Original Article

Multimarket trading at merger announcement and completion

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ABSTRACT We examined multimarket trading in the stock and option markets during merger announcement and successful and failed completion. Using contemporary intraday stock and options data, we observed alternate call buying and stock selling for acquirer stock in cash mergers, call writing and stock selling, followed by put buying for acquirer stock in stock mergers at merger announcement. For successful completions, stock selling dominated for cash acquirers and put buying for stock acquirers. Deal failure was accompanied by initial put buying, followed by call writing and stock selling on target stock. Signalling between markets and the alternation of informed trading between markets was inferred.

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INTRODUCTION

At information events, such as earnings announcements, dividend announcements and merger announcements, informed traders in the options market seek profit-making opportunities by capitalizing upon their private information about the direction of movement of the future stock price. In the Mitchell *et al.*,¹ conceptualization, the signals on mergers at announcement and completion depend on

whether the acquirer purchases the target for cash or stock. Cash mergers release positive signals at announcement. Stock mergers release negative signals. Completion may be successful or unsuccessful. At successful completion, cash mergers experience price reversal from merger announcement, releasing negative signals. Price reversal for stock mergers leads to positive signals upon successful completion. Deal failure is accompanied by substantial price decreases on the

target stock, or negative signals on the target stock. In essence, there are multiple trading situations at merger announcement and completion, all of which lend themselves to trading in both the stock and option markets. This study examines the effect of options and stock volume on future stock prices in each of these situations.

We add to the empirical literature that identifies trading patterns underlying options and stock trading during an information event in terms of the effect of trading volume in one market on quote revisions and trading volume in the other market and, in turn, stock price changes. While Easley *et al*² examined the effect of volume on stock price changes (option volume $\rightarrow$ stock price changes), and Chan *et al*³ the effect of volume on quote revisions and in turn trading volume in the other market (option volume $\rightarrow$ stock quote revisions $\rightarrow$ stock volume and stock volume $\rightarrow$ option quote revisions $\rightarrow$ option volume), this study is the first to establish links through the entire process of option volume $\rightarrow$ stock quote revisions $\rightarrow$ stock volume $\rightarrow$ stock price changes, and its converse, stock volume $\rightarrow$ option quote revisions $\rightarrow$ option volume. In addition, we use a unique proprietary database of 2005–2006 options data that is both contemporary and complete. There has been a scarcity of intraday options data since the discontinuation of the Berkeley Options Database in 1995.

REVIEW OF LITERATURE AND HYPOTHESIS DEVELOPMENT

Acquirer stock in cash mergers

Myers and Majluf⁴ set forth that the corporate form of organization inherently creates information asymmetry between managers and

stockholders. Management's inside knowledge of the firm about the extent of financial resources leads them to select the method of financing the forthcoming merger. If they purchase the target firm with cash or issue low-cost debt, a positive signal is sent to the financial markets that the firm's financial position is strong.

On day -1 , the day before merger announcement, there is considerable uncertainty about the extent of increase in future stock prices. Informed traders may purchase call options with the expectation of successively higher stock prices. Volatility traders may also appear in the options market and may trade so aggressively that over time market makers may increase spreads on informed traders. Higher spreads in the options market may limit further options trading. Informed traders may opt to trade in the stock market.⁵ On day 0, it is possible that trading takes place in both markets, given that it is the day of announcement and traders anticipate the highest run-up in stock prices, and wish to take advantage of profit-making opportunities at both venues. On day $+1$, there are the lowest volumes of volatility trading, given the imminent termination of the merger announcement period.

Hypothesis 1: At merger announcement, for acquirers in cash merger transactions, on day -1 trading in the options market may give way to trading in the stock market. On day 0 and day $+1$, purchases of call options or purchases of stock occur in both the options and stock markets.

Acquirer stock in stock mergers

Acquiring firms that lack internal funds may be forced to issue stock in a stock merger, sending a

negative signal to the markets that their stock is overvalued at merger announcement.

Earlier research has established that on day +1, immediately following the merger announcement, merger arbitrageurs short-sell the acquirer stock.¹ Shorting of the acquirer stock assures substantial predictable price declines, suggesting the profitability of a put-buying strategy. Trading decisions on days -1 and 0 will become more passive, as traders do not wish to engage in aggressive option trading such as put buying, which could reduce prices by an uncertain amount when they are assured of significant price declines on day +1 with short selling. On day -1 and day 0, informed traders earn modest profits in the option market by writing calls on stock that is continuously declining in value, with the secure knowledge that the calls will not be exercised. Some sale of stock occurs as well. On day +1, trading will take place in both markets, with informed traders capitalizing on declining stock values by short selling in the stock market and buying put options in the options market.

Hypothesis 2: At merger announcement, for acquirers in stock merger transactions, trading occurs in both markets, with call writing and stock selling on day 0 and day -1, and put buying and stock selling on day +1.

Acquirer stock in cash mergers at successful completion

For cash mergers at successful closings, price reversal results in a negative signal. Informed traders are unlikely to trade on the basis of volatility, as the extent of decline in stock prices is likely to be modest without any shorting

strategy or strong negative signal in place. Since the higher leverage of the options market is not a factor in choosing trading locations, it is possible that trading will be limited to stock selling, as informed traders sell stock that is moderately declining in value.

Hypothesis 3: At successful merger completion, for acquirer stock in cash merger transactions, informed trading may consist of stock selling on day -1 and day 0.

Acquirer stock in stock mergers at successful completion

Stock ownership may be attributed to bargain hunters who purchased the stock at its trough at merger announcement and were hoping to gain from price reversal. Given the modest rise in price due to reversal, volatility traders are not likely to achieve the profitability afforded by a leveraged options investment. Therefore, the options market will not experience the high transactions costs that result from the presence of volatility traders. However, neither will the options market offer the incentive for trading on the basis of leverage, thereby making the stock market the preferred location. The stock market may thus be the optimal trading location.

Hypothesis 4: At successful merger completion, for acquirer stock in stock merger transactions, informed trading may consist of stock selling on day -1 and day 0.

Target stock at deal failure

Merger arbitrageurs purchase the target stock immediately after announcement, offering an insurance policy against deal failure. Therefore,

the announcement of deal failure is the failure of this insurance policy, with possible future stock price reductions of up to 30 per cent of the stock price.⁶ Options traders may thwart this loss by purchasing put options on the day before announcement, day -1 . The next day, having exercised the options and sold the stock, no further put buying is possible as price declines may not be sufficient to ensure the profitability of a put-buying strategy. Therefore, in the remaining hours before announcement, merger arbitrageurs settle for modest profits in the form of call premiums as they shift to a limited amount of call writing.

Hypothesis 5: For failed mergers, informed trading on the target stock consists of put buying on day -1 and call writing and stock selling on day 0.

DATA AND METHODOLOGY

The list of cash and stock mergers for mergers announced in 2005 was obtained from Factset Mergerstat's⁷ database. The initial sample consisted of a total of 113 mergers, with 77 cash mergers and 36 stock mergers. For cash mergers, acquirer stocks were of significantly larger size than target stocks ($P = 9.1 \times 10^{-6}$ for market capitalization), though prices ($P = 0.4689$) and volumes ($P = 0.3514$) were not significantly different. For stock mergers, similar results were obtained, with acquirer stocks being of significantly larger size than target stocks ($P = 0.0685$ for market capitalization), and there were no significant differences for prices ($P = 0.1676$) or volumes ($P = 0.3273$). The final sample included stocks that traded options, and consisted of 31 cash mergers and 14 stock mergers.

Option volumes and National Best Bid and Offers (NBBOs) on all six exchanges were collected for the relevant days using a proprietary database. The Lee and Ready⁸ algorithm was applied to determine positive (call buys and put sells) and negative (put buys and call sells) volume. For each trade, the trade price was compared to the NBBO price, or the highest bid and the lowest ask price. Trade prices that were above the NBBO midpoint were classified as buys, while those below the midpoint were termed sells. For trade prices that were equal to the NBBO midpoint, trade prices for the current trade above the previous trade were designated as buys, and those below as sells. Intraday stock volumes were extracted from the TAQ (NASDAQ Trade and Quotes) database for each day for each stock trading from 9:30 to 16:00. The sample was restricted to trades of size ≥ 300 . Easley and O'Hara⁹ posit that informed traders trade frequently and in large size. Therefore, we used large block trades as our proxy for informed trading by selecting trades in the 75th percentile for cash mergers and 65th percentile for stock mergers for a trade size ≥ 300 .

The Glosten and Milgrom¹⁰ model implies that informed trading assumes a path that starts from stock volume $\rightarrow$ stock quote revisions $\rightarrow$ stock volume at prices based on revised quotes $\rightarrow$ stock price changes for a single market. In the multimarket case, it is suggested that options volume $\rightarrow$ stock quote revisions $\rightarrow$ stock volume at prices based on revised quotes $\rightarrow$ stock price changes and stock volume $\rightarrow$ options quote revisions $\rightarrow$ options volume.² Earlier research tested each sequence separately, by linking options volume to stock price changes through an ordinary least squares regression and by examination of the intermediate steps of volume

to quote revisions in the other market to trading volume in the other market.²⁻³ We examined the entire sequence by combining these methodologies.

RESULTS

Informed trading at merger announcement

Cash mergers: Positive signal, acquirer stock

Hypothesis 1 was supported for cash mergers whereby trading in the options market gradually gave way to trading in the stock market on day -1 , and trading in both stock and options markets occurred on day 0 and day $+1$. (Results of fixed effects regressions of stock prices on option volume and stock volume are reported in the tables; however, to maintain brevity, vector autoregressions have not been listed.) Volatility considerations influenced early trading on day -1 , with informed traders purchasing call options contemporaneously ($\beta = 0.099$, $P < 0.01$, Table 1, Panel A, Day -1 , Cash Mergers). Options market makers reacted quickly by revising quotes in the first lag ($\beta = 0.030$, $P < 0.01$), as the expected payoff from a strategy of purchasing call options was attractive just before prices started rising on the underlying stock. Within 10 min (2 lags), increased transactions costs in the options market due to the presence of volatility traders may have ended trading in the options market. Informed trading occurred in the stock market ($\beta = 0.058$, $P < 0.01$, Table 1, Panel B, Day -1 , Cash Mergers).

The prospect of further rise in stock prices on the day of announcement fuelled both call buying and stock purchases. On day 0, informed

traders purchased in both markets, with stock trades equal to 81 129 on day 0 versus 81 012 on day -1 and call buys of 120 440 000 on day 0 versus 540 000 on day -1 for in-the-money call options. Options trading took the form of signalling initiated by the options market with option volume $\rightarrow$ options quote revisions $\rightarrow$ stock quote revisions $\rightarrow$ stock price changes, suggesting that market makers in the stock market observed upward quote revisions in the option market and adjusted their own quotes accordingly. The purchase of calls and sale of puts may influence a limited amount of stock buying at higher trade prices, with most of the stock buying possibly being motivated by the higher liquidity of the stock market (options are thinly traded in relation to the underlying stock) and the lack of volatility as the impetus for options trading. Option volume resulted in significant options quote revisions (lags 1 and 3: $\beta = 0.071$, $P < 0.001$; and $\beta = 0.035$, $P < 0.05$). Option quote revisions resulted in significant stock quote revisions (lags 5 and 6: $\beta = 0.052$, $P < 0.10$; $\beta = 0.112$, $P < 0.001$). Consequent price changes were seen in the sixth and seventh lags ($\beta = 3.795 \times 10^{-6}$, $P < 0.001$; $\beta = 3.595 \times 10^{-6}$, $P < 0.01$). The traditional stock volume $\rightarrow$ stock price changes path was observed as stock traders purchased stock in the first, second, third, fourth, fifth and ninth lags ($\beta = 0.076$, $P < 0.001$; $\beta = 0.055$, $P < 0.05$; $\beta = 0.045$, $P < 0.05$; $\beta = 0.048$, $P < 0.05$; $\beta = 0.049$, $P < 0.05$; $\beta = 0.068$, $P < 0.01$).

Similar trading patterns to day 0 were observed on day $+1$, as stock traders continued to trade in early lags (lags 1 to 3: $\beta = 0.135$, $P < 0.001$; $\beta = 0.049$, $P < 0.05$; $\beta = 0.060$, $P < 0.01$ (Table 1, Panel B, Day $+1$, Cash Mergers)), followed by some late trading in lags 7 and 8 ($\beta = 0.073$, $P < 0.001$; $\beta = 0.052$,

Table 1: Effect of directional option and stock volume on stock price changes on acquirer's stock at merger announcement

	Cash mergers		Stock mergers		
	Day -1	Day 0	Day $+1$	Day 0	Day $+1$
Panel A: Panel data regressions of fixed effects models for stock price changes on directional option volume					
PV	0.099**	-1.227×10^{-6}	0.038*	—	—
PV-Lag 1	0.062	-1.077×10^{-6}	0.006	—	—
PV-Lag 2	0.022	-1.154×10^{-6}	0.003	—	—
PV-Lag 3	0.030	-1.071×10^{-6}	0.002	—	—
PV-Lag 4	0.050	-9.663×10^{-7}	-0.003	—	—
PV-Lag 5	0.020	-9.434×10^{-7}	0.053**	—	—
PV-Lag 6	0.050	3.795×10^{-6} ***	0.038*	—	—
PV-Lag 7	0.030	3.595×10^{-6} ***	0.024	—	—
PV-Lag 8	0.030	-1.115×10^{-6}	0.038*	—	—
PV-Lag 9	-0.040	-1.205×10^{-6}	0.0001	—	—
NV	—	—	—	2.00×10^{-3}	-5.05×10^{-4}
NV-Lag 1	—	—	—	3.11×10^{-4}	9.24×10^{-4}
NV-Lag 2	—	—	—	-9.73×10^{-4}	5.41×10^{-4}
NV-Lag 3	—	—	—	3.01×10^{-4}	-6.87×10^{-4}
NV-Lag 4	—	—	—	1.58×10^{-3}	-3.06×10^{-4}
NV-Lag 5	—	—	—	-2.07×10^{-5}	1.40×10^{-4}
NV-Lag 6	—	—	—	-1.93×10^{-3}	1.95×10^{-4}
NV-Lag 7	—	—	—	-7.42×10^{-5}	-1.99×10^{-4}
NV-Lag 8	—	—	—	-3.06×10^{-3} ★	-3.44×10^{-4}
NV-Lag 9	—	—	—	-2.40×10^{-4}	-1.42×10^{-4}
R ²	0.06	0.03	0.05	0.11	0.15
N	2730	2730	2730	1092	1092

Table 1 continued

	Stock mergers				
	Day + 1	Day + 2	Day + 3	Day + 4	Day + 5
NV	-0.145***	0.062	0.021	-0.025	0.001
NV-Lag 1	-0.071	-0.016	0.021	-0.009	0.002
NV-Lag 2	-0.087*	0.043	0.027	-0.004	0.002
NV-Lag 3	-0.067	0.037	0.016	0.044	0.001
NV-Lag 4	-0.186***	0.014	0.020	0.008	0.001
NV-Lag 5	-0.149***	-0.103*	0.037	0.005	0.0003
NV-Lag 6	-0.096*	-0.071	0.037	0.052	0.001
NV-Lag 7	-0.098*	0.096	0.037	0.083	0.001
NV-Lag 8	-0.144***	0.032	0.027	-0.050	0.001
NV-Lag 9	-0.128**	0.072	0.024	0.058	-0.0003
R ²	0.10	0.09	0.11	0.09	0.13
N	1083	1083	1083	1083	1083

Fixed effects coefficients in the merger announcement period

Variable	Cash mergers			Stock mergers		
	Day - 1	Day 0	Day + 1	Day - 1	Day 0	Day + 1
<i>Panel B: Panel data regressions of fixed effects models for stock price changes on directional informed stock volume</i>						
IB	0.015	0.043	0.049*	—	—	—
IB-Lag 1	0.038	0.076***	0.135***	—	—	—
IB-Lag 2	0.058**	0.055*	0.049*	—	—	—
IB-Lag 3	0.019	0.045*	0.060**	—	—	—
IB-Lag 4	0.023	0.048*	0.014	—	—	—
IB-Lag 5	-0.033	0.049*	0.037	—	—	—
IB-Lag 6	0.065**	0.002	0.019	—	—	—
IB-Lag 7	0.029	0.345	0.073***	—	—	—
IB-Lag 8	0.017	0.039	0.052**	—	—	—
IB-Lag 9	-0.008	0.068**	-0.004	—	—	—

IS	—	—	—	—0.008	—0.092*
IS-Lag 1	—	—	—	0.003	—0.089*
IS-Lag 2	—	—	—	0.008*	—0.057
IS-Lag 3	—	—	—	—0.053	—0.076*
IS-Lag 4	—	—	—	0.026	—0.010
IS-Lag 5	—	—	—	—0.035*	—0.040
IS-Lag 6	—	—	—	0.026	—0.029
IS-Lag 7	—	—	—	—0.003	0.002
IS-Lag 8	—	—	—	0.027	0.013
IS-Lag 9	—	—	—	0.001	—0.024
R ²	0.07	0.04	0.08	0.12	0.15
N	2721	2714	2721	1083	1083

<i>Stock mergers – post merger period</i>					
	<i>Day + 1</i>	<i>Day + 2</i>	<i>Day + 3</i>	<i>Day + 4</i>	<i>Day + 5</i>
IS	0.001	0.044	0.013	—0.076*	—0.046
IS-Lag 1	—0.082*	—0.019	0.038	—0.033	0.063
IS-Lag 2	—0.023	—0.125**	—0.132***	—0.036	—0.028
IS-Lag 3	—0.003*	0.040	—0.059	—0.019	0.015
IS-Lag 4	—0.074	0.045	—0.016	—0.055	—0.014
IS-Lag 5	—0.023	0.041	—0.031	—0.018	0.068
IS-Lag 6	—0.067	—0.038	—0.018	—0.047	0.067
IS-Lag 7	0.017	—0.004	0.001	0.052	0.050
IS-Lag 8	—0.047	0.034	—0.002	0.026	0.030
IS-Lag 9	—0.046	—0.006	—0.014	—0.028	0.047
R ²	0.14	0.12	0.13	0.10	0.12
N	1083	1083	1083	1083	1083

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

$P < 0.01$ (Table 1, Panel B, Day +1, Cash Mergers)). On day +1, there was also a contemporaneous effect of stock volume on stock price changes ($\beta = 0.049$, $P < 0.05$ (Table 1, Panel B, Day +1, Cash Mergers)). On day +1, options volume significantly influenced option quote revisions in lag 1, lag 2, lag 4 and lag 5 ($\beta = 0.061$, $P < 0.001$; $\beta = 0.108$, $P < 0.001$; $\beta = 0.046$, $P < 0.01$; $\beta = 0.029$, $P < 0.10$). Option quote revisions affected stock quote revisions in the second through fifth lags ($\beta = 0.161$, $P < 0.001$; $\beta = 0.056$, $P < 0.10$; $\beta = 0.060$, $P < 0.10$; $\beta = -0.061$, $P < 0.10$), thereby explaining the effect of options volume on stock price changes in the fifth, sixth and eighth lags ($\beta = 0.053$, $P < 0.01$; $\beta = 0.038$, $P < 0.05$; $\beta = 0.038$, $P < 0.05$, Panel A, Day +1, Cash Mergers).

Stock mergers: Negative signal, acquirer stock, short selling on day +1

Hypothesis 2 was supported with call selling surpassing put buying on day -1 (1 070 000 versus 120 000 for at-the-money options and 50 000 versus 30 000 for in-the-money options) and on day 0 (1 340 000 versus 1 300 000 for at-the-money options and 48 000 versus 21 000 for in-the-money options). Such call writing and stock selling continued on day 0, with put buying and stock selling on day +1.

On day -1, call selling, motivated by declining prices, occurred in response to signals from the stock market as stock volume reduced options quote revisions in lag 2 ($\beta = -0.081$, $P < 0.001$), which led to increased negative options volume in lag 4 and lag 7 ($\beta = -0.074$, $P < 0.05$; $\beta = -0.092$, $P < 0.01$), and this may explain the stock price changes in lag 8

($\beta = -3.06 \times 10^{-3}$, $P < 0.05$, Panel A, Day -1, Stock Mergers). On day 0, informed traders used the path stock volume $\rightarrow$ stock price changes to sell stock in lags 1, 2 and 4 ($\beta = -0.092$, $P < 0.05$; $\beta = -0.089$, $P < 0.05$; $\beta = -0.076$, $P < 0.05$, Table 1, Panel B, Day 0, Stock Mergers). On day +1, merger arbitrageurs short-sold the acquirer stock, using the proceeds to purchase target stock. With certainty of falling stock prices, informed traders purchased puts, trading so heavily that there were inverse stock price changes in lag 2 and lag 4 to lag 9 ($\beta = -0.087$, $P < 0.05$; $\beta = -0.186$, $P < 0.001$; $\beta = -0.149$, $P < 0.001$; $\beta = -0.096$, $P < 0.05$; $\beta = -0.098$, $P < 0.05$; $\beta = -0.144$, $P < 0.001$; $\beta = -0.128$, $P < 0.01$; Table 1, Panel A, Day +1, Stock Mergers), along with contemporaneous trading ($\beta = -0.145$, $P < 0.001$). The demand for continuously declining stock was alternatively satiated primarily in option markets, as short selling drove the prices of the acquirer stock to depths that continued to make put buying increasingly attractive. These results exhibited the strongest of all relationships in the merger announcement period.

Informed trading at closing

Successful mergers

Hypotheses 3 and 4 were partially supported in that there was significant trading activity in the stock market on acquirer stock in both cash and stock mergers. However, some options trading did occur contrary to these hypotheses. On day 0, fixed effects regressions of stock volume on stock price changes for cash mergers indicated significant negative coefficients both contemporaneously and in lags 1, 2, 4, 6 and 7 ($\beta = -0.067$, $P < 0.001$; $\beta = 0.038$, $P < 0.05$;

$\beta = -0.064$, $P < 0.001$; $\beta = -0.042$, $P < 0.05$; $\beta = -0.045$, $P < 0.01$). On day -1 , only lag 1 showed significant effects ($\beta = 3.904 \times 10^{-8}$, $P < 0.001$). Price reversals on cash mergers yielded much stronger demand for negative volume than the corresponding price reversal on stock mergers for positive volume. Contrary to Hypotheses 3 and 4, options volume marginally affected stock price changes, with a single significant relationship for both mergers (day 0: contemporaneous option volumes for cash mergers ($\beta = -4.76 \times 10^{-2}$, $P < 0.01$); and day -1 : lag 2, for stock mergers ($\beta = 8.26 \times 10^{-2}$, $P < 0.01$)).

If we support the notion that informed traders in the options market seek significant profit-making incentives, mere price reversal at closing provided a limited opportunity to trade either on the positive signal on day -1 for stock mergers and a negative signal for cash mergers on day 0. However, for a negative signal active selling occurred in the stock market.

Failed mergers: Negative signal, no short selling, target stock

Hypothesis 5 stated that failed mergers, informed trading on the target stock would consist of put buying on day -1 and call writing and stock selling on day 0. On day -1 , separate regressions of negative stock and option volume on target stock price changes yielded significant relationships in the eighth lag ($\beta = 0.198$, $P < 0.05$; $\beta = 0.337$, $P < 0.001$). On day 0, negative option volume was contemporaneously significant ($\beta = -0.161$, $P < 0.05$). The significance of the relationship in lag 8 for day -1 suggests some signalling between the stock and option markets. Accordingly, two vector autoregressions were conducted to test the paths

of (1) elevated stock volume resulting in option quote revisions, which, in turn, resulted in elevated option volume; and (2) significant option volume leading to stock quote revision and subsequent rise in stock volume. Both paths were found to be significant. For the first path, stock volume significantly influenced option quote revisions in the first ($\beta = -0.109$, $P < 0.05$), third (0.108 , $P < 0.05$) and fourth lags ($\beta = -0.115$, $P < 0.05$), with option quote revisions explaining option volume in the first lag ($\beta = 0.496$, $P < 0.001$). For the second path, option volume affected stock quote revisions in the first lag ($\beta = 0.291$, $P < 0.001$), with stock quote revisions explaining stock volume in the fourth ($\beta = 0.195$, $P < 0.001$) and ninth lags ($\beta = 0.152$, $P < 0.001$). Therefore, both stock and option markets signalled to each other on day -1 , with merger arbitrageurs possibly trading in both markets. The extremely high call-buy option volume suggests that certain option traders were trading on the basis of the original positive signal on target stock at merger announcement. The volume of trading fell substantially (by approximately 10 million trades in the stock market and up to 50 per cent in the options market for negative volume) on day 0. No significant stock selling was observed. In the options market a contemporaneous effect was observed, with negative option volume significantly influencing stock price changes ($\beta = -0.161$, $P < 0.01$). As no evidence of signalling was apparent from this regression, no further vector autoregressions were conducted.

Knowing of the impending announcement of failure of the merger, merger arbitrageurs choose to profit from declining target stock values by buying put options and selling stock simultaneously (price changes were observed in the same lag). Signalling between markets assured

the continuing decline in stock prices, thereby increasing the profitability of the put-buying strategy. At the end of the day on day -1 . Minimal option activity ensued, with call writing occurring on the remaining target stock immediately before announcement of deal failure by those traders who wished to salvage a call premium or expected an option exercise by buyers who were oblivious of the imminent announcement.

CONCLUSIONS

The method of classification of mergers into cash mergers and stock mergers provides a variety of contexts within which multimarket trading may be examined. Six different trading situations have been recognized by this study: (1) Positive signals on cash acquirers at merger announcement, (2) Negative signals on stock acquirers at merger announcement, (3) Negative signals on cash acquirers at successful completion, (4) Positive signals on stock acquirers at successful completion, (5) Positive signals from exercise of call options on target stock at successful completion, and (6) Negative signals on target stock at deal failure.

Options trading is chiefly influenced by volatility considerations, which are fleeting in nature, so that most options trading takes place in one to three 5-min intervals in early lags. For cash acquirers at merger announcement, call buying affects stock price changes in the first 10 min after trades are completed on day -1 , as informed traders transmit private information about higher projected future stock prices into call-buy trades. After uncertainty dissipates, trading ceases in the options market. Any remaining demand for positive volume is satisfied in the stock market by purchasing stocks for the remainder of the

announcement period. Both markets signal to each other, with market makers adjusting call-buy quotes or stock-buy quotes in response to trading volume in the other market. The stock market becomes the venue of trading only after options volume fully reflects the demand fuelled by uncertainty about future stock price increases. Any signals from the options market to the stock market on day 0 and day $+1$ are merely designed to direct a few traders into purchasing stock. As there is no signalling from the stock market to the options market, no further trading is expected in the options market. At successful completions, on day 0, for cash acquirers, put buying commences driven by the uncertainty experienced by informed traders about the extent of forthcoming declines in stock prices.

The most aggressive options trading occurred when informed traders had the maximum control over the extent of decline in the stock price. For stock acquirers at merger announcement, merger arbitrageurs used a short-selling strategy to force down stock prices, and then signalled to the options market to purchase puts and continue to purchase puts as revised projections of future stock prices were embedded in successive waves of put buy trades. This was not mere trading in a single 5-min period to capture the volatility of future prices; it was a coordinated effort initiated by the stock market to drive down prices and increase the profitability of a put-buying strategy. Signalling was directed by the stock market, with stock volume influencing option quote revisions and, in turn, option volume. There was no reverse signalling by the options market to the stock market. The next most aggressive options-trading strategy was put buying on day -1 of the announcement of deal failure. Here, informed traders did not control prices as they

would with short selling, but were supported by the finite nature of the time interval for put buying, that is put buying could only take place on day -1 , as on day 0 put writers would be scarce with sufficient disclosure of information about the announcement of deal failure. Put buying had to be conducted early in the day on day -1 , as information began to be disseminated slowly about deal failure later in the day, making put buying infeasible. In both of these cases, stock trading acted in conjunction with call writing to minimize losses, permitting informed traders to mask their profit-making actions either before the forthcoming event (short selling) or subsequent to the event (announcement of deal failure).

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