The Irish Accounting Review (2000), Vol. 7, No. 2, 1-37

THE IMPACT OF FREE CASH FLOW ON TARGET AND BIDDER PROBABILITY: A STUDY OF UK FIRMS 1989-95

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ABSTRACT

This study examines the influences on target and bidder probability for UK firms over the period 1989-95. Managerial theory suggests that managers may sub-optimally exercise discretion over free cash flow (FCF). Following Jensen (1986), it is suggested that the take-over market can potentially resolve this FCF problem - firms with high FCF may become bidders or attractive targets to value-optimising predators. The contribution of the study is twofold. A sample of UK firms is examined over a relatively recent time period, where most of the extant literature is more dated and is based on US companies. Importantly, a FCF metric is devised to explore the issue of identification of bidding and target firms, which, it is posited, captures the essence of Jensen's agency cost model more coherently than metrics currently utilised in related studies. Empirical support for this theory of take-over activity controlling for alternative influences on target/bidder likelihood is documented. Of the drivers of target and bidder probability analysed here, FCF performs strongly and examination of marginal effects suggests that FCF has substantial economic consequences for take-over activity. Application of the proposed Logit model to an out-of-sample group of firms resulted in accurate prediction of targets (bidders) in 73 per cent (71 per cent) of cases respectively. Weaker evidence of a positive role for gearing (prior performance) in the identification of target (bidder) firms is also documented. The precise impact of FCF on acquisition returns is suggested as an important area for future research.

INTRODUCTION

Merger and acquisition activity is an area of global commercial importance. International booms in acquisition activity were seen in the 1960s and 1980s, and while the world-wide recession of the early 1990s has slowed activity, the recent recovery has seen a re-emergence of a very active take-over market where 'mega mergers' valued well in excess of $1bn are frequently reported. Indeed, reports of corporate combinations such as the mooted Chevron-Texaco deal with a projected value of $120bn are no longer unusual. This study covers a period from 1989 to 1995 inclusive. The boom in UK merger and acquisition activity, which preceded this period, was truly remarkable. In terms of the number of publicly quoted companies acquired, the boom reached its peak in 1987 when a record 197 UK publicly quoted firms were acquired for a total consideration of £14bn. By 1989 the total number of public firms acquired had declined to 159 but the total consideration paid had jumped to £28bn.

The fall off in merger and acquisition activity began in late 1990. Several increases in interest rates made it more costly to finance take-overs with debt and dampened both economic activity and corporate profitability, making it less attractive to acquire other firms. By 1993 the number of bids for UK publicly quoted firms had declined to 61, of which 53 were successful. The recovery commenced in 1994, and by 1995 a total of 98 bids were made for UK public companies, 85 of which were successful, for a new record £36bn in consideration. In the seven-year period covered by this study a consideration of just under £100bn was paid in the acquisition of publicly quoted firms, approximately 15 per cent of the average annual GNP of the UK over the period in question. A total of 623 UK public companies were acquired during the period under examination. There was some considerable variation in activity during the sample period itself. In the first year of the study (1989), 159 public companies were acquired but the number of take-overs had declined to 53 by 1993 before recovering to 85 by 1995 (*Acquisitions Monthly*, 1996).

The potential for research in the field of mergers and acquisitions is considerable. Areas of interest include an examination of the influences

on the type of consideration paid in acquisitions, the characteristics of targets and bidders and factors that may influence gains from take-over activity. Many previous studies in the area have sought to identify the specific sources of gains/losses on acquisition with limited success. Many more analyses of the take-over question have focused on the magnitude of gains to the separate parties to the corporate transaction, and evidence in this respect is widely documented. In this study, we concern ourselves with attempting to identify the characteristics of both target and bidder firms in the UK. Given the buoyancy of the take-over and mergers market and the potential for significant gains that is generally recognised, it is considered that accurate prediction of potential take-over targets may add value to an investment strategy. The particular emphasis is on the inadequately explored role of free cash flow (FCF), motivated by Jensen (1986). The analysis differs to the extant literature in that the FCF metric used in this study is cash flow rather than profits based. Accounting profit is ambiguous and any FCF measure based on reported profits is likely to be an inadequate reflection of actual cash flow and investment potential. However, other hypotheses of the determinants of take-over activity, such as managerial motivations, growth differentials and P/E ratios are considered. A Logit model is the basis for testing these various hypotheses. Greene (1993) and Maddala (1992) note that for practical purposes, the underlying distributions to Logit (logistical) and Probit (normal) models are very close to one another, so that coefficients for both models are very similar unless samples are very large. Thus it makes little difference which model is utilised, but the Logit model has cost advantages and is more straightforward to interpret.

The question arises as to the legitimate interest that potentially exists in this analysis and its findings. Effectively five different user groups may be expected to find the identification of target and bidder characteristics useful. Shareholders, both current and prospective, gain significantly in active take-over markets. There is a general consensus in the literature that target shareholders earn a disproportionate level of any take-over benefits. However, despite a substantial body of work on take-over payoffs, it is far from certain that bidding shareholders necessarily lose. Jensen (1986, p. 326) notes that:

> Take-overs benefit shareholders of target companies. Premiums in hostile offers historically exceed 30 per cent on average, and in recent times have averaged about 50 per cent.

In light of the widely documented empirical evidence that target shareholders gain from take-overs, it is important that shareholders understand which characteristics render a firm attractive to potential predators. Jensen and Ruback (1983, p. 608) argue that:

> ...post outcome negative abnormal returns (to bidders) are unsettling because they are inconsistent with market efficiency and suggest that changes in stock price during take-overs overestimate the future efficiency gains from mergers.

If target gains really do come at the expense of bidding firms (Magenheim and Mueller, 1987, document abnormal returns of -16 per cent to bidding firms), identification of the characteristics which distinguish bidding firms from their non-bidding counterparts should be of interest to shareholders. If they could reliably predict such an event, this might plausibly reduce shareholders' exposure to losses ahead of a take-over. Alternatively, the returns to acquisition may be such that investors could profit from devising a trading strategy involving long (short) positions in potential targets (bidders). Academics have long debated the size and significance of take-over gains, their source, the parties who benefit and those who lose. It is anticipated that conclusive identification of firm characteristics which impact on bidder or target probability may further insights into, or a quest for, a coherent theory of firm external growth. Employees equally have an interest in take-over activity, as take-overs are usually followed by some rationalisation and financial restructuring of the target. Regulatory authorities closely track merger and acquisitive activity with a view to framing legislation on competition policy and its implications for international trade. Finally, business contact groups can be affected by intra- and inter- industry restructuring. For example: suppliers' contracts with target firms may be set aside; consumers' implicit guarantees and warranties may not be honoured; product or service agreements may be left unfilled; and, competitors may experience turbulence in their markets due to further restructuring between existing firms. Thus identification of target and bidder characteristics speaks to legitimate investment and commercial concerns and justifies a study of this issue.

This paper represents an attempt to summarise some of the key issues in the various debates surrounding identification of take-over parties, and is organised as follows. The next section presents a brief discussion of the major streams in the mergers and take-over literature; it derives a list of the factors that theoretically influence target and bidder probability, and proposes a number of formal hypotheses to be tested. A detailing of the data selection procedure, the empirical analysis that is undertaken and some methodological issues that are relevant to the study follows this. Study regression results are subsequently presented. The final section summarises and concludes.

THE LITERATURE ON TAKE-OVERS AND MERGERS

The purpose of this section is to provide an insight into the relevant issues in the market for take-overs and it thus speaks to the precise nature of the corporate control literature. The literature in relation to the prediction of take-over targets has followed a similar pattern to that on the prediction of financial distress, and adopts essentially two approaches. One branch involves the use of a large number of variables such as gearing, P/E ratio, market to book ratio, various size variables (such as sales or total assets) and different performance measures (return on shareholders' capital, market adjusted returns, etc.) in an attempt to identify the characteristics of targets. In separate univariate and multivariate regressions the statistical significance of these variables in explaining the incidence of take-over bids is determined, while there may also be some effort to provide ex-ante theoretical justification for the explanatory power of the statistically significant variables. Such a data-mining approach is problematic to an extent; results obtained may be sample specific and lack general applicability. While regression results do provide evidence in support of a particular phenomenon they do not prove economic causality. An alternative approach has been to allow theoretical discourse to inform the choice of variables to be included in a take-over prediction model. A plausible set of theories facilitates definition of variables associated with the proposed hypotheses, together with formulation of some priors as regards associations between identified variables and likely incidence of a take-over bid. Finally a sample of targets (bidders) together with a control sample can be used to test the model empirically. This study adopts this approach.

Theoretical Analysis of Take-over Activity

The theoretical literature posits many and varied motivations for take-over activity, primary among them being corporate control considerations and resolution of the conflicts inherent in the separation of ownership and control in large corporations. The costs which such conflicts impose are well documented in both theoretical and empirical literatures. Practical impediments to the efficient operation of markets for financial and managerial capital and non-independence of the Board of Directors frequently result in investment inefficiencies. Appropriate managerial incentive contracts may be designed to limit divergences from shareholder wealth maximisation. However, given information asymmetries, the long-term nature of contracts, barriers to renegotiation, the failure of internal controls and possibly prohibitive costs of mounting an internal challenge to an entrenched managerial team, the market for corporate control may constitute the most effective albeit extreme mechanism for resolving problems of managerial discretion. This is the disciplinary motive for take-overs, as discussed by Grossman and Hart (1980). A take-over, by removing the incumbent management and replacing it with a new team mandated to make the necessary changes to improve efficiency and increase returns, may accomplish what internal control systems have frequently failed to achieve. Notwithstanding the substantial premiums payable in hostile take-overs, acquisition of under-performing firms may constitute the most efficient mechanism for halting and/or reversing investment inefficiencies. Nutall (1999) suggests that this motive will be stronger when other control mechanisms are less effective. Friedman (1953) argues that competition in product markets promotes managerial efficiency and profit maximisation. The 'invisible hand of competition' allocates societal resources to their most efficient use, so that firms with inefficient managers would be forced out of business. This synergy motive for take-overs has been discussed by Shleifer and Vishny (1997) among others. The threat of a take-over would be a sufficient discipline on managerial activity to ensure firm survival. However, given the imperfectly competitive nature of product markets Friedman's prediction does not always hold true in practice. Neo-classical economists such as Meade (1968) suggest that despite the separation of ownership from control, competition in capital markets and the threat of take-over will force managers to maximise profit. Managerial goals which diverge from profit maximisation will be penalised by rendering the firm more attractive as a take-over target to corporate raiders who will reverse

inefficiencies, replace the incumbent manager and adopt a profit maximisation strategy. Thus the neo-classical view of take-overs is that they are motivated by the desire to maximise profit and ultimately shareholder wealth. They will therefore take place only when they produce synergistic benefits such as technical economies of scale, an increase in market power or where there is potential for improvements in operational, investment and/or financial policy. Furthermore, any efficiency improvements must outweigh any take-over costs such as payment of a premium for control.

In the case of conglomerate mergers, Mueller (1969) suggests that since benefits such as economies in production, distribution or research and development are unlikely, the only justification for a take-over is the exploitation of managerial economies of scale. However this neo-classical view ignores the many other practical factors which determine whether or not a firm becomes a bidder or a target. Such considerations frequently relate to firm characteristics such as cash flow resources, growth options, performance, market rating and financial status.

Target Prediction

Jensen's (1986) FCF theory has important implications for identifying those firms likely to be subject to take-over bids and those likely to make these bids. Jensen argues that managers may exercise their discretion over cash flow to adopt inefficient operational practices or to invest sub-optimally in value-destroying projects, which afford non-pecuniary benefits or promote entrenchment. He suggests that managers may have an empire building motive for take-overs (Morck, Shleifer and Vishny, 1988). Hanson (1992) suggests that a take-over may constitute the most efficient resolution of managerial inefficiencies where agency costs of FCF are very severe. The implications of FCF theory for target identification follow logically. Firms with high FCF and significant agency costs are likely to exhibit a positive association between FCF and target probability. Relatively greater potential gains to take-over of firms with high FCF suggests that such firms would generate widespread market interest, giving rise to multiple bidders and/or a take-over contest. This is likely to further enhance take-over premiums and the probability that a take-over will be completed. Thus the following hypotheses are suggested for a target prediction model:

H_0: FCF is unrelated to target probability.
H_1: FCF is associated with target probability.

Powell (1997) utilises a multinomial Logit model to explore take-over likelihood, and finds that target probability increases with cash flow. However, his cash flow measure centres on operating cash flow scaled by total assets, which could be considered to be sub-optimal as a FCF metric, given its derivation from accounting profits and its basis in accruals accounting. Nutall (1999) also examines take-over likelihood but bases his cash flow variable in accounting profits net of interest and taxes. Dickerson, Gibson and Tsakalotos (1998) explore take-over likelihood but omit a cash flow type metric.

Lehn and Poulsen (1989) document evidence on the impact of FCF on 'going private' transactions. They suggest that companies with high FCF may choose to go private to reduce the agency costs of FCF. They find a positive association between undistributed cash flow and both the probability of going private and the premium paid to shareholders in the transaction. As take over is an alternative mechanism for resolving the FCF problem, these findings lead to the expectation of a positive association between FCF and target probability.

Lang and Litzenberger (1988) focus on the relationship between over-investment and dividend announcements, recognising that distributions reduce FCF and thus lower the scope for managerial discretion over investment. As take-over is plausibly an alternative approach to resolving the over-investment problem, this finding also indirectly supports the expectation of a positive FCF-target probability association.

Harford (1997) considers the impact of substantial undistributed cash balances on corporate take-over activity, arguing that the practice of stockpiling cash represents sub-optimal managerial behaviour. He relates a cash deviation variable (defined as the deviation of a firm's cash and marketable securities from the industry average) to the likelihood of becoming a take-over target and finds a negative association. This is consistent with a role for cash resources as a take-over defence, as per the Harris and Raviv (1989) story. Blanchard, Lopez-de-Silanes and Shleifer (1994) directly examine a cash windfall effect and find that firms which do not subsequently utilise such cash productively are

likely to be acquired within a few years, which justifies an expectation of a positive association between FCF and target probability.

Hanson (1992) documents a trend in the US in the 1970s of high FCF firms pursuing growth by deploying surplus cash in low benefit acquisitions, consistent with Jensen (1986). In the 1980s however, he uncovers a pattern of high FCF firms themselves being targeted. This trend fits the idea advanced by Mitchell and Lehn (1990) that bad bidders may ultimately become good targets and supports the expectation of a positive association between FCF and target probability. On balance, therefore, the literature thus far suggests a positive relationship between the existence of FCF and the probability of being a target in a take-over bid.

In early work on target prediction, Gort (1969) proposes a positive association between firm growth and target probability. Young, fast growing firms may be loath to issue under-priced equity if they face severe information asymmetries (Myers and Majluf, 1984). One resolution of this funding problem might involve take-over by a slower-growth firm with sufficient resources to fill the investment gap. Nutall (1999) suggests that a financial synergy incentive to take over exists for cash-rich acquirers who can identify compatible (growth) targets which are financially constrained. Palepu (1986) suggests that low growth, resource rich firms may also be attractive as targets for this very reason. In short, they may be targeted by firms which have unfunded growth options. To test this hypothesis Palepu constructs a growth resource mismatch dummy variable, based on a combination of (i) low growth, high liquidity, low leverage or (ii) high growth, low liquidity, high leverage relative to the industry average. His analysis suggests that the growth resource dummy has just weak explanatory power. Although the expected positive association is obtained where leverage and liquidity are included as explanatory variables, the effect is only marginally significant. For a sample of UK companies, Powell and Thomas (1992) fail to find the expected positive significant association.

Harford (1997) uses a more straightforward approach and simply tests the association between sales growth and target and bidder probability respectively, finding a positive, though not statistically significant, relationship between sales growth and target probability. Given the complicated nature of constructing the growth resource mismatch

dummy and its lack of explanatory power in previous studies, this study proposes a similar approach to that of Harford, and the researchers expect a positive association between sales growth and target probability. Rapidly growing firms with many productive opportunities are likely acquisition targets for more mature firms, which lack internal growth opportunities.

One possible motivation for take-overs is to replace an inefficient, under-performing management team. In an early study of UK firms and the influences on their target probability, Singh (1975) finds that over the period 1967-70 firms which fell into the three lowest profitability deciles within their own industry ran a risk of being acquired roughly one and a half times the average. However, his evidence shows that the relation between profitability and target probability is non-monotonic; more profitable firms tend to be targeted for their superior performance just as much as poorer firms for their inefficiency. Nutall (1999) reports a negative relation between take-over probability and pre-bid performance for both hostile and friendly take-overs. Palepu (1986) calculates market adjusted returns for a sample of targets as a proxy for managerial efficiency and also finds the expected negative association between the metrics studied. It appears that under-performing firms are indeed vulnerable to take-over, although the particular metric chosen to proxy for inefficiency may influence study results. One expects accounting based measures to be less sensitive to market sentiment, and to perform better in tests of this hypothesis. Firms whose shares trade below fundamental value, perhaps due to market mis-pricing or more general macroeconomic phenomena, are natural take-over targets and may be taken over by predators who seek to exploit this transitory pricing error. Evidence from Bradley, Desai and Kim (1983) reveals that target share prices return to pre-bid levels after rejection of hostile take-over bids, suggesting that take-over markets are not in fact motivated by the under-valuation hypothesis.

A related P/E hypothesis suggests that firms with high P/E ratios may acquire firms that are trading on lower multiples in order to bootstrap. Of course this theory assumes market inefficiency and high-growth firms who take over slower growth entities trade any such illusory gains for slower future growth. However P/E may proxy for omitted variables such as risk or management skills. This approximation may help to explain why such a ratio has explanatory power in a multivariate model of

target prediction. Specifically, one expects a negative relationship between P/E ratio and target probability, although the extant literature finds little support for this P/E theory. Palepu (1986) reports a positive, albeit insignificant, P/E effect in target prediction, while Powell and Thomas (1992) find that P/E is insignificantly associated with target probability for UK firms.

Gort (1969) suggests that firms operating in an industry that has experienced recent successful take-over bids (possibly motivated by changes in technology or barriers to entry) may face an increased take-over threat. Recent observational evidence of take-over/merger activity in the oil industry, which has seen substantial consolidation through 1998-99, is supportive of such an argument. Palepu (1986) uses a dummy variable analysis to test this 'industry disturbance hypothesis' and finds a perverse negative relationship, an effect which is robust to model specification. While a bid in one particular industry may increase the probability of a take-over for other firms within that industry, it is possible that industry take-over waves are of short duration or that increasing consolidation may give rise to competitive and regulatory concerns over the period studied. As an alternative, Harford (1997) uses annual dummies to examine business cycle effects, and finds a significant effect in seven of the nine years of his sample, possibly indicating that variable market sentiment over time may importantly influence target probability. It has long been recognised that mergers and take-overs occur in waves, so that this result is consistent with observational evidence.

Bidder Prediction

While the empirical literature documents clear benefits of take-overs to target shareholders, several studies have sought to explain company acquisition in the context of bidder motives. Reid (1968) applied principal-agent theory to the area of corporate control and found that take-over activity was positively related to the bidder's sales, assets and employee growth. He concluded that (p. 212):

> Mergers appear to contribute more to size maximisation than to profitability, thus they serve managers' interests and goals, independent of those of stockholders.

The apparent lack of relationship between remuneration of top corporate officers and the performance of US firms is often cited as evidence that managers of widely held corporations act contrary to the interests of their shareholders. Lev (1983) cites findings of positive market reaction to spin-offs and leveraged buy outs as evidence against the value maximisation explanation of managerial behaviour in acquisitions, and comments (p. 10):

> I would lean away from the value maximising hypothesis and towards the managerial preferences explanation. ...What we seem to be witnessing in the rise of conglomerates is mostly expansion or 'growth for growth's sake'.

Bentson (1984) documents an inconsistent, positive relationship between officer-directors' departures and stock market underperformance. The failure of a company to improve its performance following managerial replacements may indicate that poor firm performance is not driven by managerial self-interest. An alternative explanation of bidder behaviour is based on FCF. Jensen (1986) argues that acquisitions made by firms with substantial FCFs are likely to be low benefit or value destroying because they are motivated by the determination not to pay out resources to shareholders. Harford (1997) examines the relationship between bidder cash reserves and the gains to acquisition and finds a negative association, concluding that cash rich firms are more likely to initiate acquisitions, increase spending and undertake larger purchases than other firms. He also considers an optimal saving theory of acquisitions and finds a significantly negative relationship between cash deviation and bidder returns. This suggests that firms with larger than average cash reserves are less likely to engage in value enhancing acquisitions, consistent with evidence by Denis and Denis (1993) for a sample of highly levered firms. Harford also finds that firms facing severe agency problems (as measured by low insider ownership) are more likely to initiate an acquisition than to repurchase shares or pay dividends, consistent with a FCF effect. Donaldson (1984) suggests that growth may create attractive opportunities for junior managers and allow firms to recruit and retain skilled personnel. Donaldson and Lorsch (1983) also suggest that the pursuit of growth may reflect a long-run strategy to ensure firm survival, suggesting a negative association between recent growth and bidder probability. Alternatively Harford (1997) argues that strong sales growth which drives

the profitability that makes acquisitions profitable, may motivate acquisitive action. Utilising sales growth as a metric he finds the predicted strong positive association with bidder probability.

Managers tend to have undiversified human capital and may feel that the best means of consolidating their position is to engage in an acquisition programme. By diversifying, managers can make a firm less attractive as a target to potential acquirers and asset strippers, consistent with agency models in which diversification is a first order objective of entrenched managers. Blanchard et al. (1994) document a positive association between cash flow and diversification, which is broadly supportive of a positive association between FCF and bidder probability.

While theoretical argument makes clear predictions regarding the negative effect of corporate diversification on shareholder wealth, the impact of prior performance on bidder probability is less clear-cut. Morck, Shleifer and Vishny (1990) suggest that inefficient managers have an incentive to acquire in an attempt to find another venture at which they may be more successful. This suggests a negative association between past performance and bidder probability. Roll's (1986) hubris hypothesis suggests that managers of well performing firms may be infected with hubris and engage in acquisitions, believing themselves capable of turning around poor performers, which motivates a positive prior performance-bidder probability hypothesis. Scherer (1988, p. 76) suggests overvalued firms have 'a (unique) economic currency with which to make acquisitions'. Thus they may pay a premium for control of undervalued companies even when no efficiency gains are expected to result. This leads one to expect a positive association between past price performance and bidder probability. Jensen (1986) suggests a positive relationship between past performance, FCF and bidder probability, as good past performance generates cash flow to finance corporate acquisitions. In his bidder probability model, Harford (1997) finds a significant positive association between market-adjusted returns and bidder probability. Notwithstanding the arguments of Morck et al. (1990), the balance of evidence appears to support a positive association between past performance and bidder probability. In the study presented in this paper, return on shareholders' capital (ROSC) is used to proxy for prior performance in bidder prediction.

In the context of bidders, the P/E hypothesis suggests a positive association between P/E ratio and bidder probability. However, empirical evidence relating to this is not supportive of such an effect. Harford (1997) finds a significantly negative relationship between P/E ratio and bidder probability for his sample of US companies. However, P/E may proxy for performance, mis-valuation or growth potential, which may explain Harford's findings. Gort (1969) suggests that intra-industry consolidation may influence the probability that other firms in a given industry will become targets. If attack proves effective as a take-over defence, firms may engage in sub-optimal bidding simply to avoid a hostile take-over. Given the matched-pair nature of this study sample, it is not possible to test the industry disturbance hypothesis in a similar manner to Palepu (1986), so annual dummy variables will be used to examine firms' bidder probability over time. **Table 1** summarises the various hypotheses to be empirically tested.

Table 1: Summary of Hypotheses to be Tested

Hypothesis	**Variable**	**Expected Association**	
		Target Prob.	**Bidder Prob.**
Free Case Flow is needed to fund growth options	(i) FCF (ii) Cash (iii) Gearing	Positive Positive Negative	Positive Positive Negative
Growth underpins valuation	Sales Growth	Positive	Uncertain
Penalty for poor managers	ROSC	Negative	Positive
Market mis-valuation	P/E Ratio	Negative	Positive
Waves in Take Overs Exist	Annual Dummies	Uncertain	Uncertain

Note 1: FCF represents free cash flow, as defined in the paper
Note 2: ROSC represents return on shareholders' capital

DATA AND METHODOLOGY

Given the fact that in any one year only a small proportion of the total population of firms becomes involved in a take-over contest, random sampling is likely to produce a sample with very few targets and thus has poor information content. To distinguish the characteristics of targets and bidders this study commenced with the sub-samples of firms which were take-over targets (bidders) respectively and constructed control samples on a 'matched pair' principle, where firms were matched by industry and market capitalisation to the targets (bidders).

The estimation sample comprised a pooled sample of firms that were the target of (bidders in) a take-over during the period 1989 to 1995. Criteria for inclusion in the estimation sample were: the firm was a UK publicly quoted firm; the firm was the target of (bidder in) a take-over (whether successful or unsuccessful) during the period 1989 to 1995; and, at least four years of accounting data relating to the firm was available. To be included in the matched-pair control sample a firm had to fulfil the following criteria: the match was neither a target nor a bidder in a take-over during the sample period; the match firm had the same industry classification as the target (bidder) firm; the match had a similar market capitalisation to the target (bidder); and, at least four years of accounting data was available for the match.

For almost 90 per cent of matches, market capitalisation was within +/- 25 per cent of the estimation sample firm. The sample excluded firms who bid for private UK firms or foreign firms but did not exclude the possibility that the match firm had launched a bid for a privately owned UK firm or a publicly or privately owned foreign firm, given the difficulty of identifying such firms. A total of 613 (683) targets (bidders) were identified of which 183 (150) met all the data requirements and were included in the estimation sample. A number of companies made more than one public bid and provided the bids were at least four years apart (to ensure that there was no overlap in the data used) these companies were included twice in the bidder sample. Ten companies fell into this category. When these observations were omitted, study results were not influenced in any substantial way.

The initial data source was *Acquisitions Monthly*, a trade publication which provides a full list of all completed acquisitions of publicly quoted companies, failed public bids and bid values. The *FT Mergers and Acquisitions Report* yielded information on the timing of bid announcements and on the successful completion of bids. Company accounts data was obtained from Datastream. As a precaution, four yearly means of variables were calculated to minimise the impact of once-off events such as pre-bid restructuring on study inferences. (Evidence by Dann and DeAngelo, 1988, suggests that such pre-bid activity is not uncommon. Subsequent analysis of median values yielded qualitatively similar results to those obtained for four-yearly means). The accounting variables used in the regression models as explanatory variables for target and bidder probability were:

- FCF
- Cash (and cash equivalent)
- Return on shareholders' capital
- Gearing
- P/E ratio
- Sales growth

The Financial Reporting Standard (FRS) 1 measure of net cash inflow from operating activities is an ideal basis for the FCF variable as it reflects actual cash flow rather than an accruals-driven performance measure. The researchers believed it to be closer than measures utilised in similar studies to the spirit of Jensen's theory so this was the metric chosen to reflect firms' FCF position. However, the FRS 1 measure was available post-1991 only. For the earlier study period, a comparable measure was constructed which is closely associated with net cash inflow before investing and financing activities. The resulting FCF variable is scaled by total assets, to control for the influence of firm size on target or bidder probability. ROSC is defined as after tax profits adjusted for minority interests and directors' bonuses, scaled by total share capital and reserves, and proxies for managerial performance. This deflator excludes intangibles given the subjective valuations attributable thereto. The cash variable is deflated by total assets, as absolute cash values may proxy for firm size. Gearing, the measure of firm indebtedness, is defined as total debt including preference capital, divided by total assets. The P/E ratio utilises firm price on the date just prior to initial public announcement of the relevant bid. Descriptive statistics for these explanatory variables for the target (bidder) predic-

tion models are presented in **Tables 2 and 3** respectively. Targets had on average higher mean and median FCF, cash reserves, gearing and sales growth than non-targets, however their ROSC measure was lower. Insignificant differences in mean/median values for FCF, ROSC and gearing between the target firms and their control group suggest that outliers have little influence on calculated coefficients. Mean values are substantially higher than medians for the cash and sales growth variables suggesting caution in making inferences based on regression coefficients for these variables. Bidders have on average higher mean FCF, ROSC, gearing, sales growth and P/E ratio but lower cash reserves than their non-bidder counterparts. Median/mean values were qualitatively similar for the bidder sample, except for the sales growth variable where some large positive observations were recorded. For non-bidders, mean/median values differed significantly for cash reserves and sales growth, indicating the influence of outliers and suggesting caution when drawing inferences regarding the ability of potential drivers to predict bidder firms.

Table 2: Descriptive Statistics for Target Probability Model

Panel A Target Firms						
Variable	**FCF**	**Cash**	**ROSC**	**Gearing**	**Sales Growth**	**P/E**
No. of Companies	183	183	183	183	181	176
Mean	0.127	0.173	0.136	0.308	0.185	18.03
Std. Deviation	0.122	0.169	0.175	0.203	0.255	13.82
Median	0.117	0.113	0.136	0.271	0.125	13.60
Minimum	-0.180	0.000	-0.691	0.000	-0.278	1.30
Maximum	0.576	0.892	1.058	0.959	1.730	79.60
Quartile 1	0.054	0.045	0.074	0.168	0.040	10.00
Quartile 3	0.181	0.255	0.181	0.409	0.234	20.50
Panel B: Control Firms						
Variable	**FCF**	**Cash**	**ROSC**	**Gearing**	**Sales Growth**	**P/E**
No. of Companies	183	183	183	183	173	177
Mean	0.10	.014	0.14	0.27	0.17	15.8
Std. Deviation	0.11	0.14	0.15	0.17	0.20	10.43
Median	0.11	0.10	0.13	0.25	0.12	12.00
Minimum	-0.055	0.00	-0.63	0.00	-0.39	2.80
Maximum	0.51	0.77	0.95	1.01	1.24	50.00
Quartile 1	0.04	0.04	0.07	0.15	0.37	9.85
Quartile 3	0.16	0.23	0.19	0.37	0.22	17.65

Notes:

FCF represents free cash flow, as defined in the paper

ROSC represents return on shareholders' capital, as defined in the paper

Due to negative earnings in the pre-bid year, no P/E could be calculated for a number of firms

Table 3: Descriptive Statistics for Bidder Probability Model

Panel A: Bidder Firms						
Variable	**FCF**	**Cash**	**ROSC**	**Gearing**	**Sales Growth**	**P/E**
No. of Companies	150	150	150	150	150	144
Mean	0.130	0.120	0.177	0.329	0.272	0.17
Std. Deviation	0.135	0.193	0.219	0.219	0.287	10.96
Median	0.120	0.127	0.155	0.290	0.176	13.70
Minimum	-0.156	0.000	-1.021	0.000	-0.170	5.00
Maximum	0.775	0.955	1.136	1.000	1.077	70.10
Quartile 1	0.049	0.081	0.934	0.175	-0.077	10.72
Quartile 3	0.203	0.270	0.220	0.448	0.384	0.20
Panel B: Control Firms						
Variable	**FCF**	**Cash**	**ROSC**	**Gearing**	**Sales Growth**	**P/E**
No. of Companies	150	150	150	150	149	136
Mean	0.09	0.17	0.11	0.31	0.21	15.89
Std. Deviation	0.15	0.17	0.25	0.23	0.19	9.10
Median	0.10	0.12	0.14	0.27	0.15	12.75
Minimum	-0.044	0.00	-1.47	0.00	-0.18	0.40
Maximum	0.63	1.06	0.79	1.00	1.08	54.10
Quartile 1	0.003	0.05	0.08	0.14	0.44	10.12
Quartile 3	0.17	0.21	0.19	0.44	0.26	0.18

Notes:

FCF represents free cash flow, as defined in the paper

ROSC represents return on shareholders' capital, as defined the paper

Due to negative earnings in the pre-bid year, no P/E could be calculated for a number of firms

A positive correlation is expected and is evident in the data between the FCF and cash reserves variables. To mitigate multi-collinear effects, the impact of both variables on target and bidder probability is tested separately in univariate and multivariate regressions. As interest charges reduce FCF, a negative correlation with gearing is also expected and again the data bear this out for both models. A positive correlation between gearing and sales growth exists for the bidder prediction model; young, rapidly growing firms facing severe information problems tend to prefer debt financing. However, the pair-wise correlation is not sufficiently high to be problematic in the model. Correlation between FCF and cash for targets (bidders) was 0.308 (0.353) respectively. Corresponding metrics for FCF with gearing are -0.225 (-0.297) respectively.

In this study the dependent variable takes the form of a dummy variable, and assumes a value of one if the firm had been the target of (bidder in) a take-over during the previous twelve months, and zero otherwise. The OLS linear probability model is problematic in this context, for reasons of non-normality, possible heteroskedasticity, unboundedness and inaccuracy of R^2 as a measure of goodness of fit. What is ultimately needed is a systematic method of forcing the dependent dummy variable estimates to range from zero to one in a smooth and meaningful fashion within a model that is not sensitive to small sample size. Binary logistic regression provides a means of achieving this objective, through obtaining maximum likelihood estimates of the parameters using an iterative-reweighted least squares algorithm and through use of categorical response variables which can assume only a limited number of possible values. The binomial Logit model takes the form:

$$\ln \frac{D_i}{1-D_i} = \beta_0 + \beta_1 X_{1i} + B_2 X_{2i} + \varepsilon$$

where D_i = dummy variable having a value of 1 or 0
X_{1i} = the ith observation of explanatory variable X_1
X_{2i} = the ith observation of explanatory variable X_2
β_0, β_1 = the regression coefficients (or parameters)
ε = the stochastic error term

In the context of target (bidder) prediction, the Logit coefficients indicate the impact of a unit change in a given explanatory variable on the log of odds that a bid will be received (made) divided by the number of times it will not, and not on the probability itself. The model avoids unboundedness, as it can be shown that D_1 estimates are limited by zero and one. Hosmer-Lemeshow and Pearson measures of goodness of fit are reported as probability (p) values, lower p values indicating a greater fit. Specifications of the regression models estimated to examine the influences on target and bidder probability are reported in the **Appendix**. Models 1 and 6 are univariate regressions of FCF and gearing on target/bidder probability respectively. Model 2 includes FCF, ROSC, gearing and sales growth as explanatory variables, together with annual dummy variables. Model 3 includes just FCF and P/E ratio while Models 4 and 5 examine the impact of [cash, ROSC, gearing, sales growth] and [ROSC, gearing, sales growth] combinations respectively. While Models 1 and 6 are simple, the strong associations they suggest motivate further examination of FCF and gearing effects. Models 2 to 6 represent an effort to identify the most important drivers of target and bidder probability. Annual dummies made little contribution to predictive power in Models 3 to 5 and were omitted for clarity of presentation.

EMPIRICAL RESULTS

Results for Target Prediction Models

Regression results for the various specifications of the target prediction model are presented in **Table 4**. Model 1 clearly indicates that FCF is a significant influence on target probability, the reported coefficient being positive and significant at the 5 per cent level. Controlling for managerial performance, gearing and sales growth (Model 2) leaves this effect perfectly intact and even more strongly significant at the 1 per cent level. Differential statistical significance across models suggests that this effect may be sensitive to model specification. Consistent with the extant literature in the area, P/E ratio has no systematic influence on the determination of targets, nor is there any significant support for Harford's (1997) stockpiling hypothesis. Although substantial cash reserves might theoretically be utilised to mount a take-over defence, suggesting a negative association between this cash variable and target probability,

these data provide little evidence in support of such a proposition. Alternatively substantial cash reserves might render a firm particularly attractive as a target to a bidding firm with plans for deploying such cash resources, suggesting a positive association between cash reserves and target probability. No evidence in support of this alternative proposition was obtained. The coefficient on the cash reserves variable has the predicted positive sign but is not significant at any traditionally acceptable level. Gearing is strongly positively associated with target probability in univariate analysis (Model 6) and in multivariate models which incorporate controls for alternative influences on target probability.

Table 4: Target Characteristics Logit Model 1989-95

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept	-0.273 (-0.149)	-0.851** (-0.401)	-0.505* (-0.217)	-0.674* (-0.266)	-0.458** (-0.233)	-0.355 (-0.194)
FCF	2.41* (0.95)	3.05*	2.274*			
Cash				1.195 (0.699)		
ROSC		0.003 (0.007)		0.005 (0.007)	0.006 (0.007)	
Gearing		0.019**		0.159**	0.015*	0.012*
Sales Growth		0.004 (0.005)		0.001 (0.005)	0.005 (0.004)	
P/E Ratio			0.014 (0.008)			
Yearly Dummies:						
1990		-0.019 (0.352)				
1991		-0.011 (0.352)				
1992		-0.048 (0.389)				
1993		-0.127 (0.438)				
1994		-0.053 (0.444)				
1995		0.017 (0.376)				
P (slope=0)	0.009*	0.118	0.017*	0.008**	0.045*	0.034*
Pearson (p)	0.297	0.349	0.408	0.419	0.434	0.833
HL (p)	0.001	0.641	0.04	0.265	0.968	0.037

Notes:

* (**) indicates significance at the 5% (1%) level respectively

Standard errors are in parentheses; 366 firm observations

Table 4 reports a positive and significant association between gearing and target probability when gearing is included as an explanatory variable. The effect is apparent both in a univariate regression (Model 6) and in separate multivariate regressions with FCF, ROSC and sales growth (Model 2), with cash reserves, ROSC and sales growth (Model 4) and with ROSC and sales growth (Model 5). This positive gearing relation is perhaps unexpected, in light of Jensen's (1986) thesis that debt reduces the agency costs of FCF and thus the scope for exploiting value gains through the take-over process. However, Jensen also argues that very high leverage levels may be untenable in the long run. They may actually render an entity attractive to corporate raiders who will either engage in asset stripping or alternatively institute managerial efficiencies, restructure operations and financing and gradually unwind debt funding substantially. Evidence of this latter effect has been documented by Kaplan (1989) for MBOs. Nutall (1999) obtains a similar positive relation and proposes a competing rationale, namely that take-overs and corporate bankruptcy may constitute substitute control mechanisms and that take-over is the relatively more cost effective of these controls. Firms so highly levered as to be vulnerable to financial distress might thus be susceptible to take-over (possibly by creditors) as a cheaper resolution of corporate inefficiency than forcing bankruptcy.

ROSC is included as an explanatory variable in Models 2, 4 and 5, with the expectation of a negative association between prior performance, for which this variable proxies, and target probability. In efficient markets the take-over process should ensure replacement of inefficient managerial teams and a return to an acceptable profitability level. In none of the models was this ROSC variable significant at any level, indicating that prior performance appears not to be an important determinant of target probability. Firms with strong sales growth may be targeted by mature firms who lack further valuable organic investment options, suggesting a positive relation between past sales growth and target probability. In none of the models tested was the coefficient on sales growth found to be significant, indicating that this variable is not an important driver of target probability. Neither was any significant systematic variation in target probability over time detected from the data. However, it is possible that a substantially longer sample period and/or larger sample size might provide a better basis for exploring any merger wave or serial effects. To examine the stability of the coefficients over time, the sample was divided into two sub-periods 1989-

1991 and 1992-1995. While not reported here, the evidence suggests that the FCF effect was present in both sub-periods (the results are available from the authors). In Model 2 where ROSC, gearing and sales growth are included as explanatory variables, the FCF variable is significant at the 5 per cent level in both sub-periods with the magnitude of the coefficient on the FCF variable increasing from the first to the second sub-period. The positive coefficient on gearing appears to be driven by the second sub-period, but an analysis of the Pearson residuals did not give reason to believe that this effect was influenced by heteroskedasticity in the data set.

When one looks beyond the coefficients themselves to examine the marginal effects, the economic impact of an increase in FCF on target probability becomes clearer. The estimated marginal effect of the FCF variable suggests that if FCF is increased by one standard deviation, or 13 per cent, the probability of becoming a target is increased by 25.8 per cent. The gearing effect implies that a comparable increase in gearing increases target probability by just 0.156 per cent.

Overall the evidence is supportive of a significant positive influence of FCF on target probability. Firms which are subject to severe agency costs associated with discretionary cash flows are substantially more likely to attract take-over bids than firms which are less likely to incur these costs. In terms of the goodness of fit of the models, the FCF (gearing) variables appear to have a high degree of explanatory power as demonstrated by Models 1 (6) respectively. Further interpretation of these results together with some possible implications of the results for investors is discussed in the concluding section.

Results for Bidder Prediction Models

Binary logistic regression results for the various specifications of the bidder prediction model are presented in **Table 5**. A positive association between FCF and bidder probability was expected in light of the literature reviewed. Firms generating substantial FCF with few productive organic growth opportunities and with an entrenched managerial team may prefer to utilise discretionary cash flow on acquisitions, even if they destroy value, rather than make distributions to shareholders. This hypothesis was initially tested in a univariate regression, with FCF as the independent variable (Model 1), and the evidence of a significant positive association with bidder probabil-

ity is indicative of an important role for FCF in defining and identifying bidding firms. In a multivariate regression which controls for other potential influences on bidder probability such as ROSC, gearing and sales growth (Model 2), the effect is equally strong and none of the other explanatory variables is significant at generally acceptable levels. However, this FCF effect is somewhat sensitive to model specification, since inclusion of the P/E ratio as an additional explanatory variable reduces the significance of the FCF variable. Examination of the cash reserves variable (Model 4) suggests little support for Harford's (1997) cash stockpiling effect as bidders do not seem to build up financial slack or accumulate cash resources ahead of making acquisitions.

Table 5: Bidder Characteristics Logit Model 1989-95

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept	-0.262 (0.151)	-0.864** (0.288)	-0.284 (0.250)	- 0.568* (0.263)	- 0.454* (0.236)	-0.117 (0.201)
FCF	2.284** (0.849)	2.51** (0.971)	1.497 (0.885)			
Cash				0.634 (0.679)		
ROSC		0.009 (0.006)		0.012* (0.006)	0.013* (0.006)	
Gearing		0.006 (0.008)		0.004 (0.006)	0.003 (0.007)	0.004 (0.005)
Sales Growth		0.008 (0.005)		0.007 (0.005)	0.007 (0.005)	
P/E Ratio			0.009 (0.012)			
P (slope=0)	0.005**	0.002**	0.161	0.034*	0.023*	0.475
Pearson (p)	0.765	0.457	0.476	0.398	0.412	0.484
HL (p)	0.482	0.281	0.676	0.225	0.303	0.437

Notes:

* (**) Indicates significance at the 5% (1%) level respectively

Standard errors are in parentheses; 300 firm observations

Gearing also potentially plays a role in bidder determination. On the basis that debt reduces the discretionary funds available to managers to deploy on value-diminishing acquisitions, a negative association with bidder probability is expected. In each of the three models in which gearing is included as an explanatory variable (Models 2, 4 and 5), the magnitude of the coefficient is extremely small, essentially very close to zero, indicating that no systematic relationship exists between gearing and bidder probability. Conflicting views exist regarding the impact of prior performance on bidder probability. Roll's hubris hypothesis suggests that managers of well performing firms may engage in considerable acquisition programmes believing themselves capable of turning around poor performing targets regardless of business nature. Morck, Shleifer and Vishny (1988) suggest that if the performance of a company is poor then managers have an incentive to acquire to find more successful ventures. Strong bidder share price performance also makes it attractive to finance acquisitions through a share issue. Harford (1997) documents a strong positive association between prior performance and bidder probability for his study sample. In this analysis, ROSC is used to proxy for prior performance and find evidence in support of a role for prior performance in bidder prediction. In an unreported univariate regression with ROSC as the sole explanatory variable, the coefficient on ROSC is positive and significant at the 5 per cent level. Controlling for cash reserves, gearing and sales growth (Model 4), a significant ROSC effect is still in evidence. Inclusion of sales growth and gearing as explanatory variables (Model 4) leaves this result unchanged.

The expected negative association between sales growth and bidder probability was explored by including sales growth as an explanatory variable in three regression models (Models 2, 4 and 5). Mature firms with few internal growth opportunities may pursue growth through acquisitions if organic expansion options are scarce or have been exhausted. However, the data presented in this paper does not provide support for such a thesis. In each model, the coefficient on sales growth has a perverse positive sign but is nowhere significantly different from zero, indicating that sales growth appears to have little explanatory power for bidder probability. Consistent with findings in respect of the target prediction model, annual dummy variables were found to be entirely lacking in influence on the prediction of bidder firms, thereby providing no evidence to support a thesis of take-over waves. Again, a

more extensive sample size and longer time period may yield better insights into the determinants of the timing of take-overs. A cursory examination of the spread of UK take-overs over time seems to suggest that a pattern exists in take-over activity.

Economic Impact, Predictive Ability and the Models Compared

The economic impact of an increase in FCF on bidder probability is also of interest. An examination of marginal effects suggests that if FCF is increased by one standard deviation, or 13 per cent, the probability of becoming a bidding firm is increased by 21.2 per cent; a substantial FCF is obviously at work here. In contrast, comparable marginal effects for gearing (ROSC) are just 0.06 per cent (0.076 per cent) respectively. Clearly, the FCF variable is the strongest driver of bidder probability of the variables studied here.

It is noteworthy that the FCF coefficients in respect of target and bidder Logit models are very similar, and that the economic impact of an increase in FCF on the probability of firms becoming a bidder or a target is qualitatively comparable. If FCF truly has the same impact on bidder and target likelihood, this in itself is an interesting result, as it suggests that having cash reserves does not necessarily protect a firm from a hostile take-over bid. The existence of FCF may in fact motivate firms to be aggressive in the market for take-overs, as inactivity could render a firm vulnerable to an unsolicited approach. Pooling the data to formally test whether the estimates are the same indicates that this is not a feature of the data. Nevertheless, the closeness of the estimates brings into perspective the desirability of identifying other drivers which might serve to differentiate firms. In that regard, the 'secondary influences' on target and bidder probability may plausibly come into play. In other words, while FCF increases the probability of becoming either a target or bidder, gearing may serve to distinguish potential targets, while prior performance, as measured by ROSC, may be the distinguishing feature of potential bidding firms. In the latter case, prior performance provides the currency to finance acquisitions, while in the former case gearing may in itself be indicative of a FCF agency problem and may alert potential predators to cost savings.

In terms of testing the goodness of fit of the models by seeing whether they are useful in forecasting actual take-over targets and bidders, an

out-of-sample group of 260 firms which were involved in take-over activity in 1996 was chosen. Using the Logit analysis described here for Model 2 correctly predicted 73 per cent of target firms and 71 per cent of bidders for this sample. Thus we conclude that our model has substantial predictive ability.

To examine the stability of coefficients over time the sample was divided into two sub-periods 1989-91 and 1992-95. Results are reported in **Table 6**. They are interesting in that they tentatively indicate the FCF effect may be period specific. In the first sub-period, none of the explanatory variables is significant in any of the regression models, but the FCF variable is highly significant in the univariate regression for 1992-95. Moreover, the magnitude of the FCF coefficient increases between the two sub-periods. (The FCF variable was reconstructed on the basis of the pre-1991 algorithm to explore whether differential definition pre-and post-FRS1 was driving the result. No material change in model coefficients or significance was observed so that the observed periodic effect is not due to errors in variables.) Trends in ownership structure over the period, which suggest a substantial decline in individual equity ownership and an increasing importance of institutional and overseas ownership, may help explain this pattern. A reduction in inside ownership without a proportional reduction in control increases the scope for managerial discretion over investment and acquisitions policy.

Table 6: Bidder Characteristics Logit Model by Sub-period

Panel A: 1989-91 inclusive						
Variable	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Intercept	-0.103 (0.199)	-0.759* (0.376)	-0.125 (0.366)	-0.728* (0.368)	-0.551 (0.330)	-0.275 (0.279)
FCF	1.417 (1.275)	1.741 (1.375)	0.879 (1.309)			
Cash				1.274 (1.014)		
ROSC		0.005 (0.008)		0.005 (0.008)	0.005 (0.007)	0.009 (0.007)
Gearing		0.007 (0.008)		0.01 (0.006)	0.011 (0.006)	
Sales Growth		0.012 (0.006)		0.01 (0.006)	0.011 (0.006)	
P (slope=0)	0.005**	0.023	0.116	0.116	0.062	0.724
Pearson (p)	0.526	0.42	0.443	0.29	0.313	0.438
HL (p)	0.635	0.671	0.931	0.197	0.422	0.729
Panel B: 1992-95 inclusive						
Variable	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Intercept	-0.473 (0.239)	-0.971* (0.488)	-0.617 (0.419)	-0.273 (0.398)	-0.322 (0.374)	0.058 (0.293)
FCF	3.187** (1.21)	3.093 (1.597)	2.37 (1.305)			
Cash				-0.25 (0.995)		
ROSC		0.012 (0.008)		0.021* (0.008)	0.019 (0.008)	
Gearing		0.003 (0.007)		-0.0002 (0.008)	0.0001 (0.008)	-0.003 (0.007)
P (slope=0)	0.005**	0.023	0.116	0.116	0.062	0.724
Pearson (p)	0.526	0.42	0.443	0.29	0.313	0.438
HL (p)	0.635	0.671	0.931	0.197	0.422	0.729

Notes:
* (**) indicates significance at the 5% (1%) level respectively
Standard errors are in parentheses; 146 (154) firm observations for panel A (B) respectively

The research is supportive of the FCF hypothesis. Model 2 is the preferred model overall, though Model 4 is worthy of interest mainly because it suggests the presence of additional influences on target (bid-

der) probability such as gearing (ROSC) respectively. The remaining models are less comprehensive and serve rather to indicate which variables make little incremental contribution to the prediction question. While the expected systematic relationships between cash reserves and gearing with bidder probability were not found, the results from the models using the FCF variable itself were much more supportive. The expected positive association between FCF and bidder probability was found even after controlling for prior performance, gearing and sales growth. The ROSC variable was significant in univariate regression. However, in a model that includes both ROSC and FCF, the FCF variable is significant and dominates any ROSC effect. It appears that ROSC has some explanatory power but its influence is reduced by the inclusion of the FCF variable. Exploration of the influence of market returns, although outside the scope of this study, might prove helpful in resolving the precise nature and strength of the influence of performance on bidder probability, and is suggested as a potentially fruitful avenue for future research. Further increments to the body of knowledge in the area equally suggest themselves. For example, the data might usefully be pooled to test for estimate similarity. Given that 'the world changes' and that we have seen many significant developments in financial markets in recent months, some further out-of-sample testing might highlight important omissions in the model in the future. While annual dummy variables are incorporated in the model to control for business cycle effects, there is yet scope to control for further macro-economic effects in the model such as, for example, market volatility. Finally, O'Sullivan and Wong (1999) have published insightful work in the area of UK hostile take-overs. While the current paper is concerned more with the determinants of take-overs in general, regardless of the hostility factor, nevertheless O'Sullivan and Wong highlight some firm-specific factors, incorporation of which may contribute importantly to the current model. Such factors include board composition and issues of ownership and control, and these variables have been found to bear importantly on other corporate financial decisions of public companies.

SUMMARY AND CONCLUSIONS

The two main findings presented in the previous section are that:

- A FCF phenomenon appears to exist, which significantly impacts on the probability that a company will become involved in a competition for corporate control, as either a target or a bidding firm. FCF facilitates managerial discretion over investment and may result in poor or value-destroying acquisitions as managerial teams seek to entrench or to pursue growth objectives.
- The extent of this FCF problem may be period specific as there is some evidence that the FCF effect in target and bidder prediction models is stronger in the 1992-95 sub-period.

The direction and nature of causality merit some consideration in this context. Firms with substantial FCF may acquire other firms as a means of deploying this cash rather than returning it to their shareholders. Alternatively availability of FCF may lead to increased target probability on the part of these same firms. Because both bidders and targets exhibit positive FCF effects, prior performance and gearing may be attributes that differentiate potential bidders and targets. Bidders exhibit stronger performance pre-bid, while targets tend to be highly levered. The high FCF characteristics of both bidders and targets may be related to the concept of bad bidders becoming good targets, as proposed by Lehn and Poulsen (1989). An examination of the returns to acquisition may shed important light on this question and is suggested as a fruitful area for further research. Equally, changes in the pattern of ownership structure over the period, which saw declining levels of inside ownership and increasing cash flow stakes of institutional and overseas shareholders, may provide the key. Over the period 1989-93 individual ownership levels fell from 20.6 per cent to 17.7 per cent notwithstanding the privatisations which substantially boosted the number of individual investors who owned shares in publicly quoted companies, as founder ownership dwindled and effective managerial control became disproportionate with cash flow stake. The decline in levels of 'inside ownership' and the increase in relative power of institutional investors increase the possibility of non-value maximising activity on the part of the managers of a firm. This is particularly the case if the experience of sub-optimal US institutional shareholder activism per-

tains also to UK firms, and may be associated with higher levels of acquisition activity even if these acquisitions are non-value maximising.

The relevance of FCF to the take-over market has been documented here. Managers with discretion over substantial FCF may be more likely to engage in (low-value) acquisitions. Evidence has also been presented to the effect that firms most prone to the agency costs of FCF face a greater target probability. It may therefore be the case that corporate control activity helps to reverse target investment inefficiency. Denis and Denis (1993) report reduced investment activity for firms subject to leveraged buyouts (LBOs), although they note that firms do not necessarily make better investment decisions after ownership restructuring. Rather, they make fewer of these expenditures. If activity in the market for corporate control truly mitigates such investment inefficiencies, and if summary evidence of Jensen and Ruback (1983) in respect of target/bidder relative take-over gains truly holds, two questions arise: could an investor devise a profitable trading strategy possibly along the lines of taking a long position in potential targets and a short position in potential bidders?; could the restructuring achieved by take-overs be achieved otherwise at lesser cost? Over a three-year period post-take-over, Magenheim and Mueller (1987) find that bidders earn abnormal returns of -16 per cent. In light of this study's finding of a positive association between FCF and bidder probability, it may be the case than the performance of high FCF firms is even worse that the average performance of bidding firms reported by Magenheim and Mueller. Take-over premiums received by target shareholders may reflect both a premium for control and anticipated efficiency gains. It is possible that accurate identification of and subsequent purchase of an ownership stake in potential targets could yield abnormal returns to the astute investor. If the premium on acquisition is positively related to the extent of the FCF problem then the potential gains to identifying high FCF targets are even greater.

Turning to the issue as to whether restructuring benefits of take-over can be achieved at lower cost. Nutall (1999) suggests that take-overs are more cost effective than bankruptcy as a control mechanism. Nevertheless, bid preparation, legal costs, financing and integration costs associated with combining different entities can be significant and recent observational evidence suggests that integration of systems and cultures in particular can be the stumbling blocks which either prevent

take-overs coming to fruition or limit the profitability of completed take-overs. It might be argued that greater focus on corporate governance and the need to maximise shareholder value could limit managerial discretion and reduce the need for costly acquisitions. However, Karpoff (1999) presents evidence to the effect that shareholder activism in the US market has negligible effect on target company share value, earnings or operations.

In conclusion, this study has highlighted the important role of FCF in corporate control considerations. The FCF variable as defined appears to be a significant influence in identification of both bidders and targets after controlling for other influences on bidder and target probability such as prior performance, gearing and sales growth. To the extent that high FCF firms make poor acquisitions, the evidence is supportive both of Roll's (1986) hubris hypothesis and Jensen's (1986) agency theory.

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APPENDIX

Regression Models Estimated to Examine Influences on Bidder and Target Probability.

$$\ln \frac{D_i}{1 - D_i} = \beta_0 + \beta_1 FCF_i + \varepsilon \qquad [Model\ 1]$$

$$\ln \frac{D_i}{1 - D_i} = \alpha_0 + \alpha_1 FCF_i + \alpha_2 ROSC_i + \alpha_3 GEAR_i + \alpha_4 SG_i + \varepsilon \qquad [Model\ 2]$$

$$\ln \frac{D_i}{1 - D_i} = X_0 + X_1 FCF_i + X_2 P/E_i + \varepsilon \qquad [Model\ 3]$$

$$\ln \frac{D_i}{1 - D_i} = \delta_0 + \delta_1 CASH_i + \delta_2 ROSC_i + \delta_3 GEAR_i + \delta_4 SG_i + \varepsilon \qquad [Model\ 4]$$

$$\ln \frac{d_i}{1 - D_i} = \phi_0 + \phi_1 ROSC_i + \phi_2 GEAR_i + \phi_3 SG_i + \varepsilon \qquad [Model\ 5]$$

$$\ln \frac{D_i}{1 - D_i} = \gamma_0 + \gamma_1 GEAR_i + \varepsilon \qquad [Model\ 6]$$

where :
D_i = 1 if the company was the subject of a take-over bid during the period of study and 0 otherwise
FCF = Free Cash Flow: FRS 1 net cash inflow from operations
ROSC = Return on shareholders capital: profits after tax, minority interests, directors bonuses, scaled by total share capital and reserves.
GEAR = Gearing: total debt and preference capital, scaled by total assets.
SG= Sales growth: average annual per cent change in sales revenue
P/E= Price earnings Ratio: pre-bid price divided by EPS
CASH = Cash and marketable securities, divided by total assets .