blanchard, 1986) does not include expectations about the company's growth potential[3] and assumes that investment grows along with total sales. A more fundamental criticism of these two types of model is that a positive relation between investment and cash flow is assumed to be evidence of liquidity constraints. However, a positive cash flow coefficient may not reflect the importance of internally generated funds for investment purposes, but could instead indicate higher future profitability.

Investment is likely to depend not only on the current level of optimal capital stock but also on its future optimal level (Bond, Meghir, 1994b). As data on expectations are not available, the relation between investment decisions, expected future levels of output and the hurdle rate (the minimum required rate of return to accept investment projects) cannot be estimated. The inclusion of current and lagged levels of output and hurdle rate into investment models is not a proper solution because no distinction is made between factors influencing the optimal capital stock (the level of capital for which the marginal product of capital equals the hurdle rate) and factors which forecast the future value of the capital stock. Therefore, the cash flow variable of the above investment models could reflect either financial constraints or the formation of expectations.

Models incorporating Tobin's q (defined as the ratio of market values of equity and debt over the replacement value of the firm's capital stock) have attempted to solve this problem, as the expectation of future profitability is captured by the forward-looking stock market valuation (see e.g. Abel, 1990):

$$\left(\frac{I}{K}\right)_{it} = \gamma_i + \gamma_1 Q_{it} + \gamma_2 \left(\frac{CF}{K}\right)_{it} + \varepsilon_{it} \qquad (1)$$

where I is the level of investment, K is the capital stock, Q_{it} stands for Tobin's q, CF is the cash flow and γ_i is the investment for firm i needed to generate future profitability, which is reflected in Q. If firms are not financially constrained, γ_2 is expected to be equal to zero, otherwise γ_2 will typically be different from zero.

However, estimating q-models is not without problems for various reasons. First, Tobin's q is difficult to measure: the replacement value of assets is not reported in most European countries. Proxying the denominator of Tobin's q by book value of assets also suffers from estimation problems such as the measurement of intangibles. Second, Tobin's q will only include future expectations if the firm is a price taker in perfectly competitive industries,

[1] Some exceptions are Kathuria and Mueller (1995), Kaplan and Zingales (1997), Hadlock (1998), Gugler, Mueller and Yurtogly (1999), Vogt (1994) and Cho (1998) for the US, Degryse and deJong (2000) for the Netherlands, Haid and Weigand (1998) for Germany, and Gugler (1999) for Austria.

[2] See e.g. Jorgenson (1963) for an overview.

[3] Fazzari et al. (1988) test alternative versions of the sales accelerator model by adding Tobin's q to equation (2). They show that the inclusion of Tobin's q diminishes the effect of the cash flow variable, although the latter remains still significant.

if there are constant returns to scale and if the stock market value correctly measures the fundamental expected present value of the firm's future net cash flows (Hayashi, 1982). In practice, these conditions may not be fulfilled, e.g. if the stock market displays excessive volatility relative to the fundamental value of the companies.

Thus, if cash flow (or profitability) variables are included in an investment model along with Tobin's q, these cash flow variables may still be made up of expectations not captured by Tobin's q. It may then be difficult to disentangle the effect of expectations from the one of liquidity constraints in the parameter estimate of the cash flow variable. Chirinko and Schaller (1995) show that average Tobin's q is flawed as it reflects the average return on a company's total capital whereas it is the marginal return on capital that is relevant. Gugler, Mueller and Yurtoglu (1999) develop a technique to measure marginal Tobin's q and test the degree of cash flow sensitivity to investment in different Tobin's q scenarios to distinguish between cases with asymmetric information and agency conflicts.

The Euler-equation model of Bond and Meghir (1994a, 1994b) (hereafter called B&M) is based on the first-order conditions of a maximisation process. The model deals with the shortcomings of the neoclassical and average Tobin's q-models. The level of investment relative to the capital stock is a function of discounted expected future investment adjusted for the impact of the expected changes in the input prices and net marginal output. The Euler specification has the advantage that it controls for the influence of expected future profitability on investment spending whilst no explicit measure of expected demand or expected costs is required as future unobservable values are approximated by instrumental values. The theoretical model translates into the following empirical specification and tests the wedge between retained earnings and outside financing:

$$\left(\frac{I}{K}\right)_{it} = \alpha_1\left(\frac{I}{K}\right)_{i,t-1} + \alpha_2\left(\frac{I}{K}\right)^2_{i,t-1} + \alpha_3\left(\frac{CF}{K}\right)_{i,t-1} + \alpha_4\left(\frac{S}{K}\right)_{i,t-1} + \alpha_5\left(\frac{D}{K}\right)_{i,t-1} + \psi_t + \varphi_i + \varepsilon_{it} \qquad (2)$$

where D stands for the debt of the firm, S is sales, ψ_t and φ_i stands for time specific effects and fixed effects, respectively and all the other symbols are previously defined.[4]

2.2 Hypotheses

Empirical attempts to answer the question whether or not investment activity is influenced by movements in generated profits (or cash flow) have a long history and date back to the business cycle research of Tinbergen (1939) and Meyer and Kuhn (1957). Both studies found evidence that financial profitability influences investment decision in the short run. However, these results and those of more recent studies could as well imply that liquidity variables are a proxy for omitted variables. We try to control for the latter possibility by using the Generalized Method of Moments in Systems (GMM_{sys})[5] rather than OLS. Within this econometric setting, we hypothesise that there is no relation between a firm's investment decision and its cash flow stock (hypothesis 1).

Over the past decade — especially since the Fazzari et al. (1988) paper has triggered renewed interest in the topic — the above null hypothesis has been frequently rejected. The standard approach in the literature has been to test the above models on subsamples of firms which are supposed to be liquidity constrained, e.g. firms with low dividend pay-out ratios and new equity issues. Fazzari et al. (1988) find that the sensitivity of capital expenditure with respect to cash flow fluctuations is highest for fast growing and/or low-dividend firms.

Several papers have since then extended investment models by incorporating different sources of funds such as working capital (Fazzari, Petersen, 1993). They find that the investment-cash flow sensitivity is significantly positive but the coefficient on working capital changes is significantly negative, reflecting that working capital seems to compete for funds with fixed investment. Carpenter (1995) further extends this model by adding changes in debt level and finds evidence of significant financing constraints in firms with low growth opportunities (low Tobin's q) and with low dividend pay-out ratios.

Furthermore, the investment-cash flow relation may be influenced by the concentration and nature of ownership. Managerial discretion may be curbed if shareholders assume an active monitoring role, which reduces over-investment and is reflected in no or a smaller investment-cash flow relation. Likewise, the positive investment-cash flow relation may be reduced in the presence of large corporate blockholders. For example, Hoshi, Kashyap and Scharfstein (1991) distinguish between two samples of Japanese firms, the ones that belong to a keiretsu group and those that are independent. Hoshi et al. investigate whether or not keiretsu membership has an impact on the

[4] As the time series for I/K is relatively short (1988–1993) it may be influenced by the economic slow down of the UK economy in this period. As I/S (Investment standardised by Sales) is more stable over time, Steve Bond suggested to test also the following variant of the B&M model. We are grateful for this suggestion.

$$\left(\frac{I}{S}\right)_{it} = \alpha_1\left(\frac{I}{S}\right)_{i,t-1} + \alpha_2\left(\frac{I}{S}\right)^2_{i,t-1} + \alpha_3\left(\frac{CF}{S}\right)_{i,t-1} + \alpha_4\left(\frac{D}{K}\right)_{i,t-1} + \psi_t + \varphi_i + \varepsilon_{it} \qquad (3)$$

[5] This estimation technique controls for the potential omitted variables problem by using lagged variables as instruments.

access to external capital. Keiretsu firms are expected to face fewer or no liquidity constraints because the keiretsu usually comprises financial institutions which can provide soft loans for investments. The results suggest that firms belonging to a keiretsu are less susceptible to financing constraints.

The positive relation between internally generated funds and investment may not be present or may be less strong in the presence of a large outside shareholder for two reasons. First, the problem of overinvestment may be reduced by enhanced monitoring which decreases the squandering of free cash flows by management. Second, asymmetric information between management and large shareholders may decrease if it pays for the large shareholder to spend time and effort to collect more accurate information on the management's quality and its investment projects. Hence, we will test whether in the presence of a large outside share block held by an industrial or commercial company, or an individual or family not related to a director, a (positive) relation between investments and cash flow is absent (hypothesis 2).

Institutional investors are the largest owners of firms listed on the London Stock Exchange. However, institutions have been reproached by the Cadbury (1992), Hampel (1998) and Newbold (1999) corporate governance committees to be passive investors. Stapledon (1996), Goergen and Renneboog (2000) as well as Faccio and Lasfer (2000a) confirm that institutions do not normally intervene in a company's business for two reasons. First, they may lack the monitoring expertise. Second, they may want to ensure investment liquidity as insider-trading regulation may immobilise portfolio rebalancing. In contrast, recent anecdotal evidence seems to suggest that, even if institutional shareholders do not publicly intervene, they act behind the scenes. Moreover, surveys on the actual voting behaviour of investment funds reveal that vote casting by institutions has been growing rapidly (Mallin, 1996). Some institutions have even established voting policies which compel them to cast their votes on e.g. managerial investment decisions in firms where they hold an equity stake of 3% or more (for examples, see Mallin, 1999). Hence we formulate our null hypothesis as follows: for companies in which institutional shareholders own large ownership stakes, there is no relation between investment and internally generated funds (hypothesis 3).

Managerial ownership can be used as a proxy for the alignment of interests between managers and shareholders. At low levels of insider ownership, managerial interests may be very different from the ones of shareholders whereas at high levels of insider ownership agency problems may be less severe. An increased sensitivity is expected when managerial ownership is small. This may lead to overinvesting. This reasoning hinges on Jensen's (1986) free cash flow argument resulting from the existence of agency costs.

The predictions about the investment-cash flow sensitivity in the context of managerial ownership are different under asymmetric information. Inferior knowledge about the quality of the management and its investment decisions by the capital markets may be the reason why a premium on external capital is required and why an underinvestment problem arises. When insider ownership grows and managerial interests become more and more aligned with those of the other shareholders, managers internalise more of the mispricing of external funds (Hadlock, 1998). Consequently, the underinvestment problem becomes worse as managers are increasingly reluctant to reward external capital with an excessive premium. Investment will rely even more on the availability of internal funds and hence — at low levels of insider ownership — the investment-cash flow sensitivity rises with increasing levels of insider ownership.

In summary, insider ownership does not influence the investment-cash flow relation (null hypothesis 4). Alternatively (in an agency context), at low levels of insider holdings, high free cash flow will entail overinvestment. At high levels of insider holdings, investments should become less sensitive to cash flows as the overinvestment problem is less severe. Conversely, in an asymmetric information setting, investment-cash flow sensitivity increases with insider ownership.

2.3 Measurement of control concentration

In the B&M investment model described above, three alternative definitions of ownership and control are used: (i) the total proportion of shares held by each category of owner, (ii) the largest stake of all ownership stakes, and (iii) the Herfindahl index of the largest three stakes held by each category of owner.

High and low levels of ownership or control are subjective notions as the levels depend upon the distribution of ownership in the company. The Herfindahl index succeeds in capturing the dispersion of ownership across shareholders and the relative power of a group of shareholders.

3. Data Description and Methodology

3.1 Sample selection

A sample of 250 companies was randomly selected from all the companies quoted on the London Stock Exchange in 1988. Financial institutions, estate companies and insurance companies were excluded. A data panel was constructed for the period 1988–1993. The reason for the relatively short time series is that ownership data had to be collected by hand from company reports. Seven of the 250 companies were dropped because accounting data were not available from Datastream. Only those companies with a minimal panel of four years were retained in order to allow for a dynamic analysis. As a result, companies delisted through take-overs or insolvencies between 1988 through to 1991 were therefore excluded, but those that were delisted after 1991 were included in the analysis. Subsequent to 1991, 29 of the sample companies were acquired and 5 were liquidated or entered a formal bankruptcy process. The pattern of ownership is not significantly affected by recent IPOs (where insider ownership is particularly high) because 71% of the sample firms had been listed for at least eight years.

Table 1

Descriptive statistics for the financing variables

	I/S	CF/S	D/S
1988	0.159	0.147	0.100
1989	0.129	0.173	0.122
1990	0.084	0.117	0.111
1991	0.057	0.104	0.110
1992	0.051	0.097	0.119
1993	0.059	0.116	0.137
Average	0.091	0.126	0.071
Standard deviation	0.275	0.232	0.417
Observations		1,004	
Source: Own calculations; data from Datastream.			

3.2 Data sources, variable definitions and data description

As the B&M model is the model underlying the investment and liquidity relation, data for the model were collected using the same variable definitions and the same Datastream codes as the ones used by Bond and Meghir (1994a). In equation (3), Gross Investments (I) is defined as purchases of fixed assets and fixed assets acquired through take-overs. Cash flow (CF) is the sum of the provision for depreciation of fixed assets and operating profit before tax, interest and preference dividends. Sales (S) are total sales and Debt (L) is total loan capital consisting of all loans repayable in more than one year. New Share Issues are collected from the London Share Price Database. Table 1 shows the evolution of investment and cash flow standardised by sales.

$$\left(\frac{I}{S}\right)_{it} = \alpha_1\left(\frac{I}{S}\right)_{i,t-1} + \alpha_2\left(\frac{I}{S}\right)^2_{i,t-1} + \alpha_3\left(\frac{CF}{S}\right)_{i,t-1} + \alpha_4\left(\frac{D}{K}\right)_{i,t-1} + \psi_t + \varphi_i + \varepsilon_{it} \qquad (3)$$

The data reflect the start of a recession with investment (on sales) reduced from 15.9% to 6% and cash flow (on sales) decreasing from 14.7% to 11.6%.

Ownership data on the size of shareholdings both for existing and new shareholders for each year in the period 1988–1993 were collected from annual reports. All directors' holdings greater than 0.1% are included as well as other shareholders' stakes of 5% and more (until 1989) and of 3% and above (from 1990 when the statutory disclosure threshold was reduced to 3%). The status of the directors (executive/non-executive) and the dates of joining and leaving the board were also obtained from the annual reports. Non-beneficial share stakes held by the directors on behalf of their families or charitable trusts were added to the directors' beneficial holdings. Although directors do not obtain cash flow benefits from these non-beneficial stakes, they usually exercise the voting rights.

Shareholdings were classed into the following categories: (i) institutions, consisting of funds managed by banks, by insurance companies, by estate firms, by government agencies and consisting of investment/pension funds, (ii) industrial and commercial companies, (iii) families and individuals (not directly related to any director), (iv) executive directors, and (v) non-executive directors. Directors and their families, categories (iv) and (v), are referred to as 'insiders' whereas categories (ii) and (iii) are labelled as 'outside' shareholders.

Table 2 describes ownership concentration over the period 1988–1993. The mean across time for the largest shareholding amounts to 16.6%. The sum of all disclosed shareholdings is 39.1%. The Herfindahl index of all shareholders amounts to 0.36 and thus reflects the wide distribution of shareholdings across large shareholders (of which there are about 6 in the average company). The increase in the number of shareholders from 4 in 1989 to 6 in 1990 results from the decrease in the ownership disclosure threshold from 5 to 3%. Panel B shows the average stake by category of owner. Institutions own the largest cumulative equity stakes (24.4%), but they also have the highest frequency in the average firm. Industrial companies, directors and individuals or families own relatively larger shareholdings. Panel C shows the percentage of companies which may have financing needs: they are financially distressed, have an interest coverage below two, reduce or omit dividends or issue rights.

There are two main approaches to test the investment-cash flow relation. The sample can be partitioned by a variable expected to reflect financing constraints (e.g. a low dividend pay out ratio) and the models are subsequently run for each sub-sample (e.g. Kadapakkam et al., 1998). Alternatively, the model is estimated for the entire sample with the inclusion of interactive terms, each consisting of a dummy variable set to one if the firm's ownership or financial situation satisfies a certain criterion (e.g. Gugler, 1999). The advantage of the latter method is that

Table 2

Descriptive statistics of ownership and control

Panel A : Evolution of ownership percentages and control distribution across shareholders

		1988	1989	1990	1991	1992	1993	Mean
Largest shareholder	% ownership	18.9	18.2	17.3	16.1	15.3	13.9	16.6
All shareholders	% ownership	37.6	36.4	42.4	43.6	41.1	33.7	39.1
All shareholders	Herfindahl	0.46	0.45	0.32	0.29	0.29	0.34	0.36
Average number of share-holders per company		3.46	3.92	6.08	6.62	6.44	5.45	
Total number of investors in all companies		840	879	1,429	1,549	1,327	839	
No. of sample companies		223	224	235	234	206	154	

Panel B : Ownership and Herfindahl Indices by category of owner

1992	Shareholder	Number of companies[1)]	% ownership[1)]	% ownership[2)]	Herfindahl[1)]	Herfindahl[2)]
Total institutions	Largest	187	9.2	8.4		
	Sum	187	24.4	22.4	0.18	0.16
Industrial companies	Largest	86	12.8	5.4		
	Sum	86	14.3	6.0	0.13	0.06
Families and individuals	Largest	31	10.7	1.6		
	Sum	31	16.4	2.5	0.07	0.01
Executive directors	Largest	103	8.1	4.1		
	Sum	103	11.6	5.9	0.07	0.04
Non-executive directors	Largest	58	10.3	2.9		
	Sum	58	14.5	4.1	0.08	0.02
Total directors	Largest	118	10.1	5.8		
	Sum	118	17.3	10.0	0.10	0.06

Panel C : Evolution of financing needs and relative voting power over time
– % of sample companies –

	1988	1989	1990	1991	1992	1993	1988–93
Financing needs[3)]	4.68	8.47	15.47	15.22	11.66	28.91	13.45

[1)] Averages are calculated over the number of companies with shareholdings of that specific shareholder category. — [2)] Averages are taken over the total number of sample companies (including those companies lacking a shareholder of a specific shareholder category). The averages are calculated for the total the number of sample companies (204). — [3)] Panel C gives the percentage of the sample companies with financing needs. A company is considered to be in “financing need” when it issues new equity, reduces dividend payments, omits dividends, has an interest coverage of less than 2 or is financially distressed (files for bankruptcy).

the ownership concentration and financial status of the sample firms are not restricted into one single subsample over the whole period, but are allowed to vary over time and hence move from one category or subsample to another. Cleary (1999) discusses the advantages of such a time-varying approach.

The time-varying variables used to interact with the variables in equation (3) are defined as follows:

$L_{category}{}^{i}$ = 1 if the largest share stake is held by a shareholder of category i;

$T_{category}{}^{i}$ = 1 if the sum of all shareholdings owned by shareholders of category i is higher than the total percentage of equity held by each other category of shareholders;

$H_{category}{}^{i}$ = the Herfindahl index of the 3 largest stakes held by shareholders of category i.

Financing needs = 1 if more than one (the median value for the sample was one) of the following 5 conditions (each of which might indicate liquidity constraints) are fulfilled: the firm files for bankruptcy, new equity is issued in the form of a rights issue, the firm omits dividend payments, the firm decreases dividend payments, or the firm has an interest coverage of less than 2.

where i = executive directors;
all the directors (inside shareholders);
outside shareholders (defined as industrial company or an individual or family);
industrial or commercial companies;
institutional investors (bank managed funds, investment and pension funds, funds managed by insurance companies.

3.3 Methodology

A panel over a six-year period (1988–1993) was collected to capture dynamic adjustment processes and to control better for the effect of omitted variables (Hsiao, 1986). If there are unobserved fixed effects, dynamic OLS models provide biased and inconsistent estimates because the error term will be correlated with the explanatory variables. In this case, the coefficient on the lagged dependent variable suffers from an upward bias. One of the characteristics of our sample is that, although the firms are randomly selected, they are selected from a non-random population, i.e. the companies listed on the London Stock Exchange. This can be controlled for by allowing for fixed effects. In addition, Meghir (1988) shows that using a fixed effects estimation takes care of the attrition bias resulting from non-random exit from the sample.

The Within Groups-OLS (WGOLS) allows for the elimination of the fixed effects (φ_i) in the error term by taking the deviations from the time mean. This method focuses on time series variation and omits cross-sectional variation. However, in equation (3), unless the number of time periods is high, $(I/S)_{i,t-1}$ will be strongly correlated with $\varepsilon_{i,t-1}$ in the time mean of ε_i.

As a result the estimate of the coefficient on the lagged dependent variable will be heavily downward biased.

For a short and unbalanced panel, a more efficient method was developed by Arellano and Bond (1991). Their procedure consists in taking the first differences of the model and then applying the Generalised Method of Moments (GMM_{diff}), using the lagged levels of the dependent variable and the independent variables as instrumental variables. By taking first differences, the fixed error term φ_i is eliminated. Given that the shocks $\varepsilon_{i,t}$ are not serially correlated, the lagged levels dated t–2 and earlier of the dependent variable and the independent variables can be used as instruments to obtain a consistent estimator. The advantage of the Arellano-Bond technique over other methods — such as the widely used Anderson-Hsiao (1982) procedure — lies in its efficient use of available instrumental variables.

However, Blundell and Bond (1998) have shown that when the period of study is relatively short the GMM_{diff} estimation procedure performs poorly in two situations. The first situation is where the coefficient on the lagged dependent variable (α_1) is close to unity and the second situation is where the relative variance of the fixed effects (φ_i) is large. In these situations, the lagged levels of the variables are weak instruments and GMM_{diff} provides a downward-biased estimate of α_1, the coefficient on the lagged dependent variable. Using Monte Carlo simulations, Blundell and Bond (1998) show that in these situations the Generalised Method of Moments in system (GMM_{sys}) provides better estimators than GMM_{diff}. The system consists of two types of equations, each of which has its own instruments. The first type of equations is in levels and their instruments are the lagged differences in the dependent variable and the independent variables. The second type consists of equations in first differences with the levels of the dependent variable and the independent variables as instruments.

For each estimation we report (i) the p-values for the tests on first-order correlation (m_1) and second-order correlation (m_2) in the residuals, (ii) the p-value for the Sargan test and (iii) the p-values for the parameter estimates, based on standard-errors asymptotically robust to heteroskedasticity. If m_1 is significant, then the instruments dated t–2 are not valid, but later instruments such as t–3 and t–4 may still be valid. Likewise, if m_2 is significant, then the instruments dated t–3 are not valid, but later instruments such as t–4 and t–5 may be.

The Sargan (1958) test is used to determine the valid instruments for each model and detect over-identifying restrictions. Under the null hypothesis of valid instruments, it is asymptotically distributed as a $\chi^2(n)$ with n degrees of freedom.

4. Results

The basic B&M model was estimated using the three different estimation techniques: OLS, GMM_{diff} and GMM_{sys}. Table 3 shows that only for the model estimated with GMM_{sys} (column iii) dynamics of the structural adjustment costs of the B&M model are not rejected and the size, sign and significance of the explanatory variables are in line with the theoretical predictions and the empirical results of the B&M model. As expected, the coefficient of the lagged dependent variable is close to 1 while the coefficient of the squared lagged dependent variable is negative and close to 1 (Bond, Meghir, 1994a). Both OLS and GMM_{diff} provide biased estimates.

Theoretically, an insignificant cash flow coefficient is expected as a company should be able to pursue its investment policy regardless of the amount of internally generated funds and as the company should be able to attract as much external capital as needed to finance positive NPV projects.

However, the negative cash flow coefficient reflects that for the random sample of companies there is neither an overinvestment nor an underinvestment problem because companies do not invest more when their generated cash flow is large nor do they invest less when the internally generated funds are low. The negative relation between investment and cash flow may however result from the fact that the time window captures a

Table 3

Basic Euler-equation model estimated using (i) OLS, (ii) GMM_{diff} and (iii) GMM_{sys}

Variable	(i) OLS	(ii) GMM_{diff}	(iii) GMM_{sys}
Constant	0.095***	–0.039	0.106
	(0.000)	(0.835)	(0.135)
I/S_{t-1}	0.486***	0.608*	0.821**
	(0.000)	(0.055)	(0.014)
$(I/S_{t-1})^2$	–0.067***	–0.101	–0.998*
	(0.000)	(0.667)	(0.075)
CF/S_{t-1}	–0.120*	–0.215	–0.232**
	(0.095)	(0.454)	(0.030)
$(D/S_{t-1})^2$	0.029	–0.212	0.031**
	(0.431)	(0.132)	(0.036)
p-value of m_1	0.022	0.035	0.169
p-value of m	0.009	0.699	0.972
p-value of Sargan test	–	0.790	0.172
Observations	814	633	790

(a) $(I/S)_{i,t}$ is the dependent variable in each model.
(b) Each model contains time dummies and industry dummies.
(c) m_1 and m_2 are tests for the absence of first-order and second-order correlation in the residuals respectively. These test statistics are asymptotically distributed as $N_{(0,1)}$ under the null of no serial correlation.
(d) The Sargan test statistic is a test of the over-identifying restrictions, asymptotically distributed as $\chi^2(k)$ under the null of valid instruments, with k degrees of freedom reported in parentheses.
(e) Model (i) is OLS in levels. Model (ii) is the model in first differences with levels dated t–3 and t–4 of the dependent and independent variables as instruments. Model (iii) is a linear system of first-differenced and levels equations. The instruments are levels of $(I/S)_{t-1}$, $(I/S)_{t-12}$, $(CF/S)_{t-1}$, $(D/S)_{t-12}$, $IA^*(I/S)_{t-1}$, $IA^*(I/S)_{t-12}$, $IA^*(CF/S)_{t-1}$, and $IA^*(D/S)_{t-12}$ dated t–4 for the differenced equations and first differences dated t–3 for the levels equations.
(f) p-values, based on standard-errors asymptotically robust to heteroskedasticity, are reported in parentheses.
***, ** and * stand respectively for statistical significance within the 1%, 5% and 10% confidence levels.

recession in the UK.[6] The results obtained from the OLS estimation in column (i) may also be substantially different from their expected values due to first-order serial correlation. The fact that m_1 is highly significant for the OLS estimation is worrying as the t-tests will no longer be valid. If the t-tests are still used in the presence of (first-order) serial correlation, this may lead to the wrong conclusions about the significance of the coefficients (Gujarati, 1995, p. 411).

Table 4 investigates the impact of financing needs on investment spending with financing needs being defined as a company issuing new equity, reducing dividend payments, omitting dividends, suffering from financial distress (filing for bankruptcy) or has an interest coverage of less than 2. The interaction term with cash flow shows that the investment spending of companies with financing needs is almost three times as sensitive to the availability of cash flow liquidity constraints as firms without financing needs. This is evidence that companies with financing needs suffer from underinvestment and it leads to the rejection of hypothesis 1 stating that internal funds do not influence a firm's investment policy. Table 4 also reports the impact of the combined voting rights concentration held by institutions on the investment-cash flow relation. Whereas, in the absence of institutional holdings, investment spending is sensitive to the presence of internally generated funds, this sensitivity disappears for companies with high levels of institutional ownership (the coefficient of the cash flow term and the one of the interacting cash flow term cancel out). This suggests that institutional shareholders may somehow reduce suboptimal investment spending. This finding rejects hypothesis 3. Furthermore, the negative debt coefficient and the positive cash flow coefficient point out that a high level of leverage leads to a reduction of investment as bond market and banks require high premia to compensate for the bankruptcy risk if internally generated funds do not suffice for investment spending.

Table 5 shows the results for the investment-cash flow model with the interaction terms reflecting the ownership

[6] The models in tables 3–6 include time dummies, as well as industry dummies interacting with the time dummies. The time dummies interacting with the industry dummies control for trends in the (I/S) series, which may be particular to certain industries and are not captured by the simple time dummies.

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Table 4

Investment model with financing needs

Variable	Financing Needs	$T_{institutions}$
Constant	0.200	0.156
	(0.179)	(0.137)
I/St_{-1}	0.933**	0.485**
	(0.007)	(0.044)
$(I/St_{-1})^2$	–0.401**	–0.360***
	(0.027)	(0.000)
CF/S_{t-1}	0.296*	0.574**
	(0.085)	(0.020)
$(D/S_{t-1})^2$	–0.138	–0.028***
	(0.140)	(0.000)
$IA*(I/S_{t-1})$	–0.676	0.963
	(0.283)	(0.115)
$IA*(I/S_{t-1})^2$	0.413	–0.453
	(0.163)	(0.153)
$IA*(CF/S_{t-1})$	0.889*	–0.512*
	(0.100)	(0.068)
$IA*(D/S_{t-1})^2$	0.048	–0.034
	(0.505)	(0.595)
p-value of m_1	0.366	0.669
p-value of m_2	0.196	0.313
p-value of Sargan test	0.422	0.335
Observations	820	820

(a) $(I/S)_{i,t}$ is the dependent variable in each model. IA stands for interaction dummy and is to be replaced by the following dummy variables: (i) Financing needs is a dummy variable, which is set to one if a company issues new equity, reduces dividend payments, omits dividends or is financially distressed (files for bankruptcy). (ii) $T_{institutions}$ is a dummy variable, which is set to one if the total proportion of shares held by institutional investors is at least a third of the total proportion of significant share stakes held in the firm.
(b) Each model contains time dummies and industry dummies.
(c) m_1 and m_2 are tests for the absence of first-order and second-order correlation in the residuals respectively. These test statistics are asymptotically distributed as N(0,1) under the null of no serial correlation.
(d) The Sargan test statistic is a test of the over-identifying restrictions, asymptotically distributed as $\chi^2(k)$ under the null of valid instruments, with k degrees of freedom reported in parentheses.
(e) The models are a linear system of first-differenced and levels equations. For all the models the instruments are levels of $(I/S)_{t-1}$, $(I/S)_{t-1}^2$, $(CF/S)_{t-1}$, $(D/S)_{t-1}^2$, $IA^*(I/S)_{t-1}$, $IA^*(I/S)_{t-1}^2$, $IA^*(CF/S)_{t-1}$, and $IA^*(D/S)_{t-1}^2$ dated t–4 for the differenced equations and first differences dated t–3 for the levels equations.
(f) p-values, based on standard-errors asymptotically robust to heteroskedasticity, are reported in parentheses.
***, ** and * stand respectively for statistical significance within the 1%, 5% and 10% confidence levels.

and control power of industrial companies. A priori, one would expect more concentrated outside control to lead to a better investment policy for two reasons. First, the management's inclination to overinvest would be curbed as a result of closer monitoring. Second, management would underinvest less because asymmetric information may be reduced as a result of the existence of large outside shareholders. Control concentration is captured by three variables: a dummy variable indicating whether or not an industrial company controls the largest equity stake, a dummy variable indicating whether the category of industrial companies holds a larger combined shareholder than any other category, and the percentage of the Herfindahl index of the largest three industrial shareholdings. Model (i) reported in table 5 shows that at low levels of control concentration held by industrial companies, there is no relation between investment spending and cash flow. Model (ii) suggests that there is a relationship, although weak in terms of its impact. When the control power is concentrated in the hands of just a few industrial companies (as measured by the Herfindahl in model ii), a strong positive relation at high levels rejects hypothesis 2 and suggests that powerful industrial shareholders seem to be able to stimulate investment spending when the company has high (free) cash flow, or restrict investments when the internally generated funds are low. The former action may result from the fact that industrial companies can extract private benefits of control from concentrated ownership. Examples of tunnelling given in Johnson et al. (2000) show that tunnelling — defined as e.g. investment in assets subsequently sold or leased to a controlling shareholder, transfer pricing advantageous to the controlling shareholders, loan guarantees granted to the controlling shareholder, expropriation of corporate opportunities —

Table 5

Investment model with control power of industrial companies

Variable	(i) $T_{\text{industrial co's}}$	(ii) $H\%_{\text{Industrial co's}}$
Constant	0.114	0.840**
	(0.170)	(0.035)
I/S_{t-1}	0.400	0.383**
	(0.136)	(0.019)
$(I/S_{t-1})_2$	–0.130	–0.114
	(0.383)	(0.186)
CF/S_{t-1}	0.039	0.207**
	(0.741)	(0.022)
$(D/S_{t-1})^2$	–0.002	–0.044
	(0.819)	(0.118)
$IA*(I/S_{t-1})$	–0.831	–0.899
	(0.393)	(0.213)
$IA*(I/S_{t-1})^2$	1.067	–1.926
	(0.202)	(0.426)
$IA*(CF/S^{t-1})$	0.860	1.051*
	(0.175)	(0.092)
$IA*(D/S_{t-1})^2$	–0.435***	–0.808
	(0.001)	(0.605)
p-value of m_1	0.324	0.593
p-value of m_2	0.174	0.512
p-value of Sargan test	0.413	0.752
Observations	814	814

(a) $(I/S)_{i,t}$ is the dependent variable in each model. IA stands for interaction dummy and is to be replaced by the following: $T_{\text{industrial co's}}$ is a dummy variable equalling 1 if the total proportion of shares owned by industrial companies is higher than the total percentage of equity held by each other category of shareholders. $H\%_{\text{industrial co's}}$ is the Herfindahl index of the 3 largest stakes held by industrial companies.
(b) Each model contains time dummies and industry dummies.
(c) m_1 and m_2 are tests for the absence of first-order and second-order correlation in the residuals respectively. These test statistics are asymptotically distributed as N(0,1) under the null of no serial correlation.
(d) The Sargan test statistic is a test of the over-identifying restrictions, aymptotically distributed as $\chi^2(k)$ under the null of valid instruments, with k degrees of freedom reported in parentheses.
(e) The models are a linear system of first-differenced and levels equations. The instruments are levels of $(I/S)_{t-1}$, $(I/S)_{t-1}^2$, $(CF/S)_{t-1}$, $(D/S)_{t-1}^2$, $IA^*\ (I/S)_{t-1}$, $IA^*(I/S)_{t-1}^2$, $IA^*(CF/S)_{t-1}$, and $IA^*(D/S)_{t-1}^2$ dated t–4 for the differenced equations and first differences dated t–3 and t–4 for the levels equations (except for the model with Tindustrial co's where the instruments for the levels equations are first differences dated t–4).
(f) p-values, based on standard-errors asymptotically robust to heteroskedasticity, are reported in parentheses.
***, ** and * stand respectively for statistical significance within the 1%, 5% and 10% confidence levels.

is seldom penalised by courts. The fact that the models capturing that an industrial company controls the largest equity stake and that industrial companies combined own the largest equity stake (model i) do not yield significant results in contrast to model (ii), provides some indirect evidence that it is a high relative voting power of industrial companies which influences the investment policy but not absolute levels of power.

The impact of voting rights concentration in the hands of management (executive directors) is analysed in table 6. At low managerial ownership, there is no positive relation between investment spending and cash flow availability and hence no evidence of consistent over- or under-investment. High levels of internally generated funds even lead to reduced investments. However, if executive ownership is high and is highly concentrated among a small number of executive directors (measured by the ratio of Herfindahl indices in model (iii)), the coefficient on the general cash flow variable and the one on the interacted term cancel each other out. This suggests that at high levels of managerial ownership — when managerial interests are more aligned with those of the shareholders — there is no link between investment and cash flow. The significance of the negative sign on the general cash flow variable is puzzling. This calls for further research. One possible explanation may be that the managers who do not hold substantial share stakes in their firm may be constrained to use expensive dividend signalling to show their shareholders that they are not wasting internal funds.

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Table 6

Investment model with control power of insider shareholders

Variable	(i) $L_{executives}$	(ii) $H\%_{executives}$	(iii) $H_{executives}$
Constant	0.096	0.876	–0.022
	(0.129)	(0.156)	(0.866)
I/S_{t-1}	0.699***	0.517***	0.690***
	(0.004)	(0.006)	(0.004)
$(I/S_{t-1})^2$	–0.664**	–0.161*	0.021***
	(0.018)	(0.053)	(0.000)
CF/S_{t-1}	–0.222**	0.054	–0.314***
	(0.018)	(0.688)	(0.000)
$(D/S_{t-1})^2$	0.035**	–0.076**	0.039***
	(0.012)	(0.028)	(0.000)
$IA^*(I/S)_{t-1}$	0.577	–0.084	–0.336
	(0.613)	(0.989)	(0.140)
$IA^*(I/S)_{t-1}^2$	–1.591	–4.057	–0.148
	(0.644)	(0.606)	(0.504)
$IA^*(CF/S_{t-1})$	0.100	1.670	0.252***
	(0.840)	(0.398)	(0.009)
$IA^*(D/S)_{t-1}^2$	–0.301	0.815*	–0.019
	(0.735)	(0.094)	(0.580)
p-value of m_1	0.227	0.878	0.614
p-value of m_2	0.418	0.883	0.258
p-value of Sargan test	0.457	0.487	0.633
Observations	790	814	820

(a) $(I/S)_{i,t}$ is the dependent variable in each model. IA stands for interaction dummy and is to be replaced by the following dummy variables: $H\%_{executives}$ is the Herfindahl index of the 3 largest stakes held by executives. $H_{executives}$ is a dummy variable set to one if the ratio of the Herfindahl index of the 3 largest stakes held by executives over the Herfindahl index of the 3 largest stakes (whatever their owner) is higher than the median of the ratio for all the firms in that year.
(b) Each model contains time dummies and industry dummies.
(c) m_1 and m_2 are tests for the absence of first-order and second-order correlation in the residuals respectively. These test statistics are asymptotically distributed as N(0,1) under the null of no serial correlation.
(d) The Sargan test statistic is a test of the over-identifying restrictions, asymptotically distributed as $\chi^2(k)$ under the null of valid instruments, with k degrees of freedom reported in parentheses.
(e)The models are a linear system of first-differenced and levels equations. The instruments are levels of $(I/S)_{t-1}$, $(I/S)_{t-1}^2$, $(CF/S)_{t-1}$, $(D/S)_{t-1}^2$, $IA^*\,(I/S)_{t-1}$, $IA^*(I/S)_{t-1}^2$, $IA^*(CF/S)_{t-1}$, and $IA^*(D/S)_{t-1}^2$ dated t–4 for the differenced equations and first differences dated t–3 and t–4 for the levels equations (except for the model with Lexecutives the instruments for the levels equations are first differences dated t–4).
(f) p-values, based on standard-errors asymptotically robust to heteroskedasticity, are reported in parentheses.
***, ** and * stand respectively for statistical significance within the 1%, 5% and 10% confidence levels.

5. Conclusion

The empirical literature documents that the level of internally generated funds significantly influences investment spending. The positive cash flow sensitivity of investments can result from excess cash flow which management perceives to be too inexpensive and therefore squanders in negative NPV projects. In contrast to such agency problems, the positive relation may also be the consequence of liquidity constraints which cause the company to pass up valuable investment projects if the premium paid for external financing is high. This paper has investigated this relation for a random sample of companies listed on the London Stock Exchange and has analysed whether the cash flow sensitivities differ for companies with financing needs and for companies with varying degrees of ownership control. To this end, the Bond and Meghir (1994a) model, which overcomes some of the drawbacks of neo-classical and Tobin's q investment models, was extended. In addition, the models were estimated using the GMM in systems technique which avoids the estimation biases of usual methods (like weighted least squares, GMM in differences).

For the whole sample, there was no evidence of a positive relation between the levels of internally generated funds and subsequent investment spending, or no evidence of consistent over- or underinvesting. However, companies with financing constraints seem to underinvest since their investment spending is strongly and positively related to the amount of internally generated funds. For companies in which institutions own a large amount of the voting rights, the relation between investment spending and cash flow is reduced. Whereas for companies without large share stakes controlled by industrial companies investment is not cash flow dependent, the presence of voting control by industrial companies induces a positive relation between cash flow and investment spending. This may result in either overinvestment — perhaps stimulated by industrial companies desiring to reap private benefits of control by tunnelling — or from underinvestment if these large shareholders reduce the company's intention to attract external funding. Given that in the absence of concentrated control by industrial companies, investment spending does not depend on cash flow levels, the first interpretation seems the most plausible one.

As cash flow sensitivity is only observed for models where industrial ownership is captured by the Herfindahl indices, it seems that industrial shareholders only have an impact on investment policy if their relative voting power is strong. Finally, high levels of managerial ownership seem to mitigate agency problems.

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References

Abel, A. (1990): Consumption and Investment. In: B. Friedman, F. Hahn (eds.): Handbook of Monetary Economics, New York.

Abel, A., O. Blanchard (1986): Investment and Sales: Some Empirical Evidence. In: NBER Working Paper, 2050.

Akerlof, G. (1970): The Market for "Lemons": quality uncertainty and the market mechanism. In: Quarterly Journal of Economics, 84, 488–500.

Arellano, M., S. *Bond* (1991): Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. In: Review of Economic Studies, 58, 277–297.

Blundell, R., S. *Bond* (1998): Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. In: Journal of Econometrics, 87, 115–143.

Bond, S., C. *Meghir* (1994a): Dynamic Investment Models and the Firm's Financial Policy. In: Review of Economic Studies, 61, 197–222.

Bond, S., C. *Meghir* (1994b): Financial Constraints and Company Investment. In: Fiscal Studies, 15, 1–18.

Carpenter, R. (1995): Finance Constraints of Free Cash Flow? A New Look at the Life Cycle Model of the Firm. In: Empirica, 22, 185–209.

Chirinko, R., J. *Schaller* (1995): Why Does Liquidity Matter in Investment Equations? In: Journal of Money, Credit and Banking, 27, 527–548.

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Cho, M. (1998): Ownership Structure, Investment, and the Corporate Value: An Empirical Analysis. In: Journal of Financial Economics, 47, 103–121.

Cleary, S. (1999): The Relationship between Firm Investment and Financial Status. In: Journal of Finance, 54, 673–692.

Degryse, H., A. *de Jong* (2000): Investment Spending in the Netherlands: The Impact of Liquidity and Corporate Governance. Working Paper, CentER, Tilburg University.

Faccio, M., M. *Lasfer* (2000): Do Occupational Pension Funds Monitor Companies in which they Hold Large Stakes? In: Journal of Corporate Finance, 6, 71–110.

Fazzari, S., R. *Hubbard*, B. *Petersen* (1988): Financing Constraints and Corporate Investment. In: Brookings Papers on Economic Activity, 1, 141–195.

Fazzari, S., B. *Petersen* (1993): Working Capital and Fixed Investments: New Evidence on Financing Constraints. In: Rand Journal of Economics, 24, 328–331.

Franks, J., C. *Mayer*, L. Renneboog (1998): Who Disciplines the Management of Poorly Performing Companies? Working Paper, CentER, Tilburg University.

Goergen, M., L. *Renneboog* (2000): Strong Managers and Passive Institutional Investors in the UK: Stylized Fact. In: F. Barca, M. Becht (eds.): The Control of Corporate Europe, Oxford, forthcoming.

Gugler, K. (1999): Investment Spending in Austria: Asymmetric Information versus Managerial Discretion. Working Paper, University of Vienna.

Gugler, K., D. *Mueller,* B. *Yurtoglu* (1999): Marginal Q, Tobin's q, Cash Flow and Investment. Working Paper, University of Vienna.

Gujarati, D. (1995): Basic Econometrics, 3rd ed. New York.

DOI https://doi.org/10.3790/vjh.70.2.248

Hadlock, C. (1998): Ownership, Liquidity and Investment. In: RAND Journal of Economics, 29, 487–508.

Hayashi, F. (1982): Tobin's Marginal q and Average q: A Neoclassical Interpretation. In: Econometrica, 50, 213–224.

Hoshi, T., A. *Kashyap,* D. *Scharfstein* (1991): Corporate Structure, Liquidity and Investment: Evidence from Japanese Industrial Groups. In: Quarterly Journal of Economics, 20, 33–60.

Hsiao, C. (1986): Analysis of Panel Data, Cambridge.

Jensen, M. (1986): Agency Costs of Free Cash Flow, Corporate Finance and Takeovers. In: American Economic Review Papers and Proceedings, 76, 323–329.

Johnson, S., R. *La Porta,* F. *Lopez-de-Silanes,* A. *Shleifer* (2000): Tunneling. In: American Economic Review, 90, 22–28.

Jorgenson, D. (1963): Capital Theory and Investment Behavior. In: American Economic Review, 53, 247–259.

Kadapakkam, P., P. *Kumar,* L. *Riddick* (1998): The Impact of Cash Flows and Firm Size on Investment: The International Evidence. In: Journal of Banking and Finance, 22, 293–320.

Kaplan, S., L. *Zingales* (1997): Do Investment-Cash Flow Sensitivities Provide Useful Measures of Financing Constraints? In: Quarterly Journal of Economics, 20, 169–215.

Mallin, C. (1996): The Voting Framework: A Comparative Study of Voting Behaviour of Institutional Investors in the US and the UK, Corporate Governance: An International Review, 4.

Mallin, C. (1999): Corporate Governance: Financial Institutions and their Relations with Corporate Boards. Working Paper, Nottingham Business School.

Meghir, C. (1988): Attrition in Company Panels. Working Paper, University College London.

Meyer, J., E. *Kuhn* (1957): The Investment Decision: An Empirical Study, Cambridge.

Modigliani, F., M. *Miller* (1958): The Cost of Capital, Corporation Finance and the Theory of Investment. In: American Economic Review, 48, 261–297.

Sargan, J. (1958): The Estimation of Economic Relationships Using Instrumental Variables. In: Econometrica, 26, 393–415.

Stapledon, G. (1996): Institutional Shareholders and Corporate Governance, Oxford.

Tinbergen, J. (1939): A Method and its Application to Investment Activity. In: Statistical Testing of Business Cycle Theories 1. League of Nations, Geneva.

Vogt, S. (1994): The Cash Flow/Investment Relationship: Evidence from U.S. Manufacturing Firms. In: Financial Management, 23, 3–20.