STOCK MARKET VALUATION AND ACQUISITIONS:

AN EMPIRICAL TEST OF ONE COMPONENT OF MANAGERIAL UTILITY

D.A. KUEHN

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INTRODUCTION*

While it is conceptually possible to incorporate some merger situations into the neo-classical maximizing models of firm behaviour, the influence of economic theory on the merger literature has been embarrassingly slight. There are, I believe, at least two reasons why this has been so. First of all, theoreticians have devoted their efforts to the development of sophisticated oligopoly and monopoly models while apparently viewing mergers as merely the vehicle by which imperfections in the product market emerge. Secondly, there is little agreement among economists as to the political, social and economic effects of mergers and as a consequence, the literature has often-times been prejudiced in various directions according to the authors' subjective positions. Some view combinations as a reflection of the desire to suppress competition and as such represents a social problem. Others interpret the question in terms of the technical possibilities for monopoly such as limitations on the supply of raw materials or the technical efficiency that results from the impositions of the 'survival of the fittest' and the removal of the 'wastes of small-scale enterprise' doctrines. Still others regard mergers as a legal problem to be dealt with through the interpretation of anti-monopoly statutes. The persistence of these divergent schools of thought most likely stems from the apparent willingness to accept one simple explanation of why firms merge. It is clear, however, that no single explanation exists. Some mergers have been initiated for monopolistic purposes and have been socially undesirable; others have represented a technical or competitive adjustment to changes in economic conditions; still others have resulted in no marked effect on the structure, conduct or performance of the market. This divergence of thought as well as the lack of a formal theory of mergers can probably account for the disorganisation and lack of purpose that the literature displays.

Jesse Markham has levelled similar critical remarks elsewhere,[1] but I think it is possible to take the argument one step further. Not only is there not a single framework into which the merger question can be squeezed, but also framing it predominantly in terms of a monopoly problem represents a gross misplacement of emphasis. Most major industrial nations have removed the possibility of monopoly by merger by establishing regulatory commissions such as the Federal Trade Commission in the U.S. and the Monopolies Commission in the U.K.

empowered with cease and desist and divesture decrees. Within this social framework, the mergers that do occur are predominantly of the type that have little influence on industrial structure or performance outside the particular firms involved.[2] While a discussion of the effect mergers can and occasionally do exert on the fabric of industry is important, it nevertheless should play only an equal, if not subordinate role, as compared with the questions of the non-monopolistic motives for merger and the effect the threat of acquisition can have on the behaviour of firms. It is in connection with these two issues that this empirical enquiry was initiated.

The investigation of an alternate approach to the motives behind acquisitions actually emerged as a side issue to the attempt to answer the second question. Specifically, it became possible to test the relevance of a non-monopolistic approach to mergers. This school essentially rejects the monopolistic power motive as being of little importance and in its place regards acquisitions as one form of investment decision. As such, it may be proper to incorporate this phenomenon into a theory of portfolio management. A test of the applicability of this approach to acquisitions will be offered in section IV below, but the discussion will be deferred to the conclusion.

More important to the purposes of this paper is the effect the ever-present probability of take-over can exert on firms' behaviour. Between 1948 and 1961 no less than 735 public companies quoted on the London Exchange were taken over by other quoted companies, or one quarter of the original population. There also appears to have been between two and three hundred unsuccessful bids.[3] This same tendency towards rationalisation has been maintained in the 1960's and, if anything, appears to have been slightly accelerated.

It would be inappropriate, however, to attempt to analyse this phenomenon within the structure of the neo-classical theory of the firm because there is nothing in this to predict the occurrence or the effect of amalgamation on this scale. After all, on methodological grounds, it is on the predictive power of a theory that its merits must be judged and not simply on the realism of its assumptions. Nevertheless, the theory of the firm has progressed since the days of Hall and Hitch,[4] when the neo-classical models were first thrown into disrepute but without an alternative explanation being offered. While the new theories of the firm have sought revision along many different lines, two may be singled out as having made the most significant contributions

towards a generalised theory of the behaviour of firms. Both Robin Marris[5] and Oliver Williamson[6] independently formulated theories based on managerial rather than entrepreneurial behaviour developing an objective function in which profits were not the only ingredient. It is within this framework that it is possible to examine the relationship between the threat of take-over raids and the firm's behaviour.

For the purposes of this paper, I will be considering only the effect the danger of take-over can have on the firm and will ignore the small number of voluntary mergers which occur between companies of similar or dissimilar size. Take-overs, however, typically display two properties that are not present in voluntary mergers; they are accomplished by the process of a bid for the ordinary shares of a company and the company acquired is usually small relative to the bidder, so that if the raid has been successful the identity of the parent company is still retained. The reason for ignoring voluntary mergers as I have defined them[7] will become clear in the next section. This restriction, however, is not likely to be critical as only one or two percent of all amalgamations fall into this category.

The organisation of this paper falls logically into five sections. Section I is intended to provide a theoretical framework within which the effect of the threat of take-over on managerial behaviour may be examined. We will rely heavily on the works of Marris and Williamson here. In Section II the institutional background of take-overs will be discussed. Section III will be devoted to the formulation of a testable model that will lend itself to regression analysis. Specifically this model will be designed to test the effect the stock market valuation of a firm (a variable capable of being influenced by managerial policies) can exert on the probability that a firm will experience a take-over raid. Section IV will contain an account of the empirical analysis including a discussion of the practical problems encountered with the collection and interpretation of the data, a description of the estimational procedure, an analysis of the results, and some suggestions as to how this test might be improved upon. Section V will include some concluding remarks as well as a discussion of the relevance of this approach to the theory of the firm.

I THE BEHAVIOURAL REVISIONS

As it is within the utility maximizing approach to the theory of the firm that it is possible to integrate a theory of take-over, some discussion of the basic postulates of this assumption is required. Rejecting the notion of an entrepreneur as employed in the neo-classical approach, both Marris and Williamson direct their analyses to incorporate the separation of owner and manager as in the modern joint stock company. Managerial behaviour then emerges as a major influence upon the operation of the firm and its decisions as the owners or stockholders are typically so diffuse as to have the power to exert only a very limited influence upon the firm. This refinement obviously would be of little interest if managers were motivated solely by the desire to maximize the flow of profits to the stockholders. If, as seems reasonable, managers do possess some power to act independently of the owners, then within an analysis of their motivations must surely lie the key to the firm's behaviour.

In order to avoid the pitfall of devising a theory which proves to hold in only a limited number of cases, Marris and Williamson borrow the classical utility theory which underlies consumption behaviour and apply it to managerial behaviour. Instead, however, of revising the utility function[8] which tends to lead to somewhat arbitrary results, Marris and Williamson allow other influences on utility to emerge based upon what is known about the functioning of modern joint stock companies with separate owners and managers. These influences replace the neo-classical constraints of private ownership and zero costs of defecting and correcting deviations in employee (i.e. managerial) behaviour from that which maximizes the profits or wealth of the owners.

In his models, Marris is particularly interested in the notion of growth of the firm as a managerial objective. He argues, that because those 'commodities' assumed to be contained in managers' utility functions such as salary, power, and status all have been found to be positively correlated with the size of the firm,[9] a primary objective of managers would appear to be the maximization of the growth of the firm. The argument is complete when linked with the observation that at the upper levels management mobility is very low.[10] Thus, managers are seen as maximizing the growth of their own firm rather

than moving to larger firms. In practice, however, managers are constrained from making decisions that could lead to loss of employment, financial failure of the firm, or a successful take-over raid because of a competing desire for security. These two drives are competing in the sense that the avoidence of risky investments and risky means of obtaining capital and the maintenance of adequate liquidity while all providing security for managers, all tend to restrain the growth possibilities of the firm. Furthermore, a minimum profits constraint inhibits the firm's ability to stimulate the growth of demand for its products and a constraint on retentions affects its ability to obtain capital to meet the demand. These constraints become operative via the influence of the stock market on the price of the firm's ordinary shares. Not only are investers seen as having a positive preference for the shares of a firm which avoids undue risk in its financial policies but also they will favour those securities which yield or are expected to yield the highest rate of return (both in terms of dividends and capital gains).

Normalizing the price of the stock by dividing it by the book value of assets per share yields what Harris defines as the valuation ratio.

Variations in the valuation ratio represents at least in part the result of deliberate financial policy. Its level is the result of choices made concerning its various financial decision variables including the gearing ratio,[11] and the retention ratio. An increase in the gearing ratio, while facilitating the expansion of the firm, will also negatively affect the security of the firm. This is because the larger the ratio of debt to assets and hence the claim on profits of interest payments the more disasterous would be an unexpected and even temporary decline in profits on the firm's survival. The effect of the retention ratio on the valuation ratio is slightly more complicated for it depends upon the market's evaluation of the profitability or efficiency of the use with which the retentions will be made. Thus the valuation ratio will move with the retention ratio if the retentions are to be used for a project which is likely to earn a rate of return greater than the market rate of discount. Alternatively, the valuation ratio will move against the retention ratio if they are to be used otherwise. The 'approval' or 'disapproval' of the market will be registered by its valuing the firm at more than the book value in the former case and less in the latter.

The valuation ratio enters the manager's utility function for two reasons. First, it registers the degree of investor approval of the management's policies and as such is likely to transmit utility by way of reassurance and the satisfaction of 'ethical' responsibilities to stockholders. Secondly, the valuation ratio directly represents security from take-over, under the assumption that there exists an inverse relationship between the probability of take-over and a firm's valuation ratio. A discussion of the implications and validity of this assumption will be reserved for Section IV, where a testable model of take-overs will be developed.

In its simplest form, the valuation ratio may enter the utility function as a constraint. With this sort of lexicographic of discrete utility function, the possibility of substitution between various growth rates and valuation ratios is denied. Below some critical value of the valuation ratio either the danger of take-over or the loss of investor approval become overwhelming. Ratios above this critical value are assumed to furnish no gain in utility. The level of this subjective critical value will depend upon the conservatism of management, the dispersion of shareholdings as a measure of stockholder (owner) influence, the scarcity and efficiency of raiders and the actual valuation ratios of comparable firms.

A more general and hence more realistic formulation of the managerial utility function allows security and growth to be 'traded off' continuously. A function of this form is continuously differentiable and displays the usual convexity assumptions including diminishing marginal utility. As before, the utility associated with any given growth rate depends on the strength of the managerial preference for growth, salary, power and prestige. Now, however, the utility of any given level of valuation ratio depends not only on the strength of the managerial preference for security but also on the 'supply' of raiders and the valuation ratios of similar firms in the industry. The solution position that maximises managerial utility occurs at the point of tangency between an indifference curve (derived from the utility function) and the appropriate transformation curve. This transformation curve is in fact an inverted U-shaped valuation curve representing the effect various growth rates will have on the valuation ratio. The valuation curve becomes negatively sloped after a certain neo-classical 'optimum' growth rate because the

attainment of very high growth rates must usually involve more risky means of obtaining capital as well as a rising retention ratio. (see figure I, in the Appendix). Thus the theory predicts a growth rate of the firm in excess of that which would be observed were neo-classical constraints and motivations operative. Moreover, since the profit or wealth maximising position occurs at a growth rate corresponding to the peak of the valuation curve (Point A), the extent to which the utility maximizing solution is down and to the right of A represents the positive costs involved in detecting the correcting deviations in profit maximizing behaviour.

Oliver Williamson independently developed a similar utility maximizing appeoach to managerial behaviour. The basic differences between Marris and Williamson lie in the choice of variables which enter the utility function. For our purposes, there is little to be gained from a detailed description of Williamson's models. A few remarks, however, relating it to the main theme of this paper would be in order. In place of the Marris growth maximization hypothesis, Williamson sees managers' motivations in terms of the utility associated with pecuniary and non-pecuniary emoluments as well as the amount of the firm's resources under a manager's discretionary control; a proxy variable for which is expenditures on staff. The operative constraint, which is after all of primary interest, is imposed by the stockholders. Profits, net of taxes, are constrained by the requirement to maintain normal dividends. In addition, profits are in themselves a source of utility for such Simonian[12] reasons as self-fulfillment and organizational achievement. The final form of the utility function then contains the 'commodities' emoluments, expenditures on staff and profits. The solution exists at the point of tangency between the resulting indifference curve and a transformation curve relating various levels of staff expenditures (and emoluments) with the profits that will accrue to shareholders. (See figure II in the Appendix). Because of the usual convexity properties of the utility function, this intersection must imply a level of staff and emoluments in excess of that which corresponds to the peak of the transformation curve (i.e. the level of staff and emoluments which maximizes the wealth of the owners).

Williamson considers briefly the effect the threat of take-over may exert on managerial utility. While not denying its existence, he nevertheless regards it as of only minor importance. Hence he concludes, "In general, as long as the firm earns modest profits, it seems unlikely that the raiders will be highly successful in generating the interest and support they usually require from other stockholders."[13] In the

institutional context of the American economy, this conclusion is likely to be valid. Take-overs and mergers of quoted companies by quoted companies in the U.S. are quite rare, at least as compared with the U.K. For this reason, the threat of take-over is not likely to be serious nor exert any significant influence on managerial utility and hence managerial behaviour. The significantly larger size of the U.S. quoted companies (making take-over difficult because of the limits on the supply of finance) as well as the much wider dispersion of share holdings probably go far to explain the relatively low incidence of take-overs and mergers. Furthermore, the dispersion of outside ownership and control probable explains why Williamson's security constraint is effected within the organizational structure and not by forces outside.

Within the U.K. setting, however, where ownership is less diffuse and take-over more common, the stock market is likely to represent a significant influence on the behaviour of managers. But while it may be likely on the basis of the a priori reasoning and casual empiricism that has been so far employed, the validity of this conclusion must be examined with reference to the empirical evidence. If, as Marris argues, a statistically significant relationship exists between a firm's valuation ratio and the probability of its being taken over, then the necessary support for the probable existence of an externally imposed security constraint on managerial behaviour and all that this implies[14] will have been found. In the following section the institutional background of take-overs in the U.K. will be discussed, from which a testable model will be evolved in Section III.

II THE INSTITUTIONAL BACKGROUND

A take-over raider is usually a company (though it can be an individual) which attempts to acquire the ownership rights of another company. To do this they require at least fifty-one percent of the voting stock but normally, in a successful raid, end up with more. Since, in the vast majority of companies, only the ordinary shares carry voting rights, it is in this form of security that the raider is interested. Two methods of acquiring a sufficient number of ordinary shares are available. The raider may secretly attempt to buy a controlling interest on the stock market. This has the disadvantage that it is unlikely his operations will go unnoticed, in which case the price is almost certain to rise. If this happens, he may find himself forced to pay more for a share than he believes it to be worth. A more common method of take-over is by conditional offer to purchase all the existing ordinary shares at a given price, with the provision that before the offer becomes final, the raider must have acquired a certain percentage of the firm's voting equity. This sort of acquisition by take-over bid suffers because the offer price must normally be above the market price, so that some of the expected gain from the raid must be shared with the old owners. Furthermore, the public announcement often brings rivals into the field, including firms in the same industry seeking to prevent the raider from increasing his share of the market.[15] Thus, by whatever method employed the raider is likely to be forced to pay more for the shares of a company than was indicated by the market price prevailing before the bid was tendered. Even after the tender is announced, the managers still have at their disposal means of opposing the take-over.[16] The success of any such defensive tactic will ultimately depend upon the ability of the company to raise the price of their shares to a 'safer' level and on their ability to enlist the support of their shareholders.

The inclusion of the valuation ratio in the managerial utility function was justified on the basis of three considerations. First, it is likely that the market valuation of a company in itself may directly affect managerial utility. Because policies must affect the price of the company's shares, managers may feel prestige as the result of healthy prices, as it may be taken as a sign of confidence from the shareholders or they may feel loyalty to their shareholders.

Secondly, share prices may also affect the supplies of finance, not only from new issues but also through their effect on the strength of the company's borrowing power in the bond market. Thus if managers desire growth of the firm, their utility may be directly affected by unhealthy stock prices. In the longer run, if the limitations on the supplies of external finance prove inimical to expansion, other firms will tend to surpass it in the market. Hence, financial policies not fovouring growth do not have survival value. Thirdly, the prices of the ordinary shares may affect the probability of the firms being taken over. Since it is usual for all or part of the existing management to be displaced when a firm is taken over,[17] the effect of the probability of take-over on managerial security is obvious.

While one may believe in the first two justifications for the inclusion of share prices in the utility function, it is difficult, if not impossible, to demonstrate this empirically. First of all, only by the somewhat dubious technique of questionnaire would it be possible to shed some light on the presence of a managerial super-ego with respect to the price of their firm's ordinary shares. Any inferences from such an investigation would be subject to the usual methodological criticisms. Secondly, while one might be able to employ valid statistical techniques to examine the relationship between share prices and growth, there would be difficulties involved in the functional identification[18] and therefore in the interpretation of the results. Specifically, when regressing share prices on growth, one could not be sure the line of causation was only one way. In fact, it is likely that the rate of growth of the firm's assets would have an important effect on the price of its shares. A simultaneous equation model is suggested as a solution but it is difficult to think of any quantifiable exogenous variables which could serve to identify the direction of causation.

It is possible, however, to test for the existence of a causal relationship between the share price (valuation ratio) and the probability of being taken over. This will be considered in sections III and IV below.

III THE MODEL

Much of what has been argued above has been based on the assumption that the price of the firm's ordinary shares or its valuation ratio directly enters the managerial utility function through its causal relationship with the probability of being taken over, and hence with security. The primary difficulty with the formulation of a model to test the validity of this assumption is that the probability of a firm being taken over is a non-observable parameter. All that is observable in a sample of companies is whether they were taken over or not taken over within a given time period. The dichotomous nature of the data, however, suggests the use of a dummy variable taking on values of unity when a take-over is observed and zero elsewhere.

Because the employment of a dummy as the dependent variable is somewhat uncommon, it might be useful to offer some comments on its interpretation. This technique has been extensively explored by Guy H. Orcutt and his associates at the Social Systems Research Institute of the University of Wisconsin.[19] When the dependent variable takes a bi-valued form, unity may be used to indicate the occurrence of an event and zero its nonoccurrence. By running a multiple regression of such values of the dependent variable Y on several explanatory variables X, the calculated values of Y for any given value of X may be interpreted as an estimate of the conditional probability of Y, given X. Thus in the present context, Y compute is interpreted as the probability of being taken-over for any given valuation ratio. The intercept term is then the expected probability of take-over when the valuation ratio is zero. This technique is very similar to the analysis of the mean and variance of cells of data with the use of the chi-square test when the cell probabilities are functions of some unknown parameters. For our purposes, however, regression analysis has several advantages. First of all, it yields parameter estimates and standard errors, thus making a more intensive use of the data and allowing the model to be predictive. Secondly, it avoids the difficulties which arise out of the use of the chi-square test when there are unequal cell frequencies. Furthermore, experience with the use of the chi-square test has shown it to yield poor approximations when the number of observations in a cell is small. When formulating the model it was anticipated that this situation would in fact occur. As a result, this estimating technique was rejected in favour of multiple regression analysis.

Another difficulty in the formulation of a testable hypothesis is the calculation of the valuation ratio. Because there exists a different valuation ratio for every market price that prevailed during the sample period, the choice becomes somewhat arbitrary. The problem is less dramatic although it still exists for those firms which have been taken over. It was decided in this case to employ the lowest valuation ratio over the twelve months previous to the first mention of a bid. The purpose of this lag is to avoid picking up any stock market reaction to the bid and to allow for the time that would be required to prepare the bid. Thus the valuation ratio would approximate that which faces the bidder and upon which he is assumed to act. Using the lowest valuation ratio over the year previous to the bid may, however, be unrealistic in some instances if for some reason the share price dipped temporarily and artificially to a low level. In order to partially avoid this possibility, a second measure of the valuation ratio was employed; the mean value of the valuation ratio for the twelve months previous to the bid.

For those firms not taken over, we were faced with the same problem, though of a greater magnitude. If the inverse relationship between the valuation ratio and the probability of take-over existed, then it seemed reasonable to suppose that the measure of the valuation ratio employed for firms taken over would be somewhere near the lowest that had existed in the recent history of the firm. In order to be consistent with the data, the valuation ratio for firms not taken over was calculated at the lowest level it had reached during the sample period. Again a second measure was employed - the lowest annual mean value of the valuation ratio during the sample period - to avoid the possibility that the first measure represented a temporary and artificial low.

In formulating the model it was soon realised that a third category existed in addition to the occurrence or non-occurrence of a take-over. There seemed to have been a significant number of unsuccessful take-over bids made during various periods since the war. On the Marris data, the proportion of unsuccessful to successful take-overs was approximately one-third. From the discussion in Sections I and II above, it would be a mistake to ignore these for several reasons. First, any bid, whether ultimately successful or not, is likely to significantly affect managerial utility if it involves managers in taking the sort of defensive action described in

note 16; or in terms of the theoretical utility function, if it forces management to alter the policies designed to maximise the rate of growth. Secondly, since our prime concern is the relationship between the valuation ratio and the probability of take-over, it would be a mistake to allow whatever influences the likelihood of the bid being successful once it is made (such as the ability of firms to fight a take-over bid), to be included in a disguised form in the relationship. In any case, the argument for the effect of take-over bids as opposed to actual take-overs on managerial utility is only slightly less convincing.

The inclusion of take-over bids in the dependent variable could be handled by allowing the dummy to take on three values. But this requires the ability to assume a system of weighting take-overs, take-over bids and non-take-overs, according to various different valuation ratios. Since there is no a priori reason to assume that whatever enables a firm to avoid take-over once it has been bid for will necessarily be reflected in the pre-bid level of the valuation ratio, allowing the dummy to take on arbitrary values such as 0, 1, 2 or 0, 1, 10 would be without justification. It was decided therefore to run the regressions twice, once in terms of the probability of being taken over and again in terms of the probability of experiencing a take-over bid (both successful and unsuccessful). The valuation ratio for those firms experiencing unsuccessful take-over bids was calculated in the same way as it was for those actually taken over.

With respect to the two measures of the valuation ratio and the inclusion of a regression with take-over bids, it seems reasonable on grounds of statistical methodology where no single method of measurement suggests itself, to let the data identify the best method according to the fit. For this reason, a third measure of the valuation ratio was constructed from a combination of the two columns of data. For firms experiencing a take-over bid (both successful and unsuccessful), the lowest valuation ratio was used, while for firms not taken over, the lowest annual mean valuation ratio was applied.

The model was constructed on the assumption of a linear relationship between stock market valuation and the probability of take-over because there is no basis with which to justify a curvilinear term. The addition of other variables to act as 'shifters' such as

the rate of growth, profitibility, the liquidity ratio and the retention ratio was considered, but on the basis of the theory developed in Section I we would expect their effects on the probability of experiencing a take-over bid to be felt via the valuation ratio and not on their own. For this reason they were not included. There is, however, the possibility that the size of a company may affect its probability of experiencing a take-over bid. For example, one might expect small companies to be swallowed up even though their valuation ratios were not dangerously low, while with very large companies, no matter how low their valuation ratio, there might not be a bidder available with sufficiently large supplies of finance to make an offer. On this reasoning, the size of a company, calculated from balance sheet data, was added to the basic relationship as a 'shifter'. The final functional relationship that is to be tested then is of the form:

$$Y_i = a + bV_i + cS_i + u_i$$

where Vi is the relevant measure of the valuation ratio; Si is the size 'shifter'; ui is the stochastic error term; and Yi is the dummy variable indicating the occurance or non-occurrence of either a take-over or a take-over bid. The subscript i relates to observations in the sample of firms where i = 1, 2, ..., 250. The choice of the length of the sample period is critical to the interpretation of the parameters of this model. The longer the period of observation, the greater will be the probability that a firm will experience some sort of take-over threat during that period. The sample of firms was examined over the 6½ year period January 1961 to June 1967.

In the following section we will present an account of the empirical analysis of the model, including a discussion of the practical problems encountered with the collection and interpretation of the data, a description of the estimational procedure, an analysis of the results and some suggestions on how this test might be improved upon.

IV ANALYSIS AND RESULTS

The Data

A stratified sample of 250 firms quoted on the London Stock Exchange was generated with the use of tables of random numbers. Such types of securities as Banks, Foreign Investment Trusts and the assorted foreign mining and agriculture were excluded so that the population can be regarded as what is basely termed 'Commercial and Industrial'. The sample was taken from the Financial Times, January 2nd, 1961, from a total of 1153 quoted companies. This source is somewhat unsatisfactory because the 'Commercial - Industrial' classification in the Financial Times is itself an approximately 40 percent sample of the total number of Commercial - Industrial quoted companies. The other 60 percent are typically small companies (less than £1 million assets). Their omission may significantly affect the importance of the size 'shifter' in our model. There is, however, no other available source from which companies in existence in 1961 could be sampled. Twenty-two of the firms were replaced from the original sample for various reasons, including disappearance through wind-up, steel nationalization, merger (under the definition on page 3), and take-over previous to 1961, where some shares were still outstanding on January, 2nd, 1961. The final sample of 250 firms was made up of 199 firms who had not experienced a take-over bid and 51 who had, of which 38 were successful. While it was not too difficult to identify successful take-over bids, there was no systematic means available with which to uncover unsuccessful take-over bids. Those unsuccessful bids that do appear in the sample data were discovered by examining past issues of the Financial Times, Investors Chronicle and the Stock Exchange Gazette. It is recognised that this is an uncertain means of obtaining the required information and as such there is no guarantee that the list of unsuccessful take-overs is complete. The time period over which the 250 firms were examined ran from January 2nd, 1961, to June 30th, 1967.

The valuation ratios were computed in the manner described in Section III above. In all cases the denominator was the net assets per ordinary share for the relevant year, while the numerator was either the low or mean share price for the same year. The variable for size was derived from balance sheet data representing the book value of the company net of depreciation and current liabilities. All statistical data was extracted from EXTEL Ordinary Service and Auxiliary Service cards.[20]

Some interesting features emerge from a cursory examination of the data. First of all, as might be expected, the mean value of the valuation ratios for all companies centres approximately on unity. For the valuation ratios computed of the 6½ year lows the mean was 0.8994; for the lowest annual mean value, the mean was 1.176; and for the combined data (i.e. lowest annual mean for non-take-over bids and lowest value for take-overs plus take-over bids) the mean was 1.126. Secondly, it appeared to be possible for companies with very low valuation ratios to survive for a 6½ year period. Ten firms' valuation ratios had dipped to below 0.3 without experiencing a take-over raid and the valuation ratio of fourteen firms had persisted for a year or more at less than 0.5, apparently without experiencing a take-over bid. Thirdly, only two of the thirty-eight take-overs had valuation ratios greater than the mean for the sample, while in three of the eleven unsuccessful take-over bids the valuation ratios exceeded the sample mean.

Estimational Procedure

Twelve single equation, least-squares regressions were run using the alternative measures of the valuation ratio, with and without the variable for size, against the dependent variable, first including only take-overs and secondly with both take-overs and unsuccessful take-over bids. The definitions of the variables are set out below.

Y1i - a dummy variable taking the values zero for the non-occurrence of a successful take-over and unity for the occurrence of a successful take-over.

Y2i - a dummy variable taking the values zero for the non-occurrence of a take-over bid and unity for the occurrence of a take-over or an unsuccessful take-over bid.

Si - a variable for size defined as the book value of the company net of depreciation and current liabilities.

V1i - the valuation ratio measured at its lowest level during the period for those companies not experiencing a take-over bid and its lowest level in the year previous to the bid for those companies which experienced a take-over bid.

V2i - the valuation ratio measured at the lowest mean value for those companies not experiencing a take-over bid, and at its mean value in the year previous to the bid for those companies which experienced a take-over bid.

V3i - the valuation ratio measured at the lowest annual mean value for those companies not experiencing a take-over bid and at its lowest value during the year previous to the bid for those companies which experienced a take-over bid.

Results

The results of the various formulations of this model are set out in Table I and Table II. Taking as a rough measure of statistical significance that the parameter estimate must be at least twice its standard error,[21] all formulations of the model indicated a significant inverse relationship between the valuation ratio (V1i, V2i and V3i) and the probability that a firm will experience a take-over bid (Y2i) or actually be taken over (Y1i) during the 6½ year sample period. In no equation does the size variable (Si) emerge as significant, though it consistently takes on the expected negative sign. In comparing Tables I and II, Si is shown to be larger than its standard error when only take-overs are used as the dependent variable, but becomes smaller than its standard error when unsuccessful take-overs are included. Thus, the results may indicate that while size is an unimportant influence on the probability that a firm will experience a take-over bid, it may be important in determining whether or not the bid will in fact be successful. One may conclude from this that the size of a firm is related to its ability to take defensive action against a raider. It also may be true that the larger the firm bid for, the more likely the bid will be foiled by counter-bids from other firms in the industry seeking to prevent the raider from increasing his share of the market. Furthermore, because the sample was obtained from a truncated size distribution in which the smaller quoted companies were excluded, it may be that the parameter estimate of Si of the 'true' population of all quoted companies would prove to be significant. That is, it seems likely that the exclusion of small companies from the sample was at least partially responsible for the effects of company size not having an important impact on the probability of take-over.

TABLE I

Regression Equations Explaining the Conditional Probability of Take-Over (Y1i)

Equation	Constant	Si	Y1i	Y2i	Y3i	R^2
1	0.2578	-0.0004932 (0.000365)	-0.1081 (0.04039)			0.0351
2	0.2516	-0.0005079 (0.0003661)		-0.07719 (0.03246)		0.0293
3	0.3124	-0.0005078 (0.0003568)			-0.1347 (0.03038)	0.0781
4	0.2491		-0.1080 (0.04046)			0.0279
5	0.2417			-0.07631 (0.03252)		0.0217
6	0.3031				-0.1342 (0.03094)	0.0705

Note: Figures in brackets indicate the standard errors of the associated coefficients.

TABLE II

Regression Equations Explaining the Conditional Probability of Experiencing a Take-Over Bid (Y2i)

Equation	Constant	Si	V1i	V2i	V3i	R^2
1	0.3374	-0.0002978 (0.0004085)	-0.1426 (0.0452)			0.0407
2	0.3324	-0.0003178 (0.0004099)		-0.1045 (0.03634)		0.0344
3	0.4110	-0.0003173 (0.0003953)			-0.1790 (0.0)421)	0.1016
4	0.3322		-0.1426 (0.04516)			0.0386
5	0.3263			-0.1040 (0.03630)		0.0320
6	0.4051				-0.1737 (0.03419)	0.0992

Note: Figures in brackets indicate the standard errors of the associated coefficients.

In none of the regression equations was the explanatory power of the valuation ratio very impressive. The highest R^2 achieved was just over 10 percent in the equation relating V3i and Si with the probability of experiencing a take-over bid. That is, at best, variations in the valuation ratio and size explained only 10 percent of the total variation in the dependent variable. V3i proved to be the superior measure of the valuation ratio as the R^2 associated with V2i and V1i were approximately a third of the R^2 associated with V3i. The inclusion of unsuccessful take-over bids only marginally improved the R^2 between Table I and Table II.

The size of the intercept term is as was expected from an examination of the data. We already noticed that no matter how low their valuation ratio, some companies were not taken over, or bid for. The interpretation of a constant term of .4110 (Table II, equation 3) is that at a zero valuation ratio a company has a 41 percent probability of experiencing a bid, or nearly a 60 percent chance of avoiding the disutility of a take-over bid - as measured in the sample period.

Other Variables

Judging from the low R^2 in all the above regressions it is obvious that other factors are influencing the probability that a firm will be raided. One obvious candidate is the industry classification of the firm. In industries such as breweries, machine tools, food shops, soft drinks, small electricals, and motor components, take-overs have been proceeding at a swift pace, while in others they have been virtually unknown. The rationale for including such a variable would be either that some industries had a greater supply of raiders than others or that a technical innovation within the industry had recently made large-scale operation more profitable. One way to specify a variable for the industry is to include a string of dummy variables in the functional form. This was not possible, however, in this study because the sample was too small to give enough observations to each dummy for sensible industry classifications. Using something like the Ministry of Labour's Standard Industrial Classification would be unsuitable because of its excessive generality.

Another possibility is to attempt to include the industry effect in the equation by way of concentration ratios; such that the greater the concentration and hence the supply of raiders, the more likely that a take-over would be attempted. A variable of this sort

would be superior to a dummy because of the interpretative power that could be attached to it. Again, this was not possible because of the limitations imposed by the size of the sample.

A third possibility is to specify a yearly time 'shifter' in dummy variable form. While there is little evidence to support the commonly held belief that the incidence of take-overs varies with the trade cycle,[22] such a variable might still prove significant if it picked up other influences such as changes in Government policy towards business.

Finally, one could explicitly specify those variables which, under our theory, are supposed to affect the valuation ratio such as the retention ratio, the liquidity ratio, profitability and the rate of growth. If our object was simply to predict the occurrence of take-overs, then the includion of these variables would be justifiable. To do this here, however, would represent a departure from our central purpose, which is to test the validity of the hypothesis within the theoretical context of utility maximization.

All the above hypotheses are being examined with respect to all quoted U.K. companies in a study currently in progress. The primary emphasis will be to construct an econometric model of take-overs, disaggregating to the industry level, in an attempt to explain the occurrence of take-overs in the light of the industrial structure. In addition, the characteristics of raiders, the factors which determine whether or not a bid will be successful and the effect take-overs have had on the industrial structure will be examined.

V CONCLUSIONS

Because the results of this enquiry are rather agnostic, the scope of the concluding remarks must be somewhat limited. Nevertheless, I think several tasks have been accomplished. First of all, the results have tended to confirm the Marris hypothesis that the firm's valuation on the stock market, which is itself to some extent the result of the firm's financial policies, is likely to have some feed-back as managerial behaviour via the security component of the managerial utility function. As such, our study lends confirmation to the increasing body of data supporting the validity of the behavioural revisions to the theory of the firm.

The low explanatory power of the valuation ratio was almost bound to result from the sort of cross-section sampling that was employed because spacial variations are typically more pronounced than, for example, variations through time. It would be overly optimistic to expect any theory describing a wide spectrum of behaviour to do much more than suggest important influences on that behaviour. This, as has been shown, the theory has accomplished. Furthermore, the probabilities of take-over which have been generated, are objective probabilities based on the historical occurrence of an event. If managers are 'mini-maxers' they may associate a much higher subjective probability of take-over with a given valuation ratio because of the regret attached to being taken over. In essence, though the 'objective' probability of take-over may be linearly related to the valuation ratio, the subjective probability, reflecting its effect on managerial utility, may be curvi-linear. Thus the low R^2 associated with our objective relationship may actually under-estimate the subjective effect low valuation ratios can exert on managerial utility. Furthermore, if managers regard the other objective influences on the probability of take-over as random, unknown, or unalterable (as the industry classification reflecting the supply of raiders or the degree of concentration) they are likely to see their security as dependent upon the one variable they do have the power to influence - the valuation ratio.

With regard to the discussion in the introduction concerning the possibility of incorporation take-overs into a theory of investment decision, our results tend to confirm the inappropriateness of such a

theoretical approach. The primary obstacle to any theory of take-over has always been its unwillingness to fit into a single mould. To attempt to analyse it solely in terms of a portfolio management policy would be to perpetrate the same error as those who choose to analyse take-overs solely in terms of a monopoly problem. This, I think, has been adequately demonstrated by the weak fit of the relation between the selling price of a firm's assets and the probability that in fact it will be purchased.

APPENDIX

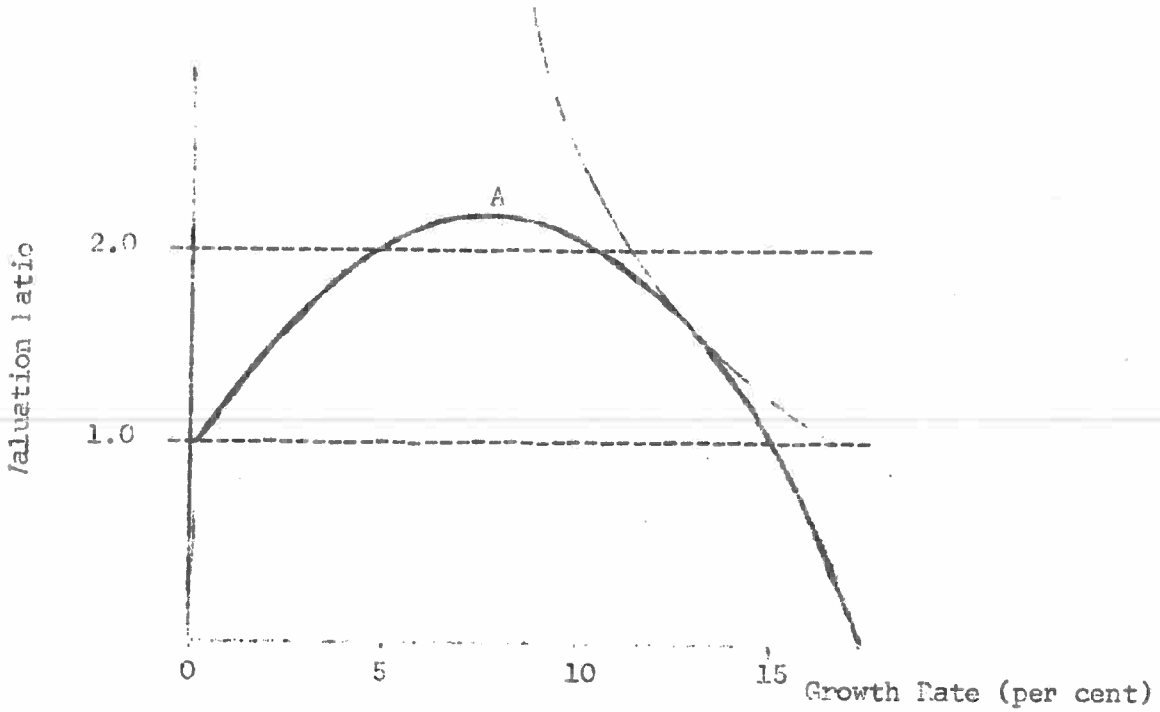

Figure I - Valuation Curve and Managerial Indifference Curve.

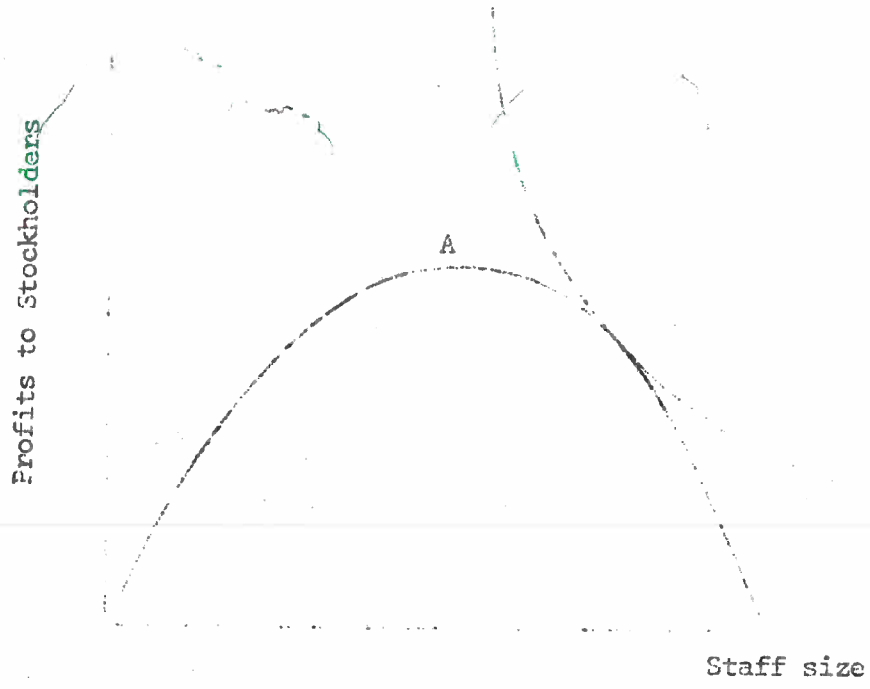

Figure II - Profits as a function of Staff and Managerial Indifference Curve.

FOOTNOTES

*This paper was submitted as partial fulfillment of the requirements for an M.A. at the University of Warwick. I am grateful to Dr. K. Cowling who made numerous helpful comments during the writing and revision of this paper and to Robin Marris, John Williamson and Professor F.G. Pyatt who offered suggestions on an earlier draft of this paper.

1) J.W. Markham, 'Survey of the Evidence and Findings on Mergers", in Business Concentration and Price Policy, National Bureau of Economic Research, Princeton University Press, 1955.

2) After examining the evidence Markham, Ibid. p. 180, reached the conclusion that relatively few U.S. mergers had monopolization as their goal. In approximately one-fifth of the larger combinations between 1887 and 1904 monopoly can be unquestionably identified as the goal, but since then it appears to have played a dormant role. The most important single motive appears to have been promotional profits, but a large number have simply reflected ordinary business transactions among entrepreneurs or market adjustments to technical innovations.

3) R.L. Marris, 'Incomes Policy and the Rate of Profit in Industry', in Manchester Statistical Society, Dec. 1964.

4) Hall and Hitch, 'Price Theory and Business Behaviour', Oxford Economic Papers, No. 2, 1939.

5) R.L. Marris, The Economic Theory of 'Managerial' capitalism, Macmillan & Co. Ltd., London, 1964.

6) O.E. Williamson, The Economics of Discretionary Behaviour: Managerial Objectives in a Theory of the Firm, Prentice Hall, Inc., N.J., 1964.

7) There is little agreement to be found in the literature as to what consistutes a merger. Early tabulations of mergers in the U.S. included only those which in the eyes of the researchers loomed large in the world of business and none involving a capitalisation of less than $1 million. The biases towards conclusions about monopoly and merger are obvious. Nevertheless, most commonly, merger is taken to be the general term applied to any sort of integrative process, while take-overs or acquisitions are a subset of this population usually displaying the above characteristics.

8) Some attempts have been made in this direction by postulating lexicographic or discrete utility functions which rank goods by some criterion and assert that those of a lower rank provide no utility until those of a higher rank have reached some critical or minimum level. For a discussion of the possibility of incorporating this notion in the Marris model see page 6 above.

9) See D.R. Roberts, Executive Compensation, Glencoe, 1959. Roberts carries out cross-section regression studies with U.S. data and finds that measures of size, in contrast to profitability, explain most of the inter-firm variances in executive compensation rates. As required under the Companies Act, 1965, this data will soon be available for the U.K.

10) Ibid. Roberts found that in a sample of 500 corporate officers, only one in seven had changed firms since becoming an officer, and on average each had only 2½ employers since the beginning of his career.

11) Defined as the ratio of debt to gross assets.

12) See H.A. Simon, Models of Man, New York, John Wiley & Sons, Inc., 1957.

13) O.E. Williamson, op.cit. p. 23.

14) See pages 5 and 6 above.

15) A recent example of this is the Showerings bid for I.D.V. which has been foiled partly due to Watney Mann's purchase of 17 percent of the I.D.U. shares. This made it more difficult for Showerings to amass the necessary controlling interest, and at the same time drove the price of the stock up from a low of 11/6d to just below the revised offer of 23/3½d.

16) See S.C. Hayes, III and R.A. Taussig, 'Tactics of Cash Take-over Bids', in Harvard Business Review, March - April 1967. The authors describe seven methods which have been successfully employed in the opposition of take-over bids:

1. Split the stock - which has the effect of not only increasing the price of the stock for psychological reasons (people regard a split as an extra divident) thereby reducing the premium over the pre-bid market price, but also makes the premium look smaller.

2. Raise the dividend - one-third of the companies in their sample used this tactic. This strategy is designed both to win shareholder confidence and to drive up the price of the stock.

3. Repurchase shares - with surplus cash or even borrowed funds. This will tend to drive up the market price and reduce the number of shares in 'nervous' hands.

4. Secure outside assistance - either from consulting firms or other firms in the industry who may be anxious to prevent the bidder from increasing his market share.

5. Launch a publicity campaign - to encourage stockholders not to sell at an 'unfair' tender price.

6. Legal action - threatening to bring into bear federal anti-trust laws or simply threatening to impose law suits on the grounds that the bidder is disrupting the regular operation of business by asking for stockholders' lists and so forth. A further possibility is to create a situation where anti-trust or other regulatory statutes become a factor by acquiring a company which competes with the bidder.

7. Counteractive take-over - of a third company and paying in stock. This reduces the proportion of stock the bidder has acquired and places a large block of shares in more friendly hands.

17) See 'How Managements get Tipped Over', Fortune, May 1959; 'Pirates by Proxy', Management Review, Dec. 1957; "How Well-Bred Investors Overthrow a Management', Fortune, May 1959.

18) An equation in a system is said to be identified if it is not possible to derive from linear combinations of the variables an equation in terms of the same variables.

19) G.H. Orcutt, M. Greenberger, J. Korbel and A.M. Rivlin, Microanalysis of Socioeconomic Sustems: A Simulation Study, Harper & Row, New York, 1961. An account of this technique can also be found in J. Johnston, Econometric Methods, McGraw-Hill, 1960, pp. 224-228.

20) Worksheets are available upon request.

21) This approximately corresponds to the 5 percent probability level.

22) For a summary and analysis of the evidence for the cyclical behaviour of mergers see J.W. Markham, op.cit., pp. 146-54.

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