Why Do Acquirers Under-Perform their Matching Firms: a Liquidity Story[1]

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Abstract

   Recent literature confirms that liquidity is an important source of price risk. Building from there, this paper examines whether liquidity explains a previously documented anomaly that the acquiring firms persistently underperform their size and book-to-market matching firms in the long run after the acquisitions. First, we document that an acquiring firm is persistently more liquid (up to five years following the acquisition) than its size and book-to-market matching firm. The acquisition improves an acquiring firm's liquidity relative to its size and book-to-market matching firm. Second, we follow a new approach (the decomposed buy-and-hold calendar time approach) to examine the acquiring firms' long-term performance. In particular, we calculate the acquiring firms' decomposed buy-and-hold abnormal returns following Liu and Strong (2007), and adjust such returns using multifactor asset pricing models. This approach not only preserves the investors' wealth experience reflected in the buy-and-hold returns, but also is robust to the typical measurement or statistical problems inherit in the buy-and-hold approach and the traditional calendar time approach. We find that the two factor model (market and liquidity) of Liu (2006) well explains the anomalies from both the Fama-French three factor model and a momentum augmented four factor Carhart model. In subsample tests, we further confirm that the underperformances of the glamour acquiring firms and the acquiring firms in stock dominated offers(relative to their size and book-to-market matching firms) are not robust once we account for liquidity, using the two factor(market and liquidity) model. Finally, we match each acquiring firm by a non-event firm that have similar liquidity exposure estimated over the three years after the acquisition. The buy-and-hold abnormal return of the acquiring firm is not statistically significantly from zero. Taken together, our results suggest that it is important to account for liquidity risk when examining the acquiring firm's long-run performance. The matching firm approach based on size and book-to-market ratio fails to provide a proper control for such risk.

JEL Classification: G12, G14, G34

Key words: liquidity, acquiring firm, matching firm, long-term performance,

decomposed buy-and-hold return, decomposed buy-and-hold calendar time approach

1. Introduction

The importance of liquidity risk in asset pricing has been gradually recognized since early 1980s.[4] Focusing on different dimensions of liquidity, recent studies confirm the important role of liquidity in explaining asset returns, both in the cross-section and over time (see Amihud, 2002; Pastor and Stambaugh, 2003; and Liu, 2006).[5]

Pastor and Stambaugh (2003) suggests that it is potentially interesting to explore the role of liquidity in explaining various pricing anomalies associated with corporate events. A recent study for example, by Eckbo and Norli (2005) finds that the underperformance of NASDAQ IPO firms disappear once the liquidity risk is controlled for.

In this paper, we ask the question whether liquidity explains a previously documented anomaly that the acquiring firms persistently underperform their size and book-to-market matching firms in the post-acquisition years. Simultaneously, we address another question: whether the matching firm approach based on size and book-to-market ratio provide a proper control for liquidity risk in the studies of long-term performance.

The matching firm approach based on size and book-to-market is advocated by Barber and Lyon (1997). In their comprehensive analysis, the buy-and-hold abnormal return based on the size and book-to-market matching firm approach is show to have well specified test statistic, for both the random sample and most subsamples biased toward extreme size or book-to-market ratio. This approach has been used in numerous studies of the event firm's long-horizon performances.[6] According to Loughran and Vijh(1995), an average acquiring firm underperform its size and book-to-market matching firm by 25 percent during a five-year period following the acquisitions financed by stocks (these acquiring firms are called stock acquiring firms

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[4] Empirical studies on the relation between liquidity and asset prices include Amihud and Mendelson (1986), Brennan and Subrahmanyam (1996), Brennan, Chordia, and Subrahmanyam (1998), Aatar, Naik, and Radcliffe(1998), and Fiori (2000). Theoretical studies include Amihud and Mendelson (1986), Constantinides (1986), Heaton and Lucas (1996), Vayanos (1998), Lo, Mamaysk, and Wang (2001) and others.

[5] Amihud (2002) and Pastor and Stambaugh (2003) focus the measures on the price impact of trading. Liu's (2006) measure reflects trading speed, trading quantity and trading cost, with emphasis on trading speed.

[6] For examples, see Eckbo, Masulis and Norli (2000), Eckbo and Norli (2004), Chan, Wang and Wei (2004), Spiess and Affleck-Graves (1999), Loughran and Vijh (1997), and others.

or stock acquirers henceforth). However, our main concern is that the matching based on size and book-to-market ratio may not be able to properly control for the liquidity risk, in spite of that size and book-to-market ratio is to some extent, associated with liquidity risk. Further, Fama (1998) and Mitchell and Stafford (2000) argue that the buy-and-hold abnormal return tend to over rejects the null hypothesis of zero abnormal return, as it fails to account for the cross-correlation in abnormal returns. They recommend the use of calendar time approach in long-horizon event studies. However, the application of the calendar time approach in existing finance literature is not flawless. Virtually all previous studies form portfolios in each month and thus assume simplified rebalancing schemes, for example researchers often assume equal weights for the portfolio components when a new portfolio is formed. According to a recent study by Liu and Strong (2007), no rational investors will ex ante seriously consider such investment strategies due to the prohibitive transaction costs from rebalancing. Liu and Strong (2007) propose a new return metric to overcome this problem, of which we provide a brief description in section 2.

We therefore design a new approach in the spirit of Liu and Strong (2007), that 1) preserves the typical investor's wealth experience over the long horizon reflected in the buy-and-hold abnormal returns; 2) is robust to the criticisms to the buy-and-hold approach and the traditional calendar time approach with simplified rebalancing scheme. In particular, to assess the acquiring firm's stock price performance relative to its size and book-to-market matching firm, we form portfolios of the acquiring and matching firms respectively in each calendar year and hold each portfolio up to five years.[7] Following Liu and Strong (2007), we use the monthly decomposed buy-and-hold returns to calibrate the returns to portfolios. We then calculate the monthly return difference between the acquiring and the matching firm portfolios. We recognize that the matching practice may not fully control for the risk exposure of the return difference's risk exposure, either due to imperfect matching or due to missed risk characteristics. Therefore, we adjust the time series of monthly return difference by multifactor asset pricing models, namely the Fama-French three factor model and the momentum augmented four factor Carhart model (see Carhart, 1997). We rely on the intercepts from different multifactor asset pricing models (henceforth the risk-adjusted return differences) to draw conclusions on whether the acquiring firm

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[7] Our core results generally persist when the holding period is three years.

underperform their size and book-to-market matching firms. We hence forth name our method the decomposed buy-and-hold calendar time approach and. To distinguish between our approach and the calendar time approach in previous literature, we call the calendar time approach that assume simplified rebalancing schemes the traditional calendar time approach. In section 2, we provide a more detailed discussion on the decomposed buy-and-hold calendar time approach, as an improved alternative to the traditional calendar time approach.

Our results strongly suggest the importance of liquidity risk in explaining the acquiring firm's underperformance relative to its size and book-to-market matching firms.

At the outset, we document that the acquiring firms are persistently more liquid relative to their size and book-to-market matching firms in both the post-acquisition and pre-acquisition periods, indicating the size and book-to-market matching can not fully control for the effect of liquidity on price. In addition, the acquiring firms experience persistent (up to five years) improvement in both the liquidity characteristics and exposure.[8] Both pieces of evidence suggest that liquidity is an important risk dimension when examining the acquiring firm's long-run abnormal performance relative its size and book-to-market matching firms.

Our main results focus on the risk-adjusted return differences (i.e. the intercept from different multifactor asset pricing models). In our full sample analyses, risk-adjusted return difference is -0.223% per month and -0.231% per month for the Fama-French three factor and the momentum augmented four factor Carhart model respectively (at 5% statistical significance). Consistent with Loughran and Ritter (1995), in the subsample of acquiring firms in stock dominated offers (defined as the deals over fifty percent of whose value is paid in stock), the risk-adjusted return difference is -0.432% per month and -0.324% per month respectively for the Fama-French three factor and the momentum augmented four factor Carhart model, representing a five-year abnormal return of -25.92% and -19.44% respectively. Rau and Vermaelen (1998) find the underperformance is concentrated in glamour (or growth) acquiring firms. Consistently, in our sample of glamour acquiring firms, the risk-adjusted return difference is -0.323% per month and -0.298% per month

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[8] The liquidity characteristics include measures proposed in Amihud (2002) and Liu (2006). The liquidity exposure is measured by the liquidity beta from the two factor (market and liquidity) model of Liu (2006).

respectively for the Fama-French three factor and the momentum augmented four factor Carhart model. Consistent with our expectation, when we use the two-factor (market and liquidity) model of Liu (2006) to adjust the return differences, the acquiring firms' underperformance disappear in both the full sample and the subsample of glamour and stock acquiring firms. Specifically, in the full sample analysis, the risk-adjusted return difference is significantly reduced to -0.133% per month and its statistical significance falls well below the conventional level (p-value = 0.275). The risk-adjusted return difference is reduced to -0.199% per month and -0.215% per month for the subsample of glamour and stock acquiring firms respectively (none is statistically at the conventional level). Taken together, these results are well consistent with our conjecture that liquidity is an important source of risk that explains the acquiring firms' underperformance relative to their size and book-to-market matching firms documented in the previous literature. Matching on size and book-to-market does not fully control for the acquiring firm's exposure to liquidity risk.

In our final set of analyses, we draw a matching firm for each acquiring firm based on the liquidity beta measured over the three years after the acquisition.[9] We then calculate the acquiring firms' buy-and-hold abnormal returns relative to their liquidity-risk matching firms. The buy-and-hold abnormal returns are neither economically nor statistically significant. Given the buy-and-hold approach reject the null of zero abnormal return too often, we are confident to claim that when matched on liquidity beta, the acquiring firms do not have negative buy-and-hold abnormal over the long horizon. These results further confirm the explanatory power of liquidity to the acquiring firm's post-acquisition performance.

Overall, we make two contributions in this paper. Firstly, our results taken together suggest that liquidity is an important risk dimension when examining the acquiring firm's long-run performance. The acquiring firms' underperformance relative to their size and book-to-market matching firm is explained by a failure of the matching-firm approach and/or the multifactor model approach to provide a proper control for the liquidity risk. There have been very few studies examining the role of liquidity in explaining various anomalies associated with corporate events; secondly, our new

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[9] Due to the hind-sight nature, this does not form a feasible trading strategy.

approach of measuring the event firm's long-horizon performance not only preserves the investor's wealth experience during the holding period reflected in the buy-and-hold abnormal returns, but also is robust to various problems inherit in the buy-and-hold abnormal return and the traditional calendar time approach with simplified rebalancing scheme. It therefore provides a more robust approach for future long-horizon event studies.

The rest of this paper is organized as follows: Section 2 provides a detailed discussion of our new approach in measuring the acquiring firm's long-run abnormal returns; section 3 describes data; section 4 reports our empirical results and section 5 concludes.

2. The Decomposed Buy-and-Hold Calendar Time Approach

Measuring an event firm's long-run performance can be problematic, for three reasons. First and foremost, the true expected return is unobservable and the estimation error compound over the long horizon; second, it can be challenging to choose a return measurement or metric that properly reflect the wealth experience of an typical investor; third, the test statistic can be poorly specified when we are not clear about the return measure's underlying distribution.

To estimate the unobservable expected return, finance researchers use either a matching approach (to a matching firm or a reference portfolio) or an asset pricing model. Barbar and Lyon (1997) perform comprehensive analyses of the matching approach and isolate the size and book-to-market matching firm's return as a benchmark with well specified test statistic. This benchmark has been used in numerous studies of the event firm's long-horizon performance.[10] Our concern here however, is that the size and book-to-market matching firm approach do not fully reflect the effect of liquidity on stock returns.[11] Such concern is shown to be valid in the empirical analyses presented in section IV.

Different measures of abnormal return are proposed for different approaches. When the matching approach is used, the buy-and-hold abnormal return is normally used to measure the abnormal performance of the event firm. Ritter (1991), Barber and Lyon

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[10] Such studies include Eckbo, Masulis and Norli (2000), Eckbo and Norli (2004), Chan, Wang and Wei (2004), Spiess and Affleck-Graves (1999), Loughran and Vijh (1997), and others.
[11] Similar concern is raised by Fama (1998).

(1997, 1999), and Loughran and Ritter (2000) recommend the buy-and-hold abnormal returns as it properly reflects the wealth experience of a typical investor. Fama(1998), Brav (2000) and Mitchell and Stafford (2000) however, argue that the buy-and-hold abnormal returns fail to fully correct for the correlation in the abnormal returns across events. Fama(1998), and Mitchell and Stafford (2000) therefore advocate the calendar time approach. Specifically, in each calendar month, calculate the abnormal return on each event firm that has an event date in the last five years (the abnormal returns can be estimated in any reasonable way, for example, with a matching firm or reference portfolio approach, or with an asset pricing model). Then average the abnormal returns in each calendar month across the event firms to get the abnormal return in the month to the portfolio of firms that have their event dates in the last five years. As a result, the portfolio is reformed each month. According to Fama (1998), the calendar time approach accurately control for the effects of the correlation across the event-firm abnormal returns. Nevertheless, the traditional calendar time approach involves rebalancing the portfolio at the start of every month to equal weights or to the contemporaneous value weights. This simplification is unrealistic according Liu and Strong (2007), because due to the prohibitive transaction costs, no rational investor will ex ante seriously consider such rebalancing strategy. Therefore, such approach does not accurately reflect the wealth experiences typical of a long-term investor, originally reflected in the buy-and-hold abnormal return.

Liu and Strong (2007) propose a straightforward calculation of the monthly portfolio returns over an m-month holding, which preserves the buy-and-hold property and minimizes the transaction costs.[12] The formula is given by equation (1). For brevity, we refer those who are interested in more details to page 6 of Liu and Strong (2007).

$$r_{P,\tau} = \sum_{i=1}^{N} \frac{w_i \prod_{t=1}^{\tau-1}(1+r_{it})}{\sum_{j=1}^{N} w_j \prod_{t=1}^{\tau-1}(1+r_{jt})} r_{i\tau} \quad \tau = 2,...,m \; ; \; r_{P1} = \sum_{i=1}^{N} w_i r_{i1} \qquad (1)$$

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[12] This calculation also largely avoids the market microstructure biases as discussed in Roll (1983), Blume and Stambaugh(1983) and Conrad and Kaul (1993).

where N is the number of stocks in the component; w_i is the weight in stock i at the beginning of the holding period; $r_{P,\tau}$ is the portfolio return in month τ; r_{it} (t=1,…, m) is stock i's return in month t; and $r_{i\tau}$ (t=1,…, m) is stock i's return in month τ.

Building on Liu and Strong (2007), we use the decomposed buy-and-hold calendar time approach to calibrate the long-run performance of our acquiring firms. In particular, in each July, we form an equal weighted portfolio of the firms that complete at least one acquisition in the past 12 months[13,14,15,16]. The portfolio is held for the next five years.[17] The first month portfolio return is $r_{P1} = \dfrac{1}{N}\displaystyle\sum_{i=1}^{N} r_{i1}$. The remaining fifty nine monthly portfolio returns is given by equation (1). As each portfolio is held for five years, we hold five portfolios formed in successive years in a typical month. We calculate the monthly return to the acquiring- and matching-firm portfolio as the average of the monthly returns to the five portfolios formed in successive years. We examine the monthly return differences between the acquiring- and the matching-firm portfolios are further calculated. It is possible that the time-series of return differences has residual exposure to size and book-to-market risk, as the matching can be imperfect and there can be other risk factors that the matching fails to consider. We therefore subject the time-series of monthly return differences to the adjustments of multi-factor asset pricing models, namely the Fama-French three factor model, the momentum augmented four factor Carhart model and the two-factor (market and liquidity) model of Liu (2006). Our focus is on the risk-adjusted return differences (i.e. the intercept) from different multi-factor asset pricing model specifications. Our approach in essence is a calendar time approach, and therefore fully correct for the cross-correlation problem in the buy-and-hold approach. Moreover, the risk adjusted return differences preserve the buy-and-hold property, and therefore properly reflects a typical investor's wealth experience, adjusted for risk. Finally, compared with the traditional calendar time approach, our decomposed buy-

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[13] Our core results remain unchanged if we form portfolios in each January.
[14] The equal weights are the initial weights assigned to each component stock at the start of holding period.
[15] According to Fama (1998), anomalies are weak among large firms. We thus focus on the equal weighting scheme. Indeed, the underperformance of acquiring firms relative to their matching firms is not obvious under an initial value-weighting scheme.
[16] An acquiring firm is included for only once if it completes several transactions in the past 12 months.
[17] We also hold the portfolios for three years, the results similar.

and-hold calendar time approach minimizes transaction costs, representing a feasible trading strategy.

3. Sample, Data and Summary Statistics

Our sample of acquiring firms is drawn from the SDC Merger and Acquisition database. We impose the following criteria for an acquiring firm to be included in our sample:

a) Our empirical analyses cover the period of 1980-2005. All transactions should be completed before 2002, as we need at least three years to compute the buy-and-hold abnormal returns. When we examine the five-year performances, the sample stops in 2000. We also require there be at least 10 acquiring firms in each year to minimize the heteroskedasticity in the time-series of portfolio returns (see Mitchell and Stafford, 2000). This requirement excludes all three years before 1980 covered by SDC;

b) Similar to Loughran and Vijh (1995), we require the deal value be at least USD 10 million and no less than 1% of the acquiring firm's market value of equity, as tiny transactions hardly have any wealth impact on the acquiring firm;

c) Both the announcement date and the completion date should be available from SDC;

d) Both the acquiring firm and the target firm should be listed in NYSE/AMEX or NASDAQ;

e) Data should be available from CRSP/COMPUSTAT to compute the acquiring firm's market value of equity and the book-to-market ratio of equity in the completion month. For this reason, we exclude negative book value firms at each portfolio formation. To accurately calculate the book equity value of the acquiring firm in the completion month, we adjust the acquiring firm's book value of equity in the completion month by adding the target's book value of equity in the same month and deducting the amount of cash payment to the target shareholders. The market value of equity is updated each month. When using the book value to calculate the book-to-market ratio, a 5-month gap between the fiscal year end date and the annual reporting date is assumed.

f) Daily trading volume data should be available from CRSP to compute the liquidity measures for the acquiring firm;

These requirements give us a raw sample of 3585 transactions, made by 1975 acquiring firms. We further require that in the three years prior to the announcement, the acquiring firm should not be involved in similar acquisitions (being either an acquiring or a target firm), in SEOs or in IPOs, because we suspect such confounding events will spurious inflate the underperformance of the acquiring firms. This requirement gives us a focused sample of 1658 deals, made by 1293 acquiring firms at different time point.

For each acquiring firm, we find a matching firm based on size and book-to-market equity ratio. We require a matching firm belong to the acquiring firm's NYSE size decile in the completion month. If the acquiring firm is listed on NASDAQ (NYSE/AMEX), the matching should be from the same exchange(s) to make their trading volume comparable. We then choose the firm whose book-to-market equity ratio is closest to the acquiring firm's from below.[18] We also make sure our candidate firms are not involved in any similar acquisitions either as target or as acquirer, in IPO or SEOs. In addition, we allow the same firm to be chosen as a matching firm for more than once. In such case, we treat this firm as different firms when calculating the portfolio returns. We are able to find a matching firm for 1385 of our acquiring firms in the completion month. When a matching firm is delisted, we replace the remaining time-series of returns with the returns of second best matching firm, then the third best matching firm, and so on. If the acquiring firm is delisted, the time series of returns stop before the month of delisting.

Table 1 reports the descriptive statistics for both the acquiring firms and the transactions. Among the 1658 transactions, there are 799 stock dominated offers (over 50% paid in stock) and 859 cash dominated ones (over 50% paid in cash). There is a clear pattern over time: in the 1980s the number of cash dominated offers dominates the number of stock offers; in the 1990s however, this is reversed. There are 1097 acquiring firms, or about two thirds of our sample is from NYSE/AMEX and 561 are from NASDAQ. On average, the acquiring firms' market value of equity is USD 4217.706 million in nominal term, tilted towards large firms. Barber and Lyon (1997) find that the test statistic to the sample of the largest size-decile is biased towards zero under the size and book-to-market matching firm approach. Therefore the bias

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[18] Requiring the matching book-to-market ratio being lower than the acquiring firm's will bias the buy-and-hold approach toward finding zero buy-and-hold abnormal returns for the acquiring firms, when matching is based on size and book-to-market ratio. The results are broadly the same if we choose the firm with the closest book-to-market ratio, regardless of the sign of difference.

introduced in our sample due to non-random firm size should be against finding negative performances, when using the buy-and-hold abnormal returns. The deal value on average is 937.139 million, about one fourth of the average of the average acquiring firm's size. In panel A, we report the acquiring firm's liquidity characteristics prior to the announcement month, for the entire sample and by year. It is measured by the acquiring firm's turnover-adjusted number of zero trading volume days in a year (zero-trading-volume day henceforth), following Liu (2006). It captures several dimensions of liquidity, including trading speed, trading quantity and trading costs. We use this measure as the main gauge for the acquiring firm's liquidity characteristics. On average, an acquiring firm has 4.674 zero-trading-volume days during the year prior to the announcement month. It is noticeable that the number of zero-trading-volume days is higher in the early and mid 1990s, relative to those in other years. Meanwhile, it can be traced that the size of acquiring firm is relatively smaller. In panel A, we also report the acquiring firm's liquidity beta estimated from the two-factor (market and liquidity) model of Liu (2006), using 36 monthly data (at least 30) prior to the announcement month. On average, our acquiring firms have negative liquidity risk exposure (liquidity beta = -0.014), indicating our event firms are tilted toward more liquid firms. In panel B, We report more variables that are related to the acquiring firms' liquidity, by subsamples. An acquiring firm belongs to the glamour group if its book-to-market equity ratio is less than or equal to the in-sample median of the acquirers in the same year, otherwise it belongs to the value group. A transaction is a stock-dominated offer if at least half of the deal value is financed with stocks, otherwise it is a cash-dominated offer. On average, relative to the value (cash) acquirers, the glamour (stock) acquiring firms are larger in size and deal value, have higher growth (measured by book-to-market equity ratio), have more analyst following and institutional shareholders.[19] Regarding liquidity, apart from the zero-trading-volume days, we also report the absolute daily ratio of stock return to dollar volume averaged over the prior 12 months (the Armihud measure henceforth; see Armihud, 2002) and the average daily turnover over the prior 12 months. These measures consistently show that the glamour (stock) acquiring firms are more liquid firms compared with the value (cash) ones. Further, the glamour (stock) acquiring

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[19] Data on Analysts are from I/B/E/S. Data on institutional investors are from SDC spectrum.

firms have negative liquidity risk exposure, while the value (cash) acquiring firms'
have positive risk exposure.

4. Empirical Results

4.1 Confirming Previous Findings

We set out by confirming the previous results on an acquiring firm's post-
acquisition performance that are based on either the buy-and-hold abnormal return or
the traditional calendar time abnormal return.

The results are reported in table 2. In the top section of panel A, the acquiring firms
on average earn a buy-and-hold return of 76.536% over 5 years, while the size and
book-to-market matching firms earn 105.230%. The buy-and-hold abnormal return
for the acquiring firm in the overall sample therefore is -28.694% (statistically
significant at 1%). The three-year buy-and-hold return of an average acquiring firm is
-12.783% (statistically significant at 1%). In the first year after deal completion, the
acquiring firms do not under perform their matching firms (neither economically nor
statistically). We further examine the subsample of stock and glamour acquiring firms,
two subgroups that have been documented to have the most severe underperformance.
By the buy-and-hold abnormal return, the glamour acquiring firms underperform their
size and book-to-market matching firms by 33.934% (statistically significant at 1%)
over five years. Stock acquiring firms underperform their size and book-to-market
matching firms by 36.793% (statistically significant at 1%) over five years. These
results contrast the weaker underperformance of value acquiring firms (23.562% over
five years) and cash acquiring firms (21.126% over five years). In general, the
acquiring firms' underperformances reported in table 2 are consistent with the
findings of Loughran and Vijh (1995) and Rau and Vermaelen (1998).

As mentioned earlier, we require that an acquiring firm in our sample should not be
involved in similar acquisitions, in SEOs or IPOs. We suspect that inclusion of such
firms will spurious inflate underperformance. This conjecture is confirmed in the
bottom section of panel A. Including those acquiring firms with confounding events
dramatically inflate the under performance of the acquiring firms relative to their size
and book-to-market matched firms. For example, the buy-and-hold abnormal return is
now -40.149% in the overall sample over five years, in contrast to -28.694% when the

firms with confounding events are excluded. Therefore, we perform all our remaining analyses based on the smaller sample where acquiring firms with confounding events are excluded.

In Panel B of table 2, in each month, we form equal-weighted acquiring firm portfolio that includes all acquiring firms in the previous 5 or 3 years, following the traditional calendar time approach. We do the same for the matching firms. We then report the un-adjusted monthly average returns for the acquiring firm portfolio, the un-adjusted monthly average returns for the matching firm portfolio and their differences. The un-adjusted calendar time return is not statistically significant in any of the samples. In the same panel, to calculate the traditional calendar time abnormal return, we further adjust the monthly traditional calendar time returns using the Fama-French three factor model and the momentum augmented four factor Carhart model. This is performed on the acquiring firm portfolio returns, the matching firm portfolio returns and their differences. The calendar time abnormal returns (i.e. the intercepts) from all estimations are then reported. The calendar time abnormal returns are statistically insignificant for all samples, expect for the glamour acquiring firms. In summary, the results here are broadly consistent with the finding of Mitchell and Stafford (2000) that most of the anomalies disappear under the traditional calendar time approach which adjust for the cross-sectional dependence of abnormal returns.

4.2 An Acquiring Firm's Liquidity Relative to Its Size and Book-to-Market Matching Firms

We next move our attention to both the level of and the change in the acquiring firms' liquidity, relative to its size and book-to-market matching firms. Table 3 shows that an acquiring firm is more liquid relative to its size and book-to-market matching firm, especially in the post-acquisition years. In the first year after the acquisition, an average acquiring firm has 2.022 zero-trading-volume days, 5.858 days less than that of its matching firm. The magnitude of such difference remains stable over the next four years. There is also a clearly traceable tendency that the acquiring firms' liquidity improves relative to their size and book-to-market matched firms. An average acquiring firm have 4.457 zero-trading-volume days in the year prior to the announcement month, 2.355 days less than its size and book-to-market matching firm in the same period. This difference dramatically increases to 5.858 days in the first

year following the completion month and remain at similar levels in the next four years. The increases in difference are statistically significant in all years after the acquisitions according to untabulated t statistics. The Armihud measure provides similar evidence. In the first year after the acquisition, an average acquiring firm's Armihud measure is 0.313 (multiplied by 10^{-6}), in dramatic contrast to 2.027 (multiplied by 10^{-6}) of its matching firm. In the year prior to the announcement month, the Armihud measure for an average acquiring firm is 0.533, 0.373 below that of its size and book-to-market matching firm. In the first year after the completion month, the level of difference increases to 1.713 and remain at similar level in the next four years. The increases in difference are statistically significant in all years (except for year 3) after the acquisitions according to untabulated t statistics. The changes in the acquiring firm's turnover also indicate that the acquiring firm's liquidity improve after the acquisitions, relative to its size and book-to-market matching firm. Li and Swaminanthan (2000) question the turnover as a clean measure of liquidity. We therefore only use the turnover to corroborate the findings with the other two measures of liquidity.

Table 3 also reports that an average acquiring firm experiences more dramatic increase in the number of analysts following and number of institutional investors holding, compared to its size and book-to-market matching firm. The increases in the number of analyst following and institutional holding suggest plausible factors that lead to the improvement in the acquiring firm's liquidity.

The bottom two sections of table 3 report the changes in size and book-to-market equity ratio of the acquiring firms, matching firms and their differences. It can be puzzling to see that the acquiring firm's size grows at a faster pace than its matching firm's, given its underperformance. The primary reason is that the acquiring firms make more acquisition[20] in the post-acquisition years than their matching firms[21]. For example, Rexam Plc. made ten acquisitions in the five years after the completion month, for a total value of USD 1033.621 million, while its matching firm made no acquisition.

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[20] These takeovers include those transactions that are excluded from our sample.
[21] In the interest of brevity, we do not report the detailed information here. It is available from the authors at request.

4.3 The Acquiring Firm's Post Acquisition Performance Measured on the Decomposed Buy-and-hold Calendar Time Approach

We report our core results based on the decomposed buy-and-hold calendar time approach in table 4 and 5. As is described in section two, the decomposed buy-and-hold calendar time approach implicitly controls for the omitted risk exposure due to imperfect matching.[22] We rely on the risk-adjusted return differences (i.e. the intercept) from different multi-factor asset pricing model specifications to infer the performance of the acquiring firms relative to their size and book-to-market matching firms in the post-acquisition period.

Panel A of Table 4 reports the un-adjusted monthly returns to the acquiring firm portfolio, the un-adjusted monthly returns to the matching firm portfolio and their differences. The analyses are based on both the full sample and sub samples. For the overall sample, the average monthly return difference between the acquiring firm portfolio and the matching firm portfolio is -0.204% (statistically significant at 5%). The difference is -0.273% to the glamour acquiring firms and -0.313 to the stock acquiring firms, both are statistically significant at 5%. The monthly differences are much weaker to the value or cash acquiring firms. In general, the un-adjusted acquiring firm performances measured under the decomposed buy-and-hold calendar time approach are qualitatively consistent with those based on the buy-and-hold abnormal returns.

In Panel B and C of table 4, we adjust the portfolio returns and return differences presented in panel A by different multi-factor asset pricing models. Only full sample results are examined here. Panel B of table 4 assumes a five-year holding period for the portfolios. The Fama-French three factor model yields an alpha of -0.223% (statistically significant at 5%), representing an underperformance of 13.38% of the acquiring firm relative to its matching firms. The momentum augmented four factor Carhart model has an alpha of similar magnitude and statistical significance. Consistent with our expectation, when adjusted by the two-factor (market and liquidity) model, the magnitude of the alpha is significantly reduced to -0.133%, translating into a five-year underperformance of -7.98%. More importantly, the statistical significance of the two-factor model alpha is well below the conventional

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[22] By imperfect matching, we mean that the matching is performed on an incomprehensive set of risk dimensions (e.g. matching only on size and book-to-market, not considering liquidity) or that matching based on risk characteristics fail to fully control for the exposure to risk.

level (p-value=0.257). The loading on the liquidity factor is negative, consistent with the finding in table 3 that the acquiring firms have better liquidity relative to their matching firms. In panel C of table 4, we assume a three-year holding period for the portfolios. The results are generally consistent with those with a 5-year holding period in panel B.

In table 5, we form the portfolios from the subsamples, glamour and stock acquiring firms in particular. A five-year holding period is assumed. The results are qualitatively consistent with the full-sample results and quantitatively stronger. Panel A of table 5 reports the results based on glamour acquiring firms. The Fama-French three factor model yields an alpha of -0.323%, corresponding to an underperformance of 19.38% over five years. The momentum augmented four factor model has an alpha of similar magnitude and statistical significance. The two-factor (market and liquidity) model yields an alpha that is statistically insignificant (p-value=0.171). The magnitude is reduced to -0.199%, representing an underperformance of 11.94% over five years. Loading on the liquidity factor is -10.234% (statistically significant at 5%).

Panel B of table 5 is based on stock acquiring firms. The Fama-French three factor model and the momentum augmented four factor model yield an alpha of -0.432% (statistically significant at 5%) and -0.324% (statistically significant at 10%) respectively, representing a five year underperformance of 25.92% and 19.44% respectively. The two-factor (market and liquidity) model reduces the alpha to -0.215% (-12.9% over five years) and make it statistically insignificant (p-value=0.260).

In table 6, we use an alternative approach to confirm the explanatory role of liquidity for the acquiring firm's underperformance relative to its size and book-to-market matching firm. In particular, we perform a matching based on the acquiring firm's liquidity beta, which is estimated using the monthly return data over the first three years after the acquisitions. The matching is performed in the thirty sixth month after the completion month. We require the matching firm have a liquidity beta immediately above the acquiring firm's.[23] A benefit of this alternative approach is that, relative to the matching firm approach based on size and book-to-market, it keeps the methodology constant and allows the risk characteristics to vary. The drawbacks are that it is subject to the same statistical problem of cross-correlation in

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[23] This will biases the buy-and-hold approach toward finding underperformance for the acquiring firms.

abnormal returns and that it does not form a feasible trading strategy due to its hind-sight nature. This exercise is only to examine the explanatory power of liquidity risk to the acquiring firm's underperformance originally documented based on the buy-and-hold strategy. It does not form and implementable investment strategy. When matched on the liquidity beta, the acquiring firms do not show any symptom of underperformance. The buy-and-hold abnormal returns are neither economically nor statistically significant under any holding period (five or three years). Given that the buy-and-hold abnormal returns reject the null of zero abnormal return too often (Fama, 1998 and Mitchell and Stafford, 2000), we are confident to claim that when matched on liquidity beta, the acquiring firms do not have negative buy-and-hold abnormal over the long horizon.

Taken together, the results in table 4, 5 and 6 are well consistent with our conjecture that matching on size and book-to-market does not fully capture the acquiring firm's exposure to liquidity risk. Liquidity is an important risk characteristic that explains the acquiring firms' underperform relative to their size and book-to-market matching firms documented in the previous literature.

5. Conclusion

Liquidity has been confirmed as an important risk factor in the formation of prices. We build from there and ask the question whether the acquiring firm's underperformance relative to its size and book-to-market matching firms can be explained by liquidity? Our study simultaneously address another question that, in the study of acquiring firm's long-run performance, whether the size and book-to-market matching advocated by Barber and Lyon (1997) can fully capture the event firm's risk exposure.

We design an approach that is robust to the measurement and statistical problems discussed in the recent literature of long-horizon event studies. Our results show that the size and book-to-market matching approach fails to fully capture the acquiring firm's exposure to the liquidity risk. The acquiring firms underperform their size and book-to-market matching firms largely because they are subject to less liquidity risk in the post-acquisition periods. When we match on liquidity beta, even the buy-and-hold abnormal returns do not support the underperformance of the acquiring firms,

further confirming the importance of liquidity in the studies of the acquiring firm's long-horizon performance.

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Table 1: Descriptive Statistics

Panel A reports the sample distribution and the acquiring firm's and the deal's characteristics by year. All transactions are completed. N1 is the number of deals for the sample where the acquirer may have confounding events (IPO, SEO or other acquisitions) in the previous 3 years before the current announcement. All the entries in other columns are based on a smaller sample where we exclude the acquirers with previous confounding events. The left hand side of Panel A reports the number of deals in each category. N represents the number of deals in the overall sample (excluding acquiring firms with confounding events). A stock (cash) dominated offer has more than half of the deal value financed in stock (cash). The right hand side of Panel A reports the deal and acquiring firm characteristics by year. LM12 is the standardized turnover-adjusted number of zero-trading-volume days over the 12 months (Liu, 2006) prior to the deal announcement month. The liquidity beta is the coefficient on the liquidity factor of the two factor (market and liquidity) model in Liu(2006), estimated on 36 months of return prior to the announcment month. Both the acquirer's market value of equity and the book-to-market ratio of equity are measured in the May prior to the announcement. Panel B reports more acquring firm characteristics by acquirer type. A glamour (value) acquirer is defined as that having a book-to-market ratio of equity that is below (above) the median value of all the acquirers in the same year of completion. The Acquirer's Average Daily Turnover is the average daily turnover measured over the 12 months prior to the announcement month. The acquirer's Armihud measure is the average daily absolute return to dollar volume ratio (multiplied by 10^6) measured over the 12 months prior to the announcement (Armihud, 2002). Number of Analysts Following acquirer is the number of analyst providing earning forecasts over the 12 months prior to the announcement month. Number of Institutions Holding acquirer is the number of institutional investors that hold the acquirer in the 3 months prior to the announcement. Mean values are reported for the characteristics.

Panel A: Sample Distribution and Acquirer and Deal Characteristics by Year										
Sample Distribution by Year (Entries Are the Number of Deals Unless Denoted Otherwise)						Acquirer and Deal Characteristics by Year				
Year	N1 (%)	N (%)	Stock Dominated Offer	Cash Dominated Offer	Acquirers from NYSE/AMEX	Acquirers from NASDAQ	Acquirer's Turnover-adjusted number of Zero Trading Volume Days (LM12)	Acquirer's Liquidity Beta	Deal Value (Mil.)	Acquirer's Market Value of Equity(Mil.)	Acquirer's Book-to-Market Ratio of Equity
1980	22 (0.61)	19 (1.15)	0	19	16	3	0.000	0.192	297.680	3494.889	0.748
1981	64 (1.79)	53 (3.20)	7	46	49	4	1.293	0.423	371.987	1153.933	1.059
1982	64 (1.79)	44 (2.65)	3	41	37	7	0.891	0.469	206.381	2076.000	1.050
1983	90 (2.51)	54 (3.26)	4	50	44	10	1.468	0.303	188.222	796.215	0.919
1984	121 (3.38)	68 (4.10)	7	61	57	11	7.477	0.461	580.435	1330.614	0.859
1985	113 (3.15)	49 (2.96)	21	28	39	10	0.997	0.236	674.950	2392.328	0.698
1986	111 (3.10)	46 (2.77)	10	36	36	10	0.778	-0.217	316.466	1809.839	0.606
1987	111 (3.10)	44 (2.65)	21	23	31	13	4.563	-0.238	300.842	1222.169	0.518
1988	121 (3.38)	68 (4.10)	19	49	53	15	2.958	0.022	215.494	2142.224	0.691
1989	94 (2.62)	52 (3.14)	17	35	32	20	8.160	0.020	832.288	1770.071	0.535
1990	64 (1.79)	38 (2.29)	13	25	26	12	1.496	-0.137	581.914	4027.856	0.591
1991	73 (2.04)	36 (2.17)	20	16	24	12	7.611	-0.140	152.192	996.750	0.784
1992	71 (1.98)	33 (1.99)	20	13	19	14	3.920	0.304	360.030	1424.769	0.593
1993	105 (2.93)	52 (3.14)	27	25	35	17	7.150	-0.012	390.386	2699.334	0.469
1994	198 (5.52)	102 (6.15)	64	38	67	35	4.523	0.136	360.479	2433.655	0.612
1995	239 (6.67)	114 (6.88)	69	45	62	52	5.728	-0.060	567.865	2769.134	0.474
1996	265 (7.39)	111 (6.69)	68	43	65	46	6.852	0.024	1127.522	3838.660	0.741
1997	360 (10.04)	133 (8.02)	80	53	83	50	6.922	-0.101	786.672	4300.834	0.415
1998	375 (10.46)	146 (8.81)	92	54	96	50	3.863	-0.245	1976.593	6947.308	0.709
1999	326 (9.09)	164 (9.89)	100	64	104	60	3.309	-0.158	2401.810	11565.230	0.847
2000	261 (7.28)	94 (5.67)	49	45	56	38	3.628	-0.387	1681.955	6250.781	3.862
2001	209 (5.83)	84 (5.07)	58	26	37	47	8.965	0.076	1104.091	5457.488	0.801
2002	128 (3.57)	54 (3.26)	30	24	29	25	4.112	-0.243	490.814	4689.994	0.772
Overall	3585 (100)	1,658 (100)	799	859	1097	561	4.674	-0.014	937.139	4217.706	0.873

Table 1 (cont'd)

	Panel B: Acquirer Characteristics by Acquirer Type			
	Glamour Acquirers	Value Acquirers	Stock Dominated Offers	Cash Dominated Offers
Deal Value(mil)	1266.578	604.505	1439.917	469.479
Market Value of Equity(Mil.)	6632.850	1779.142	4760.017	3713.275
Book-to-Market Ratio of Equity	0.310	1.441	0.605	1.122
Turnover-adjusted Number of Zero Trading Volume Days(LM12)	2.657	6.706	4.717	4.632
Average Daily Turnove(%)	0.513	0.311	0.488	0.340
Armihud Measure(10^{-6})	0.348	0.723	0.606	0.466
Number of Analysts Following the Acquirer	15.205	11.115	13.760	12.624
Number of Institutions Holding the Acquirer	157.994	95.084	129.086	124.497
Liquidity Beta	-0.146	0.120	-0.065	0.034
N	833	825	799	859

Table 2: The Acquirer's Post-acquisition Buy-and-Hold Abnormal Return(BHAR) and the Traditional Calendar Time Abnormal Return (to confirm previous findings)

We find a matching firm for each acquiring firm based on size and book-to-market ratio. The acquiring firm's abnormal return is then calculated and reported, using either the buy-and-hold approach (panel A) or the traditional calendar time approach (panel B). The traditional calendar time approach assumes equal-weighted monthly rebalancing for the portfolios under examination. Panel A reports th buy-and-hold abnormal returns(BHAR) for the acquiring firms. In addition, we report the buy-and-hold returns for the acquiring and the matching firms. The buy-and-hold returns are calculated over 6 months to 5 years after the completion month. Both the raw sample (with confounding events) and the focused sample (excluding confounding events) are examined. P-values are reported in parentheses, indicating the significance of the BHAR. Panel B reports the traditional calendar time abnormal returns for the acquiring firms. Only the focused sample is examined. Following the traditional calendar time approach, we first form equal-weighted acquiring firm portfolio in each month, which includes all acquiring firms in the previous 5 or 3 years. We do the same for the matching firms. We first report the u adjusted monthly average returns for the acquiring firm portfolio, the un-adjusted monthly average returns for the matching firm portfoli and also their differences. To calculate the traditional calendar time abnormal return, we adjuste the monthly traditional calendar time returns using the Fama-French three factor model or the momentum augmented four factor Carhart model. This is performed on the acquiring firm portfolio returns, the matching firm portfolio returns and their differences. The intercepts(i.e. the calendar time abnormal return) from each estimation are then reported. P-values for the intercepts are in the parentheses. In both panels, a glamour (value) acquirer has a book-to-market ratio of equity that is below (above) the median value of all the acquiring firms in the same year of completion. A stock (cash) dominated offer has more than half of the deal value paid in stock (cash). *, ** and *** indicate significance level of 10%, 5% and 1% respectively. All returns are reported in percentage.

Panel A: The Buy-and-Hold Abnormal Return(BHAR) for the raw and focused sample.						
		Overall	Glamour Acquirers	Value Acquirers	Stock Dominated Offer	Cash Dominated Offer
Buy-and-hold Abnormal Return(BHAR) for the focused sample(i.e. the sample excluding the Acquirers with previous confounding events)						
5-year holding period	Acquirer (%)	76.536	62.401	90.380	61.635	90.459
	Matched(%)	105.230	96.335	113.942	98.428	111.585
	BHAR(%)	-28.694***	-33.934***	-23.562**	-36.793***	-21.126***
		(0.000)	(0.003)	(0.027)	(0.002)	(0.043)
3-year holding period	Acquirer (%)	44.940	38.950	50.794	41.763	48.069
	Matched(%)	57.722	49.798	65.468	48.938	66.374
	BHAR(%)	-12.783***	-10.848	-14.674**	-7.175	-18.306***
		(0.007)	(0.124)	(0.019)	(0.309)	(0.003)
2-year holding period	Acquirer (%)	28.605	21.708	35.346	27.319	29.872
	Matched(%)	34.763	30.855	38.584	32.164	37.323
	BHAR(%)	-6.518**	-9.146**	-3.238	-4.845	-7.451**
		(0.042)	(0.027)	(0.462)	(0.319)	(0.040)
1-year holding period	Acquirer (%)	15.520	12.403	18.567	15.009	16.023
	Matched(%)	16.924	14.814	18.986	15.350	18.475
	BHAR(%)	-1.404	-2.411	-0.420	-0.340	-2.452
		(0.417)	(0.360)	(0.852)	(0.890)	(0.315)
6-month holding period	Acquirer (%)	8.058	5.997	10.073	7.914	8.201
	Matched(%)	8.378	7.971	8.776	7.368	9.373
	BHAR(%)	-0.320	-1.974	1.297	0.546	-1.173
		(0.769)	(0.232)	(0.363)	(0.724)	(0.445)
Buy-and-hold Abnormal Return(BHAR) for the raw sample(i.e. the sample containing the acquirers with previous confounding events)						
5-year holding period	Acquirer (%)	61.529	46.647	76.032	48.146	76.875
	Matched(%)	101.678	91.174	111.913	99.366	104.328
	BHAR(%)	-40.149***	-44.527***	-35.882***	-51.220***	-27.453***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
3-year holding period	Acquirer (%)	37.134	27.667	46.373	31.039	44.482
	Matched(%)	54.391	48.588	60.054	50.657	58.893
	BHAR(%)	-17.257***	-20.912***	-13.681***	-19.618***	-14.411***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Table 2 (cont'd)

Panel B: The Traditional Calendar Time Abnormal Returns for the Focused Sample (i.e. the sample excluding the acquirers with previous confounding events)

	Overall	Glamour Acquirers	Value Acquirers	Stock Dominated Offer	Cash Dominated Offer
5-years holding period					
The Monthly Average of the Un-adjusted Traditional Calendar Time Returns					
Acquirer (%)	(1.222)	(1.121)	(1.447)	(1.216)	(1.206)
Matched(%)	(1.269)	(1.173)	(1.483)	(1.305)	(1.225)
Acquirer -Matched(%)	-(0.047)	-(0.052)	-(0.037)	-(0.089)	-(0.019)
	(0.730)	(0.652)	(0.773)	(0.757)	(0.906)
The Traditional Calendar Time Returns adjusted by the Fama-French Three Factor Model(i.e. the Traditional Calendar Time Abnormal Return Estimated on the Fama-French Three-Factor Model)					
Acquirer (%)	-0.175**	-0.291***	0.012	-0.162	-0.204**
	(0.038)	(0.003)	(0.914)	(0.159)	(0.041)
Matched(%)	-0.017	-0.112	0.200**	-0.107	-0.072
	(0.889)	(0.261)	(0.044)	(0.707)	(0.607)
Acquirer -Matched(%)	-0.158	-0.179*	-0.187	-0.055	-0.133
	(0.230)	(0.082)	(0.129)	(0.852)	(0.400)
The Traditional Calendar Time Returns adjusted by the Momentum Augmented Four Factor Carhart Model(i.e. the Traditional Calendar Time Abnormal Return Estimated on the Momentum Augmented Four Factor Carhart Model)					
Acquirer (%)	-0.124	-0.158	-0.018	-0.115	-0.187*
	(0.166)	(0.122)	(0.885)	(0.349)	(0.080)
Matched(%)	0.019	0.034	0.179*	-0.115	-0.030
	(0.884)	(0.740)	(0.089)	(0.703)	(0.840)
Acquirer -Matched(%)	-0.144	-0.192*	-0.197	0.001	-0.157
	(0.306)	(0.081)	(0.135)	(0.998)	(0.352)
3-years holding period					
The Traditional Monthly Average of the Un-adjusted Calendar Time Returns					
Acquirer (%)	1.150	0.996	1.415	1.184	1.137
Matched(%)	1.142	1.140	1.501	1.090	1.127
Acquirer -Matched(%)	0.008	-0.144	-0.086	0.094	0.010
	(0.961)	(0.270)	(0.518)	(0.765)	(0.959)
The Traditional Calendar Time Returns adjusted by the Fama-French Three Factor Model(i.e. the Traditional Calendar Time Abnormal Return Estimated on the Fama-French Three-Factor Model)					
Acquirer (%)	-0.204**	-0.401**	0.060	-0.179	-0.204*
	(0.018)	(0.000)	(0.620)	(0.145)	(0.055)
Matched(%)	-0.088	-0.106	0.273**	-0.188	-0.128
	(0.546)	(0.280)	(0.012)	(0.550)	(0.470)
Acquirer -Matched(%)	-0.116	-0.294**	-0.213	0.009	-0.076
	(0.451)	(0.015)	(0.103)	(0.978)	(0.699)
The Traditional Calendar Time Returns adjusted by the Momentum Augmented Four Factor Carhart Model(i.e. the Traditional Calendar Time Abnormal Return Estimated on the Momentum Augmented Four Factor Carhart Model)					
Acquirer (%)	-0.137	-0.221**	0.009	-0.092	-0.213*
	(0.132)	(0.041)	(0.944)	(0.480)	(0.061)
Matched(%)	-0.093	0.038	0.229**	-0.264	-0.126
	(0.555)	(0.711)	(0.049)	(0.433)	(0.508)
Acquirer -Matched(%)	-0.045	-0.259**	-0.220	0.172	-0.088
	(0.786)	(0.044)	(0.116)	(0.616)	(0.677)

Table 3: The Changes in Acquiring Firm's Characteristics Relative to Those of the Matching Firm's

   This table reports the characteristics of the acquiring firms, of the matching firms and their differences. The matching is performed on size and book-to-market in the completion month. All years are relative to the event time. For example, Year - 1 is the 12-month period prior to the announcement month. Year +1 is the first 12-month period following the completion month and so on. LM12 is the standardized turnover-adjusted number of zero-trading-volume days in each year (Liu, 2006). The Average Daily Turnover is the average daily turnover over each year. The Armihud measure is the average daily absolute return to dollar volume ratio (multiplied by 10^6) in each year (Armihud, 2002). Number of Analysts Following Acquirer is the number of analysts providing earning forecasts for the acquiring firm in each year. Number of Institutions Holding Acquirer is the number of institutional investors that hold the acquiring firm in the 3 months prior to the ending month in each year. Obs is the number of observations. *, ** and *** indicate the significance of difference at 10%, 5% and 1% respectively. Mean values are reported.

Matching Performed on Size and Book-to-market in the Completion Month						
	year -1	year + 1	year +2	year + 3	year + 4	year + 5
Turnover-adjusted Number of Zero Trading Volume Days(LM12)						
Acquirer	4.457	2.022	2.369	1.972	1.879	1.925
Matched Firm	6.813	7.880	7.850	7.392	7.958	6.882
Acquirer-Matched	-2.355***	-5.858***	-5.481***	-5.420***	-6.079***	-4.957***
Obs	1385	1358	1301	1232	1160	1075
Average Daily Turnover(%)						
Acquirer	0.401	0.447	0.424	0.439	0.463	0.482
Matched Firm	0.355	0.376	0.368	0.381	0.393	0.412
Acquirer-Matched	0.046***	0.070***	0.056***	0.058***	0.070***	0.070***
Obs	1385	1358	1301	1232	1160	1075
Armihud Measure(10^{-6})						
Acquirer	0.533	0.313	0.440	0.571	0.612	0.688
Matched Firm	0.907	2.027	2.004	2.188	2.626	2.213
Acquirer-Matched	-0.373**	-1.713***	-1.564***	-1.618	-2.01***	-1.524*
Obs	1385	1358	1301	1232	1160	1075
Number of Analysts Following						
Acquirer	14.061	15.177	15.888	16.322	16.511	15.872
Matched Firm	13.162	14.367	14.656	14.830	14.603	13.878
Acquirer-Matched	0.899***	0.810***	1.231***	1.492***	1.908***	1.994***
Obs	1384	1358	1301	1232	1160	1075
Number of Institutions Holding						
Acquirer	132.561	155.427	163.776	177.597	192.316	195.087
Matched Firm	130.024	142.952	152.946	162.814	171.581	173.066
Acquirer-Matched	2.538	12.474***	10.829***	14.782***	20.734***	22.021***
Obs	1384	1358	1301	1232	1160	1075
Market Value of Equity(Mil.)						
Acquirer	4416.915	6255.469	6105.503	6748.864	7797.859	8122.375
Matched Firm	4672.352	5592.288	6407.596	6393.126	6674.564	7089.669
Acquirer-Matched	-255.437	663.181	-302.093	355.739	1123.294	1032.706
Obs	1385	1358	1301	1232	1160	1075
Book-to-Market Ratio of Equity						
Acquirer	0.904	1.004	1.301	1.256	1.900	0.984
Matched Firm	0.852	1.364	1.939	1.542	1.514	2.792
Acquirer-Matched	0.052	-0.362**	-0.650	-0.301	0.367	-1.75**
Obs	1383	1353	1290	1206	1122	1035

Table 4: The Risk-adjusted Portfolio Returns and Return Differences Calculated Based on the Decomposed Buy-and-hold Calendar Time Approach

We form portfolios from all the acquiring firms and their matching firms in each July and hold for the next 5 or 3 years. The matching is performed on size and book-to-market ratio in the completion month. We then calculate the monthly portfolio returns using equation (1). In panel A, we report the monthly returns to the acquiring firm portfolios, to the matching firm portfolios and their differences. The caculation is based on both the full sample and the subsamples. P-values are reported in parentheses, indicating the significance of the un-adjusted return differences. In panel B and C, we only examine the full sample. The monthly returns reported in Panel A are adjusted for risks, using different multi-factor asset pricing model specifications. The multi-factor asset pricing models are respectively the Fama-French three factor model, the momentum augmented four factor Carhart model and the two factor (market and liquidity) model of Liu (2006). The numbers in parentheses are p-values. In all panels, the returns and coefficients are reported in percentage. *, ** and *** indicate significance at 10%, 5% and 1% respectively.

	Overall	Glamour Acquirers	Value Acquirers	Stock Dominated Offer	Cash Dominated Offer
Panel A: The un-adjusted Monthly Portfolio Returns and Returns Differences					
5-year holding period					
Acquirer (%)	1.180	1.088	1.285	1.119	1.143
Matched(%)	1.383	1.361	1.416	1.432	1.378
Acquirer -Matched(%)	-0.204**	-0.273**	-0.131	-0.313**	-0.234**
	(0.048)	(0.032)	(0.351)	(0.033)	(0.024)
3-year holding period					
Acquirer (%)	1.202	1.069	1.342	1.130	1.230
Matched(%)	1.371	1.274	1.476	1.411	1.379
Acquirer -Matched(%)	-0.169*	-0.206	-0.134	-0.281*	-0.149
	(0.100)	(0.114)	(0.331)	(0.069)	(0.266)

Table 4(Cont'd)

Panel B: The Risk-adjusted Portfolio Returns and Return Differences for the Full Sample (5-year Holding Period)

The Risk-adjusted Monthly Portfolio Returns and Return Differences from the Fama-French Three Factor Model and the Momentum Augmented Four Factor Carhart Model (only the intercept is reported)

	Fama-French Three Factor Model	Four Factor Model
Acquirer		
Alpha (%)	-0.084	-0.138
P-value	(0.313)	(0.120)
Matched		
Alpha (%)	0.139	0.093
P-value	(0.129)	(0.337)
Acquirer-Matched		
Alpha (%)	-0.223**	-0.231**
P-value	(0.039)	(0.045)

The Risk-adjusted Monthly Portfolio Returns and Return Difference from the Two-factor (Market and Liquidity) of Liu (2006) (all coefficients are reported)

	Alpha (%)	Rm-rf(%)	liquidity factor(%)	R^2
Acquirer	0.003	104.365***	3.229	0.882
	(0.980)	(0.000)	(0.417)	
Matched	0.136	93.884***	6.931*	0.855
	(0.245)	(0.000)	(0.078)	
Acquirer-Matched	-0.133	10.480***	-3.703	0.110
	(0.257)	(0.003)	(0.346)	

Panel C: The Risk-adjusted Portfolio Returns and Return Differences for the Full Sample (3-year Holding Period)

The Risk-adjusted Monthly Portfolio Returns and Return Differences from the Fama-French Three Factor Model and the Momentum Augmented Four Factor Carhart Model (only the intercept is reported)

	Fama-French Three Factor Model	Four Factor Model
Acquirer		
Alpha (%)	-0.117	-0.216**
P-value	(0.189)	(0.020)
Matched		
Alpha (%)	0.156	0.114
P-value	(0.097)	(0.252)
Acquirer-Matched		
Alpha (%)	-0.272**	-0.330***
P-value	(0.011)	(0.004)

The Risk-adjusted Monthly Portfolio Returns and Return Difference from the Two-factor (Market and Liquidity) of Liu (2006) (all coefficients are reported)

	Alpha (%)	Rm-rf(%)	liquidity factor(%)	R^2
Acquirer	-0.053	105.737***	3.673	0.865
	(0.682)	(0.000)	(0.397)	
Matched	0.162	92.681***	5.789	0.854
	(0.165)	(0.000)	(0.139)	
Acquirer-Matched	-0.214*	13.056***	-2.116	0.131
	(0.069)	(0.000)	(0.593)	

Table 5: The Risk-adjusted Portfolio Returns and Return Differences for Sub-samples of Glamour Acquirers and Stock Dominated Offers, Calculated Based on the Decomposed Buy-and-hold Calendar Time Approach

We form portfolios from the sub-samples of acquiring firms and their matching firms in each July and hold for the next 5 years. The matching is performed on size and book-to-market ratio in the completion month. We then calculate the monthly portfolio returns using equation (1). The monthly portfolio returns and the return differences between the acquiring firm portfolio and the matching firm portfolio are adjusted for risks, using different multi-factor asset pricing model specifications. The multi-factor asset pricing models are respectively the Fama-French three factor model, the momentum augmented four factor Carhart model and the two factor (market and liquidity) model of Liu (2006). Results in Panel A are based on the sub-sample of glamour acquirers. A glamour acquirer is defined as that having a book-to-market ratio of equity that is below the median value of all the acquirers in the same year of completion. Results in Panel B is based on the sub-sample of stock dominated offers. A stock dominated offer has more than half of the deal value financed in stock. All coefficients are reported in percentage. The numbers in parentheses are p-values. *, ** and *** indicate significance at 10%, 5% and 1% respectively.

Panel A: Glamour Acquirers (5-year Holding Period)		

The Risk-adjusted Monthly Portfolio Returns and Return Differences from the Fama-French Three Factor Model and the Momentum Augmented Four Factor Carhart Model (only the intercept is reported)

	Fama-French Three Factor Model	Four Factor Model
Acquirer		
Alpha (%)	-0.186**	-0.123
P-value	(0.036)	(0.191)
Matched		
Alpha (%)	0.136	0.175
P-value	(0.234)	(0.151)
Acquirer-Matched		
Alpha (%)	-0.323**	-0.298**
P-value	(0.017)	(0.039)

The Risk-adjusted Monthly Portfolio Returns and Return Difference from the Two-factor (Market and Liquidity) of Liu (2006) (all coefficients are reported)

	Alpha (%)	Rm-rf(%)	Liquidity Factor(%)	R^2
Acquirer	-0.016	104.468***	-8.668**	0.897
	(0.894)	(0.000)	(0.029)	
Matched	0.183	94.705***	1.566	0.830
	(0.172)	(0.000)	(0.728)	
Acquirer-Matched	-0.199	9.762**	-10.234**	0.126
	(0.171)	(0.023)	(0.036)	

Panel B: Stock Dominated Offers (5-year Holding Period)		

The Risk-adjusted Monthly Portfolio Returns and Return Differences from the Fama-French Three Factor Model and the Momentum Augmented Four Factor Carhart Model (only the intercept is reported)

	Fama-French Three Factor Model	Four Factor Model
Acquirer		
Alpha (%)	-0.037	-0.080
P-value	(0.765)	(0.547)
Matched		
Alpha (%)	0.395	0.245
P-value	(0.007)	(0.109)
Acquirer-Matched		
Alpha (%)	-0.432**	-0.324*
P-value	(0.017)	(0.091)

The Risk-adjusted Monthly Portfolio Returns and Return Difference from the Two-factor (Market and Liquidity) of Liu (2006) (all coefficients are reported)

	Alpha (%)	Rm-rf(%)	Liquidity Factor(%)	R^2
Acquirer	0.091	99.972***	-3.496	0.829
	(0.540)	(0.000)	(0.482)	
Matched	0.306*	99.745***	14.778**	0.743
	(0.073)	(0.000)	(0.010)	
Acquirer-Matched	-0.215	0.228	-18.274***	0.068
	(0.260)	(0.968)	(0.005)	

Table 6: The Buy-and-Hold Return When an Acquiring Firm is Matched on Liquidity Beta Estimated in the 36th month After the Acquisitions

   This table reports the buy-and-hold returns (in percentage) to the acquiring firms, the matching firms and their differences (the buy-and-hold abnormal returns) for the overall and sub samples. The holding period is either 5 or 3 years after the completion month. The matching is performed on the liquidity beta in the 36th month after the completion month. The liquidity beta in a particular month is estimated from the two-factor(market and liquidity) model of Liu(2006) over a 3-year period prior to that month. A glamour acquirer has a book-to-market ratio of equity that is below the median value of all the acquirers having the same year of completion. A stock dominated offer has more than half of the deal value financed in stock. The numbers in parentheses are p-values. *, ** and *** indicate significance at 10%, 5% and 1% respectively.

	Buy-and-hold Abnormal Returns					
	5-years holding period(%)			3-years holding period(%)		
	Acquirer	Matched	Acquirer-Matched (BHAR)	Acquirer	Matched	Acquirer-Matched (BHAR)
Overall	82.656	82.137	0.519	47.895	42.208	5.687
			(0.952)			(0.382)
Glamour Acquirer	67.836	67.421	0.414	41.185	32.547	8.639
			(0.967)			(0.220)
Stock Dominated Offers	68.642	74.814	-6.172	45.466	39.581	5.885
			(0.608)			(0.611)