ESSAYS ON VALUE AND VALUATION IN

MERGERS AND ACQUISITIONS

By

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(Chair)

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Abstract

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This dissertation contains three chapters. Chapter one discusses the relevant literature; chapter two examines the value and valuation of merged firms in the long run; and chapter three investigates which type of investors is more likely to drive prices away from fundamentals.

In chapter one, I review the relevant literature on mergers and acquisitions that addresses two fundamental questions: Do mergers create value? What drives mergers? I first summarize extant evidence on both short-horizon and long-run stock performance of mergers and discuss three possible explanations for long-run abnormal returns. I further review the motives for mergers from behavioral, neoclassical and agency perspectives.

In chapter two, I address the question of whether mergers create value in the long run by examining changes in intrinsic values (estimated using the residual income model). The results indicate that overvalued (high price-to-value) value (low price-to-book) firms experience a significant increase in intrinsic value following mergers. In contrast, undervalued (low price-to-value) glamour (high price-to-book) firms suffer a significant loss in intrinsic value. The results are consistent with value-firm managers using their overvalued equity to

make prudent acquisitions that increase intrinsic value while glamour-firm managers over-extrapolate past good performance and destroy firm value when using their undervalued equity to make acquisitions.

In chapter three, I examine which investor type, institutional versus individual, is more likely to be responsible for the overvaluation of acquiring firms, assuming, consistent with prior work and interpretation, that acquirers are, on average, overvalued. The findings can be summarized as follows. First, stock acquirers exhibit high valuation levels at the quarter end before announcement. Second, institutional investors are net buyers of acquiring firms in the three years prior to acquisition. Third, changes in valuation and institutional demand over the same pre-merger periods are positively strongly correlated in the cross-section even after controlling for institutional momentum trading. Last, abnormal returns in the post-merger period are inversely related to institutional demand in the pre-merger period. Overall, my findings suggest that institutional investors, rather than individual investors, are more likely to drive misvaluations that encourage companies to exploit their overvalued equity in making acquisitions.

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Dedication

This dissertation is dedicated to my mother and father

CHAPTER ONE

LITERATURE REVIEW

There is a vast literature on mergers and acquisitions. In this chapter, I focus on papers that relate to the following two questions: Do mergers and acquisitions create value? What drives mergers and acquisitions?

1.1. Do mergers and acquisitions create value?

A large body of work addresses this question by examining stock returns around merger announcements or during the long-run period after merger completion. I first review results based on the announcement window, followed by those based on long-term period.

1.1.1. Announcement window evidence

To measure the wealth effects of mergers and acquisitions, early event studies focus on cumulative abnormal returns during a short announcement window.[1] Most studies show that mergers create value, with most of the gains accruing to the targets (Jensen and Ruback,

[1] The event window is usually defined as a period surrounding the announcement date or month. Jensen and Ruback (1983, Table 3 of page 11) summarize the event windows employed in the early literature. The before announcement part of the window can go back to forty days (Jarrell and Bradley, 1980) or just one day before the public announcement (Dodd, 1980; Asquith, 1983; Eckbo, 1983). The post-announcement part of the event window can be as short as the day of the announcement (e.g., Asquith, 1983), or the month after announcement month (e.g., Dodd and Ruback, 1977), or ten days after outcome date (Asquith, 1983). More recent literature uses generally shorter event window. For example, Fuller, Netter, and Stegemoller (2002) use a symmetric five-day window surrounding the announcement date. Moeller, Schlingemann and Stulz (2004) calculate cumulative abnormal returns from the day before to the day after announcement. Paul (2007) uses five days before to one day after announcement.

1983; Jarrell, Brickley and Netter, 1988; Andrade, Mitchell, and Stafford, 2001). Target firms earn significant announcement abnormal returns for both stock financed and cash financed deals. Acquiring firms that use stock to finance their acquisitions have negative announcement abnormal returns (ARs) while acquirers in cash deals have insignificant announcement abnormal returns. The average combined ARs are zero for stock financed mergers and significantly positive for cash financed deals. For all deals (stock and cash financed), the overall combined abnormal returns over the announcement event window are positive, indicating that mergers create value.

In addition to findings on average abnormal returns, the early literature also documents wide cross-sectional variance in these abnormal returns. The most notable factors driving differences in abnormal returns are the mode of acquisition (mergers vs. tender offers) and the method of payment (cash or stock). Dodd (1980), Firth (1980), and Eger (1983) find significant negative abnormal returns to acquirers in merger deals while Dodd and Ruback (1977), Bradley (1980), and Bradley, Desai, and Kim (1983) report significant positive (albeit small) abnormal returns to acquirers in tender offers. Travlos (1987) documents evidence that stock acquirers earn significant lower announcement abnormal returns than cash acquirers.

1.1.2. Long horizon evidence

Another stream of the literature studies long-run efficiency gains of mergers and acquisitions by examining either long-run stock returns or operating performance.

1.1.2.1. Long-run abnormal returns

The short-horizon studies assume that capital markets are efficient. Under the efficient market hypothesis, stock prices around merger announcement rationally incorporate the expected value impact of mergers so that we can interpret the positive combined abnormal returns as the market expecting the merger to create value and negative combined abnormal returns as the market expecting the merger to destroy value. Market efficiency also requires that long-run abnormal stock returns of merged firms should, on average, be zero. Although a small body of earlier work finds empirical evidence of long-run underperformance of merged firms, the profession pays little attention to the results mainly due to strong believes in market efficiency. The long-run underperformance of merged firms should not be ignored, however, because it not only poses a challenge to market efficiency but also casts doubt on the conclusion that mergers create value, which is based on short announcement periods.

To investigate whether mergers create value in the long-run, extant long-run event studies examine abnormal returns over three to five years following merger completion. Agrawal and Jaffe (2000) summarize the empirical findings as following. First, average long-run performance is negative following mergers and non-negative following tender offers. Second, long-run abnormal returns are lower when the deal is stock-financed, and when acquirers have lower book-to-market ratios. The overall negative long-run stock returns indicate that mergers do not create value in the long-run and the market overestimates future efficiency gains of mergers at announcement. In fact, Loughran and Vijh (1997) find that the long-term negative returns of stock mergers overwhelm the positive combined abnormal return at announcement, making the net wealth effect negative.[2]

As a growing number of studies report long-run underperformance of merged firms, quite a few papers devoted to searching for possible explanations of the phenomenon. Below, I review three hypotheses that are well supported by the empirical evidence.

a. Misvaluation Hypothesis

Shleifer and Vishny (2003) assume that market is irrational, but managers are rational. They suggess that stock acquirers are overvalued. Rational managers of overvalued firms time the market and use their overvalued equity to buy less overvalued targets. In the long-run, overvalued acquirers earn negative stock returns as the overvaluation reverses when market correct itself.

b. Performance extrapolation hypothesis

Rau and Vermaelen (1998) classify acquirers into "value", "neutral" and "glamour" firms based on their book-to-market ratios (B/M) at the month of announcement. They find that glamour firms (low B/M) underperform value firms (high B/M) in the long run. They argue that both the market and glamour firm managers are irrational, and over-extrapolate the past performance of the acquiring firm when they assess the value of an acquisition. Glamour firms have high past stock returns and earnings (Lakonishok, Shleifer, and Vishny, 1994). Thus, their managers are more likely to be infected by hubris (Roll, 1986), and overestimate their ability to manage an acquisition. Hayward and Hambrick (1997) find that CEOs who are

[2] However, long-run event studies are subject to methodological debate (Barber and Lyon, 1997; Kothari and Warner, 1997; Fama, 1998; Lyon, Barber, and Tsai, 1999; Mitchell and Stafford, 2000). Because of those methodology concerns, some researchers (e.g. Andrade, Mitchell, and Stafford, 2001) embrace the conventional view that mergers create value.

more subject to hubris tend to pay larger premium when making acquisitions and their shareholders suffer greater losses following the acquisition. On the other hand, they find that value firm managers are more prudent and make relatively good acquisitions.

The performance extrapolation hypothesis implies a slow learning process in which the market learns about the acquisitions. Over the announcement period, glamour acquirers will experience higher abnormal returns than value acquirers, but in the long run their performance reverses.

c. Method of payment

Loughran and Vijh (1997) find that long-run abnormal returns for cash tender offers are positive while stock financed mergers experience negative abnormal returns over long horizon. Broadly speaking, this hypothesis could fit into the misvaluation hypothesis. Acquiring managers are better informed about the long-term prospects of their firm than is the market. If managers know that their firms are overvalued, they will choose stock payment instead of paying cash. Mispricing will be corrected by the market in the long-run, so the method of payment hypothesis predicts that stock-financed acquisitions will experience negative long-run abnormal returns.

1.1.2.2. Long-run operating performance

While most papers studying long-run performance focus on stock returns, a couple studies look at operating performance. For example, Healy, Palepu and Ruback (1992) use post merger accounting data to directly test changes in operating performance that result from mergers. Their purpose is to determine whether takeovers create real economic gains and to identify the sources of such gains. In a sample of the 50 largest U.S. mergers between 1979 and mid-1984, they find significant improvements in asset productivity of merged firms and higher operating cash flow returns. Heron and Lie (2002) study the operating performance for a large sample of acquirers that make acquisitions between 1985 and 1997. They find acquirers outperform benchmark firms before the announcement and continue to outperform after acquisitions.

1.1.2.3. Sources of value creation in mergers

A relatively thin literature explores the sources of value creation in mergers and acquisitions. Instead of using ex post operating or stock price data as surveyed above, it uses forecasts by professionals, such as managers or third-party analysts. For example, Devos, Kadapakkam and Krishnamurthy (2008) use Value Line forecasts to estimate synergy gains in a sample of large mergers and decompose the synergy gains into underlying financial and operating synergies. They estimate an overall synergy gain of 10.03%, of which 8.38% is from operating synergy and the remaining 1.64% is from tax savings. Using managers' own estimates of projected cost savings and revenue enhancements, Houston, James, and Ryngaert (2001) find that the bulk of the total gains of bank mergers come from estimated cost savings rather than revenue enhancements.

To summarize, while a great deal of effort has been devoted to finding whether mergers create value, the empirical evidence is mixed and the question remains unanswered. In chapter two, I offer an alternative approach to studying value creation in mergers and acquisitions.

1.2. What drives mergers?

In this section, I review three main motives behind mergers and acquisitions: behavioral view (market-driven acquisitions), neoclassical view (economic shocks and Q-theory), and agency view.

1.2.1. Behavioral (Misvaluation) view

Shleifer and Vishny (2003) and Rhodes-Kropf and Viswanathan (2004) develop models in which merger activity is driven by market misvaluation. In their model, acquirers are overvalued and managers try to take advantage of the mispricing. Target managers are rational. They agree to a merger either for self interest or because they lack perfect information and thus overestimate synergies during market valuation peaks. Valuation explains who buys whom, the method of payment and the mode of acquisition. Moreover, the misvaluation view predicts long-run underperformance of misvalued acquirers.

Consistent with this hypothesis, Rau and Vermaelen (1998) find that low book-to-market "glamour" firms underperform and Loughran and Vijh (1997) find mergers financed with stock tend to underperform cash tender offers. Louis (2004) documents a significant negative correlation between the pre-merger earnings management and the acquirers' long-term performance for stock mergers. Using accounting information, Dong et al. (2006) extend predictions of the mispricing theory and test various deal characteristics such as method of payment and mode of acquisition. Their proxies for valuation are significantly related to the method of payment, mode of transaction and many other deal characteristics. Controlling for pre-merger overvaluation, Ang and Cheng (2006) document a positive acquirer abnormal return from one day before the merger announcement through three years after completion.

Akbulut (2006) finds evidence in support of the mispricing theory by examining insider trading activities surrounding merger announcements. Rhodes-Kropf, Robinson, and Viswanathan (2005) show that aggregate merger waves occur when market-to-book ratios are high relative to true valuations. However, they note that their results are consistent with both the behavioral mispricing stories and the interpretation that merger activity spikes when growth opportunities are high, or when firm-specific discount rates are low.

1.2.2. Neoclassical view

Another major line of literature explaining merger activity is the neoclassical view (Gort, 1969). Jovanovic and Rousseau's (2002) Q theory predicts that high Q (the ratio of market value to the replacement cost of asset) firms buy low Q firms. As a result, mergers and acquisitions are a channel through which capital flows to better projects and better management. Andrade, Mitchell, and Stafford (2001) document that in 66% of all mergers from 1973 to 1998, the acquirer's Q is greater than the target's Q. Servaes (1991) finds that the combined abnormal return is larger when the target has a low Q and the bidder had a high Q. Dong et al. (2006) also find evidence consistent with the Q theory.

Besides the Q-theory, the neoclassical view also links merger waves to underlying economic shocks. For example, Mitchell and Mulherin (1996) find that merger waves result from shocks to an industry's economic, technological, or regulatory environment. Harford (2005) supports the view that merger waves occur in response to specific industry shocks and also argues that macro-level liquidity component causes industry merger waves to cluster. These neoclassical explanations do not provide specific predictions about long-run returns of merged firms. Harford (2005) documents long-run abnormal returns that are not significantly different from zero. He also presents evidence that operating performance following mergers during waves is not worse than, and by some measures is better than, changes following non-wave mergers. This finding is consistent with Healy, Palepu, and Ruback (1992) who find merged firms show significant improvements in asset productivity relative to their industries, leading to higher operating cash flow returns.

1.2.3. Agency view

The agency view of the motives of mergers and acquisitions is pioneered by Manne (1965), who posits that the control of a company constitutes a valuable asset and that the management teams in the economy compete against each other for control over corporate assets. As Manne (1965) points out, the fundamental premise underlying the corporate control market is the high positive correlation between managerial efficiency and stock price. In this market, stock prices of firms with inefficient management will be lower relative to firms with efficient management, ceteris paribus. These firms will then become targets. This seminal article initiated academic interest in how the market for corporate control works. The early scientific evidence is summarized in a survey paper by Jensen and Ruback (1983).

The proposition of the market for corporate control posited in Manne (1965) implies that target companies in takeovers are somehow inefficient. The empirical results, however, are mixed. Jensen and Ruback (1983), after surveying the relevant papers, conclude that it is difficult to find managerial actions that harm shareholder value, except for actions that eliminate actual or potential bidders, such as targeted repurchases or standstill agreements. Agrawal and Jaffe (2003) investigate whether target firms underperform but find no evidence (either operational or stock price performance) supporting this notion. Lang, Stulz, and

Walkling (1989) study a sample of successful tender offers and find that shareholders from low Q targets benefit more from the takeover than shareholders from high Q targets while shareholders of high Q bidders gain significantly more than shareholders of low Q bidders. To the extent that Tobin's Q measures managerial performance, their findings indicate that the total takeover gain is highest for tender offers by well managed bidders for poorly managed targets. This is consistent with the view that the market for corporate control is a disciplining mechanism for inefficient management.

Examining managerial turnover rates within successful target firms is perhaps an obvious venue to identify potential inefficiencies with target firms. Martin and McConnell (1991) find that target managerial turnover increases after completed takeovers and that higher turnover rates are negatively associated with pre-offer target performance. The evidence supports the view that the takeover market plays an important role in disciplining managers that do not maximize shareholder value.

Safieddine and Titman (1999) find that target firms that terminate takeover offers significantly increase leverage ratios. These firms also reduce capital expenditures, sell assets, reduce employment, and increase focus. Ultimately, in the five years after terminated takeover, their share prices outperform benchmarks. The evidence supports the existence of inefficiencies in target firms. That is, the increased leverage helps these target firms remain independent through committing managers to making improvements that would be made by potential raiders.

Another venue for eliminating inefficiency is managerial compensation with target firms. Agrawal and Walkling (1994) find that the higher the abnormal compensation for target managers the more likely the firms receive takeover bids.

Takeover activity, as described in Manne (1965), is viewed as a solution to eliminating inefficient management in target firms. However, acquirer firm managers themselves are also potentially infected by agency problems. Thus, making value-reducing acquisitions can be a symptom of their own agency problems.

Jensen (1986) argues that holding free cash flows (cash flows available after taking all positive NPV projects) can promote inefficiency, in the sense that it could lead to overinvestment. Managers, seeking to maximize their own benefits, use these free cash flows to invest in negative net present value projects, including making value-destroying acquisitions. Such empire-building motives are a source of agency costs. Lang, Stulz, and Walkling (1991) develop a measure of free cash flow to test Jensen's free cash flow theory. Studying a sample of successful tender offers, they find that bidder returns are significantly negatively related to cash flow for low *q* bidders but not for high *q* bidders. They argue that acquisitions made by firms with high cash flow and a low *q* reveal negative information about bidder's management or investment opportunities. Servaes (1994) empirically examines the implication of overinvestment from free cash flows but find little evidence in general except for a small subset of oil and gas firms and large companies. Faleye (2004) finds evidence supporting the agency costs of free cash flow. He reports that in proxy fight targets hold 23% more cash than comparable firms, and that excessive cash holding increases the probability of proxy fight. After the proxy fight, cash holdings decrease as special cash distributions to shareholders increase, accompanied by increased managerial turnover.

Jensen's (1986) agency cost of free cash flow also suggests that companies with free cash flows are more likely to become both targets and bidders. Empirical evidence is ample. Morck, Shleifer and Vishny (1990) examine the managerial motives behind acquisitions and identify three types of value-reducing bidders: bidders with poor prior performance, bidders buying growth, and bidders making diversifying acquisitions. Mitchell and Lehn (1990) find that bidders that make bad acquisitions subsequently become acquired by other companies. Lehn and Zhao (2006) find that CEOs of bidders that make bad acquisitions are more likely to be fired. Masulis, Wang, and Xie (2007) document evidence showing that acquirers with greater antitakeover provisions experience lower abnormal returns, suggesting that bidders, when insulated from being acquired in the takeover market, are more likely to indulge in value-reducing acquisitions.

The following two chapters of my dissertation are closely related to the mergers and acquisitions literature reviewed above. In chapter two, I address the question of whether mergers create value in the long run by examining changes in intrinsic value. The research question is motivated by recent findings that some mergers are driven by stock market misvaluation. In chapter three, I use overvalued firms engaged in mergers and acquisitions as a unique setting to study which type of investors, individuals versus institutions, are more likely to drive prices away from fundamental values.

CHAPTER TWO

VALUE, VALUATION, AND THE LONG RUN PERFORMANCE OF MERGED FIRMS

2.1. Introduction

Do mergers create value over the long-run? Most of the efforts to answer this question have been based on long-run, post-merger stock returns. Results vary, but acquiring firm shares tend to underperform, on average, over the three- to five-year period following merger completion (see Agrawal and Jaffe, 2000, for a review of this literature). Recent evidence suggests, however, that acquiring firms tend to be overvalued and that they use their overvalued equity to acquire less overvalued firms.[3] Given this evidence of acquirer overvaluation, and assuming that any overvaluation tends to correct itself over time, it remains an open question whether long-term stock underperformance is driven by the reversal of overvaluation or by changes in firm fundamental or intrinsic value.

Thus, in this study, I address the fundamental question of whether mergers create value by focusing on changes in merged firms' intrinsic values, *V*. I use multiple approaches to estimate changes in *V*, but my analysis focuses primarily on estimates using a residual income model following Edwards and Bell (1961) and Ohlson (1995). In addition, I examine whether the results of this analysis combined with changes in valuation/misvaluation can help explain the long-horizon abnormal returns associated with mergers.

My study is closely related to two hypotheses that have implications for post-merger performance-the misvaluation hypothesis and the performance extrapolation hypothesis. The

[3]See, for example, Shleifer and Vishny (2003), Rhodes-Kropf and Viswanathan (2004), Rhodes-Kropf, Robinson, and Viswanathan (2005), and Dong et al. (2006).

misvaluation hypothesis (Shleifer and Vishny, 2003; Rhodes-Kropf and Viswanathan, 2004; Rhodes-Kropf, Robinson, and Viswanathan, 2005; Dong et al., 2006) suggests that overvalued firms rationally use their overvalued equity to acquire less overvalued firms. Assuming overvaluation tends to correct itself over time, this hypothesis predicts long-run negative stock returns for acquiring firms. The performance extrapolation hypothesis (Rau and Vermaelen, 1998) suggests that markets and managers (especially managers of glamour firms) make overly optimistic predictions about the firm's ability to sustain good prior performance and, as a result, these managers make poor acquisitions that destroy firm value. Thus, both explanations predict negative long-run post-merger stock returns.

Although both hypotheses predict poor long-run stock performance for merged firms, the individual hypotheses make different predictions about the future intrinsic value of merged firms. The misvaluation hypothesis, which is based on the argument that market misvaluation drives merger activity, suggests that acquisitions by overvalued acquirers (high price-to-value) are rational decisions that increase firm value (or, at a minimum, do not decrease firm value).[4] The performance extrapolation hypothesis, which is based on the argument that both the market and managers of glamour firms make overly optimistic predictions about the firms' abilities to sustain good prior performance, suggests that acquisitions by glamour acquirers (high price-to-book) are poor decisions that reduce firm value.[5]

[4]Following Dong et al. (2006), we use the price-to-value (P/V) ratio to proxy for misvaluation. Dong et al. (2006) argue that V filters out growth expectations in P, leaving P/V a 'pure' measure of misvaluation, while the variations in P/B are influenced by growth opportunities or managerial discipline, which are not related to misvaluation. As a robustness check, we also use misvaluation measures following Rhodes-Kropf, Robinson, and Viswanathan (2005) and our main conclusions remain unchanged. Details are described in Section 5.

[5]Following Lakonishok, Shleifer, and Vishny (1994) and Rau and Vermaelen (1998), we use price-to-book (P/B) to measure the glamour /value status of acquirers.

My empirical results are easily summarized. First, although both explanations play a role in explaining post-merger changes in intrinsic value, the performance extrapolation hypothesis seems to play a larger role. Specifically, based on my sample of mergers between 1978 and 2002, changes in acquiring firms' industry-adjusted intrinsic values are negative on average. Second, this result is driven predominantly by glamour firms (high P/B) that are relatively undervalued (low price-to-value). Consistent with the performance extrapolation hypothesis, mergers by these firms tend to result in a decline in industry-adjusted intrinsic values and, as a result, negative stock returns. Third, mergers by overvalued firms (high price-to-value) are consistent with the predictions of the misvaluation hypothesis. Specifically, when value firms (low P/B) are overvalued and engage in acquisitions, it results in increased intrinsic value on average. In fact, my results suggest that this increase in intrinsic value more than offsets the overvaluation reversal and, as a result, these firms garner positive long-run abnormal returns.

In sum, my results suggest that both hypotheses play an important role in explaining post-merger performance. When a value firm's price is high relative to its intrinsic value, managers use their overvalued equity to buy hard assets, thereby increasing intrinsic value for shareholders (Shleifer and Vishny, 2003; Savor, 2006). This is consistent with value firm managers being subject to greater scrutiny and, therefore, making more prudent acquisitions (Rau and Vermaelen, 1998). In contrast, when a glamour firm's intrinsic value is high relative to its price (i.e., undervalued), managers extrapolate past performance too far into the future and make decisions infected by hubris. As a result their bad acquisitions ultimately destroy intrinsic values.

The remainder of the paper is organized as follows. Section 2.2 discusses related literature and develops the hypotheses. Section 2.3 introduces the methodology and sample selection. Section 2.4 presents the primary results. Section 2.5 describes the robustness checks and considers alternative explanations for the results while Section 2.6 examines changes in valuation levels and reconciles my results with those found in long-horizon event studies. Finally, Section 2.7 concludes.

2.2. Related literature and hypothesis development

My study is closely related to two streams of mergers and acquisitions literature. The first examines the motivation for mergers. Recent studies in this area focus on the misvaluation hypothesis, which argues that the relative valuation of merging firms explains who acquires whom, the method of payment, and merger waves (Shleifer and Vishny, 2003; Rhodes-Kropf and Viswanathan, 2004; Rhodes-Kropf, Robinson, and Viswanathan, 2005; Dong et al., 2006). According to the misvaluation hypothesis, acquirers are overvalued relative to targets on average. Further, it suggests that the overvaluation of acquirers will reverse over the long run following merger completion. Therefore, negative long-run stock returns of merged firms might, at least in part, reflect the reversal of overvaluation and, therefore, be biased toward finding poor post-merger performance.

The second related stream of literature examines post-merger stock performance. My paper draws from at least three hypotheses that provide empirical implications for long-horizon stock returns. These are the method of payment, performance extrapolation, and misvaluation hypotheses. The method of payment hypothesis (Loughran and Vijh, 1997) has been used to explain why cash-financed tender offers earn significant positive long-run abnormal returns while stock-financed mergers earn significant negative long-run abnormal returns. The performance extrapolation hypothesis (Rau and Vermaelen, 1998) argues that long-run underperformance of merged firms is driven by glamour acquirers (firms with low book-to-market ratios) not being able to sustain their historically superior performance into the future. According to the misvaluation hypothesis, higher bidder valuation predicts negative long-run bidder returns. The misvaluation hypothesis also predicts that overvalued acquirers are more likely to use stock as their method of payment.

These three hypotheses are not mutually exclusive. Loughran and Vijh (1997) state that their findings are consistent with the hypothesis that acquirers tend to chose stock payment when their stock is overvalued and cash payment when it is undervalued. Dong et al. (2006) also show that stock deals are associated with higher bidder valuations, suggesting that valuation ratios of merging firms help explain the method of payment decision. From this point of view, the method of payment hypothesis and the misvaluation hypothesis can be considered two parts of the same story (Shleifer and Vishny, 2003). Therefore, I suggest that the predictive power of the method of payment and misvaluation hypotheses in explaining the stock returns of merged firms is primarily due to changes in the valuation/misvaluation of acquiring firms.

The performance extrapolation hypothesis is also related to the misvaluation hypothesis. Rau and Vermaelen (1998) use the book-to-market ratio (reciprocal of the *P/B* ratio) to differentiate glamour firms from value firms and find evidence to support the performance extrapolation hypothesis. Dong et al. (2006) use both *P/B* and *P/V* ratios to measure misvaluation and find support for the misvaluation hypothesis. Both hypotheses predict poor long-run stock performance for high *P/B* (in the performance extrapolation hypothesis) and/or high *P/V* (in the misvaluation hypothesis) firms. As I discuss in the following subsections, however, the individual hypotheses provide different implications for the future intrinsic value of merged firms.

2.2.1. The misvaluation hypothesis and changes in intrinsic value

According to the misvaluation hypothesis, rational managers of overvalued acquirers time the market and use their overvalued equity to buy less overvalued targets. The higher the valuation levels of acquirers, the greater the likelihood that acquirers will use stock as currency and the lower the long-run returns. If poor long-run returns are mainly due to the reversal of overvaluation, it is then unclear whether poor stock returns indicate bad acquisition decisions. Shleifer and Vishny (2003) argue that managers making acquisitions using overvalued equity are actually serving the interests of long-term shareholders because their stock returns would be even worse without the acquisitions.

Shleifer and Vishny (2003) cite the classic example of America Online (AOL)'s acquisition of Time Warner using stock. AOL stock was trading at $73.75 the day prior to the announcement date and fell to $12.53 about 20 months after merger completion. Despite the 83% drop in price, this deal is now viewed as beneficial to AOL's long-term shareholders because AOL could be selling at half that price had it not acquired Time Warner (Sloan, 2002). By making acquisitions, managers of AOL were using their overvalued equity to buy "hard assets of Time Warner to avoid even worse returns in the long run," according to Shleifer and Vishny (2003). Consistent with this explanation, Savor (2006) compares unsuccessful stock bidders with successful bidders and finds unsuccessful stock bidders underperform. His findings support the argument that overvalued firms create value for their long-term shareholders by making acquisitions with their overvalued equity. Therefore, although overvalued acquirers may experience poor long-run returns due to the reversal of overvaluation, the mergers do not necessarily destroy intrinsic value. In fact, if managers are acting in the interests of long-term shareholders, I expect to observe an increase in post-merger intrinsic value for these overvalued acquirers. Hence, I propose the following two predictions concerning the impact of pre-merger valuation levels on post-merger changes in intrinsic value:

H1: Overvalued acquirers tend to make acquisitions that increase intrinsic value.

H2: Overvalued acquirers outperform undervalued acquirers in creating intrinsic value.

2.2.2. The performance extrapolation hypothesis and changes in intrinsic value

According to the performance extrapolation hypothesis (Rau and Vermaelen, 1998), the long-run poor stock returns of merged firms are driven by the poor performance of glamour acquirers, which tend to have higher prior returns and growth in sales and earnings (Lakonishok, Shleifer, and Vishny, 1994). According to this hypothesis, the market tends to extrapolate past good performance into the future and is, therefore, overly optimistic about future firm performance. At the same time, managers of glamour firms are infected by hubris (Roll, 1986) and are overconfident in their abilities to manage an acquisition. Receiving positive feedback from the market, boards of directors and shareholders are more likely to approve a merger even though it might be value destroying. On the other hand, managers of value firms, which tend to have relatively poor past performance, are subject to more scrutiny when making acquisitions. The board of directors and shareholders are also more prudent when evaluating a possible deal. Therefore, acquisitions made by value acquirers are more likely to be value enhancing relative to acquisitions made by glamour acquirers. By examining changes in intrinsic value, I expect to find:

H3: Glamour acquirers tend to make acquisitions that destroy intrinsic value.

H4: Glamour acquirers underperform value acquirers in creating intrinsic value.

2.2.3. Misvaluation and performance extrapolation

I further suggest that the predictions of the misvaluation hypothesis and performance extrapolation hypothesis interact in a way that has implications for post-merger changes in intrinsic value. For example, according to the misvaluation hypothesis, managers of overvalued acquirers tend to time the market and use their overvalued equity to buy hard assets in targets, thus creating intrinsic value. According to the performance extrapolation hypothesis, however, any changes in intrinsic value may also be influenced by firms' premerger performance as reflected in their glamour/value status. If overvalued acquirers are also value firms with relatively poor past performance, managers will tend to be more prudent in making acquisitions, thus strengthening the positive impact of overvaluation on intrinsic value. On the other hand, the performance extrapolation hypothesis also argues that managers of glamour acquirers tend to extrapolate good past performance too far into future and make bad acquisitions, thereby destroying intrinsic value. Further, if these glamour acquirers have undervalued equity, they will be unable to offset the negative impact of glamour status on intrinsic value by converting equity into valuable assets. Therefore, by examining valuation levels and glamour/value status together, I expect to find:

H5: Overvalued value acquirers tend to make acquisitions that increase intrinsic value.

H6: Undervalued glamour acquirers tend to make acquisitions that destroy intrinsic value.

2.3. Methodology and sample selection

My approach to examining the economic impact of mergers is to estimate how a firm's intrinsic value changes during the 36 months following merger completion. Although somewhat arbitrary, the 36-month period is chosen because it has been commonly used in long-horizon event studies of mergers. In addition, it is long enough to allow for an observable long-term impact of a merger and short enough to minimize the impact of confounding events.

2.3.1. Estimating intrinsic value

To estimate a firm's intrinsic value, I begin with the standard dividend discount model, which shows that the value of a given firm's common equity at time t equals the present value of all expected future dividends conditional on currently available information. That is,

$$V_t = \sum_{i=1}^{\infty} \frac{E_t[DIV_{t+i}]}{(1+R_e)^i}, \tag{1}$$

where $E_t[DIV_{t+i}]$ is the expected dividend for period $t+i$, and R_e is the cost of equity.

Ohlson (1990, 1991, 1995) demonstrates that, assuming clean surplus (i.e., the change in book equity equals net income minus dividend), V_t defined in Eq. (1) can be expressed as the book value of common equity plus an infinite sum of discounted residual income:

$$V_t = B_t + \sum_{i=1}^{\infty} \frac{E_t[NI_{t+i} - (R_e * B_{t+i-1})]}{(1+R_e)^i}$$

$$= B_t + \sum_{i=1}^{\infty} \frac{E_t[(ROE_{t+i} - R_e) * B_{t+i-1}]}{(1+R_e)^i}, \quad (2)$$

where B_t is book value of equity at time t, $E_t[\ .\ ]$ is an expectation operator conditional on information available at time t, NI_{t+i} is net income for period $t+i$, R_e is the cost of equity, and ROE_{t+i} is the return on equity for period $t+i$. The term in the square brackets is the residual income or abnormal earnings, which is excess earnings after accounting for the cost of equity.

I use the discounted residual income approach, which is often referred to as the EBO model following Edwards and Bell (1961) and Ohlson (1995), rather than the dividend discount model or a discounted cash flow analysis because empirical evidence supports the EBO model over the alternatives (Penman and Sougiannis, 1998; Dechow, Hutton, and Sloan, 1999; Francis, Olsson, and Oswald, 2000). In addition, the residual income, or EBO, model based on analysts' forecasted earnings has been used extensively in finance literature.[6]

For any implementation of the model, the infinite sum must be replaced by a finite series of *T-1* periods, plus an estimated terminal value, *TV*, for all periods starting from *T*. Truncating the horizon inevitably introduces estimation errors. Lee, Myers, and Swaminathan (1999) report that the estimation of V_t is not sensitive to the choice of T if T is equal to or greater than three. For My implementation of the model, I use a three-year forecast horizon and, therefore, equation (2) is rewritten as:

$$V_t = B_t + \frac{(fROE_{t+1} - R_e) * B_t}{1+R_e} + \frac{(fROE_{t+2} - R_e) * B_{t+1}}{(1+R_e)^2} + \frac{TV}{(1+R_e)^2}, \quad (3)$$

[6]See, for example, Frankel and Lee (1998), Lee, Myers, and Swaminathan (1999), D'Mello and Shroff (2000), and Dong et al. (2006).

where

V_t is firm intrinsic value per share in month t;

B_t is the book value of equity per share in month t, that is book value from the most recent quarterly financial statements (COMPUSTAT Quarterly DATA 59) divided by the number of shares outstanding in month t from I/B/E/S. If I/B/E/S data is missing, I use the number of shares outstanding in month t from CRSP monthly data.

$fROE_{t+i}$ is the forecasted return on equity for period $t+i$. For the first three years, this variable is computed as

$$fROE_{t+i} = \frac{fEPS_{t+i}}{B_{t+i-1}}, \; i = 1, 2, 3 \qquad (4)$$

where $fEPS_{t+i}$ is the i-year ahead mean forecasted earnings per share reported in I/B/E/S for month t. Each month, I/B/E/S provides one-year-ahead ($fEPS_{t+1}$), two-year-ahead ($fEPS_{t+2}$), three-year-ahead ($fEPS_{t+3}$) earnings per share analysts' forecast, as well as an estimation of long-term growth rate.[7]

B_{t+i-1} is the book value per share for year $t+i-1$.[8] Future book value per share is estimated as $B_{t+i} = B_{t+i-1} + (1-k)\, fEPS_{t+i}$, where k is the dividend payout ratio for year t, which is calculated by dividing the common stock dividend paid in year t (COMPUSTAT Annual data item 21) by net income before extraordinary items (COMPUSTAT Annual data item 237). When earnings are negative, I estimate the dividend payout ratio as dividends divided

[7]If the forecasted EPS is not available for a given horizon but the long-term growth rate is available, we substitute the missing forecasted EPS with the EPS forecast for the first preceding available horizon compounded at the long-term growth rate. If neither the forecasted EPS nor the long-term growth rate is available for a particular horizon, we use the first preceding available EPS forecast as a substitute for the missing forecast.

[8]For any month t, we estimate intrinsic value for each acquirer based on a three-year forecast horizon. Since we use subscript t denoting month t, year t refers to the year month t belongs to. Similarly, year $t+i-1$ refers to $i-1$-year-ahead relative to the year month t belongs to and year $t+i$ refers to i-year-ahead relative to the year month t belongs to.

by 6% of total assets assuming earnings are on average 6% of total assets following Frankel and Lee (1998). I exclude observations with k greater than 1.

Following Lee, Myers, and Swaminathan (1999), D'Mello and Shroff (2000), and Dong et al. (2006), terminal value TV is computed by treating the third year residual income as a perpetuity:

$$TV = \frac{(fROE_{t+3} - R_e) * B_{t+2}}{R_e} \tag{5}$$

For the residual income model, I assume a flat term structure. Because my focus is on changes in intrinsic value over the long-run post-merger period, however, I incorporate a time-varying cost of equity into my time-series analysis. For each month t, I determine a firm-specific annualized cost of equity using the Capital Asset Pricing Model (CAPM), where beta at time t is estimated using the preceding 60-month monthly return data from CRSP (I require at least 24 months of data available), and the market risk premium is the average annual market risk premium over the risk-free rate for the CRSP value-weighted return on all NYSE, AMEX, and NASDAQ stocks over the previous 30 years.[9] Generally, my estimation of R_e follows Dong et al. (2006) and, as in their study, I winsorize the estimated cost of equity to be within the 3-30% range.

2.3.2. Changes in intrinsic value

I am interested in how the intrinsic value of merged firms changes over time. It is not appropriate, however, to directly compare the intrinsic value of a particular firm at two different points in time. Other corporate events such as equity offerings, debt/equity exchange

[9]The monthly risk-free rate and monthly annualized market risk premium are obtained from Kenneth R. French's website.

offers, and share repurchases, among others, will cause changes in the book value of equity, thereby changing my estimates of V_t. To control for the impact of these events on intrinsic value, I normalize the estimated V_t by the book value of equity. Specifically, I define $ln(V/B)_{j,t}$ as the raw intrinsic value of a merged firm *j* at month *t*.

Accordingly, the changes in raw intrinsic value are defined as $[ln(V/B)_{j,t} - ln(V/B)_{j,1}]$. Ideally, subscript "1" would represent the first month after merger completion. Because of delays in merger completion being reflected in quarterly financial statements and analyst forecasts, I use the third month following the completion month as the starting point of the long-run period. Therefore, changes in raw intrinsic value are estimated as $[ln(V/B)_{j,t} - ln(V/B)_{j,3}]$.

Firms' intrinsic values might potentially be affected by market- and industry-wide factors as well as firm-specific factors. The acquisitions I study are at the firm level, thus I focus on firm-specific changes in intrinsic value as it reflects the impact of merger events. To filter out market-wide and industry-wide changes in intrinsic value, I construct an industry-adjusted intrinsic value for merged firm *j* at month *t* by differencing the raw intrinsic value from the industry median, that is $[ln(V/B)_{j,t} - ln(V/B)_{Industry,t}]$, where industry classifications follow Fama and French (1997). Accordingly, changes in industry-adjusted intrinsic value are defined as $[ln(V/B)_{j,t} - ln(V/B)_{Industry,t}] - [ln(V/B)_{j,3} - ln(V/B)_{Industry,3}]$.

2.3.3. Changes in valuation

Shleifer and Vishny (2003) and Rhodes-Kropf and Viswanathan (2004) argue that market valuation/misvaluation affects merger activity. They suggest that valuation ratios are higher for acquirers than for targets. The ratio of price to value is an intuitive proxy for misvaluation. Moreover, my estimate of *V* contains both forward looking earnings information and information about future growth, which are also incorporated in stock price, leaving *P/V* as a relatively pure measure of misvaluation. D'Mello and Shroff (2000) use the *P/V* ratio to measure misvaluation and examine whether undervaluation is related to equity repurchase decisions. Dong et al. (2006) use the *P/V* ratio as a proxy for misvaluation when testing the empirical implications of the misvaluation hypothesis. In both these studies, *V* is estimated using the residual income model.

For firm *j* at month *t*, I define its valuation level as the natural logarithm of its price to value ratio $ln(P/V)_{j,t}$, where *P* is the month end price from CRSP. To filter out market-wide and industry-wide misvaluation, I define industry-adjusted valuation as [$ln(P/V)_{j,t}$ – $ln(P/V)_{Industry,t}$], where $ln(P/V)_{Industry,t}$ is the industry median. Accordingly, changes in industry-adjusted valuation is [$ln(P/V)_{j,t}$ – $ln(P/V)_{Industry,t}$] – [$ln(P/V)_{j,3}$ –$ln(P/V)_{Industry,3}$].

2.3.4. Sample selection

My original sample is drawn from Securities Data Corporation (SDC) Mergers and Acquisitions Database and includes deals announced and completed between 1978 and 2002. My final sample includes 1,089 deals satisfying the following criteria:

- Both acquirer and target are publicly traded on the NYSE, AMEX, or NASDAQ.
- The transaction value is at least $1 million.
- The transaction is not classified as a buyback, exchange offer, or recapitalization deal.
- The acquirer owns 100% of the target after the transaction.
- The transaction value is at least 5% of the acquirer's market value of equity in the month before deal announcement.

- The acquirer's price and return data are available from CRSP for the period from at least 24 months before announcement to 36 months after completion.
- The acquirer is covered in I/B/E/S.
- Data on the acquirer's industry-adjusted *ln(P/V)* at announcement, industry-adjusted *ln(P/B)* at announcement, and changes in industry-adjusted intrinsic value from the 3^{rd} to the 36^{th} month relative to completion month exist.
- Data on the acquirer's buy-and-hold abnormal returns over the period from the 3^{rd} to 36^{th} month after merger completion exist.

For each year covered in my sample, Table 1 shows the number of transactions, mean transaction value, method of payment, form of transaction, and average acquirer industry-adjusted valuation at announcement. As found in other studies, Table 1 documents that merger activity was high in the late 90s. Most importantly, acquirers in the late 90s are overvalued, according to my measure, and more deals are financed with equity. These data are broadly consistent with Dong et al. (2006).

Table 1
Sample description

For each year covered in my sample, this table lists the number of transactions, average transaction value, percent of all-cash payment, all-stock payment, and mixed payment, percent of tender offers and mergers, and the average industry-adjusted valuation of acquirers at announcement. My sample is drawn from SDC and includes mergers and tender offers announced and completed between 1978 and 2002. Both acquirers and targets are listed on the NYSE, AMEX, or NASDAQ and I further require that acquirers have data available from CRSP, COMPUSTAT and I/B/E/S and that buy-and-hold abnormal returns over the period from the 3rd to 36th month following merger completion exist. Industry-adjusted valuation is defined as the difference between *ln(P/V)* of acquirer firms and the industry median *ln(P/V)* at the announcement month, where *P* is the month end price from CRSP, *V* is the intrinsic value estimated using the residual income model, and industry definition follows Fama-French (1997). All dollar values are in millions of year 2000 dollars.

Year	N	Avg. deal value ($m)	Cash (%)	Stock (%)	Mixed (%)	Tender (%)	Merger (%)	Avg. industry-adj. valuation at ann.
1978	2	424.7	50.0	50.0	0.0	50.0	50.0	-0.35
1979	2	331.8	100.0	0.0	0.0	0.0	100.0	-0.19
1980	10	206.8	20.0	0.0	80.0	10.0	90.0	-0.02
1981	15	765.9	13.3	0.0	86.7	33.3	66.7	-0.48
1982	15	184.6	0.0	0.0	100.0	20.0	80.0	-0.32
1983	29	211.4	0.0	0.0	100.0	34.5	65.5	-0.02
1984	29	200.8	20.7	6.9	72.4	37.9	62.1	0.02
1985	34	560.1	47.1	29.4	23.5	44.1	55.9	-0.11
1986	35	381.7	60.0	28.6	11.4	48.6	51.4	-0.09
1987	25	281.9	24.0	44.0	32.0	20.0	80.0	-0.02
1988	25	356.9	64.0	28.0	8.0	44.0	56.0	-0.01
1989	19	937.6	36.8	42.1	21.1	36.8	63.2	-0.06
1990	20	483.1	25.0	40.0	35.0	10.0	90.0	0.12
1991	21	403.0	4.8	66.7	28.6	9.5	90.5	0.19
1992	29	438.5	13.8	62.1	24.1	17.2	82.8	0.03
1993	23	1152.5	21.7	47.8	30.4	17.4	82.6	0.16
1994	61	560.0	14.8	63.9	21.3	11.5	88.5	0.07
1995	82	1111.5	13.4	72.0	14.6	11.0	89.0	0.09
1996	88	1330.9	10.2	60.2	29.5	5.7	94.3	0.26
1997	108	1501.4	12.0	64.8	23.1	9.3	90.7	0.07
1998	114	4639.2	8.8	63.2	28.1	8.8	91.2	0.21
1999	96	2909.9	13.5	42.7	43.8	14.6	85.4	0.35
2000	99	4409.3	17.2	47.5	35.4	20.2	79.8	0.47
2001	81	2515.9	14.8	38.3	46.9	16.0	84.0	0.17
2002	27	662.1	18.5	25.9	55.6	33.3	66.7	0.22
All	1089	1858.9	17.7	47.7	34.6	18.0	82.0	0.14

2.4. Changes in intrinsic value in the long-run

2.4.1. One-way sort on changes in intrinsic value

I begin my analysis by examining changes in intrinsic value by sorting my sample into several subgroups based on acquirer industry-adjusted valuation at announcement [$ln(P/V)_{j,t}$ – $ln(P/V)_{Industry,t}$], acquirer industry-adjusted glamour/value status [$ln(P/B)_{j,t}$ – $ln(P/B)_{Industry,t}$], the method of payment, and the form of acquisition.

The first two columns of Table 2 show the mean industry-adjusted intrinsic values for the acquirers in the month before announcement and the mean industry-adjusted intrinsic value for the merged firms in the third month following completion, respectively (except for Panel A, which reports raw intrinsic values). The remaining columns report the mean values of changes in intrinsic value over the one, two, and three years after completion, respectively.

Panel A reports raw intrinsic value and changes in raw intrinsic value for all merged firms in my sample. On average, raw intrinsic value of merged firms increases significantly over the 36-month post-merger period. When I control for industry trends in Panel B, however, industry-adjusted intrinsic value decreases significantly over the same period, suggesting that mergers have a negative impact on firm value on average.

In Panel C, acquirers are sorted into three equal groups of “undervalued”, “normal”, and “overvalued” firms according to their industry-adjusted valuation [$ln(P/V)_{j,t}$ – $ln(P/V)_{Industry,t}$] at announcement. Over the 36 months following completion, the intrinsic value of overvalued acquirers increases and that of undervalued acquirers decreases significantly (H1). The difference between these two groups is also statistically significant at the 1% level (t=3.978), indicating that overvalued acquirers outperform undervalued acquirers in creating intrinsic value over the long run (H2).

In Panel D, I sort my sample firms into three equal subgroups based on the acquirers' industry-adjusted *ln(P/B)* [$ln(P/B)_{j,t} - ln(P/B)_{Industry,t}$] at announcement. Firms in the group with the lowest industry-adjusted *ln(P/B)* are "value" firms while firms in the group with the highest industry-adjusted *ln(P/B)* are "glamour" firms. Following Rau and Vermaelen (1998), I call firms in the middle group "neutral" firms. As shown in Panel D, glamour acquirers experience significant decreases in intrinsic value over the one, two, and three years following merger completion. Value acquirers, on the other hand, experience a marginal increase in intrinsic value over the two-year post merger period, but their intrinsic value does not change significantly over the three-year post merger period. Furthermore, mean changes in intrinsic value for the two extreme groups over the 36 months following completion are significantly different from each other at the 5% level (t=-2.293). These results are consistent with the argument that glamour firms tend to extrapolate past good performance into the future and engage in value destroying mergers, lending support to my hypotheses H3 and H4.[10]

In Panels E and F, I sort my sample by the method of payment and form of acquisition, respectively. As discussed in Section 2.2, the literature finds that valuation levels are closely related to the method of payment. It is also well documented that mergers are more

[10]These arguments presume that glamour acquirers have superior prior performance. Previous studies show that glamour firms have higher prior returns and growth in sales and earnings (Lakonishok, Shleifer, and Vishny, 1994), In untabulated results, we examine the average sales growth rate and average asset growth rate over 3-year period prior to announcement, and prior one-year, two-year, and three-year buy-and-hold abnormal returns (relative to equal weighted market returns and, separately, value weighted market returns). We then calculate the mean of these performance measures for each of our three groups in Panel D of Table 2. Consistent with the notion that glamour acquirers have good past performance, our results (available upon request) show that glamour acquirers earn significantly positive prior stock returns while value acquirers earn significantly negative prior stock returns during the same periods. Moreover, prior 3-year average sales growth rate and average asset growth rate for glamour acquirers are significantly higher than those for value acquirers.

likely than tender offers to be financed with stock (Travlos, 1987; Agrawal, Jaffe, and Mandelker, 1992; Rau and Vermaelen, 1998). Therefore, it is reasonable to expect the method of payment and form of acquisition to be related to changes in post-merger intrinsic value because valuation levels seem related to changes in intrinsic value (Panel C of Table 2). In contrast, Panels E and F show that neither method of payment nor form of acquisition is consistently related to post-merger changes in intrinsic value.

The results shown in Panels E and F indicate that valuation levels cannot fully explain the long-run economic impact of mergers. On average, Panel C of Table 2 suggests that overvalued firms tend to create intrinsic value as a result of an acquisition. Consequently, I would normally expect stock acquisitions to create value, or at least not destroy value, because overvalued acquirers typically use stock to make acquisitions, according to the literature. Some overvalued firms, however, will also be considered glamour firms. Given the results shown in Panel D of Table 2, these firms are likely to experience a decline in intrinsic value. Therefore, it is not surprising that stock acquisitions do not necessarily create intrinsic value.

Overall, price-to-book (*P/B*) and price-to-value (*P/V*) ratios seem to help explain changes in intrinsic value, but they seem to have different implications – high P/B ratios seem to lead to a decline in intrinsic value while high P/V ratios seem to lead to an increase in intrinsic value. This is consistent with my hypotheses, but it is also somewhat surprising given the high correlation between the two ratios. I investigate this further by performing two-way sorts based on the two ratios.

Table 2
Changes in intrinsic value

This table shows raw intrinsic value (Panel A) and industry-adjusted intrinsic value (Panel B to Panel F) for acquirers at one month before announcement and for merged firms at three months after completion as well as changes in intrinsic value of merged firms over one-year, two-year and three-year periods after completion. Panels A and B report results for the whole sample. In Panel C, I sort my sample into three equal groups by acquirers' industry-adjusted valuation at announcement, that is acquirer firms' *ln(P/V)* adjusted by its industry median [$ln(P/V)_{j,t}$ – $ln(P/V)_{Industry,t}$]. Firms in the group with lowest industry-adjusted valuation are undervalued firms and firms in the group with highest industry-adjusted valuation are overvalued firms. I name firms in the middle group normal firms. In Panel D, I sort sample firms into three equal groups by acquirers' industry-adjusted *ln(P/B)* at announcement. *P* is the month-end stock price and *B* is the book equity value from the most recent quarterly financial statements (COMPUSTAT Quarterly data item 59). Firms in the group with lowest industry-adjusted *ln(P/B)* are value firms, firms in the group with highest industry-adjusted *ln(P/B)* are glamour firms. I name firms in the middle group as neutral firms. In Panels E and F, I sort my sample by the method of payment and form of acquisition, respectively. The method of payment and form of acquisition are defined as in SDC. T-tests are testing for equal means for the two extreme subgroups in each panel. Raw intrinsic value for firm *j* at month *t* is $ln(V/B)_{j,t}$, where $V_{j,t}$ is the intrinsic value for firm *j* at month *t*, which is estimated using the residual income model with analysts' forecast data from I/B/E/S, $B_{j,t}$ is firm *j*'s book value of equity from the most recent quarterly financial statements relative to month *t*. Accordingly, industry-adjusted intrinsic value is defined as $ln(V/B)_{j,t}$ –$ln(V/B)_{Industry,t}$, where $ln(V/B)_{Industry,t}$ is the industry median *ln(V/B)*. Industry classification follows Fama-French (1997). Changes in raw intrinsic value of firm *j* from month 3 to month *t* (relative to the completion month) are defined as $ln(V/B)_{j,t}$ –$ln(V/B)_{j,3}$. Changes in industry-adjusted intrinsic value of firm *j* from month 3 to month *t* are defined as [$ln(V/B)_{j,t}$ –$ln(V/B)_{Industry,t}$] – [$ln(V/B)_{j,3}$ –$ln(V/B)_{Industry,3}$]. I treat the third month after completion as the beginning of the post-merger period to ensure that the book value of equity reflects the completed acquisition deal.

Table 2: Continued

	Ann. – 1	Eff. + 3	Eff.+3~12	Eff.+3~24	Eff.+3~36
Panel A: Raw intrinsic value for whole sample					
All	0.378***	0.351***	0.001	0.048**	0.054**
Panel B: Industry-adjusted intrinsic value for whole sample					
All	0.052***	0.004	-0.029**	-0.029*	-0.055**
Panel C: Industry-adjusted intrinsic value by acquirer industry-adjusted ln(P/V) at announcement					
Undervalued	0.324***	0.224***	-0.094***	-0.122***	-0.158***
Normal	0.068***	0.073***	-0.011	-0.034	-0.080***
Overvalued	-0.230***	-0.285***	0.018	0.065*	0.074*
T-test	-11.283***	-9.944***	3.131***	3.964***	3.978***
Panel D: Industry-adjusted intrinsic value by acquirer industry-adjusted ln(P/B) at announcement					
Value	-0.243***	-0.222***	-0.009	0.055*	0.004
Neutral	0.059**	0.026	0.002	-0.022	-0.040
Glamour	0.339***	0.208***	-0.078***	-0.118***	-0.129***
T-test	12.482***	8.562***	-1.982**	-3.816***	-2.293**
Panel E: Industry-adjusted intrinsic value by method of payment					
Stock	0.055**	0.017	-0.030	-0.021	-0.058*
Mix	0.056	-0.046	-0.021	-0.034	-0.046
Cash	0.037	0.067*	-0.040	-0.042	-0.063
T-test	-0.349	0.998	-0.296	-0.497	-0.076
Panel F: Industry-adjusted intrinsic value by form of acquisition					
Merger	0.050**	-0.003	-0.021	-0.017	-0.057**
Tender	0.061	0.036	-0.064**	-0.086**	-0.048
T-test	0.213	0.768	-1.296	-1.681*	0.138

***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

2.4.2. Two-way sorts examining changes in intrinsic value

Consistent with my hypotheses, Panels C and D of Table 2 show that price-to-value ratio and price-to-book ratio provide different predictions about changes in the intrinsic value of merged firms. For my sample, the correlation between industry-adjusted *ln(P/B)* and industry-adjusted *ln(P/V)* at announcement month is 0.470, indicating that the price-to-book ratio includes information beyond the price-to-value ratio (Dong et al., 2006).

To further examine changes in intrinsic value in the long run, I sort my sample on both industry-adjusted *ln(P/V)* and industry-adjusted *ln(P/B)*. First, I label my sample firms as either “glamour” or “value” according to their industry-adjusted *ln(P/B)* at announcement. Firms with industry-adjusted *ln(P/B)* above (below) the sample median are “glamour” (“value”) firms. Independently, I label sample firms as either “overvalued” or “undervalued” according to their industry-adjusted *ln(P/V)* at announcement. Firms with industry-adjusted valuation above (below) the sample median are “overvalued” (“undervalued”) firms. I then classify all sample firms into four groups: undervalued value firms, overvalued value firms, undervalued glamour firms, and overvalued glamour firms.[11]

Table 3 shows summary statistics (mean, number of observations, and *t*-statistic tests for zero mean) for changes in intrinsic value over one-, two-, and three-year post-merger periods for each group. The “T-test” column shows the *t*-statistic testing for equality of the means for undervalued and overvalued subgroups within the value and glamour groups, respectively. The “T-test” row shows *t*-statistics testing for equality of the means for value

[11]The *P/B* and *P/V* sorts are independent and, therefore, lead to an unequal number of firms in the four groups. Note also that, unlike Table 2, which includes sorts into three groups, the *P/B* and *P/V* sorts shown in Table 3 are into two groups each. This allows for a simpler analysis and keeps the number of observations for each grouping sufficiently large to allow for meaningful results. Three-by-three results are slightly weaker, but qualitatively similar and are available from the authors upon request.

and glamour subgroups within the undervalued and overvalued groups, respectively. The last row of the table reports *t*-statistics testing for equal means for the overvalued value group (the upper right quadrant in each section of the table) and the undervalued glamour group (the lower left quadrant), the two extreme groups of primary interest.

Panel A of Table 3 shows changes in raw intrinsic value as defined in Section 2.3 ($ln(V/B)_{j,t}$ – $ln(V/B)_{j,3}$). Over the 36 months following merger completion, overvalued acquirers experience significant increases in raw intrinsic value. In addition, overvalued acquirers outperform undervalued acquirers in creating intrinsic value over the three years following merger completion (t-statistics equal to 2.438 and 2.755 for the 'value' and 'glamour' groups, respectively). When comparing glamour acquirers with value acquirers, I find that glamour acquirers significantly underperform value acquirers over the two-year and three-year periods following merger completion (t-statistics for the three-year period equal to -2.067 and -1.972 for the 'undervalued' and 'overvalued' groups, respectively). In addition, overvalued value acquirers significantly outperform undervalued glamour acquirers (t =3.963 for the three-year period).

In Panel B I examine changes in intrinsic value that filter out market and industry effects ([$ln(V/B)_{j,t}$ – $ln(V/B)_{Industry,t}$] – [$ln(V/B)_{j,3}$ – $ln(V/B)_{Industry,3}$]). Consistent with the one-way analysis and Panel A, the results shown in Panel B indicate that overvalued acquirers perform much better than undervalued acquirers over the 36-month post-merger period (t-statistics equal to 2.865 and 3.777 for the 'value' and 'glamour' groups, respectively). Glamour acquirers significantly underperform value acquirers over the same period (t =-3.019 and -2.573 for the "undervalued" and "overvalued" groups, respectively).

Most importantly, Panel B shows that overvalued value acquirers experience significant increases in intrinsic value over the one-, two-, and three-year periods following merger completion while undervalued glamour firms experience significant decreases in intrinsic value over the same periods. The differences between these two extreme groups are significant at the 1% level (t=3.404, 6.418, and 5.124 for the one-, two-, and three-year periods, respectively). Consistent with my hypotheses H5 and H6, these results suggest that overvalued value firms tend to engage in mergers and acquisitions that create intrinsic value. For glamour firms, which tend to have superior prior stock returns and relatively high growth rates, the results suggest that both investors and managers tend to be overconfident and extrapolate past good performance into the future when evaluating the quality of potential acquisitions and tend to make bad acquisitions, especially when their equity is undervalued.

Table 3
Two-way sorts examining changes in intrinsic value

All merged firms in my sample are classified into four groups based on the sample medians of acquirer firms' industry-adjusted *ln(P/B)* and industry-adjusted *ln(P/V)* measured in the announcement month. "value" ("glamour") firms are firms with industry-adjusted *ln(P/B)* at announcement below (above) the sample median and "undervalued" ("overvalued") firms are firms with industry-adjusted *ln(P/V)* at announcement below (above) the sample median. For each subgroup the table presents summary stats (mean, N and t-stats testing zero mean) of changes in raw intrinsic value (Panel A) and changes in industry-adjusted intrinsic value (Panel B) over one-, two-, and three-year post-merger periods. T-tests reported in columns are testing equal means for overvalued (OV) and undervalued (UV) subgroups. T-tests reported in the next to the last row are testing equal means for value and glamour subgroups. The last row of the table shows *t*-stats testing equal means for overvalued value firms and undervalued glamour firms. *P/B* ratio is the market-to-book equity ratio, where *P* is month end stock price and *B* is the book value of equity available in the most recent quarterly financial statements (COMPUSTAT Quarterly data item 59). Industry-adjusted *ln(P/V)* in month *t* is defined as $[ln(P/V)_{j,t} - ln(P/V)_{Industry,t}]$, where *V* is estimated using the residual income model with analysts' forecast data from I/B/E/S, and $ln(P/V)_{Industry,t}$ is the industry median. Changes in raw intrinsic value for firm *j* from month 3 to *t* (relative to the completion month) are defined as $ln(V/B)_{j,t} - ln(V/B)_{j,3}$ while changes in industry-adjusted intrinsic value are $[ln(V/B)_{j,t} - ln(V/B)_{Industry,t}] - [ln(V/B)_{j,3} - ln(V/B)_{Industry,3}]$. Industry classification follows Fama-French (1997). The third, rather than the first, month after deal completion is chosen as the beginning of the long-run period to ensure that data reflect completed deals.

Panel A: Changes in raw intrinsic value $(ln(V/B)_{j,t} - ln(V/B)_{j,3})$

		Months 3 to 12			Months 3 to 24			Months 3 to 36		
		UV	OV	T-test	UV	OV	T-test	UV	OV	T-test
Value	Mean	-0.022	0.107 ***	2.960 ***	0.023	0.277 ***	3.976 ***	0.031	0.232 ***	2.438 **
	N	342	180		333	170		357	187	
	T	-0.927	2.933		0.724	5.015		0.671	3.360	
Glamour	Mean	-0.049	-0.006	0.906	-0.079	0.025	1.658 *	-0.115 **	0.073 *	2.755 ***
	N	178	352		174	345		187	358	
	T	-1.170	-0.234		-1.571	0.662		-2.136	1.741	
T-test		-0.557	-2.590 **		-1.714 *	-3.796 ***		-2.067 **	-1.972 **	
T (OV/Value – UV/Glamour)				2.806 ***			4.763 ***			3.963 ***

***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 3: Continued

Panel B: Changes in industry-adjusted intrinsic value $[\ln(V/B)_{j,t} - \ln(V/B)_{Industry,t}] - [\ln(V/B)_{j,3} - \ln(V/B)_{Industry,3}]$

		Months 3 to 12			Months 3 to 24			Months 3 to 36		
		UV	OV	T-test	UV	OV	T-test	UV	OV	T-test
Value	Mean	-0.056 ***	0.084 **	3.591 ***	-0.044 *	0.215 ***	4.794 ***	-0.071 *	0.143 **	2.865 ***
	N	342	180		333	169		357	187	
	T	-2.630	2.572		-1.678	4.552		-1.774	2.268	
Glamour	Mean	-0.090 **	-0.029	1.378	-0.193 ***	-0.052 *	2.706 ***	-0.248 ***	-0.041	3.777 ***
	N	178	352		174	345		187	358	
	T	-2.286	-1.508		-4.534	-1.702		-5.751	-1.217	
T-test		-0.751	-2.982 ***		-2.987 ***	-4.748 ***		-3.019 ***	-2.573 **	
T (OV/Value – UV/Glamour)				3.404 ***			6.418 ***			5.124 ***

***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

2.4.3. Regression of changes in intrinsic value

My two-way sort results show that both *P/B* ratios and *P/V* ratios can help explain changes in intrinsic value in the long run, but my analysis to this point has not controlled for other factors that may impact intrinsic value. In Table 4 I present the results of multivariate regressions in which the dependent variable is changes in industry-adjusted intrinsic value over 36 months following merger completion. I estimate three different models. In model (1), the main explanatory variables are acquirer industry-adjusted *ln(P/V)* and industry-adjusted *ln(P/B)* at announcement. In model (2), I replace these continuous variables with two dummy variables. One dummy variable takes the value of one if the acquirer is overvalued (with industry-adjusted *ln(P/V)* at announcement above the sample median) and zero otherwise. The other dummy variable takes the value of one if the acquirer is a glamour firm (with industry-adjusted *ln(P/B)* at announcement above the sample median) and zero otherwise. In model (3), I use another two dummy variables as primary explanatory variables: one that takes the value of one if the acquirer is an overvalued value firm (with higher than median industry-adjusted *ln(P/V)* and lower than median industry-adjusted *ln(P/B)* at announcement) and zero otherwise, and the other that takes the value of one if the acquirer is an undervalued glamour firm (with industry-adjusted *ln(P/V)* below the median and industry-adjusted *ln(P/B)* above the median at announcement) and zero otherwise.

In all models, I also control for other characteristics found to be related to post-merger performance in the existing literature: method of payment (pure stock financed or pure cash financed), tender offer or merger, relative size, acquirer size at the month end before announcement, the target's price-to-book ratio at the month before announcement, and whether the acquisition is diversifying (acquirer and target do not share 2-digit Standard

Industry Codes). Finally, to control for the possibility that changes in intrinsic value may be affected by dividends paid during the post-merger period, I include the industry-adjusted cumulative dividend yield over the period from the 3rd to 36th month after completion in my regression model. All regressions control for industry and year fixed effects, which are not reported to save space, and *t*-stats are based on heteroskedasticity-robust standard errors.

Regression results show that *P/V* and *P/B* ratios (measured at announcement) have significant power in explaining long-run changes in intrinsic value even after controlling for other variables related to post-merger performance. Model (1) reports a significant positive coefficient on industry-adjusted *ln(P/V)* (t =5.98) and a significant negative coefficient on industry-adjusted *ln(P/B)* (t =-4.66). The results are consistent with my hypotheses: higher acquirer valuation predicts an increase in intrinsic value and good past performance (indicated by higher price-to-book ratio) predicts a decrease in intrinsic value. Results from model (2) confirm those from my one-way sort: overvalued acquirers outperform undervalued acquirers in creating intrinsic value over the long-run post-merger period. Model (3) suggests that overvalued value firms tend to increase intrinsic value over 36 months after merger completion while undervalued glamour firms tend to destroy intrinsic value over the same period. Overall, the results presented in Table 4 further support my hypotheses (H2, H4, H5, and H6).

Table 4
Regression of changes in industry-adjusted *ln(V/B)*

The dependent variable is changes in industry-adjusted intrinsic value over the period from the 3rd to 36th month following merger completion, which is measured as $[ln(V/B)_{j,36} - ln(V/B)_{Industry,36}] - [ln(V/B)_{j,3} - ln(V/B)_{Industry,3}]$. *V* is intrinsic value estimated using the residual income model with analysts forecast data from I/B/E/S. *B* is the book value of equity from the most recent quarterly financial statements (COMPUSTAT Quarterly data item 59). Independent variables include acquirer firms' industry-adjusted *ln(P/V)* and industry-adjusted *ln(P/B)* at announcement and several dummy variables indicating whether acquirers are overvalued firms (with industry-adjusted *ln(P/V)* at announcement higher than sample median), glamour firms (with industry-adjusted *ln(P/B)* at announcement higher than sample median), overvalued value firms (with industry-adjusted *ln(P/V)* at announcement higher than sample median and industry-adjusted *ln(P/B)* at announcement lower than sample median), and undervalued glamour firms (with industry-adjusted *ln(P/V)* at announcement lower than sample median and industry-adjusted *ln(P/B)* at announcement higher than sample median), and whether the acquisition is diversifying (acquirer and target firms do not share 2-digit SIC code). Other independent variables are relative size calculated as transaction value divided by acquirer's market value of equity at the end of the month prior to announcement, ln(acquirer size) calculated as the natural logarithm of the acquirer's market value of equity at the end of the month leading to announcement, *ln(P/B)* of the target at the end of the month prior to announcement, and industry-adjusted cumulative dividend yield during the post-merger period. Industry-adjusted cumulative dividend yield is defined as the acquirer firms' total (simple summation) dividend yield over 34 months (3rd to 36th) after deal completion, adjusted by industry median. All regressions control for the industry and year fixed effects and t-stats are based on heteroskedasticity robust standard errors. All continuous variables are winsorized at the 1st and 99th percentiles.

Table 4: Continued

	Model (1)		Model (2)		Model (3)	
	Coef.	T	Coef.	T	Coef.	T
Acquirer industry-adjusted *ln(P/V)* at announcement	0.301	5.98***				
Acquirer industry-adjusted *ln(P/B)* at announcement	-0.236	-4.66***				
Dummy=1 if acquirer is overvalued firm			0.227	5.16***		
Dummy=1 if acquirer is glamour firm			-0.157	-3.31***		
Dummy=1 if acquirer is overvalued value firm					0.197	3.20***
Dummy=1 if acquirer is undervalued glamour firm					-0.188	-3.71***
Industry-adjusted cumulative dividend yield	1.560	2.51**	1.137	1.90*	0.878	1.59
Dummy=1 if pure stock payment	-0.035	-0.67	-0.029	-0.54	-0.025	-0.47
Dummy=1 if pure cash payment	-0.035	-0.54	-0.039	-0.60	-0.039	-0.59
Dummy=1 if tender offer	0.027	0.46	0.027	0.46	0.023	0.39
Relative size	-0.044	-0.90	-0.026	-0.54	-0.034	-0.71
ln(acquirer size)	-0.006	-0.36	-0.002	-0.10	0.004	0.23
Dummy=1 if acquirer and target do not share 2-digit SIC	0.072	1.60	0.078	1.71*	0.076	1.67*
Target *ln(P/B)* at the month before announcement	0.000	-0.01	0.014	0.25	0.020	0.37
Constant	0.226	0.97	0.142	0.63	0.142	0.63
N	1089		1089		1089	
Adj. R^2	0.098		0.067		0.065	

***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

2.5. Alternative hypotheses and robustness checks

Although my results are compelling and broadly consistent with the existing literature, they are potentially sensitive to the choices I make in estimating long-run performance, changes in intrinsic value. In addition, it is possible that my results are due to factors not related to the merger hypotheses I have examined here. This section addresses these concerns.

2.5.1. Robustness of V estimation

Existing literature has shown the reliability of using the residual income model and analysts' forecasted earnings to estimate intrinsic value (Frankel and Lee, 1998; Dechow, Hutton, and Sloan, 1999; Lee, Myers, and Swaminathan, 1999; Francis, Olsson, and Oswald, 2000; Dong et al., 2006). Nevertheless, I examine whether my results are sensitive to the parameter specification of V because my analysis depends on an accurate estimation of V. Specifically, I apply the following alternative approaches to estimating intrinsic value:

- Two different approaches to calculating residual income: analysts' forecasted EPS from I/B/E/S and realized EPS from COMPUSTAT.[12]
- Six different models for estimating cost of equity (for each firm and month in the period I examine): (1) the CAPM with beta estimated using monthly return data over months -60 to -1 (relative to the reference month), (2) CAPM with beta estimated over months -30 to -1 and +1 to +30, (3) Fama-French (1993) three-factor model with betas estimated over months -50 to -1, (4) Fama-French (1993) three-factor model with betas estimated over months -30 to -1 and +1 to +30, (5) Fama-French

[12]Using realized earnings, ROE for year t is based on COMPUSTAT annual data (item 58*item 54)/(item 60 for previous fiscal year). If any of these data are missing, we treat the intrinsic value V as missing.

(1993) three-factor model with betas estimated over months +1 to +60, (6) and a constant of 12.5% (following D'Mello and Shroff (2000), and Dong et al. (2006)).

- Three different choices of T to determine terminal value in the residual income model: T=3, 5, 10 for I/B/E/S data and T=3 for realized earnings data.
- Two approaches to estimating terminal value: treating residual income after period T as a perpetuity and assuming constant growth with a growth rate of 4% (following Penman and Sougiannis (1998), and Francis, Olsson, and Oswald (2000)).

These alternative approaches give us forty-eight different models for estimating intrinsic value. My main conclusions that intrinsic value increases significantly for overvalued value firms and decreases for undervalued glamour firms holds for the overwhelming majority of the 48 cases at comparable significance levels (except as discussed below). Specifically, for the overvalued value group, the average estimated mean change in intrinsic value is 0.192. The average *t*-stat testing for a zero mean is 2.454 with a range from 0.570 to 4.318. Among all 48 *t*-stats, 32 (67%) are greater than 2.000 and only five are less than 1.282 (t-stat for one tail test at 10% significant level). A similar pattern emerges from the 48 cases with regard to the undervalued glamour firms: the mean change in intrinsic value ranges from -0.788 to -0.154 with a mean of -0.388. Only one t-stat is greater than –2.000, but smaller than –1.282. Overall, the main results presented in Table 3, Panel B seem remarkably robust to various parameter specifications in estimating intrinsic firm value, and whether earnings information is from analyst forecasts (I/B/E/S data) or realized earnings (COMPUSTAT). Finally, I winsorize all dependent variables in my univariate tests at 1% and 99% and the results remain qualitatively the same, indicating that my findings are not driven by outliers.

2.5.2. Alternative approach to estimating intrinsic value

Rhodes-Kropf, Robinson, and Viswanathan (2005, henceforth RKRV) test the misvaluation hypothesis using a regression-based method to estimate intrinsic value. To assess whether their approach might yield different results, I estimate intrinsic value following RKRV except that I use quarterly regressions rather than annual regressions. My estimation period is from 1977 to 2005. I define the first quarter end month after completion month as the beginning of the long-run period to ensure that accounting data fully reflect the merger event.

Following RKRV, I use three different regression models to estimate intrinsic value. Using these estimates, I repeat the two-way sorts in Table 3 Panel B and the first multivariate regression in Table 4.[13] For overvalued value acquirers, changes in intrinsic value over 36 months following merger completion are significantly positive at the 1% level under all three models. For undervalued glamour firms, changes in intrinsic value are significantly negative at the 1% level under models 1 and 3. Under model 2, changes in intrinsic value are negative, but not significant (t=-1.271). Under all three models, the difference in changes in intrinsic value between the two extreme groups, overvalued value firms and undervalued glamour firms, are significant at the 1% level. In multivariate regressions using estimates from models 1 and 2, the coefficients on RKRV's analog to *ln(P/B)* are significantly negative at the 1% level and the coefficients on RKRV's analog to *ln(P/V)* are significantly positive at the 1%

[13]To define overvalued (undervalued) firms and value (glamour) firms, we sort our merger sample on announcement month $m_{it} - v(\theta_{it}; \alpha_{jt})$ and $m_{it} - b_{it}$ independently. Firms with $m_{it} - v(\theta_{it}; \alpha_{jt})$ above (below) sample median are overvalued (undervalued) firms, and firms with higher (lower) than median $m_{it} - b_{it}$ are glamour (value) firms. $m_{it} - v(\theta_{it}; \alpha_{jt})$ and $m_{it} - b_{it}$ are for the most recent quarter relative to the announcement month. Changes in intrinsic value are defined as changes in $v(\theta_{it}; \alpha_{jt}) - b_{it}$ over 36 months following merger completion.

level. Under model 3, the coefficient on *ln(P/B)* is marginally negative while the coefficient on *ln(P/V)* is positive, but not significant. In summary, results based on RKRV's regression method are similar to those in Tables 3 and 4 albeit these results are slightly weaker.

2.5.3. Are the results driven by analysts' forecast error?

Because I use I/B/E/S consensus analysts' forecasts to estimate cash flows in my calculation of *V*, my results might be affected by analysts' forecast errors. According to Frankel and Lee (1998), analysts are more optimistic for firms with high *P/B* ratios. Table 5 Panel A reports results of another two-way sort that examines changes in intrinsic value after controlling for the *P/B* ratio. For each sample firm at the third month following completion, I identify control firms as all non-merger firms in the same industry as the sample firm.[14] I then sort these control firms in the same industry by the absolute value of the difference between *ln(P/B)* of my sample firm and *ln(P/B)* of the control firm at the third month following completion and keep the first quintile. I further sort the kept firms by the absolute value of the difference between *ln(P/B)* of my sample firm and *ln(P/B)* of the control firm at the thirty-six month following completion and keep the first quintile as my final set of control firms. I measure changes in intrinsic value adjusted for *P/B* ratio as $[ln(V/B)_{j,t} - ln(V/B)_{j,3}] - [ln(V/B)_t - ln(V/B)_3]_{\text{control, median}}$. The method I use to construct control firms is intended to control for forecast error at both the beginning and ending points of the long-run period. As shown in Table 5 Panel A, the results remain qualitatively the same as reported in Table 3 Panel B.

[14] To be included in this control sample, a firm must not have had a merger with a completion month during the period 36 months preceding the beginning of the long-run period to 36 months after the completion month of the merger for the sample firm.

Frankel and Lee (1998) also suggest that analysts are overly-optimistic in firms with a high forecasted long-term growth rate (LTG). In Panel B, I control for LTG following the same procedure as in Panel A. My main findings remain the same: overvalued value acquirers create value in the long run while undervalued glamour acquirers lose value regardless how I define the long-run horizon. The difference between these two extreme groups is significant at the 1% level for all long-run horizons. In general, Table 5 suggests that, although I use analysts' forecast data to estimate intrinsic value, my results are unlikely to be driven by forecast error.

Table 5
Changes in intrinsic value adjusted for forecast error

All merged firms in my sample are classified into four groups based on the sample medians of acquirer firms' industry-adjusted *ln(P/B)* and industry-adjusted *ln(P/V)* measured at the announcement month. "Value" ("glamour") firms are firms with industry-adjusted *ln(P/B)* at announcement below (above) sample median and "undervalued" ("overvalued") firms are firms with industry-adjusted *ln(P/V)* at announcement below (above) sample median. For each subgroup the table presents the summary stats (mean, N and t-stats testing zero mean) of changes in intrinsic value adjusted for *P/B* ratio (Panel A) and changes in intrinsic value adjusted for forecasted long-term growth rate (Panel B) over the one-, two-, and three-year post-merger periods. T-tests reported in columns are testing equal means for overvalued (OV) and undervalued (UV) subgroups. T-tests reported in the next to bottom row are testing equal means for value and glamour subgroups. The last row of this table reports *t*-stats testing equal means for overvalued value firms and undervalued glamour firms. In Panel A, for each sample firm at the third month following completion, I find my control firms as all non-merger firms that are in the same industry as my sample firms. I sort these control firms in an ascending order by the absolute value of the difference between *ln(P/B)* of sample firm and *ln(P/B)* of control firms at the third month following completion and keep the first quintile. I sort the kept firms again in an ascending order by the absolute value of the difference between *ln(P/B)* of sample firm and *ln(P/B)* of control firms at the thirty-six month following completion and keep the first quintile as my final control firms. *P/B* ratio is the market-to-book equity ratio, where *P* is month end stock price and *B* is the book value of equity from the most recent quarterly financial statements (COMPUSTAT Quarterly data item 59). Changes in intrinsic value adjusted for *P/B* ratio is $[ln(V/B)_{j,t} - ln(V/B)_{j,3}] - [ln(V/B)_t - ln(V/B)_3]_{\text{control, median}}$, with the second term representing the median of the changes in intrinsic value of control firms. In Panel B, I find control firms using the same method as in Panel A but based on analysts' forecasted long-term growth rate from I/B/E/S. Changes in intrinsic value adjusted for long-term growth rate is defined in the same way as in Panel A.

Panel A: Changes in intrinsic value adjusted for P/B ratio

		Months 3 to 12			Months 3 to 24			Months 3 to 36		
		UV	OV	T-test	UV	OV	T-test	UV	OV	T-test
Value	Mean	-0.038	0.107**	2.729***	-0.038	0.157***	3.264***	-0.018	0.139**	2.052**
	N	290	151		280	145		300	159	
	T	-1.246	2.460		-0.959	3.505		-0.412	2.201	
Glamour	Mean	-0.087*	-0.014	1.381	-0.162***	0.038	3.097***	-0.216***	0.062*	4.339***
	N	162	322		156	312		168	329	
	T	-1.875	-0.589		-3.136	0.981		-4.056	1.742	
T-test		-0.878	-2.433**		-1.903*	-2.016**		-2.895***	-1.063	
T (OV/Value – UV/Glamour)				3.051***			4.667***			4.294***

***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 5: Continued

Panel B: Changes in intrinsic value adjusted for forecasted long-term growth rate

		Months 3 to 12			Months 3 to 24			Months 3 to 36		
		UV	OV	T-test	UV	OV	T-test	UV	OV	T-test
Value	Mean	-0.017	0.083 *	1.957 *	-0.034	0.303 ***	4.732 ***	-0.029	0.304 ***	3.601 ***
	N	243	132		236	127		251	137	
	T	-0.689	1.857		-0.942	4.928		-0.546	4.031	
Glamour	Mean	-0.101 **	-0.007	1.741 *	-0.167 ***	0.018	2.569 **	-0.143 **	0.039	2.296 **
	N	145	289		136	281		148	292	
	T	-2.171	-0.249		-2.737	0.477		-2.280	0.807	
T-test		-1.588	-1.710 *		-1.884 *	-3.919 ***		-1.378	-2.945 ***	
T (OV/Value – UV/Glamour)				2.853 ***			5.424 ***			4.557 ***

***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

2.5.4. Are the results driven by mean reversion?

According to the results shown in Tables 2, overvalued (undervalued) firms begin the long-run period with relatively low (high) intrinsic values but experience long-run intrinsic value increases (decreases). Glamour (value) firms begin the long-run period with relatively high (low) intrinsic values but experience long-run intrinsic value decreases (increases). These results suggest that my findings might be driven by mean reversion in firms' intrinsic values. To address this possibility, I control for the initial intrinsic value level using a method similar to my analysis of the impact of analysts' forecast error. I sort all non-merger firms in the same industry as my sample firm by the absolute value of the difference between the *ln(V/B)* of my sample firm and the *ln(V/B)* of the non-merger firm at the beginning of the long-run period. I keep those firms in the lowest 20% as my control firms. I then calculate changes in intrinsic value for each of these control firms over the one-, two-, and three-year periods after merger completion. I use the median changes in intrinsic value for the control firms as the benchmark to calculate mean-reversion-adjusted changes in intrinsic value for my sample firms ($[ln(V/B)_{j,t} - ln(V/B)_{j,3}] - [ln(V/B)_t - ln(V/B)_3]_{\text{control, median}}$).

Table 6 shows the results of two-way sorts examining changes in mean-reversion-adjusted intrinsic value. The results are not as strong as those shown in Panel B of Table 3, suggesting that some mean reversion is occurring in my estimate of intrinsic value. Interestingly, my main findings remain the same for the two-year post-merger period. Overvalued value acquirers' intrinsic value increase significantly (t=1.698) while undervalued glamour acquirers experience significant loss in intrinsic value (t=-2.399). When I look at the shorter horizon (one-year), however, some results become statistically insignificant. In addition, I find some evidence of mean-reversion for the overvalued value firms over the three-year period.

Finding weaker results for overvalued value firms after controlling for initial intrinsic value levels suggests that all firms with relatively low intrinsic values tend to increase their intrinsic values over time, regardless of whether they make acquisitions. Interestingly, this result is not inconsistent with the predictions of the misvaluation hypothesis. According to the misvaluation hypothesis, managers of overvalued firms rationally take advantage of market misvaluation by making acquisitions. In my sample, these firms tend to have low pre-merger intrinsic values. Other firms with relatively low intrinsic values, but not necessarily high valuation levels, will pursue other strategies to increase intrinsic value. My results suggest that firms with low intrinsic values tend to increase their intrinsic values over time, with my sample firms accomplishing the increase via acquisition.

In contrast with the results for overvalued valued firms, mean-reversion does not seem to explain the intrinsic value decrease experienced by the subgroup of undervalued glamour firms. Acquisitions tend to reduce intrinsic values for these firms even after controlling for mean reversion. The evidence suggests that those firms with high pre-merger intrinsic values that also engage in acquisitions will tend to lose intrinsic value relative to other high pre-merger intrinsic value firms.

Table 6
Changes in intrinsic value adjusted for mean reversion

All merged firms in my sample are classified into four groups based on the sample medians of acquirer firms' industry-adjusted *ln(P/B)* and industry-adjusted *ln(P/V)* measured at the announcement month. "Value" ("glamour") firms are firms with industry-adjusted *ln(P/B)* at announcement below (above) sample median and "undervalued" ("overvalued") firms are firms with industry-adjusted *ln(P/V)* at announcement below (above) sample median. For each subgroup the table presents the summary stats (mean, N and t-stats testing zero mean) of changes in intrinsic value adjusted for mean reversion over the one-, two-, and three-year post-merger periods. T-tests reported in columns are testing equal means for overvalued (OV) and undervalued (UV) subgroups. T-tests reported in the next to bottom row are testing equal means for value and glamour subgroups. The last row of this table reports *t*-stats testing equal means for overvalued value firms and undervalued glamour firms. For each sample firm at the third month following completion, I find all non-merger firms that are in the same industry as the sample firm. I then sort these non-merger firms in an ascending order by the absolute value of the difference between the *ln(V/B)* of sample firm and the *ln(V/B)* of non-merger firms. *V* is intrinsic value estimated using the residual income model with analysts' forecast data from I/B/E/S and *B* is the book value of equity available in the most recent quarterly financial statements (COMPUSTAT Quarterly data item 59). I keep those firms in the first quintile as my control firms. I then separately calculate changes in intrinsic value for all control firms over the one-, two-, and three-year periods after completion and use the median value from my control firms as the benchmark. Changes in intrinsic value adjusted for mean reversion are estimated as $[ln(V/B)_{j,t} - ln(V/B)_{j,3}] - [ln(V/B)_t - ln(V/B)_3]_{\text{control, median}}$.

		Months 3 to 12			Months 3 to 24			Months 3 to 36		
		UV	OV	T-test	UV	OV	T-test	UV	OV	T-test
Value	Mean	-0.043 *	0.029	1.755 *	-0.028	0.078 *	1.971 **	-0.033	-0.041	-0.115
	N	337	178		328	169		351	186	
	T	-1.852	0.862		-1.001	1.698		-0.822	-0.678	
Glamour	Mean	-0.060	-0.022	0.891	-0.104 **	-0.044	1.130	-0.117 ***	-0.009	1.916 *
	N	176	351		172	345		185	358	
	T	-1.583	-1.033		-2.399	-1.418		-2.763	-0.257	
T-test		-0.401	-1.277		-1.490	-2.201 **		-1.448	0.446	
T (OV/Value – UV/Glamour)				1.757 *			2.883 ***			1.025

***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

2.6. Value, valuation, and long-run stock returns

To this point, I have focused on changes in intrinsic value. To gain a more complete understanding of the long-run performance of merged firms, I need to also examine changes in valuation levels and, ultimately, long-run stock returns. This section examines both in an effort to understand the relation between changes in intrinsic value, valuation levels, and long-run stock returns.

The misvaluation hypothesis predicts a reversal of acquirer valuation levels over the long horizon as the market corrects itself. Table 7 presents two-way sort results examining changes in industry-adjusted *ln(P/V)*. The two-way sort structure is the same as that in Table 3. I find that industry adjusted valuation of undervalued acquirers increase significantly over the 36 months following completion while overvalued acquirers experience decrease in their industry adjusted valuations. The difference between the two is statistically significant at the 1% level for all three horizons.

Table 7
Changes in valuation

All merged firms in my sample are classified into four groups based on the sample medians of acquirer firms' industry-adjusted *ln(P/B)* and industry-adjusted *ln(P/V)* measured at the announcement month. "Value" ("glamour") firms are firms with industry-adjusted *ln(P/B)* at announcement below (above) sample median and "undervalued" ("overvalued") firms are firms with industry-adjusted *ln(P/V)* at announcement below (above) sample median. For each subgroup the table presents the summary stats (mean, N and t-stats testing zero mean) of changes in industry-adjusted valuation over one-, two-, and three-year post-merger periods. T-tests reported in columns are testing equal means for overvalued (OV) and undervalued (UV) subgroups. T-tests reported in the next to bottom row are testing equal means for value and glamour subgroups. The last row of this table reports *t*-stats testing equal means for overvalued value firms and undervalued glamour firms. Changes in industry-adjusted valuation is $[ln(P/V)_{j,t} - ln(P/V)_{Industry,t}] - [ln(P/V)_{j,3} - ln(P/V)_{Industry,3}]$, where $ln(P/V)_{Industry,t}$ is the industry median, *P* is month end stock price and *V* is intrinsic value estimated using residual income model with analysts' forecast from I/B/E/S.

		Months 3 to 12			Months 3 to 24			Months 3 to 36		
		UV	OV	T-test	UV	OV	T-test	UV	OV	T-test
Value	Mean	0.094***	-0.031	-2.905***	0.099***	-0.134***	-4.581***	0.146***	-0.046	-3.103***
	N	342	180		333	169		357	187	
	T	3.996	-0.864		4.095	-2.996		4.987	-0.844	
Glamour	Mean	0.050*	-0.103***	-4.186***	0.108***	-0.177***	-6.404***	0.151***	-0.238***	-7.600***
	N	178	352		174	345		187	358	
	T	1.800	-4.346		3.241	-5.999		3.754	-7.511	
T-test		-1.209	-1.654*		0.229	-0.809		0.089	-3.039***	
T (OV/Value – UV/Glamour)				-1.782*			-4.340***			-2.903***

***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

The results shown in Table 3 combined with the results shown in Table 7 indicate that valuation levels and glamour/value status at announcement have substantially different influences on intrinsic value and valuation levels after completion. This also suggests that I may be able to use these results to gain a better understanding of long-horizon stock returns. I first calculate buy-and-hold abnormal returns (BHARs) of my sample firms over the one, two-, and three-year post merger periods.[15]

Table 8 reports results of a one-way sort of BHARs on firm and deal characteristics. On average, acquirers earn significant –6.2% buy-and-hold abnormal return over the period from the 3rd to 36th month following deal completion. Consistent with the performance extrapolation hypothesis, glamour acquirers underperform value acquirers. I also find that overvalued acquirers earn significant negative BHARs over the 36 months following merger completion, as predicted by the misvaluation hypothesis. Further, my BHARs are consistent with other regularities documented in the existing literature such as stock deals underperforming cash deals and mergers underperforming tender offers (Loughran and Vijh, 1997).

[15]BHARs are calculated using the reference portfolio approach. Each month, we sort all NYSE common stocks into size deciles based on their month end market capitalization. These deciles are further sorted into quintiles using book-to-market ratios. We then place AMEX and NASDAQ firms into one of these 50 portfolios based on their month-end size and book-to-market ratio. We calculate the monthly return for each of the 50 reference portfolios by averaging the monthly returns across all stocks in each portfolio. These portfolio returns are then used as benchmarks to calculate buy-and-hold abnormal returns (BHARs) for our sample firms. The BHAR return is defined as in Rosen (2006).

Table 8
Buy-and-hold abnormal returns by acquirer and deal characteristics

This table shows buy-and-hold abnormal returns (BHARs) for merged firms over one-year, two-year and three-year periods after completion. Panel A reports average BHARs for the whole sample. In Panel B, I sort my sample into three equal groups by acquirers' industry-adjusted *ln(P/V)* at announcement. Firms in the group with lowest industry-adjusted *ln(P/V)* are "undervalued" firms and firms in the group with highest industry-adjusted *ln(P/V)* are "overvalued" firms. I name firms in the middle group "normal" firms. In Panel C, I sort sample firms into three equal groups by acquirers' industry-adjusted *ln(P/B)* at announcement. Firms in the group with lowest industry-adjusted *ln(P/B)* are "value" firms, firms in the group with highest industry-adjusted *ln(P/B)* are "glamour" firms. I name firms in the middle group as "neutral" firms. In Panels D and E, I sort my sample by the method of payment and form of acquisition, respectively. The method of payment and form of acquisition are defined as in SDC. T-tests are testing for equal means for the two extreme subgroups in each panel. BHARs are calculated using reference portfolio approach. Each month, I sort all NYSE common stocks into size deciles based on their month end market capitalization. These deciles are further sorted into quintiles using book-to-market ratios. I then place AMEX and DASDAQ firms into one of these 50 portfolios based on their month end size and book-to-market ratio. I calculate the monthly return for each of the 50 reference portfolios by averaging the monthly returns across all stocks in each portfolio. These portfolio returns are then used as benchmark to calculate buy-and-hold abnormal returns for my sample firms.

Table 8: continued

	Eff.+3~12	Eff.+3~24	Eff.+3~36
Panel A: BHARs for whole sample			
All	-0.028 ***	-0.055 ***	-0.062 ***
Panel B: BHARs by industry-adjusted ln(P/V) at announcement			
Undervalued	0.035 **	0.054	0.045
Normal	-0.024 *	-0.047 **	-0.021
Overvalued	-0.097 ***	-0.171 ***	-0.211 ***
T-test	-5.224 ***	-4.960 ***	-5.196 ***
Panel C: BHARs by industry-adjusted ln(P/B) at announcement			
Value	0.083 ***	0.140 ***	0.177 ***
Neutral	-0.033 **	-0.077 ***	-0.085 ***
Glamour	-0.136 ***	-0.228 ***	-0.279 ***
T-test	-9.162 ***	-8.339 ***	-9.301 ***
Panel D: BHARs by method of payment			
Stock	-0.074 ***	-0.118 ***	-0.128 ***
Mix	0.017	0.016	0.012
Cash	0.005	-0.022	-0.033
T-test	3.252 ***	2.280 ***	1.845 *
Panel E: BHARs by form of acquisition			
Merger	-0.039 ***	-0.067 ***	-0.067 ***
Tender	0.018	0.001	-0.040
T-test	2.405 **	1.987 **	0.698

***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

To further examine long-run BHARs of merged firm, I decompose stock returns into two components: dividend yield and capital gains yield.

$$R = \text{Div. Yield} + \Delta\ln(P), \tag{6}$$

which is equivalent to the following identity:

$$R = \Delta\ln(P/V) + \Delta\ln(V/B) + \Delta\ln(B) + \text{Div. Yield}. \tag{7}$$

From Eq. (7), I can see that both changes in valuation ($\Delta\ln(P/V)$) and changes in value ($\Delta\ln(V/B)$) affect long-run buy-and-hold stock returns. Based on the predictions of the misvaluation hypothesis, I conjecture that overvalued acquirers can earn poor buy-and-hold returns due to the reversal of overvaluation even though they may experience an increase in intrinsic value.

Table 9 reports results of a two-way sort examining buy-and-hold abnormal returns (BHARs) of merged firms over the one-, two-, and three-year post-merger periods. I find that, although all glamour acquirers earn significant negative long-run abnormal stock returns, as predicted by the performance extrapolation hypothesis, the difference between long-run abnormal returns of overvalued glamour acquirers and undervalued glamour acquirers are significant at the 1% level. I argue that the difference is due to undervalued glamour acquirers and overvalued glamour acquirers experiencing changes in valuation in opposite directions as shown in Table 7.

Moreover, not all overvalued acquirers earn negative long-run abnormal returns as predicted by the misvaluation hypothesis. Over the 36 months following merger completion, overvalued value firms earn significant positive abnormal returns while overvalued glamour firms earn significant negative abnormal returns. These results can be explained by the offsetting effects of changes in intrinsic value and changes in valuation shown in Tables 3 and

7. For example, Table 7 shows that although industry-adjusted valuation levels for overvalued value firms decrease over the 36 months following merger completion, the decrease is insignificant (mean=-0.046 and t=-0.844). Table 3 Panel B, on the other hand, shows that overvalued value acquirers experience significant increases in industry-adjusted intrinsic value (mean=0.143 and t=2.268). Therefore, the two effects combine to yield positive long-run abnormal returns for these firms (mean=0.094 and t=2.439) as shown in Table 9. For overvalued glamour firms, their intrinsic value does not change significantly over the 36 months following deal completion (Table 3 Panel B) while their valuation levels decrease significantly (Table 7), resulting in significant negative BHARs. Unlike long-run abnormal returns of overvalued value acquirers, the underperformance of overvalued glamour acquirers is mainly driven by the reversal of overvaluation.

Changes in valuation and changes in value also combine to explain long-run abnormal stock returns for undervalued firms. For these firms, Table 7 reports a significant increase in industry-adjusted valuation for both undervalued value firms (mean=0.146, t =4.987) and undervalued glamour firms (mean=0.151, t=3.754) while Table 3 Panel B reports a significant decrease in industry-adjusted intrinsic value for undervalued glamour acquirers (mean=-0.248, t=-5.751) and a marginal decrease for undervalued value firms (mean=-0.071, t=-1.774). For undervalued value firms, the valuation effect dominates the value effect, causing significant positive long-run abnormal returns. For undervalued glamour firms, on the other hand, the negative value effect outweighs the positive valuation effect, causing significant negative long-run abnormal stock returns.

Table 9
Two-way sorts on buy-and-hold abnormal returns

All merged firms in my sample are classified into four groups based on the sample medians of acquirer firms' industry-adjusted *ln(P/B)* and industry-adjusted *ln(P/V)* measured at the announcement month. "Value" ("glamour") firms are firms with industry-adjusted *ln(P/B)* at announcement below (above) sample median and "undervalued" ("overvalued") firms are firms with industry-adjusted *ln(P/V)* at announcement below (above) sample median. For each subgroup the table presents the summary stats (mean, N and t-stats testing zero mean) of buy-and-hold abnormal returns over the one-, two-, and three-year periods following completion. T-tests reported in columns are testing equal means for overvalued (OV) and undervalued (UV) subgroups. T-tests reported in the next to bottom row are testing equal means for value and glamour subgroups. The last row of this table reports *t*-stats testing equal means for overvalued value firms and undervalued glamour firms. Buy-and-hold abnormal returns (BHARs) are constructed using reference portfolio approach. Each month, I sort all NYSE common stocks into size deciles based on their month end market capitalization. These deciles are further sorted into quintiles using book-to-market ratios. I then place AMEX and DASDAQ firms into one of these 50 portfolios based on their month end size and book-to-market ratio. I calculate the monthly return for each of the 50 reference portfolios by averaging the monthly returns across all stocks in each portfolio. These portfolio returns are then used as benchmark to calculate buy-and-hold abnormal returns for my sample firms.

		Months 3 to 12			Months 3 to 24			Months 3 to 36		
		UV	OV	T-test	UV	OV	T-test	UV	OV	T-test
Value	Mean	0.062***	0.049*	-0.414	0.111***	0.091**	-0.364	0.123***	0.094**	-0.531
	N	342	180		333	169		357	187	
	T	4.028	1.731		2.774	2.459		3.120	2.439	
Glamour	Mean	-0.041**	-0.143***	-4.044***	-0.079**	-0.236***	-4.109***	-0.141***	-0.287***	-2.924***
	N	178	352		174	345		187	358	
	T	-2.021	-9.318		-2.426	-11.937		-3.171	-12.254	
T-test		-4.052***	-5.980***		-3.683***	-7.781***		-4.443***	-8.474***	
T (OV/Value – UV/Glamour)				2.584**			3.448***			3.994***

***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

2.7. Conclusion

I investigate the long-run performance of merged firms by examining changes in intrinsic value. Most of the existing literature on this topic focuses on long-horizon stock returns, but recent evidence suggests that acquisitions are motivated, at least in part, by market misvaluation of firm equity. Assuming this misvaluation corrects itself over the long term, it is not surprising to observe that most studies find evidence of poor long-run stock returns following mergers. By focusing my analysis on changes in intrinsic value, I offer an alternative perspective on whether mergers create long-run value.

I find that overvalued acquirers that are also value firms increase their intrinsic value over the 36 months following deal completion. Undervalued glamour acquirers experience decreases in intrinsic value. My findings are consistent with the misvaluation theory and the performance extrapolation hypothesis in that overvalued acquirers create value by buying hard assets with their overvalued equity and glamour acquirers extrapolate past good performance into the future and tend to make bad acquisitions.

Moreover, by showing how changes in intrinsic value together with changes in valuation help explain long-run abnormal returns, my results help to explain long-run post-merger performance. The performance extrapolation hypothesis suggests that glamour acquirers tend to engage in value destroying acquisitions, but this alone cannot explain the significant difference in long-run stock returns between overvalued glamour acquirers and undervalued glamour acquirers. The misvaluation hypothesis predicts that overvalued acquirers earn negative abnormal stock returns over the long horizon when the market corrects itself. By itself, however, the misvaluation hypothesis cannot explain why overvalued value acquirers earn significant positive long-run abnormal returns while overvalued glamour acquirers earn significant negative abnormal long-run returns. Taken together, my findings concerning intrinsic value combined with the predictions of the misvaluation and performance extrapolation hypotheses provide a more complete understanding of the long-run economic impact of mergers than is possible by examining only BHARs.

Finally, I propose and test several alternative explanations for my results. In general, my results are robust. One notable exception to this, however, is the notion that changes in intrinsic value, like changes in valuation levels, are subject to mean reversion. Based on my analysis, I find some support for this argument. After controlling for potential mean reversion, the changes in industry-adjusted intrinsic value for value firms that are also undervalued are no longer statistically significant over the three-year post-merger horizon. This result can be attributed to all firms with relatively low intrinsic values having a tendency to increase their intrinsic values over time. Interestingly, it is not inconsistent with the arguments of the misvaluation hypothesis. According to arguments made by Shleifer and Vishny (2003), if these firms had not made acquisitions, their intrinsic values could have declined compared to the intrinsic values of other firms with relatively low intrinsic values. The results for glamour firms that are also undervalued remain significant even after controlling for potential mean reversion, indicating that when these firms engage in merger activity, they suffer a greater loss in intrinsic value than other firms with relatively high intrinsic values.

CHAPTER THREE

INDIVIDUALS, INSTITUTIONS, AND FIRM VALUATION: EVIDENCE FROM MERGERS AND ACQUISITIONS

3.1. Introduction

Although a growing literature suggests “noise traders” or “sentiment traders” sometimes drive prices from fundamental values, it remains an open question as to who, exactly, are these noise traders responsible for driving prices from fundamental values. While most authors suggest individual investors are irrationally letting their emotions get the better of them and systematically driving prices from fundamental values, a number of other studies suggest that, in fact, institutional investors may be primarily responsible for mispricings.

In this chapter, I use a unique dataset to test which investor type is more likely to drive prices from fundamentals. Specifically, the mergers and acquisition literature suggests that overvalued companies are likely to use their overvalued equity to finance acquisitions. Alternatively, undervalued, fairly valued, or at least less overvalued, companies are more likely to use cash to finance their acquisitions. If stock acquirers tend to be overvalued, assuming a given stock acquirer has not always been overvalued, either institutional or individual investors are primarily responsible for making the company overvalued. That is, if as previous literature suggests, stock acquirers are more overvalued than cash acquirers, stock and cash acquirers provide a sample of relatively more or less overvalued securities.

I begin by confirming that stock acquirers have larger increases in valuation levels (P/B ratios) and greater positive market adjusted returns than cash acquirers in the three years prior to merger announcement.[16] This result is consistent with the explanation that stock acquisitions are more likely to occur after "investor sentiment" drives the company's price beyond fundamental values and yields two testable hypotheses. First, whichever investor type is responsible for the increase in valuation levels and positive market adjusted returns will be net buyers in the pre-acquisition period. That is, since there is a buyer for every seller, institutional and individual investors cannot both be driving prices from fundamentals. If individual investors are net buyers of stock acquirers prior to acquisition, driving their overvaluation, then institutional investors must be net sellers. Alternatively, if institutional investors are net buyers (and therefore individual investors are net sellers) of stock acquirers prior to acquisitions, then institutional investors must be responsible for the mispricing.

Second, as noted in the literature review (Chapter 1), stock acquirers experience negative abnormal returns following acquisition, consistent with overvaluation at the time of the merger. Thus, if individual investors are responsible for driving valuations too high, I expect that post-merger abnormal returns should be inversely related to demand by individual investors in the pre-merger period. Alternatively, if institutional investors are primarily responsible for driving valuations too high, I expect that post-merger abnormal returns should be inversely related to net demand by institutional investors in the pre-merger period.

My findings suggest that institutional investors are more likely to drive mispricing than individual investors. Specifically, the findings in this chapter can be summarized as follows. First, consistent with previous work, stock acquirers exhibit higher valuations than cash acquirers at the quarter end before merger announcement. Further consistent with

[16] The choice of three years is somewhat arbitrary. A three-year period, however, is long enough to observe significant changes in firm valuation but short enough to minimize contamination by other major corporate events. The main conclusions in this chapter hold qualitatively for two and four years as well.

previous work, stock acquirers exhibit significant negative abnormal returns in the post-merger period, while cash acquirers do not. Second, as noted above, stock acquirers exhibit significantly greater changes in valuation and returns than cash acquirers prior to acquisition. This result is consistent with the hypothesis that investor sentiment has driven the price of stock acquirers beyond fundamental value in the three years prior to acquisition. Third, institutional investors are net buyers and individual investors are net sellers of acquiring firms in the three years prior to acquisition. More important, institutional investors buy stock acquirers to a greater degree than cash acquirers in the three years prior to acquisition. Fourth, changes in valuation and institutional demand over the same pre-merger periods are positively strongly correlated in the cross-section. Last, I find that abnormal returns in the post-merger period are inversely related to institutional demand in the pre-merger period.

The findings in this chapter contribute to the burgeoning investment sentiment literature. Specifically, contrary to conventional wisdom, my findings suggest that institutional investors, rather than individual investors, are more likely to drive misvaluations that encourage companies to exploit their overvalued equity in making acquisitions.

The balance of the chapter proceeds as follows. The next section reviews the literature on institutional versus individual investors and stock misvaluation; section 3.3 describes data; section 3.4 presents empirical evidence, and section 3.5 concludes.

3.2. Institutional versus individual investors and stock misvaluation

Although there is agreement in general that investor sentiment plays a role in setting security prices (e.g., Black, 1986; De Long et al., 1990a), there is little agreement about whether institutional or individual investors are more likely to drive prices from fundamental values.

Most early work suggests irrational individual investors are more likely to drive prices from fundamentals than ‘smart money’ institutions. Shiller (1984), for example, argues that “ordinary investors”, compared to institutional investors, are more likely to be subject to herding, fads and fashions. Shleifer and Summers (1990) suggest that individual investors may herd if they follow the same pseudo-signals such as brokers’ advice or financial gurus, or overreact to recent news. Lakonishok, Shleifer, and Vishny (1994) argue that individual investors extrapolate past growth and engage in glamour investment strategies, which persistently underperform. Patel, Zeckhauser, and Hendricks (1991) show that the net flows of funds from individuals to the mutual fund sector is an increasing function of recent market performance, indicating that individuals positive feedback trade. Similarly, Sirri and Tufano (1998) find that individuals invest disproportionately more in funds that perform well in prior period. Extant evidence also suggests that individual investors are subject to psychological biases and suffer from their irrational investment decisions. For example, individual investors’ trading exhibits disposition effect, the representativeness heuristic, and attention driven investment style (e.g., Odean, 1998; Barber, Odean and Zhu, 2006; Barber and Odean, 2008). Moreover, individual investors tend to trade excessively due to overconfidence (Odean, 1999) and, as a result, trading is hazardous to their wealth (Barber and Odean, 2000; Barber et al., 2007).

Much of the empirical evidence focuses on whether individual investors’ sentiment impacts security prices. Lee, Shleifer, and Thaler (1991) find that both closed-end funds and small stocks tend to be held by individual investors and that the changing sentiment of individual investors explains the fluctuations of discounts on closed-end funds and the performance of small stocks. Barber, Odean and Zhu (2006) show that the aggregate trading by individuals is systematic, a necessary condition for the biases and sentiment of individual investors to affect securities prices. Kumar and Lee (2006) present evidence that systematic retail (individual investors') trading behavior explains return comovements for stocks with high retail concentration.

By contrast, another strand of the literature describes institutional investors as driving prices away from fundamentals and generating excess volatility in the financial market. Friedman (1984) argues that institutional investors are also subject to socially determined fads and fashions and may be even more so than individual investors for the following possible reasons: 1) institutional investors exist in a closely knit community; 2) institutional investors are evaluated based on relative performance; and 3) institutional investors have stronger disincentives to underperform than incentives to outperform. Consistent with Friedman (1984), Scharfstein and Stein (1990) present a model in which managers will trade with the crowd because they face a reputation risk of acting differently from others.[17] Consistent with this view, extant work documents substantial evidence that institutions involve in herding and feedback trading (e.g., Grinblatt, Titman, and Wermers, 1995; Wermers, 1999; 2000; Nofsinger and Sias, 1999; Dennis and Strickland, 2002; Badrinath and Wahal, 2002; Griffin, Harris, and Topaloglu, 2003; Sias, 2004; 2007; Choi and Sias, 2008).[18]

[17] Managers trading with the crowd is usually called "institutional herding" in the literature, that is institutions following each other into or out of the same stock.
[18] Positive feedback trading could be viewed as a special case of herding when lag returns or variables correlated with lag returns serve as the common signal, which herds follow, See Nofsinger and Sias (1999) for a detailed discussion.

Given the increasingly dominant role of institutional investors in the financial market, the common perception is that institutional trading will have price impact (Gompers and Metrick, 2001). A number of studies document a positive correlation between institutional demand and contemporaneous stock returns (Nofsinger and Sias, 1999; Wermers, 1999; 2000; Chakravarty, 2001; Gibson and Safieddine, 2003; Cai and Zheng, 2004; Sias, Starks, and Titman, 2006). Moreover, Chakravarty (2001) and Sias, Starks, and Titman (2006) find that the relation between changes in institutional ownership and same period returns results primarily from price effects associated with institutional trading.

In addition, a growing number of theoretical and empirical studies address whether institutional trading stabilizes or destabilizes stock prices. If institutional herding primarily results from institutions following correlated signals or inferring information from each other, such herding stabilizes stock prices (Hirshleifer, Subrahmanyam, and Titman, 1994; Wermers, 1999). On the other hand, if institutional investors herd because they ignore their private information but respond to fads, their investment decisions are not warranted by information on fundamentals. As a result, such trend-chasing will more likely destabilize stock prices and exacerbate stock price volatility (Scharfstein and Stein,1990). Dennis and Strickland (2002) investigate the relationship between institutional ownership and stock returns on days when there are large moves in the stock market and conclude that institutional investors, at least in the short-run, drive prices away from fundamental values. Jackson (2003) finds excess volatility and excess correlation between stocks and claims that the existing noise trader risks more likely come from institutional investors. Pirinsky and Wang (2004) present evidence that institutional investors contribute to both long-term and short-term changes of stock price comovement. Gabaix et al. (2006) argue that trades by large institutions cause excess market volatility even in the absence of significant changes in fundamentals. Sias and Whidbee (2008) show that institutional demand adversely influences insiders' perceptions of mispricing.

While the notion that institutions destabilize prices sounds at odds with the view that institutions are rational and better informed, institutions do not have to behave irrationally to drive prices away from fundamentals. For example, De Long et al. (1990b) show that rational speculations by institutional investors could cause stock prices to deviate from their fundamental values if there are positive feedback traders in the market. Similarly, Brunnermeier and Nagel (2004) find that hedge funds ride bubbles instead of exerting a correcting force on stock prices during the recent technology bubble. Abreu and Brunnermeier (2002) propose synchronization risk as an explanation for rational arbitragers not correcting mispricing right away.

The discussion above suggests that either type of investors, individuals and institutions, is possible can drive prices away from fundamentals. The findings in this chapter add to the debate by examining the relation between investor demand and firm overvaluation in a unique setting of companies that make acquisitions.

3.3. Data

3.3.1. Sample selection

The sample of acquiring firms is originally drawn from Securities Data Corporation (SDC) Platinum online mergers and acquisitions database. All deals selected are announced and completed between 1986 and 2002, the transaction form is acquisition of assets, merger, or acquisition; the method of payment is either 100% stock or 100% cash.[19] To ensure that the deal is economically significant, I further require that deal value is at least $10 million and transaction value is at least 1% of acquirer's market value of equity at the month end before announcement.

For empirical analyses, I further require that both acquirer and target be publicly traded; acquirers' return data are available from the Center for Research in Security Prices (CRSP), and the book value of equity of acquirers is available from COMPUSTAT quarterly financial statement. I also restrict that acquirers' price-to-book ratios exist for the first and thirteenth quarter end prior to announcement to calculate changes in valuation during this period, and that acquirers remain publicly traded and are covered in CRSP for at least twelve quarters after completion.

Quarterly institutional ownership of each acquirer comes from CDA-Spectrum /Thomson Financial and is derived from institutional investors' quarterly 13F reports. Acquirers are deleted from the sample if their total institutional ownership is reported as greater than 100% for any quarter during the three-year period before announcement, which implies possible errors in the 13F reports. For analyses based on institutional demand, I also require that the cumulative changes in institutional holdings in acquirers over the three-year (twelve quarters) prior to announcement exist.

This sampling procedure generates a total of 1,024 sample transactions with 741 stock-financed and 283 cash-financed. Figure 1 shows the total deal value and number of

[19] As shown in the following analysis, the misvaluation hypothesis focuses on stock deals because overvalued acquirers are more likely to use stock as a method of payment. The differences between cash deals and stock deals in terms of acquirer valuation and stock performance are well documented in the literature. I also include cash deals to compare with stock deals. Since misvaluation hypothesis and the existing merger literature does not draw any specific conclusions on deals with mixed payment, I also exclude these deals from the merger sample.

transactions for each year, according to the year when the acquisitions are announced. The most obvious pattern in the sample distribution is the hump during the second half of the last decade, which represents the recent merger wave that is viewed largely as driven by market overvaluation (Shleifer and Vishny, 2003), indicating that many of the sample firms are likely overvalued at the time of making acquisitions.

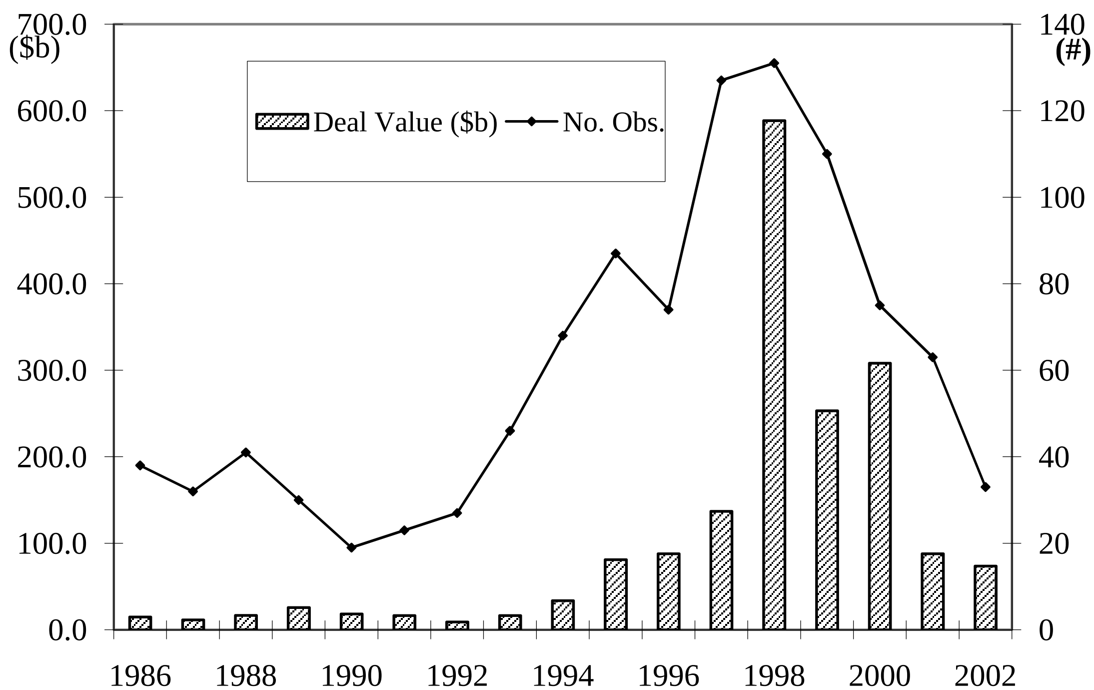

Figure 1
Sample distribution

The whole sample includes 1,024 deals that are announced and completed between 1986 and 2002. The columns stand for the total deal value in $billion (the left vertical axis) and the line shows the number of deals in the sample (the right vertical axis).

3.3.2. Valuation and changes in valuation

Following the literature (e.g., Dong et al., 2006), I use price-to-book ratio as a proxy for firm valuation. For each quarter, price is the quarter end price from CRSP, and book value of equity per share is defined as data item #59 from the most recent COMPUSTAT quarterly financial statement divided by quarter end number of shares outstanding from CRSP. I further take the natural logarithm of price-to-book ratios to correct the noisy distribution of price-to-book ratios. Therefore, $\ln(P/B)_t$ measures a firm's valuation at the end of quarter *t*. [20]

The "changes in valuation" over the twelve quarters prior to announcement is defined as the difference between the valuation at the first quarter end prior to announcement and that at the thirteenth quarter end prior to announcement: $\ln(P/B)_{-1} - \ln(P/B)_{-13}$.[21]

Rhodes-Kropf and Viswanathan (2004) point out that possible misvaluations have both firm-specific and market-wide components. To filter out the market-wide factors that affect firm valuation, I define "abnormal valuation" as the difference between acquirer price-to-book ratio and the median of price-to-book ratios of all firms covered in CRSP and COMPUSTAT in the same quarter. Accordingly, "changes in abnormal valuation" for firm *i* is defined as $[\ln(P/B)_{i,-1} - \ln(P/B)_{market,-1}]$- $[\ln(P/B)_{i,-13} - \ln(P/B)_{market,-13}]$.

3.3.3. Institutional demand and individual demand

To investigate whether institutional investors or individual investors drive prices away from fundamental values, I need to differentiate institutional demand and individual demand in my empirical analysis. Following the literature (e.g., Sias and Whidbee, 2008; San, 2007), I

[20] By taking natural logarithm, I further exclude firms with negative book value at the first quarter end prior to announcement or at the thirteenth quarter end prior to announcement.
[21] For example, if a merger is announced in February, 1999, the first quarter end prior to announcement quarter is the end of December, 1998 and the thirteenth quarter end prior is the end of December, 1995.

use 13F investors as the measure of ownership by institutions and non-13F investors as the measure of ownership by "individual investors."[22] Based on this definition, the net demand of institutions must be offset by net supply of individuals. Throughout this chapter, I focus on the institutional demand because net buying by institutions is equivalent to net selling by individuals.

I construct two variables of institutions' demand for firm *i* during the twelve quarters before announcement: institutional demand and abnormal institutional demand.

First, I define "quarterly institutional demand" as the net fraction of firm *i*'s shares moving to (or from) institutional investors over quarter *t*:

$$Quarterly\ Institutional\ Demand_{i,t} = \frac{\#Shares\ Institutions\ Buy_{i,t} - \#Shares\ Institutions\ Sell_{i,t}}{\#Shares\ Oustanding_{i,t}}. \qquad (8)$$

The institutional demand over the twelve quarters before the announcement is calculated by accumulating the quarterly institutional demand from the twelfth to the first quarter prior to announcement. The twelve-quarter period matches the period from the thirteenth quarter end prior to announcement to the first quarter end prior to announcement over which I measure changes in valuation.

A number of studies document empirical evidence that institutional investors engage in momentum trading--buying past winners and selling past losers (Nofsinger and Sias, 1999; Chen, Hong, and Stein, 2002; Bennet, Sias, and Starks, 2003; Cai and Zheng, 2004; Sias, 2007). A positive relation between institutional demand and changes in valuation over the same period could be due to, at least partially, institutional investors engaging in momentum

[22] Non-13F investors also include some small institutions but they only make up a tiny percentage of this group.

trading within the period. To control for institutional momentum trading, I define quarterly abnormal institutional demand as the residual from quarterly cross-sectional regressions of institutional demand on lag returns.[23] The regression intercept captures average institutional demand across all firms and the slope coefficient captures institutional momentum trading. The time-series average intercept and slope coefficient of the 79 quarterly cross-sectional regressions are 0.004 (t=8.297) and 0.016 (t=17.668), respectively. Consistent with extant studies, I find strong evidence of institutional momentum trading.

Based on the quarterly abnormal institutional demand, the "abnormal institutional demand" for firm *i* is defined as the sum of the quarterly residuals over the twelve quarters prior to announcement.

3.3.4. Buy-and-hold abnormal returns

I use buy-and-hold abnormal returns over the twelve quarters following merger completion to measure long-run performance of merged firms. Buy-and-hold abnormal returns are calculated using the reference portfolio approach following Barber and Lyon (1997). Each month, all NYSE common stocks are sorted into size deciles based on their month end market capitalization. These deciles are further sorted into quintiles using book-to-market ratios. AMEX and NASDAQ firms are then placed into one of these 50 portfolios based on their month end sizes and book-to-market ratios. The monthly return is calculated for each of the 50 reference portfolios by averaging the monthly returns across all stocks in each portfolio. These portfolio returns are then used as benchmark to calculate acquirer buy-and-hold returns over the twelve quarters following merger completion.

[23] The method used to construct abnormal institutional demand is similar to the method used by Parrino, Sias, and Starks (2003).

Following Rosen (2006), BHAR for firm *i* is defined as $BHAR_i = \frac{\prod_{t-1}^{36}\left(1+R_{i,t}\right)}{\prod_{t=1}^{36}\left(1+R_{reference,t}\right)} - 1$,

where t=1 and t=36 refer to the first and the thirty-sixth month after merger completion quarter, respectively.

3.4. Empirical tests

3.4.1. Valuation, changes in valuation, and buy-and-hold abnormal returns

The misvaluation hypothesis in mergers and acquisitions literature (Shleifer and Vishny, 2003; Rhodes-Kropf and Viswanathan, 2004; Rhodes-Kropf, Robinson, and Viswanathan, 2005; Dong et al., 2006) suggests that overvalued firms use their stocks to buy less overvalued firms. Moreover, the misvaluation hypothesis predicts long-run underperformance of acquirers as the market corrects itself and overvaluation reverses. I begin the empirical analysis by examining pre-merger valuation and post-merger buy-and-hold abnormal returns of the sample firms.

Panel A of Table 10 reports the mean and median of valuation and abnormal valuation for the whole sample as well as for the stock and cash subsamples. Consistent with the literature, the sample average abnormal valuation (i.e., valuation adjusted by the median of all firms in the market) is significantly positive (mean=0.408 and significant at 1% level), indicating that acquiring firms are on average more highly valued relative to the market. Further, consistent with the literature, stock acquirers are more overvalued than cash acquirers.

While a good deal of empirical evidence shows that stock acquirers are overvalued, few studies provide evidence that cash acquirers are overvalued. Furthermore, misvaluation theory does not fully explain why overvalued firms pay cash for their acquisitions rather than using their overvalued stocks. Consistent with this view, extant literature shows that long-run performance is negative following stock mergers and non-negative following cash tender offers.[24] In Panel B of Table 10, I also find significant under-performance of stock deals. As for the cash deals, the mean of buy-and-hold abnormal returns is insignificantly different from zero while the median is significantly negative. This finding provides weak evidence that cash acquirers are overvalued. Although the *t*-statistic testing equal means of stock and cash subgroups is not significant at conventional level, the nonparametric test yields a significant *p* value, indicating that stock acquirers are more overvalued than cash acquirers.

Results in Panel A of Table 10 confirm the misvaluation story that stock acquirers are on average overvalued before announcement. Assuming that investor sentiment plays an important role in driving prices away from fundamentals, I expect to observe increases in valuation and positive excess stock returns of acquiring firms over a certain period prior to merger announcement. To the extent that stock acquirers have a higher valuation level than cash acquirers, investor sentiment should have impacted stock acquirers to a greater degree than cash acquirers. Therefore, I investigate changes in valuation, changes in abnormal valuation, and excess returns over the twelve quarters prior to announcement.

Results are reported in Panel C of Table 10. Acquirers on average experience significant increases in both valuation and abnormal valuation and such increases are more pronounced in stock subsamples. Over the same period, the mean excess return (average

[24] See Agrawal and Jaffe (2000) for a survey of this literature.

monthly return adjusted by CRSP value-weighted market return) for all acquirers is 1.033% and significant at 1% level, indicating that superior stock performance results in higher valuation levels that drive acquisitions. Moreover, stock acquirers earn significant higher excess returns than cash acquirers, consistent with the notion that investor sentiment impacts stock acquirers more than cash acquirers.

Overall, results in Table 10 support the misvaluation hypothesis. In summary, the table shows a significant increase in acquirer valuation during the pre-merger period, high valuation level at announcement, and underperformance in the post-merger period. Furthermore, all these effects are more pronounced with stock acquirers than with cash acquirers. This suggests that samples of stock and cash acquirers in their pre- and post-merger period are a unique testing ground for examining which type of investors drives prices away from fundamental values.

Table 10
Valuation, changes in valuation, and buy-and-hold abnormal returns

The whole sample includes 1,024 acquirers that announce and complete acquisitions between 1986 and 2002. The mean and median of the variables are presented for the whole sample (N=1,024), the stock (N=741), and the cash (N=283) subsamples. The *p*-values are derived from two-sample *t*-tests assuming unequal variances, and from Wilcoxon rank-sum test, respectively, for the stock and cash subsamples. Stock (cash) subsample contains all acquirers that pay 100% stock (cash) for acquisition. *Valuation* is the natural logarithm of the price-to-book ratio of the acquirer at the first quarter end prior to announcement, where P is the stock price at the first quarter end before announcement and B is book equity (COMPUSTAT quarterly #59) of the most recent quarterly statement relative to the first quarter end before announcement divided by the number of shares outstanding (from CRSP) at the first quarter end before announcement. *Abnormal valuation* is the acquirer's $\ln(P/B)_{-1}$ minus the median of same quarter ln(P/B) for all firms covered in COMPUSTAT and CRSP. *Buy-and-hold abnormal returns* are calculated using the reference portfolio approach following Barber and Lyon (1997). *Changes in valuation* is $\ln(P/B)_{-1} - \ln(P/B)_{-13}$, where $\ln(P/B)_{-1}$ and $\ln(P/B)_{-13}$ are ln(P/B) measured at the 1^{st} and 13^{th} quarter end prior to announcement, respectively. *Changes in abnormal valuation* is defined as $[\ln(P/B)_{i,-1} - \ln(P/B)_{market,\,-1}] - [\ln(P/B)_{i,-13} - \ln(P/B)_{market,\,-13}]$, where $\ln(P/B)_{market,t}$ is the market median of ln(P/B) at the end of t^{th} quarter prior to announcement. *Prior excess return* is the monthly average excess returns of the firm over the twelve quarters before announcement, adjusted by CRSP value-weighted market returns.

	Whole (N=1,024)		Stock (N=741)		Cash (N=283)		p-values (H_0: Stock = Cash)	
	Mean	Median	Mean	Median	Mean	Median	T-test	Wilcoxon
Panel A: Valuation level								
Valuation	0.993***	0.904***	1.065***	0.978***	0.807***	0.746***	0.000	0.000
Abnormal valuation	0.408***	0.311***	0.466***	0.360***	0.257***	0.196***	0.000	0.000
Panel B: Buy-and-hold abnormal returns								
Buy-and-hold abnormal returns	-0.090***	-0.208***	-0.112***	-0.235***	-0.032	-0.149***	0.108	0.009
Panel C: Changes in valuation								
Changes in valuation	0.192***	0.232***	0.246***	0.289***	0.050	0.101**	0.000	0.000
Changes in abnormal valuation	0.177***	0.203***	0.222***	0.246***	0.057	0.089***	0.000	0.000
Prior excess returns (%)	1.033***	0.752***	1.196***	0.849***	0.608***	0.493***	0.000	0.000

***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

3.4.2. Stock deals, cash deals, and institutional versus individual investor demand

I now investigate which type of investor is responsible for the overvaluation of acquiring firms by first looking at investors' demand for these firms over the same pre-merger period when firm valuation increases significantly. If institutions are driving the overvaluation of the acquiring firms, I expect institutional investors to be net buyers over the twelve quarters before announcement. I also expect institutions to buy stock acquirers to a greater degree than cash acquirers. On the other hand, if individuals are responsible for overvaluations, individuals should be net buyers and institutions net sellers.

Results reported in Table 11 suggest that institutions are net buying during the pre-merger period when acquirer valuation level runs up. Moreover, while institutions are net buyers of average sample firms (the average institutional demand over twelve quarters prior to announcement is .144 and significant at the 1% level), they buy stock acquirers to a greater degree than cash acquirers.

In addition to that institutional trading impact stock prices, institutional momentum trading could also contribute to the fact that institutions are net buyers during the same period when acquirers' valuation increases. To control for momentum trading, I further look at the abnormal institutional demand over the same pre-announcement twelve quarters. As indicated in Table 11, institutions remain net buyers for both stock and cash acquirers even after accounting for the extent to which of institutional demand is due to momentum trading. Moreover, the differences in abnormal institutional demand between stock and cash acquirers remain statistically significant.

Table 11
Summary statistics of institutional demand

The whole sample includes 1,024 acquirers that announce and complete acquisitions between 1986 and 2002. The mean and median of the variables are presented for the whole sample (N=1,024), the stock (N=741), and the cash (N=283) subsamples. The *p*-values are derived from two-sample *t*-tests assuming unequal variances, and from Wilcoxon rank-sum test, respectively, for the stock and cash subsamples. The stock (cash) subsample contains all acquirers that pay 100% stock (cash) for acquisition. *Institutional demand* is the cumulative quarterly institutional demand in the firm over the twelve quarters before announcement, where quarterly institutional demand for firm *i* in quarter *t* is the net fraction of firm *i*'s shares moving to (or from) institutional investors over quarter *t*. *Abnormal institutional demand* is the cumulative quarterly abnormal institutional demand over the twelve quarters before announcement, where quarterly abnormal institutional demand is the residual from quarterly cross-sectional regressions of institutional demand on lag returns.

	Whole (N=1,024)		Stock (N=741)		Cash (N=283)		p-values (H_0: Stock = Cash)	
	Mean	Median	Mean	Median	Mean	Median	T-test	Wilcoxon
Institutional demand	0.144***	0.103***	0.160***	0.116***	0.101***	0.056***	0.000	0.000
Abnormal institutional demand	0.081***	0.042***	0.095***	0.059***	0.047***	0.012*	0.000	0.000

***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

3.4.3. Valuation and institutional demand

The previous sections document significant increases in both acquirer valuation and institutional ownership over the pre-merger three-year period. This suggests that institutions, as net buyers, are more likely to be responsible for the overvaluation of the sample firms. In this section, I directly examine the relation between institutional demand and acquirer valuation using both univariate and regression analyses and I expect that institutional demand will be stronger for firms with higher valuations and changes in valuation.

3.4.3.1 Univariate sorts

Table 12 reports institutional demand and abnormal institutional demand for different quintiles sorted on valuation (Panel A) and changes in valuation (Panel B). For each quarter, I sort all acquirers with deal announced in the same quarter into quintiles based on their pre-deal valuation $\ln(P/B)_{-1}$ and changes in valuation separately. I then assign 1 to 5 to each firm, with 1 referring to the lowest valuation or changes in valuation quintile. Firms assigned the same quintile number are then pooled together to form quintiles for the whole sample, or stock and cash subsamples, respectively.

Panel A of Table 12 shows that, in the whole sample, acquirers with higher valuation levels have higher prior institutional demand. The mean institutional demand increases monotonically from 0.105 for the lowest valuation quintile to 0.193 for the highest valuation quintile. The differences in institutional demand between the two extreme quintiles are significant (t=4.056). The Wilcoxon rank-sum test further confirms that the two extreme groups are drawn from different distributions. Panel A also shows that abnormal institutional demand varies across different valuation quintiles in a similar pattern as institutional demand.

The means and distributions of abnormal institutional demand for the two extreme quintiles are different from each other.

In Panel B, firms are sorted by changes in valuation. The results show that firms with higher changes in valuation have higher institutional demand during the same period. Similar results based on abnormal institutional demand are obtained with similar but slightly weaker statistical significance, indicating that institutional momentum trading does not explain part of the positive relation between institutional demand and changes in valuation but not the whole story.

Table 12 also reports institutional demand and abnormal institutional demand across different valuation and changes in valuation quintiles within stock acquirers and cash acquirers, respectively. The overall results for the stock subsample are largely similar to those for the whole sample, but the results become weaker for the cash subsample, especially when sorted on changes in valuation. While the weaker results in cash acquirers might be due to smaller sample size, it could also be the case that institutional demand has less strong effects on valuations of cash acquirers. Given that cash acquirers are less overvalued than stock acquirers, the latter explanation is plausible.

Table 12 overall shows that firms with higher valuation level and higher changes in valuation have higher institutional demand, indicating a positive relation between institutional demand and firm valuation.

Table 12
Institutional demand sort on valuation and changes in valuation quintiles

The whole sample includes 1,024 acquirers that announce and complete acquisitions between 1986 and 2002. For each of the quarters between 1986 and 2002, acquirers in the whole sample are sorted into quintiles based on valuation (Panel A) or changes in valuation (Panel B);. The quarterly quintiles are then pooled to form quintiles for the whole sample, stock subsample, and cash subsample, respectively. The mean and median of institutional demand and abnormal institutional demand are presented for the whole sample and the stock and cash subsamples. Stock (cash) subsample contains all acquirers that pay 100% stock (cash) for acquisition. T-statistic tests the null hypothesis that the means of the "High" and "Low" quintiles are equal assuming unequal variances and the Z-statistic tests the null hypothesis that the distributions of the "High" and "Low" quintiles are identical. *Valuation* is the natural logarithm of the price-to-book ratio of the acquirer at the first quarter end prior to announcement, where P is the stock price at the first quarter end before announcement and B is book equity (COMPUSTAT quarterly #59) of the most recent quarterly statement relative to the first quarter end before announcement divided by the number of shares outstanding (from CRSP) at the first quarter end before announcement. *Changes in valuation* is $\ln(P/B)_{-1} - \ln(P/B)_{-13}$, where $\ln(P/B)_{-1}$ and $\ln(P/B)_{-13}$ are ln(P/B) measured at the 1^{st} and 13^{th} quarter end before announcement, respectively. *Institutional demand* is the cumulative quarterly institutional demand in the firm over the twelve quarters before announcement, where quarterly institutional demand for firm *i* in quarter *t* is the net fraction of firm *i*'s shares moving to (or from) institutional investors over quarter *t*. *Abnormal institutional demand* is the cumulative quarterly abnormal institutional demand over the twelve quarters before announcement, where quarterly abnormal institutional demand is the residual from quarterly cross-sectional regressions of institutional demand on lag returns.

Table 12: Continued

	Panel A: By valuation					Panel B: By changes in valuation				
		Institutional Demand		Abnormal Institutional Demand			Institutional Demand		Abnormal Institutional Demand	
Quintiles	N	Mean	Median	Mean	Median	N	Mean	Median	Mean	Median
					Whole sample (N=1,024)					
Low	179	0.105	0.087	0.049	0.029	179	0.124	0.104	0.067	0.048
2	217	0.127	0.091	0.069	0.031	218	0.128	0.078	0.070	0.026
3	221	0.132	0.085	0.071	0.038	216	0.107	0.074	0.047	0.020
4	212	0.161	0.113	0.098	0.059	216	0.172	0.126	0.108	0.061
High	195	0.193	0.149	0.119	0.065	195	0.189	0.151	0.117	0.078
T-statistic		4.056***		3.338***			2.961***		2.385**	
Z-statistic			3.826***		2.622***			2.931***		2.042**
					Stock subsample (N=741)					
Low	121	0.131	0.111	0.071	0.061	122	0.136	0.114	0.076	0.055
2	148	0.137	0.101	0.078	0.038	152	0.144	0.096	0.085	0.060
3	165	0.146	0.112	0.083	0.058	165	0.118	0.083	0.056	0.030
4	158	0.170	0.117	0.104	0.065	159	0.196	0.154	0.128	0.085
High	149	0.210	0.166	0.133	0.091	143	0.204	0.165	0.129	0.086
T-statistic		2.861***		2.316**			2.599***		2.089**	
Z-statistic			2.562**		1.718*			2.365**		1.657*
					Cash subsample (N=283)					
Low	58	0.049	0.022	0.002	-0.012	57	0.098	0.051	0.047	0.014
2	69	0.104	0.076	0.049	0.022	66	0.090	0.047	0.037	0.004
3	56	0.089	0.041	0.036	-0.001	51	0.070	0.049	0.017	0.004
4	54	0.135	0.104	0.080	0.043	57	0.104	0.069	0.050	0.022
High	46	0.137	0.071	0.074	0.025	52	0.145	0.089	0.084	0.049
T-statistic		2.970***		2.468**			1.223		0.989	
Z-statistic			2.759***		1.803*			1.647*		1.107

***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

3.4.3.2 Regression analysis

The positive correlation between changes in valuation and contemporaneous institutional demand documented in the unviariate sorts indicates that institutional investors are likely to be responsible for the overvaluation of the sample acquirers. If it is true that institutional investors, rather than individual investors, drive prices away from fundamentals, institutional demand should be able to explain changes in firm valuation even after controlling for other possible factors.

Table 13 reports regression results of changes in valuation (Panel A) and changes in abnormal valuation (Panel B) on institutional demand controlling for firm size and method of payment. Firm size is measured at the end of the thirteenth quarter prior to announcement and method of payment is represented by “stock deal dummy” that equals one if the deal is financed by pure stock and zero otherwise. Smaller firms tend to earn higher returns (e.g., Banz, 1981), suggesting an inverse relation between firm size and changes in valuation, which are positively correlated with returns. On the other hand, institutions prefer large firms (Gompers and Metrick, 2001), implying a positive relation between firm size and institutional demand. I also control for method of payment in regressions with the whole sample because stock acquirers experience significantly larger increases in valuation than cash acquirers (Table 10 Panel C).

Panel A of Table 13 reports results of two different regression models: model (1) regresses changes in valuation on institutional demand and model (2) regresses changes in valuation on abnormal institutional demand. Consistent with the hypothesis that institutional buying drives stock prices above fundamental values, I find significant positive coefficients on both institutional demand and abnormal institutional demand. Because abnormal institutional demand filters out institutional momentum trading, the results of model (2) suggest significant price impacts of institutional trading. It is worth noting that the price effects of institutional trading are mainly driven by the stock subsample. When looking at the cash subsample only, I fail to find any significant results. The different results between stock acquirers and cash acquirers are consistent with the findings reported in Table 10. First, stock acquirers are more overvalued than cash acquirers. Second, stock acquirers' valuation increases significantly while cash acquirers' valuation does not during the pre-merger period. It is not surprising that the impact of institutional demand on firm valuation is more pronounced with the stock acquirers.

As Rhodes-Kropf and Viswanathan (2004) point out, stock misvaluation has both firm specific and market-wide components. To control for the market-wide valuation changes, for which institutional demand of a particular stock should not be held responsible, I further run regressions of changes in abnormal valuation, which filters out the market-wide valuation changes, on institutional demand. Presumably, coefficients on institutional demand capture the effect of institutional trading on the firm-specific part of misvaluation only, and therefore are more accurate in reflecting how institutional demand of a particular stock drives its price away from fundamentals. Results reported in Panel B show that both institutional demand and abnormal institutional demand contribute to increases in abnormal valuation.

In summary, after controlling institutional momentum trading and other factors such as firm size, institutional demand explains both changes in valuation and changes in abnormal valuation. Moreover, the price effects associated with institutional trading are more pronounced with the more overvalued stock acquirers. These findings provide strong support to the hypothesis that institutional investors drive prices away from fundamentals.

Table 13
Regressions of changes in valuation on institutional demand

The whole sample includes 1,024 acquirers that announce and complete acquisitions between 1986 and 2002. Each panel contains six regressions, two different model specifications each for the whole sample, the stock and cash subsamples. Stock (cash) subsample contains all acquirers that pay 100% stock (cash) for acquisition. The dependent variable in Panel A is *changes in valuation*, and the dependent variable in Panel B is *changes in abnormal valuation*. *Changes in valuation* is $\ln(P/B)_{-1} - \ln(P/B)_{-13}$, where $\ln(P/B)_{-1}$ and $\ln(P/B)_{-13}$ are ln(P/B) measured at the 1st and 13th quarter end prior to announcement, respectively. *Changes in abnormal valuation* is defined as $[\ln(P/B)_{i,-1} - \ln(P/B)_{market,\,-1}] - [\ln(P/B)_{i,-13} - \ln(P/B)_{market,\,-13}]$, where $\ln(P/B)_{market,t}$ is the market median of ln(P/B) at the end of t^{th} quarter prior to announcement. *Institutional demand* is the cumulative quarterly institutional demand in the firm over the twelve quarters before announcement, where quarterly institutional demand for firm *i* in quarter *t* is the net fraction of firm *i*'s shares moving to (or from) institutional investors over quarter *t*. *Abnormal institutional demand* is the cumulative quarterly abnormal institutional demand over the twelve quarters before announcement, where quarterly abnormal institutional demand is the residual from quarterly regressions of institutional demand on past quarter returns. *Ln(firm size)*$_{-13}$ is the natural logarithm of the acquirer's market capitalization at the end of the 13th quarter before announcement. *Stock deal* is a dummy variable equal to one if the acquirer pays for acquisition with stock. T-stats are based on White (1980) robust standard errors. Year (1986 to 2001) and Fama-French (1997) 48-industry dummies are controlled but unreported to conserve space.

Table 13: Continued

	Panel A: Dep. Var. = Changes in valuation				Panel B: Dep. Var. = Changes in abnormal valuation			
	Model (1)		Model (2)		Model (3)		Model (4)	
	Coef.	T	Coef.	T	Coef.	T	Coef.	T
	Whole sample (N=1,024)							
Institutional demand	0.430	3.690***			0.425	3.626***		
Abnormal institutional demand			0.339	2.883***			0.343	2.895***
Ln(firm size$_{-13}$)	-0.007	-0.548	-0.010	-0.749	0.000	-0.026	-0.003	-0.216
Stock deal	0.085	1.603	0.091	1.700*	0.079	1.510	0.084	1.602
Constant	-0.200	-1.106	-0.151	-0.832	-0.089	-0.496	-0.043	-0.239
Adj. R^2	0.111		0.105		0.076		0.070	
	Stock subsample (N=741)							
Institutional demand	0.501	3.742***			0.496	3.723***		
Abnormal institutional demand			0.418	3.090***			0.423	3.136***
Ln(firm size$_{-13}$)	-0.009	-0.574	-0.011	-0.733	-0.002	-0.127	-0.004	-0.276
Constant	-0.010	-0.045	0.047	0.205	0.075	0.337	0.128	0.576
Adj. R^2	0.103		0.095		0.079		0.072	
	Cash subsample (N=283)							
Institutional demand	0.278	1.078			0.300	1.142		
Abnormal institutional demand			0.153	0.590			0.179	0.674
Ln(firm size$_{-13}$)	-0.008	-0.270	-0.011	-0.395	-0.001	-0.053	-0.005	-0.179
Constant	-0.499	-1.438	-0.453	-1.302	-0.344	-0.987	-0.297	-0.848
Adj. R^2	0.032		0.028		-0.018		-0.024	

***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

3.4.4. Pre-merger institutional demand and post-merger buy-and-hold abnormal returns

If institutional investors drive prices away fundamental values, I expect to observe return reversal with stocks that institutions buy. Alternatively, if institutional trading does not drive prices away from fundamentals, I expect to observe price increases without a subsequent price decreases with stocks institutions buy. Previous sections show that institutions are net buyers of acquirers prior to the merger announcement and that institutional demand contributes to the overvaluation of these acquirers. If institutions are playing a destabilizing role on stock prices, I expect to observe post-merger underperformance of acquirers with high pre-merger institutional demand as the mispricing will be corrected in the long-run. Therefore, to further test whether institutional demand drives stock prices away from fundamentals, I investigate the relation between pre-merger institutional demand and post-merger buy-and-hold abnormal returns in this section.

Recall that Table 10 (Panel B) shows that stock acquirers incur significant negative buy-and-hold abnormal returns (BHARs) while cash acquirers do not. Together with the finding that the institutional demand of stock acquirers over the pre-merger period is significantly higher than that of cash acquirers, the evidence of long-run underperformance of stock acquirers appears supportive of the hypothesis that institutional demand does drive stock prices away from fundamentals.

Table 14 reports regression results of six different model specifications for the whole sample (Panel A), stock subsample (Panel B), and cash subsample (Panel C), respectively. In the first two regressions, I regress BHARs on institutional demand and abnormal institutional demand individually and find negative coefficients on both variables, with marginal statistical significance. The findings that acquirers with higher pre-merger institutional demand experience post merger return reversal in the long-run are consistent with the hypothesis that institutional net buying pushes stock prices above fundamental values, which, in turn, encourages companies to use their overvalued equity to purchase less overvalued companies.

When BHARs are regressed on institutional demand and changes in valuation over the three-year period prior to announcement, as shown in models (3) and (4), the coefficients on institutional demand variables remain negative, but not significant at the conventional level. The weaker significance is not all surprising as institutional demand positively affects changes in valuation (as shown in Table 13 Panel A). In models (5) and (6), where BHARs are regressed on both institutional demand and valuation level at the quarter end before announcement, the coefficients on institutional demand variables become insignificant and the coefficient on pre-announcement valuation level is significantly negative for both model specifications. This finding indicates that the predictive power of institutional demand is subsumed by the predictive power of acquirer valuation level before announcement. If institutional net buying pushes up acquirer valuation levels during the pre-merger period, institutional demand should be positively correlated with acquirer valuation at the quarter end before announcement (as indicated in Table 12). It is then reasonable to assume that acquirer valuation level already incorporates information about institutional demand during prior period. Therefore, results from models (5) and (6) support the conclusion that institutional investors drive acquirer prices above fundamentals.

The results for the stock and cash subsamples are qualitatively similar to those for the whole sample albeit weaker.

Overall, the evidence presented in Table 14 shows that acquirers with higher pre-merger institutional demand experience larger post-merger return reversal, supporting the hypothesis that institutional buying drives prices above fundamental values.

Table 14
Regressions of BHARs on institutional demand and valuation

The sample includes 1,024 acquirers that announce and complete acquisitions between 1986 and 2002. The dependent variable is the buy-and-hold abnormal returns (BHARs) over the twelve quarters after deal completion. BHARs are calculated using reference portfolio approach following Barber and Lyon (1997). Panel A is for the whole sample while panels B and C are for the stock and cash subsamples, respectively. Stock (cash) subsample contains all acquirers that pay 100% stock (cash) for acquisition. *Institutional demand* is the cumulative quarterly institutional demand in the firm over the twelve quarters before announcement, where quarterly institutional demand for firm *i* in quarter *t* is the net fraction of firm *i*'s shares moving to (or from) institutional investors over quarter *t*. *Abnormal institutional demand* is the cumulative quarterly abnormal institutional demand over the twelve quarters before announcement, where quarterly abnormal institutional demand is the residual from quarterly regressions of institutional demand on past quarter returns. *Changes in valuation* is $\ln(P/B)_{-1} - \ln(P/B)_{-13}$, where $\ln(P/B)_{-1}$ and $\ln(P/B)_{-13}$ are ln(P/B) measured at the 1st and 13th quarter end before announcement, respectively. *Valuation* is the natural logarithm of the price-to-book ratio of the acquirer at the first quarter end prior to announcement, where P is the stock price at the first quarter end before announcement and B is book equity (COMPUSTAT quarterly #59) of the most recent quarterly statement relative to the first quarter end before announcement divided by the number of shares outstanding (from CRSP) at the first quarter end before announcement. T-stats are based on White (1980) robust standard errors.

Table 14: Continued

	Model (1)		Model (2)		Model (3)		Model (4)		Model (5)		Model (6)	
	Coef..	T	Coef..	T	Coef..	T	Coef..	T	Coef..	T	Coef..	T
	Whole sample (N=1,024)											
Institutional demand	-0.164	-1.770*			-0.152	-1.556			0.035	0.429		
Abnormal institutional demand			-0.160	-1.681*			-0.151	-1.521			-0.010	-0.126
Changes in valuation					-0.026	-0.509	-0.029	-0.560				
Valuation									-0.377	-8.480***	-0.375	-8.470***
Constant	-0.067	-2.366**	-0.077	-2.971***	-0.063	-2.309**	-0.072	-2.877***	0.279	4.809***	0.283	4.905***
Adj. R^2	0.001		0.001		0.001		0.001		0.130		0.130	
	Stock subsample (N=741)											
Institutional demand	-0.151	-1.318			-0.164	-1.332			0.017	0.169		
Abnormal institutional demand			-0.142	-1.197			-0.150	-1.197			-0.023	-0.219
Changes in valuation					0.026	0.429	0.023	0.384				
Valuation									-0.378	-6.744***	-0.377	-6.733***
Constant	-0.088	-2.397**	-0.099	-2.987***	-0.092	-2.681***	-0.104	-3.390***	0.288	3.614***	0.292	3.698***
Adj. R^2	0.000		0.000		-0.001		-0.001		0.130		0.130	
	Cash subsample (N=283)											
Institutional demand	-0.123	-0.743			-0.089	-0.552			0.077	0.515		
Abnormal institutional demand			-0.145	-0.928			-0.136	-0.897			0.013	0.094
Changes in valuation					-0.169	-1.943*	-0.170	-1.956*				
Valuation									-0.377	-5.538***	-0.374	-5.452***
Constant	-0.020	-0.493	-0.026	-0.632	-0.015	-0.375	-0.018	-0.432	0.264	3.814***	0.269	3.915***
Adj. R^2	-0.002		-0.002		0.017		0.018		0.114		0.113	

***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

3.5. Conclusion

In this chapter, I use samples of stock and cash acquirers to investigate whether institutional or individual investors are more likely to be responsible for the overvaluation of acquiring firms. Recent empirical studies provide evidence that stock acquirers are more overvalued than cash acquirers, thus the choice of stock and cash acquirers provides a unique setting to study the price impact of institutional trading.

Specifically, I first confirm that the sample acquiring firms are overvalued relative to the market median before announcement, with stock acquirers more overvalued than cash acquirers. Results of univariate tests can be summarized as following: the changes in valuation over the pre-merger three years are significant positive, more so for stock acquirers; institutional investors are net buyers during the same period, and institutions buy stock acquirers to a greater degree than cash acquirers; stock acquirers earn negative buy-and-hold abnormal returns over the three-year period following merger completion while cash acquirers do not. Further analyses show a strong positive relation between institutional demand and valuation levels before announcement and changes in valuation over the three-year pre-merger period. Finally, pre-merger institutional demand is inversely related to post-merger buy-and-hold abnormal returns, and the inverse relation is subsumed by the valuation level before announcement.

In sum, my results demonstrate that, contrary to conventional wisdom, it is institutional rather than individual investors that are more likely to drive stock prices from fundamental values.

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