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Endogenous mergers: Bidder momentum and market reaction

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Abstract

Recent empirical studies on stock misvaluation as a possible determinant of mergers are inconclusive concerning the central hypothesis that over(under)valuation is negatively (positively) associated with merger announcement returns in stock mergers, but not in cash mergers. We provide empirical support for this hypothesis. In contrast to prior research, we employ a two-stage model to account for endogenous mergers and suggest an alternative specification of misvaluation based on an asset-pricing model (bidder momentum). In the first stage, we specify panel logit models to predict U.S. mergers from 1981 to 2003 and find that bidder momentum triggers stock mergers, but not cash mergers. In a second stage, we regress cumulated abnormal returns on merger probabilities to control for the endogeneity of mergers. This reveals a lower market response for stock mergers compared to cash mergers, which we identify as market correction of misvalued acquirers.

Keywords: Mergers and acquisitions; overvaluation; endogeneity; momentum

JEL classification: G14, G34

1. Introduction

One central assumption common to all versions of market driven merger models is that – at least partially – past stock returns stimulate mergers. Recent models by Shleifer and Vishny (2003) (SV model) and Rhodes-Kropf and Viswanathan (2004) (RKV model) propose that the decision to merge is influenced by prior stock misvaluation.[1] Alternatively, Harford (2005) advances a more neoclassical explanation, which is based on the finding that industrial shocks can trigger merger activity (Mitchell and Mulherin, 1996; Andrade, Mitchell and Stafford, 2001). According to Harford (2005), high stock valuations are associated with high macro-level capital liquidity, which may trigger cash and stock mergers even if underlying industry shocks do not stimulate mergers.

Testing the validity of the misvaluation approach versus neoclassical explanations hinges on the stock market's abnormal reaction to the announcement of stock mergers compared to cash mergers. In line with Myers and Majluf (1984), the RKV model predicts that markets should correct acquirer's valuation downwards when overvalued stock is used, but not when cash is used as method of payment. Interestingly, recent evidence reports a negative relation between overvaluation and merger announcement returns for both stock and cash mergers (Dong et al., 2006). This is counter-intuitive and neither fully supported by misvaluation models of RKV, or Myers and Majluf (1984), nor by Harford (2005) capital liquidity explanation.[2]

[1] Similar theoretical models assert that other important managerial decisions are also endogenously influenced by market returns, e.g. seasoned equity offerings (Lucas and McDonald, 1990).

[2] The SV model does not imply any correction of misevaluation, as stock markets are assumed to be inefficient. In the long run, valuation levels converge to a 'standard' valuation level.

We suggest that the endogeneity in market driven mergers could be a reason for some of the empirical ambiguity. Event studies that account for the endogeneity of mergers showed negative returns regardless whether mean cumulative abnormal returns or buy and hold returns were used (Schultz, 2003; Viswanathan and Wei, 2004). Viswanathan and Wei (2004) provide formal proof that the expected event abnormal return is negative when returns predict events and that this bias increases with the length of the holding period. The intuition behind is that if high returns imply more events in the future, the denominator of the mean abnormal return over the cross-section of events is greater, effectively underweighting the high return period. In addition, Viswanathan and Wei (2004) find that a dependence of events on returns increases the confidence interval and lowers the power of conventional significance levels. Thus, without accounting for this dependence, statistically significant findings of a negative relation between announcement returns and prior valuations may falsely support the misvaluation approach instead of a more neoclassical explanation, as advanced by Harford (2005).

In this paper, we attempt to control for the effects discussed above by specifying a two-stage model that accounts for the endogenous probability to merge. In the first stage, we specify panel logit models to predict U.S. mergers from 1981 to 2003. Applying an asset-pricing model, we control for fundamental changes in acquirers' stock returns and interpret the remaining effect as bidder momentum that may include mispricing. As there is no consensus on the measurement of mispricing, we resort to this (novel) approach, which is the most practical measure in our setting. In the second stage, we regress cumulated abnormal returns on the merger probabilities that were predicted by bidder momentum and other control variables.

With the inclusion of this probability to merge, we are able to correct for the potential negative bias of endogenous mergers.

Our study complements the existing literature on market driven mergers in three ways: first, by explicitly controlling for endogenous decisions to merge, our results point more clearly into the direction predicted by the misvaluation approach, specifically the RKV model. In contrast, Dong et al. (2006) find a highly significant negative relations between acquirers' announcement returns and overvaluation, measured as price to residual income value (derived from Ohlson, 1995). Although this tends to be in support of the misvalution approach, they find this for stock as well as for cash mergers. In our two-stage analysis, we do not detect such a negative association of acquirers' stock returns with cash merger announcement returns, although we can confirm such a relation for stock mergers. However, in line with Dong et al. (2006), we also find that the impact of mispricing is limited to certain periods (specifically to the post-1989 period).

Second, within the misvaluation literature our study may also serve as a test between the two most prominent theoretical explanations, the SV and RKV model. The SV model takes stock overvaluation as a given and argues that shareholder value maximizing acquirers with long-term horizon and opportunistic target managers with short-term interests have an incentive to exchange relatively overvalued shares to the disadvantage of target shareholders, who finance the deal by overpaying for cheap equity issued by the acquirer. As investors are assumed to be temporarily irrational, they do not perceive or correct asset overvaluation in the short-term when a market driven merger is announced. In contrast, RKV propose a model of endogenous mispricing, where fully rational participants with imperfect information make errors in valuing potential merger synergies. If these errors are correlated with overall

market misvaluation, changes in merger activity and in the means of payment can be driven by over-and undervaluation. As RKV's investors are rational Bayesian updaters, they are expected to adjust overvalued stock downwards and undervalued stock upwards when market driven mergers are announced that are paid for in stock or cash respectively. Corrected for endogeneity, our results favor RKV's notion of rational investors that make mistakes, as we find that a negative relation between acquirers' past returns and the market reaction to stock mergers, but not to cash mergers.

Third, our main results from the panel logit show that bidder momentum increases the likelihood of stock mergers, but not that of cash mergers. This supports Rhodes-Kropf, Robinson and Viswanathan (2005) and Ang and Cheng (2003), who provide similar evidence for different measures of mispricing. However, Harford (2005) reports an increase not only in stock mergers but also in partial-firm cash acquisitions. This seems to be contradictory: while stock mergers are predicted by the misvaluation approach, an increase in cash mergers is more consistent with neoclassical explanations. One explanation could be that the effects are varying over time, which makes them hard to detect in more aggregated data. By analyzing 1978-1989 and 1990-2000 subperiods, Dong et al. (2006) conclude that their "evidence is broadly supportive of both the Q and misvaluation hypotheses in both periods, but tends to be more supportive of the Q hypothesis in the 1980s, and of the misvaluation hypothesis in the 1990s." Hence, during the 1980s firms with high Tobin's Q acquired targets with low Q, which might led to efficiency gains, whereas in the 1990s overvaluation drives mergers. Our results show that both approaches have little predictive power in the 1980s, as mergers were mainly driven by firm size and industry momentum. In the 1990s, bidder momentum explained stock mergers - but

cash mergers were mainly driven by industry momentum and the availability of cash (high equity-debt ratio and high operating cash flows relative to total assets). Macroeconomic shocks can drive both cash and stock mergers – but the partial impacts vary over time.

We interpret this result as support for another explanation, which includes the impact of economic shocks. At the industry level, Rhodes-Kropf et al. (2005) ran an empirical horse race between their misvaluation proxies and Harford's (2005) macroeconomic variables and concluded that both factors play a role: while economic shocks could well be fundamental drivers of merger waves, misvaluation affects who buys whom, as well as the method of payment. Our results corroborate this finding at the firm level. Shocks in the economic variables generally affect the likelihood of both stock and cash mergers, while the impact of bidder momentum is restricted to stock mergers only. This goes beyond the general notion that both approaches explain merger activity and beyond the prediction that overvaluation determines the bidder in stock mergers. Our results suggest that both approaches can coexist without contradicting each other. Possibly sparked off by exogenous shocks, neoclassical and market driven forces affect merger activity in a similar way, although channeled through different means of payment. Based on these considerations, we formulate two research questions.

RESEARCH QUESTION 1: Bidder momentum and mergers

We measure bidder momentum, which is defined as firm's unexpected stock return controlling for macroeconomic shocks and cross-sectional differences based on an asset-pricing model. Stock market and industry momentum are also considered in our

panel logit models. If we find that bidder momentum triggers stock but not cash mergers, we confirm the SV model.

RESEARCH QUESTION 2: Market correction of bidder momentum

We control for the endogeinity of mergers by using the probability to merge as explanatory variable. The RKV model suggests that overvaluation is corrected by the market after merger announcements. Hence, if we find a negative market response for stock mergers that were endogeneously determined by bidder momentum and hence exhibit a high merger probability, we can identify market correction of overvalued acquirers.

The paper is structured as follows: section two explains the methodology, construction of variables and data, specifically the measurement of bidder momentum. Section three describes the empirical analysis and our results, and section four concludes.

2. Data and methodology

2.1 Measuring bidder momentum

To capture individual mispricing on the firm level, we define bidder momentum, which measures the deviation of firm's stock return from fundamental values. To estimate fundamental asset prices for large samples, we use the arbitrage pricing model (APM) of Chen, Roll and Ross (1986) and apply a four-factor model based on Fama and French (1996) and Carhart's (1997) momentum factor to capture cross-sectional differences in stock returns.

The APM is based on the notion that stock prices reflect all available information and that changes are due to exogenous shocks or 'innovations' in underlying factors. Compared to statistically inferred but less interpretable factors from a factor analysis, the use of macroeconomic variables does not compromise the predictive ability of the model (Chen and Jordan, 1993). In fact, an advantage of factors with an economic meaning is that Chen et al. (1986) specification corresponds remarkably well with a number of variables that prior studies identified as determinants for mergers. Thus, to isolate the misvaluation of bidders, we need to control for these factors in our asset-pricing model. In line with the economic shock hypothesis for merger waves our asset pricing model includes changes in term spread as shocks in capital liquidity (Harford, 2005), supply shocks in oil prices (Mitchell and Mulherin, 1996), and overall market return as market momentum (Rosen, 2006), but also as a second proxy for capital liquidity.

We use the same set of variables as in the arbitrage-pricing framework of Chen et al. (1986) and compute expected and unexpected changes of these variables by exploiting serial dependencies. The Box-Pierce statistic can reject its null hypothesis that the series of macroeconomic variables is white noise. [3] Consequently, innovations in these time series can be partly anticipated. Using partial autocorrelation functions, we can identify the order of AR(p) processes for every time series and predict innovations based on past observations. Unpredicted innovations are defined as actual values minus expected values conditional on previous knowledge.

Accordingly, we compute the following macroeconomic variables: unexpected changes in oil price (u_oil), unexpected changes in industry production (u_ip), and

[3] Note that all macroeconomic variables are first-differenced (in the case of the market index, oil prices and industrial production we calculated log-returns) to ensure their stationarity.

unexpected term structure (u_ts), which is defined as spread, namely the difference between ten-year government bonds and the three-month Treasury bill rate. To determine predicted and unexpected inflation rates (p_i, u_i), we use the consumption price index. The unexpected risk premium (u_rp) is the difference between the average yield of Aaa ranked (rated by Moody's) corporate bonds and Baa ranked corporate bonds. To account for the market momentum, we insert the market return (ret_mkt), which refers to the S&P 500 index.

Apart from macroeconomic shocks, our asset-pricing model also embeds Fama and French's (1996) three-factor model, which considers market returns (ret_mkt) and cross-sectional differences in stock returns due to firm size and market valuation differences. Accordingly, we construct portfolios of the largest and smallest firms (top and bottom 5%) in every month and determine the average stock return of both portfolios. The difference in stock returns between large and small firms comprises the firm size effect (ret_size). Similarly, we construct the stock return difference of the highest and lowest stocks in terms of market valuation using book-to-market as valuation measure (ret_value). Carhart (1997) extended the three-factor model by including the past stock market returns to account for momentum effects. Finally, bidder momentum (ret_acq_{it}) of firm i at time t is defined as firm's stock return ($return_{it}$) minus the expected stock return based on our asset pricing model that embeds macroeconomic shocks, cross-section differences in stock returns due to firm size and valuation levels and stock market momentum. Therefore, the bidder momentum is the residual of the asset-pricing model and reflects deviations from fundamental values.

$$ret\_acq_{it} = return_{it} - E\left(return_{it}|\Omega_t\right) \tag{1}$$

$$E\left(return_{it}|\Omega_t\right) = \hat{\alpha} + \sum_{j}^{5}\hat{\beta}_j\left(z_{jt} - \hat{\theta}_{j0} - \sum_{h=1}^{p}\hat{\theta}_{jh}z_{jt-h}\right) + \hat{\beta}_6 p\_i_t + \hat{\beta}_7 mkt\_return_t +$$

$$\hat{\beta}_8 mkt\_size_t + \hat{\beta}_9 mkt\_value_t + \hat{\beta}_{10} mkt\_return_{t-1}$$

2.2 Why is bidder momentum a good measure for misvaluation?

The current discussion about the most appropriate proxy for mispricing is far from resolved: a number of studies use value to market (VM) proxies (Dong et al., 2006; Ang and Cheng, 2003), where residual income models serve as a fundamental value benchmark to current market valuations in the denominator. Unfortunately, the VM measure often reduces the sample size considerably (see e.g. Ang and Cheng, 2003), as it is very demanding with regard to the availability of accounting data. Viswanathan and Wei (2004) show that this issue is problematic because the biasing effects of endogeneity are especially sensitive to sample size. Thus, if we want to study large cross sections over longer time horizons, VM is not a measure of choice.[4]

A frequently used alternative measure, book-to-market (BM), is highly debatable (see Dong et al., 2006; Ang and Cheng, 2003; Alti, 2006). In contrast to VM, where the numerator explicitly captures growth opportunities, BM mixes growth and possible misevaluation effects in the denominator. In addition, both proxies, BM and VM, are typically not mean-reverting,[5] which makes it hard to detect the time-

[4] Besides the availability of accounting data, figures need to be adjusted to reflect the actual operations of a firm (e.g. operating leases). Proper adjustments need to be done on a firm-by-firm basis and thus require a substantial amount of time.

[5] Hence, both time series are non-stationary and have to be either used in first differences, which reduces the degree of information, or incorporated into a cointegration framework, which is commonly not done.

varying pattern of misvaluation. In fact, Chen and Dong (2001) find that above (below) average BM stocks tend to maintain above (below) average BM ratios, even after five years.[6]

As there is no consensus on measuring mispricing, we resort to the most practical measure in our setting. It should be a measure that avoids small sample problems and is sensitive to time-varying misvaluation. Thus, in conjunction with a time sensitive asset-pricing model that predicts changes in fundamental values, the remaining bidder momentum captures abnormal changes that cannot be explained by the asset-pricing model (see equation 1). Of course, we are aware of the inherent joint hypothesis problem that any predictability pattern we find may not reflect market inefficiency, but flaws in our asset-pricing model. Comparing the time-series properties of book-to-market (BM) and the bidder momentum (ret_acq) reveals that bidder momentum exhibits mean-reversion, whereas BM does not seem to be stationary. To illustrate the time-series properties, we ran two autorgressions with one lag, which showed that lagged values of book-to-market explain current book-to-market almost perfectly indicated by an adjusted R-squared of 92%. In addition, the coefficient of the lagged BM is in the 95% confidence interval of 1.004 to 1.006, which stresses the non-stationarity of this measure. In contrast, lagged bidder momentum does not explain current bidder momentum shown by an adjusted R-squared of only 0.05%. As we try to explain the timing of acquisitions, a 'sticky' measure like BM does not seem to be a good indicator for mergers, whereas a time-varying measure like bidder momentum could explain timing decisions.

[6] This stickiness of BM underlines the non-stationary nature of the time series.

2.3 Additional control variables

In addition to macroeconomic shocks as used in our asset-pricing model, we also compute several firm specific variables that could influence merger behavior. Following Manne (1965) and the so-called Q-theory of mergers (Jovanovic and Rousseau, 2002), firms with high Tobin's Q signal superior management performance and growth prospects, which make it possible to acquire and turn-around less successful targets. In such a market for corporate control, ceteris paribus higher returns lead to mergers, simply because they are a symptom of comparative advantage, but not of overvaluation. Accordingly, we include book-to-market (BM), which is often used as a proxy for Tobin's Q and for expected growth or managerial effectiveness. Certainly, we cannot exclude that BM also captures some effects of misvaluation. However, if BM filters out information about growth, then residual effects that may be captured by bidder momentum (ret_acq) are likely to be not related to growth, which is our primary intent at this point. In addition, our asset-pricing model captures cross-section differences in stock returns due to differences in book-to-market. Moreover, if we find bidder momentum to be significant, then this is an overly stringent test, because controlling for BM is likely to remove part of the misvaluation effect that we seek to measure.[7] As collinearity between the two variables does not bias the estimation (Wooldridge, 2003), we therefore rather accept that the influence of misvaluation is (falsely) inferred as statistically insignificant, than risk a possible bias due to omitted variables (e.g. related to growth).

As we analyze mergers by means of payments, bidders' cash flow also is a variable of interest. Companies with high cash flows could use internal sources of

[7] This argumentation follows Bhagat et al. (2005), who extensively discuss the issue of BM as a measure of growth in combination with variables of misvaluation.

finance to conduct more acquisitions, which is in line with Jensen and Ruback's (1983) free cash flow hypothesis. We therefore control for operating cash flows relative to the book value of total assets (CF). Financial leverage (LEVERAGE) defined as common equity relative to total long-term debt indicates financial strength and borrowing capacity, which might be relevant for merger decisions. Since economies of scale and market power might drive mergers, acquirers' market capitalization (SIZE) serves as a proxy of size and related benefits. To incorporate the diminishing marginal benefits of size, we take the natural logarithm of market capitalization.[8] To distinguish between different types of misvaluation on the market, industry and individual level, we use stock market returns (ret_mkt) and determine the median stock return for every industry (ret_ind) based on the three-digit SIC level. To illustrate our industry classification based on SIC codes, consider the industries 2033 (canned fruits, vegetables, preserves, jams, and jellies) and 2034 (dried and dehydrated fruits, vegetables, and soup mixes), we use the first three digit of the SIC code and would group these two sub-industries into the industry canned food.

2.4 Announcement-period returns

Ang and Cheng (2003) show that, once the pre-merger wealth effects of overvaluation are taken into account, the long-run wealth effects of overvalued stock acquirers are not necessarily lower than those of similarly overvalued but non-acquiring control firms.[9] Thus, when we incorporate pre-merger bidder momentum into our first-stage

[8] We also used sales as proxy and relative figures, like sales divided by the average sales in the respective industry. These alternative measures exhibited similar coefficients and are highly correlated.

[9] In fact, using BM as an overvaluation proxy, Ang and Cheng (2003) show that a subsample of stock acquirers, whose overvaluation is greater than their targets' premium adjusted overvaluation, are able to realize long-run wealth gains.

estimation, long-run abnormal returns might not enable us to trace the effects of mispricing anymore. Following Dong et al. (2006), we therefore focus on the market's immediate reaction and compute the short-term cumulative abnormal return (CAR) of the bidder around the announcement of the merger. We use standard event study procedures (Brown and Warner, 1985) to calculate market model abnormal returns with the S&P500 index and an estimation interval from -200 to -40 days before the event. Daily return data (closing prices) are taken from Thomson Datastream. For robustness, we use different observation windows to estimate acquirers' abnormal returns. CAR(-5,+5) denotes a 11-day observation window around the announcement, CAR(-2,+2) is associated with the five-day window surrounding the event, and CAR(-1,0) is the abnormal return on the announcement day only.

2.5 Sample and descriptive statistics

Our merger sample contains successful acquisition announcements from Thomson's SDC Mergers and Acquisitions Database. The sample of acquisitions meets the following criteria: (1) the acquisition is announced from 1981 to 2003. (2) Acquirers hold less than 50% of target shares at announcement and more than 50% after consummation. (3) The deal value is equal to or greater than USD 1 million. (4) Acquirers and targets are U.S. public firms, either independent or publicly quoted subsidiaries. (5) Acquirers did not announce a self-tender or any other kind of repurchase. (6) Acquirers have Standard Industrial Classification (SIC) codes outside the ranges 9111-9999 (public administration; unspecified) and 6000-6999 (financials).

As explained in the previous subsection, we compute several firm-specific and macroeconomic variables, which are included in the sample. Accounting data and stock data is available from Thomson Worldscope and Thomson Datastream

respectively, and the NBER provides macroeconomic data. To construct a panel, we retrieve monthly data for all bidders and for all economic variables for the period from 1981 to 2003. After deleting the cases for which not all data were available, the final sample consists of 6991 mergers. Consequently, the firms included in our sample conducted at least one acquisition during the investigation period; hence, our logit model tries to explain the underlying reasons for the timing of cash and stock mergers.

To illustrate our explanatory variables, Table 1 reports the mean and standard deviations (in parentheses) of firm characteristics and macroeconomic shocks for four-year sub periods. Table 2 reports the pair wise correlation coefficients of macroeconomic shocks and firm characteristics. The coefficients are very low; thus, multicollinearity is not present.

(Insert Table 1)

(Insert Table 2)

Table 3 reports equally weighted (EW) and value-weighted (VW) abnormal returns for the full sample and for different methods of payment. While the equally weighted (EW) CARs are not significantly different from zero, the value-weighted (VW) abnormal returns are significantly negative. When we differentiate between the means of payments, bidders' CARs of stock (cash) mergers are significantly negative (non-negative). These results generally correspond to prior studies with regard to both the effects of the means of payment (Andrade et al., 2001) and the negative impact of bigger deals in the VW measure (Moeller, Schlingemann and Stulz., 2005). Thus, we are not concerned that our data differ from previously published analysis substantially.

(Insert Table 3)

3. Analysis and results

3.1 First stage: bidder momentum and merger activity

In line with prior research at a more aggregated level (see Harford, 2005), we model the probability to merge with panel logit models. We study merger decisions (m_{it}) of individual firms (indexed i) on a monthly basis (indexed t). The dependent variable in Equation 2 is an indicator variable that takes the value one if the firm i announced a successful bid for a target in month t, and zero otherwise.

$$m_{it} = \alpha + \beta_1 ret\_acq_{it-1} + \beta_2 ret\_ind_{jt-1} + \beta_3 ret\_mkt_{t-1} + \beta_4 BM_{it-1} + \beta_5 SIZE_{it-1} \quad (2)$$
$$+ \beta_6 CF_{it-1} + \beta_7 LEVERAGE_{it-1} + \beta_8 p\_i_t + \beta_9 u\_ts_t + \beta_{10} u\_rp_t + \beta_{11} u\_i_t$$
$$+ \beta_{12} u\_ip_t + \beta_{13} u\_oil_t + \eta_{it}$$

The first explanatory variable is bidder momentum (ret_acq) as defined in equation 1. To control for macroeconomic shocks, as specified by Chen et al. (1986), we insert expected inflation (p_i), which is related to current nominal interest rates, unexpected shocks in inflation (u_i), term spread (u_ts), risk premium (u_rp), industrial production (u_ip), and oil prices (u_oil). Furthermore, we control for stock market returns (ret_mkt), and for several firm-specific characteristics, like book-to-market ratios (BM), firm size measured (SIZE), operating cash flow relative to total assets (CF), and financial leverage defined as equity-debt ratio (LEVERAGE).[10] Median stock returns within an industry (indexed j) measure the industry momentum (ret_ind) based on three-digit SIC codes. Therefore, we distinguish between 875 industries and calculate the median of monthly stock returns of firms in the respective industry. This measure reflects stock market performance on the industry level due to industry-specific effects (e.g. valuation, momentum) as described in the RKV model. By using bidder momentum (ret_acq), industry momentum (ret_ind) and stock market

[10] For a more detailed explanation and motivation of the variables employed, see the preceding section.

returns (ret_market), our model can disentangle bidder, industry and market momentum and its impact on the timing of stock and cash mergers.

Note that all explanatory variables are lagged by one month to ensure weak exogeneity. By construction, macroeconomic shocks are weakly exogenous and predictions are based on the information set in the previous month. Since merger activity exhibits a pronounced time pattern, it is helpful to decompose the analysis of market driven mergers into several sub periods. While Dong et al. (2006) study two sub periods, namely 1978-1989 and 1990-2000, our sample is large enough to estimate shorter sub periods. Several unreported estimations show that the optimal sub period length, which allows for enough observations within a sufficient amount of sub periods, is about 48 months (four years).

(Insert Table 4)

Table 4 summarizes our results for stock and cash mergers and shows that bidder momentum triggers stock mergers since 1989 – but does not explain cash mergers. This finding suggests that bidders with high stock returns not explained by fundamentals as captured by an asset-pricing model (see equation 1) are more likely to announce a stock merger in the following month. Hence, individual misvaluation – the deviation of bidder's stock return from the fundamental value – causes stock mergers, which is in line with the SV model. Industry momentum (ret_ind) measured by the median stock return within an industry is an important driver of stock and cash mergers – but stock market returns do not affect the probability to merge, which stresses the importance of industry-specific stock returns. Accordingly, the market can drive stock and cash mergers if the whole industry exhibits an upswing, which supports the RKV model. Nevertheless, individual misvaluation measured by bidder momentum determines the method of payment.

Apart from misvaluation and industry momentum, firm size (SIZE) is a consistent driver of stock and cash mergers. Interestingly, our measures for financial strength – financial leverage (LEVERAGE) and operating cash flows relative to total assets (CF) are important drivers for cash mergers – but not for stock mergers. Firms with high equity to debt ratios (LEVERAGE) find it easier to finance an acquisition by cash. A high operating cash flow to total asset ratio (CF) indicates good sources of internal finance, as projects including acquisitions can be financed by operating cash flows from exciting operations.

Macroeconomic shocks have an impact on stock and cash mergers, albeit the partial impacts are not consistent over time. This finding underlines that macroeconomic shocks might cause merger activities – but macroeconomic variables cannot be used to forecast merger activities, as the coefficients are time varying. Furthermore, by observing macroeconomic shocks, one cannot assess whether stock or cash mergers are more likely.

(Insert Table 5)

Bidder momentum is not just a significant explanatory variable for stock merger, as shown in Table 4, it is also a reliable indicator for timing decisions, as it exhibits a distinct time pattern before merger announcements. To illustrate this point, Table 5 shows the number of stock and cash mergers and the associated average bidder momentum (ret_acq), industry momentum (ret_ind) and market stock returns (ret_mkt) one month prior to the merger announcement. Motivated by our finding that bidder momentum only influences stock mergers in the post-1989 period (see Table 4), we divide our investigation period into the pre and post-1989 period. Interestingly, in the pre-1989 period bidder momentum does not exhibit any distinct time pattern before merger announcements. In this period, industry momentum drove stock and

cash mergers highlighted by the significant partial impact of industry returns uncovered by the panel logit models (see Table 4). The pattern changes in the post-1989 period, as bidder momentum preceding stock mergers reaches on average 1.99% and has not just a statistically significant effect on stock mergers as shown in the panel logit model – but also an economically relevant effect in that the magnitude of deviation from fundamental values is considerable.

3.2 Second stage: merger probability and market reaction

While an external shock may influence merger performance within or across industries, we do not expect to detect significant differences between cash and stock mergers. In the absence of misvaluation, an economic shock should lead to similar reactions on cash and stock merger announcements, mainly determined by the general nature of the exogenous influence. In contrast, mergers that are endogenously determined by bidder momentum as shown in the panel logit models (see Table 4) are likely to produce distinct differences in abnormal returns, because the decision about the means of payment is at least partially related to the motivation to merge. Thus, for stock mergers in particular, we would expect to see significantly lower announcement returns in the second stage regression when bidder momentum affected the likelihood of the merger in the first stage. In contrast, for cash mergers we do not expect to observe such a market response, for bidders' misvaluation does not influence cash mergers. As individual overvaluation is not present, the market does not need to correct acquirers' market value.

To test this hypothesis, we use the panel logit model (see Table 4) to predict the merger probability of each firm in our sample. As the CARs are not defined for calendar times, we use one pooled dataset for the whole period. Equation 3 specifies

the regression model where the bidder's CAR is explained by the first-stage merger probability (MRG_PROB), book-to-market (BM), cash flow (CF) and relative size (RS), defined as deal value divided by acquirers' market capitalizations. Furthermore, we control for industry-specific effects (3-digit SIC level) using dummy variables.

$$CAR(\tau_1, \tau_2) = \alpha_j + \beta_1 \cdot MRG\_PROB_{it} + \beta_2 \cdot BM_{it-1} + \beta_3 \cdot RS_{it-1} + \beta_4 \cdot CF_{it-1} + \varepsilon_{it} \quad (3)$$

(Insert Table 6)

Table 6 reports the OLS regression results for eleven- (τ_1=-5; τ_2=5), five- (τ_1=-2; τ_2=2) and one-day (τ_1=-1; τ_2=0) CARs of merger announcements. As expected, the predicted merger probability has a significantly negative effect on the cumulated abnormal returns of stock mergers based on five and one-day event windows. In contrast, the market reaction to cash mergers is unrelated to the probability to merge for all three CARs, clearly indicating that the announcement prompts no correction of previous bidder momentum. This finding is intuitive because bidder momentum did not trigger cash mergers in the first place. Based on Equation 3, we can assess the relevance of endogeneity for measuring merger performance in the case of stock mergers. The 95% confidence interval of the CAR(-1, 0) is in the range from -11.1% and 8.2%. Yet, the 95% confidence interval of residual values of CAR(-1, 0) after controlling for the probability to merge is considerably smaller and limits the downside of market reactions, namely from -9.4% to 8.2%. The median of CARs(-1, 0) is -0.1%, whereas the residual value of abnormal returns exhibits a median of 0.2%. Hence, controlling for endogeneity, which is mainly due to prior bidder momentum, uncovers that the negative market reaction is mainly caused by past misvaluation.

4. Conclusion

Bidder momentum, namely unexplained high acquirers' stock returns prior to merger announcements, predicts stock mergers but not cash mergers, which highlights that acquirers' overvaluation triggers merger decisions. Accordingly, we confirm that bidder's valuation can cause stock mergers, which is in line with the SV model. Controlling for industry momentum defined as the median of stock returns within an industry and for stock market returns, we confirm that industry momentum triggers stock and cash mergers, which supports the RKV model. Hence, our empirical findings reveal that mergers were market driven. In particular, industry momentum can enhance the probability of stock and cash mergers, whereas bidder momentum only increases the likelihood of stock mergers. Apart from market-driven factors, firm size fosters merger activity, and macroeconomic shocks stimulate mergers; however, the partial impacts are time varying. Bidder-specific financial strength in terms of high equity to debt ratios and high operating cash flows to total asset ratios facilitate cash mergers.

One limitation of the SV model is that stock markets are assumed to be inefficient and thus overvaluation is not corrected by investors. In contrast, the RKV model suggests that rational investor correct for overvalued acquirers. We show that – in line with market-driven merger models – bidder momentum can trigger stock mergers but not cash mergers. Using predicted merger probabilities, we reveal that market reactions are negative if the merger is predictable in the case of stock mergers – but we cannot detect any impact of merger probabilities on market reactions in the case of cash mergers. Consequently, investors realize that acquirers were overvalued before the merger announcement and they correct their mistake by adjusting market values downwards.

In addition, we show that the impact of endogenous merger events on cumulated abnormal returns is considerable suggesting that endogeneity biases the results of standard event studies heavily. Henceforth, embedding endogeneity of merger events into event studies seems to be crucial to measure announcement effects correctly. This finding supports previous results of Schultz (2003) and Viswanathan and Wei (2004). In fact, the commonly perceived negative market response after stock merger can be explained largely by overvaluation of acquirers prior to announcements.

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Table 1. Descriptive statistics for firm characteristics and macroeconomic shocks

	1981-1984	1985-1988	1989-1992	1993-1996	1997-2000	2001-2003
BM	0.556	0.428	0.346	0.338	0.467	0.533
	[4.012]	[3.318]	[3.250]	[3.359]	[5.492]	[8.547]
SIZE	5.059	5.436	5.689	6.019	6.190	6.360
	[1.926]	[2.058]	[2.266]	[2.541]	[2.756]	[2.726]
CF	0.108	0.105	0.088	0.083	0.027	0.024
	[0.093]	[0.103]	[0.120]	[0.143]	[1.347]	[0.574]
LEVERAGE	0.766	0.811	0.994	0.927	1.038	1.375
	[2.333]	[2.623]	[3.434]	[3.452]	[3.565]	[4.471]
p_i	0.004	0.003	0.003	0.002	0.002	0.002
	[0.002]	[0.001]	[0.001]	[0.000]	[0.001]	[0.001]
u_ts	-0.812	-0.031	0.080	-0.020	0.446	-0.067
	[6.053]	[0.141]	[0.415]	[0.158]	[2.442]	[0.258]
u_rp	-0.005	-0.005	-0.005	-0.004	0.003	0.007
	[0.106]	[0.070]	[0.059]	[0.057]	[0.072]	[0.107]
u_i	0.000	0.000	0.000	0.000	0.000	0.000
	[0.003]	[0.002]	[0.002]	[0.001]	[0.002]	[0.002]
u_ip	-0.001	0.000	-0.001	0.001	0.000	-0.001
	[0.008]	[0.005]	[0.005]	[0.005]	[0.005]	[0.004]
u_oil	-0.004	-0.012	-0.002	0.004	-0.003	0.002
	[0.025]	[0.070]	[0.077]	[0.055]	[0.087]	[0.072]

Note: We report means and standard deviations (in parentheses) for different sub periods.

Table 2. Correlation matrix of macroeconomic variables and firm characteristics

	p_i	u_ts	u_rp	u_i	u_ip	u_oil	BM	SIZE	CF	LEVERAGE
p_i	1.000									
u_ts	-0.107	1.000								
u_rp	0.012	-0.009	1.000							
u_i	-0.183	-0.003	-0.137	1.000						
u_ip	-0.165	-0.088	-0.060	0.073	1.000					
u_oil	-0.086	-0.018	-0.049	0.318	-0.010	1.000				
BM	-0.004	0.000	0.000	0.001	-0.001	0.002	1.000			
SIZE	-0.059	0.012	0.001	0.001	0.005	0.005	-0.003	1.000		
CF	0.018	-0.006	-0.004	0.001	0.004	-0.003	-0.402	0.041	1.000	
LEVERAGE	-0.015	0.005	0.002	-0.001	-0.006	0.004	-0.002	0.331	0.009	1.000

Table 3. Abnormal acquirer returns and method of payment

Variable	Weight	Payment	Mean	Std. Err.	95% Conf. Interval	
CAR(-1,0)	EW	ANY	0.0020	0.0013	-0.0005	0.0045
CAR(-2,2)	EW	ANY	0.0018	0.0056	-0.0092	0.0128
CAR(-5,5)	EW	ANY	-0.0041	0.0104	-0.0245	0.0162
CAR(-1,0)	VW	ANY	-0.0048***	0.0005	-0.0058	-0.0038
CAR(-2,2)	VW	ANY	-0.0076***	0.0010	-0.0095	-0.0057
CAR(-5,5)	VW	ANY	-0.0153***	0.0014	-0.0181	-0.0126
CAR(-1,0)	EW	STOCK	-0.0066**	0.0026	-0.0116	-0.0015
CAR(-1,0)	EW	CASH	0.0052**	0.0019	0.0015	0.0090
CAR(-1,0)	VW	STOCK	-0.0110***	0.0013	-0.0135	-0.0085
CAR(-1,0)	VW	CASH	-0.0010	0.0005	-0.0019	0.0000

*** $p<0.001$, ** $p<0.01$, * $p<0.05$

Table 4: Panel logit models for stock and cash mergers

	Panel A: Stock mergers						
	All years	1981-1984	1985-1988	1989-1992	1993-1996	1997-2000	2001-2003
ret_acq	0.689***	3.136	-0.701	1.060*	0.769*	0.719***	0.508*
ret_mkt	1.095	8.446	-3.705	-0.906	6.449**	1.650	1.018
BM	-0.014	-0.757	-0.104	0.012	-0.061	-0.075	0.000
SIZE	0.115***	0.648	0.343***	0.228***	0.102***	0.090***	0.035
CF	-0.012	1.181	-0.218	-0.437	0.121	0.022	-0.010
LEVERAGE	-0.006	-0.170	-0.034	-0.038	-0.082**	0.010	-0.004
ret_ind	25.284***	99.104	-0.806	58.569***	44.491***	19.366*	19.643
p_i	-259.946***	-97.550	266.731*	-45.300	-230.258	40.616	11.660
u_ts	0.084***	0.078	-0.020	-0.276	0.239	0.035**	-0.119
u_rp	0.807**	-0.556	-1.044	0.588	0.886	0.662	1.352**
u_i	-10.232	-74.649	-73.901	24.198	7.289	40.475	53.223
u_ip	2.642	-29.851	-2.887	6.913	4.401	2.542	11.924
u_oil	0.082	11.408	0.948	-0.341	-0.038	0.075	-0.684
constant	-6.022***	-13.231***	-9.568***	-7.847***	-5.951***	-6.084***	-6.008***
N	634000	59056	77006	94489	139000	165000	97345
aic	25084	157	1460	2278	6216	10253	4306
bic	25243	283	1589	2410	6354	10394	4439
	Panel B: Cash mergers						
	All years	1981-1984	1985-1988	1989-1992	1993-1996	1997-2000	2001-2003
ret_acq	0.167	-3.551**	-0.203	-0.270	0.176	0.272	0.201
ret_mkt	-0.076	3.134	-3.240**	4.496*	-2.889	-0.221	1.449
BM	-0.050***	-0.107	-0.007	-0.049	-0.011	-0.048*	-0.185*
SIZE	0.156***	0.308	0.340***	0.221***	0.123***	0.109***	0.112***
CF	0.243***	-1.258	-0.95	-0.055	1.359***	0.613***	0.181***
LEVERAGE	0.013***	0.071	0.017	0.023***	0.012*	0.012*	0.009
ret_ind	47.929***	116.718*	44.515***	42.795***	57.929***	51.865***	38.022***
p_i	-178.337***	-32.153	-92.942*	61.144	305.644**	-132.232**	87.367
u_ts	0.025**	0.079	-0.828*	0.010	-0.114	0.014	0.114
u_rp	0.028	-1.858	-0.767	-0.019	0.138	-0.198	0.197
u_i	-16.778*	-50.628	45.433	39.731	65.113*	-1.953	-7.549
u_ip	-3.594	8.812	-11.4	0.991	5.756	3.268	-4.58
u_oil	0.456*	-6.923	-0.067	0.453	0.354	0.412	2.116***
constant	-5.565***	-10.305***	-6.935***	-6.831***	-6.569***	-5.236***	-5.628***
N	634000	59056	77006	94489	139000	165000	97345
aic	58653	365	6315	7767	13845	18611	10994
bic	58812	491	6444	7900	13983	18752	11127

*** p<0.001, ** p<0.01, * p<0.05

Table 5. Bidder momentum and the timing of mergers

	Stock mergers		Cash mergers		No mergers	
	N	Mean	N	Mean	N	Mean
Panel A: Pre-1989						
ret_acq	114	0.61%	619	0.64%	171351	0.57%
ret_ind	114	0.32%	620	0.41%	172171	0.26%
ret_mkt	114	0.18%	620	0.60%	172171	0.80%
Panel B: Post-1989						
ret_acq	1909	1.99%	4926	0.73%	565476	-0.19%
ret_ind	1918	0.32%	4951	0.38%	568008	0.24%
ret_mkt	1918	1.20%	4951	1.03%	568003	1.00%

Table 6. Endogenous mergers and market reactions

	Stock mergers			Cash Mergers		
	CAR(-5,5)	CAR(-2,2)	CAR(-1,0)	CAR(-5,5)	CAR(-2,2)	CAR(-1,0)
MRG_PROB	-0.091	-3.325*	-3.197**	-0.852	-0.627	-0.438
BM	-0.002	0.000	-0.001	0.001	0.000	0.001
RS	0.000	-0.000*	0.000	0.000	0.000	0.000
CF	-0.062**	-0.042*	0.012	0.423*	0.235*	0.016
constant	-0.004	0.005	0.002	-0.038	-0.014	0.007

*** p<0.001, ** p<0.01, * p<0.05