Liquidity-based Merger Valuation and Performance

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January 2009

Abstract

Inspired by the liquidity-based asset pricing (LAPM) model in Holmström and Tirole (2001), this paper explores the potential explanatory power of aggregate liquidity factors on merger activity and performance. Using the empirically constructed aggregate liquidity demand and supply factors, we find that merger and acquisition activity and acquiring firms' pre-announcement valuation are positively correlated with aggregate liquidity factors. Acquiring firms, on average, receive 4.95% (1.77%) higher cumulative abnormal returns within two months pre-announcement period when aggregate liquidity demand (supply) measure is high. Moreover, acquiring firms establish −16.35% (−13.35%) much lower three-year post-merger performance when aggregate liquidity demand (supply) measure is high. The merger activity and performance differences between high and low aggregate liquidity factors holds with the usual controls for deal and target characteristics and the length of event-window period. Further, the difference is largest (smallest) when acquisitions in high aggregate liquidity portfolio are compared to acquisitions in low aggregate liquidity portfolio with pure stock (cash) payment.

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1 Introduction

Corporate liquidity holdings have an important and well understood role in corporate investment strategies. They provide buffers and cushion for future corporate cash against liquidity shocks or costly funding. Starting with the corporate liquidity consideration and based on their previous works,[1] Holmström and Tirole (2001) explicitly incorporate a costly external finance friction constraint into an equilibrium asset pricing model, and generate a liquidity-based asset pricing (LAPM) model. They show that the resulting model, affected by aggregate corporate liquidity demand and aggregate market liquidity supply factors, can better explain liquidity premium and the market valuation in capital markets.

In the literature of mergers and acquisitions (M&A), many studies explore potential factors from other fields to explain long lasting puzzles, such as the changing of merger activity in aggregate through time and the post-acquisition underperformance for acquiring firms. Shleifer and Vishny (2003), Rhodes-Kropf and Viswanathan (2004), Rhodes-Kropf, Robinson, and Viswanathan (2005), Dong, Hirshleifer, Richardson, and Teoh (2006) and Bouwman, Fuller, and Nain (2008) have found substantial evidence that market valuation fundamentally affects mergers activity and post-acquisition performance. High merger and low subsequent post-acquisition performance are shown to be positively correlated with high market valuations. Also, Rau and Vermaelen (1998) and Moeller, Schlingemann, and Stulz (2004) utilize commonly stock market predictors, book-to-market ratio and firm size, to explain some of the M&A phenomena and generate fruitful results.

Shedding light from these previous studies in the area of aggregate corporate liquidity pricing and market valuation driven M&A, this paper takes the next logic step by suggesting that if aggregate liquidity factors have explanatory power for asset prices and stock market valuations, then it is likely that different aggregate liquidity factors can be applied to explain some of the merger activity, valuation, and performance questions as well. In particular, the purpose of this research is to empirically address the following questions with aggregate liquidity factors: Whether merger activities in periods with high aggregate liquidity fundamentally different from those with low aggregate liquidity? Whether the differences in valuation and performance for acquiring firms can be explained by aggregate liquidity factors? The contribution of this paper is the provide another reasonable explanation, aggregate liquidity driven, for some of the commonly recognized anomalies in mergers and acquisitions.

[1] See Holmström and Tirole (1996, 1998).

Using a sample of 4162 mergers announced between January 1, 1980 and December 31, 2003, we examine whether there are fundamental differences in acquisition quality and performance between merger deals related to high aggregate liquidity periods and those related to low aggregate liquidity periods. The aggregate liquidity factors include both aggregate corporate liquidity demand measure and aggregate market liquidity supply measure. In order to measure the aggregate corporate liquidity demand, by following the methodology in Greenwood (2005), we use data reported in the Federal Reserve *Flow of Funds* to construct a measure of aggregate corporate accumulation of liquid asset as a fraction of total corporate investment spending. To construct the aggregate market liquidity supply measure, we apply the U.S. $Debt/GDP$ ratio by following Krishnamurthy and Vissing-Jorgensen (2008). Based on aggregate liquidity factors, we split transactions of mergers in our sample into high-liquidity portfolio (30%), median-liquidity portfolio (40%), and low-liquidity portfolio (30%) according to prior year's aggregate liquidity factors. Then we compare the activity and performance of acquiring firms in different aggregate liquidity portfolios.

The distribution of merger activity through time according to different level of aggregate liquidity factors reveals a positive correlation between aggregate liquidity and merger activity. The high (low) aggregate liquidity periods, for both aggregate corporate liquidity demand and aggregate market liquidity supply, are related to more (less) merger deals. For the whole sample, there are 1856 (1794) deals in high-liquidity demand (supply) portfolios compared to only 695 (582) deals in low-liquidity demand (supply) portfolios. Within each subgroup of merger deal characteristics, high-liquidity portfolios have much higher deal amount and mean transaction value than medium-, and low-liquidity portfolios. Moreover, there are more (less) acquisition with stock payment than with cash payment in high- (low-) liquidity portfolios.

To explore the performance of mergers, we analyze the acquiring firms' short-run pre-merger stock performance (twenty trading days and forty trading days pre-merger cumulative abnormal returns) and long-run post-merger stock performance (buy-and-hold abnormal returns and calendar-time portfolio regression approach) to test whether the aggregate liquidity factors affect merger quality and performance. Besides, we expect the aggregate liquidity factors to be positively correlated with pre-merger performance and to be negatively related to post-merger performance. Results show that both twenty and forty days pre-merger cumulative abnormal returns (CAR) are significantly positively related to aggregate liquidity factors. The higher the aggregate liquidity, the higher the pre-merger abnormal return, and the

pattern are consistent through all subgroups of different public status and method of payments. In average, high-liquidity demand (supply) portfolio has a 4.28% (1.38%) pre-announcement return, while low-liquidity demand (supply) portfolio only has a -0.67% (-0.40%). The differences are significant both economically and statistically. For the long-term abnormal returns, especially for buy-and-hold abnormal returns (BHAR), we find strong trend that low-liquidity portfolio followed by positive abnormal returns, while high-aggregate liquidity portfolios are followed by significant negative abnormal returns. The differences between high and low aggregate liquidity portfolios are negative and highly significant for the whole sample up to three-year post-merger periods. For instant, the three-year BHAR difference between high and low aggregate liquidity demand (supply) portfolios is -16.35% (-13.35%)and significant at 1%. Through out each sub-sample by controlling deal characteristics, the differences remain negative and significant for most of the cases. The empirical results for both short and long event-windows are consistent with our hypotheses.

This paper uniquely apply the aggregate liquidity factors in liquidity-based asset pricing model to explain realized mergers and acquisitions patterns. The important corporate liquidity issues together with the market valuation driven M&A are the two core literature strand of this paper. Although the importance of corporate liquidity holdings to theories in corporate finance has been studied broadly, most of the literature traditionally focused on firm-specific level of corporate liquidity holdings and seldom of them realize the importance of corporate liquidity at aggregate level, and its impact on asset pricing theories.[2] Since Holmström and Tirole (1998, 2001), some studies, like Livdan, Sapriza, and Zhang (2006) and Eisfeldt and Rampini (2007), started to realize the important of aggregate liquidity. Greenwood (2005) find that aggregate investment in liquid assets as a share of total corporate investment is significantly negatively related to subsequent U.S. stock market returns.

The remainder of this part is organized as follows. Section 2 explains the development of principle research hypotheses and empirical expectations, and also introduce some related literature. Section 3 provides descriptions for aggregate liquidity data and the sample of mergers. Section 4 discusses the empirical results for short-run pre-merger returns, and its correlation with aggregate liquidity. In section 5, the long-term performance of acquiring firms measured by both buy-and-hold abnormal returns and calendar-time portfolio returns are shown. Section 6

[2]See, for instance, Opler, Pinkowika, Stulz, and Williamson (1999) and Almeida, Campello, and Weisbach (2004).

summarizes and concludes this paper.

2 Hypotheses Development and Related Literature

In this paper, we intend to discover the explanatory power of aggregate liquidity factors on some merger activities and performance phenomena. According to Holmström and Tirole (1998, 2001), aggregate liquidity factors, including aggregate corporate liquidity demand and aggregate market liquidity supply, play important roles in determining the liquidity premium and even the market valuation. In M&A literature, substantial evidences have been found to support that market valuation is one of the determining factors behind many M&A phenomena. Therefore, by combining the findings in both sides, we expect aggregate liquidity factors to has substantial correlations with merger activities and subsequent performance. If liquidity premium or market valuation are explained by aggregate liquidity factors, then the commonly recognized market valuation driven acquisitions are actually "aggregate liquidity driven acquisitions". In particular, the aggregate liquidity should be able to explain the following questions. Why merger activity and volume change over time? Why acquiring firms has long-term poor performance after acquisitions? And why these post-event performance vary from time to time?

2.1 Aggregate Liquidity, Market Valuation, and Merger Activity

As ongoing entities, corporations are concerned that they may in the future be deprived of the funds that would enable them to take advantage of exciting growth prospects, strengthen existing investments, or simply stay alive. Kim, Mauer, and Sherman (1998) and Opler, Pinkowika, Stulz, and Williamson (1999) provide substantial evidences that many firms hold liquid assets and do so for extended periods of time.[3] Theoretically, Holmström and Tirole (1998) show that in presence of pure aggregate uncertainty, financial securities which can service corporate liquidity demand can be sold at liquidity premium. Starting with the corporate liquidity consideration and based on their previous works, Holmström and Tirole (2001) explicitly incorporate a costly external finance friction constraint into an equilibrium asset pricing model, and generate a liquidity-based asset pricing model (LAPM).

[3]Other studies on corporate liquidity also includes Froot, Scharfstein, and Stein (1993), Mello and Parsons (2000), Boyle and Guthrie (2003), Almeida, Campello, and Weisbach (2004).

They show that the resulting model, affected by *aggregate corporate liquidity demand* and *aggregate market liquidity supply* factors, can better explains liquidity premium in asset markets.

Since Holmström and Tirole (1998, 2001), some researchers started to realize the importance of aggregate liquidity. Eisfeldt and Rampini (2007), through studying whether the use of liquidity to hedge corporate investment opportunities can generate substantial liquidity premia, argue that financial shortfalls are more likely to occur when current cash flows are low, rendering liquidity premia counter-cyclical. Empirically, Greenwood (2005) use the aggregate date of U.S. nonfinancial corporate business sector to construct a measure of aggregate corporate accumulation of liquid assets and study its relation with subsequent market returns. He found that aggregate investment in liquid assets as a share of total corporate investment is significantly negatively related to subsequent U.S. stock market returns.

In the M&A literature, as stated in Rhodes-Kropf and Viswanathan (2004), there is a long exist puzzle that why there are periods when mergers are plentiful and other periods when merger activity is much lower. Many recent research try to find explanations through exploring the possible links between merger activity and stock price. Many of them have found substantial evidences that market valuation fundamentally impacts acquisition activity, that high merger activity is correlated with high market valuations.[4] Furthermore, in high stock valuation periods, firms tend to use stock as an major method of payment in acquisitions. Jovanovic and Rousseau (2001) show that periods of high merger activity are correlated with high market valuations. Rhodes-Kropf and Viswanathan (2004) later on show that potential market value deviations from fundamental value can rationally lead to a correlation between stock merger activity and market valuation. Merger waves and waves of cash and stock purchases can be rationally driven by periods of misvaluation of the stock market. Rhodes-Kropf, Robinson, and Viswanathan (2005) find strong support for recent theoretical contributions by Rhodes-Kropf and Viswanathan (2004) and Shleifer and Vishny (2003), which predicting that misvaluation drives mergers. All these studies, together with many anecdotal evidence, show that merger and acquisition decisions (activity) are influenced by market valuations.

Since stock market valuation has been proved to related to merger activity. Therefore, this paper takes the next logical step by suggesting that if aggregate liquidity has explanatory power for asset prices and stock market valuation, then it is likely that aggregate liquidity factors, including both aggregate corporate liquidity

[4]See, for instance, Maksimovic and Phillips (2001).

demand and aggregate market liquidity supply, will affect aggregate merger activity and acquiring firms performance as well. In particular, if liquidity premium or market valuation are explained by aggregate liquidity factors, then the commonly recognized market valuation driven acquisitions are actually "aggregate liquidity driven acquisitions".

Based on the above discussion, we propose the follow two hypotheses which reflect the perspective that aggregate liquidity impacts merger activity. The aggregate liquidity here includes both aggregate corporate liquidity demand and aggregate market liquidity supply. In Holmström and Tirole (2001), both liquidity demand and supply have the negative correlation with liquidity premium. That is, the higher (lower) the aggregate corporate liquidity demand or aggregate market liquidity supply in date t, the lower (higher) the liquidity premium in date t. Also, based on Holmström and Tirole's liquidity-based asset pricing model, liquidity premium $q-1$ is the liquid asset price q in date t minus the asset price 1 in date $t-1$. Based on this structure, we will expect the high aggregate liquidity in time t, low valuation in date t, to induce high valuation in date $t+1$. And the low aggregate liquidity in date t will lead to low value in date $t+1$. This expectation is also practical in the sense that market is changing constantly. High market valuation in this period will often followed by low market valuation in the next period. Based on the above discussion and recall that merger activity and market valuation are positively correlation, we have the following hypothesis:

Hypothesis 1 *Higher (lower) aggregate liquidity is followed by more (less) merger activity in the next period.*

Actually, Hypothesis 1 can also be generated from studies about firm-specify level of market valuation or corporate liquidity. Ang and Cheng (2006), Dong, Hirshleifer, Richardson, and Teoh (2006) provide evidence that market valuation impacts the volume of takeovers. Harford (1999) finds that firms with high liquidity reserves are more likely to become acquirers than other firms. Therefore, when the aggregate level of liquidity is high, which means that the whole amount of firms with high liquidity reserve in the market is high, there should be more mergers and acquisitions in the whole market too.

According to M&A literature, high market valuation periods not only are accompanied by more merger activity, but also have more acquisitions proceeded in the method of stock payment. It means when the whole market or firm securities have overvaluation, corporations or managers tend to use overvalued stock as the payment method to gain benefits. Thus, we can have the second hypothesis:

Hypothesis 2 *When aggregate liquidity is high (low), there should be more (less) mergers with stock payment than with cash payment in the next period.*

2.2 The Effects of Aggregate Liquidity on Merger Performance

Many studies in mergers and acquisitions focus on the announcement-period returns for target firms and acquiring firms, and post-acquisition returns to shareholders of acquiring firms.[5] Evidence for announcement-day returns are found significantly positive for target shareholder, but may be positive or negative for acquiring firms depending on different takeover characteristics (payment method, type of target, etc). For long-term performance, in general, the acquiring firms are found to suffer up to three years long-run negative stock return after acquisitions.

Many prior studies tried to find some explanations for long-term post-acquisition returns from market stock returns predictors, such as book-to-market value and firm size. Rau and Vermaelen (1998) consider the long-run underperformance of bidders in mergers and overperform of bidders in tender offers. They find that the long-term underperformance of acquiring firms in mergers is predominantly caused by the poor post-acquisition performance of low book-to-market firms. Moeller, Schlingemann, and Stulz (2004) find evidence for the existence of a size effect in acquisition announcement returns and conclude that announcement return for acquiring-firm shareholders is roughly two percentage points higher for small acquirers. Regarding payment methods, Loughran and Vijh (1997) suggest that the long-term post-acquisition returns to acquirers are higher for cash offers and tender offer than for stock offers and mergers.

Loughran and Vijh (1997), Rau and Vermaelen (1998) and Moeller, Schlingemann, and Stulz (2004) have shown that some predictors of stock market returns can actually be utilized into acquisition analysis, and produce fruitful results. Since aggregate liquidity is shown to be an important stock market return predictor, it should also has explanation and prediction power for acquiring' firms performance around and after mergers. We expect that some post-acquisition phenomena can be explained by aggregate corporate liquidity demand and aggregate market liquidity supply factors. The remaining question is how they are related? Possible answers could be found in research about market valuation and merger performance.

[5]Some of the research in this field include Asquith (1983), Asquith, Bruner, and Mullins (1983), Jensen and Ruback (1983), Bradley, Desai, and Kim (1988), Franks, Harris, and Titman (1991), Agrawal, Jaffe, and Mandelker (1992), Loughran and Vijh (1997), Rau and Vermaelen (1998), Fuller, Netter, and Stegemoller (2002), and Moeller, Schlingemann, and Stulz (2004).

We have seen that studies in market valuation suggest that high market misvaluation lead to more merger activity. In fact, market valuation may even affect the quality of acquisition, which reflect in the post-acquisition performance. Rhodes-Kropf and Viswanathan (2004) suggest that market misvaluation will lead to excess mergers and these will be value-destroying. Thus, from the perspective of acquiring-firm shareholders', the best deals are initiated when markets are depressed, and deals in market booming are worse, which means that acquisitions undertaken during booming stock markets are of poorer quality than those undertaken during depressed markets (Bouwman, Fuller, and Nain, 2008). In order to empirically address this hypothesis, Bouwman, Fuller, and Nain (2008) separate merger sample according to measures of market level valuation, and find that acquirers buying during high-valuation markets have significantly higher announcement returns but lower long-run abnormal stock performance than those buying during low-valuation markets.

Based on the established positive correlation between aggregate liquidity in date t and market valuation in date $t+1$, and the valuation movement between t and $t+1$, which is the pre-merger announcement period, we can get the following hypothesis:

Hypothesis 3 *Mergers announced in the next period of high (low) aggregate liquidity should have positive (negative) pre-merger stock returns for acquiring firms.*

Meanwhile, according to the positive correlation between aggregate liquidity in date t and market valuation in date $t+1$, and the negative correlation between market valuation and long-term post-merger returns, we can suggest the following hypothesis:

Hypothesis 4 *Mergers announced in the next period of high (low) aggregate liquidity should have lower (higher) long-run post-merger abnormal stock returns for acquiring firms.*

—insert Figure 1 here—

Figure 1 shows the time line of our aggregate liquidity prediction on merger activity and performance. This figure is also a summary of the above hypothesis.

2.3 Corporate Liquidity Level and Acquisitions

In literature, there are vast studies about corporate liquidity. Most of them try to find determinants, implications, or optimal amount of corporate liquidity hold-

ings.[6] Only very few studies realize the importance of corporate liquidity on mergers and acquisitions issues and generate fruitful results. Although these studies, similar to our research, establish correlation between corporate liquidity and mergers and acquisitions, this paper share substantial differences from them. Firstly, all of them concentrate on firm-specify liquidity level for different acquirers or targets and search for explanations from agency problem theories, while our paper focus on the aggregate liquidity demand and supply level. Secondly, and more importantly, we establish our hypotheses from asset pricing angle by applying the corporate financial liquidity considerations into it. The expectation on merger activity and performance are built on the liquidity based asset pricing model instead of corporate finance issues. The following of this section will introduce some of these studies.

Liquid assets are important tool for firms to operate in imperfect capital markets. When current internally generated funds are insufficient or externally raised funds are expensive, liquidity reserves can provide a valuable source of funds for investment opportunities or sudden liquidity shocks (Myers and Majluf, 1984). This kind of high liquidity reserves increase the financial flexibility of firms. However, firms often build up much more liquid assets than they actually need, which can worsen the agency problem between managers and investors by decreasing investor's ability to monitor managers (Easterbrook, 1984, Jensen, 1986). The free cash flow hypothesis predicts that high liquidity reserves insulate managers from monitoring by external markets, and therefore, managers could easily engage in value-decreasing investment decisions. Shleifer and Vishny (1988) propose that managers with high amount of liquidity may be tempted to use that cash to maximize their own personal utility at the expense of shareholder value by "empire building" through acquisition. Also, Roll (1986) hubris hypothesis suggests that managers' success at generate cash could make them overestimate their ability to undertake an acquisition. Thus, a high accumulated liquidity is a possible indicator of the quality of corporation's subsequent major decisions, such as acquisitions.

Harford (1999) finds that firms with high liquidity reserves are more likely to become acquirers than other firms, and shows that the market response to an unexpected acquisition announcement is significantly negatively related to the acquirer's excess liquid assets level. But Harford (1999) do not investigate the post-acquisition returns related to corporate liquidity. Oler (2005), build on Harford's results, investigate whether the announcement period market response with respect to acquirer cash is complete. He propose that if the initial market response is not complete,

[6]See, for instances, Kim, Mauer, and Sherman (1998), Opler, Pinkowika, Stulz, and Williamson (1999), and Anderson and Carverhill (2005).

then post-acquisition returns will be predictable based on the acquirer's liquidity level. Oler (2005) conclude that acquirers with high liquidity balances on the announcement date often suffer negative post-acquisition returns.

Some other studies, instead of focusing on acquirers' liquidity level, they study the effect of targets' liquidity reserves in takeovers. They argue that if the market for corporate control monitors liquidity holdings, cash rich firms should be targeted more frequently, controlling for other factors.[7] Faleye (2004) find that proxy fight targets hold 23% more cash than comparable non-targets and that the probability of a contest is significantly increasing in excess cash holdings. Harford (1999) and Pinkowitz (2002) both find that the likelihood of a firm becoming a takeover target is significantly negatively related to the holdings of excess liquidity. Although not directly related to corporate liquidity issues, Schlingemann (2004) analyzes the relation between bidder gains and the source of financing funds available. He documents that financing decisions during the year before a takeover play an important role in explaining the cross section of bidder gains after controlling for the form of payment.

3 Liquidity Measures and Data Descriptions

In order to explore the hypotheses on the correlation between aggregate liquidity and mergers activity and performance, we collect data regarding aggregate liquidity variables and acquisition transactions respectively. We focus on aggregate time series data because we are mostly interested in time series relations with aggregate liquidity and mergers. Section 3.1 shows the basic data and methods used to measure aggregate corporate liquidity demand and aggregate market liquidity supply. The transactions selection criteria for merger sample and descriptive statistics are discussed in section 3.2.

3.1 Aggregate Liquidity Measures

As discussed in hypotheses development, based on Holmström and Tirole's LAPM model, both the aggregate corporate liquidity demand and aggregate market liquidity supply have substantial affects on asset prices and market valuation. Thus, aggregate liquidity measures for demand aspect and supply aspect are introduced

[7]Cited in Pinkowitz (2002). However, there are still many studies which document that the takeover market does not account excessively liquid firms, such as Ambrose and Megginson (1992), Song and Walkling (1993), Comment and Schwert (1995)

separately.

A Aggregate Corporate Liquidity Demand

We construct an aggregate corporate liquidity demand sample by collecting data from Table L102 and F102 in the U.S. Federal Reserve Board's *Flow of Funds* accounts for the period between 1979 and 2002. The length for aggregate liquidity sample is 24 years, which is the same as the length for mergers sample. Both the beginning and ending points for aggregate liquidity sample are one year ahead of merger sample, which is to match the empirical design to investigate the correlation between aggregate liquidity factors with next year's merger valuation and performance. Table L102 and F102 shows the levels and flows (changes) in financial assets and liabilities of nonfarm nonfinancial corporate business sector in the United States through time.[8] Financial sector is exclude because its business involves inventories of marketable securities that are included in liquid assets.

The *flow of funds* accounts record the acquisition of tangible and financial assets throughout the U.S. economy and document the sources of funds used to acquire those assets. The Federal Reserve gathers capital market flows data from a variety of internal and commercial sources. The *flow of funds* accounts cover 1945 to 2008. The strengths of the *flow of funds* data are its consistent definitions, its availability over a long period of time, and its comprehensive coverage. A complete description of the *flow of funds* is available in Board of Governors of the Federal Reserve System, *Guide to the Flow of Funds Accounts*.

By following the method in Greenwood (2005), we start to construct a measure of the fraction of total corporate investment in liquidity. In aggregate level, corporate data follow the equation:

$$\underbrace{Profits - Dividends}_{\text{Internal Funds}} + \underbrace{Equity + Debt}_{\text{External Funds}} = \underbrace{\Delta L + \Delta F + \Delta Inv + \Delta W + \Delta Other}_{\text{Uses of Funds}} \tag{1}$$

where

[8]For more information of the accounts, please refer to Teplin (2001) for a brief introduction or *Guide to the Flow of Funds Accounts 2000* for a complete description. In L102 and F102, flows are equal to the change in the level for balance sheet variables.

$$
\begin{aligned}
Profits\ (P) &= \text{corporate book profits plus depreciation} \\
Dividends\ (Div) &= \text{net dividend payments} \\
Equity\ (E),\ Debt\ (D) &= \text{equity and debt issues} \\
\Delta L &= \text{changes in liquidity} \\
\Delta F &= \text{changes in fixed investments} \\
\Delta Inv &= \text{changes in inventory investment} \\
\Delta W &= \text{changes in working capital} \\
\Delta Other &= \text{residual term.}
\end{aligned}
$$

The residual term ($\Delta Other$) includes inventory valuation adjustments, changes in miscellaneous liabilities, and a calculation discrepancy. The equation (1) can also be expressed as

$$
\underbrace{\text{Internal Funds} + \text{External Funds}}_{\text{Sources of Funds}} = \text{Uses of Funds} \tag{2}
$$

where Internal Funds is defined as corporate profits minus dividends payment plus adjustments for foreign earnings retained abroad, External Funds is defined as funds raised through equity and debt issues.

The underlying logic of above equations is that, in aggregate corporate business sector level, total sources of funds must equal total uses of funds, which is also the principle underlying the *Flow of Funds* accounts. State differently, all funds supplied by the corporate sector become the funds get allocated. After paying taxes and dividends, firms can collect profits from investment and raise external financing in equity and debt markets. They must allocate funds in working capital, fixed assets such as land, plant or equipment, or they may store these funds in liquid assets. Total sources of investable funds include internal funds from production and external funds raised outside the corporate sector.

In order to measure aggregate corporate liquidity holdings, it is important to have a proper definition of *corporate liquid assets*. An ideal definition should includes all assets which can be easily converted into cash with no or low transaction costs. As stated in Greenwood (2005), too narrow definition of liquidity risk the possibility of results driven by certain classes of liquid assets; while on the other had, too broad definition risk including investment items that are held for purpose other than maintaining liquidity. Similar to Greenwood (2005), we exclude foreign deposits because they are linked to the liquidity needs of offshore subsidiaries. However, differently, we include U.S. treasury securities as they are liquid financial assets heavily held by U.S. corporations. Although the share of they decreased

through last half century, they still take up important place in corporate liquidity holdings.

—insert Figure 2 here—

Therefore, we settle on the definition of liquidity as following:

Liquidity components
- checkable deposits and currency
- time and savings deposits
- money market mutual fund shares
- short-term security repurchase agreements
- commercial paper
- U.S. treasury securities

These are common liquid assets used by corporations for liquidity reserve purposes. Figure 2 shows the time series performance of each corporate liquidity component holding levels and holding shares from 1970 to 2006. It is quite obvious that corporate sector in aggregate increase liquid assets holding through time. The figure reveals the declining share of treasury securities and the increasing importance of money market mutual fund shares. This result correspond with the fact that many corporations now hold more professionally managed money market shares. The holding ratios of security repurchase, commercial paper, and treasury securities are relatively stable through time. And the amount of treasury securities holdings decreased since 1995.

The aggregate corporate liquidity demand measure used is the *liquidity investment share* $\Delta L/S$, which is defined as the change in the level of aggregate liquidity holdings divided by total sources of funds (S). Total sources of funds is the sum of profits after paying out dividends, net equity issues, and net debt issues, which is $S = P - Div + E + D$. All other flow of funds variables are scaled by total sources of funds (S), and are summarized in Table 1. Panel A of Table 1 shows the descriptive statistic of aggregate corporate liquidity demand measures: liquidity investment share $\Delta L/S$ and percentage change in liquidity holdings $\Delta L/L_{t-1}$. Since the liquidity measures sample cover between 1979 to 2002, there are 24 annual values for each measures. liquidity investment share $\Delta L/S$ has similar mean value (4.68) and median value (4.76). Percentage change in liquidity holdings $\Delta L/L_{t-1}$ has larger mean (8.07) and median value (7.07). Compare these two aggregate corporate liquidity demand measures, $\Delta L/S$ has larger standard deviation (5.28)) than $\Delta L/S$ (2.93), which means the volatility of $\Delta L/L_{t-1}$ is bigger through time.

The autocorrelation for both liquidity measures' time series are small and similar (0.27 vs 0.29).

—insert Table 1 here—

Panel B of Table 1 shows the same data descriptive statistics for variables from *Flow of Funds*, which are used to construct aggregate corporate liquidity demand measures. For the corporate business sector, over 80% of corporate funds are obtained from internal funds financing, while external financing only takes about 18% on average for period 1979 to 2002. The $(P + Div)/S$ ratio even reached 108.69 percent in 1991 and 103.68 percent in 2002. Surprisingly, net equity issues are negative in most of time, while net debt issues typically finance over 27 percent of investments. The low average ratio of equity issues is because the *Flow of Funds* appropriately nets out equity repurchases and retirements. Standard deviation and autocorrelation results for sources of funds variables, $(P + Div)/S$, $(E + D)/S$, E/S, D/S, are quite similar, with standard deviation around 10 and autocorrelation around 0.50. Panel B also shows the summary of each variables in uses of funds side. Commonly, fixed investments $\Delta F/S$ take the biggest part of corporate sources of funds, almost 82 percent.

Intuitive feelings about the time-series performance of aggregate corporate liquidity demand measures can be get from figures. Figure 3 plots two time-series measurement of aggregate liquidity, including the liquidity investment share $(\Delta L/S)$ and the percentage change in liquidity investment level $(\Delta L/L_{t-1})$. Liquidity investment share was high during 1983 and late 1990s before the market declined during 1984, 2000, and 2002. This high liquidity investment share in the late 1980s and late 1990s correspond to the more active acquisition activity in that periods. In 1999 alone, there was 9,278 announcements compared with approximately only 4,000 announcements from 1990 to 1991 (see Mergerstat Review 2001). Moreover, these two aggregate liquidity series show a high degree of correlation, while the percentage change in liquid asset balance has bigger changing scales. Note that both of them mostly positive and only drop below zero in 1990, which means that corporate sectors were keep hoarding liquid assets through time.

—insert Figure 3 here—

B Aggregate Market Liquidity Supply

Based on Holmström and Tirole's liquidity-based asset pricing model, aggregate market liquidity supply also play an crucial role in determining the liquidity premium. The value of liquidity premium is higher when there is less liquidity. When

the market is replete with liquidity, there is no liquidity premium, the liquid asset's price is low. Therefore, LAPM suggests an negative correlation between aggregate market liquidity supply and liquidity premium or asset prices.

Empirically, what is the proper measure for aggregate market liquidity supply? By following Krishnamurthy and Vissing-Jorgensen (2008) and Bohn (1998), we use the U.S. $Debt/GDP$ ratio as our measure for aggregate market liquidity supply. Same as Krishnamurthy and Vissing-Jorgensen (2008), the $Debt/GDP$ ratio series used in the thesis is downloaded from Henning Bohn's website, and updated until 2006 from the Economic Report of the President and NIPA data. Bohn constructs the measure as the ratio of publicly held Treasury debt (from the WEFA database, Federal Reserve Banking and Monetary Statistics, and recent issues of the Economic Report to the President) relative to either GDP (after 1959) or GNP (prior to 1959). This measure of debt includes debt held by the Federal Reserve, but excludes debt held by other parts of the government such as the Social Security Trust Fund.

Treasury securities are extremely liquid assets in the market. Many research already found that treasury debt, but not equity claims, are money-like and carry a convenience value. This unique value provided by government debt relative private debt support theories such as Woodford (1990) and Holmström and Tirole (1998). In these papers, government supply debt has unique liquidity features relative to private assets, and thereby induces a premium on government assets. Based on these, measuring aggregate market liquidity supply with U.S. government debt supply to GDP ratio is reasonable and more suitable to the liquidity-based pricing model. Figure 4 shows the time series performance of aggregate market liquidity supply.

—insert Figure 4 here—

C Time Series Properties of Liquidity Measures

Before analyzing the relationship between the aggregate liquidity and acquisition performances, it is worth to examine the basic properties of the time series of aggregate liquidity measures. We test whether changes in aggregate liquidity measures can be explained by changes in other sources or uses of investment funds. Although by identity equation (1), the aggregate corporate liquidity demand is related to other investment shares for sure, it is important to check whether any one of the other variables individually accounts for most of the variation in liquidity investment

share.[9] Table 2 shows the results of time series regressions of aggregate corporate liquidity demand $\Delta L/S$ on aggregate market liquidity supply measure $Debt/GDP$, net equity and debt issues $(E+D)/S$, changes in fixed investment $\Delta Fixed/S$, and change in inventory $\Delta Inv/S$.

The results in Table 2 shows that the aggregate liquidity demand factor $\Delta L/S$ has very small correlation with aggregate market liquidity supply $Debt/GDP$, which means that government's liquidity supply doesn't not fully adjusted to corporate sector's demand. Also, $\Delta L/S$ represent more of the changing of liquidity demand in aggregate, while $Debt/GDP$ reflect more of the scale (ratio) of liquidity supply to the whole market economics. These can also explain why their correlation is so low. For external financing $(E+D)/S$ alone, it only accounts for 2.9% of correlation. Specification (3) to (5) further include $\Delta Fixed/S$ and $\Delta Inv/S$, and not strong and significant correlations are found, which means that no variables have explanatory power for the time series of liquidity investment share.

—insert Table 2 here—

3.2 The Sample of Mergers

The sample of mergers and acquisitions comes from the Thomson One Banker Mergers and Acquisitions (M&A) Database. This database is exactly the same as the Securities Data Corporation (SDC) Mergers and Acquisitions (M&A) Database. Both databases are maintained by the Thomson Financial Services.[10] For convenience and consistence, we will call the database used in this research as SDC Mergers and Mergers and Acquisitions (M&A) Database.

We select a list of completed U.S. mergers and acquisitions for domestic targets from SDC, with the announcement date and effective date lie between January 1, 1980 and December 31, 2003, respectively. Acquiring firms returns are drawn from Center for Research in Security Prices (CRSP). Since SDC has very limited cover of mergers and acquisitions transactions data before 1980, therefore, we choose 1980 as the starting point of mergers sample. Ending the sample at 2003 is to ensure three years post-merger stock returns from CRSP database. SDC reports the acquiring firms' name and CUSIP codes, the form of consideration, the announcement and effective date of transactions, and the nature of acquisition. However, SDC does not provide the CRSP PERMNO number for the the acquiring firms. So for each merger

[9] See Greenwood (2005) for more discussion. In his paper, he did more tests to see whether liquidity investment share is determined by other factors.

[10] Discussion with Thomson One Banker employee verified that both databases are the same.

transactions, I search for PERMNO number in CRSP by matching on CUSIP codes from SDC.

For merger transactions to be included into our mergers sample, we further require that:

1. The sample includes successful bids for at least 50% of the target's equity and the transaction is listed as completed.

2. The transaction value is one million dollar or more, and transaction value is defined as the total value of consideration paid by the acquiring firms, excluding fees and expenses.

3. Acquired target firms are public or private U.S. firm, or non-public subsidiary of a public or private firm.

4. Acquiring firms are U.S. firms publicly traded on the American Stock Exchange (AMEX), New York Stock Exchange (NYSE), or Nasdaq.

5. Acquiring firms have daily return data around takeover announcement date and three years monthly return data after the takeover completed date listed on the CRSP.

6. Neither the acquirer nor the target firm is a financial or utilities institution, because their business involves inventories of marketable securities.

The initial sample of mergers contains 4,248 bids. As we require acquiring firms to be on both SDC and CRSP's database with valid daily return around announcement and monthly returns after completions, the final mergers sample composed of 4,162 merger transactions. Targets in the full sample may be publicly or privately owned. If we consider only acquisitions in which the target is publicly traded, the sample will drop to 1588 bids. While the aggregate liquidity data spans from 1979 to 2002, since we consider merger announcements based on previous year's aggregate liquidity, the mergers sample is from 1980 to 2003. Note that in this research, the terms of bidder and acquirer are used interchangeably because all the bids in our sample lead to a completed acquisition. Figure 5 provides an initial idea of the changing of merger deals through years from 1980 to 2003. It also shows the annual number of acquiring firms.

—insert Figure 5 here—

Table 3 reports the distribution of merger sample through years based on announcement date. The amount of mergers increase steadily through time, and has a relative peak period between 1996 to 2000. Column 3 shows the number of acquirers in each year. The total number of acquirers is 1,955, which means that there are quite many firms in the sample did multiple mergers. For the whole sample, the average transaction value is $893.8 millions and the median transaction value is $245.7 millions. The large difference between mean and median value can be interpreted as that the sample contain more firms with small transaction value and with less firms with extremely large transaction value. Both the mean transaction values and median transaction values show the similar movement as the number of merger deals, with higher values in the late 1990s.

—insert Table 3 here—

Table 3 also shows the amount of merger deals separated by method of payments and target firms public status. Based on method of payments, the whole sample is separated into 933 pure cash payment, 1,016 pure stock payment, and 1,445 mixed payment transactions. Pure cash or stock payment refer to transactions that are known to be paid in 100% cash or stock, respectively. Mixed payment transactions include combinations of cash, stocks, and derivative securities. Based on target firms public status, the merger transactions are classified into 1,588 deals with public target firms, 1,141 deals with private target firms, and 1,384 deals with subsidiary target firms. Note that, the sum number of each subgroup within method of payment or target firms' public status is different from the total number in the sample (4,162). This is because, in some cases, these data are missing from SDC merger transaction data.

4 Merger Activity and Aggregate Liquidity

Why does merger activity and volume changes through time? Why some periods have more merger transactions than others? Can aggregate liquidity be applied to explain such phenomena? This section is going to investigate the above questions by classified merger transactions in our sample into different portfolios, say aggregate liquidity portfolios, according to aggregate liquidity factors in the prior years. Once thethree liquidity-based portfolios are constructed, the effects of aggregate liquidity on merger activity can be examined by simply comparing different aggregate liquidity portfolios.

4.1 Distribution of Mergers by Liquidity

A Single Aggregate Liquidity Separation

From 1979 to 2002, the 24 annual time-series data of aggregate corporate liquidity demand, as well as the aggregate market liquidity supply, are divided into three groups: high-liquidity (30%), medium-liquidity (40%), and low-liquidity (30%).[11] Merger transaction deals with announcement dates in the next year $(t+1)$ of high, median, or low aggregate corporate liquidity demand (or aggregate market liquidity supply) year t are put into the corresponding high-, median-, or low-liquidity portfolios. For example, if year t is considered as high (low) aggregate corporate liquidity demand year, then within the mergers sample, merger transactions with announcement year equal to year $t+1$ are put into high- (low-) liquidity portfolios. Therefore, we have two sets of high-, median-, and low-liquidity portfolios, based on aggregate corporate liquidity demand $\Delta L/S$ and aggregate market liquidity supply $Debt/GDP$.

—insert Table 4 here—

Table 4 shows the number of merger deals and mean transaction value of each liquidity portfolios constructed by aggregate corporate liquidity demand $\Delta L/S$ (in Panel A), $\Delta L/L_{t-1}$ (in Panel B), or aggregate market liquidity supply $Debt/GDP$ (in Panel C). Notes that both $\Delta L/S$ and $\Delta L/L_{t-1}$ are considered as measures for aggregate corporate liquidity demand, and Figure 3 already shown that these two measures produce similar time-series performance. Thus, in the following empirical section, we will only apply the liquidity investment share $(\Delta L/S)$ as the measure for aggregate corporate liquidity demand. Besides, merger sample distribution results for $\Delta L/S$ in Panel A and $\Delta L/L_{t-1}$ in Panel B are quite similar. Taking $\Delta L/S$ as the representative measure for aggregate corporate liquidity demand should be sufficient enough.[12]

There is a significant trend in Table 4 for the whole merger sample, that high-liquidity portfolios have much larger amount of deals and higher mean transaction value than corresponding medium-, and low-liquidity portfolios. There are 1856 merger transaction with mean transaction value of \$1152 million in high-aggregate corporate liquidity demand $\Delta L/S$ portfolio. For medium and low-liquidity portfo-

[11] High-liquidity group includes years: 1999, 2000, 1983, 1989, 1998, 1996, and 1992. Medium-liquidity group includes years: 2001, 1982, 1991, 1995, 1984, 1986, 1993, 1997, 1979. Low-liquidity group include years: 1994, 2002, 1980, 1987, 1981, 1988, 1990.

[12] The results in the following section remain the same if we undertake $\Delta L/L_{t-1}$ as the aggregate corporate liquidity demand factor.

lios, the number drop to 1611 and 695 with mean transaction values drop to \$754 and \$529 million. Panel C of table 4 shows the distribution of merger sample by aggregate market liquidity supply $Debt/GDP$. Both deal amount and mean transaction value show the same trend as aggregate corporate liquidity demand portfolios (1794 vs 582, 775 vs 518). The differences in merger amounts between high and low portfolios are all over 1,000 for each measures. The differences in mean transaction value between high and low portfolios are \$623 millions for $\Delta L/S$ measure and \$257 millions for $Debt/GDP$.

People may question that this result is driven by some mergers and acquisitions factors, such target firms' public status and methods of payment. Substantial research in this area found that these factors do have effects on merger activity and performance. Therefore, to investigate whether the aggregate liquidity factor is the driving force behind the merger activity in our sample, we further separate each aggregate liquidity portfolio into sub-portfolio according to to acquisition target firms' public status (i.e., public, private, subsidiary) or according to methods of payment in acquisitions (i.e., cash, stock, mixed).

—insert Table 5 here—

Table 5 presents the number of merger deals and mean transaction values of various sub-group of aggregate liquidity measures constructed portfolios by target firms' public status or by methods of payment. The result shows that the positive correlation between aggregate liquidity and merger activity exist for each sub-portfolios and three aggregate liquidity measures ($\Delta L/S$ in Panel A, $\Delta L/L_{t-1}$ in Panel B, and $Debt/GDP$ in Panel C). When the merger sample is separated by target firms' public status, we can find that there are more deals (1588) with public target firms in transaction with a mean transaction value of \$1666 million than private target group (1141) or subsidiary target group (1384). Even though there are differences between public, private, and subsidiary target firm portfolios, the strong correlation between aggregate liquidity and merger activity still exists for each sub-group. High liquidity ($\Delta L/S$) public target firm portfolio has 699 merger deals with average 2188 transaction value. While low liquidity ($\Delta L/S$) public target firm portfolio has only 275 transaction with mean transaction value of 868. Although this pattern exists for three types of aggregate liquidity measures, there are still some different between them. By comparing $\Delta L/S$ to $Debt/GDP$, we can find that the difference in deal amount is bigger for $Debt/GDP$ measure, and the difference in mean transaction value is bigger for $\Delta L/S$ measure.

So far, we have found strong evidence supporting Hypothesis 1: higher (lower) aggregate liquidity is followed by more (less) merger activity in the next period. This prediction is strongly supported by results for the whole merger sample and sub-sample grouped by deal characteristics. The middle part of Table 5 shows the number of mergers and mean transaction value for each portfolio classified by aggregate liquidity and methods of payment in acquisitions (i.e., cash, stock, mixed). Although the number of acquisitions distribution evenly through cash and stock payment, the stock payment portfolio has much higher mean transaction value ($1381) than cash payment portfolio ($480). Through different liquidity portfolios, again, the positive correlation between aggregate liquidity and merger activity are found. Interestingly, when the aggregate liquidity ($\Delta L/S$) is high, there are more more merger deals with stock payment (582) and less transactions with cash payment (339). When the aggregate liquidity is low, contrarily, there are less transactions with stock payment (114) compared to cash payment (189). This pattern exists for every aggregate liquidity factors ($\Delta L/S$, $\Delta L/L_{t-1}$, and $Debt/GDP$) constructed portfolios. In other means, the amount difference between high and low aggregate liquidity for pure cash payment merger sample is smaller than for pure stock payment merger sample. This findings strongly support Hypothesis 2. The bottom part of Table 5 also shows the results for classification by the level of transaction values. Strong correlation between aggregate liquidity and merger activity are found through different level of transaction value portfolios and by different liquidity measures.

B Multi-Aggregate Liquidity Separation

To take a further investigation at this pattern of positive correlation between aggregate liquidity and merger activity. we sort the 24 years mergers sample into two groups (50%, 50%) by the prior-year aggregate corporate liquidity demand $\Delta L/S$. Then we sort each set of observations by the prior-year aggregate market liquidity demand $Debt/GDP$. Figure 6 presents the distribution of merger sample by both aggregate liquidity factors $\Delta L/S$ and $Debt/GDP$. Based on above method, we will have four different aggregate liquidity portfolios: high demand high supply, high demand low supply, low demand high supply, and low demand low supply. Panel A shows the number of merger deals of each portfolio, while Panel B shows the mean transaction values of each portfolio.

—insert Figure 6 here—

Since both aggregate liquidity demand and supply share the same positive correlation with merger activity, therefore, classify merger transaction with two liquidity factors together should generate even stronger prediction. In specify, as shown in Figure 6, high aggregate corporate liquidity demand and high market liquidity supply portfolio has the highest amount of merger deals. When both the aggregate liquidity demand and liquidity supply are low, subsequent mergers amount (460) and mean transaction value ($ 495 million) are low. When both liquidity measures are high, subsequent mergers amount (1474) and mean transaction value ($ 931 million) are high. Moreover, the figure shows that the difference in merger deals amount and mean transaction values between high aggregate corporate liquidity demand and low aggregate corporate liquidity demand is greatest when aggregate market liquidity supply is low. Similarly, the the difference in merger deals amount and mean transaction values between high aggregate market liquidity supply and low aggregate market liquidity supply is greatest when aggregate corporate liquidity demand is low. In summary, amount of mergers in subsequent period is lowest when both aggregate demand and supply are low. The finding further support the prediction in Hypothesis 1.

Recall that Hypothesis 2 predicts high correlation of stock payment mergers with aggregate liquidity than cash payment mergers. This is because when market valuation is high, corporate prefer to pay acquisitions with overvalued stocks than cash. When premium is low, corporate prefer to use cash payment than using (undervalued) stock. This correlation are shown in table 5. Therefore, when the merger sample with cash payment or stock payment are grouped by both aggregate liquidity demand and supply measures, we expect to observe a strong correlation between merger activity and aggregate liquidity for stock payment mergers than cash payment mergers.

—insert Figure 7 here—

Figure 7 shows the distribution of acquisition deal amounts by using the sample classification methods in figure 6 on sample of pure cash payment mergers and sample of pure stock payment mergers. In our sample, the amount of cash payment mergers (933) is similar to that of stock payment mergers (1016). However, when both aggregate corporate liquidity demand and aggregate market liquidity supply is high, there are more stock payment mergers (409) than cash payment mergers (301). When both aggregate liquidity is low, there are much less stock payment mergers (38) than cash payment mergers (138). The differences between high and low aggregate liquidity portfolio is 371 for stock payment compared to only 163 for

cash payment. This findings are consistent with our prediction and further support Hypothesis 2. To sum up, strong evidences have been found to support Hypothesis 1 and Hypothesis 2.

4.2 Regression Analysis

In above discussion, we find clear evidence that aggregate liquidity and merger activity are positively correlated by separating merger sample on aggregate liquidity factors. In this section, we intend to use simple regression methods to test the correlation between aggregate liquidity and merger activity. We also run regression of 12 months post-merger raw returns of different portfolios on aggregate liquidity to provide initial evidence for our following tests on the correlation between aggregate liquidity and merger performance for acquiring firms.

—insert Table 6 here—

Table 6 shows the results of univariate regression of merger activity on aggregate liquidity measures. The univariate OLS regressions of annual log number of mergers on lagged aggregate liquidity measures:

$$Mrg = \alpha + \beta X_{t-1} + \mu_t \tag{3}$$

where dependent variables Mrg are the annual log number of merger deals of the full sample and each sub-sample separated based on target firms' public status (i.e., public, private, subsidiary), or payment methods (i.e., cash, stock, mixed). The independent variable X_{t-1} include aggregate corporate liquidity demand measures ($\Delta L/S$, $\Delta L/L_{t-1}$), aggregate market liquidity supply $Debt/GDP$. Coefficient β capture the correlation between aggregate liquidity and merger activity.

Table 6 shows that aggregate corporate liquidity demand $\Delta L/S$ has positive correlation 5.84 with merger activity in general and significant at 5% level. The aggregate market liquidity supply $Debt/GDP$ is also positively related to merger activity 3.36 with significant level at 1% degree. Both correlations exist through sub-sample separated by target firms' public status. These results strong support the prediction in Hypothesis 1. When look at the regression coefficient results by taking number of cash payment or stock payment as dependent variable, we found strong support to Hypothesis 2. Stock payment has much stronger correlation (6.16) with aggregate corporate liquidity demand $\Delta L/S$ than that of cash payment (0.69). This pattern also exist for aggregate market liquidity supply $Debt/GDP$ that the coefficient for stock payment is 4.77 while only 1.23 for cash payment mergers.

In order to see whether aggregate liquidity has predictive power for or has correlation with acquisition quality and performance, table 7 shows the results for univariate and multivariate time-series regressions of annual portfolio returns on prior-year aggregate corporate liquidity demand $\Delta L/S$ and aggregate market liquidity supply $Debt/GDP$. Panel A of Table 7 shows the univariate regressions results for different merger sample separated based on target firms' public status, and methods of payment. The univariate OLS regressions of annual portfolio returns on lagged aggregate liquidity measures is constructed as:

$$R_{pt} = \alpha + \beta X_{t-1} + \mu_t \tag{4}$$

where R_{pt} is the annual returns on the equal-weighted post-merger portfolios of the full sample and each subgroup separated based on target firms' public status (i.e., public, private, subsidiary), or payment methods (i.e., cash, stock, mixed). Acquirer firms enter the portfolio on the effective month of the merger and remain for 12 months. Calendar portfolios are rebalanced each month to include firms that have just completed a merger and to disregard the ones that have just fulfilled 12 months. The independent variables include $\Delta L/S$, $\Delta L/L_{t-1}$, $Debt/GDP$, and $(E+D)/S$. Each subgroup's annual portfolio returns are taken regression on external financing share $(E+D)/S$ for compare. Panel B of Table 7 shows the multivariate regressions results for $\Delta L/S$ by controlling $(E+D)/S$. The multivariate OLD regression is

$$R_{pt} = \alpha + \beta X_{t-1} + \gamma Y_{t-1} + \mu_t \tag{5}$$

where the dependent variables is the same as univariate regressions, X denotes the $\Delta L/S$ and Y denotes the $(E+D)/S$.

—insert Table 7 here—

As shown in Panel A of Table 7, all regression results for the whole merger sample, as well as for different subgroups, on both aggregate corporate liquidity demand measures $\Delta L/S$ and $\Delta L/L_{t-1}$ are all negative and highly significant. For the results measured on liquidity investment share $\Delta L/S$, the whole merger sample shows a -4.40 negative correlation and significant at 1 percent level. The negative correlation are even higher for subgroups of private targets (-5.11) and stock payment (-6.96), both of them are significant at 1%. By using the alternative measure of aggregate corporate liquidity demand measures, the correlation pattern remains. All results are negative and significant, and with higher negative correlation for subgroup of private targets (-2.09) and stock payment (-4.05). Compared with

$\Delta L/S$, both the correlation and significant level are weaker for regression results measured on $\Delta L/L_{t-1}$. For instance, the results for all targets drops from -4.40 to -1.96, and significant level drops from -3.62 to -2.63. Therefore, in the following empirical investigation on the effects of aggregate liquidity on merger performance, we will only apply the liquidity investment share $\Delta L/S$ to separate merger sample. When comparing results from pure cash payment sample and pure stock payment sample, consistent with our prediction, the correlation between aggregate liquidity and performance of stock payment mergers are stronger (-6.96) than that of cash payment mergers (-4.05). Panel A of table 7 also shows the regression results on aggregate market liquidity supply $Debt/GDP$ and external financing $(E + D)/S$. However, no significant correlations have been found throughout the different samples, which means that external financing has no explanatory power separately on acquiring-firm post-merger performance. Panel B of Table 7, even after having control the external financing effect, shows similar results are panel A, where all different samples show significant negative correlations, Moreover, the samples of private target firm and stock payment show stronger negative correlation, -5.21 and -6.94 respectively. The high negative correlation support our hypothesis 2 that stock payment has stronger correlation with aggregate liquidity. Since firms undertake more stock payment when aggregate liquidity is high, the subsequent performance should be more negatively correlated.

Therefore, the results shown in table 6 and table 7 support the predictions of Hypothesis 1 and 2. Also, the results are consistent with the findings of comparing different aggregate liquidity constructed merger portfolios. In the following section, we will explore the explanation power of aggregate liquidity on acquisitions' valuation and post-merger performance. Acquiring firms' performance around announcement and long-term post-merger performance for different aggregate liquidity constructed portfolios will be measured and compared.

5 Merger Performance and Aggregate Liquidity

The important prediction of liquidity-based asset pricing model is that both aggregate corporate liquidity demand and aggregate market liquidity supply affect liquidity premium. The discussion in section 2.2 strength the importance of aggregate liquidity on market valuation, and then apply aggregate liquidity to explain phenomena of acquisition performance. Some of the commonly recognized abnormal performance of acquiring firms in mergers can be explained by aggregate liquidity

based on LAPM model. Here we explore the potential correlation between aggregate liquidity and merger performance. Both stock returns for acquiring firms around merger announcements and long-term post-merger acquirer stock performance are examined. Substantial evidence have been found, which is consistent with the prediction of Hypothesis 3 and 4.

5.1 Announcement Effect Study

Hypothesis 3 predicts that mergers announced in the next period of high (low) aggregate liquidity should have positive (negative) pre-merger stock returns for acquiring firms. In literature, the evidence for acquiring firms' announcement effect is mixed. In order to test this hypothesis, we choose two event windows: one month pre-merger announcement (twenty trading days event window) and two-month pre-merger announcement (forty trading days event window). The one- (two-) month pre-merger announcement event window is twenty (forty) trading days prior to the announcement date of mergers to one trading day prior to the announcement date. Then, within these two event windows, cumulative abnormal returns (CAR) are calculated by summing the abnormal returns over the event window period. If the prediction is correct, we should be able to observe positive pre-merger announcement abnormal returns for acquiring firms. Moreover, there should be positive correlation between aggregate liquidity and pre-merger acquiring firms performance.

We apply the market-adjusted model to calculate abnormal returns:

$$AR_{it} = R_{it} - R_{mt} \tag{6}$$

$$\widehat{CAR}_{i(T_1,T_2)} = \sum_{t=T_1}^{T_2} AR_{it} \tag{7}$$

$$CAR_{(T_1,T_2)} = \frac{1}{N} \sum_{i=1}^{N} \widehat{CAR}_{i(T_1,T_2)} \tag{8}$$

and the t-statistic for $CAR_{(T_1,T_2)}$ is calculated with cross-Sectional standard deviation test:

$$t_{CAR} = \frac{CAR_{(T_1,T_2)}}{\hat{\sigma}_{CAR_{(T_1,T_2)}}/\sqrt{N}} \tag{9}$$

where the estimated variance of $CAR_{(T_1,T_2)}$ is

$$\hat{\sigma}^2_{CAR_{(T_1,T_2)}} = \frac{1}{N-1} \sum_{j=1}^{N} \left(CAR_{j,(T_1,T_2)} - \frac{1}{N} \sum_{i=1}^{N} CAR_{i,(T_1,T_2)} \right)^2 \tag{10}$$

—insert Table 8 here—

From the descriptive statistics for the sample of mergers, there are many mergers are undertaken by the same acquiring firms, which means that the sample contains many multi-bidders. In this case, using market-adjusted model can avoid the unexpected affects in pre-estimation period caused by multi-bidders.

Table 8 shows the results of short-run pre-announcement abnormal returns for acquiring firms. Results generated by aggregate corporate liquidity demand $\Delta L/S$ are shown in panel A and results generated by aggregate market liquidity supply $Debt/GDP$ are shown in panel B. Abnormal returns for both twenty-day event window $(-20, -1)$ and forty-day event window $(-40, -1)$ are presented. Similar to our prediction, we found positive and significant pre-merger abnormal returns for acquiring firms. For the whole sample, the abnormal return for twenty-day pre-merger period is 1.38% and significant at 1 percent. Comparing two event windows, there is significant positive 2.48% CAR of window $(-40, -1)$, which is larger than CAR of event window $(-20, -1)$.

More importantly, there is a consistent positive correlation between aggregate liquidity and pre-announcement abnormal returns. In general, the higher the aggregate liquidity, the higher the pre-merger abnormal returns. For twenty-day pre-merger event window, the high-liquidity demand portfolio for the whole sample has a 2.57% positive return which is significant at 1% level. The abnormal returns drop to 0.88% for medium-liquidity demand portfolio and -0.63% for low-liquidity demand portfolio. As expected, there are positive difference between high and low aggregate corporate liquidity demand portfolios for both event windows. For example, there is a positive 4.95% difference for event window $(-40, -1)$ with 5.58 t-value. While the difference is smaller for event window $(-20, -1)$ with only 3.19%, the result is also statistical significant at 1% level. Panel B of table 8 shows the abnormal returns for different portfolio constructed by aggregate market liquidity supply $Debt/GDP$. The differences between high and low aggregate liquidity portfolios are still positive and highly significant, 1.34% for twenty-day event window, and 1.77% for forty-day event window. Still, the longer the event period, the bigger the difference. The CAR results for different aggregate liquidity portfolios are also presented in figure 8, which provides a more direct view.

—insert Figure 8 here—

The positive correlation between aggregate liquidity and pre-merger returns is also observed in every sub-sample of mergers separated by target firms' public status, methods of payment, and transaction value. Table 9 shows these results. In

general, by judging at the difference between high and low aggregate liquidity portfolios for each subsample, there are stronger and more significant positive correlations between aggregate corporate liquidity demand $\Delta L/S$ and pre-merger announcement abnormal returns, than that of aggregate market liquidity supply $Debt/GDP$. The difference by aggregate corporate liquidity demand $\Delta L/S$ is 2.57% for public target firms' merger sample under event window $(-20, -1)$, and significant at 1 percent. By aggregate market liquidity supply $Debt/GDP$, the difference is positive, although insignificant. For all of the subgroups separated by target firms' public status, the results of differences between high and low liquidity portfolio are positive and significant for most of them.

—insert Table 9 here—

Table 9 also shows the results for subgroups by methods of payment. Similar to the findings in literature, mergers with stock payment have positive abnormal returns before announcement for acquiring firms, which means that firms choose to pay with stock when securities are overvalued. We have 4.63% and 8.16% abnormal returns for pre-merger event window $(-20, -1)$ and $(-40, -1)$ respectively, while the corresponding returns for cash payment mergers are negative and insignificant. We also capture positive and significant differences between high and low aggregate liquidity portfolios. Again, the pattern is strong for aggregate liquidity demand $\Delta L/S$. Moreover, the differences generated by aggregate corporate liquidity demand $\Delta L/S$ are higher for merger sample with pure stock payment, which are 5.69% for window $(-20, -1)$ and 8.39% for window $(-40, -1)$. The differences are much lower for merger sample with pure cash payment, which are 1.46% for window $(-20, -1)$ and 3.76% for window $(-40, -1)$. This larger differences for merger sample with stock payment also valid for portfolios constructed by aggregate market liquidity supply $Debt/GDP$.

The last part of table 9 is related to merger sub-sample of high, median, and low transaction values. The difference by aggregate corporate liquidity demand $\Delta L/S$ are positive and significant through out these three subgroups, with larger positive abnormal returns for longer event windows. Although we also find positive differences for aggregate market liquidity supply $Debt/GDP$ portfolios, only one of them are significant.

To sum up, the results for pre-merger announcement CAR strongly support our Hypothesis 3. We found positive pre-merger abnormal returns for acquiring firms, where the returns increase with pre-announcement event window length. This positive abnormal returns only exist for high and median aggregate liquidity portfolios,

but negative for low aggregate liquidity portfolio. There are strong positive correlation between aggregate liquidity and pre-merger stock performance for acquiring firms for the whole sample and each sub-sample separated by M&A deal characteristics. Moreover, the differences between high and low aggregate liquidity portfolios are all positive and significant in most cases. This positive correlation between aggregate liquidity and pre-merger abnormal return can be considered as a "building up period" for overvaluation or "preparation" for long-term post-merger underperformance. When aggregate liquidity is high (low), subsequent period stock market are overvalued (undervalued). Therefore, pre-merger returns capture this unusually movement of stock price, positive for high liquidity and negative for low liquidity.

Furthermore, the reason why stock payment have such higher returns than cash payment is that acquirers who choose stock as payment probability have already realized the overvaluation of their stocks. Therefore, stock is consider as an "acquisition currency" in period of high aggregate liquidity, because it is more reasonable to pay with overvalue stock than cash. The differences in pre-merger announcement CAR for aggregate liquidity portfolios classified by cash or stock payment are shown in figure 9.

—insert Figure 9 here—

5.2 Post-Merger Long-term Performance Analysis

It is important to investigate the post-merger performance and aggregate liquidity. It has been widely recognized in literature that acquiring firms suffer negative post-merger abnormal returns up to three years. Our purpose here is not to find further evidence for this negative performance, but to explore whether aggregate liquidity has effects on acquiring firms post-merger long-term performance. In particular, similar to Hypothesis 4, we intend to investigate whether aggregate liquidity factors are negative related to long-term post-merger performance, that mergers announced in the next period of high (low) aggregate liquidity should have lower (higher) long-run post-merger abnormal stock returns for acquiring firms.

By following methods in analyzing mergers announcement effects, we classify the whole sample of merger and each sub-sample with different target or deal characteristics into high-, median-, and low-aggregate liquidity portfolios. Then, we calculate post-merger abnormal returns for 12, 24, and 36 months for every portfolios. And the differences in returns between high- and low-liquidity portfolios are also examined. There are long debates about the proper estimation of long-term abnormal returns. Beginning with Ritter (1991), the most popular method

for long-term abnormal performance is the mean buy-and-hold abnormal return (BHAR). Although quite many concerns are given to this method, it is still widely used in empirical studies and supported by many research. Another well recognized methodology is the calendar-time portfolio returns (CTPR). This methodology is strongly supported by Fama (1998). Following literature in event-study research, we apply both methodologies for our long-term event studies. The uniqueness and properties of these two long-term methodologies can also affect the significant of results.

A Buy-and-Hold Abnormal Returns

Using buy-and-hold abnormal returns (BHAR) method for long-term abnormal performance estimation are advocated by Barber and Lyon (1997) and Kothari and Warner (1997). The long-term BHAR model we applied as follows:

$$BHAR_{(T_1,T_2)} = \frac{1}{N}\sum_{i=1}^{N}(BHR_{i,(T_1,T_2)} - BHR_{p_i,(T_1,T_2)}) \tag{11}$$

where

$$BHR_{i,(T_1,T_2)} = \prod_{t=T_1}^{T_2}(1+R_{it}) - 1. \tag{12}$$

$$BHR^{reb}_{p_i,(T_1,T_2)} = \prod_{t=T_1}^{T_2}\left[1 + \frac{\sum_{j=1}^{N_t} R_{jt}}{N_t}\right] - 1 \tag{13}$$

Notes $BHR_{i,(T_1,T_2)}$ is the buy-and-hold returns for firm i over period T_1 to T_2. $BHR_{p_i,(T_1,T_2)}$ is the buy-and-hold returns for firm i's size and book-to-market reference portfolio over period T_1 to T_2. N is the number of firms in the sample. $T_2 - T_1$ is the horizon in months over which abnormal returns are calculated. Taken the merger completion months as month 0, we set event period $T_2 - T_1$ equal to 12 months period (+1,+12), 24 months period (+1,+24), and 36 months period (+1, +36).

—insert Table 10 here—

In order to calculate the long-term buy-and-hold abnormal returns on size and book-to-market matched reference portfolios for acquiring firms, we assign acquirers to quintiles using the breakpoints from Kenneth French's web site. Size and book-to-market reference portfolios are constructed by following Fama and French (1993). The equal-weighted monthly returns of 25 reference portfolios formed on size and

book-to-market (5×5) are downloaded from Kenneth French's web site. To test the null hypothesis that the mean buy-and-hold abnormal return is equal to zero for a sample of n firms, we first employ a *conventional t-statistic*:

$$t = \frac{\overline{BHAR}_{(T_1,T_2)}}{\hat{\sigma}(BHAR_{(T_1,T_2)})/\sqrt{N}} \tag{14}$$

where $\overline{BHAR}_{(T_1,T_2)}$ is the sample mean of $BHAR_{(T_1,T_2)}$ and $\hat{\sigma}(BHAR_{(T_1,T_2)})$ is the cross-sectional sample standard deviation of buy-and-hold abnormal returns for the sample of N firms.

Table 10 presents the acquiring firms' post-merger (effective date) buy-and-hold abnormal returns (BHAR) for merger deals within aggregate corporate liquidity demand $\Delta L/S$ and aggregate market liquidity supply $Debt/GDP$ constructed portfolios. There are negative and significant BHAR results for acquiring firms in the post-merger long-term period. The longer the post-merger period, the larger the negative abnormal returns. For example, 12 months BHAR is -6.02%, 24 months BHAR is -9.38%, and 36 months BHAR is -11.62%, all of which highly significant at 1 percent level. This results are consistent with general findings in M&A literature that acquiring firms realize long-term poor post-merger performance. From figure 10, we can see the clear pattern between aggregate liquidity and post-merge BHAR for 12, 24, 36 months event period.

—insert Figure 10 here—

The BHAR results for different aggregate liquidity portfolios show interesting pattern and correlation, which strongly support hypothesis 4. Firstly, for high aggregate corporate liquidity demand and high aggregate market liquidity supply constructed portfolios, they suffer stronger negative post-merger long-term returns than that of the whole sample. For instance, high aggregate corporate liquidity demand $\Delta L/S$ portfolio has -9.88% BHAR for 12 months, -13.14% for 24 months, and -16.06% for 36 months. These long-term BHAR are all lower than the corresponding event period BHAR for median, low aggregate liquidity portfolios and event lower than that of the whole sample. Post-merger BHAR for low-aggregate liquidity portfolio are event positive, although insignificant. Column 7 in table 10 shows the differences in BHAR of high and low aggregate liquidity portfolios. Without exception, all differences are negative and highly significant. This means that acquisitions happen in the next period of high aggregate corporate liquidity demand $\Delta L/S$ period experience much larger significant negative performance than mergers related to low aggregate liquidity period. Moreover, the longer the event

windows, the larger the differences, which means that these performance differences related to different aggregate liquidity last for times up to three years. Panel B of table 10 shows the BHAR results for aggregate market liquidity supply constructed portfolios. The negative correlation between post-merger BHAR and aggregate liquidity is still obvious and significant for three event-window periods. The differences between high and low aggregate market liquidity supply $Debt/GDP$ portfolios are all negative and significant. The level of differences are smaller related to those of aggregate liquidity demand portfolio, such as difference of 12 months BHAR is only -3.48%, 24 months BHAR is only -10.12%, and 36 months BHAR is only -13.35%. Figure 10 summarizes results and patterns in table 10. The negative correlation between aggregate liquidity is shown clearly in the figure.

The findings in table 10 support a strong negative correlation between post-merger BHAR and aggregate liquidity, and negative differences in post-merger performance measured by BHAR of high and low aggregate liquidity portfolios. This evidence strongly support our hypothesis 4 that mergers announced in the next period of high (low) aggregate liquidity should have lower (higher) long-run post-merger abnormal stock returns for acquiring firms. In the following, we will separate the whole mergers sample into various subsample base on deal characteristics. Table 11 presents the acquiring firms' post-merger buy-and-hold abnormal returns (BHAR) for different deal characteristics sorted subsample of merger deals within aggregate corporate liquidity demand $\Delta L/S$ and aggregate market liquidity supply $Debt/GDP$ constructed portfolios. Various high-, medium-, and low-liquidity portfolios are further divided into target firms' public status (i.e., public, private, subsidiary), payment methods (i.e., cash, stock, mixed), and transaction values (i.e., high (30%), medium (40%), low (30%)). Panel A shows the results for target firms' public status classification, panel B shows the results for methods of payment classification, and panel C shows the results for transaction values classification.

—insert Table 11 here—

In general, results shown in table 11 further support our findings in table 10, that post-merger BHAR are negatively related to aggregate liquidity. However, the degree of significance various across aggregate liquidity measures ($\Delta L/S$ or $Debt/GDP$), and across different merger transaction deal characteristics. The significant correlations are maintained in aggregate corporate liquidity demand $\Delta L/S$ portfolios even when portfolios are further sorted into different characteristics subsamples. The results for aggregate market liquidity supply $Debt/GDP$ become much weaker for subsamples.

In panel A of table 11, for subsample of public, private, or subsidiary target firms, acquiring firms' post-merger return are lower for those who takeover public or private target firms. Three years BHAR are -15.95 and -13.49 for acquiring firms who merger public and private targets, and is only -4.43 for those merger subsidiary targets. More important, when each samples are divided into high-, median-, and low- liquidity portfolios by $\Delta L/S$, the negative correlation exists through out the subsamples and three event window periods. The differences are largest for subsidiary targets sample, and lowest for public targets sample. The right hand side of the table shows the BHAR results by aggregate market liquidity supply $Debt/GDP$ constructed portfolios. The results are consistent with hypothesis 4 through out the sample and each event window periods. Also, the differences between high and low aggregate market liquidity supply portfolios are all negative for subsample of public, private, pr subsidiary target firms, although the significance is related weaker.

Panel B of table 11 shows the BHAR results for high-, median, and low-aggregate liquidity portfolios, which are further sorted into different methods of payment (pure cash, pure stock, mixed) subsamples. For the whole merger sample, acquiring firms paid with cash suffer much less long-term BHAR than those paid with stock. This results are consistent with market valuation driven M&A theory, that firms pay with overvalued stock will suffer bigger long-term negative post-merger returns. The difference between high and low aggregate liquidity portfolios are negative and significant for liquidity measure $\Delta L/S$. For instance, acquiring firms paid with pure stock have larger negative returns (-17.49%) relate to high aggregate liquidity. While those paid with stock be relate to low aggregate liquidity have only (-2.21%) BHAR. The difference between these two portfolios is (-15.28%) and significant at 1 percent. Unfortunately, when using aggregate market liquidity supply measure $Debt/GDP$ to construct aggregate liquidity portfolios, the results become inconsistent and some differences even become positive even though insignificant. Only subsample results for mixed payment still exist the pattern and have significant and negative differences.

In panel C of table 11, each portfolios are sorted into subsample by transaction values. We sort the whole mergers sample on transaction values, and take the top 30% and bottom 30% into larger and small transaction values portfolios, and take the median 40% into median transaction values portfolios. Similar to results in panel A, there are negative correlation between aggregate liquidity and post-merger BHAR for both aggregate liquidity measures. The differences for high and low liquidity portfolios are all negative, and highly significant for aggregate corporate liquidity demand $\Delta L/S$ constructed portfolios. The results for aggregate market

liquidity supply $Debt/GDP$ are weaker in term of significance.

To sum up, based on results in table 10 and 11, strongly support hypothesis 4. There are clear negative correlation between aggregate liquidity and post-merger long-term performance of acquiring firms. The correlation is strong and significant for the whole merger sample. For different subsample sorted on deal characteristics, in general, the post-merger BHAR has stronger correlation with aggregate corporate liquidity demand $\Delta L/S$ than with aggregate market liquidity supply $Debt/GDP$. Almost all the differences between high and low aggregate liquidity are negative, and most of them are highly significant. For cash and stock payment mergers, aggregate liquidity have strong effect on pure stock payment mergers, which is consistent with prediction.

B Calendar-Time Portfolio Approach

In order to investigate the correlation between aggregate liquidity and post-merger performance more thoroughly, we also apply the calendar-time portfolio regression approach. This methodology is strong suggested by Fama and French (1993) and Mitchell and Stafford (2000). Instead of using the traditional ordinary least square (OLS) regression methods, we apply the weighted least square, which will weight the results in each calendar months with the number of securities in that months. Because in OLS, event months with heavily weighted securities are treated the same with others, which will reduce the importance of "hot" event months. The time-series of portfolio returns net of the risk-free return over the sample period is regressed on the three Fama and French (1993) factors:

$$R_{pt} - R_{ft} = \alpha_p + \beta_p(R_{mt} - R_{ft}) + s_p SMB_t + h_p HML_t + \epsilon_t \tag{15}$$

where R_{pt} is the event portfolio return, R_{ft} is the risk-free rate, $(R_{mt} - R_{ft})$ represents excess return on the market, SMB is the difference between a portfolio of "small" and "big" stocks, HML is the difference between a portfolio of "high" and "low" book-to-market stocks. Within this framework, the intercept α_p measures the average monthly abnormal return on the portfolio of event firms, which is zero under the null of no abnormal performance.

—insert Table 12 here—

Table 12 contains the calendar-time regression results for the whole sample portfolio. Calendar-time returns are calculated for 12, 24, and 36 months of post-merger periods. Panel A of Table 12 use the separation of aggregate corporate liquidity

demand $\Delta C/S$. Panel B shows the results by aggregate market liquidity supply $Debt/GDP$. Abnormal return results for high-, medium-, and low- aggregate liquidity portfolios are presented. As shown in Panel A, for period of 1-12 after completion of acquisitions, low-liquidity portfolio has significant -0.596% abnormal return per month, which corresponds to -7.152% over a period of one year. On the other side, the intercept (abnormal return) for high-aggregate liquidity portfolio is -0.339% per month, and the value is significant at 5 percent. For event windows 12 months and 24 months, we find negative correlations between aggregate corporate liquidity demand and post-merger performance.

Panel B of Table 12 shows the calendar-time portfolio approach results by aggregate market liquidity supply $Debt/GDP$ constructed portfolios. For high aggregate liquidity portfolios, we find significant and negative post-merger performance for acquiring firms up to three years after merger completions. For low aggregate liquidity portfolios, there are not such negative performance, and all coefficient are not different from zero.

In order to see whether this negative correlation between aggregate liquidity and post-merger performance exist in each sub-sample mergers, we calculate the calendar-time portfolio abnormal returns for 12 months time after the completion of acquisitions for each subgroups, which sorted into targets' public status and method of payment. The results are shown in table 13. We can see that the pattern partially remains for some subsamples.

—insert Table 13 here—

To sum up, the results by calendar-time portfolio approach strongly support our prediction for the whole merger sample. Subsample created on deal characteristics generate mixed results. Also, the long-term results become weaker as the testing period increase. Further investigation with calendar-time portfolio approach are needed.

6 Conclusion

This study is motivated by the theoretical model of Holmström and Tirole (1998, 2001) and many research in M&A about market valuation on merger activity and performance. Previous studies seldom realize the important of the aggregate liquidity and its implication on asset pricing. Considering that many predictors for stock market returns can be successfully used in mergers and acquisitions studies, and have quite predictive power, therefore we suppose that liquidity premium, measured

by aggregate corporate liquidity demand and aggregate market liquidity supply can also be applied to explain merger activity or performance. In this paper we seek answers to the following questions. Are merger activity in periods after high aggregate liquidity fundamentally different from activity after low aggregate liquidity? Whether acquisitions undertaken after low aggregate liquidity period are of better performance than those undertaken after high aggregate liquidity periods? If aggregate liquidity and liquidity premium, indeed, can be used to explain merger activity and performance, we should find strong correlation between aggregate liquidity and acquisitions.

Through empirical investigation, we find that aggregate liquidity do has positive impact and prediction on merger activity. Merger activity tend to be high in the period after high aggregate liquidity, and activity become lower when aggregate liquidity is low. Also, there are more (less) merger announcements with pure stock payment than cash payment merger announcements in high (low) aggregate liquidity period. Short-run abnormal returns around announcement and long-run post-merger performance all show some supporting results, although long-run results only significant in period of one year. Our overall conclusion is that merger activity is highly correlated with the aggregate liquidity factors. The results also suggest that acquisitions undertaken after periods of high aggregate liquidity are of lower quality than those undertaken during periods of low aggregate liquidity.

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Figure 1: Time Line of Aggregate Liquidity Prediction on Mergers

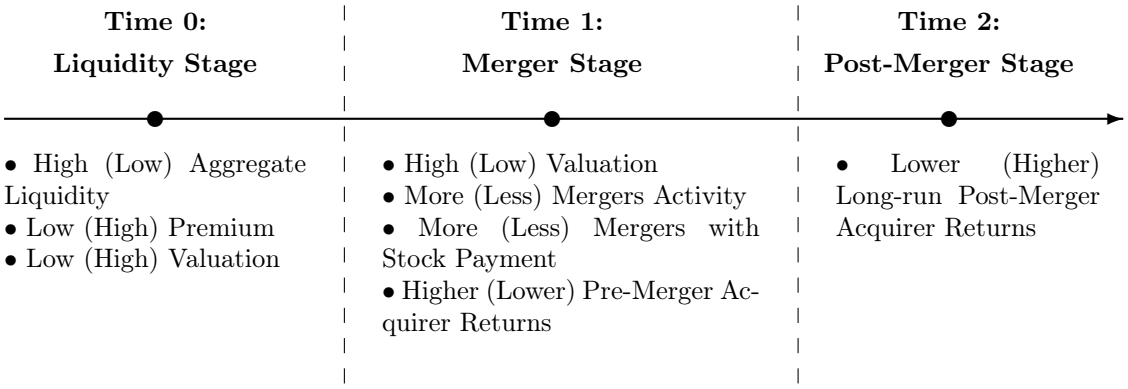
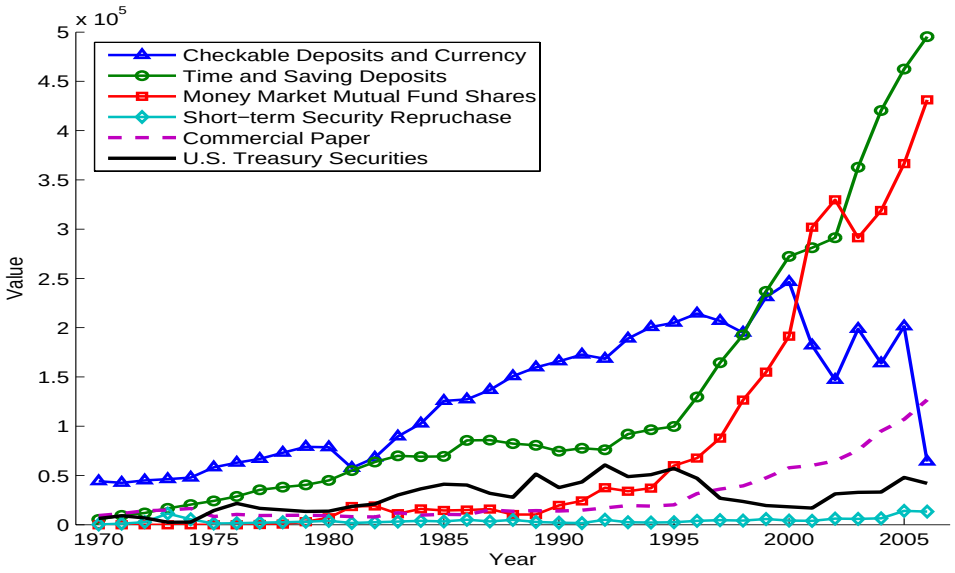


Figure 2: Time-Series of Liquidity Components

This figure presents the time series performance of each corporate liquidity component holding levels (in Panel A) and holding shares (in Panel B). The sample of aggregate corporate liquidity components consists of 37 annual data between 1970 and 2006 measured from Federal Reserve *Flow of Funds* Accounts. The liquidity components include checkable deposits and currency, time and savings deposits, money market mutual fund shares, short-term security repurchase agreements, commercial paper, and U.S. treasury securities. Panel A shows the values of these aggregate liquidity components in each year. Panel B shows the ratios of each of these liquidity components to total liquidity levels in each year.

Panel A. Liquidity Component Values



Panel B. Liquidity Component Ratios

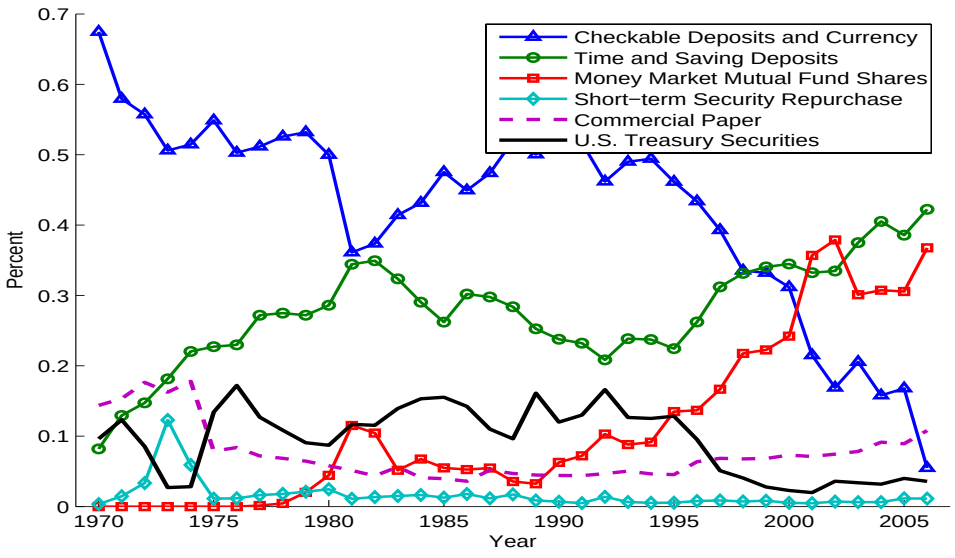


Figure 3: Aggregate Corporate Liquidity Demand

This figure presents the time-series performance of aggregate corporate liquidity demand measures. The sample of aggregate liquidity measures include 24 years' annual aggregate corporate liquidity demand measures ($\Delta L/S$, $\Delta L/L_{t-1}$) between 1979 and 2002. Aggregate corporate liquidity demand measures include the liquidity investment share ($\Delta L/S$), which is the ratio of changes in aggregate corporate liquidity (ΔL) to aggregate sources of corporate funds (S), and the percentage changes in liquidity holdings ($\Delta L/L_{t-1}$), which is the ratio of changes in aggregate corporate liquidity (ΔL) to the level of aggregate corporate liquidity holdings in last year (L_{t-1}). The aggregate sources of corporate funds (S) is the sum of corporate internal funds ($(P + Div)$), equity issues (E), and debt issues (D). The thick sold line represent the time series of the change in liquidity investment level divided by total sources of funds ($\Delta L/S$). The dashed line shows the time series of the change in liquidity investment level scaled by previous holdings ($\Delta L/L_{t-1}$). Data for liquidity measures are collected from the Federal Reserve *Flow of Funds* Accounts.

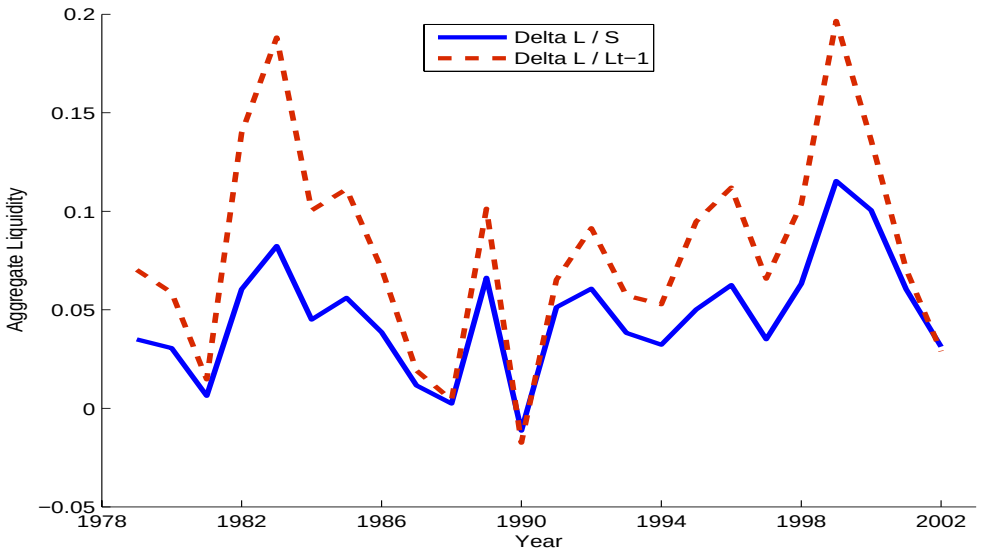


Figure 4: Aggregate Market Liquidity Supply

This figure presents the time-series performance of aggregate market liquidity supply measures. The sample of aggregate liquidity measures include 24 years' annual aggregate market liquidity supply measures ($Debt/GDP$) between 1979 and 2002. Aggregate market liquidity supply measure ($Debt/GDP$), is the ratio of U.S. publicly held treasury debt relative to U.S. GDP in that year. The Debt/GDP ratio data is downloaded from Henning Bohn's website, and updated until 2006 from the Economic Report of the President and NIPA data.

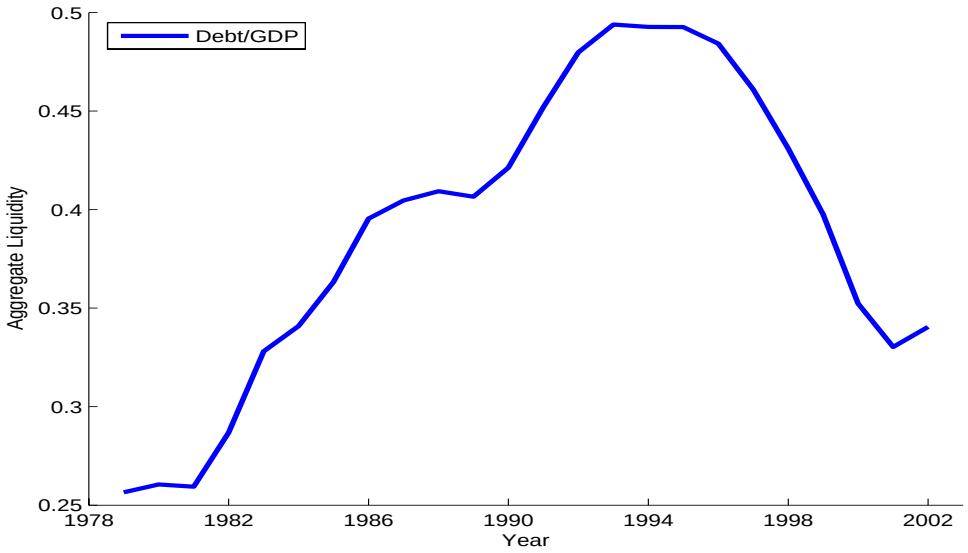


Figure 5: Annual Number of Mergers Deals, 1980 to 2003

This figure presents the annual number of merger deals and annual number of acquiring firms from 1980 to 2003. The merger sample contains 4162 completed U.S. domestic mergers and acquisitions between 1980 and 2003 listed on SDC, where the publicly traded acquiring firm is listed on the NYSE, AMEX, or NASDAQ, and gains control of a public, private, or subsidiary target firm whose transaction value is at least $100 million.

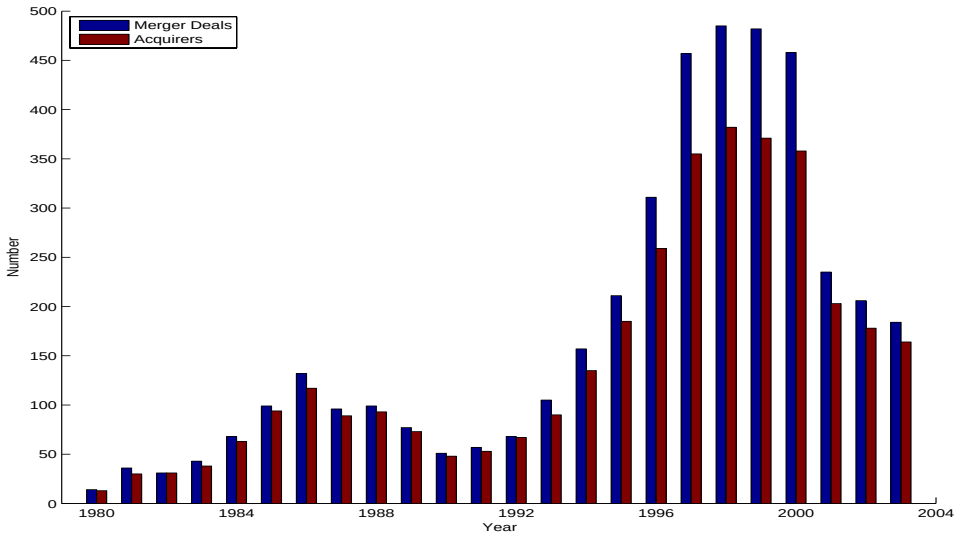
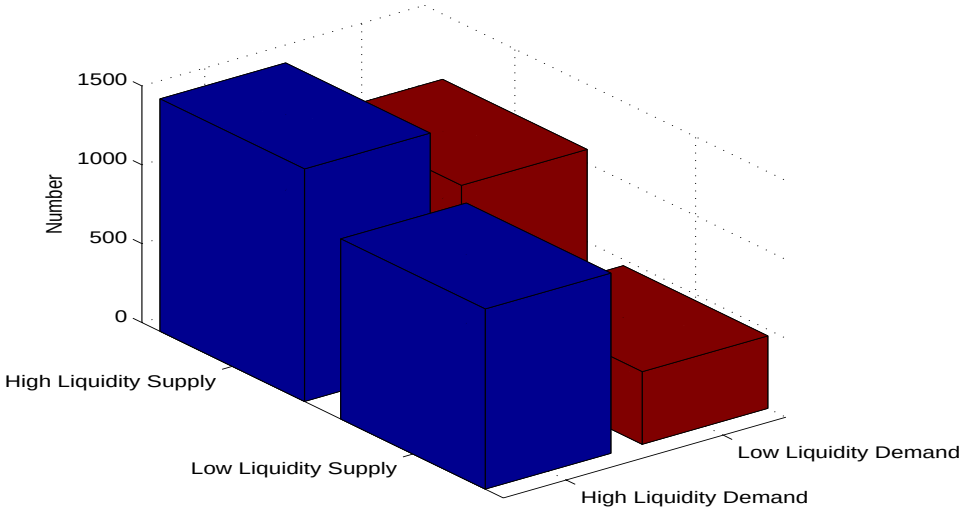


Figure 6: Merger Sample Distribution by Aggregate Liquidity Measures

This figure presents the distribution of merger sample by both aggregate corporate liquidity demand measure $\Delta L/S$ and aggregate market liquidity supply measure $Debt/GDP$. The merger sample contains 4162 completed U.S. domestic mergers and acquisitions between 1980 and 2003 listed on SDC, where the publicly traded acquiring firm is listed on the NYSE, AMEX, or NASDAQ, and gains control of a public, private, or subsidiary target firm whose transaction value is at least \$100 million. The merger sample is first divided into high liquidity demand portfolio and low liquidity demand portfolio. Then each portfolio is further divided into high liquidity supply and low liquidity supply groups. Aggregate corporate liquidity demand is the liquidity investment share ($\Delta L/S$), which is the ratio of changes in aggregate corporate liquidity (ΔL) to aggregate sources of corporate funds (S). Aggregate market liquidity supply measure ($Debt/GDP$), is the ratio of U.S. publicly held treasury debt relative to U.S. GDP in that year. Panel A shows the number of merger deals of each portfolio, while Panel B shows the mean transaction values of each portfolio.

Panel A. Deal Amount



Panel B. Mean Transaction Value (\$ millions)

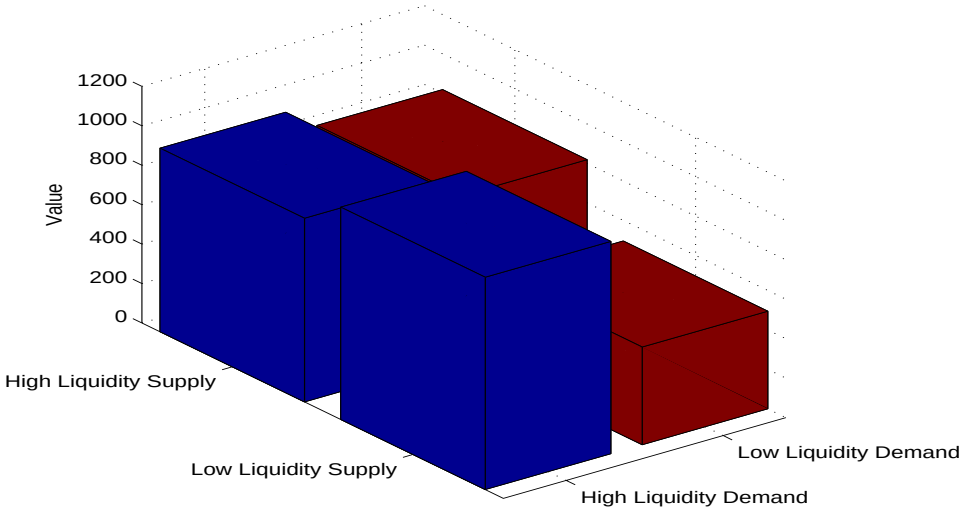
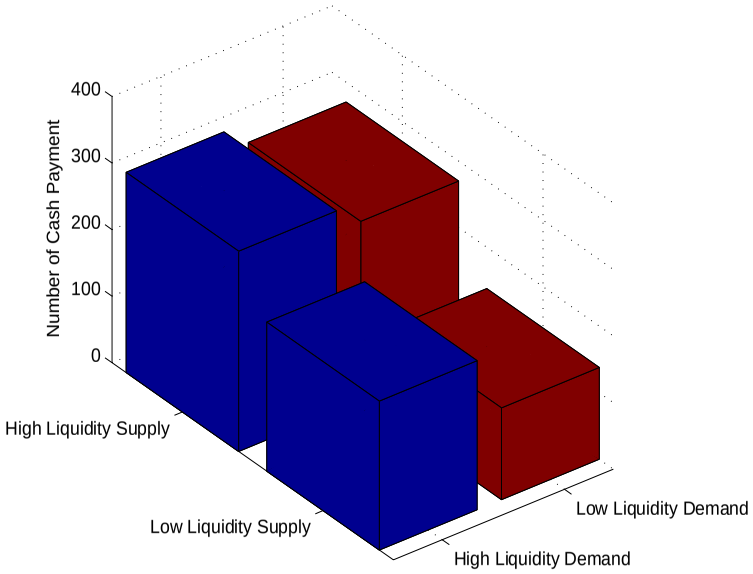


Figure 7: Merger Sample Distribution by Aggregate Liquidity Measures and Methods of Payment

This figure presents the distribution of pure cash or stock payment merger sample by both aggregate corporate liquidity demand measure $\Delta L/S$ and aggregate market liquidity supply measure $Debt/GDP$. The merger sample contains 4162 completed U.S. domestic mergers and acquisitions between 1980 and 2003 listed on SDC, where the publicly traded acquiring firm is listed on the NYSE, AMEX, or NASDAQ, and gains control of a public, private, or subsidiary target firm whose transaction value is at least $100 million. The pure cash (or stock) payment merger sample is first divided into high liquidity demand portfolio and low liquidity demand portfolio. Then each portfolios is further divided into high liquidity supply and low liquidity supply groups. Aggregate corporate liquidity demand is the liquidity investment share ($\Delta L/S$), which is the ratio of changes in aggregate corporate liquidity (ΔL) to aggregate sources of corporate funds (S). Aggregate market liquidity supply measure ($Debt/GDP$), is the ratio of U.S. publicly held treasury debt relative to U.S. GDP in that year. Panel A shows the amount of merger deals distribution of pure cash payment merger sample, while Panel B shows the amount of merger deals distribution of pure stock payment merger sample.

Panel A. Cash Payment Mergers



Panel B. Stock Payment Mergers

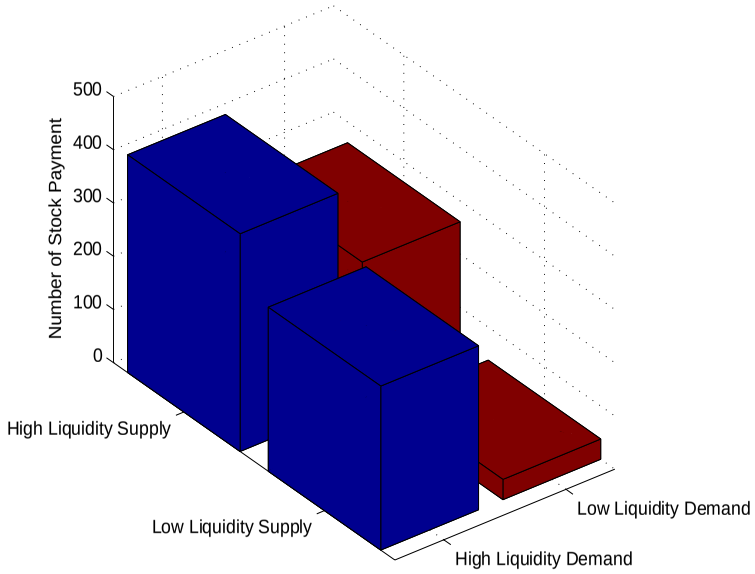
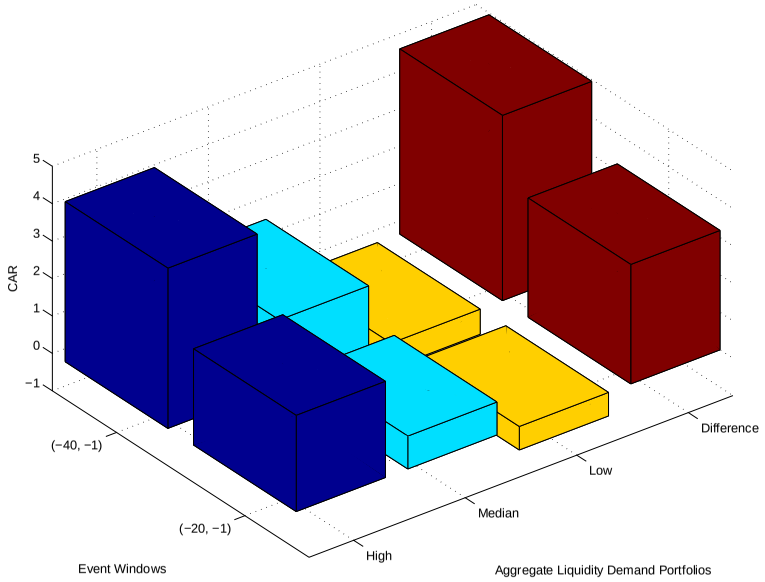


Figure 8: Pre-Announcement Cumulative Abnormal Returns

This figure presents the acquiring firms' pre-announcement cumulative abnormal returns (CAR) for merger deals within aggregate corporate liquidity demand $\Delta L/S$ and aggregate market liquidity supply $Debt/GDP$ constructed portfolios. The merger sample contains 4162 completed U.S. domestic mergers and acquisitions between 1980 and 2003 listed on SDC, where the publicly traded acquiring firm is listed on the NYSE, AMEX, or NASDAQ, and gains control of a public, private, or subsidiary target firm whose transaction value is at least $100 million. Merger deals with announcement happened in the next year $(t+1)$ of the lowest (or highest) 30% aggregate corporate liquidity demand $(\Delta L/S)$ or aggregate market liquidity supply $(Debt/GDP)$ years (t) are put into the low (or high) aggregate corporate liquidity demand portfolios or aggregate market liquidity supply portfolios respectively. Panel A shows the results of aggregate corporate liquidity demand portfolios based on $\Delta L/S$. Panel B shows the results of aggregate market liquidity supply portfolio based on $Debt/GDP$. To calculate CAR, firstly the daily abnormal returns (AR) for each event firm for period ranging from -1 day to -40 day are calculated: $AR_{it} = R_{it} - R_{mt}$, where R_{it} is i firm's stock return on date t and R_{mt} is the return for the EW-CRSP index on date t. Then CAR are calculated by summing the daily AR over the event windows (-20,-1) and (-40,-1) respectively. The differentials between high liquidity portfolios and low liquidity portfolios for each category are reported and labeled as "Difference".

Panel A. Aggregate Corporate Liquidity Demand ΔL Portfolios



Panel B. Aggregate Market Liquidity Supply $Debt/GDP$ Portfolios

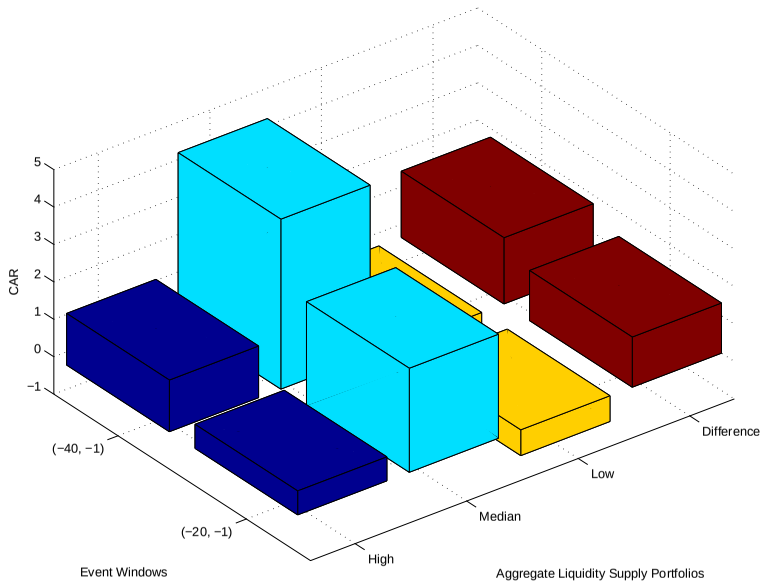
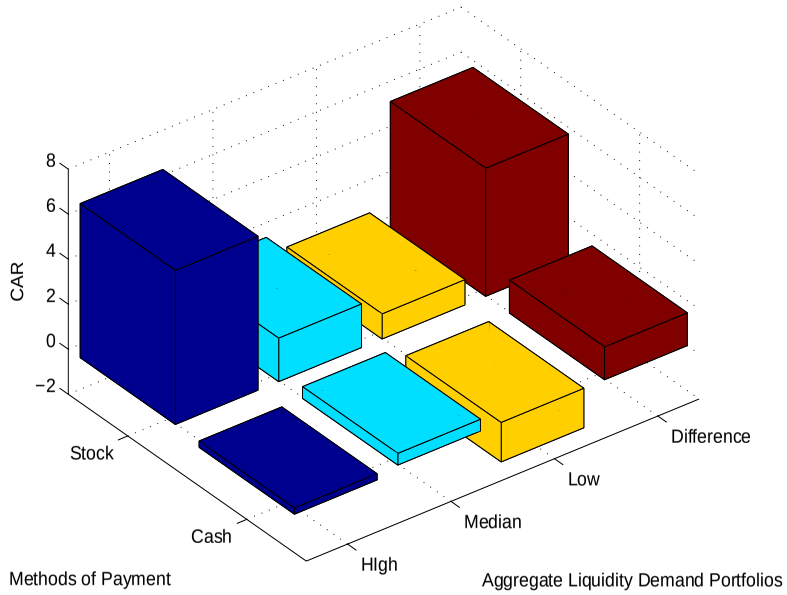


Figure 9: Pre-Announcement Cumulative Abnormal Returns for Aggregate Liquidity Demand Portfolios separated by Methods of Payment

This figure presents the acquiring firms' pre-announcement cumulative abnormal returns (CAR) for merger deals within aggregate corporate liquidity demand $\Delta L/S$ and aggregate market liquidity supply $Debt/GDP$ constructed portfolios. The merger sample contains 4162 completed U.S. domestic mergers and acquisitions between 1980 and 2003 listed on SDC, where the publicly traded acquiring firm is listed on the NYSE, AMEX, or NASDAQ, and gains control of a public, private, or subsidiary target firm whose transaction value is at least $100 million. Merger deals with announcement happened in the next year $(t+1)$ of the lowest (or highest) 30% aggregate corporate liquidity demand $(\Delta L/S)$ or aggregate market liquidity supply $(Debt/GDP)$ years (t) are put into the low (or high) aggregate corporate liquidity demand portfolios or aggregate market liquidity supply portfolios respectively. Panel A shows the results of aggregate corporate liquidity demand portfolios based on $\Delta L/S$. Panel B shows the results of aggregate market liquidity supply portfolio based on $Debt/GDP$. To calculate CAR, firstly the daily abnormal returns (AR) for each event firm for period ranging from -1 day to -40 day are calculated: $AR_{it} = R_{it} - R_{mt}$, where R_{it} is i firm's stock return on date t and R_{mt} is the return for the EW-CRSP index on date t. Then CAR are calculated by summing the daily AR over the event windows (-20,-1) and (-40,-1) respectively. The differentials between high liquidity portfolios and low liquidity portfolios for each category are reported and labeled as "Difference".

Panel A. Event Window (-20, -1)



Panel B. Event Window (-40,-1)

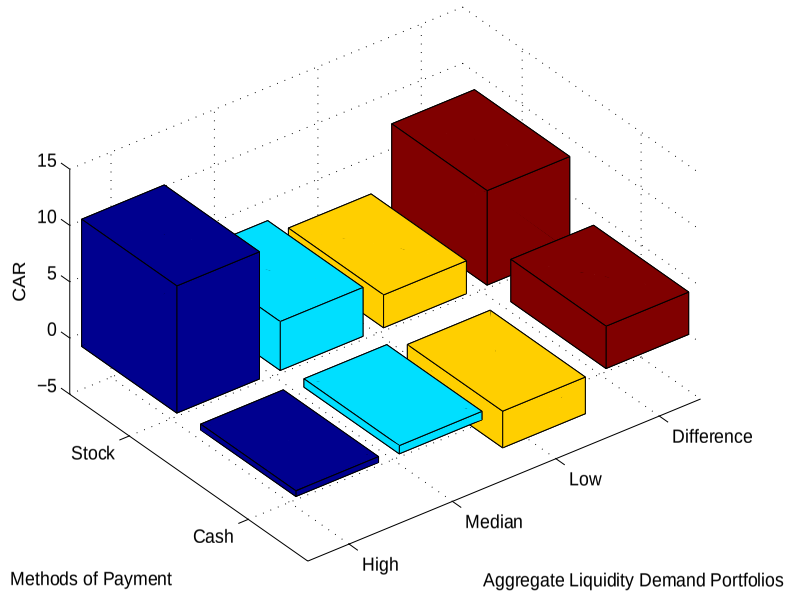
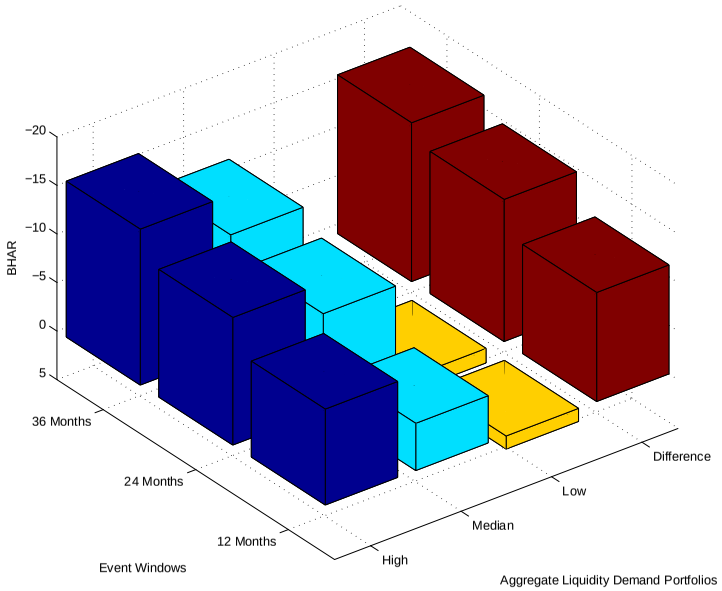


Figure 10: Post-Merger Buy-and-Hold Abnormal Returns

This figure presents the acquiring firms' post-merger buy-and-hold abnormal returns (BHAR) for merger deals within aggregate corporate liquidity demand $\Delta L/S$ and aggregate market liquidity supply $Debt/GDP$ constructed portfolios. The merger sample contains 4162 completed U.S. domestic mergers and acquisitions between 1980 and 2003 listed on SDC, where the publicly traded acquiring firm is listed on the NYSE, AMEX, or NASDAQ, and gains control of a public, private, or subsidiary target firm whose transaction value is at least \$100 million. Merger deals with announcement happened in the next year $(t+1)$ of the lowest (or highest) 30% aggregate corporate liquidity demand $(\Delta L/S)$ or aggregate market liquidity supply $(Debt/GDP)$ years (t) are put into the low (or high) aggregate corporate liquidity demand portfolios or aggregate market liquidity supply portfolios respectively. Panel A shows the results of aggregate corporate liquidity demand portfolios based on $\Delta L/S$. Panel B shows the results of aggregate market liquidity supply portfolio based on $Debt/GDP$. To calculate the BHAR, we first calculate the buy-and-hold returns (BHR) for each event firm for a period ranging from 1 month to 12, 24, or 36 month respectively, where month 0 is the effective month in mergers: $BHR_{iT} = \prod_{t=1}^{T}(1+R_{it}) - 1$, where i is the event-firm index, R_{it} is the month t simple return on firm i, and T is the horizon over which the BHR_{iT} is computed. Then the buy-and-hold returns for a reference portfolio is calculated as $BHR_{p_i,T} = \prod_{t=1}^{T}[1 + \frac{\sum_{j=1}^{N_t} R_{jt}}{N_t}] - 1$, where p_i is the index for the reference portfolio of the event firm i, N_t is the number of firms in the reference portfolio in month t, and R_{jt} is the return for firm j in the reference portfolio p_i during the event-month t for event firm i. The mean BHAR are then calculated as $BHAR_T = \frac{1}{N}\sum_{i=1}^{N}(BHR_{iT} - BHR_{p_iT})$, where N is the number of event firms that have valid BHR for event period 12, 24, or 36 months. The differentials between high liquidity portfolios and low liquidity portfolios for each category are reported and labeled as "Difference".

Panel A. Aggregate Corporate Liquidity Demand ΔL Portfolios



Panel B. Aggregate Market Liquidity Supply $Debt/GDP$ Portfolios

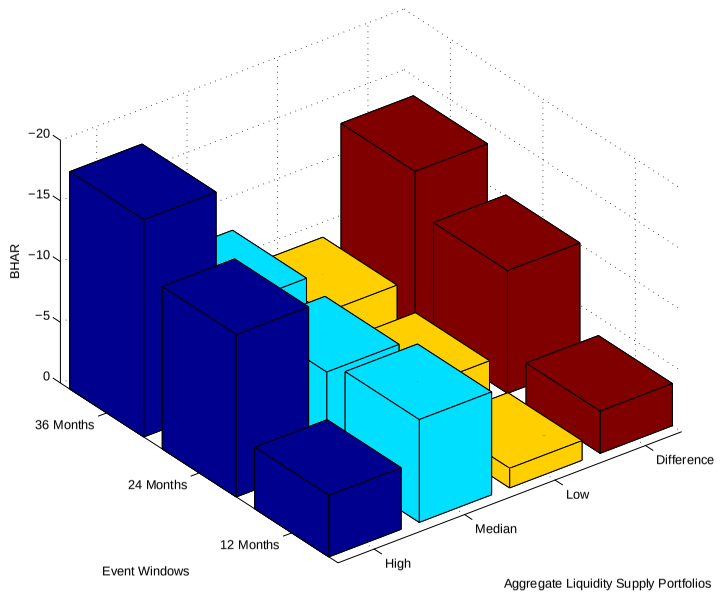


Table 1: Summary Statistics for Aggregate Liquidity Measures

This table presents the descriptive statistics results for aggregate liquidity measures. The sample of aggregate liquidity measures include 24 years' annual aggregate corporate liquidity demand measures ($\Delta L/S$, $\Delta L/L_{t-1}$) and aggregate market liquidity supply measure ($Debt/GDP$) between 1979 and 2002. Aggregate corporate liquidity demand measures include the liquidity investment share ($\Delta L/S$), which is the ratio of changes in aggregate corporate liquidity (ΔL) to aggregate sources of corporate funds (S), and the percentage changes in liquidity holdings ($\Delta L/L_{t-1}$), which is the ratio of changes in aggregate corporate liquidity (ΔL) to the level of aggregate corporate liquidity holdings in last year (L_{t-1}). The aggregate sources of corporate funds (S) is the sum of corporate internal funds ($(P+Div)$), equity issues (E), and debt issues (D). Aggregate market liquidity supply measure ($Debt/GDP$), is the ratio of U.S. publicly held treasury debt relative to U.S. GDP in that year. Panel A reports the number of observations, time-series mean, median, extreme values, first and third quartile, autocorrelation for aggregate liquidity measures. Panel B report the same analysis results for the ratio of each flow of funds variables, including internal funds ($(P+Div)/S$), external funds ($(E+D)/S$), net equity or debt issues (E/S or D/S), changes in fixed investment ($\Delta Fixed$), changes in inventory investment (ΔInv), changes in working capital (ΔWC), and changes in residual term ($\Delta Other$), to the aggregate sources of corporate funds (S). All variable results are given in percentage terms (%) except number and autocorrelation. Data is collected from the Federal Reserve *Flow of Funds* Accounts and Henning Bohn's website.

	Number	Mean	Minimum	First Quartile	Median	Third Quartile	Maximum	Standard Deviation	Auto-Correlation
Panel A: Aggregate Liquidity Measures									
Aggregate Corporate Liquidity Demand									
$\Delta L/S$	24	4.69	−1.13	3.15	4.76	6.21	11.53	2.93	0.27
$\Delta L/L_{t-1}$	24	8.07	−1.75	5.39	7.07	10.93	19.66	5.28	0.29
Aggregate Market Liquidity Supply									
$Debt/GDP$	24	38.92	25.65	33.29	40.11	45.88	49.39	7.75	0.89
Panel B: Flow of Funds									
Sources of Funds									
$(P+Div)/S$	24	81.47	69.73	73.81	79.07	86.59	108.69	9.88	0.44
$(E+D)/S$	24	18.53	−8.69	13.41	20.93	26.19	30.27	9.88	0.44
E/S	24	−8.57	−28.00	−16.29	−7.36	−0.32	5.36	9.93	0.58
D/S	24	27.10	−13.26	22.02	29.69	37.10	46.14	14.88	0.51
Uses of Funds									
$\Delta F/S$	24	81.80	69.44	73.59	81.17	87.92	103.62	8.88	0.50
$\Delta Inv/S$	24	3.86	−5.31	1.78	4.80	6.49	11.75	3.73	0.05
$\Delta W/S$	24	1.83	−2.75	−1.05	0.78	2.61	15.53	4.73	0.67
$\Delta Other/S$	24	7.83	−10.17	1.62	8.00	16.55	24.69	9.87	0.36

Table 2: Time-Series Regression Analysis

This table presents the time series regressions of aggregate corporate liquidity demand $\Delta L/S$ on aggregate market liquidity supply measure $Debt/GDP$, net equity and debt issues $(E+D)/S$, changes in fixed investment $\Delta Fixed/S$, and change in inventory $\Delta Inv/S$. The sample of aggregate liquidity measures include 24 years' annual aggregate corporate liquidity demand measures $(\Delta L/S)$ and aggregate market liquidity supply measure $(Debt/GDP)$ between 1979 and 2002. Aggregate corporate liquidity demand measures include the liquidity investment share $(\Delta L/S)$, which is the ratio of changes in aggregate corporate liquidity (ΔL) to aggregate sources of corporate funds (S). The aggregate sources of corporate funds (S) is the sum of corporate internal funds $((P+Div))$, equity issues (E), and debt issues (D). Data is collected from the Federal Reserve *Flow of Funds* Accounts and Henning Bohn's website. T-statistics are reported in parentheses.

Independent Variable	(1)	(2)	(3)	(4)	(5)
$Debt/GDP$	0.011				0.128
	(0.14)				(1.17)
$(E+D)/Sources$		0.029		0.087	0.165
		(0.46)		(1.09)	(1.60)
$\Delta Fixed/Sources$			0.051	0.112	0.164
			(0.66)	(1.18)	(1.58)
$\Delta Inv/Sources$			0.010	0.030	−0.028
			(0.05)	(0.16)	(−0.15)
Intercept	0.042	0.042	0.005	−0.062	−0.166
	(1.33)	(3.15)	(0.07)	(−0.69)	(−1.32)

Table 3: Yearly Distribution of Mergers Sample

This table presents the number of transactions, number of acquirers, mean (median) value of transactions, the number of mergers classified by method of payment (e.g., pure cash, pure stock, and mixed), the number of mergers classified by target firms' public status (e.g., public, private, and subsidary) by calendar year. The merger sample contains 4,162 completed U.S. domestic mergers and acquisitions between 1980 and 2003 listed on SDC, where the publicly traded acquiring firm is listed on the NYSE, AMEX, or NASDAQ, and gains control of a public, private, or subsidiary target firm whose transaction value is at least $100 million. Mean (median) value of transaction is the average (median) transaction value in millions of U.S. dollar as reported by SDC. Pure cash or stock payment refer to transactions that are known to be paid in 100% cash or stock, respectively. Mixed payment transactions include combinations of cash, stocks, and derivative securities. Transactions with unknown type of payment or missing data are omitted from the method of payment columns.

Year	Number	Number of Acquirers	Mean Value of Transactions	Median Value of Transaction	Pure Cash Payment	Pure Stock Payment	Mixed Payment	Public Targets	Private Targets	Subsidiary Targets
1980	14	13	379.1	270.3	1	1	10	5	4	5
1981	36	30	321.1	226.1	2	1	30	21	5	10
1982	31	31	277.0	200.0	0	0	30	11	6	14
1983	43	38	318.9	193.0	0	0	41	21	9	13
1984	68	63	323.5	188.8	5	2	55	32	3	30
1985	99	94	696.2	264.0	43	10	27	51	6	41
1986	132	117	439.5	250.0	33	13	27	53	25	54
1987	96	89	487.3	222.1	28	11	26	43	12	41
1988	99	93	563.5	230.0	38	6	23	42	17	38
1989	77	73	612.4	190.0	29	12	18	35	6	34
1990	51	48	621.6	185.5	13	15	14	19	8	24
1991	57	53	354.2	202.4	16	10	24	24	10	22
1992	68	67	357.6	202.2	17	18	22	29	18	21
1993	105	90	786.6	205.0	23	26	35	36	17	50
1994	157	135	630.9	186.9	51	42	36	57	40	58
1995	211	185	652.4	227.1	40	70	69	97	47	64
1996	311	259	691.7	228.0	65	77	114	124	83	100
1997	457	355	661.9	255.0	87	102	179	168	128	159
1998	485	382	1,092.1	232.3	96	121	170	173	151	157
1999	482	371	1,486.7	294.9	96	171	141	194	152	129
2000	458	358	1,511.2	347.4	58	217	127	167	197	91
2001	235	203	1,234.9	300.0	57	49	93	83	72	76
2002	206	178	745.7	211.1	71	27	74	58	65	79
2003	184	164	471.4	179.6	64	15	60	45	60	74
Total	4,162	1,955	893.8	245.7	933	1,016	1,445	1,588	1,141	1,384

Table 4: Merger Sample Distribution by Aggregate Liquidity Measures

This table presents the number of merger deals and mean transaction values of various liquidity measures constructed portfolios. The merger sample contains 4162 completed U.S. domestic mergers and acquisitions between 1980 and 2003 listed on SDC, where the publicly traded acquiring firm is listed on the NYSE, AMEX, or NASDAQ, and gains control of a public, private, or subsidiary target firm whose transaction value is at least $100 million. Merger deals with announcement happened in the next year $(t+1)$ of the lowest (or highest) 30% aggregate corporate liquidity demand ($\Delta L/S$, $\Delta L/L_{t-1}$) or aggregate market liquidity supply ($Debt/GDP$) years (t) are put into the low (or high) aggregate liquidity demand portfolios or aggregate liquidity supply portfolios respectively. Panel A (B) shows the results of aggregate corporate liquidity demand portfolios based on $\Delta L/S$ ($\Delta L/L_{t-1}$). Panel C shows the results of aggregate market liquidity supply portfolio based on $Debt/GDP$. Mean value of transactions is the average transaction value in millions of U.S. dollars and reported in brackets.

	Total	High (30%)	Medium (40%)	Low (30%)
Panel A: Liquidity Demand: $\Delta L/S$				
All Firms	4162	1856	1611	695
	[894]	[1152]	[754]	[529]
Panel B: Liquidity Demand: $\Delta L/L_{t-1}$				
All Firms	4162	1875	1471	816
	[894]	[1117]	[795]	[558]
Panel C: Liquidity Supply: $Debt/GDP$				
All Firms	4162	1794	1786	582
	[894]	[775]	[1135]	[518]

Table 5: Merger Sample Distribution by Aggregate Liquidity and Deal Characteristics

This table presents the number of merger deals and mean transaction values of various sub-group of aggregate liquidity measures constructed portfolios. The merger sample contains 4162 completed U.S. domestic mergers and acquisitions between 1980 and 2003 listed on SDC, where the publicly traded acquiring firm is listed on the NYSE, AMEX, or NASDAQ, and gains control of a public, private, or subsidiary target firm whose transaction value is at least $100 million. Merger deals with announcement happened in the next year $(t+1)$ of the lowest (or highest) 30% aggregate corporate liquidity demand ($\Delta L/S$, $\Delta L/L_{t-1}$) or aggregate market liquidity supply ($Debt/GDP$) years (t) are put into the low (or high) aggregate liquidity demand portfolios or aggregate liquidity supply portfolios respectively. Panel A (B) shows the results of aggregate corporate liquidity demand portfolios based on $\Delta L/S$ ($\Delta L/L_{t-1}$). Panel C shows the results of aggregate makret liquidity supply portfolio based on $Debt/GDP$. Various high-, medium-, and low-liquidity portfolios are further divided into target firms' public status (i.e., public, private, subsidiary), methods of payment (i.e., cash, stock, mixed), and transaction values (i.e., high 30%, median 40%, low 30%). Mean value of transactions is the average transaction value in millions of U.S. dollars and reported in brackets.

		Panel A: Demand $\Delta L/S$			**Panel B: Demand $\Delta L/S$**			**Panel C: Supply $Debt/GDP$**		
	Total	High(30%)	Med(40%)	Low(30%)	High(30%)	Med(40%)	Low(30%)	High(30%)	Med(40%)	Low(30%)
Sorted by Targets Public Status										
Public	1588	699	614	275	718	559	311	684	711	193
	[1666]	[2188]	[1430]	[868]	[2073]	[1551]	[933]	[1442]	[2075]	[955]
Private	1141	577	413	151	586	369	186	484	505	152
	[318]	[378]	[275]	[209]	[381]	[249]	[258]	[280]	[382]	[229]
Subsidiary	1384	559	569	256	552	528	304	609	550	225
	[491]	[666]	[379]	[357]	[662]	[385]	[364]	[428]	[618]	[350]
Sorted by Methods of Payment										
All Cash	933	339	405	189	336	359	238	379	411	143
	[480]	[493]	[485]	[445]	[513]	[438]	[497]	[489]	[519]	[342]
All Stock	1016	582	320	114	554	307	155	456	514	46
	[1381]	[1541]	[1326]	[719]	[1562]	[1376]	[742]	[1018]	[1642]	[2059]
Mixed	1445	644	547	254	663	522	260	625	520	300
	[1112]	[1523]	[893]	[545]	[1427]	[971]	[594]	[1056]	[1595]	[395]
Sorted by Transaction Values										
High Value	1248	635	445	168	644	402	202	539	536	173
	[2509]	[2963]	[2208]	[1586]	[2851]	[2380]	[1674]	[2131]	[3255]	[1340]
Med Value	1666	724	655	287	742	604	320	721	715	236
	[260]	[267]	[256]	[250]	[267]	[256]	[252]	[245]	[297]	[211]
Low Value	1248	497	511	240	489	465	294	534	535	173
	[125]	[126]	[125]	[123]	[126]	[125]	[124]	[123]	[132]	[115]

Table 6: Aggregate Liquidity Measures and Merger Activity

This table presents the results of univariate regression of merger activity on aggregate liquidity measures. The merger sample contains 4162 completed U.S. domestic mergers and acquisitions between 1980 and 2003 listed on SDC, where the publicly traded acquiring firm is listed on the NYSE, AMEX, or NASDAQ, and gains control of a public, private, or subsidiary target firm whose transaction value is at least $100 million. The univariate OLS regressions of annual log number of mergers on lagged aggregate liquidity measures: $Mrg = \alpha + \beta X_{t-1} + \mu_t$. The dependent variable is the annual log number of merger deals of the full sample and each subsample separated based on target firms' public status (i.e., public, private, subsidiary), or payment methods (i.e., cash, stock, mixed). The independent variables X_{t-1} include aggregate corporate liquidity demand measures ($\Delta L/S$,$\Delta L/L_{t-1}$), aggregate market liquidity supply $Debt/GDP$. Aggregate corporate liquidity demand measures include the liquidity investment share ($\Delta L/S$), which is the ratio of changes in aggregate corporate liquidity (ΔL) to aggregate sources of corporate funds (S), and the percentage changes in liquidity holdings ($\Delta L/L_{t-1}$), which is the ratio of changes in aggregate corporate liquidity (ΔL) to the level of aggregate corporate liquidity holdings in last year (L_{t-1}). Aggregate market liquidity supply measure ($Debt/GDP$), is the ratio of U.S. publicly held treasury debt relative to U.S. GDP in that year. t-statistics are reported in parentheses. Superscripts a, b, c indicate significant at the 1, 5, and 10 percent levels, respectively.

		Public Status			Payment Method		
	All	Public	Private	Sub	Cash	Stock	Mix
$\Delta L/Sources$	5.84^b	5.45^b	7.66^c	4.59^c	0.69	6.16	5.59^b
	(2.13)	(2.07)	(2.04)	(1.75)	(0.27)	(1.60)	(2.48)
$\Delta L/L_{t-1}$	2.28	2.41	2.28	1.64	-0.43	2.17	2.72^b
	(1.42)	(1.60)	(1.02)	(1.08)	(-0.30)	(0.97)	(2.10)
$Debt/GDP$	3.36^a	3.26^a	4.00^a	3.26^a	1.23	4.77^b	$1.67c$
	3.79	3.90	3.09	4.07	0.94	2.62	1.85
N	24	24	24	24	20	20	24

Table 7: Aggregate Liquidity Measures and Post-Merger Returns

This table presents the results of univariate regression and multivariate regressions of post-merger portfolio returns on various aggregate liquidity measures. The merger sample contains 4162 completed U.S. domestic mergers and acquisitions between 1980 and 2003 listed on SDC, where the publicly traded acquiring firm is listed on the NYSE, AMEX, or NASDAQ, and gains control of a public, private, or subsidiary target firm whose transaction value is at least $100 million. Panel A shows the univariate OLS regressions of annual portfolio returns on lagged liquidity measures: $R_{pt} = \alpha + \beta X_{t-1} + \mu_t$. The dependent variable is the annual returns on the equal-weighted post-merger portfolios of the full sample and each subgroup separated based on target firms' public status (i.e., public, private, subsidiary), or payment methods (i.e., cash, stock, mixed). Acquirer firms enter the portfolio on the effective month of the merger and remain for 12 months. Calendar portfolios are rebalanced each month to include firms that have just completed a merger and to disregard the ones that have just fulfilled 12 months. The independent variables include liquidity investment share ($\Delta L/S$), which is the ratio of changes in aggregate corporate liquidity (ΔL) to aggregate sources of corporate funds (S); percentage changes in liquidity holdings ($\Delta L/L_{t-1}$), which is the ratio of changes in aggregate corporate liquidity (ΔL) to the level of aggregate corporate liquidity holdings in last year (L_{t-1}); and liquidity supply measure ($Debt/GDP$), which is the ratio of US publicly held Treasury debt relative to GDP. Panel B shows the results for multivariate OLS regressions: $R_{pt} = \alpha + \beta X_{t-1} + \gamma Y_{t-1} + \mu_t$, where the dependent variables is the same as univariate regressions. X denotes the $\Delta L/S$ and Y denotes the $(E+D)/S$. t-statistics are reported in parentheses. Superscripts a, b, c indicate significant at the 1, 5, and 10 percent levels, respectively.

		Public Status			Payment Method		
	All	Public	Private	Sub	Cash	Stock	Mix
Panel A: Univariate Regressions							
$\Delta L/S$	-4.40^a	-4.06^a	-5.11^a	-3.45^a	-2.87^a	-6.96^a	-3.40^b
	(-3.62)	(-3.52)	(-2.88)	(-3.17)	(-2.78)	(-4.71)	(-2.45)
$\Delta L/L_{t-1}$	-1.96^b	-1.84^b	-2.09^c	-1.59^b	-1.35^b	-4.05^a	-1.47^c
	(-2.63)	(-2.62)	(-1.95)	(-2.46)	(-2.30)	(-4.17)	(-1.82)
$Debt/GDP$	0.08	-0.03	0.08	0.18	0.34	-0.00	0.13
	(0.13)	(-0.05)	(0.11)	(0.36)	(0.72)	(-0.00)	(0.22)
$(E+D)/S$	-0.29	-0.40	0.09	-0.29	-0.28	-0.23	-0.35
	(-0.65)	(-0.95)	(0.13)	(-0.74)	(-0.80)	(-0.36)	(-0.76)
Panel B: Multivariate Regressions							
$\Delta L/S$	-4.34^a	-3.97^a	-5.21^a	-3.39^a	-2.73^b	-6.94^a	-3.32^b
	(-3.50)	(-3.39)	(-2.87)	(-3.05)	(-2.65)	(-4.59)	(-2.34)
$(E+D)/S$	-0.17	-0.29	0.27	-0.19	-0.18	-0.15	-0.25
	(-0.46)	(-0.83)	(0.48)	(-0.57)	(-0.59)	(-0.34)	(-0.60)
Intercept	0.35^a	0.36^a	0.31^a	0.33^a	0.29^a	0.45^a	0.30^a
	(3.82)	(4.14)	(2.34)	(3.96)	(3.83)	(4.07)	(2.86)
N	24	24	23	24	23	22	23

Table 8: Pre-Announcement Cumulative Abnormal Returns

This table presents the acquiring firms' pre-announcement cumulative abnormal returns (CAR) for merger deals within aggregate corporate liquidity demand $\Delta L/S$ and aggregate market liquidity supply $Debt/GDP$ constructed portfolios. The merger sample contains 4162 completed U.S. domestic mergers and acquisitions between 1980 and 2003 listed on SDC, where the publicly traded acquiring firm is listed on the NYSE, AMEX, or NASDAQ, and gains control of a public, private, or subsidiary target firm whose transaction value is at least \$100 million. Merger deals with announcement happened in the next year $(t+1)$ of the lowest (or highest) 30% aggregate corporate liquidity demand $(\Delta L/S)$ or aggregate market liquidity supply $(Debt/GDP)$ years (t) are put into the low (or high) aggregate corporate liquidity demand portfolios or aggregate market liquidity supply portfolios respectively. Panel A shows the results of aggregate corporate liquidity demand portfolios based on $\Delta L/S$. Panel B shows the results of aggregate market liquidity supply portfolio based on $Debt/GDP$. To calculate CAR, firstly the daily abnormal returns (AR) for each event firm for period ranging from -1 day to -40 day are calculated: $AR_{it} = R_{it} - R_{mt}$, where R_{it} is i firm's stock return on date t and R_{mt} is the return for the EW-CRSP index on date t. Then CAR are calculated by summing the daily AR over the event windows (-20,-1) and (-40,-1) respectively. The differentials between high liquidity portfolios and low liquidity portfolios for each category are reported where statistical significance is obtained using two sample t-tests. t-statistics are provided in parenthesis. Superscripts a, b, c indicate significant at the 1, 5, and 10 percent levels, respectively.

	Event Windows	Total	High (30%)	Medium (40%)	Low (30%)	**Differences (High-Low)**
Panel A: Aggregate Corporate Liquidity Demand: $\Delta L/S$						
All Firms	(-20, -1)	1.38%^{a}	2.57%^{a}	0.88%^{a}	−0.63%^{c}	3.19%^{a}
		(6.30)	(6.32)	(3.16)	(−1.84)	(6.03)
	(-40, -1)	2.48%^{a}	4.28%^{a}	1.76%^{a}	−0.67%	4.95%^{a}
		(7.70)	(7.39)	(4.47)	(−0.99)	(5.58)
Panel B: Aggregate Market Liquidity Supply: $Debt/GDP$						
All Firms	(-20, -1)	1.38%^{a}	0.64%^{a}	2.78%^{a}	−0.69%	1.34%^{a}
		(6.30)	(2.60)	(6.69)	(−1.53)	(2.59)
	(-40, -1)	2.48%^{a}	1.38%^{a}	4.54%^{a}	−0.40%	1.77%^{b}
		(7.70)	(3.80)	(7.69)	(−0.47)	(1.95)

Table 9: Pre-Announcement Cumulative Abnormal Returns sorted by Deal Characteristics

This table presents the acquiring firms' pre-announcement cumulative abnormal returns (CAR) for merger sample separated by deal characteristics within aggregate corporate liquidity demand $\Delta L/S$ and aggregate market liquidity supply $Debt/GDP$ constructed portfolios. The merger sample contains 4162 completed U.S. domestic mergers and acquisitions between 1980 and 2003 listed on SDC, where the publicly traded acquiring firm is listed on the NYSE, AMEX, or NASDAQ, and gains control of a public, private, or subsidiary target firm whose transaction value is at least \$100 million. Merger deals with announcement happened in the next year $(t+1)$ of the lowest (or highest) 30% aggregate corporate liquidity demand $(\Delta L/S)$ or aggregate market liquidity supply $(Debt/GDP)$ years (t) are put into the low (or high) aggregate corporate liquidity demand portfolios or aggregate market liquidity supply portfolios respectively. Panel A shows the results of aggregate corporate liquidity demand portfolio based on $\Delta L/S$. Panel B shows the results of aggregate market liquidity supply portfolio based on $Debt/GDP$. Various high-, medium-, and low-aggregate liquidity portfolios are further divided into target firms' public status (i.e., public, private, subsidiary), payment methods (i.e., cash, stock, mixed), and transaction values (i.e., high (30%), medium (40%), low (30%)). To calculate CAR, firstly the daily abnormal returns (AR) for each event firm for period ranging from -1 day to -40 day are calculated: $AR_{it} = R_{it} - R_{mt}$, where R_{it} is i firm's stock return on date t and R_{mt} is the return for the EW-CRSP index on date t. Then CAR are calculated by summing the daily AR over the event windows (-20,-1) and (-40,-1) respectively. The differentials between high liquidity portfolios and low liquidity portfolios for each category are reported where statistical significance is obtained using two sample t-tests. t-statistics are provided in parenthesis. Superscripts a, b, c indicate significant at the 1, 5, and 10 percent levels, respectively.

			Panel A: Liquidity Demand: $\Delta L/S$				**Panel B: Liquidity Supply:** $Debt/GDP$			
	Event Windows	Total	High (30%)	Medium (40%)	Low (30%)	**Differences (High-Low)**	High (30%)	Medium (40%)	Low (30%)	**Differences (High-Low)**
Sorted by Targets Public Status										
Public	(-20, -1)	1.22%^{a}	2.22%^{a}	2.05%^{c}	−0.36%	2.57%^{a}	0.55%	2.21%^{a}	−0.04%	0.58%
		(3.67)	(3.62)	(1.85)	(−0.62)	(3.06)	(1.41)	(3.68)	(−0.05)	(0.63)
	(-40, -1)	2.35%^{a}	3.83%^{a}	0.88%^{a}	−0.78%	4.61%^{a}	1.71%^{a}	3.70%^{a}	−0.09%	1.80%
		(5.15)	(4.69)	(3.28)	(−0.98)	(4.04)	(3.01)	(4.68)	(−0.08)	(1.36)
Private	(-20, -1)	3.00%^{a}	5.19%^{a}	1.52%^{a}	−1.25%^{c}	6.44%^{a}	1.14%^{b}	5.72%^{a}	−0.29%^{b}	1.43%
		(5.80)	(5.69)	(2.65)	(−1.86)	(5.69)	(2.12)	(5.75)	(−0.33)	(1.38)
	(-40, -1)	5.60%^{a}	9.21%^{a}	2.66%^{a}	−0.07%	9.28%^{a}	2.26%^{a}	10.14%^{a}	0.08%	1.50%
		(6.89)	(6.83)	(3.26)	(−0.03)	(3.46)	(2.80)	(6.93)	(0.32)	(0.60)
Subsidiary	(-20, -1)	0.37%	0.58%	0.57%	−0.49%	1.06%	0.47%	1.03%^{c}	−1.45%	1.93%^{b}
		(1.18)	(1.03)	(1.19)	(−0.89)	(1.36)	(1.19)	(1.73)	(−2.09)	(2.40)
	(-40, -1)	0.32%	0.28%	0.90%	−0.86%	1.14%	0.40%	0.94%	−1.35%	1.75%
		(0.71)	(0.35)	(1.38)	(−1.03)	(0.98)	(0.71)	(1.11)	(−1.33)	(1.50)

(continued)

Table 9—*Continued*

	Event Windows	Total	Panel A: Liquidity Demand: $\Delta L/S$ High (30%)	Medium (40%)	Low (30%)	**Differences (High-Low)**	Panel B: Liquidity Supply: *Debt/GDP* High (30%)	Medium (40%)	Low (30%)	**Differences (High-Low)**
Sorted by Methods of Payment										
All Cash	(-20, -1)	−0.23%	−0.28%	0.52%	−1.75%^{a}	1.46%^{c}	0.32%	−0.22%	−1.73%^{b}	2.04%^{b}
		(−0.64)	(−0.44)	(0.91)	(−2.83)	(1.64)	(0.65)	(−0.35)	(−1.98)	(2.04)
	(-40, -1)	−0.16%	0.51%	0.74%	−3.25%^{a}	3.76%^{a}	0.34%	0.43%	−3.14%^{a}	3.48%^{a}
		(−0.31)	(0.57)	(0.97)	(−3.60)	(2.97)	(0.54)	(0.49)	(−2.64)	(2.58)
All Stock	(-20, -1)	4.63%^{a}	6.81%^{a}	1.93%^{a}	1.12%	5.69%^{a}	1.92%^{a}	7.42%^{a}	0.49%	1.43%
		(7.72)	(7.25)	(2.62)	(1.19)	(4.26)	(3.20)	(7.22)	(0.22)	(0.62)
	(-40, -1)	8.16%^{a}	11.30%^{a}	4.34%^{a}	2.92%^{b}	8.39%^{a}	4.65%^{a}	12.66%^{a}	−5.18%^{c}	9.83%^{a}
		(9.59)	(8.56)	(3.95)	(2.25)	(4.53)	(5.12)	(8.93)	(−1.68)	(3.06)
Mixed	(-20, -1)	0.57%^{c}	1.28%^{b}	0.35%	−0.74%	2.01%^{b}	0.34%^{b}	1.63%^{b}	−0.80%	1.14%
		(1.67)	(2.07)	(0.77)	(−1.30)	(2.40)	(0.81)	(2.27)	(−1.33)	(1.56)
	(-40, -1)	1.13%^{b}	1.51%^{c}	1.01%	0.47%	1.03%	0.40%	1.91%^{c}	1.30%	−0.89%
		(2.12)	(1.69)	(1.58)	(0.31)	(0.59)	(0.69)	(1.83)	(0.95)	(−0.60)
Sorted by Transaction Values										
Large	(-20, -1)	2.15%^{a}	2.58%^{a}	1.84%^{a}	−0.07%	2.65%^{a}	0.97%^{b}	3.47%^{a}	−0.10%	1.07%
		(5.61)	(3.69)	(3.72)	(−0.12)	(2.90)	(2.47)	(4.68)	(−0.13)	(1.27)
	(-40, -1)	3.34%^{a}	4.49%^{a}	2.54%^{a}	−0.46%	4.95%^{a}	1.34%^{b}	5.76%^{a}	0.31%	1.02%
		(5.98)	(4.52)	(3.64)	(−0.52)	(3.72)	(2.28)	(5.48)	(0.28)	(0.81)
Medium	(-20, -1)	0.95%^{a}	2.56%^{a}	0.31%	−0.78%	3.35%^{a}	0.19%^{a}	2.51%^{a}	−0.68%	0.87%
		(2.67)	(3.89)	(0.71)	(−1.41)	(3.89)	(0.45)	(3.76)	(−0.99)	(1.08)
	(-40, -1)	1.73%^{a}	4.00%^{a}	1.20%^{c}	−1.10%	5.10%^{a}	0.98%	4.03%^{a}	−0.85%	1.82%
		(3.52)	(4.33)	(1.88)	(−1.32)	(4.09)	(1.61)	(4.35)	(−0.84)	(1.55)
Small	(-20, -1)	1.20%^{a}	2.55%^{a}	0.64%	−0.97%	3.53%^{a}	0.91%^{b}	2.45%^{a}	−1.32%	2.23%^{b}
		(3.00)	(3.38)	(1.25)	(−1.54)	(3.59)	(2.02)	(3.20)	(−1.33)	(2.12)
	(-40, -1)	2.63%^{a}	4.45%^{a}	1.72%^{b}	−0.29%	4.74%^{b}	1.96%^{a}	3.99%^{a}	−0.51%	2.47%
		(4.14)	(4.01)	(2.41)	(−0.17)	(2.31)	(2.89)	(3.59)	(−0.24)	(1.09)

Table 10: Post-Merger Buy-and-Hold Abnormal Returns

This table presents the acquiring firms' post-merger buy-and-hold abnormal returns (BHAR) for merger deals within aggregate corporate liquidity demand $\Delta L/S$ and aggregate market liquidity supply $Debt/GDP$ constructed portfolios. The merger sample contains 4162 completed U.S. domestic mergers and acquisitions between 1980 and 2003 listed on SDC, where the publicly traded acquiring firm is listed on the NYSE, AMEX, or NASDAQ, and gains control of a public, private, or subsidiary target firm whose transaction value is at least \$100 million. Merger deals with announcement happened in the next year $(t+1)$ of the lowest (or highest) 30% aggregate corporate liquidity demand $(\Delta L/S)$ or aggregate market liquidity supply $(Debt/GDP)$ years (t) are put into the low (or high) aggregate corporate liquidity demand portfolios or aggregate market liquidity supply portfolios respectively. Panel A shows the results of aggregate corporate liquidity demand portfolios based on $\Delta L/S$. Panel B shows the results of aggregate market liquidity supply portfolios based on $Debt/GDP$. To calculate the BHAR, we first calculate the buy-and-hold returns (BHR) for each event firm for a period ranging from 1 month to 12, 24, or 36 month respectively, where month 0 is the effective month in mergers: $BHR_{iT} = \prod_{t=1}^{T}(1+R_{it})-1$, where i is the event-firm index, R_{it} is the month t simple return on firm i, and T is the horizon over which the BHR_{iT} is computed. Then the buy-and-hold returns for a reference portfolio is calculated as $BHR_{p_i,T} = \prod_{t=1}^{T}[1+\frac{\sum_{j=1}^{N_t} R_{jt}}{N_t}]-1$, where p_i is the index for the reference portfolio of the event firm i, N_t is the number of firms in the reference portfolio in month t, and R_{jt} is the return for firm j in the reference portfolio p_i during the event-month t for event firm i. The mean BHAR are then calculated as $BHAR_T = \frac{1}{N}\sum_{i=1}^{N}(BHR_{iT} - BHR_{p_iT})$, where N is the number of event firms that have valid BHR for event period 12, 24, or 36 months. The differentials between high liquidity portfolios and low liquidity portfolios for each category are reported where statistical significance is obtained using two sample t-tests. t-statistics are reported in parentheses. Superscripts a, b, c indicate significant at the 1, 5, and 10 percent levels, respectively.

	Event Windows	Total	High (30%)	Medium (40%)	Low (30%)	**Differences (High-Low)**
Panel A: Aggregate Corporate Liquidity Demand: $\Delta L/Sources$						
All Firms	1 Year	$-6.02\%^a$	$-9.88\%^a$	$-4.86\%^a$	1.34%	$-11.22\%^a$
		(-7.11)	(-7.05)	(-3.74)	(0.83)	(-5.27)
	2 Years	$-9.38\%^a$	$-13.14\%^a$	$-9.97\%^a$	1.49%	$-14.63\%^a$
		(-7.70)	(-7.22)	(-4.98)	(0.53)	(-4.39)
	3 Years	$-11.62\%^a$	$-16.06\%^a$	$-11.92\%^a$	0.29%	$-16.35\%^a$
		(-7.51)	(-7.43)	(-4.59)	(0.07)	(-3.64)
Panel B: Aggregate Market Liquidity Supply: $Debt/GDP$						
All Firms	1 Year	$-6.02\%^a$	-5.08^a	-8.47^a	-1.61	-3.48^c
		(-7.11)	(-3.89)	(-6.14)	(-1.01)	(-1.68)
	2 Years	$-9.38\%^a$	-13.38^a	-7.45^a	-3.26	-10.12^a
		(-7.70)	(-6.12)	(-4.63)	(-1.3)	(-3.04)
	3 Years	$-11.62\%^a$	-17.90^a	-7.96^a	-4.54	-13.35^a
		(-7.51)	(-6.42)	(-4.00)	(-1.28)	(-2.96)

Table 11: Post-Merger Buy-and-Hold Abnormal Returns sorted by Deal Characteristics

This table presents the acquiring firms' post-merger buy-and-hold abnormal returns (BHAR) for different deal characteristics sorted subsample of merger deals within aggregate corporate liquidity demand $\Delta L/S$ and aggregate market liquidity supply $Debt/GDP$ constructed portfolios. The merger sample contains 4162 completed U.S. domestic mergers and acquisitions between 1980 and 2003 listed on SDC, where the publicly traded acquiring firm is listed on the NYSE, AMEX, or NASDAQ, and gains control of a public, private, or subsidiary target firm whose transaction value is at least $100 million. Merger deals with announcement happened in the next year $(t+1)$ of the lowest (or highest) 30% aggregate corporate liquidity demand $(\Delta L/S)$ or aggregate market liquidity supply $(Debt/GDP)$ years (t) are put into the low (or high) aggregate corporate liquidity demand portfolios or aggregate market liquidity supply portfolios respectively. Panel A shows the results of aggregate corporate liquidity demand portfolios based on $\Delta L/S$. Panel B shows the results of aggregate market liquidity supply portfolios based on $Debt/GDP$. Various high-, medium-, and low-liquidity portfolios are further divided into target firms' public status (i.e., public, private, subsidiary), payment methods (i.e., cash, stock, mixed), and transaction values (i.e., high (30%), medium (40%), low (30%)). To calculate the BHAR, we first calculate the buy-and-hold returns (BHR) for each event firm for a period ranging from 1 month to 12, 24, or 36 month respectively, where month 0 is the effective month in mergers: $BHR_{iT} = \prod_{t=1}^{T}(1+R_{it}) - 1$, where i is the event-firm index, R_{it} is the month t simple return on firm i, and T is the horizon over which the BHR_{iT} is computed. Then the buy-and-hold returns for a reference portfolio is calculated as $BHR_{p_i,T} = \prod_{t=1}^{T}[1 + \frac{\sum_{j=1}^{N_t} R_{jt}}{N_t}] - 1$, where p_i is the index for the reference portfolio of the event firm i, N_t is the number of firms in the reference portfolio in month t, and R_{jt} is the return for firm j in the reference portfolio p_i during the event-month t for event firm i. The mean BHAR are then calculated as $BHAR_T = \frac{1}{N}\sum_{i=1}^{N}(BHR_{iT} - BHR_{p_iT})$, where N is the number of event firms that have valid BHR for event period 12, 24, or 36 months. The differentials between high liquidity portfolios and low liquidity portfolios for each category are reported where statistical significance is obtained using two sample t-tests. t-statistics are reported in parentheses. Superscripts a, b, c indicate significant at the 1, 5, and 10 percent levels, respectively.

		Aggregate Corporate Liquidity Demand: $\Delta L/Sources$				Aggregate Market Liquidity Supply: $Debt/GDP$			
Event Windows	Total	High (30%)	Medium (40%)	Low (30%)	**Differences (High-Low)**	High (30%)	Medium (40%)	Low (30%)	**Differences (High-Low)**

(continued)

Table 11—*Continued*

Panel A: Sorted by Targets Public Status

			Aggregate Corporate Liquidity Demand: $\Delta L/Sources$				Aggregate Market Liquidity Supply: $Debt/GDP$			
	Event Windows	Total	High (30%)	Medium (40%)	Low (30%)	**Differences (High-Low)**	High (30%)	Medium (40%)	Low (30%)	**Differences (High-Low)**
Public	1 Year	−7.37%^{a}	−8.25%^{a}	−7.57%^{a}	−4.67%^{c}	−3.58%	−8.73^a	−7.50^a	−2.13	−6.59^b
		(−6.04)	(−4.13)	(−4.01)	(−1.89)	(−1.13)	(−4.47)	(−4.06)	(−0.83)	(−2.04)
	2 Years	−11.77%^{a}	−13.50%^{a}	−11.65%^{a}	−7.74%^{c}	−5.76%	−18.18^a	−6.80^a	−6.93	−11.25^b
		(−6.13)	(−4.60)	(−3.69)	(−1.83)	(−1.12)	(−5.39)	(−2.73)	(−1.53)	(−1.99)
	3 Years	−15.95%^{a}	−17.09%^{a}	−17.79%^{a}	−9.12%	−7.97%	−25.86^a	−8.23^a	−9.66	−16.20^b
		(−6.62)	(−5.26)	(−4.27)	(−1.46)	(−1.13)	(−6.27)	(−2.57)	(−1.56)	(−2.18)
Private	1 Year	−6.65%^{a}	−11.84%^{a}	−3.79%	3.95%	−15.79%^{a}	−2.54	−12.06^a	−2.27	−0.27
		(−3.36)	(−3.67)	(−1.32)	(1.09)	(−3.25)	(−0.90)	(−3.51)	(−0.67)	(−0.06)
	2 Years	−13.30%^{a}	−17.00%^{a}	−12.15%^{a}	−3.46%	−13.54%^{b}	−14.26^a	−15.63^a	−3.36	−10.90^c
		(−5.52)	(−5.12)	(−2.82)	(−0.64)	(−2.14)	(−3.18)	(−5.09)	(−0.69)	(−1.64)
	3 Years	−13.49%^{a}	−18.65%^{a}	−10.64%^{c}	−2.85%	−15.80%^{c}	−16.28^a	−14.73^a	−2.12	−14.16
		(−4.37)	(−4.45)	(−1.94)	(−0.37)	(−1.79)	(−2.72)	(−4.00)	(−0.32)	(−1.58)
Subsidiary	1 Year	−3.85%^{a}	−10.01%^{a}	−2.40%	6.24%^{b}	−16.25%^{a}	−2.50	−6.94^a	−0.10	−2.40
		(−2.81)	(−4.61)	(−1.08)	(2.39)	(−4.79)	(−1.12)	(−3.25)	(−0.04)	(−0.70)
	2 Years	−2.89%	−7.91%^{b}	−6.13%^{c}	14.58%^{a}	−22.49%^{a}	−6.35^c	−0.34	0.02	−6.37
		(−1.37)	(−2.39)	(−1.89)	(2.93)	(−3.76)	(−1.68)	(−0.12)	(0.01)	(−1.17)
	3 Years	−4.43%^{c}	−11.91%^{a}	−5.39%	13.07%^{c}	−24.97%^{a}	−8.35^c	−1.15	−2.42	−5.93
		(−1.64)	(−2.94)	(−1.29)	(1.92)	(−3.16)	(−1.71)	(−0.32)	(−0.42)	(−0.79)

(continued)

Table 11—*Continued*

Panel B: Sorted by Methods of Payment

			Aggregate Corporate Liquidity Demand: $\Delta L/Sources$				Aggregate Market Liquidity Supply: $Debt/GDP$			
	Event Windows	Total	High (30%)	Medium (40%)	Low (30%)	**Differences (High-Low)**	High (30%)	Medium (40%)	Low (30%)	**Differences (High-Low)**
All Cash	1 Year	−4.54%^{a}	−6.10%^{b}	−2.98%	−5.20%^{b}	−0.90%	−2.36	−6.08^a	−6.02^c	3.66
		(−3.13)	(−2.27)	(−1.37)	(−2.01)	(−0.24)	(−1.01)	(−2.72)	(−1.87)	(0.92)
	2 Years	−5.81%^{a}	−10.81%^{a}	−2.95%	−3.10%	−7.71%	−6.94^c	−3.77	−8.41^c	1.47
		(−2.55)	(−2.80)	(−0.81)	(−0.74)	(−1.36)	(−1.66)	(−1.26)	(−1.75)	(0.23)
	3 Years	−3.12%	−8.44%^{c}	1.37%	−2.87%	−5.57%	−1.61	−2.13	−9.83	8.23
		(−0.99)	(−1.65)	(0.28)	(−0.43)	(−0.66)	(−0.28)	(−0.52)	(−1.58)	(0.97)
All Stock	1 Year	−11.41%^{a}	−17.49%^{a}	−4.52%	−2.21%	−15.28%^{a}	−4.31	−18.89^a	−3.50	−0.80
		(−5.04)	(−5.74)	(−1.07)	(−0.48)	(−2.76)	(−1.24)	(−5.92)	(−0.57)	(−0.11)
	2 Years	−18.48%^{a}	−23.16%^{a}	−12.42%^{b}	−13.84%^{c}	−9.32%	−9.60^c	−26.41^a	−21.03^b	11.40
		(−6.33)	(−6.64)	(−2.03)	(−1.84)	(−1.12)	(−1.75)	(−9.22)	(−2.32)	(1.08)
	3 Years	−26.14%^{a}	−29.16%^{a}	−26.15%^{a}	−12.70%	−16.40%	−20.16^a	−29.84^a	−39.60^a	19.50
		(−7.97)	(−7.75)	(−4.15)	(−1.05)	(−1.30)	(−3.14)	(−9.85)	(−3.48)	(1.49)
Mixed	1 Year	−6.36%^{a}	−7.49%^{a}	−11.32%^{a}	7.58%^{a}	−15.07%^{b}	−10.15^a	−5.78^b	0.80	−10.95^a
		(−4.08)	(−3.36)	(−6.01)	(2.71)	(−4.22)	(−5.19)	(−2.30)	(0.36)	(−3.67)
	2 Years	−10.35%^{a}	−9.28%^{a}	−21.20%^{a}	−10.52%^{b}	−19.81%^{a}	−24.55^a	0.17	0.56	−25.11^a
		(−5.15)	(−2.94)	(−7.32)	(2.10)	(−3.35)	(−7.67)	(0.05)	(0.15)	(−5.13)
	3 Years	−11.70%^{a}	−12.01%^{a}	−21.49%^{a}	10.27%	−22.28%^{a}	−29.07^a	−0.08	1.53	−30.59^a
		(−4.45)	(−3.16)	(−5.10)	(1.53)	(−2.88)	(−6.76)	(−0.02)	(0.29)	(−4.45)

(continued)

Table 11—*Continued*

Panel C: Sorted by Transaction Values										
			Aggregate Corporate Liquidity Demand: $\Delta L/Sources$				Aggregate Market Liquidity Supply: $Debt/GDP$			
	Event Windows	Total	High (30%)	Medium (40%)	Low (30%)	**Differences (High-Low)**	High (30%)	Medium (40%)	Low (30%)	**Differences (High-Low)**
Large	1 Year	$-7.20\%^{a}$	$-10.60\%^{a}$	$-5.88\%^{a}$	-1.41%	$-12.02\%^{a}$	-7.24^{a}	-9.34^{a}	-1.03	-6.20^{c}
		(-4.54)	(-4.04)	(-2.57)	(0.52)	(-3.18)	(-3.01)	(-3.74)	(-0.41)	(-1.78)
	2 Years	$-12.26\%^{a}$	-14.49^{a}	$-11.87\%^{a}$	-2.71%	$-11.78\%^{b}$	-17.90^{a}	-9.34^{a}	-2.27	-15.64^{a}
		(-5.99)	(-4.70)	(-3.68)	(-0.61)	(-2.18)	(-4.73)	(-3.55)	(-0.56)	(-2.82)
	3 Years	$-15.31\%^{a}$	$-18.67\%^{a}$	$-13.66\%^{a}$	-4.44%	$-14.22\%^{b}$	-27.46^{a}	-10.38^{a}	-0.75	-26.72^{a}
		(-6.19)	(-5.74)	(-3.15)	(-0.69)	(-1.96)	(-6.27)	(-3.26)	(-0.13)	(-3.68)
Medium	1 Year	$-6.60\%^{a}$	$-11.00\%^{a}$	$-6.16\%^{a}$	-1.17%	$-12.17\%^{a}$	-4.46^{b}	-9.66^{a}	-2.11	-2.34
		(-5.22)	(-5.34)	(-3.17)	(0.42)	(-3.51)	(-2.25)	(-4.76)	(-0.80)	(-0.71)
	2 Years	$-7.99\%^{a}$	$-13.35\%^{a}$	$-7.58\%^{b}$	2.33%	$-15.68\%^{a}$	-8.97^{b}	-8.52^{a}	-5.66	-3.30
		(-4.13)	(-4.61)	(-2.31)	(0.52)	(-2.96)	(-2.54)	(-3.49)	(-1.38)	(-0.61)
	3 Years	$-10.61\%^{a}$	$-16.17\%^{a}$	$-9.99\%^{b}$	0.49%	$-16.66\%^{b}$	-11.25^{b}	-8.93^{a}	-7.83	-3.42
		(-4.17)	(-4.60)	(-2.27)	(0.07)	(-2.22)	(-2.34)	(-2.80)	(-1.38)	(-0.46)
Small	1 Year	$-4.02\%^{b}$	$-7.57\%^{a}$	-2.16%	-1.48%	$-9.05\%^{b}$	-3.73	-5.86^{b}	-1.56	-2.17
		(-2.50)	(-2.76)	(-0.83)	(0.54)	(-2.33)	(-1.50)	(-2.11)	(-0.49)	(-0.54)
	2 Years	$-8.28\%^{a}$	$-11.44\%^{a}$	$-11.15\%^{a}$	4.76%	$-16.20\%^{b}$	-14.59^{a}	-3.96	-1.14	-13.46^{b}
		(-3.47)	(-3.25)	(-2.85)	(0.83)	(-2.41)	(-3.58)	(-1.17)	(-0.23)	(-2.08)
	3 Years	$-9.10\%^{a}$	$-13.17\%^{a}$	$-12.65\%^{a}$	4.99%	$-18.17\%^{b}$	-16.83^{a}	-3.99	-4.44	-12.39
		(-3.01)	(-2.98)	(-2.68)	(0.68)	(-2.12)	(-3.28)	(-1.00)	(-0.62)	(-1.41)

Table 12: Calendar-Time Three-Factor WLS Regressions for Aggregate Liquidity Portfolios

This table presents the calendar-time portfolio approach by Fama and French three factors model with weighted least square (WLS) regressions on aggregate corporate liquidity demand $\Delta L/S$ and aggregate market liquidity supply $Debt/GDP$ constructed portfolios. The merger sample contains 4162 completed U.S. domestic mergers and acquisitions between 1980 and 2003 listed on SDC, where the publicly traded acquiring firm is listed on the NYSE, AMEX, or NASDAQ, and gains control of a public, private, or subsidiary target firm whose transaction value is at least $100 million. Merger deals with announcement happened in the next year $(t+1)$ of the lowest (or highest) 30% aggregate corporate liquidity demand $(\Delta L/S)$ or aggregate market liquidity supply $(Debt/GDP)$ years (t) are put into the low (or high) aggregate corporate liquidity demand portfolios or aggregate market liquidity supply portfolios respectively. Panel A shows the results of aggregate corporate liquidity demand portfolios based on $\Delta L/S$. Panel B shows the results of aggregate market liquidity supply portfolios based on $Debt/GDP$. Each monthly abnormal return is calculated using a time-series regression, where the dependent variables is the equally weighted portfolio return in each calendar month of all bidders within each subgroup that completed an acquisition in the previous 12, 24, or 36 months. The independent variables are the Fama-French (1993) factors, where the regression equation is:
$R_{pt} - R_{ft} = \alpha_p + \beta_p(R_{mt} - R_{ft}) + s_p SMB_t + h_p HML_t \epsilon_t$.
where R_{pt} is the event portfolio return, R_{ft} is the risk-free rate, $(R_{mt} - R_{ft})$ represents excess return on the market, SMB is the difference between a portfolio of "small" and "big" stocks, HML is the difference between a portfolio of "high" and "low" book-to-market stocks. The intercept of the time-series regression for each subgroup is the monthly abnormal return (in percentage). t-statistics are reported in parentheses.

	High (30%)	Medium (40%)	Low (30%)	All
Panel A: Liquidity Investment Share Ranks of Merger Acquirer				
1 Year	-0.596^{c}	-0.404^{a}	-0.339^{b}	-0.630^{a}
	(-1.80)	(-2.75)	(-2.07)	(-3.56)
2 Years	-0.393	-0.387^{a}	-0.228^{c}	-0.476^{a}
	(-1.37)	(-2.71)	(-1.77)	(-2.71)
3 Years	-0.016	-0.226^{c}	-0.137	-0.225
	(-0.06)	(-1.73)	(-1.18)	(-1.36)
Panel B: Liquidity Investment Share Ranks of Merger Acquirer				
1 Year	-0.609^{a}	-0.101	-0.001	-0.630^{a}
	(-3.52)	(-0.33)	(0.00)	(-3.56)
2 Years	-0.569^{a}	0.299	-0.004	-0.476^{a}
	(-2.99)	(1.10)	(-0.03)	(-2.71)
3 Years	-0.342^{c}	0.422^{c}	0.037	-0.225
	(-1.75)	(1.69)	(0.33)	(-1.36)

Table 13: Calendar-Time Three-Factor WLS Regressions sorted by Deal Characteristics

This table presents the calendar-time portfolio approach by Fama and French three factors model with weighted least square (WLS) regressions on aggregate corporate liquidity demand $\Delta L/S$ and aggregate market liquidity supply $Debt/GDP$ constructed portfolios. Each liquidity portfolio are further divided into targets' public status (i.e., public, private, subsidiary), payment methods (i.e., cash, stock, mixed), and size of deal values (i.e., large 30%, medium 40%, small 30%). The merger sample contains 4162 completed U.S. domestic mergers and acquisitions between 1980 and 2003 listed on SDC, where the publicly traded acquiring firm is listed on the NYSE, AMEX, or NASDAQ, and gains control of a public, private, or subsidiary target firm whose transaction value is at least \$100 million. Merger deals with announcement happened in the next year $(t+1)$ of the lowest (or highest) 30% aggregate corporate liquidity demand $(\Delta L/S)$ years (t) are put into the low (or high) aggregate corporate liquidity demand portfolios. Each monthly abnormal return is calculated using a time-series regression, where the dependent variables is the equally weighted portfolio return in each calendar month of all bidders within each subgroup that completed an acquisition in the previous 12, 24, or 36 months. The independent variables are the Fama-French (1993) factors, where the regression equation is:
$R_{pt} - R_{ft} = \alpha_p + \beta_p(R_{mt} - R_{ft}) + s_p SMB_t + h_p HML_t \epsilon_t$.
where R_{pt} is the event portfolio return, R_{ft} is the risk-free rate, $(R_{mt} - R_{ft})$ represents excess return on the market, SMB is the difference between a portfolio of "small" and "big" stocks, HML is the difference between a portfolio of "high" and "low" book-to-market stocks. The intercept of the time-series regression for each subgroup is the monthly abnormal return (in percentage). t-statistics are reported in parentheses.

	High (30%)	Medium (40%)	Low (30%)	All
Sorted by Targets Public Status				
Public	-0.577^{c}	-0.618^{a}	-0.944^{a}	-0.708^{a}
	(-1.93)	(-2.66)	(-3.78)	(-4.21)
Private	-0.096	-0.349	0.006	-0.645
	(-0.12)	(-1.53)	(0.02)	(-1.62)
Subsidiary	-0.834^{a}	-0.231	0.045	-0.445^{a}
	(-2.74)	(-1.38)	(0.21)	(-3.04)
Sorted by Methods of Payments				
All Cash	-0.322	-0.326^{c}	-0.643^{b}	-0.371^{b}
	(-0.85)	(-1.70)	(-2.49)	(-2.27)
All Stock	-0.035	-0.410	-0.805	-0.634
	(-0.05)	(-1.05)	(-1.64)	(-1.58)
Mixed	-0.840^{a}	-0.905^{a}	-0.030	-0.770^{a}
	(-2.66)	(-4.22)	(-0.14)	(-4.75)
Sorted by Transaction Values				
Large	-0.578	-0.535^{b}	-0.508^{c}	-0.805^{a}
	(-1.30)	(-2.30)	(-1.85)	(-3.75)
Medium	-0.820^{b}	-0.471^{a}	-0.491^{b}	-0.646^{a}
	(-2.36)	(-2.61)	(-2.11)	(-3.49)
Small	-0.222	-0.240	-0.364	-0.430^{b}
	(-0.43)	(-1.10)	(-1.61)	(-1.94)