Stock market driven acquisitions versus the Q theory of takeovers – The UK evidence

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Abstract

Using a sample of UK mergers and acquisitions from 1985-2004, we show that equity over-valuation appears to play an important role in the determination of financing method. Our results are broadly consistent with those theories based upon market over-valuation driving mergers and their financing, rather than a Q-theory explanation. In some contrast to the US results of Dong et al (2006) we find that proxies for over-valuation appear to be the more persuasive explanation for acquisition behaviour in the UK. We do not find any evidence to support the Q-hypothesis. Given the evidence in favour of valuation effects, we argue that a selection model is necessary in investigating the long run performance of acquirers. Taken together with results from a univariate analysis, such a model reveals some modest, but not overwhelming, support for the Shleifer and Vishny (2003) hypothesis. However, we are unable to conclude that managers are acting in the best interests of the shareholders by using over-valued equity to purchase relatively under-valued targets.

JEL Classifications: *G14; G34*

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All errors remain the responsibility of the authors

Stock market driven acquisitions versus the Q theory of takeovers – The UK evidence

One of the more interesting theories to emerge from behavioural finance theorists in recent years has been that of market timing. Loughran and Ritter (2000) advance a theory of what they term "behavioural timing" which suggests that managers may seek to exploit perceived misvaluations of their firm's stock. This exploitation could, for example, take the form of issuing either equity or debt depending on perceived relative cheapness, or timing the decision to launch an initial public offering (IPO). Baker and Wurgler (2002) show that the financing structure of firms appears to be the result of past attempts to time the market. Shleifer and Vishny (2003) extend this market timing idea to suggest that firms make stock-financed acquisitions when their equity is highly valued, and in particular when it is more highly valued than the target's stock. Underlying all of these theories is the notion that management perceives the firm's stock to be misvalued by an inefficient market, and responds accordingly. In each case, they will be acting rationally and in the interests of existing stockholders, but at the expense of either new stockholders or new debtholders. For example, Loughran and Ritter (1995) and Baker and Wurgler (2000) show that stock returns are low following the issue of equity, and it is well-documented that stock returns are low following equity-financed acquisitions (Agrawal and Jaffe (2000); Agrawal, Jaffe and Mandelker, 1995; Gregory, 1997; Loughran and Vijh, 1997; Rau and Vermaelen, 1998). A refinement of the theory of over-valuation driving mergers is found in Rhodes-Kropf and Viswanathan (2004, henceforth RKV) where both bidders and targets have private information about the stand-alone values of their firms, but valuations have market-wide and firm-specific components. Furthermore, the combination of these misvaluation effects means that the target cannot assess the true value of any synergies. A key difference between the Shleifer and Vishny (2003, henceforth SV) and RKV models is that the latter assumes that target management acts rationally and in the interests of the shareholders, whereas in the SV model target management are either compensated or have short horizons leading to a preference for "selling out".

Our focus in this paper is on the acquisition decision in the UK. SV point out that a management team in an over-valued company that pursues a stock-financed acquisition of a less over-valued target could be acting rationally, in that although stock returns will be low following the acquisition, they will nonetheless be higher than they would have been had management taken no action[1]. In fact this will only be the case if management pursue an otherwise successful post acquisition strategy. The somewhat mixed evidence from cash-financed acquisitions (e.g. Agrawal and Jaffe, 2000) does not suggest that this can be entirely relied upon, for the UK at least. Furthermore, there are alternative actions available to management in the case where stock is over-valued. They could, for example, simply issue equity, either to finance future investment or to retire debt. This is potentially an important issue in framing the research design to address the Shleifer and Vishny hypothesis. If one takes the view that an equity financed acquisition is the *only* way to exploit a perceived over-valuation of stock, compared to an alternative of doing nothing, then the best research design is to compare a sample of stock-financing acquirers with a matched sample of equivalently-valued but non-acquiring firms. This design is found in Ang and Cheng (2006). In effect, the model employed assumes that the decision to acquire is endogenous, and simply the result of a market misvaluation that has arisen. An alternative view is that the decision to acquire a firm is exogenous, and that it is the financing method, or possibly the timing of the takeover, that is endogenous to the misvaluation of the equity. If one takes this second view, then the appropriate research design involves study acquiring companies, their financing choices, and the stock market performance following the acquisition decision. This is the type of research design employed by Dong, Hirshleifer, Richardson and Teoh (2006) and is also the design followed here. Rhodes-Kropf, Robinson and Viswanathan (2005) also study the set of bidding firms, but using a decomposition of market-to-book ratio approach.

In complete contrast to the market valuation models of mergers, under the Q-hypothesis of acquisitions as described in Dong et al (2006), firms are highly valued because they are well-run and have high NPV opportunities. Market values simply reflect growth opportunities and managerial ability. There is no particular reason for

[1] The RKV model leads to a similar prediction.

high-Q firms to prefer equity financing, although as Dong et al (2006, p.753) note, bidders with strong growth opportunities may prefer to preserve cash or keep gearing low in order to fund opportunities in the future. However, a critical difference between Q-theory and the valuation theories of mergers is that long run stock returns should be either positively related to, or unrelated to[2] Q whilst they should be negatively related to "over-valuation".

We study the UK market for two reasons. First, there is the usual (though nonetheless important) case for an out of sample test of the SV/RKV and Q hypotheses. If market valuation effects drive acquisitions and their financing, then *ceteris paribus*, one should find the effect exists in markets outside the US. However, markets have different ownership structures. For example, Andre and Ben-Amar (2008) describe Canada as having highly concentrated ownership with dominant family shareholdings, whilst Gregory and Matatko (2005, Table 1) discuss the very different ownership structure that prevailed in US and UK markets between 1975-1995, noting that "The relative unimportance of individual investors in the UK throughout the sample period means that there is less likely to be an emphasis on cash as a form of payment in acquisitions". In terms of concentration of ownership, Stapledon and Bates (2002, Table 2) show that the top twenty UK fund managers controlled 37.06% of the UK market by value as at the end of 1997, with the top three alone controlling just under 11%. Such concentration may mean that, to some degree at least, target shareholders are less likely to have the motivations claimed by SV, and may also be less likely to suffer from the information asymmetry that drives the RKV theory. In a concentrated market, we would also expect these fund managers to have a greater chance of identifying the market, sector and firm specific components of misvaluation identified in RKV. In short, there are reasons to suppose that stock market valuation effects on mergers should be weaker in the UK than in the US.[3]

The paper now proceeds as follows. First, we describe the data set and the research method. Second, we show how the data seem to be consistent with valuation effects influencing the form of payment. Third, we confirm the well-established result that

[2] Unrelated as if markets are efficient the reaction takes place on announcement.

[3] However, note that Gregory (2000) finds no evidence that institutional shareholdings have an influence in determining the form of financing.

equity acquirers perform worse than cash-financing acquirers. We also show that "highly valued" acquirers perform in a different fashion than "lowly-valued" acquirers, and that the form of financing is important in explaining this difference. We then go on to show that in a logit model which controls for factors that have been shown to influence the form of payment in UK studies, our proxies for valuation have a significant role to play in predicting the choice of financing method.

Finally, having shown that our proxies for valuation influence financing choice, we argue that the correct analysis of announcement period and longer-term performance requires that a treatment effects model is employed. We estimate such a model and show that there is some evidence to suggest that once the effect of valuation on financing choice is taken into account, there is at least some evidence to support the conjecture that SV "rational" equity financing acquirers seem to be acting in the interests of their shareholders. However, we find no evidence in the performance analysis to support the Q-hypothesis.

Data and Research Method

Our sample is mainly drawn from the SDC-Platinum Database (Securities Data Company), from 1985 to 2004 (inclusive), but in the early years' data are supplemented by the use of the *Acquisitions Monthly* AMDATA database. We require both acquirer and target firms to be UK listed companies on the London Stock Exchange, and for their monthly returns to be available on the London Business School Share Price Database (LSPD). The accounting data used in this research come from *DataStream*, with missing values hand-collected where possible from the *London Stock Exchange Official Year Book*. In addition, the market capitalisation data are collected from the LSPD.

We classify the sample according to the dominant method of payment. In this respect, it should be noted that there is a key difference between takeovers in the UK and takeovers elsewhere. In the UK, according to *The City Code on Takeovers and Mergers*, a share offer must be accompanied by a cash alternative offer if any shares have been purchased in the market for cash during the 12 months preceding the merger. This cash alternative has to be set, as a minimum, at the highest price paid for any shares in the market in this period. In practice, this means that a considerable number of UK takeovers are classified as shares and cash by SDC, when the reality is that many such takeovers are really stock financed deals with a regulatory cash alternative added on. Cooke, Gregory and Pearson (1994) provide some evidence on the generally low take-up of such an alternative. Accordingly, we use the following criteria to classify the method of payment:

> if the method of payment is 100% cash, or cash with a loan note alternative[4], then it is a cash transaction;
>
> if the method of payment includes some portion of shares, then it is a share transaction;
>
> any alternative offers are classified as other.

The total sample in this research is (initially) 805 acquisitions, with 251 being pure cash offers, 501 being share-offers and 53 deals being classified as "other". Given the paucity of information concerning the structure of the "other" bids[5], we choose to drop these from the analysis and concentrate on the distinction between equity and cash bids, which is at the heart of the SV hypothesis. For our initial univariate tests we require accounting data on earnings and book values for both acquirers and targets, in order to compute a residual income valuation (RIV), and we require at least the announcement month returns to be available for both acquirers and targets which reduces our core sample to 611 matched pairs of acquirer and target firms. As an alternative to the RIV, given the prevalence of dividend payment in the UK we also investigate our hypotheses using a dividend discount model (DDM). This gives a sample of 541 acquirers and 538 targets. Finally, we investigate a sub-sample for which IBES forecast data is available. This allows us to investigate a sample of 454 acquirers and 384 targets.

For this sample of firms, we estimate valuation models, as described below, and announcement month and longer term abnormal returns. Our model for abnormal returns is the buy and hold abnormal returns (BHAR) model, with bootstrapped skewness adjusted t-statistics p-values calculated following Lyon, Barber and Tsai

[4] During the early years of our sample this was a common offer as the loan note alternative was a tax-efficient form of payment for some private investors.

[5] Where we are able to fully assess these bids, by cross-referencing to copies of *Acquisitions Monthly*, these typically involve equity like components, such as warrants or convertible loan notes. Nonetheless, because of the complexity of these deals, we exclude them from the analysis.

(1999). We report these returns for up to 36 months post acquisition for acquirers, and up to 36 months pre-acquisition announcement month for both acquirers and targets. Given the evidence in Loughran and Ritter (2000) we present results for returns benchmarked against ten size-based control portfolios.[6] As in Lyon et al (1999), missing returns for firms lacking a full 36 months data are filled in with the size benchmark return.

The characteristics of our initial sample are presented in Table 1. We show acquiring firms characterised according to their size and book to market ratio (BTMV). We use deciles for size classification, and quintiles for BTMV classification, with an additional group (F) for those firms with negative book-to-market ratios. One striking characteristic from this table is that over one third of all equity financing acquirers are in the low (i.e. "glamour") book to market quintile, with 58.6% being in the two "glamour" quintiles. Not surprisingly, acquirers tend to be larger firms and this is particularly the case for cash acquirers.

We start by valuing our acquirers and targets using two models. Our first model is the residual income valuation (RIV) model used in both Ang and Chen (2006) and Dong et al (2006). Those papers follow the Lee, Myers and Swaminathan (1999, henceforth LMS) version of the Peasnell (1982) model[7] which requires a consensus analyst forecast of earnings and dividends to be available from IBES for three years ahead. Unfortunately, such forecasts are not available for the UK for the full period of our study (they start in 1987) and are somewhat patchy, and we find a large number of instances where forecasts are missing. UK analysts typically only forecast two years ahead and this is reflected in the poor availability of third year forecasts. We also find many examples of missing dividend forecasts. Were we to rigidly insist on full 3 year forecasts of earnings and dividends, our sample would be reduced to less than 150 target firms. By contrast, one year ahead forecasts are far more common, and 92% of

[6] An earlier version of this paper used both size and size and book to market matching, finding little qualitative difference between the model, although abnormal returns tended to be more negative for the size-matched BHARs. However, given our analysis here now reports results partitioned on book to market, we simply control for size in calculating BHARs.

[7] Often rather misleading referred to as the Ohlson (1995) model. The Ohlson model is a special case of the Peasnell model where abnormal earnings are assumed to mean revert according to a particular pattern which Ohlson terms a "linear information dynamic". In fact, the Lee et al (1999) framework is a special case of the Ohlson model where abnormal earnings are assumed to be persistent (ω=1) and where the value of Ohlson's "other information" variable is assumed to be zero.

firms that have a one year ahead forecast also have a two year one.[8] Dividend forecasts are only available for 62% of the targets which have earnings forecasts. Accordingly, we need to modify the LMS model somewhat. As all analysts' forecasts are in nominal terms, we fill in missing second and third year forecasts by assuming earnings grow in line with inflation, plus a real growth term. For real growth we take the long run UK average real earnings growth figure of 1.6% reported in Gregory (2007).[9] For missing dividends, we assume that the dividend paid is the same as the latest financial year end pre-merger dividend. We could, of course, assume a constant payout rate, but given the evidence on "sticky" dividends this is a not unreasonable assumption and, if earnings are rising, is more conservative than assuming a constant payout.[10] The expected long term inflation rate (g_t) at time t in the UK is calculated by using the difference[11] between the yield on long-dated gilts (the UK equivalent of the long dated Treasury Bond) and the yield on long dated index-linked gilts (the UK equivalent of TIPS, which have been in existence in the UK since 1984). Last, we model the growth in long term RI using one of two different alternatives. In model 1, we assume that from year 3 to year 4, earnings and book values grow at a real rate of 1.6% and that beyond that RI is constant in real terms. In model 2 we assume that RI grows in line with inflation from year 3 onwards. As Lundholm and O'Keefe show, assuming a given rate of RI growth is not the same as assuming that earnings and asset grow by this same rate from year n to year n+1 where n is the forecast horizon. We choose these two alternatives in order to measure the sensitivity of our modelling to changes in assumptions.[12] Formally, if $EPS_{i,t+1}...EPS_{i,t+3}$= are the consensus analyst's forecast earnings per share for firm i 1 to 3 years ahead, D_{it} ... D_{it+3} the consensus forecast dividends, and B_{it} is the current book value per share for firm i, our models are:

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[8] Note that even requiring any sort of forecast is not without cost. As we show later, the subset of firms for which forecasts are available exhibit less negative long term abnormal returns than the full sample.

[9] We do not believe that the absence of long run earnings forecasts for the UK should be a particular cause for concern. For the UK, Capstaff et al (1995) show that besides exhibiting bias, the consensus analyst forecast fails to out-perform a random walk model of earnings at horizons greater than 15 months. More generally, using US data Bulkley and Harris (1997) show that analysts' long run earnings forecasts are so biased as to be employable in a successful contrarian investment strategy.

[10] It is tempting to invoke dividend irrelevance, but whilst this applies in the long term, in the short term the assumed dividend has a modest impact on value, as it influences closing book value and hence the following periods' RI.

[11] (1 + nominal rate)/(1 + index-linked rate) -1

[12] We also allow RI to grow by more than the inflation rate in sensitivity tests. Whilst this changes the price-to-value ratios, our main results remain unaffected.

Model 1

$$RIV_{it} = B_{it} + \frac{RI_{i,t+1}}{(1+k_{ei})} + \frac{RI_{i,t+2}}{(1+k_{ei})^2} + \frac{RI_{i,t+3}}{(1+k_{ei})^3} + \frac{RI_{i,t+4}}{(1+k_{ei})^3(k_e - g_t)}$$, if RI_{t+4}>=0

Model 2

$$RIV_{it} = B_{it} + \frac{RI_{i,t+1}}{(1+k_{ei})} + \frac{RI_{i,t+2}}{(1+k_{ei})^2} + \frac{RI_{i,t+3}}{(1+k_{ei})^3} + \frac{RI_{i,t+3}(1+g_t)}{(1+k_{ei})^3(k_{ei} - g_t)}$$, if RI_{t+3}>=0

Where:

$RI_{i,t+j} = EPS_{i,t+j} - k_{ei}.B_{it+j-1}$, for j=1 to 3

$B_{i,t+j} = B_{it+j-1} + EPS_{i,t+j} - D_{i,t+j}$, for j=1 to 3

$RI_{i,t+4} = EPS_{i,t+3}.(1+g).(1.016) - k_{ei}.B_{i,t+3}$

In cases where the horizon value RI is negative, we replace the final RI terms in the equations for Models 1 and 2 above with zero, effectively assuming that at the end of the forecast period the firm is worth the closing book value implied by the short run earnings forecasts.

To estimate the above model we need a cost of equity capital, k_{ei}. Note that unlike Ang and Chen (2006) we do not employ a firm or an industry specific cost of capital. Fama and French (1997) express their disappointment at the instability of their own industry estimates, noting that "estimates of the cost of equity are distressingly imprecise". Gregory and Michou (2009) undertake a Fama and French (1997) type analysis for the UK, and in addition evaluate conditional and Cahart models. They end up by concluding that "Overall, the picture that emerges from the UK research is every bit as bleak as that which emerges from the Fama and French US study". As such, we see little point in doing anything other than assuming that the long run real cost of equity capital is similar across all our firms. Thus our estimate of the cost of equity capital, k_{ei}., only varies between firms because the expected inflation rate changes. We choose a 5% real rate as being broadly consistent with long run estimates of the UK cost of equity given in Dimson, Marsh and Staunton (2005), but we also sensitise our models by varying the cost of equity between 4% and 6% real.[13]

[13] We prefer to estimate the cost of equity directly, rather than estimate an equity risk premium. The first reason is theoretical, in that as Jenkinson (1993) points out, the risk free terms in any CAPM need to be consistent. As we effectively assume β=1 for all firms, this argument applies here. Second, from

Although the valuation ratios of course change, the inferences with regard to relative valuation do not.

Note that in any attempt to conduct an RIV valuation using forecasts, the estimates obtained are sensitive to both the cost of capital and the long run earnings growth assumptions used. One can "reverse engineer" an RIV model to extract an implied cost of capital (as, for example, in Claus and Thomas, 2001) or even jointly estimate the cost of capital and implied growth, as in Easton (2006), although his model cannot be applied at the level of the individual firm. Easton (2006) also notes that these estimates of cost of capital are sensitive to long run growth assumptions and this point will, of course, be equally valid in the calculation of RIV. We have to acknowledge that our models are limited in that they assume the same long run growth across all firms. However, in the absence of any long run consensus earnings growth forecasts for individual firms in the UK, we can do little else. Using realised long run average industry earnings growth estimates would be one possibility, but unfortunately this suffers from two flaws. First, UK earnings were not clean surplus, or even close to being so, for most of our sample period. Second, such an approach would give rise to hindsight bias in our valuations, which we seek to avoid.

As we note above, to impose the requirement that a consensus analyst's forecast be available reduces our sample considerably. Accordingly, we investigate two alternatives. The first simply involves filling in all missing forecasts using the procedures described in the preceding paragraph. In other words, in the absence of *any* analysts' forecasts whatsoever, we simply assume a real growth in earnings of 1.6%, but otherwise apply the models as described in (1) and (2) above. These form model 3 and 4 respectively. As a complete alternative, instead of using any forecasts, we simply assume that the current year's abnormal earnings grow in line with long run inflation and therefore have zero real growth. This is model 5. As is well-known, the RIV model requires that earnings and book values are in "clean surplus" form. Whilst using forecasts of earnings (either from using our "fill in" procedure or by using actual analysts forecasts), the projections made are clean surplus by design.

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an empirical standpoint, Wright et al (2003) argue against the separate estimation of the risk free rate and an equity risk premium on the grounds that estimates of the return on equities exhibit more stability than estimates of the equity risk premium.

However, in Model 5 we have to use the year *t-1* and year *t* accounting data RI for the firm, and this poses two problems. The first is that UK earnings are not clean surplus in the period being studied. Goodwill write-offs were common place (Gregory, 2000) and re-valuations of property (or real estate) assets took place on a regular basis. In neither case did the adjustments flow through the income statement. The second problem involves the issue of new equity. Here, we apply the process suggested by Cohen, Polk & Vuolteenaho (2005), in which new equity issues are calculated from the formula $MV_t - (MV_{t-1} * (1+R_t)) + D_t$, where MV_t is the market value of the firm at time *t*, and R_t is the total shareholder return on the equity for the period *t-1* to *t*. We then estimate Clean Surplus Earnings as $CSE_t = B_t - B_{t-1} - New\ Equity + D_t$, where B_t is the book value of the firm. In calculating the clean surplus return on equity, we assume any new equity is issued in middle of each year, so the Return on Equity $(ROE_t) = CSE_t / (B_{t-1} + 0.5 * New\ Equity)$. The RIV formula now becomes:

$$RIV_{it} = B_{it} + \frac{(ROE_{it} - k_{ei}).B_{i,t-1}(1 + g_t)}{k_{ei} - g_t}$$

where the long-term growth rate, g_t, is again equal to the expected long-term inflation rate at time *t*. With this model, in cases where the residual income is negative, we assume that the fair value of the firm is simply book value. For this model, we drop negative book-to-market firms.

We investigate two alternatives to the RIV models described above. The first is a dividend discount model. Clearly, this can only be estimated for the sub-set of firms which pay dividends, which results in a smaller sample. In the absence of a consensus analyst's forecast, the expected short run dividend growth rate for years 1-3 is calculated by using the geometric average of the past five years' dividend growth.[14] Where forecasts are available, we use the specific forecast dividends, but fill in second and third year dividends if missing using the short run forecast growth rates which are available. In order to estimate the long run value of the firm, we assume that this short run growth rate reverts according to a linear pattern over a five year period to a long-term growth rate of 1.3%, which is UK long-term real dividend growth rate from Gregory (2007). If the firm has a negative average dividend growth rate during our estimation period, we assume an initial real growth rate of zero.

[14] A shorter period is used where a full five year history does not exist.

Again, 5% is the assumed real cost of equity in the valuations for all firms. This gives us Model 6 for valuation.

Finally, we experimented with the forward earnings growth (FEG) model of Ohlson and Juettner-Nauroth (2005), where short term growth is the consensus analyst's forecast growth from year 1 to year 2, and long run growth is 1.6% plus inflation. Unfortunately, this model turns out to be capable of yielding some fairly wild estimates of value, that even with Winsorisation look unrealistic. We therefore dropped this model.

For all of these models, we then calculate a price to theoretical valuation ratio, such that values of the ratio greater than unity imply firms are over-valued. To avoid implausible values[15], we Winsorise the price-to-value ratio at the 5% level. Models 1 and 2, and models 3 and 4, turn out to be highly correlated with each other (perhaps not surprisingly), and give very similar results, so for reasons of space we drop these. Model 5 stands out from the other RIV models as having considerably higher price-to-value ratios[16], and although we show in an earlier version of this paper that we get similar results using such a model, we drop it here. For the dividend discount (DD) model the mean price-to-value ratio is far higher than those from the other models.[17] These valuations may appear extreme, but as Lundholm and O'Keefe (2001) show, DD valuations will tend to be low when firms are growing, unless dividend payout ratios are adjusted to be consistent with g = *retention ratio* x *ROE* at the forecast horizon. We have not attempted to do that here, so naturally our DD model forecasts will be conservative for "growth" firms. Nonetheless, the DD model gives results broadly consistent with our other models, with the exception of the sub-sample results reported in Tables 6 and 7 of the paper, where results seem to show rather "noisier" estimates of abnormal returns leading to lower significance levels in the tests.

For reasons of space, our reported results are limited to Model 1 (RIV requiring analysts' forecasts at least one year ahead), and Model 3 (RIV but with estimated RI based on projected earnings if no analysts' forecasts available). We also report results

[15] In particular, note that models 1-4 can potentially give rise to negative valuations if residual income is negative.
[16] In part, because of our assumption that RIV = book value if RI is negative.
[17] A mean of 3.37, with a median of 1.37.

on the basis of a simple book-to-market definition, where book-to-market is a proxy for the inverse of Q.[18] To test for differences in our univariate analysis, we use both a T-test (assuming unequal variances) and the Wilcoxon/Mann-Whitney rank-sum test.

Summary statistics on these models are presented in Table 2A, where we show the mean price-to-value ratio, the standard error of this ratio and the median for both acquirer and target.[19] Both of the RIV models, Model 1 and Model 3, exhibit mean ratios for acquirers that are significantly greater than 1.0. For Model 3, this ratio is 1.35, whilst for Model 1 (the "pure" forecast model) the mean is 1.16. The medians are 0.98 and 0.90 respectively. The book-to-market (BTM) model reveals that the average acquirer has a BTM of 0.58, with a median of 0.41. It is also clear from Table 2A equity acquirers have considerably higher valuation ratios than cash acquirers, with the p-value being significant at the 5% level in the case of Models 1 and 3. The non-parametric analysis also reveals significant differences. However, the difference in book to market ratios is not statistically significant, using a T-test, although the rank-sum test is significant at the 5% level. Under the Q-hypothesis, of course, there is no reason to suppose it should be different, but note that this result is different from that found in Dong et al (2006). Finally, given SV specifically predict that bidders in stock acquisitions earn high pre-bid returns, we test this using the pre-bid BHARs at 12 and 36 month horizons. Both cash and equity acquirers out-perform over the 36 months pre-bid, with the returns being significant using the Lyon et al (1999) bootstrapped skewness adjusted t-test, but at the 12 month horizon only the equity acquirers outperform. Finally, as predicted by SV, the prior returns are significantly greater for equity acquirers than for cash acquirers. However, given the properties of BHARs, it is arguably better to use a non-parametric test for differences, and the rank-sum test reveals both 1 year and 3 year prior abnormal returns are significantly different from one another using the rank-sum test.

Turning to target firms, we see that valuation ratios are considerably less than those for acquirers, and indeed significantly less than unity in the case of Model 1. However, whilst in all cases the target price-to-value ratios are, as predicted by the SV

[18] We are forced to use book-to-market rather than the more intuitive market-to-book ratio as we have a small number of negative book value firms in our sample. Dropping this small number of firms from our sample does not materially affect our results.
[19] Results from other models are available from the authors on request.

hypothesis, higher in the case of equity offers, the differences are not striking, and are never close to being statistically significant, using either the T-test or the rank-sum test.. Targets as a whole show significant under-performance pre-bid, with the exception of the cash sub-sample at the 36 month horizon, where the bootstrapped skewness-adjusted t-statistic just fails to be significant at the 10% level. This under-performance of targets is consistent with the SV hypothesis, although in contrast to the SV hypothesis cash targets show no evidence of pre-bid performance being worse than that of the equity targets.

We further partition these price-to-value models in two ways. First, we simply partition at the median, classifying firms as either "over-valued" or "under-valued". Doing so shows that under every model (including the book-to-market model), over-valued acquirers are significantly more likely to use equity financing than cash financing. It is also the case, perhaps not surprisingly, that each category of over-valuation has significantly higher pre-bid returns than under-valued firms, although it is perhaps worth noting that for every model at both 12 and 36 month horizons, mean pre-bid returns are never actually negative for under-valued acquirers.

Our second, and more detailed, analysis is undertaken by classifying firms into quintiles based on these price to value ratios, as in Dong et al (2006). This analysis for the acquirers is shown in Table 2B. Dividing into quintiles allows the comparison of "over-valued" and "under-valued" firms, as well as an analysis of the central quintile, which under models 1 and 3 have price-to-value ratios not significantly different from unity. Two features immediately stand out. First, there is a significant difference between the propensity to use equity in the lower and higher quintiles no matter which model of valuation is used. However, the result is only significant at the 10% level in the case of the BTMV model.[20] The difference fails to be significant using a rank-sum test, the p value being only 0.1249.. Furthermore, the proportion of firms using equity does not increase monotonically as we move from under-valued (Quntile 1 [Q5 under BTMV]) to over-valued (Quintile 5 [Q1 under BTMV]). Indeed, under model 1 and the BTMV model the central quintile has the highest proportion of equity to cash deals. Whilst this latter does not conflict with the Q-

[20] Similarly for the unreported DD model.

hypothesis, the results for the other models suggest that it may be principally firms that are under-valued that prefer to finance bids with cash, whilst those that are roughly correctly valued or over-valued use equity. That said, SV (p.305) note that an acquirer that is valued more highly than its target would only make a cash bid if the target is undervalued even at the bid price. This does not seem to be consistent with the evidence we see in Tables 2A and 2B.

The second striking feature of Table 2B is that highly valued acquirers buy highly valued targets. Under models 1 and 3, the target value increases monotonically as we move from under-valued to over-valued acquirers, and the difference between quintiles 1 and 5 is highly significant. The effect is not completely monotonic in the case of the BTMV model, but is still significant. In all models, as would be predicted by both SV and RKV, this relationship is strong in the case of equity bidders. Less comfortably for either theory, it is also strong in the case of cash bids.[21] However, this could simply be due to the fact that if markets as a whole are over-valued, then bid activity is more likely to be observed under both SV and RKV hypotheses. Because of this possibility, we control for market timing effects in our later logistic regression tests. Last, note that whilst acquirer book to market ratios differ significantly between Q5 and Q1 for all models and both cash and equity bids, the same variation does not always exist for the targets. Overall, target BTM ratios are significantly different between Q5 and Q1 acquirers, but the difference just fails to be significant (p=0.109) for equity bids under Model 3 using a T-test, whilst cash targets for this model only show a significant difference under this model using a rank-sum test.

In Table 2C, we present the data for target quintiles. This same effect is apparent here – expensive targets are purchased by expensive acquirers. Note, though, that there is no relationship between the propensity to finance with equity and the value of the target. In terms of target valuation effects, there appears to be no support here for any market valuation theory of mergers, nor for Martin’s (1996) risk-sharing hypothesis. For reasons of space, the results presented are simply for Model 3, but near identical

[21] Except when the DD model is employed

results are found under the other models. In particular, we note that this also holds for the book-to-market quintiles.

Last, in terms of the basic data description, In Table 3 we present correlations for each of the models between the price to value ratio, the value quintiles, the over-valuation dummy variable, the book-to-market ratio, and pre-bid returns. For the acquirer, we see a strong positive correlation between pre-bid performance and valuation. This effect is weaker in the targets and fails to be significant in the case of Model 3.

Simple Univariate Tests of Valuation and Method of Payment

Table 2A has already shown that the valuation ratio of equity acquirers is higher than the valuation ratio of cash acquirers, except in the case of the BTMV model, and that there are no significant valuation differences between equity and cash targets. We also show that the pre-bid performance of equity acquirers is significantly greater than that of cash acquirers, but that there is no difference in the pre-bid performance of cash and equity targets. Our next test, reported in Table 4, show the differences in price-to-value ratios between acquirers and targets. Together with the results in Table 2, these are the most basic tests of the SV model. We should expect that for the equity financing sub-sample, acquirers have a higher valuation ratio than the target firms, and, as we have already seen in Table 2, that the valuation ratio for equity financing acquirers is higher than that of cash financing acquirers. The overall figures show that no matter which model of valuation is employed, acquirer valuations are significantly higher than target valuations. The equity sub-sample behaves exactly as predicted by SV, where once again, no matter which valuation model is used, acquirers have significantly higher valuation ratios than their targets. To a degree, this valuation difference exists in the case of cash bids, although the statistical significance here depends on whether a parametric or non-parametric test statistic is used. Under the latter, only Model 3 has significant differences between bidder and target firms. The SV misvaluation hypothesis predicts (p.305) that cash bids take place when the target is under-valued at the bid price. Whilst Table 4 shows that cash targets have lower valuations than cash acquirers, Tables 2A and 2C highlight two problems for this specific prediction. First, from Table 2A there is no significant variation between the valuations placed on targets between cash and equity deals. Second, from Table 2C there is no significant variation in the proportion of cash deals between lowly valued and highly valued targets. Note also from Table 4 that for cash deals, the valuation difference between acquirers and targets in terms of book-to-market ratios is only significant at the 10% level, and is not significant using the rank-sum test. Under the Q-hypothesis the book to market difference should be significant for both cash and equity deals.

So far, target valuation excepted, the results are supportive of the SV hypotheses, but as Dong et al (2006) point out, they could also be supportive of the Q-theory of takeovers. Under the Q-theory, acquirers have higher market to book ratios (a proxy for Tobin's Q) than targets because they are more efficiently managed. Distinguishing between these competing hypotheses implies that we need to look at returns, and to look more closely at the factors that influence the form of financing. Accordingly, we now investigate these two issues.

Long and Short Run Abnormal Returns

The only way that we can reliably distinguish between the Q hypothesis and the SV hypothesis is to examine the post-acquisition returns of bidding firms. Under the SV hypothesis, equity financing acquirers would be expected to perform worse than cash financing acquirers. Under the Q-hypothesis, it is low Q acquirers which should perform worse than their high-Q counterparts. Of course, if markets are efficient, then this effect should appear at announcement. But the SV hypothesis is quite explicitly a misvaluation hypothesis, and the authors specifically state that it is the *long* run returns that will be negative (p.305). RKV also imply a concern with long run price corrections (p.2688). Although we report short run announcement month returns, we concentrate on the longer run BHARs to examine the competing hypotheses. We choose 1 year and 3 year BHARs simply because the years of our study do not allow the computation of full 5 years returns for the later years in our sample. Nonetheless, analysing 5-year BHARs where available generate results that are generally consistent with the 3 year BHARs.

In Table 5 we report the overall mean and median acquirer announcement month return (*acqar*), the target announcement month return (*tarar*), and the 1 year and 3 year BHARs for the acquirer (*acq1bhar*; *acq3bhar*). The first section of table 5 reports returns for the full sample of firms, for which both Model 3 can be estimated and for which BTM figures are available. Note that, in line with other studies, announcement period returns are not significantly different from zero, and target returns are a highly significant 21%. The 1 and 3 year BHARs are a significant -6.76% and -12.46% respectively, with both figures being highly significant using the bootstrapped skewness-adjusted T-statistic (BSAT). As predicted by SV (and RKV), the equity sub-sample performs worse, with significant abnormal returns of -8.26% and -17.13% respectively, although announcement period returns are insignificant. For the cash sample, the long run abnormal returns are an insignificant -3.88% after one year and -3.86% after 3 years. Target returns are higher in the case of cash bids, and significantly so using a conventional t-test.

However, it is apparent that the sub-sample for which analysts' forecasts are available has rather different characteristics. Announcement month returns are significantly negative, and only the 1 year BHARs are significantly negative. The 3-year BHAR is considerably smaller than that of the BTM/Model 3 sample. This is troubling, especially as tests (not reported) do not suggest that it is primarily a date effect.[22] With the caveat that the Model 1 returns may exhibit some sort of sub-sample bias, we now turn to an analysis of these returns by over/under valuation, and by relative over-valuation.

Table 6 reports the results when acquirers are classified into two groups based on model median price-to-value ratios: "over-valued" (which are the "high-Q" firms in the case of the BTM classification) and "under-valued" ("low-Q" in the case of the BTM classification). The prediction of the SV or RKV hypotheses would be that over-valued firms should have the lowest returns whilst the Q-hypothesis could be interpreted as either suggesting the opposite, or at least should predict that high-Q bidders do not experience negative returns. Tests for differences use the non-parametric rank-sum test. Model 3 results are reported in Table 6 Panel A. Overall, the announcement period returns are insignificant, but the Year 1 BHARs are significantly negative for both over-valued and under-valued firms, with over-valued firms having a worse (but not significantly worse) performance. However, the effect reverses slightly at the 3-year horizons. Overall, it is difficult to distinguish between

[22] Analysts' forecasts are not available before January 1987. Dropping the early years from our sample gives returns that are closer to those of the full sample than the Model 1 sub-sample.

the over-valued and under-valued groups. Turning to the cash acquirers, we see that although none of the abnormal returns are statistically significant, the over-valued acquirers appear to fare rather worse (although not significantly so) than their under-valued counter-parts, even though the target announcement period returns for this group are significantly lower. However, the equity acquirers reveal a more interesting picture. At the one year horizon, BHARs for both groups are significantly negative, with the over-valued firms having somewhat higher negative abnormal returns (-9.05% vs a return of -7.35% for the undervalued acquirers). By the third year, the BHARs have reversed, with over-valued firms having a insignificant abnormal return of -13.65% compared to a significant -21.04% for the under-valued group, although the difference is not significant using the rank-sum test. Over-valued firms also pay a significantly higher premium to targets. This evidence is not actually inconsistent with the SV hypothesis, but it does require that we investigate the role of *relative* valuation, to which we turn after summarising the results from the other models.

Model 1 produces results (Table 6, Panel B) that, as we note above, have overall higher mean abnormal returns than other models, but also suggest that it is under-valued equity acquirers that under-perform. This effect is also weakly significant in the announcement month for these firms. However, at the one year horizon over-valued cash acquirers under-perform, although the return of -6.94% is only significant at the 10% level. By year 3, under-valued acquirers under-perform by a significant 29.57% and the difference between over and under-valued equity acquirer performance is significant at the 10% level.

Perhaps the most interesting results come from the test of the Q-hypothesis in Table 6, Panel B. Looking at the overall results, we see that the high-Q ("overvalued") acquirers have negative abnormal returns at the 1 and 3 year horizons, and that the difference in returns is significant at the 10% level. It is hard to reconcile this with Q-theory. One could appeal to a rational risk pricing explanation, were it not for the fact that this sub-group earn far higher pre-bid abnormal returns than the set of low-Q acquirers (a significant +38.4% for the overvalued/high-Q group compared to an insignificant +1.8% for the low-Q/under-valued group for the year ending 1 month before announcement). It seems more plausible that book-to-market is serving as a proxy for over-valuation rather than investment opportunities. However, note that low-Q/under-valued acquirers also exhibit poor performance, although it is less poor and less significant at the 3 year horizon. Intriguingly, in the sub-analysis by financing we observe that after one year, both sub-sets of acquirers under-perform significantly, but the under-valued equity acquirers have an abnormal return of -9.12% compared to -7.51% for the over-valued firms. Although the latter have a larger negative return after 3 years, the over-valued group is not significantly different from zero, whereas the under-valued group of equity acquirers is. A further interesting result is that High-Q bidders are associated with significantly higher target announcement period returns than low-Q bidders, the abnormal returns being 25.02% compared to 17.15%, and this difference is particularly marked (and is significant) when acquisitions are for shares. Of course, this is not necessarily inconsistent with the Q-hypothesis, in that highly valued acquirers (reflective of managerial ability under Q-theory) may be prepared to pay more to secure the best targets, but the finding fits more comfortably with a SV or RKV framework, where over-valued bidders have to pay more either to "buy off" target managers under the SV hypothesis, or to persuade target managers that the bid is worth more than their stand-alone value in the case of the RKV model.

Our last tests in this section investigate the specific prediction of the SV model (p.305) that relatively over-valued acquirers undertake equity-financed acquisitions of relatively less over-valued targets. Accordingly, in Table 7, we report the results after partitioning on the basis of relative values. An acquirer is relatively over-valued if its price-to-value ratio is greater than the target's, and relatively under-valued otherwise. Turning to the Model 3 results, we see that the announcement period returns for the whole sample of relatively over-valued firms are negative, as they are for the equity sub-sample. This contradicts the SV hypothesis. However, the SV model does not predict an efficient market reaction on announcement. Turning to the longer term we see that for the whole sample, both relatively over-valued acquirers and relatively under-valued acquirers earn negative abnormal returns (the former significant only at the 10% level at 36 months). However, for cash acquirers, relatively over-valued bidders actually suffer negative long-run returns of -5.35% and -11.32% at the 12 and 36 month horizons (both significant at the 10% level), whereas relatively over-valued equity acquirers have significant negative abnormal returns of -7.92% after 12 months but these just fail to be significant after 36 months. By contrast, relatively under-valued cash acquirers have abnormal returns close to zero (actually positive but insignificant after 36 months), whereas equity acquirers that are relatively under-valued have highly significant negative abnormal returns of -8.74% after 12 months and -23.06% after 36 months. None of the differences in bidder performance are significant using the rank-sum test. One point worth emphasising is that the long run outcome gives a different result from the short run outcome. The results here are consistent with the market initially assuming that relatively over-valued bidders are signalling that over-valuation by bidding in stock, yet that subsequently it is the relatively under-valued firms that should not have been using stock to finance a deal. This long run outcome is entirely consistent with the SV hypothesis. It is also the case that the target abnormal returns are greater in the case of relatively over-valued acquirers as a whole, and is particularly the case for relatively over-valued equity acquirers compared to relatively under-valued acquirers, where the difference is significant. Again, this is consistent with both the SV and RKV hypotheses.

We have already noted the possible bias in the returns for the Model 1 sub-sample, and highlighted the differences in long run abnormal returns between Model 1 and 2 in Table 5. Nonetheless, the results in Table 7 Panel B broadly confirm the "big-picture" message with regard to the equity sub-sample from Model 3 in Panel A, save for the fact that the differences in target returns are no longer significant. Despite announcement period returns being negative, the long run BHARs for the relatively over-valued equity acquirers are not significantly different from zero, whilst the relatively under valued equity acquirers show a significant negative 3 year BHAR of -22%. Furthermore, the difference in returns is significant. Although the pattern for cash acquirers follows that of Model 3, none of the returns are significant.

Finally, Panel C of Table 7 investigates what happens when we partition on the basis of relative Q-ratios. The Q-hypothesis would predict that the best performance should be observed by relatively highly valued acquirers, as these are the firms with the superior investment opportunity set. By contrast, relatively "under valued" acquirers are those where, presumably, the target has the better investment opportunity set. Consequently, Q-theory would predict this should be the worst performing sub-group. The results are simply not supportive of the Q-hypothesis. Overall, it is the relatively over-valued/High-Q firms that perform the worst over 36 months, although both relatively over-valued and relatively under-valued firms have significantly negative BHARs after 1 year. The difference in 3 year BHAR just fails to be significant at the 10% level (p=0.1086). In the short run, announcement period returns for the relatively under-valued cash acquirers are significantly negative which, whilst consistent with the Q-hypothesis, leaves us with the intriguing question of why it is only low-Q cash acquirers (rather than all low-Q acquirers) that experience negative announcement period returns. Over the longer term, the abnormal returns for the cash financing group exhibit no significance, but for the group of equity financing acquirers we observe a significantly negative announcement period return of -1.42% and negative 1 year and 3 year BHARs of -7.13% and -19.9%. This result is hard to reconcile with the Q-hypothesis, but straightforward to reconcile with an over-valuation story. Once more, any appeal to rational risk pricing has top overcome the fact that the pre-bid returns for the relatively high-Q group are far higher than those for the relatively low-Q group.[23]

Logit regression tests of acquisition financing

In keeping with the Dong et al (2006) and Ang and Cheng (2006) studies we undertake a logit regression analysis to analyse the method of payment. Above, we have examined univariate tests, which is helpful in shedding some light on the financing decision, but a more rigorous method of testing the form of consideration is to run a logistic regression on the method of payment, where the dependent variable is equity financing. Following Ang and Chen (2006) we investigate the issue of momentum in acquirer stock returns, but split it into two components – a general market return term, *dmkt*, the return on the FT All Share Index in the 12 months pre-announcement of the acquisition, and *acqp3bhar*, the BHAR of the acquirer in the twelve months prior to the bid announcement month.[24] As pre-bid abnormal return and the valuation metric are highly correlated (0.4 in Model 3, from Table 3) we do not include pre-bid abnormal returns and the valuation metric in the same regressions.[25] However, we do include the *dmkt* variable as general market-wide conditions seem to play an important role in determining financing. Our other market

[23] The 12 month pre-bid BHARs are 24.2% and 9.7% respectively.
[24] We also ran regressions using the BHAR for 36 months pre bid, with similar results.
[25] Doing so results in both variables becoming marginally insignificant.

timing variable is designed to pick up the effect of the underlying real interest rate, as measured by *indexlkyield*, the UK Government Index-Linked Yield immediately prior to the acquisition. We also include the expected inflation term, *inflation*, as proxied by the difference between nominal and index-linked gilt rates.[26] Our valuation variables are: *val3(1)quin*, the acquirer market value to RI value quintile[27] in the month pre-acquisition from either Model 3 or 1; *tarval3(1)quin*, the target market value to RI value quintile in the month pre-acquisition from either Model 3 or 1; *abtmvquin*, the acquirer's book-to-market quintile in the month pre-acquisition; *tbtmvquin*, the target's book-to-market ratio quintile in the month pre-acquisition either Model 3 or 1; *relovervalri3(1)*, a dummy variable = 1 if the acquirer's RIV valuation either Model 3 or 1 is higher than the target's RIV valuation; *relovervalMTB*, a dummy variable = 1 if the acquirer's market-to-book valuation is higher than the target's market-to-book valuation. We include the latter dummies to pick up the SV hypothesised relationship that it is *relative* over valuation of acquirers compared to their targets that will influence the decision to launch an equity-financed bid. We also control for target size and relative size using *logrelsize*, the log of the relative market capitalisation of the target divided by that of the acquirer, and *lnacqcap*, the log of the market capitalisation of the acquirer. Last, we include the target announcement period return as a measure of the bid premium, *tarar*.[28]

The results are reported in Table 8, where we run six alternative models: the two RIV models, and the "Q" model, and also the same models run on the basis of absolute values rather than relative values. For reasons of space we do not report the prior return models, but note that (independently) both the prior 12 month acquirer BHAR and the prior 36 month acquirer BHAR are significant in explaining the issue of equity, although the Pseudo R-squared statistics are lower than those obtained from the quintile models.

Turning to the results in Table 8 we can see that the 12-month prior return on the stockmarket is highly significant in the case of Model 3 and the book-to-market

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[26] See footnote x

[27] Note that including the price-to-value variable itself results in similar significance though somewhat weaker explanatory models, hence our preference for the quintile variables.

[28] Using the target's premium measured as bid price less price 1 month previously yields similar results.

model, but not in Model 1. High real interest rates also seem to have an association with the likelihood of an equity offer, although the effect is marginal and depends on the model and whether over-valuation is measured in absolute or relative terms. However, periods of high inflation are associated with cash offers. As may be expected, relatively large targets increase the probability of an equity offer. However, the target premium never has any significant relationship with the method of payment.

Turning to the specific models, under Model 3 we find the acquirer's market to RI value quintile is a highly significant determinant of the probability of an equity financed bid, but the target's valuation quintile fails to be significant. The results in columns 4 and 5 show that relative value is not significant in determining the probability of an equity offer. Rather, it is the absolute over-valuation of the acquirer that drives the decision to use equity financing. This result on absolute valuation is confirmed using Model 1, but here we find that relative valuation is also an important explanatory factor, with the coefficient being significant at the 10% level. When book-to-market is employed as the valuation model, a low book to market ratio is associated with a higher probability of an equity offer. Furthermore, we observe that relative overvaluation is significantly associated with the probability of an equity offer. As we noted in the univariate results section, one might argue that this tendency for high-Q firms to finance with equity not in itself problematic for the Q-theory of takeovers. However, a propensity for *relatively* highly valued firms to finance takeovers through equity would appear to be more consistent with the book-to-market ratio capturing over-valuation rather than acquirer efficiency. Furthermore, this finding is inconsistent with Martin's (1996) risk-sharing hypothesis, which would predict that equity offers are more likely when targets are relatively highly valued. One further test of this matter lies in the relationship between equity offers and subsequent returns, once the factors that influence the decision to issue equity are allowed for, and it is to that issue that we now turn.

Tests of long run acquirer performance contingent on the decision to issue equity

The above findings clearly show that market timing variables, acquirer valuation and possibly relative valuation ratios, together with variables capturing the size of acquirers and targets are important determinants of the acquirer's financing decision. Neither the Ang and Chen (2006) nor the Dong et al (2006) papers investigate the long run performance of equity acquirers relative to cash acquirers. Yet as we noted earlier this matter would seem to be critically important in comparing the SV hypothesis to the Q-hypothesis of takeovers. Under the SV hypothesis, we would expect under-performance of equity acquirers relative to that of cash acquirers, but the acquisition itself represents the rational exploitation of over-valued equity by the acquirer's management. Under Q-theory, the equity valuation of the acquirer is rational and is reflective of the managerial skill and investment opportunity set of the firm. As such, we would expect to see high-Q firms (that is, those with low book-to-market ratios) performing better than low-Q firms, irrespective of the choice of financing.

It is tempting to run OLS regressions to try and detect any abnormal performance, either in the form of two regressions for the equity and cash sub-samples, or one regression with a dummy variable for *shares*. Indeed, if we do so we find that *shares* is a significant explanatory variable for all or model sub-sets, implying that issuing equity has a negative impact on post bid returns, which simply confirms our Table 5 findings and those of other researchers. Unfortunately, it turns out that neither of these approaches to assessing the impact of equity issuance is correct. For example, Greene (2000, pp 933-4) shows that if we try to estimate the regression:

$$R_i = \beta' x_i + \delta S_i + \varepsilon_i ,$$

Where R_i is a measure of abnormal returns and S_i is a dummy variable=1 if the takeover is financed by equity, in general the OLS estimate of S_i will over-state will over-state the effect of an equity offering because of self-selection bias. The managers that select equity may do so because of factors that were expected to influence returns, such as overvaluation. The correct approach here is to model the decision on financing using a first stage probit model, and then form a selectivity correction term (or "hazard" function), λ_i, which is incorporated in a second-stage OLS regression (Maddala, 1983; Greene, 2000, p.934), known as a "treatment effects" model. We follow this procedure and run the model using the 2-stage treatment effects procedure available in Stata.[29] For the first stage model we use as predictors the variables used

[29] Note that in general, either a two-stage process or maximum-likelihood can be used to estimate the parameters of any selection model. However, Greene (2000, p.930) seems to prefer the former, noting that the latter is "quite cumbersome". Nonetheless, we obtain similar results under a maximum likelihood procedure.

in the logistic regression, save for the fact we drop the target abnormal return which never comes close to approaching significance in any of the models run. Neither do we report the relative over valuation model for either Model 3 or Model 1.[30] In the second-stage regression we employ the 36 month BHARs, but Winsorise them at the 5% level to reduce the influence of outliers.[31] The point here is that if SV are correct, and managers are issuing equity in response to over-valuation, once that valuation is taken into account then the coefficient on shares should be zero. As more a direct test of the SV hypothesis, we also form a new variable *rightshares*, which is a dummy variable equal to one if the acquirer finances by equity and its stock is relatively over-valued compared to that of the target. We hypothesise that the coefficient on this variable should be positive, whilst the coefficient on *shares* (which, in the presence of the *rightshare*s dummy variable picks up firms who issue equity when their equity is relatively under-valued compared to the target) should be negative if the SV hypothesis holds.

The parsimonious results from this analysis are shown in the first panel of Table 9, whilst the second panel presents the results from the first stage probit model. The third panel gives information on the selectivity correction term, lambda. First, note that the results from the first-stage probit model are entirely consistent with those of the logistic regressions reported above. We drop the target announcement return in carrying out the probit regression as it never comes close to significance in the Table 8 logistic regressions. In the second stage, it turns out to be difficult to predict the post-event BHARs. Perhaps this is not surprising given the inevitably skewed distribution of the BHARs, to which our Winsorisation only makes a modest reduction. Whilst BHARs reflect the realised abnormal returns of investors[32], they do not have the statistical properties that might be thought desirable for analysis in an OLS framework. Before proceeding, it is perhaps worth noting that a simple OLS analysis for the full sample and equity and cash sub-samples suggests that a measure of the long interest rate on UK Government Gilts, *giltyield*, is a significant negative predictor of long run returns as are the target abnormal return (other interest rate

[30] Simply because such models do not have significant coefficients on the relative over-valuation terms in the first stage probit regression.
[31] Although Winsorisation only leads to a modes improvement in explanatory power.
[32] Subject, of course, to the usual caveats on an adequate risk-adjusted benchmark being employed.

variables [Treasury Bill rates and real gilt yields] fail to be significant), *tapar* and the log of the market capitalisation of the acquirer, *lnacqcap*

At the 36-month horizon, the augmented regression shows that the UK Gilt fails to be a predictor of returns in any of the models, as does the acquirer's market capitalisation, except in Model 3. The target abnormal return is always a significant negative predictor of return. One of our central variables of interest, *shares,* has no explanatory power in Model 1, but retains significance in Model 3 at the 10% level. *Rightshares* similarly behaves inconsistently in Models 3 and 1. In Model 3, it has the predicted sign but only has a 16.4% significance level. In Model 1, it is significantly positive at the 10% level. However, we should note that whilst a Wald test on model 3 shows the treatment regression to be highly significant, the model 1 regression is only significant at the 10% level.[33] We can also test the joint significance of both the *shares* and *rightshares* variables in the above regressions using a Wald test. It turns out that doing so reveals that we cannot reject the joint hypothesis that both coefficients are zero. Whilst these results are not inconsistent with the SV hypothesis, strong evidence in favour of the model would have required consistent behaviour of these coefficients under both models, and for Model 1 to have a Wald test significant at the 5% level.

Under the BTM model, we first report the results from the full regression used for Models 1 and 3. Here, *shares* just fails to be significant at the 10% level and *rightshares* is completely insignificant. However, under Q-theory there is no reason to investigate the role of a variable that hypothesises managers should finance with equity when the firm is under-valued. Accordingly, we re-run the model without *rightshares*. The result is that the *shares* variable still maintains its explanatory power in the augmented regression. The Wald test is significant at the 1% level for both models. Thus even allowing for the fact that the book-to-market ratio influences the choice of equity financing, stock acquirers under-perform significantly. These results for the BTM model provide no support for the Q-hypothesis. However, to the extent that book-to-market is a proxy for value, neither does the result that *shares* retains significant explanatory power, after allowing for valuation effects, provide support for

[33] The simple expedient of dropping the *giltrate* variable improves the p value to 6.24%.

the SV hypothesis. For completeness we note that the unreported dividend discount model shows *shares* to be significantly negative at the 5% level but *rightshares* to be insignificant. As with Model 3, the Wald test for the DD model is highly significant. Thus the DD model produces a result similar to that from the BTM model. As a final check, we can also run a treatment effects model using prior 3 year returns, instead of any of our valuation models, as the dependent variable predicting the likelihood of an equity offer. This confirms that prior returns have significant (at the 5% level) predictive power, and also reveals that *shares* has significant power in explaining post-bid returns.

Conclusions

In this paper, we have explored the SV and Q hypotheses of takeovers using a new sample taken from a market that has not so far been subject to a test of the SV hypothesis. Most of our findings are broadly supportive of the SV market-driven theory of takeovers. Proxies for acquirer over-valuation seems to increase the probability of an equity offer, even after market timing and relative size effects have been allowed for. “Over-valued” acquirers also tend to buy “over-valued” targets. Our finding that acquirers are more highly valued than their targets adds support to the SV hypothesis, but is also consistent with the Q-hypothesis. We argue that the best way of distinguishing between the SV and Q hypotheses is to examine long run returns, since SV specifically predict that these should be negative for equity financing acquirers, although not as negative as they would have been if the acquisition had not taken place. By contrast, the Q-hypothesis would predict that long run returns should either be positive or zero. We find that for equity-financed takeovers long-run abnormal returns are significantly negative. Digging deeper, we find that acquirers that are relatively under-valued (as proxied by an RIV model) compared to their targets have poorer long run returns than acquirers that are relatively over-valued, whereas for cash acquirers it is the relatively-over valued acquirers that perform worse. This seems to be consistent with the SV hypothesis. When we investigate the position of relatively high-Q acquirers, we find that it is high-Q equity acquirers that perform poorly in the long-run. This seems to be inconsistent with the Q-hypothesis.

Given our finding that the form of financing can be predicted by valuation related variables, we argue that a treatment effects model should be used in any subsequent analysis of abnormal returns. The results from this are simply model dependent. From our full RIV model there are some modest indications of support for the SV proposition that managers of over-valued firms may be acting rationally in buying relatively under-valued targets for equity, but we are unable to demonstrate strong support for this. However, we find no evidence in favour of this using either a DD model or a BTM model. Taken as a whole, our results leave us in the position of being unable to confirm SV's proposition that managers of over-valued acquirers are acting in the shareholders best interests by exploiting that over-valuation to buy under-valued targets.

Where all our models agree is in rejecting the Q-hypothesis. High-Q acquirers perform worse than low-Q acquirers in the long run, relatively high-Q acquirers do worse than relatively low-Q acquirers, and in our logit regressions we find that book-to-market quintile is a significant predictor of the probability of an equity-financed bid. All of these are evidence against the Q-hypothesis.

Whilst our results are generally consistent with the SV hypothesis, and by extension are supportive of the RKV model, there are some results that are not consistent. First, we are unable to detect that any variation in the value of target firms has any significant influence on the probability of an equity offer. Neither can we show, controlling for other factors that might influence the form of financing, that relative over-valuation always has a significant role to play in predicting the probability of an equity offer, although our results here are model dependent. Of course, we have to acknowledge that our results are dependent on our valuation models being reasonable. To an extent we are handicapped here by the poor availability of analysts' forecasts, particularly in the early years, which has required us to use our own RI estimation techniques. Nonetheless, cross-checking with a dividend discount model confirms many, but by no means all, of our results.

One important caveat remains. Under the SV hypothesis, managers knowingly issue over-valued equity to buy targets. However, as an anonymous referee has pointed out, a plausible explanation is that the over-valued firms may simply be firms with a strong price run up, and that the managers in those firms are likely to suffer from hubris. They will finance bids with equity to conserve financial slack. Given we find a correlation between prior abnormal returns and over-valuation, and that prior returns also have predictive power in explaining the decision to acquire using equity, most of our results that support the SV hypothesis can be also interpreted as being consistent with this alternative "hubris"-type hypothesis. The only way that we can see of testing this is to examine the trading activity of the acquiring firm's directors. SV specifically predict that there will be evidence of stock selling by insiders in over-valued firms that finance bids by equity. This test of the hubris hypothesis versus the SV hypothesis is a matter worthy of detailed investigation in its own right, and we leave that for future research.

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Table 1: Acquirer Size and book to market (BTMV) details

Each year from 1985 to 2004, all firms recorded in LSPD are sorted on their market capitalisation in descending order, and classify all these firms into 10 size deciles, deciles 1 contains largest firms, while deciles 10 contains the smallest firms. Acquirers are assigned into their appropriate size deciles according to their individual market capitalisation in the year of acquisition.

We also collect all the BTMV values for all the firms recoded on LSPD each year from 1985—2004 for which book-to-market ratios are available on *DataStream*, and divide all the firms with positive BTMV ratio into 5 group, with Group A contains the lowest BTMV ratio firm, and Group E contains the highest BTMV ratio firm. All firms with negative BTMV ratio are assigned into Group F. The acquiring firms are allocated into the appropriate BTMV group in each year based upon their end June BTMV ratios.

Size decile	**Whole sample**	**%**	**Cash**	**%**	**Equity**	**%**
1	195	31.9%	91	43.3%	104	25.9%
2	102	16.7%	41	19.5%	61	15.2%
3	84	13.7%	26	12.4%	58	14.5%
4	72	11.8%	16	7.6%	56	14.0%
5	35	5.7%	6	2.9%	29	7.2%
6	35	5.7%	8	3.8%	27	6.7%
7	41	6.7%	8	3.8%	33	8.2%
8	26	4.3%	10	4.8%	16	4.0%
9	14	2.3%	3	1.4%	11	2.7%
10	7	1.1%	1	0.5%	6	1.5%
Total	611	100.0%	210	100.0%	401	100.0%
BMV Quintile	**Whole sample**	**%**	**Cash**	**%**	**Equity**	**%**
A	196	32.1%	55	26.2%	141	35.2%
B	127	20.8%	33	15.7%	94	23.4%
C	88	14.4%	28	13.3%	60	15.0%
D	89	14.6%	44	21.0%	45	11.2%
E	103	16.9%	45	21.4%	58	14.5%
F	8	1.3%	5	2.4%	3	0.7%
Total	611	100.0%	210	100.0%	401	100.0%

Table 2. Simple Univariate Analysis of Valuation Differences

Table 2A: Mean and Median ratios The values show the mean, standard error of the mean, and median market value (P) to theoretical value (V) ratios for acquirers, targets and the difference between them for the full sample, equity financing and cash sub-samples respectively, using the models described in the text. Pre-acquisition Buy and Hold Abnormal Returns are shown with significance levels of 1%, 5% and 10% from a bootstrapped skewness adjusted t-statstic indicated by *, ** and ** respectively. For differences the tests used are the two-sample T-statsistic assuming unequal variances (significance indicated by *) and the Wilcoxon Rank-Sum Test, (significance indicated by †).

Acquirers					
Cash	Mod1 P/V	Mod3 P/V	BTMV	Prior 1 year BHAR	Prior 3 Year BHAR
Mean	1.053	1.202	0.615	0.076	0.244
SE Mean/Sig Skew T	0.062	0.072	0.042	ns	**
Median	0.803	0.857	0.464	0.007	-0.029
Equity					
Mean	1.234	1.423	0.563	0.240	0.657
SE Mean/Sig Skew T	0.054	0.060	0.032	***	***
Median	0.957	1.031	0.381	0.066	0.147
All					
Mean	1.167	1.347	0.581	0.184	0.515
SE Mean/Sig Skew T	0.041	0.047	0.026	***	***
Median	0.905	0.980	0.406	0.038	0.071
Sig Equity v cash	**, †††	**, ††	n.s,††	**, ††	***, ††
Targets					
Cash	Mod1 P/V	Mod3 P/V	BTMV	Prior 1 year BHAR	Prior 3 Year BHAR
Mean	0.896	1.004	0.676	-0.091	-0.264
SE Mean/Sig Skew T	0.039	0.041	0.041	**	ns
Median	0.819	0.866	0.543	-0.104	-0.361
Equity					
Mean	0.914	1.063	0.660	-0.098	-0.211
SE Mean/Sig Skew T	0.029	0.031	0.027	**	**
Median	0.795	0.904	0.545	-0.132	-0.441
All					
Mean	0.907	1.043	0.666	-0.096	-0.230
SE Mean/Sig Skew T	0.024	0.025	0.022	***	***
Median	0.801	0.880	0.545	-0.119	-0.399
Sig Equity v cash	n.s., n.s.	n.s., n.s.	n.s., n.s.	n.s., n.s.	n.s., n.s.

Table 2B: Value Quintile ratios for Acquirers. Values show the mean market value (P) to theoretical value (V) ratios for acquirers, with significance tests of value for differences between Q1 and Q5: the two-sample T-statsistic assuming unequal variances (significance indicated by *) and the Wilcoxon Rank-Sum Test, (significance indicated by †).

	All	All	All	All	All	All	Shares	Shares	Shares	Shares	Cash	Cash	Cash	Cash
val3quin	cash	shares	PV Acquirer	PV Target	acqbtmv	tarbtmv	PV Acquirer	PV Target	acqbtmv	tarbtmv	PV Acquirer	PV Target	acqbtmv	tarbtmv
Model3														
1	0.415	0.585	0.369	0.838	0.933	0.776	0.347	0.814	0.993	0.701	0.400	0.872	0.848	0.883
2	0.434	0.566	0.724	0.893	0.560	0.615	0.732	0.872	0.501	0.622	0.714	0.921	0.637	0.607
3	0.295	0.705	0.994	1.104	0.585	0.641	0.988	1.129	0.571	0.697	1.008	1.046	0.617	0.508
4	0.303	0.697	1.406	1.173	0.493	0.707	1.404	1.225	0.478	0.737	1.410	1.052	0.528	0.637
5	0.270	0.730	3.250	1.206	0.330	0.588	3.268	1.194	0.337	0.549	3.201	1.240	0.311	0.694
Total	0.344	0.656	1.347	1.043	0.581	0.666	1.423	1.063	0.563	0.660	1.202	1.004	0.615	0.676
Diffs 5-1	-0.144	0.144	2.881	0.368	-0.603	-0.188	2.921	0.380	-0.656	-0.152	2.800	0.368	-0.537	-0.188
P	***,††	***,††	***,†††	***,†††	***,†††	***,†††	***,†††	***,†††	***,†††	n.s., †	***,†††	***,†††	***,†††	n.s., †
Model1														
1	0.473	0.527	0.364	0.727	0.977	0.825	0.346	0.687	1.035	0.799	0.384	0.774	0.913	0.854
2	0.429	0.571	0.690	0.818	0.506	0.589	0.691	0.816	0.487	0.635	0.688	0.821	0.531	0.527
3	0.308	0.692	0.906	0.954	0.598	0.646	0.913	0.940	0.508	0.670	0.891	0.987	0.800	0.592
4	0.330	0.670	1.266	1.016	0.509	0.651	1.269	1.038	0.517	0.733	1.262	0.970	0.492	0.486
5	0.311	0.689	2.623	1.051	0.275	0.491	2.668	1.029	0.272	0.443	2.525	1.096	0.281	0.598
Total	0.370	0.630	1.167	0.910	0.574	0.641	1.234	0.912	0.543	0.649	1.053	0.907	0.625	0.626
Diffs 5-1	-0.161	0.161	2.259	0.325	-0.702	-0.334	2.321	0.343	-0.763	-0.356	2.141	0.321	-0.632	-0.256
P	**, ††	**, ††	***,†††	***,†††	***,†††	***,†††	***,†††	***,†††	***,†††	***,†††	***,†††	**, ††	***,†††	*, ††
BTMV														
1	0.298	0.702	N/A	N/A	0.104	0.441	N/A	N/A	0.101	0.411	N/A	N/A	0.113	0.513
2	0.306	0.694	N/A	N/A	0.249	0.693	N/A	N/A	0.250	0.700	N/A	N/A	0.247	0.678
3	0.258	0.742	N/A	N/A	0.412	0.566	N/A	N/A	0.413	0.568	N/A	N/A	0.410	0.561
4	0.446	0.554	N/A	N/A	0.671	0.777	N/A	N/A	0.670	0.808	N/A	N/A	0.673	0.739
5	0.392	0.608	N/A	N/A	1.531	0.883	N/A	N/A	1.572	0.904	N/A	N/A	1.468	0.850
Total	0.340	0.660	N/A	N/A	0.592	0.672	N/A	N/A	0.568	0.664	N/A	N/A	0.640	0.687
Diffs 5-1	0.094	-0.094	N/A	N/A	1.427	0.442	N/A	N/A	1.471	0.493	N/A	N/A	1.355	0.337
P	*, n.s.	*, n.s.	N/A	N/A	***,†††	***,†††	N/A	N/A	***,†††	***,†††	N/A	N/A	***,†††	**, †††

Table 2C: Value Quintile ratios for Targets. Values show the mean market value (P) to theoretical value (V) ratios for targets, with a P-value for differences between Q1 and Q5.

tarval3quin	**cash**	**shares**	**"P to V, acquirer"**	**"P to V, Target"**	**acqbtmv**	**tarbtmv**
1	0.374	0.626	1.062	0.385	0.681	0.803
2	0.344	0.656	1.167	0.659	0.522	0.677
3	0.393	0.607	1.346	0.889	0.593	0.624
4	0.254	0.746	1.621	1.221	0.538	0.636
5	0.352	0.648	1.541	2.063	0.568	0.587
Total	0.344	0.656	1.347	1.043	0.581	0.666
Diffs 5-1	-0.022	0.022	0.479	1.678	-0.114	-0.216
P	n.s., n.s.	n.s., n.s.	***,†††	***,†††	*, n.s.	***, ††

Table 3: Correlations between model variables:

Panel A: Acquirers

	val3quin	**overval3**	**w5aptovmod3**	**acqp1bhar**	**acqp3bhar**	**acqbtmv**
val3quin	1					
overval3	0.8488	1				
w5aptovmod3	0.79	0.6328	1			
acqp1bhar	0.1971	0.1498	0.2502	1		
acqp3bhar	0.3031	0.2236	0.3984	0.4152	1	
acqbtmv	-0.2846	-0.2073	-0.2725	-0.1314	-0.1917	1
	val1quin	**overval1**	**W5aptovmod1**	**acqp1bhar**	**acqp3bhar**	**acqbtmv**
val1quin	1					
overval1	0.8482	1				
W5aptovmod1	0.8207	0.6583	1			
acqp1bhar	0.2039	0.1635	0.2496	1		
acqp3bhar	0.2863	0.1968	0.3837	0.4152	1	
acqbtmv	-0.3056	-0.2214	-0.2869	-0.1314	-0.1917	1

Panel B: Targets

	tarval3quin	**overvaltar3**	**w5tptovmod3**	**tarp1bhar**	**tarp3bhar**	**tarbtmv**
tarval3quin	1					
overvaltar3	0.8488	1				
w5tptovmod3	0.9016	0.7491	1			
tarp1bhar	0.1	0.086	0.0982	1		
tarp3bhar	0.0669	0.0782	0.0654	0.5413	1	
tarbtmv	-0.1214	-0.0794	-0.1189	-0.1707	-0.1427	1
	tarval1quin	**overvaltar1**	**W5tptovmod1**	**tarp1bhar**	**tarp3bhar**	**tarbtmv,**
tarval1quin	1					
overvaltar1	0.8398	1				
W5tptovmod1	0.9141	0.7547	1			
tarp1bhar	0.1434	0.1122	0.1595	1		
tarp3bhar	0.2295	0.2089	0.2433	0.5413	1	
tarbtmv	-0.1505	-0.1207	-0.1587	-0.1707	-0.1427	1

Table 4:Simple Univariate Test for Differences between Acquirer and Target Price-Value Ratios For differences the tests used are the two-sample T-statsistic assuming unequal variances (significance indicated by *) and the Wilcoxon Rank-Sum Test, (significance indicated by †).

Overall	**Model 1**	**Model 3**	**BTMV Model**
Acquirer (a) P/V (or BTM)	1.167	1.347	0.532
Target (t) P/V (or BTM)	0.907	1.043	0.647
Diff (P/V a – P/V t)	0.259	0.304	-0.115
P value PVa>PVt	***, †††	***, †††	***, †††
Cash			
Acquirer (a) P/V (or BTM)	1.053	1.202	0.582
Target (t) P/V (or BTM)	0.896	1.004	0.648
Diff (P/V a – P/V t)	0.156	0.198	-0.065
P value PVa>PVt	**, n.s.	***, †	*, n.s.
Equity			
Acquirer (a) P/V (or BTM)	1.234	1.423	0.506
Target (t) P/V (or BTM)	0.914	1.063	0.647
Diff (P/V a – P/V t)	0.319	0.360	-0.140
P value PVa>PVt	***, †††	***, †††	***, †††

Table 5: Summary BHARs for all firms for which model variables are available. *Acqar* is the acquirer's announcement month return; *Tarar* is the target's announcement month return; *Acq1bhar* is the acquirer's 12-month buy and hold return; *Acq3bhar* is the acquirer's 36-month buy and hold return

Model 3&BTM	**Overall**	**Overall**	**Overall**	**Overall**	**Cash**	**Cash**	**Cash**	**Cash**	**Equity**	**Equity**	**Equity**	**Equity**
Item	acqar	tarar	acq1bhar	acq3bhar	acqar	tarar	acq1bhar	acq3bhar	acqar	tarar	acq1bhar	acq3bhar
Mean	0.0012	0.2109	-0.0676	-0.1246	-0.0095	0.2364	-0.0388	-0.0386	0.0067	0.1976	-0.0826	-0.1713
SE Mean	0.0142	0.0120	0.0152	0.0321	0.0072	0.0193	0.0246	0.0504	0.0213	0.0152	0.0192	0.0411
Sig under BSAT		***	***	***		***				***	***	**
Median	-0.0185	0.1720	-0.0522	-0.1898	-0.0187	0.2052	-0.0364	-0.0878	-0.0179	0.1564	-0.0716	-0.2185
Model 1 sample												
Mean	-0.0147	0.2228	-0.0591	-0.0741	-0.0090	0.2573	-0.0451	0.0116	-0.0180	0.2025	-0.0673	-0.1266
SE Mean	0.0055	0.0134	0.0167	0.0383	0.0083	0.0220	0.0257	0.0571	0.0071	0.0168	0.0218	0.0507
Sig under BSAT	**	***	***			***			**	***	***	*
Median	-0.0240	0.1841	-0.0524	-0.1365	-0.0187	0.2494	-0.0364	-0.0361	-0.0262	0.1682	-0.0787	-0.2057

Table 6: Abnormal returns for Over-valued (or High-Q) acquirers and under-valued (or Low-Q) acquirers. *Acqar* is the acquirer's announcement month return; *Tarar* is the target's announcement month return; *Acq1bhar* is the acquirer's 12-month buy and hold return; *Acq3bhar* is the acquirer's 36-month buy and hold return. Difference tests are reported using the Wilcoxon Rank-Sum test.

Panel A: Model 3

Model 3	Overall	Overall	Overall	Overall	Cash	Cash	Cash	Cash	Equity	Equity	Equity	Equity
Overvalued	**acqar**	**tarar**	**acq1bhar**	**acq3bhar**	**acqar**	**tarar**	**acq1bhar**	**acq3bhar**	**acqar**	**tarar**	**acq1bhar**	**acq3bhar**
Mean	-0.0098	0.2127	-0.0794	-0.1185	-0.0082	0.2000	-0.0527	-0.0771	-0.0104	0.2180	-0.0905	-0.1365
SE Mean	0.0071	0.0172	0.0212	0.0464	0.0127	0.0283	0.0305	0.0684	0.0086	0.0213	0.0272	0.0597
Sig under BSAT		***	***	*		***				***	**	
Median	-0.0171	0.1724	-0.0696	-0.2057	-0.0200	0.1588	-0.0500	-0.1126	-0.0151	0.1760	-0.0795	-0.2205
Undervalued												
Mean	0.0120	0.2092	-0.0558	-0.1305	-0.0104	0.2632	-0.0286	-0.0100	0.0266	0.1740	-0.0735	-0.2104
SE Mean	0.0274	0.0167	0.0218	0.0444	0.0083	0.0260	0.0365	0.0718	0.0449	0.0214	0.0272	0.0558
Sig under BSAT		***	**	**		***				***	***	***
Median	-0.0209	0.1710	-0.0345	-0.1700	-0.0155	0.2653	-0.0118	-0.0373	-0.0298	0.1198	-0.0492	-0.2138
Diff test	n.s.	n.s	n.s	n.s	n.s	††	n.s	n.s	n.s	††	n.s	n.s

Panel B: Model 1

Model 1	Overall	Overall	Overall	Overall	Cash	Cash	Cash	Cash	Equity	Equity	Equity	Equity
Overvalued	**acqar**	**tarar**	**acq1bhar**	**acq3bhar**	**acqar**	**tarar**	**acq1bhar**	**acq3bhar**	**acqar**	**tarar**	**acq1bhar**	**acq3bhar**
Mean	-0.0150	0.2215	-0.0561	-0.0584	-0.0107	0.2391	-0.0694	-0.0731	-0.0169	0.2136	-0.0502	-0.0514
SE Mean	0.0082	0.0184	0.0217	0.0559	0.0152	0.0378	0.0323	0.0747	0.0097	0.0207	0.0279	0.0745
Sig under BSAT		***	**			***	*			***		
Median	-0.0222	0.1769	-0.0609	-0.1703	-0.0230	0.1631	-0.0603	-0.0968	-0.0222	0.1802	-0.0609	-0.1861
Undervalued												
Mean	-0.0144	0.2241	-0.0620	-0.0899	-0.0078	0.2703	-0.0276	0.0736	-0.0195	0.1891	-0.0881	-0.2176
SE Mean	0.0072	0.0195	0.0254	0.0525	0.0094	0.0264	0.0375	0.0821	0.0105	0.0275	0.0343	0.0659
Sig under BSAT	*	***	**			***			*	***	**	***
Median	-0.0260	0.2058	-0.0438	-0.1147	-0.0150	0.2781	-0.0100	0.0441	-0.0348	0.1385	-0.0894	-0.2957
Diff test	n.s.	n.s	n.s	n.s	n.s	†	n.s	n.s	n.s	n.s	n.s	†

Panel C BTM Model

BTM	Overall	Overall	Overall	Overall	Cash	Cash	Cash	Cash	Equity	Equity	Equity	Equity
High-Q	**acqar**	**tarar**	**acq1bhar**	**acq3bhar**	**acqar**	**tarar**	**acq1bhar**	**acq3bhar**	**acqar**	**tarar**	**acq1bhar**	**acq3bhar**
Mean	-0.0111	0.2502	-0.0671	-0.1561	-0.0132	0.2710	-0.0484	-0.0979	-0.0102	0.2413	-0.0751	-0.1816
SE												
Mean	0.0070	0.0181	0.0207	0.0462	0.0113	0.0303	0.0315	0.0709	0.0088	0.0224	0.0263	0.0587
Sig under BSAT		***	***	**		***				***	**	
Median	-0.0150	0.2045	-0.0638	-0.2613	-0.0178	0.2500	-0.0455	-0.1314	-0.0145	0.1985	-0.0833	-0.2974
Low-Q												
Mean	0.0134	0.1715	-0.0681	-0.0920	-0.0066	0.2094	-0.0314	0.0081	0.0260	0.1476	-0.0912	-0.1589
SE												
Mean	0.0276	0.0153	0.0223	0.0444	0.0094	0.0247	0.0364	0.0707	0.0446	0.0194	0.0282	0.0567
Sig under BSAT		***	**	*		***				***	***	**
Median	-0.0219	0.1265	-0.0399	-0.1098	-0.0190	0.1859	-0.0327	-0.0384	-0.0267	0.1005	-0.0526	-0.1950
Diff test	n.s.	†††	n.s	†	n.s	n.s	n.s	n.s	n.s	†††	n.s	n.s

Table 7: Abnormal returns for Relatively Highly valued acquirers and Relatively Lowly Valued Acquirers. *Acqar* is the acquirer's announcement month return; *Tarar* is the target's announcement month return; *Acq1bhar* is the acquirer's 12-month buy and hold return; *Acq3bhar* is the acquirer's 36-month buy and hold return

Panel A: Model 3

Model 3	**Overall**	**Overall**	**Overall**	**Overall**	**Cash**	**Cash**	**Cash**	**Cash**	**Equity**	**Equity**	**Equity**	**Equity**
Relatively over-valued	**acqar**	**tarar**	**acq1bhar**	**acq3bhar**	**acqar**	**tarar**	**acq1bhar**	**acq3bhar**	**acqar**	**tarar**	**acq1bhar**	**acq3bhar**
Mean	-0.0137	0.2357	-0.0708	-0.1230	-0.0115	0.2482	-0.0535	-0.1132	-0.0147	0.2296	-0.0792	-0.1280
SE Mean	0.0068	0.0177	0.0202	0.0418	0.0116	0.0288	0.0271	0.0561	0.0084	0.0223	0.0270	0.0564
Sig under BSAT	*	***	***	*		***	*	*	*	***	***	
Median	-0.0203	0.1864	-0.0434	-0.1840	-0.0241	0.2045	-0.0118	-0.1434	-0.0171	0.1802	-0.0783	-0.1899
Relatively Under-valued												
Mean	0.0205	0.1786	-0.0634	-0.1267	-0.0071	0.2226	-0.0218	0.0507	0.0365	0.1532	-0.0874	-0.2306
SE Mean	0.0315	0.0149	0.0231	0.0500	0.0078	0.0248	0.0431	0.0875	0.0495	0.0184	0.0266	0.0591
Sig under BSAT		***	**	**		***					***	***
Median	-0.0172	0.1490	-0.0629	-0.1965	-0.0133	0.2108	-0.0539	0.0198	-0.0219	0.1189	-0.0668	-0.2907
Diff test	n.s.	††	n.s	n.s	n.s	n.s.	n.s	n.s	n.s	†††	n.s	n.s

Panel B Model 1

Model 1	**Overall**	**Overall**	**Overall**	**Overall**	**Cash**	**Cash**	**Cash**	**Cash**	**Equity**	**Equity**	**Equity**	**Equity**
Relatively over-valued	**acqar**	**tarar**	**acq1bhar**	**acq3bhar**	**acqar**	**tarar**	**acq1bhar**	**acq3bhar**	**acqar**	**tarar**	**acq1bhar**	**acq3bhar**
Mean	-0.0233	0.2466	-0.0406	-0.0096	-0.0228	0.3005	-0.0587	-0.0573	-0.0236	0.2195	-0.0316	0.0160
SE Mean	0.0084	0.0214	0.0251	0.0596	0.0145	0.0422	0.0308	0.0674	0.0103	0.0240	0.0344	0.0842
Sig under BSAT		***				***			**	***		
Median	-0.0269	0.2051	-0.0388	-0.0674	-0.0288	0.2588	-0.0273	-0.0244	-0.0240	0.1898	-0.0609	-0.0818
Relatively Under-valued												
Mean	-0.0085	0.2209	-0.0548	-0.1099	-0.0166	0.2441	-0.0444	0.0309	-0.0026	0.2038	-0.0624	-0.2200
SE Mean	0.0082	0.0219	0.0329	0.0711	0.0103	0.0299	0.0545	0.1118	0.0120	0.0310	0.0409	0.0903
Sig under BSAT		***				***				***		**
Median	-0.0217	0.2113	-0.0658	-0.1716	-0.0166	0.2593	-0.0584	0.0441	-0.0246	0.1707	-0.0803	-0.3197
Diff test	n.s.	n.s	n.s	n.s	n.s	n.s	n.s	n.s	n.s	n.s	n.s	††

Panel C: BTM Model

BTM Model	**Overall**	**Overall**	**Overall**	**Overall**	**Cash**	**Cash**	**Cash**	**Cash**	**Equity**	**Equity**	**Equity**	**Equity**
Relatively over-valued	**acqar**	**tarar**	**acq1bhar**	**acq3bhar**	**acqar**	**tarar**	**acq1bhar**	**acq3bhar**	**acqar**	**tarar**	**acq1bhar**	**acq3bhar**
Mean	-0.0087	0.2363	-0.0610	-0.1524	0.0036	0.2559	-0.0378	-0.0518	-0.0142	0.2275	-0.0713	-0.1990
SE Mean	0.0061	0.0141	0.0201	0.0391	0.0094	0.0263	0.0345	0.0735	0.0078	0.0168	0.0246	0.0458
Sig under BSAT		***	**	***		***			*	***	**	***
Median	-0.0151	0.1983	-0.0687	-0.2235	-0.0093	0.2256	-0.0441	-0.0878	-0.0171	0.1918	-0.0872	-0.2821
Relatively Under-valued												
Mean	0.0158	0.1733	-0.0774	-0.0821	-0.0247	0.2137	-0.0400	-0.0227	0.0422	0.1470	-0.1017	-0.1226
SE Mean	0.0341	0.0209	0.0233	0.0547	0.0110	0.0283	0.0352	0.0677	0.0559	0.0290	0.0308	0.0796
Sig under BSAT		***	**		**	***				***	***	
Median	-0.0240	0.1107	-0.0354	-0.1063	-0.0241	0.1880	-0.0205	-0.0801	-0.0240	0.0904	-0.0442	-0.1709
Diff test	n.s.	†††	n.s	n.s	†	n.s.	n.s	n.s	n.s	†††	n.s	n.s

Table 8: Logistic regression estimates with equity financing acquirers (*Shares*) as the dependent variable

Variables are: *dmkt*, the return on the FT All Share Index in the 12 months pre-announcement of the acquisition; *indexlkyield*, the UK Government Index Linked Gilt immediately prior to the acquisition; *inflation* the UK expected long run inflation rate immediately prior to the acquisition; *acq val quin*, the acquirer market value to model value quintile in the month pre-acquisition; *tar val quin*, the target market value to model value quintile in the month pre-acquisition; *reloverval*, a dummy variable = 1 if the acquirer's model valuation is higher than the target's model valuation; *logrelsize*, the log of the relative market capitalisation of the target divided by that of the acquirer; *logacqcap*, the log of the market capitalisation of the acquirer; *tarar*, the abnormal return on acquisition announcement for the target; and *_cons*, the intercept term.

Dep var	Model 3		Model 3		Model1		Model1		BTM Model		BTM Model	
	Coef.	P(z)	Coef.	P(z)	Coef.	P(z)	Coef.	P(z)	Coef.	P(z)	Coef.	P(z)
dmkt	2.167	0.000	2.401	0.000	0.521	0.551	0.740	0.388	2.452	0.000	2.391	0.000
Acq Val Quin	0.203	0.004			0.238	0.015			-0.213	0.004		
Tar Val Quin	0.020	0.776			0.034	0.737			0.062	0.393		
logrelsize	0.968	0.000	0.971	0.000	1.413	0.000	1.465	0.000	1.014	0.000	0.980	0.000
lnacqcap	-0.085	0.156	-0.065	0.266	-0.083	0.332	-0.025	0.756	-0.075	0.228	-0.064	0.279
indexlkyield	32.686	0.101	33.714	0.090	44.936	0.077	45.615	0.070	45.015	0.028	32.450	0.103
inflation	-27.093	0.025	-24.371	0.044	-47.827	0.003	-42.894	0.007	-30.617	0.013	-24.446	0.042
tarar	0.136	0.669	0.094	0.763	0.158	0.727	0.067	0.879	-0.009	0.981	0.054	0.862
reloverval			0.168	0.371			0.441	0.082			0.374	0.047
_cons	27.977	0.021	25.540	0.035	49.546	0.002	44.635	0.006	32.336	0.009	25.540	0.035
Adj R2		0.117		0.107		0.160		0.152		0.123		0.111
LR ch2 & p-value	91.64	0.000	83.08	0.000	72.57	0.000	68.76	0.000	92.36	0.000	86.22	0.000

Table 9. Two-stage Treatment effects model, with regression dependent variables the acquiring firm's 12-month and 36-month BHAR. The first panel shows the results from the treatment model augmented regression from Maddala (1983) with the additional panels showing the first stage probit results from this process, together with the hazard or selectivity correction. Estimation is conducted using the 2-stage estimator in Stata. Variables are: *shares*, a dummy variable denoting equity financing acquirers; *giltyield*, the UK Government Long Term Rate immediately prior to the acquisition; *dmkt*, the return on the FT All Share Index in the 12 months pre-announcement of the acquisition; *tarar*, the premium paid on acquisition announcement for the target; *rightshares* = *reloverval* x *shares*; *indexlkyield*, the UK Government Index Linked Gilt immediately prior to the acquisition; *inflation* the UK expected long run inflation rate immediately prior to the acquisition; *acq val quin*, the acquirer market value to model value quintile in the month pre-acquisition; *tar val quin*, the target market value to model value quintile in the month pre-acquisition; *reloverval*, a dummy variable = 1 if the acquirer's model valuation is higher than the target's model valuation; *logrelsize*, the log of the relative market capitalisation of the target divided by that of the acquirer; *logacqcap*, the log of the market capitalisation of the acquirer; *tarar*, the abnormal return on acquisition announcement for the target; and *_cons*, the intercept term.

	Model 3		**Model 1**		**BTM Model**		**BTM Model**	
Augmented regression	**Coefficient**	**p-value**	**Coefficient**	**p-value**	**Coefficient**	**p-value**	**Coefficient**	**p-value**
lnacqcap	0.026	0.085	0.022	0.260	0.022	0.131	0.022	0.145
giltyield	-1.513	0.174	-0.602	0.702	-1.775	0.118	-1.790	0.116
tarar	-0.230	0.013	-0.258	0.030	-0.219	0.022	-0.228	0.016
rightshares3	0.086	0.164	0.163	0.057	-0.039	0.548		
shares	-0.306	0.069	-0.203	0.263	-0.264	0.103	-0.305	0.039
_cons	0.055	0.776	-0.054	0.828	0.123	0.507	0.140	0.444
First stage probit								
dmkt	1.363	0.000	0.747	0.162	1.546	0.000	1.546	0.000
Acq val quin	0.099	0.022	0.124	0.035	-0.129	0.004	-0.129	0.004
Tar val quin	0.015	0.737	0.018	0.770	0.033	0.455	0.033	0.455
logrelsize	0.604	0.000	0.862	0.000	0.647	0.000	0.647	0.000
lnacqcap	-0.040	0.279	-0.034	0.514	-0.038	0.323	-0.038	0.323
indexlkyield	37.711	0.005	48.096	0.004	49.303	0.000	49.303	0.000
inflation	-22.199	0.003	-36.481	0.000	-25.803	0.001	-25.803	0.001
_cons	22.380	0.003	37.058	0.000	26.372	0.001	26.372	0.001
Hazard function								
lambda	0.101	0.314	0.003	0.980	0.115	0.227	0.125	0.182
Wald Chi2 and p	22.98	0.000	10.64	0.100	24.51	0.000	23.57	0.000