AN EVENT TIME STUDY OF THE PRICE REACTION TO BLOCK TRADES ON THE AUSTRALIAN STOCK EXCHANGE

ALEX FRINO, ELVIS JARNECIC* and ANDREW LEPONE

Finance Discipline, School of Business, Faculty of Economics and Business,

University of Sydney, NSW, 2006, Australia.

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* Corresponding Author. Finance Discipline, School of Business, University of Sydney, NSW, 2006, Australia. Tel: +61 2 9351 8708 Fax: +61 2 9351 6461 Email: e.jarnecic@econ.usyd.edu.au. Email address for Alex Frino – a.frino@econ.usyd.edu.au. Email address for Andrew Lepone – a.lepone@econ.usyd.edu.au. This research has been funded by the Cooperative Research Centre for Technology Enabled Capital Markets. We thank SIRCA for the provision of data. We thank participants at the AFAANZ 2003 conference for useful suggestions. We also thank Joel Fabre, Vito Mollica, Teddy Oetomo, Joel Grant and Zaffar Subedar for useful comments.

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Abstract

This paper analyzes block trades on the Australian Stock Exchange using an event study approach. A major finding in studies of this nature is an immediate reversal for the trade subsequent to the block transaction, for both block purchases and block sales. This reversal is inconsistent with the overwhelming majority of previous findings which show a stock price continuation following purchases to the close of trading. We confirm the reversals first using transaction prices, and then show that continuations follow both block purchases and sales when quote data is used. We conclude that the transaction price reversal is driven by using quote based rules to classify block transactions into purchases and sales, in conjunction with natural bid-ask bounce.

1. Introduction

Several studies have looked at the impact of block trades on stock prices. A number of these studies, including Holthausen, Leftwich and Mayers (1987, 1990), Choe, McInish and Wood (1992) and Chan and Lakonishok (1993) in the USA, and Aitken and Frino (1996) in Australia, have found that an unusual phenomenon is associated with these block trades. Although both block purchases and sales are associated with positive and negative permanent price effects respectively, the returns calculated from the block trade to some post-block period indicate positive returns for *both* purchases and sales. That is, a continuation in the stock price follows block purchases, while the stock price shows a *partial* reversal following block sales. This asymmetric reaction has been described as both 'intriguing' (Holthausen et al., 1987,p.90; Chan and Lakonishok, 1993, p.175) and a 'key puzzle' (Chan and Lakonishok, 1993, p.197), and has attracted a significant amount of research.

These same studies, as well as Keim and Madhavan (1995, 1996, 1997), Chan and Lakonishok (1995, 1997) and Chiyachantana, Jain, Jiang and Wood (2004) also show that even with a partial reversal following block sales, there are significant permanent price effects associated with both large buyer– and seller– initiated transactions. A recent study by Frino, Jarnecic and Lepone (2004), after adjusting for possible microstructural biases in transaction data, confirms that these permanent price effects are robust.

A smaller body of research, dominated by Holthausen et al. (1990) and Gemmill (1996), analyze block trades using an event-time study approach. These two studies find that there are significant positive and negative reactions associated with block purchases and sales respectively, consistent with previous literature. Of greater interest are the significant reversals, following both purchases and sales, on the trade subsequent to the block trade. The return immediately following a block purchase appears to be significantly negative, while a significantly positive return follows block sales. In particular, Gemmill (1996) finds that

approximately 80% of the initial impact of the block trade is reversed in the subsequent transaction. This study seeks to examine these results in greater detail.

The findings of the above two event-time studies highlight two major discrepancies with the majority of existing literature. The first is the immediate reversal following block purchases. While the partial reversal following block sales is well documented, the overwhelming majority of this research shows a positive continuation, to a post-block period, following block purchases. Within the same study, Holthausen et al. (1990) find that, after adjusting for the price impact of small transactions, there is a positive stock price continuation associated with block purchases. The immediate transaction time reversal is thus inconsistent with these other findings.

The second is the (lack of) existence of permanent price effects. While Holthausen et al. (1990) indicate that permanent price effects do exist for both buyer– and seller– initiated transactions, the findings of Gemmill (1996) are not as conclusive. The permanent price effect for block purchases does appear to be significant, although the magnitude of the impact is generally much smaller than in previous studies. The permanent price effect for block sales was found to be statistically insignificant in each of the six years analyzed. While this is predominantly driven by the significant reversals immediately following the block sale, the lack of a permanent effect is at odds with previous findings.

The primary motivation for this study is to explore, and ultimately resolve, these inconsistencies. A number of studies, including Foerster, Keim and Porter (1990), Lease, Masulis and Page (1991) and Bhardwaj and Brooks (1992) have shown that transaction data containing microstructural biases can result in misleading conclusions. Frino et al. (2004) find that directionally symmetric reactions following block trades (to the close of trading) exist when returns are calculated using quote data. As quote based rules classify block trades at the ask quote as block purchases, and block trades at the bid quote as block sales,

measuring returns from the block trade to other post-block trades may induce bias to the results. This paper, by using a sample of block trades executed on the Australian Stock Exchange (herein ASX), will analyze the exact behaviour of the stock price in the trades surrounding the block trade, and the possible impact of any microstructural biases, by measuring price effects using both transaction prices and bid / ask quotes.[1]

In addition to this primary motivation, analysing block transactions using an event-study approach has several, desirable advantages. As with Holthausen et al. (1990) and Gemmill (1996), an event time approach allows us to determine the speed of response to block trades. Secondly, as argued by Easley and O'Hara (1987), the sequence of trades preceding a block trade may convey information to the market, and should be included in analysing price effects. Finally, there may be several block transactions in a stock on the one day. Measuring returns from the open to the close of trading will then be an aggregation of all price impacts. Being able to pinpoint the block trade, and surrounding trades, will lead to superior accuracy in measuring the price impact of these trades.

The remainder of this paper is set-out as follows. The following section describes the data used in this study, as well as the event-time approach adopted for analysis. Section 3 presents the results for both transaction prices and quote data. Section 4 explains the exact nature of the stock price behaviour surrounding block trades. Section 5 presents some tests of robustness, while Section 6 concludes.

[1] Trade classification based on trade and quote data from markets in the USA is imperfect due to time lags between the recording of trades and quotes. Lee and Ready (1991) demonstrate that 59.3 percent of quotes are recorded ahead of trades, and that over 30 percent of all trades fall inside the bid-ask spread. Since the ASX operates an electronic trading system, and data is captured on-line in real time, this enables the application of quote-based rules with perfect accuracy.

2. Data and method

The equities data used in this study are from the ASX, and captured from its electronic trading system, SEATS. The ASX operates via a fully automated, order driven environment, based on price then time priority. The SEATS database contains complete information of all trades and orders submitted to the ASX. Each trade and order record contains a date and time stamp (to the nearest hundredth of a second) which allows precise identification of the chronological order in which orders were placed and transactions executed. Intraday data for the Share Price Index (SPI) futures traded on the Sydney Futures Exchange is also available, and is of similar format to the data available from the ASX. The data available extends from the January 1, 2000 to December 31, 2001.

Block transactions are defined as the largest 1% of on-market transactions for each stock, in each calendar year, over the sample period. Trades are unambiguously categorised as purchases or sales on the basis of the market order which preceded them. Block purchases represent trades where a market bid executes against a standing limit ask(s), whilst block sales represent trades where a market ask executes against a standing limit bid(s). In addition, trades in which market orders are executed against a series of limit orders, are combined and treated as one transaction for the purposes of identifying block trades.[2] To ensure that a 'clean' sample of block trades is analyzed, a block trade is excluded if it is within five trades of another block trade. This is to ensure that the price impact of one block trade does not

[2] Off-market transactions are excluded from the analysis because they do not involve the submission of buy and sell orders, and therefore cannot unambiguously be categorized as purchase or sale transactions.

confound the measurement of price impact for another block trade.[3] Also excluded are block trades that executed within the first five trades, or the last five trades, of the day.[4]

To examine the price behaviour surrounding block transactions an event-time approach similar to Holthausen et al. (1990) and Gemmill (1996) is employed. Trade to trade returns are calculated for the 11 trades surrounding and including the block trade. A benchmark return is calculated for each of the 11 trades as the trade to trade return on the nearest to delivery SPI futures contract at the time of each trade.[5] The abnormal return for each trade is then found by subtracting the benchmark return for each trade from the return from each trade. These abnormal returns are then aligned in transaction time, and averaged across each transaction interval.

To control for any potential microstructural biases in transaction data, the return calculations performed with transaction prices are repeated with contemporaneous bid-ask quotes.[6] In particular, ask-to-ask and bid-to-bid returns are calculated for the same 11 trades described above. Using quote returns, as previously implemented by Lease et al. (1991), Aitken, Frino, McCorry and Swan (1998), Koski and Michaely (2000) and Frino et al. (2004) should eliminate any potential bias contained in transaction data.

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[3] As discussed later in the paper, most, if not all, of the price effect of any block trade is dissipated within five trades.

[4] This is to ensure that a complete set of eleven trades surrounding and including a block trade is available for analysis.

[5] The SPI is used because unlike the underlying index its calculation is not directly impacted upon by order imbalances associated with block trades in the constituent stocks to avoid non-synchronicity problems that plague the underlying index (See Stoll and Whaley (1990)).

[6] Bessembinder (2003) and Peterson and Sirri (2003) show that contemporaneous quotes lead to improved accuracy.

For comparison purposes, price impacts commonly calculated in previous literature are also calculated. In particular, the total effect (abnormal return from the open to the block trade), the temporary effect (abnormal return from the block trade to the close), and the permanent effect (abnormal return from the open to the close on the day of the block trade) are calculated, using both transaction prices and bid / ask quotes, for the same sample of block trades used in the event-study approach.

Table 1 profiles the block transactions analyzed in this study. The overall sample consists of 36,339 block purchases and 39,450 block sales. The average value of purchases is AUD 629,830 (162,503 shares), while the average value of sales is AUD 617,048 (177,050 shares). This indicates that the samples of block purchases and block sales are relatively equal, both in terms of the number, and magnitude, of transactions analyzed.

<INSERT TABLE 1 ABOUT HERE>

3. Event study results

3.1. Transaction price results

Figure 1 and Table 2 (Panel A) summarise the price impact of block purchases and block sales measured using transaction prices. Consistent with the findings of Holthausen et al. (1990) and Gemmill (1996), a significantly positive abnormal price reaction of 0.3278% is associated with block purchases, and a significantly negative abnormal price reaction of –0.3749% with block sales. Figure 1 and Table 2 also show reversals similar to those found by Holthausen et al. (1990) and Gemmill (1996) in the trade subsequent to the block transaction. The reversal following purchases is –0.1523%, which amounts to approximately 46.5% of the initial price impact. A reversal of 0.1864% follows sales, which is approximately 50% of the initial price impact. This reversal continues on the second trade

after the block (and is significantly different from zero for sales). Trades three to five are all associated with returns insignificantly different from zero for both purchases and sales (although the returns for purchases are all positive, indicating some formation of a return pattern).

<INSERT FIGURE 1 ABOUT HERE>

<INSERT TABLE 2 ABOUT HERE>

Also of interest are the returns prior to the block trade. Panel A of Table 2 indicates that the returns prior to the block purchase (trades –1 to –4) are significantly positive, while the returns prior to the block sale (trades –1 to –3) are significantly negative. There appears to be some form of information leakage before both block purchases and sales, and the leakage is greater for purchases than for sales. This is consistent with the theoretical model of Easley and O'Hara (1987), and with the empirical findings of Keim and Madhavan (1996) and Madhavan and Cheng (1997) who show that information can leak into the market prior to the block transaction.[7]

Table 2 (Panel B) presents the total, temporary and permanent effects. As is clearly evident, the temporary effect is significantly positive for both block purchases and sales (0.1136% for purchases, 0.0518% for sales), indicating a continuation following block purchases, and a partial reversal following block sales, consistent with prior literature. Also,

[7] Gemmill (1996) finds that this information leakage occurs mainly for purchases. Holthausen et al. (1990) find that for trades –5 to –2 there is evidence of information leakage, which is stronger for purchases than for sales. Surprisingly, they find that the return at trade –1 is negative for purchases and positive for sales.

the permanent effect is significantly positive for purchases (0.6705%), and significantly negative for sales (–0.4164%).[8]

Although three very different market structures (NYSE, LSE and ASX) over three different time horizons have been analyzed, the results are remarkably similar. There appears to be very clear evidence of a reversal following both block purchases and block sales in transaction time, which is inconsistent with the results when price effects are calculated to the close of trading.

3.2. Quote results

In order to control for any potential microstructural biases in transaction data, the returns calculated using transaction prices are recalculated as ask-to-ask and bid-to-bid returns. These results are presented in Figure 2 and Panel A of Table 2.

<INSERT FIGURE 2 ABOUT HERE>

The ask-to-ask results for purchases indicate, as with transaction prices, that block purchases are associated with positive price impact. However, the return of 0.1972% is less than the return (0.3278%) measured using transaction prices. It appears as if measurement using transaction prices is overstating the initial impact of block trades.[9] Of far greater interest is the significantly positive return of 0.0298% on the trade subsequent to the block purchase. This is an extreme contrast to the significant reversal found with transaction prices. In addition, the returns on trades two to four are significantly positive. When measuring returns

[8] The permanent price impact asymmetry, in which block purchases exhibit greater price impact than block sales, is thus evident in our sample.

[9] This is consistent with the findings from Frino et al. (2004).

using ask quotes, block purchases appear to be associated with positive initial impacts followed by significant continuations in the stock price.

Looking at the bid-to-bid results for sales, a very similar pattern is evident. The negative initial price impact of –0.1928% is smaller than the equivalent return calculated with transaction prices. The return on the subsequent trade (–0.0384%) is significantly negative, and this significant continuation in the stock price continues until three trades after the block sale. So measuring returns using ask quotes for purchases and bid quotes for sales appears to have dispelled the idea that there are immediate reversals in the stock price following block transactions.[10] This finding is also clearly evident in Figure 2.

Turning to the bid-to-bid returns for purchases, a couple of interesting points arise. The return on the block trade, while being significantly greater than zero, at 0.0348%, is much smaller than the equivalent ask return. The return of 0.1557% on the subsequent trade is much larger than the equivalent ask return. The ask-to-ask returns for block sales present a similar story, with a block return of –0.0375%, and subsequent trade return of –0.1426%. It appears as if the ask (bid) side of the market gets "hit" on the block purchase (sale), and the bid (ask) side "recovers" on the subsequent trade. This finding is consistent with Jang and Venkatesh (1991) and Engle and Patton (2000) who show that one side of the market experiences a greater impact for a block transaction.

Panel B of Table 2 presents the total, temporary and permanent effects measured using bid / ask quotes. The temporary effect is significantly positive for block purchases, and significantly negative for block sales, consistent with the results from the event-study

[10] Ask-to-ask returns prior to the block purchase, and bid-to-bid returns prior to the block sale give support to the theory of information leakage prior to the block trade, and are consistent with the findings using transaction prices.

approach. The permanent effect, as when measured using transaction prices, is significantly positive for purchases, and significantly negative for sales.

4. Explanation

The previous section has confirmed a quite perplexing result. When using transaction prices to measure returns, significant reversals follow the initial impact of both block purchases and sales. However, when we measure these returns using bid / ask quotes, it is clear that the quotes following purchases move up, while the quotes move down following sales, indicating continuations. If quotes move in the same direction as the initial impact of the block trade, it appears to be unclear how reversals of the magnitude found in this paper, as well as in Holthausen et al. (1990) and Gemmill (1996), could have resulted. In order to grasp a greater understanding of these findings, we measure the average bid-ask spreads surrounding, and including the block trade. We then determine the average location of the transaction prices within these spreads. The results are presented in Table 3.

<INSERT TABLE 3 ABOUT HERE>

Table 3 clearly shows that the spread is larger on the block trade than on surrounding trades. This occurs as the ask (bid) side of the market gets 'hit' on the block purchase (sale), with the bid (ask) side recovering immediately after. This is consistent with the findings of both Hasbrouck (1991) and Huang and Stoll (1997). There are also very strong biases to the ask following block purchases, and an equally strong bid bias following block sales. There appears to be an increase in buying activity following block purchases, and an increase in

selling activity following block sales. This bias, while lessening in intensity, continues through to five trades after the block trade.[11]

Figure 3 presents a scaled diagram of the average bid-ask spreads for the 11 trades centred on the block trade. The solid line tracks the average transaction price path. Starting from five trades before the block purchase, the transaction path tracks through a level just above the midpoint of the spread, on average, until we reach the block trade. From there, the transaction path hits the ask quote, until again returning, on average, to just above the midpoint for the remaining trades.[12] From this, it is evident that measuring a return from the block purchase (constrained to the ask), to the next transaction price (although biased to the ask, is still significantly different from the ask), is driving the reversal (similarly for block sales).[13] By (necessarily) applying quote based rules to classify block purchases and block sales, measuring returns from the block trade to other trades without this constraint automatically leads to inaccuracies in measured returns. This problem will be evident in many microstructure studies which require the use of quote based classification rules, and can only be overcome by measuring returns using quote data which is free of any such bias.

<INSERT FIGURE 3 ABOUT HERE>

5. Tests of Robustness

A series of tests were conducted to ascertain the robustness of results presented in this paper. First, to examine the possible correlation between block trades, both over time and

[11] There is also a bias to the ask at the close following block purchases, and a bias to the bid at the close following block sales.

[12] The transaction path for block sales goes from just below the midpoint prior to the trade on average, hits the bid quote at the block trade, and returns to just below the midpoint, on average, for the remaining trades.

[13] A similar argument applies for the open-to-close returns.

across stocks, an alternate sample is used. From the complete sample of the largest 1% of trades, one block trade per stock per day was randomly selected from all block trades executed on that day. Then the eleven trade-to-trade returns, and associated t-statistics, are calculated separately for each stock. These results are then aggregated across all stocks using the method described in Christie (1990). The results are presented in Table 4.

<INSERT TABLE 4 ABOUT HERE>

The results in Table 4 are consistent with the original sample. The immediate reversals when using transaction prices, and the subsequent continuations when quote data is used, are clearly evident. The aggregated Z-statistics, based on complete independence between block trades, indicate that these continuations and reversals are significantly different from zero. To examine the possibility of dependence between block trades across stocks, we calculate how large the mean correlation ρ would need to be to render the statistics insignificant.[14] All values of ρ, for the block trade and subsequent trade, are greater than one. This implies that even perfectly correlated t-statistics across stocks would not invalidate the conclusion that the initial reversals found with transaction prices, and subsequent continuations when quote data is used, are significantly different from zero.

Second, a study by Chiyachantana et al. (2004) show that the underlying market conditions affect the price impact of block trades. To explore if the behaviour of the market affects our results, we stratify our sample. First, we calculate monthly returns for the SPI futures contract. We then place block trades executed in months experiencing positive returns in one sample, and block trades executed in months experiencing negative returns in another sample. The eleven trade-to-trade returns are the calculated for each of the samples

[14] A Z-statistic, if less than 2.58, is considered insignificant in this paper.

separately.[15] The results are presented in Table 5. The results here are remarkably similar to the initial results, both in terms of direction and magnitude of price reaction. It appears as if the underlying market conditions do not affect any of our conclusions.

<INSERT TABLE 5 ABOUT HERE>

Finally, our sample selection method employs various 'cleaning' procedures. To test how sensitive our findings are, we recalculate all results after removing or altering these procedures. We first include all block trades, irrespective of their proximity to other block trades. We then allow block trades executed in the first or last five trades of the days, to be included in the sample. We also extend this restriction to the first or last ten trades of the day. The main effect of these alternate sample definitions is on sample size. Easing the restrictions leads to significantly larger samples, whilst extending the restriction reduces sample size. Under all three definitions though, results are qualitatively similar, with identical conclusions reached.[16]

6. Conclusion

Much of the previous literature analysing the price impact of block trades has found that there are stock price continuations following block purchases, and partial stock price reversals following block sales. These studies also show significant permanent effects for both purchases and sales. However, the two prominent event-time studies find significant reversals following *both* purchases and sales on the trade subsequent to the block transaction. These reversals highlight two major inconsistencies with previous literature. First, the immediate reversal following purchases conflicts with a stock price continuation to a post-

[15] To save space, we report only seven trade-to-trade returns, although all eleven returns are calculated.

[16] Due to space considerations, these results are not presented.

block period. Secondly, the reversals following sales result in no significant permanent price effect, which contradicts prior findings. In this paper we attempt to reconcile these inconsistencies, using both transaction prices and quote data to control for any potential microstructural patterns.

The results of our transaction price analysis confirm the existence of reversals following both block purchases and sales. However, our analysis with quote data reveals that, contrary to the transaction price findings, a positive continuation follows the positive initial impact of block purchases, while a negative continuation follows the initial negative impact of block sales. The cause of this difference in results is simply natural bid-ask bounce. By applying quote based rules which classify block trades at the ask as block purchases, and block trades at the bid as block sales, measuring returns from the block transaction, to other unconstrained transactions automatically leads to some form of bias. This bias may be evident in many other microstructure studies, and can only be addressed by employing quote, rather than transaction price, data.

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Table 1
Summary Statistics of Trade Size
This table reports the number of observations, the mean, median, minimum, maximum and standard deviation of share volume (Panel A), and dollar volume (Panel B) for block trade size. The sample consists of the largest 1% of trades, in each stock, in each calendar year, on the ASX, for the period of January 1, 2000 to December 31, 2001. Transactions are classified into purchases and sales using a quote based rule.

	Number of Observations	Mean	Median	Minimum	Maximum	Standard Deviation
Panel A: Share volume						
Purchases	36,339	162,503	90,000	5,000	23,000,000	301,105
Sales	39,450	177,050	100,000	5,000	17,800,000	350,726
Panel B: Dollar volume						
Purchases	36,339	629,830	520,000	7,950	27,660,000	701,726
Sales	39,450	617,048	485,000	8,125	42,080,200	802,825

Table 2
Intraday Price Reactions Surrounding Block Trades
This table reports abnormal trade-to-trade returns (Panel A) for the 11 trades centred on the block trade (trade 0), as well as total, temporary and permanent price effects (Panel B). Returns are calculated using (i) transaction prices, (ii) ask quotes, and (iii) bid quotes. t-statistics result from the test of whether the mean abnormal return is significantly different from zero. Block trades are defined as the largest 1% of trades in each stock, in each calendar year, on the ASX, from January 1, 2000 to December 31, 2001. Transactions are classified into purchases and sales using a quote based rule. The final sample consists of 36,339 purchases and 39,450 sales. Results are calculated separately for purchase and sale transactions.

	Trade-to-Trade		Ask-to-Ask		Bid-to-Bid	
Trade	Abnormal Return %	t-statistic	Abnormal Return %	t-statistic	Abnormal Return %	t-statistic
Panel A: Transaction Time Returns						
Purchases (n = 36,339)						
-5	0.0076	2.183	0.0055	1.932	0.0027	0.894
-4	0.0095	2.773	0.0080	2.717	0.0046	1.511
-3	0.0119	3.629	0.0113	3.698	0.0086	2.778
-2	0.0137	4.001	0.0082	2.907	0.0077	2.607
-1	0.0291	7.429	0.0192	6.072	0.0179	3.728
0	0.3278	70.85	0.1972	44.38	0.0348	9.013
1	-0.1523	-35.67	0.0298	8.675	0.1557	35.95
2	-0.0046	-1.399	0.0189	5.603	0.0229	6.750
3	0.0061	1.987	0.0124	4.000	0.0178	5.810
4	0.0078	2.025	0.0092	2.905	0.0137	4.167
5	0.0082	2.197	0.0040	1.279	0.0126	3.875
Sales (n = 39,450)						
-5	-0.0047	-1.433	-0.0029	-1.006	-0.0057	-1.980
-4	-0.0067	-1.945	-0.0036	-1.174	-0.0083	-2.710
-3	-0.0094	-2.697	-0.0055	-1.753	-0.0073	-2.431
-2	-0.0097	-2.823	-0.0015	-0.486	-0.0058	-2.030
-1	-0.0201	5.753	-0.0026	-0.790	-0.0152	-4.102
0	-0.3749	-76.83	-0.0375	-12.31	-0.1928	-46.50
1	0.1864	39.08	-0.1426	-32.16	-0.0384	-9.663
2	0.0201	5.542	-0.0172	-4.939	-0.0102	-2.944
3	-0.0046	-1.225	-0.0157	-4.553	-0.0105	-3.180
4	0.0035	0.997	-0.0071	-2.097	0.0004	0.121
5	-0.0019	-0.286	-0.0069	-2.030	-0.0021	-0.650

(Table 2, continued)

Panel B: Open to Close Returns						
Purchases (n = 36,339)						
Total Effect	0.5569	51.14	0.4358	44.39	0.2905	32.16
Temporary Effect	0.1136	14.85	0.1399	18.78	0.2361	26.54
Permanent Effect	0.6705	53.42	0.5757	50.48	0.5266	49.02
Sales (n = 39,450)						
Total Effect	-0.4682	-47.24	-0.2228	-23.45	-0.3070	-30.16
Temporary Effect	0.0518	8.75	-0.1755	-18.24	-0.1034	-9.85
Permanent Effect	-0.4164	-40.73	-0.3983	-32.22	-0.4104	-38.84

Table 3
Frequency of Transactions at the Ask Quote, and Associated Bid-Ask Spreads, Surrounding Block Trades

This table reports the frequency of the transaction price to be at the ask quote, and associated proportional bid-ask spreads, for the 11 trades centred on the block trade (trade 0), as well as for the opening and closing transactions, for the sample of block trades analyzed in this paper. The t-statistic emanates from the test of whether the proportion of trades at the ask is significantly different from 50%. Results are calculated separately for purchase and sale transactions.

	Purchases			Sales		
Trade	Proportion of Trades at Ask	t-statistic	Proportional Spread	Proportion of Trades at Ask	t-statistic	Proportional Spread
-5	0.5305	14.10	0.4518	0.4855	-4.189	0.5075
-4	0.5374	16.27	0.4551	0.4843	-5.543	0.5122
-3	0.5413	19.73	0.4579	0.4785	-8.659	0.5140
-2	0.5539	25.84	0.4583	0.4669	-12.19	0.5183
-1	0.5773	36.75	0.4592	0.4370	-26.39	0.5219
0	1	--	0.5678	0	--	0.6467
1	0.6159	47.48	0.4749	0.3928	-39.46	0.5454
2	0.5627	27.13	0.4709	0.4542	-16.00	0.5383
3	0.5441	21.65	0.4655	0.4697	-9.982	0.5332
4	0.5366	14.98	0.4610	0.4824	-4.005	0.5256
5	0.5371	15.55	0.4524	0.4872	-2.326	0.5208
Opening Transaction	0.5001	0.001	0.9475	0.5100	3.16	0.9386
Closing Transaction	0.5127	6.64	0.7893	0.4835	-7.65	0.7845

Table 4
Intraday Price Reactions Surrounding Block Trades, and Associated Tests of Dependence Between Stocks

This table reports price effects, based on both transaction prices and quotes. Effects are calculated as price-to-price returns for both purchase and sale transactions. Ask-to-ask returns are calculated for purchase transactions, and bid-to-bid returns for sale transactions. Block trades are defined as the largest 1 percent of trades in each stock, in each calendar year, on the ASX, from January 1, 2000 to December 31, 2001. From this possible sample, one block transaction per stock, per day, is randomly selected from all block transactions executed on the day in that particular stock. Returns are calculated separately for each stock, and then aggregated across all stocks. N represents the number of stocks analysed, while n is the number of block transactions. The Z-Statistic (from Christie (1990)) is an aggregation of t-statistics from all stocks, and is based on independence between stocks. ρ is the level of correlation between stocks required to render the Z-Statistics insignificant (a value of less than 2.58 is deemed insignificant for this study).

	Price-to-Price			Ask-to-Ask / Bid-to-Bid		
Trade	Abnormal Return (%)	Z (under independence)	ρ (mean correlation among t-statistics to make Z insignificant)	Abnormal Return (%)	Z (under independence)	ρ (mean correlation among t-statistics to make Z insignificant)
Panel A: Purchases (N = 738, n = 16,207)						
-5	0.0085	19.768	0.078	0.0075	17.495	0.061
-4	0.0091	25.111	0.127	0.0098	24.603	0.122
-3	0.0098	32.862	0.219	0.0141	33.487	0.227
-2	0.0151	36.231	0.266	0.0182	26.324	0.140
-1	0.0322	76.328	1.186	0.0205	54.984	0.615
0	0.3836	641.57	83.90	0.2081	401.88	32.92
1	-0.1237	-323.01	21.27	0.0669	78.56	1.26
2	-0.0077	-12.668	0.031	0.0309	50.737	0.523
3	0.0091	17.993	0.065	0.0214	36.222	0.266
4	0.0052	18.337	0.067	0.0152	26.306	0.140
5	0.0065	19.895	0.079	0.0095	11.582	0.026
Panel B: Sales (N = 755, n = 18,635)						
-5	-0.0077	-13.125	0.033	-0.0046	-18.135	0.064
-4	-0.0085	-17.814	0.062	-0.0095	-24.821	0.121
-3	-0.0105	-24.702	0.120	-0.0108	-22.266	0.097
-2	-0.0123	-25.856	0.132	-0.0111	-18.593	0.068
-1	-0.0205	73.273	1.068	-0.0212	-37.571	0.280
0	-0.4329	-703.69	98.66	-0.2067	-425.90	36.14
1	0.1841	357.94	25.53	-0.0410	-88.50	1.56
2	-0.0061	50.760	0.512	-0.0211	-26.964	0.144
3	-0.0076	-11.220	0.024	-0.0135	-29.126	0.168
4	-0.0050	9.132	0.015	0.0014	1.108	0.001
5	-0.0029	-2.619	0.000	-0.0027	-5.953	0.006

Table 5
Intraday Price Reactions Surrounding Block Trades During Positive / Negative Market Conditions

This table reports abnormal trade-to-trade returns for the 7 trades centred on the block trade (trade 0). Returns are calculated using (i) transaction prices and (ii) ask quotes for purchases and bid quotes for sales. t-statistics result from the test of whether the mean abnormal return is significantly different from zero. Block trades are defined as the largest 1% of trades in each stock, in each calendar year, on the ASX, from January 1, 2000 to December 31, 2001. Transactions are classified into purchases and sales using a quote based rule. Results are calculated separately for months in which the SPI futures contract experienced positive (Panel A) and negative (Panel B) returns.

Trade	Price-to-Price		Ask-to-Ask / Bid-to-Bid	
	Abnormal Return (%)	t-statistic	Abnormal Return (%)	t-statistic
Panel A: Positive Market Returns (11 months)				
Purchases (n = 17,617)				
-3	0.0135	2.629	0.0165	3.191
-2	0.0146	3.031	0.0079	2.225
-1	0.0395	10.38	0.0181	5.562
0	0.3204	79.81	0.2041	62.07
1	-0.0987	-25.21	0.0283	6.344
2	0.0293	8.18	0.0181	3.743
3	0.0076	3.917	0.0136	2.132
Sales (n = 18,238)				
-3	-0.0104	-2.169	-0.0055	-1.712
-2	-0.0166	-2.330	-0.0088	-2.131
-1	-0.0370	-9.002	-0.0170	-5.217
0	-0.3644	-80.48	-0.1858	-56.76
1	0.1615	36.20	-0.0216	-4.924
2	-0.0215	-4.242	-0.0202	-2.807
3	-0.0087	-2.825	-0.0114	-1.980
Panel B: Negative Market Returns (13 months)				
Purchases (n = 18,481)				
-3	0.0119	2.489	0.0129	2.394
-2	0.0158	2.933	0.0082	1.935
-1	0.0366	9.750	0.0205	6.651
0	0.3187	83.64	0.1933	62.21
1	-0.1161	-31.19	0.0228	5.204
2	0.0230	6.629	0.0281	4.470
3	0.0095	3.997	0.0158	2.835
Sales (n = 20,895)				
-3	-0.0132	-2.172	-0.0042	-1.228
-2	-0.0211	-2.538	-0.0068	-1.671
-1	-0.0320	-8.890	-0.0137	-4.540
0	-0.3630	-88.61	-0.1991	-63.57
1	0.1391	33.55	-0.0366	-8.588
2	-0.0130	-3.400	-0.0372	-10.12
3	-0.0072	-2.114	-0.0101	-1.641

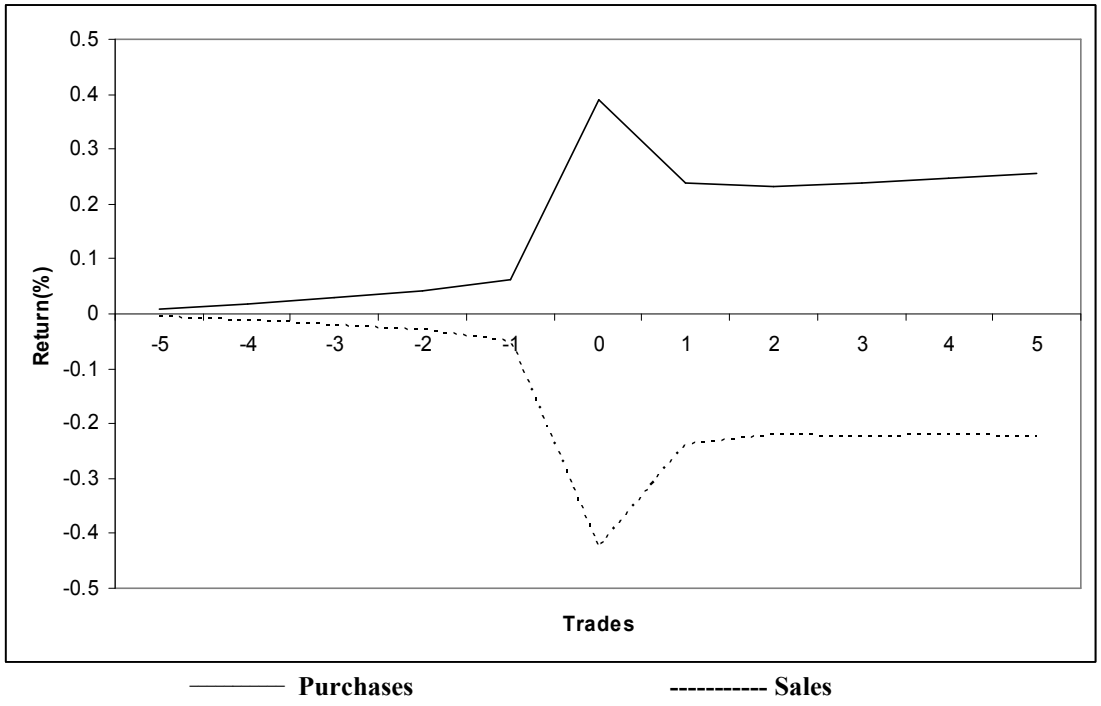

Figure 1
Cumulative Abnormal Returns Surrounding Block Trades Measured Using Transaction Prices
This figure presents the cumulative abnormal return, measured using transaction prices, for the 11 trades centered on the block trade (trade 0). Block trades are defined as the largest 1% of trades in each stock, in each calendar year, on the ASX, from January 1, 2000 to December 31, 2001. Transactions are classified into purchases and sales using a quote based rule. The final sample consists of 36,339 purchases and 39,450 sales. Results are calculated separately for purchase and sale transactions.

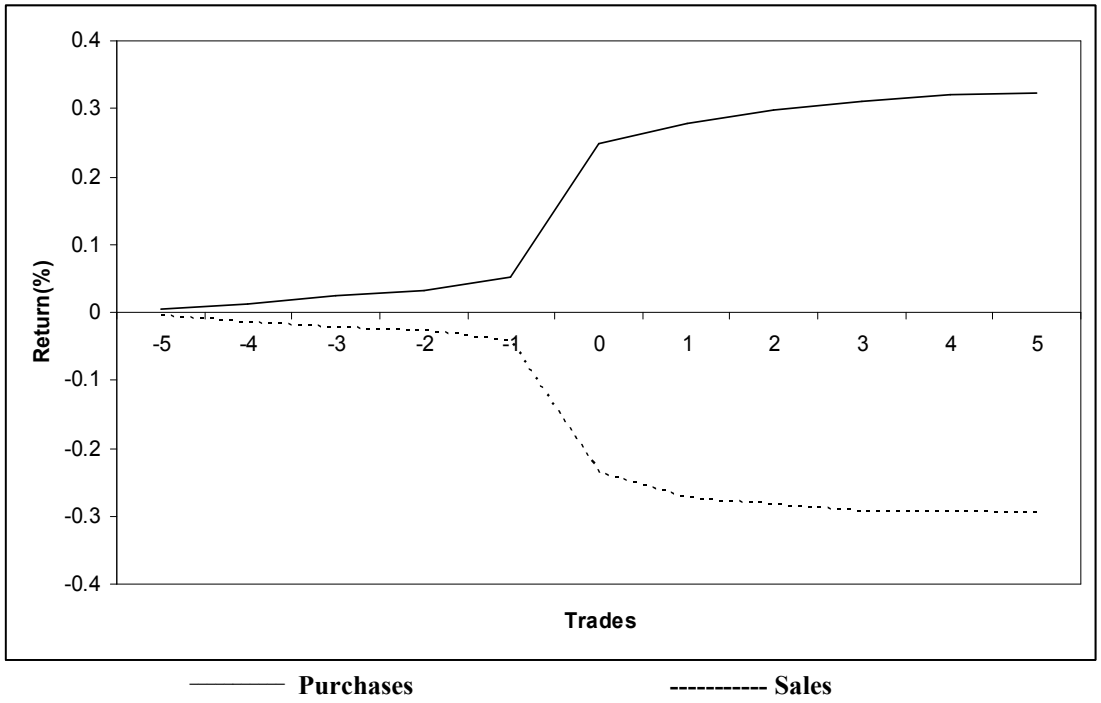

Figure 2
Cumulative Abnormal Returns Surrounding Block Trades Measured Using Quotes
This figure presents the cumulative abnormal return, measured using ask quotes for block purchases and bid quotes for block sales, for the 11 trades centered on the block trade (trade 0). Block trades are defined as the largest 1% of trades in each stock, in each calendar year, on the ASX, from January 1, 2000 to December 31, 2001. Transactions are classified into purchases and sales using a quote based rule. The final sample consists of 36,339 purchases and 39,450 sales.

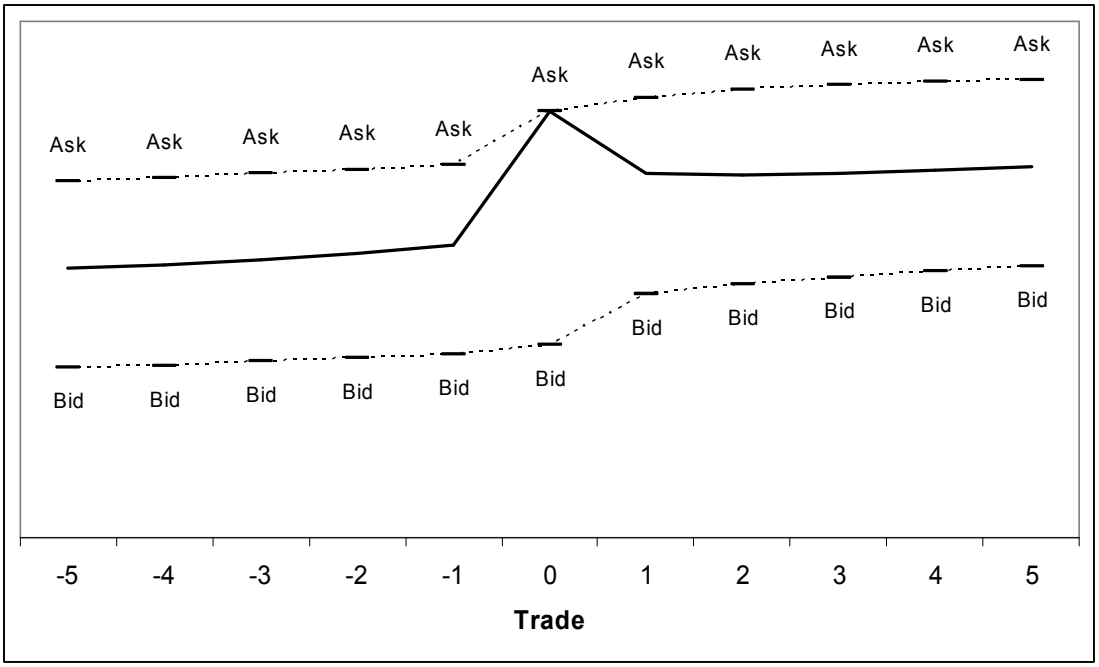

Figure 3(A)
Quote Movements Around Block Purchases
This figure presents a scaled account of the average bid-ask spreads surrounding, and including, the block purchases analyzed in this paper. The solid line running through the spread depicts the average transaction price path.

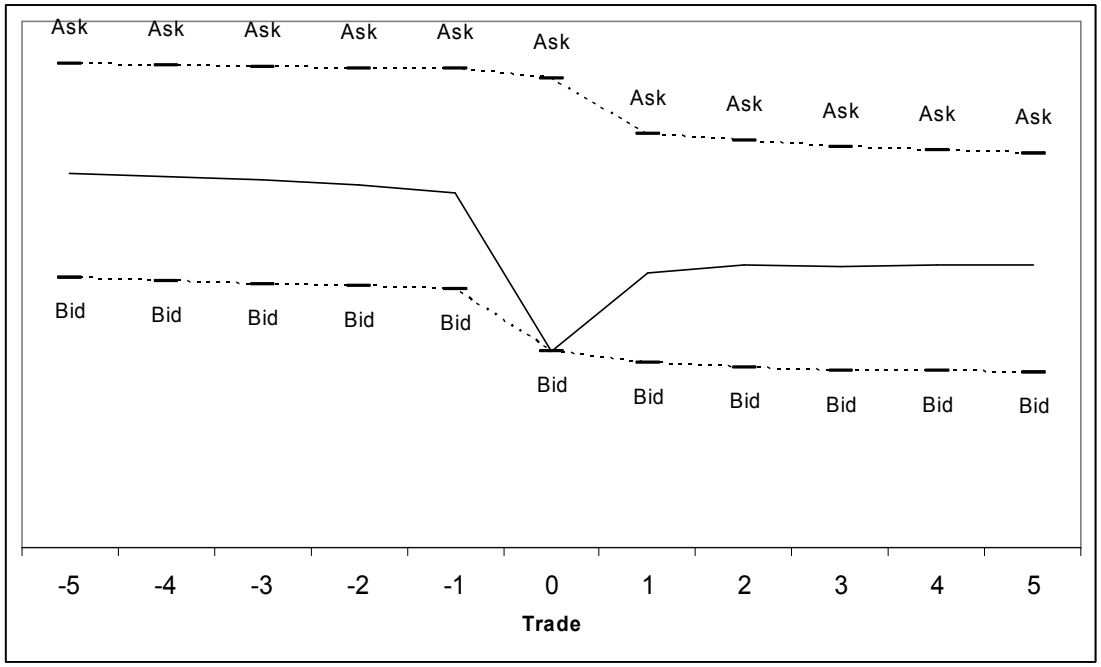

Figure 3(B)
Quote Movements Around Block Sales
This figure presents a scaled account of the average bid-ask spreads surrounding, and including, the block sales analyzed in this paper. The solid line running through the spread depicts the average transaction price path.