The Determinants of Merger Waves*

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Abstract

One of the most conspicuous features of mergers is that they come in waves, and that these waves are correlated with increases in share prices and price/earnings ratios. We discuss four hypotheses that claim to be able to account for merger waves – two neoclassical and two behavioral hypotheses. We reject the two neoclassical hypotheses, by showing that they are inconsistent with major features of merger waves. We then develop and test the two behavioral hypotheses – the managerial discretion and overvaluation hypotheses. The former posits that managers maximize the growth of their companies, and that the over optimism surrounding stock market booms gives managers more discretion to pursue mergers for empire building motives. It thus explains both why mergers come in waves and why they are correlated with stock price movements. The overvaluation hypothesis assumes that managers seek to benefit their shareholders by trading overvalued shares during stock market booms for real assets. We provide support for both hypotheses, but tests designed to discriminate between them seem to favor the managerial discretion hypothesis.

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One of the most striking characteristics of mergers is that they come in bunches. This characteristic is readily apparent in Figure 1, where the number of mergers in the United States is plotted beginning in the 1880s. The second curve in Figure 1 is the Standard and Poor’s (S&P) price/earnings ratio (P/E). A close association between aggregate merger activity and the S&P P/E is apparent, and it can be regarded as the second major regularity in aggregate merger data. Any hypothesis that claims to explain merger waves must account for this relationship.

Although an enormous number of hypotheses have been advanced to explain why mergers take place, their proponents have typically not claimed to be able to explain merger waves, but rather specific sorts of mergers. Moreover, we do not believe that the most popular explanations for mergers can explain merger waves. Vertical mergers have been explained, for example, as attempts both to increase market power by increasing barriers to entry (Comanor, 1967), and to increase efficiency by reducing transaction costs (Williamson, 1975). Both of these hypotheses are plausible explanations for some vertical mergers, but neither offers a convincing explanation for waves in aggregate merger activity. For example, a vertical merger between two firms possessing assets dedicated to transacting with each other can reduce transaction costs, but it is difficult to imagine why the conditions necessary to make such mergers profitable would appear across a sufficient number of industries at a particular point in time to generate a wave in aggregate merger activity, and why this point in time should correspond to a stock market rally.

We contend that to understand merger waves one must understand the stock market booms that always accompany them, and in particular that the psychology of the stock market during a boom plays an important role in generating a merger wave. This reasoning leads us to favor two behavioral theories of mergers that explicitly take into account the characteristics of stock market booms – the managerial discretion and overvaluation theories.
These theories are *behavioral* in the sense that they rest upon assumptions regarding the behavior of managers and/or the stock market that differ from the standard assumptions of neoclassical economics – namely that managers maximize profits or shareholder wealth and that the capital market is efficient. Most of the hypotheses that have been advanced to explain mergers make these assumptions. As noted above, however, these hypotheses cannot account for merger waves. We assume that mergers that fit standard neoclassical theory are taking place all of the time. For a merger wave to occur *some sorts of mergers* must greatly increase in frequency at particular points in time. The two behavioral hypotheses give an explanation for why certain sorts of mergers are likely to increase in frequency during a stock market boom and thus give rise to a merger wave.

Recently two neoclassical theories have been presented, which *do* claim to explain merger waves – the industry shocks and *q* theories of mergers. Therefore, before presenting the logic and evidence in favor of the two behavioral theories, we examine these two neoclassical theories and explain why we do not believe that they can account for merger waves (Section I). Because of the important role it plays in both our critique of the neoclassical theories and in the two behavioral theories, we review some of the characteristics of stock market booms and bubbles (Section II). In Section III the logic underlying the managerial discretion and overvaluation hypotheses is discussed along with the methodologies used to test them. As several predictions of the two theories overlap, we develop some tests to discriminate between them. In Section IV, we review some of the empirical literature that has either directly tested the different hypotheses or is relevant to their testing. Section V presents our data and the empirical strategy. In Section VI we present our own tests using data from 1981 through the end of the last great merger wave in 2001. Some conclusions are drawn in the final section.
I. Neoclassical Theories of Merger Waves

A. The $q$ Theory

Under the $q$-theory of investment, when a firm’s return on capital exceeds its cost of capital, $q > 1$, it expands its capital stock. A straightforward extension of the theory to mergers would imply that firms with $qs > 1$ can profitably expand by acquiring assets through mergers.\(^4\) Since $q$ measures returns on a firm’s existing assets, it would seem that the $q$-theory would only allow one to explain horizontal mergers, i.e., additions to the existing capital stock. Since less than half of all mergers are horizontal, this implication of the $q$-theory leaves over half of all mergers unaccounted for.\(^5\) This implication can be avoided by assuming that a $q > 1$ indicates that a firm is well managed and could profitably expand through mergers in any direction.\(^6\)

Jovanovic and Rousseau (2002) (hereafter J&R) are the only ones to claim that the $q$-theory accounts for merger waves. They liken mergers to the purchase of used plant and equipment, and argue that the gap between the $qs$ of potential acquiring firms and targets increases during a stock market boom and this widening difference leads managers to favor purchasing other firms over used capital equipment thus creating a merger wave.

There are two serious difficulties with using the $q$-theory to explain merger waves. First, the theory takes the rise in share prices and $qs$ during a stock market boom as a signal that managers of many firms have become more talented and can profitably expand through mergers. The theory offers no explanation, however, for this sudden surge in talent other than the rise in share prices. A key implication of the theory must be that mergers generate wealth gains to the acquirers’ shareholders. If managers are maximizing shareholders’ wealth, and they have just become more talented, then the mergers must benefit the
acquirers’ shareholders. This prediction has been frequently falsified in the literature and is not supported by our results.\textsuperscript{7}

When a firm expands, it has three options: purchase new plant and equipment, purchase used plant and equipment, or acquire another company. J&R assume that a firm limits its options to the latter two. But this is unlikely to be optimal. As share prices rise during a stock market rally, the cost of acquiring capital by buying other firms rises relative to that for new and used capital. Table 1 reports the mean $q$s for acquirers and targets in tender offers and friendly mergers over our sample period.\textsuperscript{8} The mean $q$s for targets of friendly mergers exceed 1.0 in all but two years and rise to as high as 1.5 during the 1995-2000 merger wave. Since the $q$ for new or used plant and equipment equals 1.0 by definition, these forms of asset acquisitions must dominate mergers, and mergers must become relatively less attractive during a merger wave when stock prices are rising. This point is reinforced when one takes into account that acquiring firms must pay an additional premium over the market price of a company to acquire it. Thus, if one replaces a target’s $q$ prior to an acquisition (we use the end of the previous year to measure this $q$), with the price actually paid for the target, the implied cost of acquiring assets through mergers rises considerably. This can be seen in the columns labeled $D_t/K_{t-1}$ (deal value over book value of assets at previous year’s end). In several years acquirers paid on average more than double the values of the targets’ assets.\textsuperscript{9} The argument that merger waves occur during stock market booms, because buying other companies becomes relatively cheaper than purchasing assets in new or used capital markets is difficult to sustain in face of the evidence in table 1.\textsuperscript{10}

B. The Industry Shocks Hypothesis

Several studies have claimed that shocks to industries like technological innovations and deregulation suddenly make mergers profitable and lead to industry merger waves (Mitchell and Mullerin, 1996; Mullerin and Boone, 2000; Andrade, Mitchell and Stafford,
To go from waves within individual industries to an economy-wide wave, several industries must enter a wave at the same time. Only Harford has claimed that this happens, and thus we focus on his arguments and evidence.

Harford puts forth a “neoclassical explanation of merger waves” as an alternative to one of the behavioral hypotheses discussed below. He argues that

…merger waves occur in response to specific industry shocks that require large scale reallocation of assets. However, these shocks are not enough. There must be sufficient capital liquidity to accommodate the asset reallocation. The increase in capital liquidity and reduction in financing constraints that is correlated with high asset values must be present for the shock to propagate a wave…. Thus, the explanation for merger waves is intuitive: they require both an economic motivation for transactions and relatively low transaction costs to generate the large volume of transactions (Harford, 2005).

There are two ways to interpret this industry shocks hypothesis (hereafter ISH). (1) All industries are buffeted by shocks from time to time and occasionally several receive simultaneous shocks. When this event is accompanied by a macro-level expansion in liquidity, the industries receiving shocks enter into merger waves producing a wave in the aggregate. Moreover, recalling the two curves in figure 1, it must be the case that there has been a clustering of industry shocks at the beginning of every stock market boom. Such a correlation might arise if the industry shocks also precipitated the stock market rally, but this is highly unlikely, because the shocks that are claimed to cause industry waves are quite diverse and industry specific. For example, deregulation of airlines might well cause a wave of mergers in the airline industry and a rise in airline share prices, but it would be unlikely that it would lead to a general rally in stock prices.

(2) Industries are continuously buffeted by shocks and at any particular point in time several industries have recently received shocks. When there is a macro-level expansion in liquidity, all industries recently receiving shocks enter into merger waves producing an aggregate wave. Note that under this interpretation of the ISH, the shocks hitting industries
do not explain the merger wave, but only which industries enter into it. The wave itself is explained entirely by macroeconomic liquidity factors.

The argument that mergers are constrained by liquidity conditions is, however, problematic, given the neoclassical assumptions underlying the ISH – managers maximize shareholder wealth, mergers are wealth enhancing, and the capital market is efficient. To see the difficulty, assume that firm $A$ has 100 shares outstanding with a price $P_A = 1$, and thus a market value of $M_A = 100$. $B$ has 50 shares outstanding with $P_B = 1$, and $M_B = 50$. A merger between the two firms produces a company $C$ with a market value of 180. $A$ announces that it plans to acquire $B$ by issuing $I$ shares of its own stock for all 50 of $B$’s. The efficient capital market assumption implies that the share price of the new firm $C$ immediately rises upon the announcement of the merger to reflect the true value of the new firm, $180 = P_C(100+I)$. The gain from the merger to the shareholders of $A$ is $P_C 100 – 100$, and the gain to the shareholders of $B$ is $P_C 1 – 50$. The assumption that the managers of $A$ and $B$ maximize their shareholders’ wealth implies that an $I$ is agreed upon such that both gains are positive. The transaction costs of making such share exchanges should be independent of macroeconomic liquidity conditions. So long as $A$ and $B$ have shares outstanding, such exchanges are mutually beneficial.

Acquiring firms are generally much larger than the companies they acquire, and very few mergers of any importance are undertaken by firms that do not have stock outstanding. The targets of acquisitions may, however, be small firms or divisions of firms that do not have shares outstanding. This does not change the logic of the above argument, however. $A$ announces that it intends to acquire $B$ or a division of $B$, and that it will sell $I$ of its own shares to finance the purchase. The efficient capital market factors in both the sale of the shares and the acquisition of the assets and sets a new price for $A$’s shares that allows it to undertake the transaction paying for the assets with the cash raised from the sale of its shares.
The efficient capital market assumption implies that the price of a company’s shares is an unbiased predictor of its future earnings stream. A randomly selected company is just as likely to be undervalued as overvalued. At any point in time, some firms will be overvalued and some undervalued even if the capital market is efficient. The important role that Harford assigns to liquidity conditions in generating merger waves can be reconciled with the efficient capital market assumption, if one assumes that the firms making acquisitions are undervalued, and thus cannot profitably finance an acquisition by issuing shares. This interpretation of the ISH leads to a testable prediction – firms undertaking acquisitions during a merger wave will be undervalued. This prediction is diametrically opposite to that made under the overvaluation hypothesis and is thus a good way to discriminate between the two. As we shall see, acquiring firms tend to be significantly overvalued relative to non-acquirers, and so this implication of the ISH is not supported.

A second implication of the ISH is that there should be a relative expansion of the amount of assets acquired by issuing debt during a merger wave, because it is the fall in borrowing costs that precipitates mergers in industries experiencing shocks. Table 2 presents the sources of finance for mergers over our sample period. The first column presents the fraction of each acquisition financed by issuing equity, the second column presents the fraction financed by cash, and the third column presents fractions acquired using other sources of finance (mostly debt). As can be readily observed, during the merger wave years (1995-2000), the relative importance of debt actually fell.

A third implication of the ISH is that acquirers’ shareholders benefit from the mergers. An industry shock creates profitable merger opportunities, and shareholder-wealth-maximizing managers seize these opportunities. The assumption of capital market efficiency implies that all wealth gains from mergers are registered in share price movements at their announcements, and thus that the shares of acquirers exhibit positive abnormal returns at the
announcements. Over longer time spans following the mergers share performance should be indistinguishable from non-merging firms. These predictions also differ from those of both the managerial discretion and overvaluation hypotheses and thus constitute tests to discriminate between the two sets of hypotheses. Once again we shall see that the evidence does not support the ISH.

C. Summary

Both the $q$- and industry shocks theories suffer as explanations of merger waves, because important implications of them are not supported by the data. Target firms do not become relatively inexpensive during a merger wave as predicted by the $q$-theory, they become relatively more expensive than capital equipment. Debt-financed mergers do not become relatively more important, as predicted by the industry shocks hypothesis, they become less important. An additional reason for rejecting these two theories is that they fail to incorporate the most salient characteristic of a merger wave into their explanation for it – the market's over-optimism. Since this over-optimism plays a central role in both behavioral theories of merger waves, we now discuss the psychology of stock market booms.

II. The Psychology of Stock Markets

The market value of a firm $i$ can be written as the present value of its profit stream from now to infinity. If $\pi_{it}$ is $i$’s profits in period $t$, and $k_i$ is its cost of capital, under the assumption that the managers of the firm either pay out its profits as dividends and interest or reinvest the funds at returns equal to $k_i$, then the value of the firm at time zero is given by

$$V_{i0} = \sum_{t=0}^{\infty} \frac{\pi_{it}}{(1+k_i)^t}$$

Thus, today’s share price should have a definite relationship to a firm’s future earnings and dividends. In a pioneering study, Robert Shiller (1981) showed that the swings in stock
prices in the United States over the 20th century were far greater than could be accounted for by subsequent swings in earnings and dividend payments.\textsuperscript{12} During the late 1920s shareholders were far more optimistic about future earnings and dividends than was warranted by both the actual dividends and earnings that were to come, and those that one might have expected based on past dividends and earnings experience. During the late 1930s shareholders became far more pessimistic about future earnings and dividends than would prove to be warranted.

The extent to which this over-optimism and pessimism can go is dramatically revealed by the data from the late 1990s. Assuming an average rate of growth of $g_i$ from now to infinity, (1) becomes

$$V_{i0} = \sum_{t=0}^{\infty} \frac{\pi_i (1 + g_i)^t}{(1 + k_i)^t} = \frac{\pi_{i0}}{k_i - g_i}$$

if $k_i > g_i$, which implies that the price/earnings ratio of firm $i$ should equal $1/(k_i - g_i)$. As can be seen from Figure 1, at the peak of the 1990s stock market boom, the S&P price/earnings ratio topped 40. If we assume an average $k_i$ of 0.12, roughly the average return on stocks over the period 1928-2004,\textsuperscript{13} then a P/E of 40 implies an expected, perpetual growth rate of 0.095 – more than four times the average growth rate over the same period. At the peak of the 1990s stock market boom, shareholders appeared to believe that the average firm’s profits would grow indefinitely at a rate far above any rate that had ever been seen before.

This extreme optimism typifies the psychology of stock market booms. Galbraith (1961, p. 8), for example, observed that an “indispensable element of fact” during stock market bubbles is that individuals “build a world of speculative make-believe. This is a world inhabited not by people who have to be persuaded to believe but by people who want an excuse to believe.” These excuses to believe take the form of “theories” as to why share prices should rise to unprecedented levels, why the economy has entered a “new era” (Shiller,
Prominent among these are “theories” about wealth increases from mergers. Shiller gives an example from the stock market boom and merger wave at the beginning of the 20th century. “The most prominent business news in the papers in recent years had been about the formation of numerous combinations, trusts, and mergers in a wide variety of businesses, stories such as the formation of U.S. Steel out of a number of smaller steel companies. Many stock market forecasters in 1901 saw these developments as momentous, and the term community of interest was commonly used to describe the new economy dominated by them” (Shiller, 2000, p. 101, italics in original). Shiller quotes an editorial from the New York Times from April 1901, which prophesizes that the U.S. Steel merger will avoid “much economic waste” and effect “various economies coincident to consolidation.” The editorial also predicts similar benefits from mergers in railroads. Such optimism explains why U.S. Steel’s share price soon soared to $55 from the $38 it was floated at in 1901. By 1903 it had plunged to $9 (Economist, 1991, p. 11). Similar over-optimism appears to have been a major cause of the first great merger wave.

The literature provides convincing evidence that the abnormally large volume of mergers formed in 1897-1900 stemmed from a wave of frenzied speculation in asset values. Several students of the early merger movement agree that the excessive demand for securities was an impelling force in the mass promotion of mergers after 1896 (Markham, 1955).

A second example of the kind of over-optimism that can feed a merger wave comes from the 1960s conglomerate merger wave. During this wave a group of companies – the so-called conglomerates – undertook a series of diversification mergers. Each new merger announcement during the stock market boom was greeted by an increase in the conglomerate’s share price. One explanation for this given in both the popular and the academic literature was that the conglomerates were engaging in “P/E magic.” Because of the market’s optimism about the conglomerates, they were trading at P/Es as high as 30. A conglomerate would announce that it was acquiring, say a steel company, with a P/E of 10.
The lower P/E of the steel company obviously suggests that the market anticipated slower future growth in earnings for the steel company than for the conglomerate. Upon the merger announcement, however, the market would reevaluate the earnings of the steel company using the P/E of the conglomerate. Thus, if the steel company had earnings of $10 million and a market value of $100 million, these earnings would create $300 million in value for the conglomerate, which would easily allow it to buy the steel company at a hansom premium and still have a positive gain from the transaction. The obvious question to be asked is whether the conglomerates would be able to generate growth in the steel firm’s earnings to justify a P/E of 30 for it. The performance of the conglomerates once the stock market bubble burst indicates that they were not able to generate this growth.15

The P/E magic worked by the conglomerates of the sixties resembles the kind of Ponzi scheme that Shiller (2000, pp.64-66) claims characterizes all stock market bubbles. So seductive are such theories, that even a future president of the American Finance Association could not help but list P/E magic as one of his finance-based hypotheses about the motives for conglomerate mergers (Lintner, 1971).

This discussion of stock market psychology during booms sheds a different light on the ISH. To take advantage of the over-optimism in the market – the desire people have to believe that share prices will rise – managers need to give them an “excuse to believe.” Proclamations of synergies accompanying merger announcements may serve as such an excuse. If they do, other firms within an industry may decide to merge naming the same synergies, and a “theory” of industry-specific synergies is born. Twenty-five of the 34 industry waves that Harford (2005, Table 2) identifies occur during the 1995-2000 period, which we identify as the aggregate wave. One of these is in the insurance industry. The shock precipitating this wave according to Harford is “big is safer, leading to consolidation, especially in reinsurers.” But certainly the advantages of size in insurance were well-known
long before 1998. Did these gains really only become apparent in 1998, or did the optimism in the market at that time allow insurance companies to use size as a justification for mergers that would have met a cooler reception earlier? The wave in medical equipment had “Two motives: first, acquisitions in core areas to grow, then acquisitions outside core areas to offer broad products to increasingly consolidated customers (hospitals).” The first motive seems more consistent with the managerial discretion hypothesis that posits growth as a managerial goal than with a neoclassical theory of mergers, and the second resembles the justifications given for diversification mergers ever since the conglomerate merger wave of the ‘60s. Whether these and other reasons given for the industry waves represented real profit opportunities seized by managers, or merely their justifications offered to a gullible market cannot be determined ex ante. The estimates of post-merger returns of acquiring companies presented below provide a way to discriminate between the two hypotheses.16

The over-optimism that characterizes stock market booms figures prominently, but in somewhat different ways in the two behavioral theories of mergers, as we shall now see.

III. The Two Behavioral Theories of Mergers

A. The Managerial Discretion Hypothesis (MDH)

1. The underlying logic

Robin Marris (1964, 1998) was the first to posit growth as an objective for managers, and Mueller (1969) applied the theory to explain the conglomerate merger wave of the late 1960s. Managers get utility from their firm’s growth either because their incomes are tied to growth, or because they get “psychic income” from managing a larger firm.17 The constraint on managers’ pursuit of growth is the threat of takeover, which is inversely related to \( q \). Thus, managers’ utility can be expressed as a function of the growth of their firms, \( g \), and \( q \), 

\[
U = U(g, q), \quad \frac{\partial U}{\partial g} > 0, \quad \frac{\partial^2 U}{\partial g^2} < 0, \quad \frac{\partial U}{\partial q} > 0, \quad \text{and} \quad \frac{\partial^2 U}{\partial q^2} < 0.18
\]
Defining $M$ as the amount of assets acquired through mergers, and setting $g = g(M)$, we can maximize $U(g,q)$ with respect to $M$ to determine the utility maximizing level of growth through mergers. This yields the following first order condition:

$$\left( \frac{\partial U}{\partial g} \right) \left( \frac{\partial g}{\partial M} \right) = -\left( \frac{\partial U}{\partial q} \right) \left( \frac{\partial q}{\partial M} \right)$$

Since $\partial U/\partial g > 0$, $\partial g/\partial M > 0$, and $\partial U/\partial q > 0$, (3) cannot be satisfied if $\partial q/\partial M > 0$. For any merger that increases $q$ no tradeoff between growth and security from takeovers exists. Growth-maximizing managers undertake all mergers that increase $q$. Their behavior differs from managers who maximize shareholder wealth only with respect to mergers that decrease $q$. Figure 2a depicts the relationship in eq. 3 for mergers that lower $q$. When no mergers of this type are undertaken, $q$ is at its maximum and the risk of takeover is minimized. When the relationship between $q$ and $M$ yields $-\left( \frac{\partial U}{\partial q} \right) \left( \frac{\partial q}{\partial M} \right) > 0$, a utility-maximizing manager undertakes $M_N$ of value destroying mergers.

As discussed in the previous section, during a stock market boom investors are more willing to accept new news as good news. Announcements of mergers that would under normal conditions result in large declines in the acquirers’ share prices, during a stock market boom produce only modest declines, or even share price increases. Thus, in a stock market boom, the relationship between $q$ and $M$ shifts from its normal level, say line $N$ in Figure 2b, to something like $B$. This change shifts $-\left( \frac{\partial U}{\partial q} \right) \left( \frac{\partial q}{\partial M} \right)$ to the right, as in Figure 2a. The firm acquires more assets through mergers, $M_B$, since $q$ does not drop by as much or perhaps even rises when a merger is announced.

For a firm that overinvests, the marginal return on its investment is below its neoclassical cost of capital. Raising funds externally, therefore, will seem more expensive than using internal cash flows. Cash flows have, therefore, been a key variable for
distinguishing between the MDH and the neoclassical theory in studies of the determinants of corporate investment and R&D.\textsuperscript{19} Cash flows are thus included in our model, as an additional way to discriminate the MDH from the overvaluation hypothesis.

2. Testing the MDH

The discussion in subsection 1 suggests including $q$ to measure the tightness of the takeover constraint, and cash flows to measure the funding constraints on managers. A high $q$ frees managers to finance unprofitable mergers by whatever means they choose, but a high $q$ should also make them particularly more willing to use their favorite source of finance – cash flows. Thus, we also include an interaction term between $q$ and cash flow with a predicted positive sign. The higher $q$ is, the more discretion managers have to undertake unprofitable investments, and the larger is the predicted coefficient on cash flows.\textsuperscript{20}

Holding $M$ constant, the larger the size of a potential acquirer, the less impact the acquisition has on its $q$. Thus, the curve relating $q$ to $M$ in Figure 2 should be flatter, the larger the size of the acquiring firm ($S$) relative to the target, $M$. A second justification for including size in the equation is that the costs of taking over a firm and replacing its managers should grow with the size of the company. Managers of large companies have more discretion, therefore, to make bad acquisitions. For these reasons, we expect assets acquired through mergers to vary positively with firm size.

To test the MDH, we need a variable to capture the degree of over optimism in the stock market. A measure implied by Shiller’s (2000) work is the S&P P/E ratio (P/E\textsubscript{t}). (We could subtract the average P/E to measure over optimism, but subtracting a constant would not change the variable’s statistical properties.) These considerations lead to the following predictions under the MDH.
Tender offers are more likely to meet with resistance from target managers and thus involve higher transaction costs. Since acquiring firms’ managers are only interested in growth under the MDH, they should not care which firms they acquire, and will thus favor friendly mergers because of their likely lower transaction costs. We thus anticipate less support for the MDH for tender offers, $T_t$, than for friendly mergers, $F_t$.

Mergers under the MDH are not assumed to be wealth creating. Since an acquiring firm pays a premium for a target’s shares, its shareholders should suffer a wealth loss equal at minimum to the gain to the targets. On the other hand, the over optimism in the market that encourages managers to undertake wealth-destroying mergers should ensure that the acquirer’s share price does not drop precipitously when the mergers are announced. Thus, we predict that the shares of acquiring firms earn large negative abnormal returns over long time spans following the mergers, but not immediately when they are announced. During stock market booms managers have more discretion to make wealth-destroying mergers, and the fraction of all mergers that fits the MDH should increase. We thus expect a worse post-merger performance for acquirers’ shares for mergers undertaken during merger waves.

B. The Overvalued Shares Hypothesis (OVH)

1. The underlying Logic

In their theory, Shleifer and Vishny (2003) (hereafter S&V) retain the assumption that managers maximize shareholders’ wealth (at least as far as the acquiring firms are concerned), but relax the assumptions that mergers create wealth and of capital market efficiency. Some firms’ share prices become overvalued during stock market booms. Their managers know their shares are overvalued, and wish to protect their shareholders from the
wealth loss that will come when the market lowers its estimates to their warranted levels. They accomplish this by exchanging their overvalued shares for the real assets of another company, which the market presumably correctly prices. Targets’ managers are assumed to have short time horizons, so they too gain by “cashing in” their stakes in their firms at favorable terms. Although mergers are not assumed to possess any wealth-creating synergies, under the OVH they appear to be win-win events, since both the acquiring firm’s shareholders and the target’s managers benefit from the mergers.

S&V’s OVH would seem to suffer from a similar difficulty to that of J&R’s $q$-theory. The shareholders of overvalued companies can be protected by exchanging the overvalued shares for any assets that are correctly priced by the market. Since all share prices tend to rise during stock market booms, any acquired firm that they buy is also likely to be overvalued, although not perhaps to the extent that the buyer is. When one adds in the merger premia, buying companies during stock market booms must be rather expensive relative to other assets (see again figures in Table 1). An obvious alternative would be to issue shares to buy back one’s own debt. The debt of other firms is another possibility, as is real estate, works of art, and any other real assets whose prices are not inflated during a stock market boom, and do not require premia of 20-30 percent or more to close the deal.

S&V (2003, p. 298) recognize this difficulty and thus add to their hypothesis the assumption that the market needs to believe that the transaction in which the firm sells its overvalued shares generates some sort of “synergy.” They thus implicitly assume that the market can only see synergies in the purchase of other firms and not in the purchase of other sorts of assets. This assumption is similar to that underlying the MDH, and thus in this respect makes it difficult to discriminate between the two hypotheses. The same is true of the version of the OVH put forward by Rhodes-Kropf and Viswanathan (2004, hereafter RKV), and tested by Rhodes-Kropf, Robinson and Viswanathan (2005, hereafter RKRV). They do
not assume, as do S&V, that target managers want to cash in their stakes, but rather that
during a stock market boom the market has difficulty evaluating the value of the shares of
acquirers and is more willing to accept them in exchange for shares in target companies.

2. Testing the OVH

To test the OVH we need to measure the overvaluation for each firm. Here, we
encounter a methodological difficulty. If we can identify firms that are overvalued, so too
presumably can the capital market and the firms cease to be overvalued. This conundrum
notwithstanding, several studies have found support for the OVH using various measures of
overvaluation (Verter, 2002; Ang and Cheng, 2003; Dong, Hirshleifer, Richardson and Teoh,
2005; and RKRV, 2005). These measures typically involve the ratio of market to book value
of equity or its reciprocal.

We assume that all firms in an industry have the same costs of capital and expected
growth rates, and use equation 2 to estimate $1/(k_i - g_i)$ for a typical firm by regressing the
market values of all firms in the industry on their profits for a period of time when, based on
the aggregate price/earnings ratio for the S&P index, shares in aggregate do not appear to be
overpriced. Call this estimate of $1/(k_i - g_i)$, $\alpha$. Using this $\alpha$ we predict firm $i$’s market value
in year $t$ as

$$\hat{V}_t = \hat{\alpha} \pi_t$$

(4)

We then create a measure of a firm’s overvaluation in any year, $O_{it}$, as

$$O_{it} = V_t - \hat{V}_t$$

(5)

With this measure of overvaluation we test whether the assets acquired though mergers are
positively related to $O_{it}$. 

17
If managers perceive their firm to be overvalued by, say 30%, they have the same incentive to exchange these shares for correctly valued real or financial assets regardless of whether the stock market is at a normal level, depressed, or in a boom. The logic of the OVH implies that the same relationship between firm overvaluation and merger activity should hold at all points in time. What drives merger waves during stock market booms is that many more firms become overvalued. This further implication of the theory can be tested by decomposing $O_t$ into two components, $O$, the mean level of overvaluation across the entire sample, and $dO_t$, the deviation of firm $i$’s overvaluation from this sample mean, $dO_t = O_t - O$. If one replaces $O_t$ in the equation explaining merger activity with $dO_t$ and $O$, both variables should have the same coefficient, if all that matters for mergers is the extent of overvaluation of the acquiring firms.

Under the S&V version of the OVH, the targets’ managers are willing partners in the mergers. Managers of targets in hostile takeovers are virtually never willing partners in the transactions. Although all tender offers are not hostile takeovers, they are a less friendly way to acquire another company than through a mutual agreement among the two companies’ managers. Thus, the OVH seems more plausible for friendly mergers than tender offers, and we test it separately for each form of merger.

3. Characteristics of targets

Under S&V’s version of the OVH, managers of targets wish to cash in their stakes in their companies. The incentive to cash in should be greater, the larger a stake is. Individuals with large stakes outside a firm might also wish to cash in. This implication of the OVH is tested by constructing $VS$, the market value of the equity held by the largest shareholder. It also seems reasonable that the managers are more eager to sell out, the more overvalued their shares are, and thus we test to see whether the probability that firm $i$ is acquired in $t$ is a positive function of $VS_t$ and $O_t$. 
At some point in time the capital market corrects its error, and the share price of an overvalued acquirer falls to its warranted level. The target’s managers will not accept the acquirer’s shares, however, if their price falls immediately upon the merger’s announcement, because this would not allow them to “cash in.” The OVH thus predicts that the shares of acquiring firms earn large negative abnormal returns over long time spans following the mergers, but not immediately when they are announced. The OVH assumes that the number of firms with overvalued shares increases during stock market booms and that this explains merger waves. Thus, it implies that the post-merger performance of acquirers’ shares is worse for mergers undertaken during merger waves. These two predictions are identical to those made under the MDH. To discriminate between them, we need additional tests. Some are described in the next subsection.

4. Discriminating between the MDH and OVH

Our test of the OVH includes only this variable in the equation, since it is the only one implied by the theory. In the equation testing the MDH, we include a measure of the level of (over) optimism in the market, a firm’s cash flow, \( q \), size and an interaction term between cash flow and \( q \). Tobin’s \( q \) will be highly correlated with any measure of overvaluation, and so it does not discriminate well between the two hypotheses. Similarly, the degree of over optimism in the market figures at least in RKV’s version of the OVH. Thus, the key discriminatory variables between the two hypotheses in the regressions to explain assets acquired, are cash flow, the cash flow-\( q \) interaction and size.

Size appears in the MDH model of mergers for two reasons. First, the transaction costs of acquiring a firm with a market value of $50 billion are much higher than for a firm with a market value of $5 billion and, thus, the managers of the larger firm have more discretion to pursue their own goals. Second, ceteris paribus, the larger the acquirer, the
smaller the impact on its share price will be from acquiring another company. One might also think of size as some sort of control variable, and argue that it also belongs in the OVH equation. The reader is, of course, free to think of size in this way, but we believe that logically size does not belong in an equation testing the OVH, and if it is included it should logically have a negative coefficient, not the positive one predicted under the MDH.

To see the logic of this argument, imagine a firm with assets worth 100 and a market value of 200 – thus an overvaluation of 100. Let us suppose that it acquires a company with assets worth 100 by issuing 100 of its own shares (it pays no premium), and that its share price remains unchanged. It now has a market value of 300 and assets worth 200. When the market corrects the overvaluation, the firm’s shareholders suffer a loss of 1/3rd the value of their shares instead of one half, and have obviously benefited from the merger.

Now suppose that the same firm acquires a firm with assets worth 1000 by issuing 1000 of its own shares, and that its share price remains unchanged. It now has a market value of 1200 and assets worth 1100. When the market corrects the overvaluation, the firm’s shareholders suffer a loss of 1/12th the value of their shares instead of one half, and are much better off from the merger with the larger firm than with the smaller one. Overvalued firms should seek out bigger merger partners not smaller ones.  

IV. Previous Tests of the Two Hypotheses

Very few studies have tried to test the MDH with a regression of assets acquired on cash flow and other variables. The pioneering study by Schwartz (1984) can be said to have obtained at best mixed support for the hypothesis. Harford (1999), however, found for the period 1950-94, that (1) cash rich companies are more likely to undertake acquisitions, (2) their acquisitions are more likely to be diversifying acquisitions, (3) the abnormal share price reaction of bidders is negative and lower than for bidders which are not cash rich, and (4)
operating performance deteriorates after acquisitions by cash rich companies. These results directly support a theory that links mergers to managerial discretion and cash flows.\(^\text{26}\)

As noted above, numerous studies have found support for the MDH using investment or R&D as the dependent variable, and cash flow as the key explanatory variable.\(^\text{27}\) Our article can thus be regarded as one of the few to test directly the MDH using assets acquired through mergers as the dependent variable.

The OVH has found empirical support in recent papers by Dong et al. (2002), Ang and Cheng (2003), and RKRV. The tests of Dong et al. focus mainly on the choice of payment in mergers, and the pattern of post merger returns. Both Ang and Cheng and RKRV find a positive relationship between the likelihood that a firm becomes an acquirer and measures of overvaluation. Ang and Cheng (2003, Table 3) include size in their logit regression to predict the identities of acquirers. It picks up a positive coefficient and is by far the most significant variable in the equation.

A huge literature exists estimating the returns to acquiring and target firm shareholders.\(^\text{28}\) The literature as it pertains to acquirers can be divided into three categories. One group of studies estimates returns to acquirers for very short windows around the merger announcements and finds that acquirers experience zero or slightly positive returns. These studies conclude that mergers are wealth creating, because the target’s shareholders obtain positive returns that are large relative to their size, and thus claim support for some neoclassical hypothesis about the causes of mergers.\(^\text{29}\) A second group of studies also estimates returns for very short windows around the merger announcements, but finds that acquirers experience negative returns, and conclude that some non-neoclassical hypothesis must explain mergers.\(^\text{30}\) Although most of these studies also find that the abnormal returns to acquirers are small in percentage terms, one recent study of the 1990s merger wave has found
huge absolute losses to acquirers over short windows around the announcements (Moeller, Schlingemann and Stulz, 2005).

The third group estimates the abnormal returns to acquirers over event windows spanning two, three or more years following the mergers. Several early event studies measured significant negative abnormal returns to acquirers over long post-merger windows — none estimated positive returns to acquirers over long windows. These negative post-merger returns were generally ignored by those who measured them or dismissed as “a puzzle” (Asquith, 1983, p. 75). Belief in the efficient market hypothesis at that time was so strong that one did not expect and therefore tended to dismiss evidence of long-run adjustments to events like mergers.31 Thus, it was in 1983 that Jensen and Ruback could conclude that mergers had on average generated wealth increases (looking only at short windows), since acquirers’ shareholders did not appear to lose from the mergers, and target shareholders gained.

Subsequent studies continued to measure significant, negative post-merger returns over long windows, and began to emphasize that these contradicted both the efficient capital market hypothesis, and the claim that mergers generated net increases in shareholder wealth. Because of the much greater size of the acquirers, their losses outweighed the gains to the targets.32 Of particular interest in this regard is the article by Agrawal, Jaffe and Mandelker (1992)(AJM). They estimated returns over five-year post-announcement periods. Over the 1955-87 period, the cumulative abnormal return to acquirers was a significant -10 percent. Significant negative post-merger returns were also estimated for the 1950s, 1960s and 1980s. Insignificantly positive abnormal returns were estimated, however, for the 1970s. This pattern is consistent with the hypothesis that merger waves are fueled by stock market speculation and that acquiring companies undertake wealth-destroying mergers out of empire-building motives when their share prices and/or cash flows are high, or simply out of
hubris fed by their companies’ high share prices. The depressed share prices of the 1970s may have brought about a more sober approach to mergers, and thus were they not followed by post-merger losses even over long windows.

Estimates of returns by Loderer and Martin (1992) and Higson and Elliott (1998) were also sensitive to the time period in which the mergers occurred. Loderer and Martin obtained only one significant estimate of a post-announcement abnormal return – a negative return for mergers between 1966 and 1969. This finding is, of course, consistent with the hypothesis that booming stock markets are associated with disproportionate numbers of ill-conceived mergers. Unlike AJM, Loderer and Martin did not estimate negative post-announcement returns for mergers during the 1980s, however.

The patterns of post-merger returns reported by Gregory (1997) and Higson and Elliott (1998) are particularly relevant for the hypotheses tested here. Higson and Elliott find that mergers in the UK between 1975 and 1980, and again between 1985 and 1990 were followed by significant wealth losses to acquirers. Mergers between 1981-84, a period of sluggish stock price movements in the UK, were, on the other hand, followed by significant positive abnormal returns. Gregory’s data begin where the data of Higson and Elliott end. He estimates a significant -12.5 percent abnormal return for acquirers between 1984 and 1992. Putting these two UK studies together, we see that mergers have been followed by negative abnormal returns to acquirers for every time period between 1975 and 1992, except the one of sluggish stock market activity in 1981-84.

Finally, mention must be made of Rau and Vermaelen (1998) (RV). They estimate significant post-announcement returns of -4 percent for 2823 acquirers in friendly mergers, and significant positive returns for 316 tender offers (time period 1980-1991). They also provide considerable support for the hypothesis that high share prices fueled by over-optimism are associated with negative returns to acquirers. Acquirers with high market
values relative to the book values of their assets earned a -17.3 percent abnormal return over the 3 years following merger announcements. In contrast, companies with relatively low market values had positive post-announcement returns. RV conclude “that these findings are consistent with the hypothesis that the market overextrapolates the past performance of the bidder management when it assesses the benefits of an acquisition decision. As a result, the market, as well as the management, the board of directors and large shareholders overestimate the ability of the glamour bidder to manage other companies” (p. 251).33

These findings from previous studies are quite consistent with the predictions of the two behavioral hypotheses. At merger announcements acquirers’ shareholders experience little or no gains from the mergers. As the market learns more about the acquirers and the mergers, the acquirers often earn significant negative abnormal returns. This is particularly likely to be true of mergers announced during periods in which stock prices are climbing. Only a couple of studies have reported positive post-merger abnormal returns for acquirers and these are always for mergers announced when the market is not advancing or for tender offers – mergers that are unlikely to fit the behavioral hypotheses.

The predictions that acquirers do not suffer large losses when mergers are announced, but do so over longer time frames are key predictions in testing the two behavioral hypotheses. We find substantial support for these predictions both in the many studies that have been conducted by others and in our own results. Nevertheless, these findings remain controversial. Several scholars continue to dismiss results based on long, post-merger windows on the grounds that they are inconsistent with the efficient capital market assumption. They claim that these results are due to econometric problems that arise when one measures abnormal returns over long windows.34 We do not believe, however, that these econometric difficulties would yield that kinds of patterns that we observe – negative abnormal returns for mergers announced during stock market advances, positive or zero
returns for mergers announced during depressed stock markets; negative returns for friendly mergers, positive returns for tender offers, and so on.

In closing this discussion of the literature, it should be pointed out that even the findings of the event studies that only look at short windows are problematic for neoclassical theories of mergers that assume that managers maximize shareholders’ wealth. The evidence that acquirers do not gain from mergers is by now overwhelming. Indeed, the business press, with which managers are more likely to be familiar than with the academic literature, is far more negative about mergers. It is also well known that the variance of returns for acquirers is quite large. Why would managers who seek to maximize the wealth of their shareholders undertake investments that promise near zero returns and high risks? The usual explanation given by those favoring the neoclassical theories is that the market for corporate control is highly competitive and the possible gains to acquirers get bid away during the process of buying the target. But this “explanation” begs the question of why managers of acquiring firms choose to enter such a highly competitive and unprofitable market.

V. Methodology and Data Description

Our principal source of data is Global Mergers and Acquisitions database from Thompson Financial Securities Data. It contains merger and spin-off data from a variety of sources such as Reuters Textline, the Wall Street Journal, Dow Jones etc. The database covers all transactions valued at $1 million or more. We define a merger or tender offer as a transaction where more than 50 percent of the target’s equity is acquired. A tender offer is a formal offer of determined duration to acquire a company's shares made to its equity holders.

Table 1 presents the total numbers of acquisitions, friendly mergers and tender offers in our sample. The popularity of tender offers during the late 1980s is readily apparent with their fraction of all acquisitions peaking at 26 percent in 1986. In reaction to the wave of hostile takeovers in the late 1980s, managers approached the legislatures in the states in
which they were incorporated and demanded legislation that afforded them better protection against takeovers. Most readily complied, which helps explain the sharp relative decline in tender offers in the early 1990s.\textsuperscript{37}

The hypotheses predict the signs on the relevant variables, but not the functional form of the relationship. We experimented with polynomials up to the third order, but report results for the higher order terms, only when they are significant.

The models might be estimated twice, once as a probit regression to determine the probability that a company undertakes an acquisition, and a second time as a Tobit regression to take into account differences in the sizes of the targets. Both probit and Tobit regressions were estimated, but only the Tobit results are reported, because they differ from the probit results only with respect to the sizes of the coefficients on the different variables. That is to say, the same variables that explain \textit{whether or not} a firm undertakes a merger in a particular year explain the \textit{amount} of assets acquired. The close similarity between the results for the probit and Tobit estimations also implies that there was little to be gained from adopting Heckman’s (1976) two-stage estimation procedure for censored data.

Summary statistics for our data are presented in Table 3a. The variables are as follows. $M_{it}$ is the deal value (total consideration paid by the acquirer excluding fees and expenses) divided by the total assets of the acquiring firm in year $t-1$. \textit{Tobin’s $q$} is a firm’s market value divided by its total assets. A firm’s market value is the sum of the market value of its common stock, the book values of total short and long term debt ($9+34$, \textit{Compustat} numbers for the items appear in parentheses), and preferred stock, defined as available, as redemption value (56), liquidating value (10), or par value (130). The market value of common stock is the end-of-fiscal year number of shares (54) times end-of-fiscal year share price (199). \textit{Cash flow} is after tax profits before extraordinary items (18) plus depreciation (14). All variables are deflated by the $CPI$ (1985=1.00). The average deal value was $307.2
million with targets of tender offers ($474.7 million) being significantly larger than for mergers ($283.9 million). This difference might be explained by the fact that tender offers were often intended to take over large diversified companies and spin off some of their assets. The average target was 10 percent of the acquirer’s size in a tender offer, 26 percent in a merger. Mean Tobin’s $q$ for acquirers in tender offers is not significantly different from that of the full sample. Acquirers in mergers had significantly higher $q$s than other companies, however. Both types of acquirers have significantly higher levels of cash flows than non-acquirers. Overvaluation as a fraction of total assets is 69.7 percent for acquirers in all acquisitions. Acquirers in friendly mergers are more overvalued (71.6%) than acquirers in tender offers (55.3%). On the other hand, overvaluation of targets in all acquisitions is lower than these figures (43.7%). More importantly, non-merging firms have the lowest overvaluation as a fraction of their total assets (37.6%). These figures do not support the contention that firms with attractive merger opportunities tend to be undervalued and thus are only able to make the acquisitions when macro liquidity conditions are favorable.

Table 3b presents correlation coefficients of our main variables. Assets acquired in friendly mergers, $FM_{it}$, are significantly correlated with $q$, $O_{it}$ and the P/E ratio. Assets acquired in tender offers, $TO_{it}$, have an insignificant correlation with Tobin’s $q$, and are negatively correlated with the P/E ratio and $O_{it}$ (insignificant). Tobin’s $q$ is highly correlated with our measure of overvaluation.

VI. Tests of the Two Behavioral Hypotheses

A. The Managerial Discretion Hypothesis

The MDH is expected to do better at explaining friendly mergers than tender offers, and so separate results for these two forms of acquisitions are we reported in Table 4. For friendly mergers all coefficients have the predicted signs and are highly significant (eq. 1).
Note in particular the positive and significant coefficient on the interaction term between lagged cash flows and $q$. The larger $q$ is, the more discretion managers have to pursue their goals, and the more willing they are to use their cash flows to undertake friendly mergers.

The degree of (over) optimism in the market, the S&P P/E, is highly significant. So too are the three firm size terms. Their coefficients imply an S-shaped relationship between size and acquired assets with the partial derivative changing in magnitude, but remaining positive, over the range of asset values. As discussed above, we interpret size as an additional measure of managerial discretion.$^{38}$

Eq. 2 tests the MDH for tender offers. As predicted, the fit is poorer than for friendly mergers – the pseudo $R^2$ is lower, the coefficient on $q_{it-1}$ is insignificant, and the coefficient on the $q_{it-1}/$cash flow interaction is of the wrong sign. We interpret this negative coefficient in the following way. The final transaction in a tender offer is almost always an exchange of cash for the target’s shares. A firm with a high $q$ can raise cash by issuing shares, and is more likely to do so, the higher its share price ($q$). Firms with low $qs$ are thus more dependent on their internal cash flows to finance tender offers, which accounts for the negative coefficient on the $q/cash$ flow interaction term. The importance of cash as the means for financing tender offers also explains the large coefficient on cash flows in eq. 2.

### B. The Overvaluation Hypothesis

Under the OVH, the targets’ managers are willing partners in mergers, and thus the OVH should receive more support for friendly mergers than for tender offers – and it does. Although the coefficient of $O_{it}$ is positive and significant for both friendly mergers and tender offers, it is more than twice as large for friendly mergers implying a much greater sensitivity of this form of acquisition to overvaluation than for tender offers (see eqs. 3 and 4).$^{39}$

Logically under the OVH the source of overvaluation should not matter, only its
magnitude. Thus, when \( O_{it} \) is separated into the average overvaluation in the market, \( O_t \), and firm \( i \)'s deviation from this average, \( dO_{it} \), both variables should have identical coefficients (\( O_{it} = O_t + dO_{it} \)). This prediction is resoundingly falsified (see eq. 5). The coefficient on \( O_t \) is some seven times larger than the one on \( dO_{it} \). What appears to drive mergers is not that some firms have overvalued shares and their managers wish to unload them, but rather that the entire market is overvalued. This market overvaluation can be viewed as measuring the degree of optimism in the market, and thus of the market’s willingness to accept the overvalued shares of the acquirer. This finding is consistent with RKRV’s version of the OVH, which emphasizes the willingness of the market to accept the overvalued shares of the acquirers. It puts a considerably different twist on the hypothesis from the one put forward by its original proponents, S&V, however. The importance of a firm’s being overvalued pales in significance against the market’s overall optimism and willingness to accept overvalued shares in mergers. This finding also makes it more difficult to discriminate the OVH from the MDH.

C. Discriminating between the MDH and OVH

1. Predicting the Probability of Being Acquired

Under the S&V’s version of the OVH, targets’ managers want to cash in their stakes and are willing partners to mergers that do not generate wealth and saddle their shareholders with overvalued shares. Thus, the likelihood of a firm becoming the target of a friendly merger should be positively related to the size of the managers’ stakes, \( VS_{it-1} \), and the extent to which they are overvalued, \( O_{it-1} \). We test these predictions by estimating a probit equation to predict the probability that a firm becomes a target (PAQ\(_{it} \)). We estimate separate coefficients on the two variables for mergers taking place in wave and non-wave years (absolute values of the \( t \)-statistics are under the coefficients).
Non-Wave: \[ PAQ_t = 3.99 \times 10^{-7} O_{it} - 0.00115 VS_{it}, \quad n=20,378, \quad R^2=0.0009 \]

\[ 0.14 \quad 1.22 \]

Wave: \[ PAQ_t = -8.10 \times 10^{-6} O_{it} - 0.00191 VS_{it}, \quad n=7,826, \quad R^2=0.0005 \]

\[ 1.22 \quad 0.63 \]

The OVH is rejected for both wave and non-wave years. None of the coefficients on VS_{it-1} and O_{it-1} are positive and significant as the OVH predicts. The inclusion of an interaction term between VS_{it-1} and O_{it-1} did not improve the results.

2. Predicting the Means of Finance

Logically the OVH explains both the amount of assets acquired by a firm and the method for financing the acquisition. A firm acquires another company because its shares are overvalued and issues additional overvalued shares to finance the acquisition. The OVH cannot account, therefore, for the 25 to 40 percent of assets acquired during the merger wave that were not financed through the issuance of shares (see Table 2). These can be explained by the MDH. Indeed, under the MDH, acquisitions can be seen as a two-step process: first, the firm decides whether or not to make an acquisition, and second, having decided to make an acquisition, chooses how to finance it. Under this interpretation, the degree to which a firm is overvalued can be expected to play a role in determining how a merger is financed, even if it does not explain the acquisition itself. To test this hypothesis, we regress SF_{it}, the fraction of assets acquired by a firm in year \( t \) through the issuance of new shares on O/MV_{it}, the ratio of the dollar amount by which an acquiring firm is overvalued to its market value in year \( t \), CF/MV_{it}, the ratio of the acquiring firm’s cash flow to its market value in year \( t \), FF_{it}, the federal funds rate in year \( t \), and TMV/MV_{it}, the ratio of the target’s market value to the acquirer’s market value in year \( t \). The more overvalued an acquirer is, the greater the share of its acquisition that it will finance with shares. The larger its cash flow is, the more cash it is
likely to use, and thus the smaller the fraction of the acquisition financed by shares will be. The federal funds rate is included as a measure of borrowing costs, and is expected to have a negative coefficient – the lower borrowing costs are the more likely the firm is to issue debt instead of equity to finance an acquisition. Finally, we expect that firms are more likely to use equity to finance relatively large acquisitions, and thus predict a positive coefficient on $\frac{TMV}{MV_t}$. Similar results were obtained when we adjusted the federal funds rate for inflation, and for both OLS and Tobit regressions, and thus we report only one set of results – OLS results with the unadjusted federal funds rate ($t$-statistics are reported under the coefficients).

$$SF_t = 63.82 + 5.19 \frac{O}{MV_t} - 141.33 \frac{CF}{MV_t} - 2.87 FF_t + 10.58 \frac{TMV}{MV_t}, \ n = 3840, \ R^2 = 0.071$$

28.51  4.49  10.72  9.46  4.17

All coefficients have the predicted signs and are highly significant. Overvaluation clearly does help explain an acquiring firm’s choice of finance for the acquisition., but so too do the levels of cash flows, borrowing costs and the relative size of the target.

3. Predicting the Post-merger Returns of Acquirers

We first present the abnormal returns for acquirers for the four windows (one month, and one, two and three years) to see whether they are consistent with the predictions of the two behavioral hypotheses. The control group for calculating the abnormal returns is all companies, which did not make an acquisition in the year prior to the month of the acquisition and over the length of the window. Separate estimates are made for mergers during the great merger wave (1995-2000), and outside of it (1980-94 and 2001-2002). We use the total return index from Datastream, which is adjusted for dividend payments and share splits.
The first set of estimates in Table 5 is for the announcement month. The mean abnormal returns for acquirers are insignificantly different from zero. This finding contradicts the two neoclassical theories, but is consistent with the behavioral theories. Also consistent with the behavioral theories, are the higher returns to acquirers in tender offers than for friendly mergers, although only the mean returns for tender offers during the wave are significantly greater than zero.

The picture changes dramatically one year after the acquisitions. Shares of acquirers in friendly mergers have significant, negative abnormal returns, and mergers during the wave produce worse performance than non-wave mergers. These results are again inconsistent with neoclassical theories of mergers, but exactly what the behavioral theories predict. Also consistent with the behavioral theories is the post-merger performance after one year of acquirers making tender offers during non-wave years. These are much larger than for friendly mergers and insignificantly different from zero. Many of these tender offers occurred during the so-called “hostile merger wave” of the 1980s and were targeted against poorly performing companies. As discussed above, the motivation behind these tender offers is likely to have been quite different from that behind friendly mergers. Tender offers made during the merger wave look quite different, however. Their post-merger share performance after one year is the worst of the four categories. The share performance of tender offers made during the wave matches the predictions of the behavioral theories. Indeed, the positive 2.23 percent returns made by these firms in the announcement month coupled with the -10.88 percent returns recorded after one year implies a good deal of optimism by the market regarding tender offers during waves – optimism that within a year had vanished.

The post-merger returns after two and three years further substantiate the inferences from the one-year results. Abnormal returns for friendly mergers decline with each passing year, with friendly mergers during the wave faring significantly worse than those outside of
the wave. After three years the mean abnormal return for an acquirer in a friendly merger during the wave was -31 percent. In half of these mergers it exceeded -42 percent. Shareholders of firms making tender offers during the wave suffered the largest post-merger losses, however, while tender offers in non-wave years produced the smallest losses. These results offer no support for neoclassical theories that claim that mergers create wealth, while strongly confirming the predictions of the two behavioral hypotheses.41

The results in Table 5 support the two behavioral hypotheses, but do not readily allow one to discriminate between them. To accomplish this, we test whether the shareholders of acquirers with overvalued shares benefit from the mergers, because the shares are traded for real assets. We do this by regressing shareholder returns on the size of the target at the time of the acquisition, $T_t$; the amount by which an acquirer was overvalued at the time of the acquisition broken down as before into the average overvaluation in the market at the time of the acquisition, $O_t$, and the acquirer’s deviation from the average, $dO_t$; and an interaction term between the target’s size and the acquirer’s overvaluation, $T_t \times O_{it}$. All variables are deflated by the size of the acquirer. The OVH predicts a positive coefficient on the interaction term, the more overvalued a firm is, the more its shareholders benefit from the acquisition of real assets. Implicitly, it also predicts a coefficient of zero on the size of the target – there are no positive or negative synergies, so the acquirer is not hurt by the acquisition. The overvaluation variables by themselves are expected to have a negative coefficient for the longer windows due to the market’s correction of the extent of overvaluation. The equation is estimated for all merging and non-merging firms, so that non-merging firms are again the control group. We do not discriminate between types of mergers in these regressions.

Under the efficient capital market assumption, none of the four variables should have a significant coefficient and the equation’s $R^2$s should be zero. The $R^2$s in Table 6 are indeed
low, but 41 of the 48 coefficients on the four variables are significant at the five percent level or better using a one-tailed test, 40 of 48 with a two-tailed test. Thus, a prediction of the efficient capital market assumption is rejected. Knowing that a firm was overvalued and that it made an acquisition in a given month does allow one to better predict its future returns, particularly over the longer time periods.

The results for one-month returns over the entire time period can be interpreted as follows. If a firm was neither overvalued nor made an acquisition, it earned on average a 1.6 percent return. If it acquired another company in that month and was not overvalued, it earned a significantly lower return (for example, if the target was half the size of the acquirer, the acquirer’s return was 1.55 percent lower, 0.5 times 0.031). It also earned a significantly lower return if the market was overvalued. Its own deviation from the market was positively associated with its returns for the whole period, however. The target size/overvaluation interaction term is positive and significant, as the OVH predicts, but it is not large enough to offset the direct negative effect of the merger on the acquirers’ returns for all but astronomically overvalued companies – overvaluation more than four times the target’s total assets.

All 12 coefficients on the relative size of the target are negative and highly significant. For the one- and two-year windows they are much larger in absolute size for mergers occurring during the wave suggesting that mergers during the wave were more unsuccessful than mergers in non-wave years. This difference is not apparent in the results for the three-year window, however.

All nine coefficients on the interaction term between target size and acquirer overvaluation are positive and significant for the longer windows as predicted by the OVH. The coefficients are not large enough in absolute size to offset the negative coefficients on $T_t$, however. For example, the partial derivative of returns with respect to $T_t$ for the 2-year
window, wave-years equals $-0.96 + 0.14(O_t)$. For an acquiring company with the mean level of overvaluation for acquirers ($0.697$), this implies a partial derivative of returns to $T_t$ of $-0.86$. The bigger the relative size of the target, the lower the returns to the acquirers. For a target of mean relative size ($T_t = 0.121$), the returns of acquirers would be 10 percentage points lower – 12 percent instead of 22 percent after two years for mergers taking place in the wave. Similar calculations apply for the other, long windows. Thus, a key prediction of the OVH is not supported. The direct negative effects of an acquisition on the returns to an acquirer are so large that they swamp any advantage that an acquirer gets from trading its overvalued shares for the target’s assets.

All 12 coefficients on the market overvaluation variable, $O_t$, are negative and significant with the coefficients for the three long windows being quite large in absolute size. These results indicate that the capital market does eventually correct its overvaluation of firms.

VII. Discussion

A conspicuous feature of aggregate merger activity is that mergers come in waves that coincide with stock market booms. Most hypotheses about the determinants of mergers ignore this characteristic of merger activity. They are not intended to explain merger waves nor do they seem capable of doing so.

In this paper we have examined four theories of mergers that do claim to explain merger waves. Two of these may be called neoclassical in so far as they make the standard assumptions of neoclassical economics – namely that managers maximize shareholder wealth and the capital market is efficient. Several of the assumptions and implications of these neoclassical theories are refuted by the facts about mergers. Under the $q$-theory, high-$q$ firms can profitably expand by acquiring other firms, because this is cheaper than acquiring used
capital equipment. Because merger waves are accompanied by stock market booms, however, the costs of acquiring assets through mergers rises dramatically during a wave making mergers a more expensive way to acquire assets than through either the new or used capital markets.

The industry shocks hypothesis explains merger waves by a coincidence of two events: (1) numerous industries experience various shocks, which make mergers profitable, and (2) favorable macro-conditions reduce the costs of financing acquisitions. It implies an expansion of debt-financed acquisitions during a merger wave as a response to the lower borrowing costs – an implication not supported by the data.

Both neoclassical hypotheses also predict positive returns to acquirers’ shareholders at the time mergers are announced and zero or at least non-negative returns to acquirers over longer time frames following mergers. Both predictions are rejected by the data. Acquirers experience small and generally insignificant returns when the mergers are announced, and large and significant negative returns over longer windows.

Perhaps, the biggest failure of the two neoclassical theories that purport to explain merger waves, however, is that they do not directly incorporate the major characteristics of merger waves into their explanations of them. They do not clearly link the existence of a stock market boom and the over optimism that accompanies it to the accompanying merger wave. Both behavioral hypotheses about merger waves directly link them to the main feature of the accompanying stock market bubbles – the extreme over optimism in the market.

While the pattern of returns to acquiring firms’ shareholders is difficult to reconcile with the two neoclassical theories, it is exactly what one expects under the two behavioral theories. Empirical support was also found for both theories in the Tobit estimations of assets acquired. These estimations revealed, however, that it was not so much the extent to
which a *given firm* was overvalued that explained the amount of assets it acquired, but the extent to which the *stock market* was overvalued. This finding casts a somewhat different light on the OVH, and makes it difficult to differentiate from the MDH, which places considerable weight on the optimism in the market during a merger wave/stock market boom. It is this (over) optimism that allows growth-oriented managers to announce wealth-destroying mergers and *not see* an immediate, precipitous decline in their share price.

Because of the overlap in assumptions and predictions of the two behavioral theories, we devised three tests to discriminate between them. All three went against the OVH. (1) Target managers do not have relatively high stakes in their firms, as one would expect, if they were eager to sell out as the S&V version of the OVH claims. (2) The OVH can only account for mergers financed by equity and, thus, cannot account for some forty percent of all mergers during the last wave. In contrast, the MDH places great weight on the importance of internal cash flows as a source of finance for growth. We suggest that borrowing costs, overvaluation and cash flows – the three variables emphasized as determinants of investment under the ISH, OVH and MDH – may be more important in explaining how a merger is financed after the decision to undertake the merger has been made than the decision to merge itself. The merger decision is more dependent on the degree of optimism in the market and managers’ discretion to pursue their growth goals. This suggestion is supported by the very strong showing of the S&P P/E, our index of market optimism, in the merger equation, and the good performance of our model to explain the source of finance for a merger.

The most significant finding against the OVH is that it does not accomplish what the proponents of the theory claim is the main objective of the managers of the acquiring companies. It *does not* protect their shareholders from suffering post-merger wealth losses. Indeed, because of the strong negative effects of mergers on the acquirers’ returns, acquirers’ shareholders are significantly *worse off* one, two and three years after a merger than were
shareholders of firms, which did not merge, even after allowing for the overvaluation of the firms.

Thus, based on our empirical results we offer the following account of merger waves. At some points in time, shareholder optimism begins to rise. This optimism is fed by various “theories” as to why share prices *should* rise. Among these are theories as to why mergers in *certain industries, or by certain firms* (e.g., the conglomerates) will generate wealth. This optimism in the market allows managers to undertake wealth-destroying acquisitions, and not have their announcements met by immediate declines in their companies’ share prices. The number of wealth-destroying mergers increases dramatically during a stock market boom creating a merger wave. As the market learns about the mergers, it realizes that they will not produce synergies, and that the theories behind them were false. The market’s optimism disappears and the share prices of acquiring firms fall relative to those of other companies. Because of the premia paid for the targets and the transaction costs of integrating separate companies, the losses to shareholders of companies making acquisitions are greater than one expects, simply because the acquiring companies were overvalued.
References:


Dong, Ming, David Hirschleifer, Scott Richardson, Siew Hong Teoh. (forthcoming). “Does Investor Misvaluation Drive the Takeover Market?” *Journal of Finance*.

*Journal of Banking and Finance*, 19, 1285-1303


Figure 1:

Mergers and Average P/E ratio

Sources: Mergers: 1895-1920 from Nelson (1959); 1921-67 from FTC; 1968-2002 from M&A.

Figure 2: The Managerial Trade-off

\[
\frac{\partial u}{\partial g} \frac{\partial q}{\partial M} \quad - \quad \frac{\partial u}{\partial g} \frac{\partial q}{\partial M}
\]

\[
\frac{\partial u}{\partial q} \frac{\partial g}{\partial M}
\]
## Table 1: Number of Acquirers and Targets in Friendly Mergers (FM) and Tender Offers (TO) and Mean Tobin’s qs

<table>
<thead>
<tr>
<th>Year</th>
<th>FM</th>
<th>TO</th>
<th>%TO</th>
<th>Acquirers</th>
<th>Targets</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FM</td>
<td>TO</td>
<td></td>
<td>(\frac{MV_{t-1}}{K_{t-1}})</td>
<td>(\frac{MV_{t-1}}{K_{t-1}})</td>
</tr>
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<td>1981</td>
<td>205</td>
<td>14</td>
<td>6.39%</td>
<td>1.275</td>
<td>0.664</td>
</tr>
<tr>
<td>1982</td>
<td>311</td>
<td>23</td>
<td>6.89%</td>
<td>1.216</td>
<td>0.906</td>
</tr>
<tr>
<td>1983</td>
<td>486</td>
<td>29</td>
<td>5.42%</td>
<td>1.377</td>
<td>0.781</td>
</tr>
<tr>
<td>1984</td>
<td>478</td>
<td>29</td>
<td>5.72%</td>
<td>1.411</td>
<td>0.921</td>
</tr>
<tr>
<td>1985</td>
<td>166</td>
<td>41</td>
<td>19.81%</td>
<td>1.154</td>
<td>0.902</td>
</tr>
<tr>
<td>1986</td>
<td>156</td>
<td>56</td>
<td>26.42%</td>
<td>1.245</td>
<td>1.001</td>
</tr>
<tr>
<td>1987</td>
<td>177</td>
<td>47</td>
<td>20.98%</td>
<td>1.380</td>
<td>1.118</td>
</tr>
<tr>
<td>1988</td>
<td>181</td>
<td>60</td>
<td>24.90%</td>
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<tr>
<td>1989</td>
<td>273</td>
<td>55</td>
<td>16.77%</td>
<td>1.327</td>
<td>0.998</td>
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<tr>
<td>1990</td>
<td>318</td>
<td>26</td>
<td>7.56%</td>
<td>1.532</td>
<td>1.356</td>
</tr>
<tr>
<td>1991</td>
<td>346</td>
<td>19</td>
<td>5.21%</td>
<td>1.459</td>
<td>1.282</td>
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<tr>
<td>1992</td>
<td>513</td>
<td>16</td>
<td>3.02%</td>
<td>1.873</td>
<td>2.034</td>
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<tr>
<td>1993</td>
<td>607</td>
<td>25</td>
<td>3.96%</td>
<td>1.681</td>
<td>1.557</td>
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<tr>
<td>1994</td>
<td>726</td>
<td>33</td>
<td>4.35%</td>
<td>1.644</td>
<td>1.732</td>
</tr>
<tr>
<td>1995</td>
<td>817</td>
<td>57</td>
<td>6.52%</td>
<td>1.623</td>
<td>1.570</td>
</tr>
<tr>
<td>1996</td>
<td>960</td>
<td>55</td>
<td>5.42%</td>
<td>1.803</td>
<td>1.581</td>
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<tr>
<td>1997</td>
<td>1001</td>
<td>73</td>
<td>6.80%</td>
<td>1.902</td>
<td>1.652</td>
</tr>
<tr>
<td>1998</td>
<td>599</td>
<td>72</td>
<td>10.73%</td>
<td>2.004</td>
<td>1.732</td>
</tr>
<tr>
<td>1999</td>
<td>588</td>
<td>63</td>
<td>9.68%</td>
<td>2.218</td>
<td>1.860</td>
</tr>
<tr>
<td>2000</td>
<td>550</td>
<td>63</td>
<td>10.28%</td>
<td>2.708</td>
<td>1.646</td>
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<tr>
<td>2001</td>
<td>453</td>
<td>47</td>
<td>9.40%</td>
<td>1.962</td>
<td>2.416</td>
</tr>
<tr>
<td>2002</td>
<td>339</td>
<td>37</td>
<td>9.84%</td>
<td>1.705</td>
<td>2.006</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>10250</td>
<td>934</td>
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<td></td>
<td></td>
<td>Wave</td>
<td>4515</td>
<td>383</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Non-wave</td>
<td>5735</td>
<td>551</td>
</tr>
</tbody>
</table>

Note: \(MV_{t-1}\) = market value of the firm in year \(t-1\). \(K_{t-1}\) = total assets of the firm in year \(t-1\). \(D_t\) = deal value: amount paid for target in year \(t\). In the text the deal value is symbolized by \(M_t\), but we use \(D_t\) here to avoid confusion with the market value.
Table 2: Sources of Finance for Acquisitions: Total Amounts of Assets Financed by the Various Sources

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<tr>
<th>Year</th>
<th>Equity</th>
<th>Cash</th>
<th>Other</th>
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<tr>
<td>1986</td>
<td>14.54</td>
<td>78.06</td>
<td>7.45</td>
</tr>
<tr>
<td>1987</td>
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<td>1988</td>
<td>16.57</td>
<td>78.70</td>
<td>5.12</td>
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<td>1989</td>
<td>18.25</td>
<td>74.89</td>
<td>7.09</td>
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<tr>
<td>1990</td>
<td>16.85</td>
<td>76.36</td>
<td>6.96</td>
</tr>
<tr>
<td>1991</td>
<td>22.33</td>
<td>68.79</td>
<td>9.30</td>
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<tr>
<td>1992</td>
<td>25.69</td>
<td>63.88</td>
<td>10.81</td>
</tr>
<tr>
<td>1993</td>
<td>14.62</td>
<td>73.97</td>
<td>10.21</td>
</tr>
<tr>
<td>1994</td>
<td>22.23</td>
<td>68.17</td>
<td>9.64</td>
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<tr>
<td>1995</td>
<td>29.88</td>
<td>63.63</td>
<td>7.04</td>
</tr>
<tr>
<td>1996</td>
<td>31.00</td>
<td>62.89</td>
<td>6.57</td>
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</tr>
<tr>
<td>1998</td>
<td>30.45</td>
<td>63.19</td>
<td>6.85</td>
</tr>
<tr>
<td>1999</td>
<td>35.33</td>
<td>59.49</td>
<td>5.72</td>
</tr>
<tr>
<td>2000</td>
<td>35.86</td>
<td>60.00</td>
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<td>2001</td>
<td>29.52</td>
<td>63.96</td>
<td>7.21</td>
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<td>2002</td>
<td>18.40</td>
<td>74.28</td>
<td>7.77</td>
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<tr>
<td>Non-Wave</td>
<td>20.11</td>
<td>72.22</td>
<td>7.85</td>
</tr>
<tr>
<td>All years</td>
<td>24.22</td>
<td>68.77</td>
<td>7.30</td>
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Source: Thompson Financial Securities database.
Table 3a: Summary statistics, mean values

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<tr>
<th></th>
<th>All Acquisitions</th>
<th>Tender Offers</th>
<th>Friendly Mergers</th>
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<tbody>
<tr>
<td><strong>Acquirer characteristics:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tobin’s q</td>
<td>1.71</td>
<td>1.48</td>
<td>1.74</td>
</tr>
<tr>
<td>Overvaluation (of Total assets)</td>
<td>69.7</td>
<td>55.3</td>
<td>71.6</td>
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<tr>
<td>Cash flow/Total assets</td>
<td>0.064</td>
<td>0.094</td>
<td>0.060</td>
</tr>
<tr>
<td>Total assets (Mn 1995 USD)</td>
<td>4828.1</td>
<td>8296.6</td>
<td>4461.0</td>
</tr>
<tr>
<td>( M_t )</td>
<td>0.121</td>
<td>0.168</td>
<td>0.116</td>
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</tbody>
</table>

| **Target characteristics:** |                  |               |                 |
| Tobin’s q | 1.28           | 1.18          | 1.33            |
| Overvaluation (of Total assets) | 43.7            | 34.6          | 48.6            |
| Cash flow/Total assets | 0.037          | 0.079         | 0.021           |
| Total assets (Mn 1985 USD) | 1095.3          | 853.4         | 1193.3          |
| Deal Value (Mn 1985 USD)* | 307.32          | 474.76        | 283.91          |

| **Non-merging firms:** |                  |               |                 |
| Tobin’s q | 1.50           |                |                 |
| Overvaluation (of Total assets) | 37.6            |                |                 |
| Cash flow/Total assets | 0.014          |                |                 |
| Total assets (Mn 1985 USD) | 503.6          |                |                 |

* Only firm years with deals are used.

Note: Tobin’s q is the market value of the firm divided by book value of assets; Overvaluation is \( O_t \) from equation (4); \( M_t \) = deal value (i.e. the total amount paid for the target) divided by total assets.

Table 3b: Correlation Coefficients

<table>
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<tr>
<th></th>
<th>Friendly Mergers</th>
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<th>Tender Offers</th>
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<tr>
<td></td>
<td>( M_t )</td>
<td>( q_t )</td>
<td>( CF_{it-1} )</td>
<td>( O_{it} )</td>
<td>( K_{it-1} )</td>
<td>( P/E_t )</td>
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<td>( M_t )</td>
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<td>( q_t )</td>
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<td>0.000</td>
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<tr>
<td>( CF_{it-1} )</td>
<td>-0.081</td>
<td>-0.029</td>
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<td>( O_{it} )</td>
<td>0.244</td>
<td>0.681</td>
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<td>0.000</td>
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<tr>
<td>( K_{it-1} )</td>
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<td>0.000</td>
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<tr>
<td>( P/E_t )</td>
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<td>0.000</td>
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<tr>
<td>( C&amp;I_t )</td>
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51
Table 4  Explaining the Amounts of Assets Acquired

<table>
<thead>
<tr>
<th>Eq.</th>
<th>Hypothesis</th>
<th>Type</th>
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<td>MDH</td>
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<td>$q_{it}CF_{it-1}$</td>
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</tr>
<tr>
<td>$K_{it}$</td>
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<td>$2.0*10^{-5}$</td>
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<td>17.83</td>
<td>14.60</td>
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<td>$K_{it}^2$</td>
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<td>$-1.2*10^{-10}$</td>
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<tr>
<td></td>
<td>13.39</td>
<td>10.62</td>
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<tr>
<td>$K_{it}^3$</td>
<td>$7.1*10^{-17}$</td>
<td>$1.6*10^{-16}$</td>
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<td></td>
<td>11.22</td>
<td>9.52</td>
<td></td>
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</tr>
<tr>
<td>Industry dummies</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td></td>
<td></td>
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<tr>
<td>N</td>
<td>89182</td>
<td>82724</td>
<td>50238</td>
<td>45974</td>
<td>50238</td>
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<tr>
<td>$R^2$</td>
<td>0.137</td>
<td>0.102</td>
<td>0.073</td>
<td>0.002</td>
<td>0.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consistent with Hypothesis</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
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<td></td>
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Table 5: The Returns to Acquiring Firms

<table>
<thead>
<tr>
<th>Window</th>
<th>Friendly Mergers</th>
<th>Tender Offers</th>
<th>All Acquisitions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Period of</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acquisition</td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>Month of Acquisition</td>
<td>Non-Wave</td>
<td>1624</td>
<td>0.021</td>
</tr>
<tr>
<td></td>
<td>Wave</td>
<td>1396</td>
<td>0.37</td>
</tr>
<tr>
<td></td>
<td>Difference</td>
<td></td>
<td>-0.35</td>
</tr>
<tr>
<td>One Year after</td>
<td>Non-Wave</td>
<td>1645</td>
<td>-5.21</td>
</tr>
<tr>
<td>Acquisition</td>
<td>Wave</td>
<td>1524</td>
<td>-7.95</td>
</tr>
<tr>
<td></td>
<td>Difference</td>
<td></td>
<td>2.73</td>
</tr>
<tr>
<td>Two Years after</td>
<td>Non-Wave</td>
<td>1636</td>
<td>-15.37</td>
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<td>Acquisition</td>
<td>Wave</td>
<td>1513</td>
<td>-20.75</td>
</tr>
<tr>
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<td>Difference</td>
<td></td>
<td>5.37</td>
</tr>
<tr>
<td>Three Years after</td>
<td>Non-Wave</td>
<td>1625</td>
<td>-23.38</td>
</tr>
<tr>
<td>Acquisition</td>
<td>Wave</td>
<td>1480</td>
<td>-31.20</td>
</tr>
<tr>
<td></td>
<td>Difference</td>
<td></td>
<td>7.81</td>
</tr>
</tbody>
</table>

Note: The wave period includes six years from 1995 to 2000. a and b indicate significant differences at 1% and 5% level, respectively. The median test is the Wilcoxon Ranksum test. Standard errors in paranthesis.
Table 6: Predicting the Post-merger Returns of Acquirers

<table>
<thead>
<tr>
<th>Window</th>
<th>Period</th>
<th>Constant</th>
<th>$T_t$</th>
<th>$O_t$</th>
<th>$dO_{it}$</th>
<th>$T_t^*O_{it}$</th>
<th>N</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Month</td>
<td>Whole</td>
<td>0.016</td>
<td>-0.031</td>
<td>-0.020</td>
<td>0.001</td>
<td>0.007</td>
<td>17015</td>
<td>0.021</td>
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<tr>
<td></td>
<td></td>
<td>27.98</td>
<td>-8.82</td>
<td>18.46</td>
<td>2.32</td>
<td>4.92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Month</td>
<td>Wave</td>
<td>0.011</td>
<td>-0.046</td>
<td>-0.012</td>
<td>0.001</td>
<td>0.009</td>
<td>12462</td>
<td>0.018</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.25</td>
<td>-8.81</td>
<td>-5.18</td>
<td>0.45</td>
<td>5.16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Month</td>
<td>NW</td>
<td>0.018</td>
<td>-0.017</td>
<td>-0.025</td>
<td>-0.001</td>
<td>0.005</td>
<td>4553</td>
<td>0.019</td>
</tr>
<tr>
<td></td>
<td></td>
<td>23.11</td>
<td>-3.77</td>
<td>-13.81</td>
<td>-4.07</td>
<td>1.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Year</td>
<td>Whole</td>
<td>0.268</td>
<td>-0.467</td>
<td>-0.247</td>
<td>0.002</td>
<td>0.112</td>
<td>16682</td>
<td>0.017</td>
</tr>
<tr>
<td></td>
<td></td>
<td>29.78</td>
<td>-8.65</td>
<td>-14.28</td>
<td>0.77</td>
<td>5.38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Year</td>
<td>Wave</td>
<td>0.188</td>
<td>-0.695</td>
<td>-0.115</td>
<td>0.006</td>
<td>0.136</td>
<td>4464</td>
<td>0.017</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.42</td>
<td>-8.29</td>
<td>-2.78</td>
<td>1.55</td>
<td>4.91</td>
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</tr>
<tr>
<td>1 Year</td>
<td>NW</td>
<td>0.311</td>
<td>-0.303</td>
<td>-0.366</td>
<td>-0.002</td>
<td>0.106</td>
<td>12218</td>
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<tr>
<td></td>
<td></td>
<td>25.85</td>
<td>-4.19</td>
<td>-12.83</td>
<td>-0.47</td>
<td>2.82</td>
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</tr>
<tr>
<td>2 Years</td>
<td>Whole</td>
<td>0.491</td>
<td>-0.823</td>
<td>-0.437</td>
<td>-0.010</td>
<td>0.171</td>
<td>14891</td>
<td>0.021</td>
</tr>
<tr>
<td></td>
<td></td>
<td>32.16</td>
<td>-9.16</td>
<td>-14.75</td>
<td>-2.4</td>
<td>4.99</td>
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<tr>
<td>2 Years</td>
<td>Wave</td>
<td>0.221</td>
<td>-0.958</td>
<td>-0.104</td>
<td>0.004</td>
<td>0.144</td>
<td>3619</td>
<td>0.014</td>
</tr>
<tr>
<td></td>
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<td>-7.18</td>
<td>-1.75</td>
<td>0.68</td>
<td>3.49</td>
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<td></td>
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<tr>
<td>2 Years</td>
<td>NW</td>
<td>0.508</td>
<td>-0.705</td>
<td>-0.456</td>
<td>-0.029</td>
<td>0.260</td>
<td>11272</td>
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</tr>
<tr>
<td></td>
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<td>24.16</td>
<td>-5.81</td>
<td>-9.11</td>
<td>-4.14</td>
<td>4.15</td>
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<tr>
<td>3 Years</td>
<td>Whole</td>
<td>0.767</td>
<td>-1.209</td>
<td>-0.743</td>
<td>-0.032</td>
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<td>-9.78</td>
<td>-14.51</td>
<td>-4.23</td>
<td>4.33</td>
<td></td>
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<tr>
<td>3 Years</td>
<td>Wave</td>
<td>0.408</td>
<td>-0.988</td>
<td>-0.419</td>
<td>0.006</td>
<td>0.154</td>
<td>2943</td>
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<td>4.84</td>
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<td>-3.28</td>
<td>0.5</td>
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<tr>
<td>3 Years</td>
<td>NW</td>
<td>0.644</td>
<td>-1.186</td>
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<td>0.205</td>
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<td>-5.77</td>
<td>2.36</td>
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</tr>
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</table>

$T_t$: The size of the target at the announcement
$O_t$: The average overvaluation in the market at the time of the acquisition
$dO_{it}$: The acquirer’s deviation from the average overvaluation in the market at the time of the acquisition
Notes:

1 The number of mergers is divided by population to control for the changing size of the economy. Although there has been some controversy over whether what look like waves in mergers are in fact waves, work by Golbe and White (1993) and Linn and Zhu (1997) for the United States, and Resende (1999) for the United Kingdom appears to have established rather firmly that mergers have come in wave.

2 Ralph Nelson (1959, 1966) was the first to document the link between merger activity and share prices, and numerous subsequent studies have confirmed this finding. See, for example, Melicher, Ledolter and D’Antonio (1983), Geroski (1984) for the US, and Geroski (1984) and Clarke and Ioannidis (1996) for the UK.

3 For surveys of this literature, see Steiner (1975), Scherer and Ross (1990, pp. 153-198), Mueller (2003, ch. 8), Weston, Chung and Hoag (1990), and Röller, Stennek and Verboven (2001), and Pautler (2003).

4 See Andrade and Stafford (1999) and Erard and Schaller (2002).

5 These conceptual differences in applying the \( q \)-theory to mergers help explain why Andrade and Stafford (1999) find the cross-sectional patterns of investments in capital equipment and mergers to be quite dissimilar. Erard and Schaller (2002), on the other hand, claim that they are similar forms of investment.

6 See, for example, Chappell and Cheng (1984), Andrade and Stafford (1999), and Jovanovic and Rousseau (2002).

7 In Section IV we review the empirical literature contradicting this prediction of the \( q \)-theory. Our results are presented in Section V.

8 Since the ratio of the market value of a firm to the book value of its assets is used in several studies testing hypotheses about the determinants of mergers, we also use it here, and define and test the \( q \)-theory using this ratio. Past research reveals a high correlation between the two variables (Perfect and Wiles, 1994).

9 We report averages for all \( \frac{MV_{t-1}/K_{t-1}}{D_t/K_{t-1}} \) for which we have data. Thus the number of firms in each column for any given year is not identical, although the overlap is substantial.

10 For further discussion and evidence against the \( q \)-theory of mergers, see GMY (2005).

11 One of the anomalies of the literature on mergers – as far as the neoclassical theory is concerned – is that the evidence is overwhelming that the shareholders of acquirers gain little or even lose at the time the mergers are announced. For references to the early literature see Jensen and Ruback (1983),


13 See, Damodaran (2005).

14 For an account of the hypothesis by an academic, see Mead (1969).

15 Several studies have traced the relative performance of the conglomerates during and after the stock market boom of the 1960s. See, for example, Melicher and Rush (1973, 1974). We discuss additional evidence below based on share performance over long windows.

16 There are many “shocks” leading to industry merger waves in the past that are very difficult to reconcile with the neoclassical theory. During the ‘60s merger wave, for example, the tobacco industry went through a wave of diversification mergers. The shock leading to this wave was a report of the US Surgeon General linking smoking to cancer and other diseases. Anticipated internal growth in the industry fell, and managers of the tobacco companies chose to substitute external for internal growth. Why a demonstration of the ill effects of smoking would create synergies between cigarette firms and razor, soft drinks and dog food companies is unclear. In the ‘70s a wave of diversification mergers took place in the petroleum industry. The shock causing these was the OPEC oil price increases, which generated billions of dollars of profits for the major oil firms. Again the link between oil price increases and synergies from diversification is not readily apparent, nor was it apparent to the capital market. In the ‘80s many oil companies had market values substantially below the known value of their oil reserves, and the oil companies became popular targets of corporate raiders. Fortune featured several of the petroleum company mergers in its list of the “worst mergers of the decade” (Fisher, 1984).

17 For recent evidence linking managerial income to growth through mergers, see Khorana and Zenner (1998).

18 A further justification for including $q$ in the managers’ utility function would be that managers own shares in the firm.


21 Several studies report higher premia for tender offers. The summary table of Jensen and Ruback (1985) shows that targets in successful tender offers enjoy a 30 percent positive return compared to 20
percent premium to targets in successful mergers. Schwert (1996) reports a premium of 20.1 percent for targets in tender offers and 4.9 percent for targets in mergers for a sample of 1814 mergers or tender offers from 1975 to 1991.

22 For evidence establishing an inverse relationship between the gains to target and the gains to bidders, see Mueller and Sirower (2003).

23 We assign each firm to one of the 48 industry groupings. These are the same groupings used by Fama and French (1997) and by Harford (2005).

24 Schwert (2000) considers unnegotiated tender offers as a measure of the hostility of US deals. He also argues that bidders are more likely to be perceived as hostile when they use tender offers rather than merger proposals.

25 One might argue that the acquirer’s share price will remain unchanged only if it acquires a smaller firm than itself, and thus that size belongs in the OVH equation and should carry a positive sign. This makes the argument quite contorted, however. One must assume that (1) the market does not realize that the acquirer is overvalued, (2) the market will recognize that it is overvalued if it acquires any asset other than another firm, and (3) the market will recognize that it is overvalued if the acquired firm is larger than it is. Although this chain of reasoning is possible, we favor the simpler justification for a positive coefficient on size – namely that it is positively related to the costs of replacing an acquirer’s managers.

26 Corroborating evidence is provided by Hubbard and Palia (1995), conflicting evidence by Andrade and Stafford (1997).


Magenheim and Mueller (1988) were among the first to stress this point. This is also the interpretation favored by Agrawal and Jaffe (2000) in their survey of the “post-merger puzzle.” Philippatos and Baird (1996) compare differences between market and book values before mergers and post-merger performance and also find that relatively high pre-merger market values are associated with poorer post-merger share performance. See, Fama (1998) and Mitchell and Stafford (2000). See, e.g., Economist (2000 and 2005) and Zweig (1995). See again Jensen and Ruback (1983) and studies cited therein. See Roe (1993). Ang and Cheng (2003, Table 3) include size in their logit regression to predict the identities of acquirers, although they offer a different justification for it. It is by far the most significant variable in the equation. Dong et al. (forthcoming) and RKRV also obtain quite different results for friendly mergers and tender offers in their tests of the OVH. Ang and Cheng (2003) also present evidence that the acquirers’ shareholders do not suffer immediate losses when the mergers are announced. Dong et al. (forthcoming) and Ang and Cheng (2003) both present evidence of lower post-merger returns for acquirers, which fit the OVH. Moeller, Schlingemann and Stulz (2005) also find that returns for mergers during the wave of the 1990s were significantly lower than for mergers before the wave, although there results differ from ours in that the losses occurred immediately upon the announcements. We also estimated the regressions with interaction terms between target size and the two overvaluation variables, but the results seemed to suffer from multicollinearity, so we report only the results with one interaction term.