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Working Paper

The adverse selection effect of corporate cash reserve: Evidence from the acquisitions solely financed by stock

Manchester Business School Working Paper, No. 550

Provided in Cooperation with:

Manchester Business School, The University of Manchester

Suggested Citation: Gao, Ning (2008) : The adverse selection effect of corporate cash reserve: Evidence from the acquisitions solely financed by stock, Manchester Business School Working Paper, No. 550, The University of Manchester, Manchester Business School, Manchester

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<https://hdl.handle.net/10419/50700>

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Working Paper Series

The Adverse Selection Effect of Corporate Cash Reserve: Evidence from the Acquisitions Solely Financed by Stock

Ning Gao

Manchester Business School Working Paper No. 550
May 2008

Manchester Business School

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Manchester Business School
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+44(0)161 306 1320
<http://www.mbs.ac.uk/research/working-papers/default.aspx>
ISSN 0954-7401

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JEL Classification

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Abstract

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How to quote or cite this document

Gao, Ning. (2008). The Adverse Selection Effect of Corporate Cash Reserve: Evidence from the Acquisitions Solely Financed by Stock. *Manchester Business School Working Paper, Number 550*, available: <http://www.mbs.ac.uk/research/working-papers.aspx>.

The Adverse Selection Effect of Corporate Cash Reserve: Evidence from the Acquisitions Solely Financed by Stock.[†]

Ning Gao[‡]
May, 2008

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Rhodes-Kropf and Viswanathan (2004) suggest an adverse selection role of corporate cash reserve. Specifically, if investors know a bidder does not have to issue to invest, an attempt to do so sends a strong pessimistic signal of overvaluation. Despite its intuitiveness, this notion has not been explicitly studied in the empirical literature. Using a sample of acquisitions that are solely financed by the bidders' equity to exclude the potential complications of free cash flow, I find that firms with higher excess cash reserve are more likely than other firms to attempt acquisitions that are solely financed by stock. I further confirm that a bidder's excess cash reserve has an adverse wealth effect at deal announcement. The adverse wealth effect of cash reserve is stronger in the hot equity market period when aggregate information asymmetry is arguably high, and for the bidders whose stand alone values are more difficult to assess. In the post-acquisition years, high-excess-cash-reserve bidders operationally out perform low-excess-cash-reserve ones. Moreover, they spend more funds on debt reduction but no more on investments than low-excess-cash-reserve bidders do. Combined, these results conform to the adverse selection effect of corporate cash reserve, and suggest that a firm holding more cash than what it requires may incur further costs in addition to the liquidity discount.

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[†] I thank Michael Bowe, Michael Brennan, Ling Cen, Sudipto Dasgupta, Jie Gan, Ian Garrett, Michael Hertz, Asad Kausar, Edward Lee, Clive Lennox, Weimin Liu, Dean Paxson, Sattar Mansi, Ser-huang Poon, Matthew Spiegel, Norman Strong, Martin Walker, Myke Yest, seminar participants of the Accounting and Finance Group of the Manchester Business School, participants and anonymous reviewers of the FMA 2007 annual conference. The author takes all responsibilities for any errors or omissions

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Abstract

Rhodes-Kropf and Viswanathan (2004) suggest an adverse selection role of corporate cash reserve. Specifically, if investors know a bidder does not have to issue to invest, an attempt to do so sends a strong pessimistic signal of overvaluation. Despite its intuitiveness, this notion has not been explicitly studied in the empirical literature. Using a sample of acquisitions that are solely financed by the bidders' equity to exclude the potential complications of free cash flow, I find that firms with higher excess cash reserve are more likely than other firms to attempt acquisitions that are solely financed by stock. I further confirm that a bidder's excess cash reserve has an adverse wealth effect at deal announcement. The adverse wealth effect of cash reserve is stronger in the hot equity market period when aggregate information asymmetry is arguably high and for the bidders whose stand-alone values are more difficult to assess. In the post-acquisition years, high-excess-cash-reserve bidders operationally out perform low-excess-cash-reserve ones. Moreover, they spend more funds on debt reduction but no more on investments than low-excess-cash-reserve bidders do. Combined, these results conform to the adverse selection effect of corporate cash reserve, and suggest that a firm holding more cash than what it requires may incur further costs in addition to the liquidity discount.

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1. Introduction

Earlier studies in M&A document that a bidder usually suffers unfavourable wealth effect at the announcement of a stock-financed acquisition (Travlos, 1987, Franks, Harris and Mayer, 1988, Asquith, Bruner and Mullins, 1987, Wansley, Lane and Yang, 1987, Servaes, 1991, Martin, 1996 and others). Such finding is consistent with the adverse selection theory of Myers and Majluf (1984). In particular, a stock offer sends a signal that the bidder is overvalued. When observing this signal, investors in an efficient market will adjust the bidder's share price downward to its fair value. Recent studies on both capital structure and M&A however, suggest that, for different reasons, price adjustment at announcement is incomplete. This makes it possible for a firm to make a gain by exploiting equity overvaluation, i.e. market timing (Baker and Wurgler, 2002, Shleifer and Vishny, 2003, Rhodes-Kropf and Viswanathan, 2004, Rhodes-Kropf, Robinson and Viswanathan, 2005, Dong, Hirshleifer, Richardson and Teoh, 2006, among others).

The incomplete price adjustment suggests a scope for investors to seek information in addition to the mere announcements of a stock offer, and justifies further price correction. A proper investigation into such additional information will not only benefit our understanding of how the market processes information, but also provide useful insights for the firms operating in a market with incomplete information.

This paper empirically studies an informational role of corporate cash reserve. I document evidence fairly consistent with the adverse selection effect of corporate cash reserve. The theoretical foundation of the adverse selection effect of corporate cash reserve is built on Rhodes-Kropf and Viswanathan (2004) and Myers and Majluf (1984). In Myers and Majluf (1984), investors are rational but know less about the value of a stock-issuing firm's assets in place than firm managers do. Investors correctly spot the conflict of interests between old and new shareholders, and interpret stock issuance as a signal that the issuing firm is overvalued. Myers and Majluf (1984) allude to the adverse selection role of corporate cash reserve, stating that if the investors know that a firm does not have to issue to invest, an attempt to issue sends a strong pessimistic signal of overvaluation (Myers and Majluf, 1984, P195). In Myers and Majluf (1984) however, the focus of information asymmetry is one-sided: on the

issuing firm's assets in place. Issuing stock always conveys bad news that the issuing firm is overvalued. To avoid adverse selection costs, a firm always follows a pecking order of financing sources, i.e. it always uses cash before resorting to external equity. But in the current paper, we do observe that cash rich firms make stock offers (see section 4.1). Puzzles then arise when we ask: i) what motivates a bidder rich in cash to offer stocks, and ii) what induces target managers to accept a stock offer if they understand that the stocks offered could be overvalued. Rhodes-Kropf and Viswanathan (2004) speak to these puzzles by emphasizing the two-sided nature of information asymmetry. In particular, target managers face uncertainties both about a bidder's stand-alone value and about the synergies arising from the deal.¹ Although some overvalued bidders want to pay with equity, target managers are not easily fooled. They are rational, sophisticated and value-maximizing.² However, endowed with limited information, they cannot distinguish between synergies and overvaluation. When overvaluation drives a stock offer, as Bayesian updaters, target managers will attribute part of the offer to positive synergies. They eventually accept the offer because they mistakenly count part of the overvaluation as synergies, and believe that the value of the offer is above their reservation value. Nevertheless, investors understand that the target managers can request cash payment in order to remove a "lemon" bidder that offers overvalued stocks. When a bidder has costless access to cash, a highly possible reason for it not to comply is that the true value of the offered stocks is indeed lower. In this case, investors will assign overvaluation a higher probability, synergies a lower probability, thereby further suppressing the bidder's share price.³ On the bidder's side, a stock offer gives two possible benefits besides synergies. First, there is possible market timing gain because the potential of positive synergies delays full correction of misvaluation. Second, an overvalued bidder will expect the target to be overvalued as well because there is a component of overvaluation that is market-wide (see Rhodes-Kropf and Viswanathan, 2004). By using stocks instead of cash, the bidder can avoid overpaying the target.

¹ See also Brusco, Lopomo, Robinson and Viswanathan (2007) which similarly show that uncertainties about both stand-alone values and synergies are necessary to describe merger outcomes without resorting to hubris, private benefits or other agency costs.

² Another important paper is Shleifer and Vishny (2003). Their model relies on the assumption of irrational market and self-dealing managers. In contrast, the current paper examines an aspect of the market rationalities suggested by Rhodes-Kropf and Viswanathan (2004).

³ Several other studies show that the market is efficient in extracting and processing information, for example see Pagano, Panetta and Zingales (1998), Subramanyam and Titman (1999) and Luo (2005).

To briefly sum up, Rhodes-Kropf and Viswanathan (2004) suggest an adverse selection effect of corporate cash reserve: if investors know that a bidder does not have to issue to invest, an attempt to issue sends a strong pessimistic signal. It is also important to note that the existence of two-sided information asymmetry plays an important role in understanding the adverse selection effect of cash that we study in this paper. The idea of the adverse selection effect of cash is intuitive, but the author is not aware of any previous empirical work that explicitly studies corporate cash reserve from such a unique angle. The aim of this paper is to examine whether or not the adverse selection effect of corporate cash reserve receives support from empirical evidence.

On the empirical front, previous M&A literature has documented a negative announcement wealth effect of cash (see Lang, Stulz and Walkling, 1991, Schlingemann, 2004, Harford, 1999). Most of the researchers attribute such a negative effect to the agency cost of free cash flows. The baseline argument is that a firm with more free cash is more likely to spend it on value destroying acquisitions. To avoid the potential complications of agency costs, I exclude from my sample those deals with an element of cash in the payment packet. Another advantage of focusing on pure stock offers is that such a sample would bias against finding significant informational effect of corporate cash reserve, because a pure stock offer is the most adverse case in Myers and Majluf (1984). The signal from the announcement is therefore the strongest, and the scope for additional information is the smallest.

A second empirical issue is that due to the non-random sampling procedure, OLS regressions are subject to the bias of self-selection. I then employ a variant of the truncated regression formalized in Eckbo, Marksimovic and Williamson (1990) in my regression analyses of the announcement wealth effects (section 4.2). A third empirical issue is how to measure a bidder's costless access to cash. Raw cash reserve as a fraction of total assets (henceforth termed Cash Reserve Ratio) is not proper because for two firms with the same level of relative cash reserve, one can be cash-rich and the other cash-poor subject to their respective required level of cash reserve (see Opler, Pinkowitz, Stulz and Williamson, 1999 and Harford, 1999). I then estimate a firm's required level of Cash Reserve Ratio using a pooled time-series cross-sectional OLS regression with year dummies, following Opler et al (1999). The

difference between the raw Cash Reserve Ratio and its required level (henceforth termed Excess Cash Reserve Ratio) is used measure a firm's costless access to cash.⁴

My first piece of evidence shows that firms with higher excess cash reserve are more likely than other firms to attempt acquisitions that are solely financed by stock. In particular, nearly half of the pure-stock-offer bidders are in the top NYSE Excess Cash Reserve Ratio quartile. Multiple probit regression results further confirm that the chance of making a pure stock offer is considerably higher for a high-excess-cash-reserve firm, even after controlling for stock price performance, firm size and other factors that affect the probability of being a stock bidder (i.e. the bidder of an acquisition that is solely financed by stock). This set of evidence is consistent with the view that high excess cash reserve is indicative of the presence of overvaluation that motivates a stock offer.

The second set of tests focuses on a bidder's announcement effect. The adverse selection effect of corporate cash reserve is primarily reflected here. The regression results confirm that a bidder with more excess cash reserve has more negative wealth effect at deal announcement. The negative wealth effect of excess cash reserve is stronger in the hot equity market period when market wide information asymmetry is arguably high. Moreover, the negative wealth effect of excess cash reserve is stronger for a bidder whose value to more extent is derived from intangible assets. All the regressions are estimated with a constant term. The negative wealth effect of excess cash reserve is therefore on top of the signal sent by the mere announcement of a stock offer. Combined, these results are consistent with the argument that investors rationally attach a higher probability of overvaluation to those stock bidders who are more likely to have costless access to cash. Further, investors have stronger tendency to do so when they face more uncertainties about a bidder's stand-alone value. These results also support the broader idea that rational investors are able to make use of additional information that is beyond the mere announcement of a stock offer in order to assess the true value of a transaction.

⁴ I also estimate the required cash reserve using industry-year specific regressions. The results do not change qualitatively under this alternative approach. The purpose of the industry-year specific estimation is to better rule out the possibility that higher excess cash reserve reflect higher growth, as growth is an important motive to reserve cash. The constant term in a regression would absorb the average cash reserve in an industry-year, which in turn better reflect expected growth. I thank the referee for pointing this out.

In the third set of tests, I further examine a bidder's post-acquisition operational cash flow performance and its use of funds. The post-acquisition operational performance is interesting because synergies will manifest themselves through operation in the long-run. In Rhodes-Kropf and Viswanathan (2004), synergy is an important motive for acquisitions, apart from overvaluation. If investors know for sure that synergies are absent, adverse selection will eliminate market timing gain and eventually will collapse the market for stock acquisitions.⁵ A stock bidder potentially benefits from both market timing gain and deal synergies. The adverse selection effect of cash reserve squeezes a high-excess-cash-reserve bidder's market timing gain, because price correction is more complete there. Higher synergies therefore are necessary to motivate a high-excess-cash-reserve bidder to bid. At the same time, target managers also need to see higher expected synergies here, before they acceptance the offer. I therefore expect a high-excess-cash-reserve bidder to have better operational cash flow performance in the post-acquisition years, relative to a low-excess-cash-reserve one. Consistently, I find that high-excess-cash-reserve bidders on average out perform low-excess-cash-reserve ones in terms of post-acquisition operational cash flow performance. Regarding the use of funds in post-acquisition years, I find that relative to a low-excess-cash-reserve bidder, a high-excess-cash-reserve bidder spends more funds on debt reduction, but no more and sometimes even less on investments. This final piece of evidence is more consistent with the interpretation that excess cash reserve is an indicator of misevaluation as opposed to a measure of growth opportunities (see Hertz and Li, 2007 and Kim and Weisbach, 2006).

Overall, this paper provides evidence supporting the adverse selection effect of corporate cash reserve suggested by Rhodes-Kropf and Viswanathan (2004). While cash reserve can guard against the underinvestment problem induced by expensive external financing, it introduces a cost of adverse selection by sending a stronger signal of overvaluation when equity financing is used. This paper contributes to several strands of literature. First, it examines an aspect of the underlying adverse selection mechanism of the recent theory of Rhodes-Kropf and Viswanathan (2004). It is also reminiscent of the pioneering work of Myers and Majluf (1984). Further, it

⁵ Myers and Majluf (1984) have a similar discussion that the existence of positive NPV projects keeps the equity market from collapsing (p 202).

conforms to a recent view that it is important to emphasize the two-sided nature of information asymmetry in order to describe merger outcomes without resorting to hubris, private benefits or other agency costs (see Brusco, Lopomo, Robinson and Viswanathan, 2007). Second, this paper adds to our understanding of the informational role of cash. A more detailed discussion of the informational role of cash can be found in section 2.2. Third, it relates to an extensive literature that studies the announcement effect of corporate takeovers in relation to the means of payment. It suggests that it is important for managers to be aware of possible market reactions when considering financing a project using stock. In such a case, corporate cash reserve can considerably influence market opinion. Finally, this paper adds to our understanding of the negative announcement effect of cash reserve documented in the previous M&A literature. While most previous studies attribute such negative effect to the agency cost of free cash flows, this paper suggests that adverse selection may as well contribute to it.

The rest of this paper proceeds as follows. Section 2 reviews relevant literature in order to provide more context and motivation for the paper. Section 3 describes data. Section 4 develops hypotheses, proposes tests and reports empirical results. Section 5 concludes the paper.

2. Literature Review

2.1 The Theoretical Background of the Adverse Selection Effect of Corporate Cash Reserve

This paper examines a particular informational role of cash: the adverse selection effect of corporate cash reserve. This effect reflects an aspect of the underlying adverse selection mechanism of a recent theory of Rhodes-Kropf and Viswanathan (2004). Their analysis is performed in a Myers and Majluf (1984) set up such that overvalued bidders make stock offers. Adverse selection does not collapse the stock acquisition market because some bidders have positive synergies, and target managers (with only limited information) are not able to distinguish between synergies and overvaluation. When overvaluation drives a stock offer, target managers (they are Bayesian updaters) misinterpret part of the overvaluation as synergies, and accept the offer if they expect the value of the offer is greater than their reservation value. The adverse selection effect of cash reserve manifests when investors (and target

managers) realize that a stock bidder has costless access to cash. It is because investors understand that the target managers can request cash payment in order to remove the “lemon” bidder that offers overvalued equity. With costless access to cash, a most likely reason for the bidder not to comply is that the value of stocks offered is indeed lower. In such a case, investors will further suppress the bidder’s share price based on the perception that overvaluation is more likely. Put briefly, if investors know that a bidder does not have to issue to invest, an attempt to do so sends a strong pessimistic signal of overvaluation. This signal is beyond the signal sent by the mere announcement of a stock offer.

The adverse selection effect of cash reserve is also alluded to in the pioneering work of Myers and Majluf (1984). But in the model of Myers and Majluf (1984), information asymmetry is one-sided, and stock issuance always sends bad news. Their model predicts that no one violates the pecking order of financing sources. However, the fact that a large proportion of stock bidders are actually not poor in cash contradicts this prediction (see section 4.1). The two-sided information asymmetry emphasized by Rhodes-Kropf and Viswanathan (2004) therefore is of vital importance in understanding what the current paper documents. When there are uncertainties about both a bidder’s stand-alone value and deal synergies, violation of the pecking order becomes possible. In another recent paper by Brusco, Lopomo, Robinson and Viswanathan (2007), the authors also emphasize the importance of the two-sided information asymmetry in understanding merger outcomes without recourse to any form of agency or behavioural explanation. In a rational framework, the authors show that when information asymmetry is two-sided, no pecking order emerges.

2.2 Other Informational Implications of Cash

The research on the informational role of cash is not new. A strand of early literature studies the signalling effect of company payout policies (for example, Bhattachaya, 1979, Miller and Rock, 1985, John and Williams, 1985). The basic idea is that firms adjust dividends to signal their prospects. An increase in dividend signals that the firm will perform better, and a decrease suggests it will do worse.

In addition to the signalling effect of dividend payout, a couple of motives for a firm to hold cash are also informationally relevant. According to the precautionary motive of cash holding, a firm holds cash to avoid the potential underinvestment problem induced either by adverse selection in equity market (Myers and Majluf, 1984) or by the agency cost of debt (Myers, 1977, Jensen and Meckling, 1976). A firm with higher growth opportunities will hoard more cash, because its shareholders suffer more costs of underinvestment if they have to rely on expensive external financing (Opler et al 1999, Almeida, Campello and Wesbach, 2004, Bates, Kahle and Stulz, 2006). The precautionary motive suggests that reserving cash by using stocks as the medium of exchange in an acquisition sends a signal that the bidder might have good growth opportunities after the deal (see Jovanovic and Braguinsky, 2004). Consistently, Faccio and Masulis (2005) find that, in Europe, a bidder with more growth opportunities is more likely to attempt a stock offer. According to the precautionary motive, higher cash reserve sends good news at the announcement of a stock acquisition, and therefore should have positive wealth effects. Another motive for a firm to hold cash is the managerial discretion motive. According to the managerial discretion motive, entrenched managers would rather hold on to cash than increase payouts to shareholders, even when their company has run out of good investment opportunities (Jensen, 1986, Opler et al 1999). High cash reserve insulates the managers from the monitoring by external capital markets. Consequently, they have more leeway in making inefficient investments or other mistakes that contradict the shareholders' interests. It is possible that entrenched managers, when putting together the financing packet for an acquisition, are reluctant to pay by cash because they are reluctant to expose themselves subsequently to the harsh monitoring by external capital markets. It is also possible that, with the insulation from external monitoring, the managers are less bothered about their fiduciary duty when proposing acquisitions. They select a bad deal simply because they are less concerned about the shareholders' wealth. The managerial discretion motive suggests that it is bad news if bidding-firm managers' reserve cash in an acquisition by paying stocks instead. Specifically, it may signal the existence of agency cost that is worse than what the market has expected. The managerial discretion motive thus predicts a negative announcement effect of cash reserve in acquisitions. It is an alternative explanation to the adverse announcement effect of cash reserve. This alternative explanation is unlikely to be true however, considering the post-acquisition evidence that high-

excess-cash-reserve bidders on average outperform low-excess-cash-reserve ones (see section 4.3.1 for details).

2.3 Stock Payment, Overvaluation and Announcement Effects of Acquisitions

Martin (1996) studies the motives behind the stock offers. He finds that a firm with higher Q ratio and higher stock price run up prior to announcement is more likely to finance an acquisition with stock. This is consistent with the view that overvaluation motivates stock offers. Other previous studies document that a bidder usually faces unfavourable price reaction at the announcement of a stock-financed acquisition (Travlos, 1987, Franks, Harris and Mayer, 1988, Asquith, Bruner and Mullins, 1987, Wansley, Lane and Yang, 1987, Servaes, 1991, and others). These findings are consistent with the adverse selection theory of corporate finance by Myers and Majluf (1984) and Myers (1984). Their theory predicts that the fact that managers know more about the firm value than investors do leads to a preference ranking of financing sources. The managers work their way up the pecking order in an effort to minimize the cost of adverse selection, first internal cash, then debt and then equity. In the classic Myers and Majluf (1984) framework, stock issuance always sends bad news that the issuing firm is overvalued. Market timing efforts on average are not profitable, because overvaluation is eliminated rapidly at announcement.

Market timing activities however are well documented in recent literature. Baker and Wurgler (2002) are the first that systematically studies market timing behaviour. They find that market timing activities have persistent effect on a firm's capital structure. Graham and Harvey (2001) show that financial managers normally seriously consider market condition when tapping external capital market. Several studies in M&A find that merger waves, especially those of stock financed acquisitions, coincided with high valuation waves (see Dong, Hirshleifer, Richardson and Teoh, 2006, and Rhodes-Kropf, Robinson and Viswanathan, 2005 and others). Further, Loughran and Vijh (1997), Rau and Vermaelen (1998), Agrawal and Jaffe (2000) find that bidders on average under perform their benchmarks in the long-run

after acquisitions.⁶ Combined, these studies suggest that the price correction at deal announcement is incomplete.

Two theories based on misvaluation are proposed to explain why merger waves coincide with valuation waves.⁷ Both speak to why a target would accept the bidder's overvalued stocks as payment, and why the pecking order of financing sources can be violated in acquisitions. Shleifer and Vishny (2003) propose a behavioural model with irrational market and self-dealing target managers who focus only on short term firm values. In their model, market irrationality implies that there is no price correction at the announcement. The fundamental value of a bidder is realized over time, implying bidder long-term underperformance. The other theory is built on a rational framework with two-sided information asymmetry. It is formalized by Rhodes-Kropf and Viswanathan (2004) (see also Brusco, Lopomo, Robinson and Viswanathan, 2007, for the importance of the two-sided information asymmetry). Detailed discussions have been provided in the introduction and section 2.1. For the sake of brevity, these discussions are not repeated here.

3. Data

The initial sample of pure stock offers is retrieved from the SDC M&A database, covering the period of 1980-2004. The acquisitions that have an element of cash in the consideration are excluded, in order to avoid the agency complications of free cash flows. The deals are the major types of acquisitions classified by SDC, i.e. mergers, acquisitions of all assets and acquisitions of majority interests. I also require that both the bidder and the target are listed on NYSE/AMEX/NASDAQ.⁸ The initial sample has 4911 deals.

⁶ Mitchell and Stafford (2000) and Andrade, Mitchell and Stafford (2001) challenge this evidence on the ground that merger observations are not statistically independent. After adjusting for such dependence, they find that a bidder's long-run abnormal return is negative but only marginally significant in the statistical sense.

⁷ There are other theories that explain the coincidence of merger waves and valuation waves. For example, Jovanovic and Rousseau (2002) provide a complete information model of merger waves that are based on technological changes and the Q-theory.

⁸ Chang (1998) finds that bidders on average earn positive announcement returns in stock offers for private targets. Chang (1998) attributes the bidder gain to the monitoring activities by the target shareholders. I do not include the private targets because the monitoring effects potentially complicate the analysis of the market reaction to deal announcements.

I impose several additional filters. Deal size is at least 10 million, and exceeds 1% of the bidder's market value. This reduces the sample size to 4137. I further exclude financial bidders (SIC 6000-6999) and intensively regulated utility bidders (SIC 4900-4999). The sample size reduces to 2490 accordingly. Finally, both the bidder and the target should have valid COMPUSTAT/CRSP data items that are required for analyses, for example, cash reserve (item 1) and total assets (item 6) for the fiscal year ending prior to the announcement, and sufficient daily returns to estimate the announcement effect.

The final sample consists of 1047 deals. There are 616 deals announced during the hot equity market period 1995-2000 (about 59% of the overall sample). In subsequent analyses, the sample size may reduce further subject to the availability of the required data. For example, in model 1 of table 3, the sample size is 774 because there is no data on certain variables.

The descriptive statistics of bidder cash reserve, bidder size and deal value are reported in table 1.

[Table 1]

The median bidder's cash reserve counts for 24.11% of the deal value. This percentage is slightly lower in the hot market period (23.57%). The median deal size in the hot equity market period is more than twice larger than that in the non-hot market period. The annual count of acquisitions is significantly higher in the hot market period, consistent with the prediction by Rhodes-Kropf and Viswanathan (2004) that merger waves coincide with valuation waves.

4. Empirical Results

This section develops hypotheses, proposes tests and reports empirical results. The analyses are organized into three groups. They are respectively discussed in the first three subsections. The fourth subsection discusses some robustness issues.

A key variable used in the analyses is the bidder's Excess Cash Reserve Ratio. It is the difference between raw Cash Reserve Ratio and required Cash Reserve Ratio. The

required Cash Reserve Ratio is estimated using a method developed by Opler et al (1999). According to Opler et al (1999), cash reserve becomes value-relevant when the capital market is imperfect. Motives of transaction, operation and investment imply that there is a required level of cash reserve. A bidder's costless access to cash therefore should be measured relative to the required level of cash reserve. Following Opler et al (1999), I use a pooled time-series cross-sectional OLS regression with year dummies to estimate a firm's required cash reserve. The estimation is performed during 1970-2004. It explains a considerable proportion of the variation in corporate cash reserve (the adjusted R^2 is 0.543). To guard against the possibility that Excess Cash Reserve Ratio primarily reflect the growth opportunities that might be optimally reflected in cash reserve, I also estimate the required Cash Reserve Ratio using industry-year specific regressions for robustness check. The idea is that the constant term would absorb the average cash reserve in an industry-year, which in turn better reflect expected growth. The adjusted R^2 is 0.407 averaged across all industry-years. Using this alternative estimation does not change the results. For the sake of parsimony, I briefly describe the estimation models in Appendix II, and refer those who are interested in more details to the original work of Opler et al (1999).⁹

Throughout this paper, I report the results based on the Excess Cash Reserve Ratio calculated from the pooled regression. The sample has a median (mean) bidder Excess Cash Reserve Ratio of -1.4% (3%). It exhibits a moderate degree of skewness (0.823) in Excess Cash Reserve Ratio. In the regression analyses, I use $\log(1 + \text{Excess Cash Reserve Ratio})$ to mitigate the potential bias introduced by the skewness and outliers. It is also possible that the market infers the likelihood of overvaluation only based on the perception whether a bidder's cash reserve is above or below the required level. I then form a dummy variable which is one if the Excess Cash Reserve Ratio is positive, and zero otherwise. The regression analyses about the probability of being a stock bidder (subsection 4.1) and the bidder's announcement effect (subsection 4.2) are performed using both variables.¹⁰

⁹ The estimation results are available from the author upon request.

¹⁰ A word of caution is necessary here. Neither the raw Cash Reserve Ratio nor the Excess Cash Reserve Ratio is an absolute measure of the costless access to cash. To a large extent, they reflect the ranking of the bidders in terms of their costless access to cash rather than the exact amount of the costless cash available. The reason is that, according to Myers and Majluf (1984), risk-free debt is as good as cash. However, risk-free debt capacity is difficult to measure despite that there are documented regularities between leverage and certain company characteristics. In fact, whether or not the

4.1. Predicting Bidders of Pure Stock Acquisitions

In the first set of analyses, I examine whether there is a relation between a firm's excess cash reserve and the probability of the firm being a stock bidder. If overvaluation motivates stock acquisitions, and a firm's costless access to cash is indicative of the extent to which the firm is overvalued, then a firm with higher excess cash reserve will be more likely to attempt a stock acquisition. It is reasonable to note that the target's effort to remove "lemon" bidders will discourage a high-excess-cash-reserve firm from making a stock offer. To the extent this is the case, it will bias against finding that a high-excess-cash-reserve firm is more likely to attempt a stock acquisition.

In panel A of table 2, I separate the sample of bidders into four groups based on to which Excess Cash Reserve Ratio quartile they belong. The purpose here is to examine whether stock bidders cluster in high excess cash reserve quartiles or not. The quartile break points are calculated each year based on all NYSE firm with valid data.¹¹ There are 516 bidders (49% of the sample) in the highest Excess Cash Reserve Ratio quartile. On average, a bidder in this quartile has an Excess Cash Reserve Ratio of 15%. Moreover, the number of bidders monotonically increases from the second lowest through the highest quartile. The fact that a large proportion of the stock bidders are not actually poor in cash highlights the importance of the two-sided information asymmetry in explaining merger outcomes. It is consistent with the view that, when information asymmetry is two-sided, the target cannot distinguish between a high synergy and a high misvaluation. This is what makes the violation of pecking order possible. There are also 198 bidders (19% of the sample) in the lowest quartile. This group of bidders is of interest because it shows that not all stock bidders are rich in cash. It is consistent with the view that only some firms have costless access to cash.

While the univariate result above is suggestive, there are limitations. The probability of a stock offer may be influenced by factors not reflected in the excess

companies have a target debt ratio is still under debate among the scholars studying capital structure (see Chang and Dasgupta, 2008 and Welch, 2004 among others).

¹¹ Using NYSE quartiles help further guard against the possibility that excess cash reserve might reflect growth. It is because including NASDAQ firms will impropotionally increase the number of growth firms, when calculating the break points. Nevertheless, using quartiles of all COMPUSTAT/CRSP firms does not alter the result.

cash reserve. Stock price performance, firm size, merger waves, etc all might distort the univariate findings. I then control for these factors in a multivariate setting. For this purpose, I estimate probit models to find out whether excess cash reserve predicts which firm becomes bidder in a given year, controlling for other effects. This specification follows Comment and Schwert (1995) and Harford (1999). Their specification draws on much of the M&A literature, and is fairly comprehensive. I therefore apply it here with only minor modification. In particular, I use $\log(1 + \text{Excess Cash Reserve Ratio})$ or the Positive Excess Cash Dummy as the primary independent variable. Before estimation, the sample of stock offer bidders is merged with all COMPUSTAT/CRSP firms during 1980-2004. The dependent variable is one if a firm announces a stock offer in a given year (year 0). The specification is as follows:

$$Bidder_{i,t} = \alpha + \beta Excash_{i,t-1} + \gamma Controls_{i,t-4:t-1} + \delta YDUM_{i,t} + \varepsilon_{i,t} \quad (1)$$

where i and t index firm and year respectively; *Excash* is either $\log(1 + \text{Excess Cash Reserve Ratio})$ or the positive Excess Cash Dummy measured at the end of year $t-1$; *YDUM* is the vector of year dummy variables from 1980 to 2004. The vector of control variables includes the daily market-model-adjusted abnormal return averaged over year $t-4$ through $t-1$. The estimation period for the market model is one year before the day on which the abnormal return is calculated. Several firm characteristics are also included: noncash working capital normalized by total assets, leverage, sales growth, market-to-book ratio of equity, price-earning ratio and size. Except for size (measured at the end of year -1), all of the control variables are averaged over years from $t-4$ to $t-1$. Detailed definition of the variables can be found in the description of table 2.

Panel B of table 2 reports the results of the probit estimations. Data requirements leave 42,144 firm-years, with 498 pure stock offers. Model 1 shows that a high-excess-cash-reserve firm is more likely to attempt an acquisition solely financed by stock. The coefficient on $\log(1 + \text{Excess Cash Reserve Ratio})$ is 0.275, suggesting that a one standard deviation increase in the current-year Excess Cash Reserve Ratio of an average firm increases the probability of a pure stock offer next year by 1.45% (see Greene 2000, p812-816 for the calculation of marginal effects). In model 2, I replace

the logarithm with the Positive Excess Cash Dummy. The coefficient on the Positive Excess Cash Dummy is 0.124, suggesting that for an average firm, the probability that it attempts a pure stock offer next year is increased by 4.94% if its current excess cash reserve changes from negative to positive.

In models 3 and 4, I repeat the estimations in models 1 and 2 respectively, but exclude SEO firm-years from the sample. If overvaluation motivates both SEOs and stock acquisitions, including SEO firm-years as non-acquisition observations will weaken the effect of excess cash reserve on the probability of being a stock bidder. Consistent with this conjecture, the coefficients on $\log(1+\text{Excess Cash Reserve Ratio})$ and the Positive Excess Cash Dummy increase to 0.322 and 0.144 respectively. The increases however are not statistically significant according to Wald test.

[Table 2]

4.2. Regression Analyses Estimating the Announcement Wealth Effect of Excess Cash Reserve

The second set of tests focuses on a bidders' announcement effects. It forms the main body of analyses in the current paper. I use regressions to estimate the wealth effect of a bidder's excess cash reserve. The Excess Cash Reserve Ratio and the Positive Excess Cash Dummy are used in the regressions to measure the extent to which a bidder has costless access to cash. Previous literature suggests that there are a number of other factors besides excess cash reserve that potentially affect a bidder's announcement returns. I control for them in the regressions. For the sake of focus here, I describe the control variables in Appendix I, together with the motivations to include them.

The first objective of this subsection is to confirm that a high-excess-cash-reserve bidder has a worse announcement effect relative to that of a low-excess-cash-reserve bidder, as is predicted by the adverse selection effect of cash reserve. The baseline regression is as follows:

$$\begin{aligned} \text{Bidder } CAR_i = & \alpha_i + \\ & \beta \text{Excash}_i + \gamma \text{Controls}_i + \delta \text{YDUM}_i + \lambda \text{INDDUM}_i + \varepsilon_i \end{aligned} \quad (2)$$

where i indexes firm; *Excash* is either $\log(1 + \text{Excess Cash Reserve Ratio})$ or the Positive Excess Cash Dummy measured prior to the deal announcement; YDUM and INDDUM are respectively vectors of year and industry dummy variables. The adverse selection effect of cash reserve predicts that β is significantly negative. It is useful to note that the regression is estimated with a constant term α_i . Therefore, the effect of excess cash reserve on CAR captured by β is on top of the effect of the mere stock offer announcement. Market model is used to estimate the CAR. The parameters are estimated over a 250-day window ending 20 days before the announcement. We require at least 40 daily returns available in the estimation period. The CARs are measured from 2 days before to 2 days after the announcement.¹² Untabulated results show that the sample median CAR is -0.029. When I separate the bidders into two equal-sized groups based on the sample median of bidder Excess Cash Reserve Ratios, the high-excess-cash-reserve group has a median CAR of -0.041 which is significantly lower (at 1% significance) than -0.023, the median of the low-excess-cash-reserve group. This evidence suggests that a stock bidder with more costless access to cash has lower announcement returns.

To correct the sample selection bias, I use a variant of the truncated regression specification formalized by Eckbo, Maksimovic and Williams (1990).¹³ Specifically, value-maximizing managers announce event E if the gain on the equity market, $y_i = x_i\gamma + \eta_i$ is positive. η_i is private information, normally distributed with mean zero and variance ω^2 . x_i is a vector of publicly known variables. Eckbo et al. (1990) develop two models for the announcement effect. In the first model, the event completely surprises the market. The bidder's announcement effect is

$$F(x_i) = (1 - p)E(y_i | y_i = x_i\gamma + \eta_i > 0) = (1 - p)[x_i\gamma + \omega \frac{n(x_i\gamma / \omega)}{N(x_i\gamma / \omega)}] \quad (3)$$

where p is the probability of completion. Lower n and capital N are respectively the standard normal density and distribution functions. In the second model, the market learns about the forthcoming announcement on a rumour date prior to the announcement. The probability the deal is eventually announced is

¹² A five day window is chosen because SDC sometimes record the announcement date with a 1-day inaccuracy. For robustness, I also measure the CAR over a three day window from one day before to one day after the announcement. The results generally persist.

¹³ The Eckbo, Maksimovic and Williams (1990) method is used in several event studies. For examples, see Maksimovic and Unal (1993), Servaes (1994) Hubbard and Palia (1995) and others.

$\Pr(x_i\gamma + \eta_i > 0) = N(x_i\gamma / \omega)$. If the acquisition does not occur, the price effect is assumed to be zero. Thus the effect on the rumour date is $F(x_i)N(x_i\gamma_i / \omega)$. On the announcement date, the probability of an acquisition is updated to 1. The announcement effect is then

$$F(x_i) = (1 - p)[x_i\gamma + \omega \frac{n(x_i\gamma / \omega)}{N(x_i\gamma / \omega)}][1 - N(x_i\gamma / \omega)] \quad (4)$$

It is typical that the market anticipates an acquisition prior to the announcement. I therefore use the second model in Eckbo et al. (1990) for estimation.¹⁴

The second objective of the announcement effect analyses is to further confirm that the negative wealth effect of excess cash reserve is due to adverse selection. To do this, I perform two tests. First, if aggregate information asymmetry on the equity market is time varying, the negative wealth effect of cash reserve should be more severe in a hot equity market period when the degree of information asymmetry is high. I then partition the sample into two groups. One group contains the deals announced in the hot equity market period (1995-2000), and the other contains those announced in the non-hot equity market period. I estimate equation (2) on these two subsamples separately. If the negative wealth effect of excess cash reserve is due to adverse selection, then β should be more negative in the hot equity market period than in the non-hot period. Second, at the firm level, when investors are less certain about a bidder's stand-alone value, they are more inclined to use additional information to infer the bidder's value. The negative announcement effect of excess cash reserve then should be stronger. In the spirit of Harris and Raviv (1991) and Leary and Roberts (2005), I use tangible assets relative to total assets net of cash as a measure of the degree of information asymmetry between the bidding firm managers and the investors.^{15,16} A dummy variable *HighT*, is then constructed to indicate a

¹⁴ In the context of pure stock offers, the bidders in fact experience two stages of selection: the decision to bid and the decision to pay using only stock. While the Heckman (1979) model is widely used in addressing the self-selection issues, it is awkward in properly incorporating the first stage of selection because the correct population is difficult to identify. The Eckbo, Maksimovic and Williams (1990) method thus provide a superior solution in my case.

¹⁵ Several other variables have been used in the literature to measure the information asymmetry between firm insiders and the market, for example size, trading volume, idiosyncratic return volatility, analyst forecast errors, and analyst coverage. However, size and trading volume are obviously noisy, reflecting various firm and market attributes in addition to information asymmetry. Dasgupta, Gan and Gao (2006) show that the relation between the idiosyncratic return volatility and firm transparency can be ambiguous. Analyst forecast errors and analyst coverage to a large extent are subject to the influence of important corporate events such as acquisitions.

bidder in the highest relative-tangible-assets quartile. *HighT* is interacted with the bidder's excess cash reserve in the regressions. The specification is as follows:

$$\begin{aligned} \text{Bidder } CAR_i = & \alpha_i + \beta \text{Excash}_i + \\ & \beta_1 \text{Excash}_i * \text{HighT}_i + \gamma \text{Controls}_i + \delta \text{YDUM}_i + \lambda \text{INDDUM}_i + \varepsilon_i \end{aligned} \quad (5)$$

If the adverse selection effect of cash reserve is true, β_1 should be significantly positive.

The results based on equation (2) and (5) are respectively reported in tables 3 and 4. Table 3 confirms the presence of a negative wealth effect of a bidder's excess cash reserve. In model 1, the coefficient on $\log(1 + \text{Excess Cash Reserve Ratio})$ is -0.585, suggesting that a one percent increase in the Excess Cash Reserve Ratio leads to a 56.5 basis points decrease in an average bidder's announcement CAR. This translates into a downward adjustment around 22 million in an average bidder's market value. Model 2 shows that a bidder with negative excess cash reserves, on average, has an abnormal announcement return that is 19.7 percentage points higher than that of a bidder with positive excess cash reserve. Earlier in section 4.1, we find that investors expect that a high-excess-cash-reserve bidder is more likely to make a stock acquisition. A bidder's market price then may start to correct even before the announcement. Such anticipation however should bias against finding more negative announcement effect for a high-excess-cash-reserve bidder. Moreover, the Eckbo et al (1990) specification (equation 4) has to some extent taken into consideration the anticipation effects. In addition to the primary effect of excess cash reserve, I also find that a bidder's announcement effect varies with a number of control variables. Size has a significantly negative effect on a bidder's CAR, consistent with Moeller, Schlingemann and Stulz (2004) who find that the announcement returns are higher for smaller bidders. Market-to-book negatively affects a bidder's CAR, consistent with Martin (1996) and others. A friendly acquisition has a significantly negative announcement effect for a bidder. It could be because that when the tone of a

¹⁶ Tangible assets are defined as the sum of receivables, inventory and capital investments. Berger, Ofek and Swary (1996) find that a dollar's worth of book value produces, on average, 72 cents in exit value for total receivables, 55 cents for inventory and 54 cents for fixed assets. Since the bidders are valued as going concerns, I do not convert the tangible assets to the liquidation value estimated in Berger et al. (1996).

negotiation is friendly, a bidder is more likely to use overvalued equity, as it suspects that the target managers are more willing to accept the offer.

Models 3 and 4 (5 and 6) replicate models 1 and 2 respectively, using the deals announced in the hot (non-hot) equity market period. The coefficients on $\log(1+\text{Excess Cash Reserve Ratio})$ and on the Positive Excess Cash Dummy are both significantly negative in the hot equity market, but are insignificant in the non-hot equity market. Wald test (not tabulated) further shows that both coefficients estimated in the hot equity market period are significantly larger in absolute value than those estimated in the non-hot equity market period. These results confirm that the negative wealth effect of excess cash reserve is primarily driven by the deals announced in the hot equity market period.

[Table 3]

Table 4 examines whether the negative wealth effect of excess cash reserve is weaker if there is less uncertainty about a bidder's assets in place. In both model 1 and 2, the coefficients on the interaction terms with the high-tangibility-bidder dummy are positive and statistically significant at 1%. In model 1 (model 2), the positive coefficient on the interaction term is larger in absolute value than the negative coefficient on $\log(1+\text{Excess Cash Reserve Ratio})$ (the Positive Excess Cash Dummy). But the differences are not statistically significant according to Wald test. Taken together, the results reported in table 3 and 4 confirm that the negative wealth effect of excess cash reserve is more pronounced when information asymmetry is more severe, consistent with the adverse selection effect of corporate cash reserve.

[Table 4]

4.3. Post-acquisition Bidder Operational Cash Flow Performance and Use of Funds

The previous set of tests examines the announcement wealth effect of a bidder's excess cash reserve. In the third set of tests, I study the bidders in more details by examining their post-acquisition operational cash flow performance and their use of funds.

4.3.1. A Bidder's Post-acquisition Operational Cash Flow Performance

A bidder's post-acquisition operational performance is of interest because in the long-run, synergies will manifest themselves through the changes in operational performance. In Rhodes-Kropf and Viswanathan (2004), a bidder's gains come from two primary sources: synergies and market timing gain. The adverse selection effect of cash reserve will reduce a high-excess-cash-reserve bidder's market timing gain, because price correction is more complete there. Higher synergies therefore are necessary to motivate the bidder to participate. Meanwhile, target managers also need to see higher expected synergies before acceptance if they believe the bidder is more likely to be overvalued. I therefore expect a bidder with higher excess cash reserve to have better operational cash flow performance in the post-acquisition years, relative to the low-excess-cash-reserve ones.

I measure a bidder's operational cash flow performance by its operating cash flow normalized by its total value of assets. Barber and Lyon (1996) show that when designing tests to study operational performance, it is important to control for abnormal firm characteristics. Such adjustments will remove the effects of firm characteristics on post-event abnormal operational performances, and allow us to attribute the post-acquisition abnormal operational performance (if any) to the event itself. Accordingly, in each year, I adjust a firm's performance by subtracting the median performance of the firms that belong to the same Excess Cash Reserve Ratio decile in the same 2-digit SIC industry.¹⁷ Only completed deals are analyzed. Prior to the announcement, the target performance and bidder performance are combined into one figure, weighted by their relative market values. After the completion, the combined firm's performance is used. Average annual operational cash flow performance is then calculated over 3 years both before the announcement and after the completion of an acquisition.¹⁸ The completion year is excluded when calculating the average performance because the numbers in that year is not comparable to those in other years, due to different accounting arrangements during the acquisition.

The regression specification follows Healy, Palepu and Ruback (1992) and Harford (1999):

¹⁷ Such adjustment is in a similar spirit of that in Harford (1999).

¹⁸ I also perform robustness tests based on 4-year and 5-year averages. The results are similar.

$$PostAcquisition \ Adj. \ OCFP_i = b_0 + b_1 PreAcquisition \ Adj. \ OCFP_i + \varepsilon_i \quad (6)$$

where i indexes deals; OCPF stands for operational cash flow performance; b_1 captures the continuation of pre-acquisition performance in the post-acquisition years; b_0 captures any improvement or deterioration in the performance after acquisition.

Table 5 presents the regression results for post-acquisition operational cash flow performance. The regression result based on all bidders (model 1) shows that the abnormal performance attributable to acquisition is significantly positive at 2% per year. The positive abnormal performance is consistent with Healy et al (1992) who find that the merged firms in the largest US mergers significantly improve their operational performance after the transactions. I further separate the completed deals into two equal-sized groups based on the bidders' Excess Cash Reserve Ratio: a high-excess-cash-reserve group and a low-excess-cash-reserve group. The regressions are then estimated separately on each group. The results show that low-excess-cash-reserve bidders on average do not have statistically significant abnormal operational performance. In contrast, high-excess-cash-reserve bidders on average have a significantly positive abnormal operational cash flow performance of 3% per year. The magnitude of a high-excess-cash-reserve bidder's abnormal performance is about 4 times of that of an average low-excess-cash-reserve bidder's. Together, these results show that high-excess-cash-reserve bidders out perform low-excess-cash-reserve bidders in terms of long-run operational performance in the post-acquisition years. These results are consistent with the view that a high-excess-cash-reserve bidder benefits more from deal synergies than a low-excess-cash-reserve bidder, supportive of the adverse selection effect of cash reserve. The results regarding operational cash performance also help to rule out a possible alternative explanation to the negative wealth effect of excess cash reserve. In particular, as is discussed in section 2.2., the managerial discretionary hypothesis argues that the bidding-firm managers exhibit cash-reserving behavior when choosing the means of payment, which may signal the existence of agency cost that is worse than what the market has expected. The managerial discretionary hypothesis predicts that a high-excess-cash-reserve bidder should have deteriorating operational performance after the acquisition, because its

managers will keep investing in projects with lower and lower NPVs. The results reported here contradict such prediction.

4.3.2. A Bidder's Use of Funds after the Acquisition

One purpose of the analyses in this subsection is to help address the concern that the Opler et al (1999) method does not effectively purge the estimated excess cash reserve of the growth opportunities that might be optimally reflected in raw cash reserve. A sanity check is especially necessary here because if higher excess cash reserve reflects better growth opportunities, a high-excess-cash-reserve bidder will also have superior operational performance after the acquisition. Apart from this, knowledge about how a bidder's post-acquisition use of funds relates to its pre-acquisition excess cash reserve is of interest by itself.

To examine how a bidder's pre-acquisition excess cash reserve affects its post-acquisition use of funds, I follow the method used by Hertz and Li (2007) and Kim and Weisbach (2006). This method tracks seven accounting variables that reflect the use of funds. If high excess cash reserve indicates high growth opportunities, a high-excess-cash-reserve bidder should invest more aggressively after an acquisition than a low-excess-cash-reserve bidder does. Specifically, in the post-acquisition years, I calculate the changes in a bidder's cash reserve, reduction of long-term debt, inventory, capital expenditure, R&D, acquisition and total assets (COMPUSTAT data items 1, 114, 3, 128, 46, 129 and 6 respectively). To control for firm size, all accounting variables are normalized by the book value of assets measured at the end of the fiscal year prior to the acquisition. More specifically, for the income statement and cash flow statement items (i.e. reduction of long-term debt, capital expenditure, R&D and acquisition), I calculate the accumulation in each item since the first year after the acquisition, normalized by book value of assets prior to the acquisition:

$\sum_{\tau=1}^t V_{\tau} / Asset_0$, for $t = 1$ to 4, where V is the accounting variable in question. $t = 0$ is the fiscal year prior to the acquisition and $t = 1$ to 4 are the first to the fourth fiscal year after the deal completion/withdrawal. For the balance sheet variables (i.e. cash, inventory and total assets), I calculate the cumulative change in each variable since the first year after completion/withdrawal of the deals: $(V_t - V_0) / Asset_0$, at $t = 1$ to 4. For $t = 1$ to 4, all the figures are of the combined firm when the deal is completed. For

a withdrawn deal, the bidder's figure is used instead.¹⁹ At T=0, total assets, cash and inventory are the combined figures of the bidder and the target, when a deal is completed; if a deal is withdrawn, the bidder's figure is used.

I perform a set of regressions analyses to estimate the effect of a bidder's pre-acquisition excess cash reserve on the post-acquisition changes in its accounting items, controlling for other effects. A bidder's use of funds to a considerable extent relies on how much funds it generates after the acquisition. I then control for the bidder's total funds generated after the acquisition. I also control for the bidder's pre-acquisition Cash Reserve Ratio, because raw cash reserve might reflect a firm's future investment opportunities. Relative deal value, bidder size, year dummies and industry dummies are also included in the regressions. Specifically:

$$\begin{aligned}
Y_t = & \\
& \beta_1 \log(1 + \text{Excess Cash Reserve Ratio}_0) + \beta_2 \log(\text{Cash Reserve Ratio}_0) \\
& + \beta_3 \log(1 + \text{Total Fund}_t / \text{Total Asset}_0) + \beta_4 \text{Relative Deal Value} + \beta_5 \text{Size}_0 \quad (7) \\
& + \sum_{i=1980}^{2002} \theta_i \text{YrDummy}_i + \sum_{j=1}^{11} \lambda_j \text{IndustryDummy}_j + \varepsilon_t
\end{aligned}$$

where $Y = \log[(\sum_{\tau=1}^t V_\tau / \text{Asset}_0) + 1]$ for $V =$ reduction of long-term debt, capital expenditure, R&D and acquisition, and $Y = \log[(V_t - V_0) / \text{Asset}_0] + 1$ for $V =$ cash, inventory and total assets, for $t = 1$ to 4. Relative Deal Value is the deal value normalized by bidder market value of assets. Size is the logarithm of bidder book value of assets in millions of dollars. *Total Fund_t* includes all the funds generated (or raised) from operations, investments and external fund raising activities. It is calculated as $\sum_{\tau=1}^t (\text{total sources of funds}_\tau)$, for $t = 1$ to 4.²⁰ Industry dummies are constructed based on the Fama-French twelve industries. In each time horizon (i.e. $t = 1$ to 4), a cross-sectional regression is estimated for each of the seven accounting variables. Firm subscripts are omitted from equation (7) for the sake of parsimony.

¹⁹ Using only the completed deals does not alter the results.

²⁰ Total sources of funds is the sum of funds from operations (item 110), sales of property, plant and equipment (item 107), sale of common and preferred stock (item 108), long-term debt issuances (item 111) and other sources of funds (item 218).

Table 6 reports the regression results based on equation (7). I find that, contrary to the view that excess cash reserve reflects growth, post-acquisition investments are generally unrelated to pre-acquisition excess cash reserve. The coefficients on $\log(1+\text{Excess Cash Reserve Ratio})$ are generally insignificant in the regressions of inventory, capital expenditure, R&D and acquisitions. Moreover, the funds used on long-term debt reduction is positively related to a bidder's pre-acquisition excess cash reserve, consistent with the idea that overvalued firms tend to reduce debt after stock offers (see Stein, 1996, Hertz and Li, 2007 and Kim and Wesbach, 2006). Combined, these results strengthen the conclusion that a stock bidder's higher excess cash reserve signals greater overvaluation.

4.4. Robustness

A possible concern is that high excess cash reserve might primarily reflect high growth opportunities, not overvaluation. This concern relates to the precautionary motive of cash reserve (discussed in subsection 2.2) that a high-growth firm hoards cash in order to mitigate the underinvestment problem. I take three measures to guard against this possibility. The first measure is taken when estimating a bidder's required level of cash reserve. In particular, market-to-book ratio is included as a regressor in equation (8) to help rule out growth from the excess cash reserve. It can also be argued however that cash reserve reflects managers' (insiders') expectation of future growth. Market-to-book is therefore not sufficient to purge the Excess Cash Reserve Ratio of growth opportunities. I then estimate equation (8) in each year by industry. The constant term in a regression would absorb the average cash holdings in an industry-year, which in turn better reflect expected growth. No results qualitatively change under this alternative estimation. Second, evidence reported in subsection 4.2 show that excess cash reserve has a negative announcement effect. This contradicts the view that excess cash reserve primarily reflects growth opportunities. If excess cash reserve primarily conveys the news that a firm has more growth opportunities than what the market initially expected, we should document a positive announcement effect of excess cash reserve. Third, the evidence in 4.3.2 shows that a high-excess-cash-reserve bidder does not invest more aggressively in the post-acquisition years. This further rules out the possibility that excess cash reserve primarily reflects growth instead of overvaluation.

Another possible concern is that bidding-firm managers use stock as the medium of exchange because they want to reserve cash. The cash-reserving behaviour of the bidding-firm managers may indicate the existence of agency cost that is worse than what the market has expected. This concern in a way reflects the managerial discretion motive of cash reserve (discussed in subsection 2.2). The managerial discretion motive predicts that a high-excess-cash-reserve bidder will invest more aggressively than a low-excess-cash-reserve bidder after an acquisition, and will have relatively worse operational performance. However the result that excess cash reserve is positively related to post-acquisition bidder operational performance but is unrelated to post-acquisition bidder investments (subsection 4.3) does not support this prediction.

5. Conclusion

Cash reserve represents a vital proportion of a company's assets. It provides liquidity, but at the same time brings costs. This paper examines the adverse selection effect of corporate cash reserve. It reflects an aspect of the underlying adverse selection mechanism of the recent theory by Rhodes-Kropf and Viswanathan (2004). The central argument is that if a bidder does not have to issue to invest, a decision to do so send a strong pessimistic signal of overvaluation. Overall, the results reported in this paper are supportive of this argument.

This paper relates to several strands of literature. First, it builds on, and provides useful evidence to the theoretical analyses by Rhodes-Kropf and Viswanathan (2004). It is also reminiscent of the pioneering work by Myers and Majluf (1984). Further, it bolsters a recent view that it is important to emphasize the two-sided nature of information asymmetry in order to describe merger outcomes without resorting to hubris, private benefits or other agency costs (see Brusco, Lopomo, Robinson and Viswanathan, 2007). Second, it emphasizes a unique aspect of the informational costs of cash: excess cash reserve introduces a cost of adverse selection. This is because if investors know that a firm does not have to issue to invest, an attempt to do so sends a strong pessimistic signal of overvaluation. Third, this paper adds to an extensive literature that studies the announcement effect of corporate takeovers in relation to the means of payment. It suggests that it is important for managers to be aware of possible market reactions when considering equity financing. In such cases, cash

reserve can considerably influence market opinion. Finally, it adds to our understanding of the previously documented negative announcement effect of cash reserve in corporate takeovers. While most previous studies attribute such negative effect to the agency cost of free cash flows, this paper suggests that adverse selection may as well contribute to it.

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Appendix I: Definitions of the Control Variables Used in the Regression Analyses of Announcement Effect

In this appendix, I define the control variables used in equation (2) and (5), and discuss related literature.

a) Size of the bidder: Moeller, Schlingemann and Stulz (2004) find that a small bidder's announcement return is about two percent higher than that of a large bidder's. I then use the logarithm of a bidder's book assets to control for the size effect.

b) Bidder market-to-book ratio: Brainard and Tobin (1977) posit a Q theory of corporate investment. According to the Q hypothesis, high market value indicates that a firm is well managed or has good business opportunities. Takeover can be used to remove wasteful behaviour of the target firm or to take advantage of better bidder investment opportunities. Thus, a higher Q will lead to higher bidder announcement return. On the other hand, the overvaluation theory posits that a bidder tend to use overvalued equity to finance the acquisitions. If Q is a proxy for the extent to which a bidder is overvalued, higher market-to-book ratio will lead to lower bidder announcement returns. I then use the bidder's market-to-book ratio of assets to control for the potential effect of the Q ratio on the bidder's announcement results.

c) Over payment to target: A bidder usually offers a considerable premium to the target shareholders. If a bidder overpays, the overpayment will have downward pressure on its share price. I then form a variable 'over pay' to control for this potential complication. Specifically, I first calculate the product of the target's CAR, the target market capitalization and the percentage of target stake sought by the bidder. I then divide this product by the bidder's market value of equity. This variable measures the target shareholder's gain relative to the bidder's size. I use it as a proxy for overpayment. Further, this variable captures the effect of tax consideration on the choice of means of payment.

d) Bidder profitability: Morck, Shleifer and Vishny (1990) find that a bidder with poor past performance has lower announcement returns. In addition, the performance extrapolation theory posits that it is likely that the good performances of a well

managed bidder are carried through to the target. I then use the return on assets (ROA) to control for the bidder performance prior to the announcement.

e) Bidder free cash flow: Schlingemann (2004), following Lehn and Poulson (1989), uses a flow variable based on the cash flow statement to measure the extent to which a bidder is subject to the agency cost of free cash flow. It is calculated as the wedge between operating income before depreciation and the demands for cash from interest expense, income taxes and dividends in the same year. I estimate the regressions with and without this control variable. The results are insensitive to this variation. I report the regressions with this variable.

f) Deal value: Keeping bidder size and other factors constant, a bidder's wealth effect is a function of deal size. I then include deal value relative to bidder market value of assets as a control variable.

g) Cash-rich and cash-poor combination: Myers and Majluf (1984) suggest a specific type of synergy that can be achieved through merger and acquisitions. A firm with low cash reserve might be subject to the underinvestment problem due to adverse selection. With sufficient cash, such underinvestment cost is mitigated because the firm do not have to rely on the external capital markets to invest. One way to overcome this type of underinvestment problem is to combine a cash-rich firm that does not have good investments with a cash-poor one that has good projects. Smith and Kim (1994) find supporting evidence to this argument. To control for the effect of this type of synergy, I classify the bidders and targets respectively into a cash-rich group and a cash-poor group using their respective sample median Cash Reserve Ratio. I then form a dummy variable that is 1 if either the bidder or the target belongs to their cash-rich group but not both. The dummy variable is set to zero otherwise.

i) High-Low Q combination. Lang, Stulz and Walkling (1989) find that a bidder's announcement CAR is highest when a low Q target is acquired by a high Q bidder. They interpret their finding as being consistent with the view that the advantages of a well managed bidder extrapolates to a poorly managed target, consist with the Q theory of corporate investments. To control for the effect of this type of synergy, I classify the bidders and targets respectively into a high Q group and a low Q group

based on their respective sample median Q ratio. I then form a dummy variable that is 1 if either the bidder or the target belongs to the high Q group but not both. The dummy variable is set to zero otherwise.

j) Deal attitude: Previous literature finds that a bidder's announcement returns are higher in friendly acquisition than in hostile ones. Hostility of target managers potentially prolongs the process and increases the cost of acquisition. In an acquisition motivated by overvaluation however, it is possible that when the tone of a negotiation is friendly, a bidder is more likely to use overvalued equity because it suspects that the target managers are more willing to accept the offer. In order to control for the effect of deal attitude, I include in the regressions a dummy variable that is 1 for a friendly acquisition and 0 otherwise.

k) Tender offer: Agrawal and Jaffe (2000) survey the evidences on the bidder post-merger performance. They conclude that the post merger performance would have been worse if tender offers are excluded from the analysis. It is necessary to control for the tender offer effect because it suggests higher subsequent firm performance relative to the negotiated acquisitions. I then form a dummy variable that is 1 for a tender offer, and 0 otherwise.

l) Diversification: Morck, Shleifer and Vishny (1990) find that a bidder's announcement CAR is lower when the offer is made to a target in a different industry, because managerial objectives may drive the bidder's decision to diversify. I then form a dummy variable to control for this potential complication. The variable is 1 if the target is from a different 2-digit SIC industry, and 0 otherwise.

Appendix II: Estimating the Required Level of Cash Reserve

I estimate a firm's required level of cash reserve following Opler, Pinkowitz, Stulz and Williamson (1999). A firm's required Cash Reserve Ratio is estimated using a time-series cross-sectional OLS regression with year dummies (model 2 in table 4 of Opler et al 1999, P25).²¹ The sample used for estimation includes all COMPUSTAT/CRSP firm-years during 1970-2004 that have valid data. The model is described using the following equation:

$$\begin{aligned} \text{Cash Reserve Ratio}_{it} = & \beta_1 \text{MTB}_{it} + \beta_2 \text{SIZE}_{it} + \beta_3 \text{CFAST}_{it} + \beta_4 \text{NWCAST}_{it} \\ & + \beta_5 \text{CAPEXAST}_{it} + \beta_6 \text{LEV}_{it} + \beta_7 \text{INDSIGMA}_{it} + \beta_8 \text{R \& D}_{it} + \beta_9 \text{DIVDUM}_{it} \\ & + \beta_{10} \text{REGDUM}_{it} + \gamma \text{YDUM}_t + \varepsilon_{it} \end{aligned} \quad (8)$$

where *i* and *t* index firm and year respectively. MTB is market-to-book ratio of assets. Size is the logarithm of sales in millions of 1994 dollars. CFAST is net income before depreciation and amortization normalized by book value of assets. NWCAST is net working capital over book value of assets. CAPEXAST is capital expenditure over book value of assets. LEV is total debt over book value of assets. INDSIGMA is the mean of standard deviations of cash flow over assets measured over 20 years, for firms in the same 2-digit SIC code industry. R&D is the expenditure on research and development normalized by net sales. DIVDUM is a dummy variable set to 1 if a firm pays dividends in a year, and 0 otherwise. REGDUM is a dummy variable set to 1 if a firm is in a regulated industry in a year and 0 otherwise. YDUM are year dummies.

To better rule out the possibility that Excess Cash Reserve Ratio picks up the growth opportunities that might be optimally reflected in the raw cash reserve, I also estimate equation (8) in each year by industry as a robustness check. The idea is that the constant term would absorb the average cash reserve in an industry-year, which in turn better reflect expected growth. The empirical results do not change qualitatively using this alternative estimation. Throughout this paper, I report the results based on the Excess Cash Reserve Ratio calculated based on the pooled regression.

²¹ Cash Reserve Ratio is defined in the introduction as the cash and marketable securities over total assets. For robustness, I also use sales as the denominator for Cash Reserve Ratio. The results generally hold.

Table 1: Descriptive Statistics of Bidder Cash Reserve, Bidder Size and Deal Value

This table reports the descriptive statistics of bidder cash reserve, bidder size and deal value during the overall sample period, and the periods of hot and non-hot equity market. Bidder cash reserve is cash plus marketable securities (compustat item 1). Size is measured by book value of total assets. All bidder variables are measured at the end of the fiscal year prior to announcement. Sample medians are reported.

	Overall(1047) (1980-2004)	Hot Equity Market(616) (1995-2000)	Non-hot Equity market(431) (1980-1994 and 2001-2004)
Bidder Cash Reserve(Mil.)	57.714	63.137	52.855
(% of Bidder Assets)	14.28%	14.00%	14.28%
(% of Deal Value)	24.11%	20.42%	30.37%
Bidder Assets(Mil.)	496.726	578.18	420.18
Deal Value(Mil.)	194.809	287.89	127.6
(% of Bidder Assets)	48.02%	55.90%	40.47%

Table 2: Predicting Bidders of Pure Stock Acquisitions

This table reports the results of univariate analyses (panel A) and probit regression analyses (panel B) regarding whether excess cash reserve predicts which firms will be bidders in a given year (year 0). Excess Cash Reserve Ratio is calculated at the end of the previous year (year -1). It is raw Cash Reserve Ratio in excess of the required level estimated using a pooled time-series cross-sectional OLS regression with year dummies, following Opler et al (1999) (Appendix II provides a brief description). Positive Excess Cash Dummy is 1 if Excess Cash Reserve Ratio is positive, 0 otherwise. In Panel A, the sample bidders are allocated into Excess Cash Reserve Ratio quartiles of all NYSE firms in each year. For each quartile, the number and percentage of the bidders and the median Excess Cash Reserve Ratio are reported. In panel B, I use probit models to predict which firms will be the bidders of pure stock offers in year 0. The dependent variable is 1 if a firm makes a pure stock offer in year 0, 0 otherwise. Size is the logarithm of a bidder's book assets in millions of dollars measured in year -1. Log(market-to-book) is the logarithm of a bidder's market-to-book assets averaged over years -4 through -1. Sales growth is the average sales growth over years -4 through -1. Noncash working capital is the net working capital (current assets - current liabilities) minus cash and cash equivalents, normalized by total assets and averaged over years -4 through -1. Leverage is the long-term debt normalized by book value of total assets, averaged over years -4 to -1. Price-to-earning is stock price divided by earning per share, averaged over years -4 to -1. Average abnormal return is daily market-model-adjusted return averaged over years -4 through -1. The results of four probits are reported. The first and second are estimated on all firm years during 1980-2004. The third and fourth are estimated on a sample of firm-years where SEO firm-years are excluded. *p*-values are in parentheses. *, ** and *** indicate significance of 10%, 5% and 1% respectively.

Panel A: Number of Bidders in Each NYSE Excess Cash Reserve Ratio Quartile					
	Overall	Q4 High	Q3	Q2	Q1 Low
Number of Bidders	1047	516	194	139	198
Percentage of Bidders (%)	100	49	19	13	19
Excess Cash Reserve Ratio	-0.014	0.150	-0.044	-0.081	-0.141
Panel B: Predicting Bidders Using Probit Regressions (bidder = 1)					
	All Firm Years		Excluding SEO Firm Years		
	(1)	(2)	(3)	(4)	
log (1+Excess Cash Reserve Ratio)	0.275** (0.011)		0.322** (0.010)		
Positive Excess Cash Dummy		0.124*** (0.000)		0.144*** (0.000)	
Size	0.162*** (0.000)	0.163*** (0.000)	0.159*** (0.000)	0.161*** (0.000)	
log(market-to-book)	0.164*** (0.000)	0.160*** (0.000)	0.149*** (0.000)	0.145*** (0.000)	
Sales growth	0.000 (0.306)	0.000 (0.259)	0.000 (0.291)	0.000 (0.240)	
Noncash working capital	-0.147 (0.144)	-0.139 (0.161)	-0.199* (0.058)	-0.192* (0.073)	
Leverage	-0.349*** (0.010)	-0.314** (0.026)	-0.337*** (0.008)	-0.297** (0.027)	
Price-to-earning	0.000 (0.107)	0.000 (0.103)	0.000 (0.292)	0.000 (0.282)	
Average abnormal return	0.094 (0.644)	0.089 (0.662)	0.017 (0.941)	0.013 (0.956)	
Constant	-4.138*** (0.000)	-4.176*** (0.000)	-4.090*** (0.000)	-4.176*** (0.000)	
Pseudo R ²	0.113	0.114	0.108	0.109	
Observations	42144	42146	39006	39008	

Table 3: The Negative Wealth Effect of a Bidder's Excess Cash Reserve

This table reports the regression estimates of the wealth effects of a bidder's excess cash reserve. The dependent variable is bidder announcement CAR from day -2 to day +2 from a market model. Model 1 and 2 use the overall sample. Model 3 and 4 (5 and 6) use the deals announced during the period of hot (non-hot) equity market. Excess Cash Reserve Ratio is raw Cash Reserve Ratio in excess of the required level estimated using a pooled time-series cross-sectional OLS regression with year dummies, following Opler et al (1999) (Appendix II provides a brief description). Positive Excess Cash Dummy is 1 if Excess Cash Reserve Ratio is positive, and 0 otherwise. Size is the logarithm of a bidder's book assets in millions of dollars. Log(market-to-book) is the logarithm of a bidder's market-to-book ratio of assets. Profitability is a bidder's return on assets. Overpay measures the target shareholders' gain relative to the size of bidder. It is calculated by first taking the product of target CAR, target market equity in millions and the percentage of stake sought in target by the bidder, then dividing this product by bidder market value of equity. Free Cash Flow is a flow variable calculated as operating income before depreciation - interest expenses - income taxes - preferred and common dividends, normalized by total assets. Relative Deal Value is deal value in millions of dollars divided by bidder market value of assets. Diversify is a dummy variable which is 1 if the target and the bidder are in the same 2-digit SIC industry, 0 otherwise. Cash Rich-Poor Combination is a dummy variable which is 1 if either the bidder or the target belongs to the within sample cash rich group but not both, 0 otherwise. High-Low Q combination is a dummy variable which is 1 if a high-Q bidder acquires a low-Q target, 0 otherwise. Attitude is a dummy variable which is 1 for friendly deals, 0 otherwise. Tend is a dummy variable which is 1 for tender offers, 0 otherwise. All bidder variables are measured at the end of the fiscal year prior to deal announcement. The models are estimated using a variant of the truncated regression, following Eckbo, Maksimovic and Williams(1990). *p*-values are in parentheses. *, ** and *** indicate significance of 10%, 5% and 1% respectively.

	Overall Sample		Hot Equity Market (1995-2000)		Non-hot Equity Market (1980-1994 & 2001-2004)	
	(1)	(2)	(3)	(4)	(5)	(6)
log (1+Excess Cash Reserve Ratio)	-0.585*** (0.002)		-0.729*** (0.007)		-0.253 (0.202)	
Positive Excess Cash Dummy		-0.197*** (0.000)		-0.279*** (0.001)		-0.122 (0.111)
Size	-0.045*** (0.003)	-0.045*** (0.003)	-0.021 (0.179)	-0.023 (0.152)	-0.081*** (0.007)	-0.079* (0.053)
Log(market-to-book)	-0.135*** (0.000)	-0.113*** (0.001)	-0.205*** (0.001)	-0.159*** (0.004)	-0.086 (0.108)	-0.085 (0.134)
Profitability	0.234 (0.267)	0.222 (0.304)	1.305* (0.096)	1.346* (0.095)	0.327 (0.221)	-0.077 (0.430)
OverPay	0.006*** (0.007)	0.005** (0.012)	0.004 (0.151)	0.003 (0.188)	0.011** (0.028)	0.012* (0.072)
Free Cash Flow	-0.099 (0.398)	-0.104 (0.410)	-1.336 (0.104)	-1.425* (0.094)	0.303 (0.218)	0.327 (0.235)
Relative Deal Value	0.004 (0.342)	0.005 (0.296)	-0.015 (0.254)	-0.009 (0.338)	0.008 (0.329)	-0.001 (0.480)
Diversify	0.055 (0.166)	0.053 (0.174)	0.032 (0.349)	0.043 (0.297)	0.090 (0.149)	0.136 (0.105)
Cash Rich-Poor Combination	-0.036 (0.256)	-0.021 (0.348)	-0.077 (0.168)	-0.070 (0.178)	-0.048 (0.280)	-0.026 (0.381)
High-Low Q Combination	-0.032 (0.322)	-0.037 (0.290)	0.072 (0.249)	0.082 (0.228)	-0.190* (0.053)	-0.210* (0.082)
Attitude	-0.193*** (0.002)	-0.230*** (0.000)	-0.236*** (0.010)	-0.275*** (0.003)	-0.108 (0.137)	-0.111 (0.130)
Tend	-0.032 (0.423)	-0.075 (0.320)	-0.009 (0.500)	-0.013 (0.500)	-0.004 (0.489)	0.003 (0.493)
Constant	0.188 (0.347)	0.288 (0.290)	0.108 (0.419)	0.206 (0.366)	0.284 (0.360)	0.363 (0.383)
Observations	774	775	445	446	329	329
Log Likelihood	684.814	693.466	384.446	388.938	307.403	309.955

Table 4: Is the Negative Wealth Effect of Excess Cash Reserve Weaker for a Bidder with High Tangible Assets?

This table reports the regression estimates of bidder announcement CAR on bidder excess cash reserve and an interaction term of bidder excess cash reserve and a high-tangibility-bidder dummy variable (HighT), controlling for other effects. The dependent variable is bidder announcement CAR from day -2 to day +2 from a market model. A dummy variable, HighT, is interacted with log (1+Excess Cash Reserve Ratio) (model 1) or Positive Excess Cash Dummy (model 2). HighT is 1 if a bidder belongs to the highest relative tangible assets quartile of the sample, 0 otherwise. Relative tangible assets is measured as the sum of receivables, inventories and capital, normalized by total assets net of cash. Cash Reserve Ratio is cash and marketable securities over total assets. Excess Cash Reserve Ratio is raw Cash Reserve Ratio in excess of the required level estimated using a pooled time-series cross-sectional OLS regression with year dummies, following Opler et al (1999) (Appendix II provides a brief description). Positive Excess Cash Dummy is 1 if Excess Cash Reserve Ratio is positive and 0 otherwise. Size is the logarithm of a bidder's book value of assets in millions. Log(market-to-book) is the logarithm of a bidder's market-to-book assets. Overpay measures the target shareholders' gain relative to the size of bidder. It is calculated by first taking the product of target CAR, target market equity in millions and the percentage of stake sought in the target by the bidder, then dividing this product by bidder market value of equity. Free Cash Flow is a flow variable calculated as operating income before depreciation - interest expenses - income taxes - preferred and common dividends, normalized by total assets. Relative Deal Value is deal value in millions of dollars divided by bidder market value of assets. Diversify is a dummy variable which is 1 if the target and the bidder are in the same 2-digit SIC industry, 0 otherwise. Cash Rich-Poor Combination is a dummy variable which is 1 if either the bidder or the target belongs to the within sample cash rich group but not both, 0 otherwise. High-Low Q combination is a dummy variable which is 1 if a high-Q bidder acquires a low-Q target, 0 otherwise. Attitude is a dummy variable which is 1 for friendly deals, 0 otherwise. Tend is a dummy variable which is 1 for tender offers, 0 otherwise. All bidder variables are measured at the end of the fiscal year prior to deal announcement. The models are estimated using a variant of the truncated regression following Eckbo, Maksimovic and Williamson (1990). *p*-values are in parentheses. *, ** and *** indicate significance of 10%, 5% and 1% respectively.

	(1)	(2)
log (1+ Excess Cash Reserve Ratio)	-1.159*** (0.000)	
log (1+ Excess Cash Reserve Ratio)*HighT	1.642*** (0.000)	
Positive Excess Cash Dummy		-0.305*** (0.000)
Positive Excess Cash Dummy*HighT		0.391*** (0.001)
HighT	-0.004 (0.477)	-0.184*** (0.009)
Size	-0.060*** (0.000)	-0.043*** (0.005)
Log(market-to-book)	-0.156*** (0.000)	-0.128*** (0.000)
Profitability	2.119*** (0.001)	0.195 (0.423)
OverPay	0.005** (0.025)	0.005** (0.012)
Free Cash Flow	-2.212*** (0.001)	-0.118 (0.457)
Relative Deal Value	-0.003 (0.374)	0.002 (0.419)
Diversify	0.025 (0.338)	0.044 (0.223)
Cash Rich-Poor Combination	-0.039 (0.238)	-0.036 (0.258)
High-Low Q Combination	-0.054 (0.225)	-0.064 (0.175)
Attitude	-0.181*** (0.005)	-0.245*** (0.001)
Tend	0.074 (0.286)	-0.030 (0.401)
Constant	0.246 (0.259)	0.381 (0.253)
Observations	763	764
Log Likelihood	685.235	688.507

Table 5: Does a High-Excess-Cash-Reserve Bidder Have Better Post-Acquisition Operational Cash Flow Performance?

This table reports the regression estimates of a bidder's post-acquisition abnormal operational cash flow performance. Only completed deals are examined. The dependent variable is annual operational cash flow performance of the combined firm averaged over 3 years after the acquisitions. In each pre-acquisition year, the target and bidder performances are combined into one figure by weighting each by their relative market values. The independent variable is the combined pre-acquisition annual operational performance averaged over 3 years before the announcement. In each year, operational cash flow performance is measured as operating cash flow normalized by a firm's total value of assets, then adjusted by the median performance of the firms in the same excess cash reserve ratio decile of the same 2-digit SIC industry. The low(high) excess cash group contains bidders whose Excess Cash Reserve Ratio is below(above) the sample median. The constant term captures any abnormal performance after the acquisition attributable to the deal. The coefficient on Pre-acquisition Operational Performance captures the continuation of operational performance after the acquisition. *p*-values are in parentheses. *, ** and *** indicate significance of 10%, 5% and 1% respectively.

	All Bidders (1)	High Excess Cash Group (2)	Low Excess Cash Group (3)
Constant	0.020*** (0.001)	0.030*** (0.000)	0.008 (0.299)
Pre-acquisition Operational Performance	0.465*** (0.000)	0.432*** (0.000)	0.510*** (0.000)
Observations	238	123	115
Adjusted R-squared	0.222	0.221	0.211

Table 6: The Effect of Excess Cash Reserve on a Bidder's Post-acquisition Increases in Assets and Expenditures

This table reports the regression results showing how a bidder's excess cash reserve affects its post-acquisition increases in assets

and expenditures. The dependent variable is $Y = \ln\left[\left(\sum_{i=1}^t V_i / TotalAsset_0\right) + 1\right]$ for $V = R\&D$, capital expenditure, long-term

debt reduction and acquisitions, and $Y = \ln\left[\left((V_t - V_0) / TotalAsset_0\right) + 1\right]$ for $V = \text{cash, inventory and total assets}$, for $t = 1$ to 4. $T=0$ denotes the year before deal announcement, and $t=1$ to 4 are the 1st to 4th year respectively after deal completion. At $T=0$, total assets, cash and inventory are the combined figures of the bidder and target, when a deal is completed; if a deal is withdrawn, the bidder's figure is used. At $t=1$ to 4, R&D, capital expenditure, Long-term debt reduction, acquisition, cash, inventory and total assets are of the combined firm, when a deal is completed; for a withdrawn deal, the bidder's figure is used. Cash Reserve Ratio is cash and marketable securities normalized by book value of assets measured in the year prior to the announcement. Excess Cash Reserve Ratio is the bidder's pre-acquisition raw Cash Reserve Ratio in excess of the required level. Required cash reserve is estimated using a pooled time-series cross-sectional OLS regression with year dummies, following Opler et al (1999) (Appendix II provides a brief description). Total fund is the sum of funds from operations (item 110), sales of property, plant and equipment (item 107), sale of common and preferred stock (item 108), long-term debt issuances (item 111) and other sources of funds (item 218), aggregated over the corresponding horizons. Relative Deal Value is deal value normalized by the bidder's pre-acquisition market value of assets. Size is the logarithm of the bidder's pre-acquisition book assets in millions of dollars. *, ** and *** indicate significance of 10%, 5% and 1% respectively. The cross-sectional regressions are specified below (firm subscripts are omitted for the sake of brevity).

$$Y_t = \beta_1 \log(1 + Excess\ Cash\ Reserve\ Ratio_0) + \beta_2 \log(Cash\ Reserve\ Ratio_0) \\ + \beta_3 \log(1 + Total\ Fund_t / TotalAsset_0) + \beta_4 Relative\ Deal\ Value + \beta_5 Size_0 \\ + \sum_{i=1980}^{2002} \theta_i Yr\ Dummy_i + \sum_{j=1}^{11} \lambda_j Industry\ Dummy_j + \epsilon_t$$

Y	t	Log(1+Excess Cash Reserve Ratio)		Log(Cash Reserve Ratio)	Relative Deal Value	Total Fund	Size	Obs	Adj. R ²
		β_1	β_2						
$\Delta Cash$	1	-0.019	-0.001	0.315***	0.004	0.003	769	0.232	
	2	-0.016	-0.007	0.177***	0.006	0.001	709	0.130	
	3	-0.008	0.001	0.232***	-0.015	-0.001	620	0.182	
	4	-0.010	0.014**	0.245***	-0.001	0.007	548	0.216	
$\sum LT\ Debt\ Reduction$	1	0.012**	-0.031***	0.256***	0.014	-0.011**	750	0.541	
	2	0.023**	-0.049***	0.248***	0.019	-0.017***	676	0.598	
	3	0.040**	-0.063***	0.366***	0.028	-0.020*	584	0.657	
	4	0.048*	-0.073***	0.421***	0.020	-0.020*	500	0.692	
$\Delta Inventory$	1	0.003	0.006***	0.077***	-0.011**	0.003**	751	0.141	
	2	0.007	0.007**	0.088***	-0.015**	0.004	691	0.194	
	3	0.009*	0.007*	0.121***	-0.013*	0.004	606	0.288	
	4	0.006	0.006	0.135***	-0.006	0.002	536	0.329	
$\sum CAPEX$	1	-0.007*	0.003	0.107***	-0.005	-0.001	758	0.598	
	2	-0.010	0.005	0.137***	-0.007	0.000	693	0.676	
	3	-0.010	0.005	0.236***	-0.002	0.000	603	0.716	
	4	-0.016	0.006	0.252***	-0.012	0.002	534	0.766	
$\sum R\&D$	1	-0.009	0.028***	0.018	0.010	-0.010***	506	0.557	
	2	-0.015	0.047***	0.040	0.025**	-0.014**	464	0.640	
	3	-0.038*	0.060***	0.096**	0.024	-0.023**	402	0.704	
	4	-0.032	0.070***	0.104*	0.022	-0.024**	352	0.720	
$\sum Acquisition$	1	0.004	0.000	0.207***	-0.008	-0.003	631	0.335	
	2	-0.009	-0.015*	0.192***	-0.013	-0.010**	558	0.431	
	3	-0.015	-0.017	0.301***	-0.009	-0.014	468	0.549	
	4	-0.021	-0.027	0.393***	-0.001	-0.019*	398	0.626	
$\Delta Total\ Assets$	1	-0.028**	0.029**	0.794***	0.015	-0.001	769	0.494	
	2	-0.014	0.028	0.693***	0.005	0.006	709	0.484	
	3	0.005	0.023	0.962***	-0.018	0.021	620	0.608	
	4	0.029**	0.027*	1.009***	0.010	0.031	548	0.643	