The impact of Trade Pre-negotiation: Evidence from the Sydney Futures Exchange

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Abstract

Empirical research, to date, has provided limited and contradicting evidence regarding the issue of pre-trade transparency. On 19th October 2004, the Sydney Futures Exchange introduced a change in the trade execution process that would permit market participants to withhold trade order details from the public limit order book. This change in the degree of pre-trade transparency provides a unique and rare opportunity to assess the impact of a reduction in pre-trade transparency on market quality within a derivatives market setting. We find that the decrease in transparency leads to a decrease in the quoted bid-ask spread and show that this change is robust to general market trends.

Introduction

The debate over optimal market structures has intensified in recent years following the rapidly changing demands of market participants. Since the turn of the decade international options exchanges have undergone several fundamental market reforms including the establishment of fully-electronic markets, such as the ISE, the listing of option classes on multiple exchanges and reforms aimed at increasing inter-market competition.[1] As a result of these and other developments, the quality of options markets has improved considerably and their future success will depend on their ability to innovate and further improve trading efficiency.

Despite the proliferation of options markets, to date, a lack of cohesive empirical research in market microstructure exists.[2] This paper contributes to the literature by assessing the impact of a reduction in pre-trade transparency on market quality within a derivatives market context. Specifically, this paper addresses the introduction of trade pre-negotiation on the Sydney Futures Exchange (SFE) and we examine whether the exchange's decision to permit the *withholding* of client orders details (price and volume) from the central limit order book in SPI 200 Index Options affects trade execution costs in a manner provided for by the equities market literature.[3]

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[1] Remarks Before the Securities Industry Association Options Market Structure Conference – US SEC Commissioner Annette Nazareth, October 14, 2006.

[2] Vijh(1990), Neal (1992), George and Longstaff (1993), Cho and Engle (1999), Mayhew (2002), de Fontnouivelle (2003), Kaul et al (2004), Petrella (2005) provide models that attempt to rationalize the main determinants of bid-ask spreads.

[3] See Madhavan (1992), Biais (1992), Bloomfield and O'Hara (1999), Flood et al. (1999), Madhavan, Porter and Weaver (2005), Boehmer et al (2005).

The scarcity of such research in derivatives markets provides the authors of this paper with a unique opportunity to further explore and understand the impact of changes in transparency on trade execution costs, liquidity and ultimately investor welfare.

Prior to the introduction of trade pre-negotiation, the withholding of orders and details of the orders from the market was action expressly prohibited.[4] So determined was the exchange at preventing such behaviour that in 1998, 20 separate cases were reported to the independent regulator involving 15 individuals undertaking illegally negotiated trades. The regulatory shift by the exchange on October 19, 2004 to introduce trade pre-negotiation was a positional change that recognised potential benefits in affording greater flexibility to market participants in the trade execution process. This change allows us to estimate the incremental benefits of such a regime change.

Our principal finding indicates that pre-negotiation leads to a reduction in bid-ask spread costs for market participants. . We find a statistically significant decrease in quoted percentage spreads following the rule change and show that this result is robust to changes in hedging parameters and market maker activity. Furthermore, we demonstrate through the use of a control market setting that the reduction in trading costs is robust to general market trends.[5] We therefore conclude that the reduction in transparency, resulting from brokers being allowed to withhold order information from the market, results in lower trader execution costs.

[4] ASIC – predicated on the belief that allowing pre-negotiation would threaten the open participation of the market and competitive price discovery.
[5] The ASX 200 Index Options contract is a substitutable contract traded on the Australian Stock Exchange.

This paper further contributes to the literature by providing evidence consistent with Cho and Engle (1999), Kaul et al (2004) and Petrella (2005) that models of market making are determined not only by derivative market but also underlying market activity. Cho and Engle (1999) suggest that if market makers in options markets can perfectly hedge their positions in the underlying market then the bid-ask spread will be determined by the liquidity in the underlying market.[6] In this paper we empirically test the cost of setting up and rebalancing a delta neutral portfolio as determinants of option bid-ask spread and find that hedging costs incurred by market-makers' to hold delta-neutral portfolios is a significant determinant of bid-ask spreads.

The remainder of this study is organised as follows. Section I describes the institutional detail. Section II reviews the literature and states our principal hypothesis. Section III provides a description of the data set as well as discussing our methodology. Section IV contains our results and a discussion of the economic significance of the results. Section V provides the concluding remarks.

I. Institutional Background

1.1 Sydney Futures Exchange (SFE)

The SFE is the largest derivatives exchange in the Asia Pacific Region and is ranked among the top ten futures and options exchanges worldwide by notional value of trading.[7] Trading in SPI 200 Index Options is conducted via a fully automated trading system, the Sydney Computerised Market (SYCOM) that encompasses a hybrid

[6] See also de Fontnouivelle (2003), Kaul et al (2004), Petrella (2005)
[7] Aitken, Frino, Hill and Jarnecic (2004) and Frino, Harris, McInish and Tomas (2004).

market structure of competing dealers. These dealers have exclusive knowledge of the limit order book and actively participate as both brokers and dealers.

1.2 Trade Pre-negotiation

Trade pre-negotiation was introduced on the Sydney Futures Exchange (SFE) in October 2004 for the SPI 200 Index Options. Pre-negotiation allows a broker to withhold an order from the centralised market for the purpose of soliciting counterparties for trades of any size. A broker is permitted to disclose details of the particular order to selected customers and aggregate client orders in satisfaction (or part satisfaction) of the original client order before bringing the negotiated business to the Exchange to fulfil the market test.[8] The process of bringing the order to the Exchange to be matched following trade pre-negotiation requires the Participants to issue a mandatory quote request to allow other participants to respond to the proposed deal arranged by the broker. This process ensures that any brokered price is *fair* and that the trade occurs at the best available price.

II. Literature Review & Hypothesis Development

Academic interest in pre-trade transparency has increased considerably in the last decade following a number of regime changes.[9] While the issue of transparency is

[8] The market test allows the broker to withhold price and volume information from the market. Withholding this information from the market in the pre-period was forbidden.

[9] US Securities and Exchange Commission (SEC, 1994) and the UK Office of Fair Trading (Carsberg, 1994) believe that greater pre-trade transparency will enhance the liquidity and specifically market depth. Furthermore Lehmann and Modest (1994) and Simaan et al. (2003) detail that the rise of ECN's which is presumed to be in part by the high level of order information flow on these systems.

directly linked to market quality, there is a mixed consensus as to whether the effects derived by market participants are predominately beneficial.

Early research in pre-trade transparency addressed the effects on market quality inherently through the development of theoretical models examining different market structures (Madhavan (1992) and Biais (1992)[10]. For example, Pagano and Roell (1996) consider trading costs associated with dealership markets relative to continuous markets and show the optimal level of transparency, modelled as a function of trading costs differs for different classes of investors. They conclude that encouraging greater transparency may reduce transaction costs to uninformed investors but may adversely affect informed investors.

Experimental studies that examine the impact of a change in transparency within the context of a multiple dealer market also present mixed findings (e.g. Bloomfield and O'Hara (1999) and Flood et al. (1999)). For example, Bloomfield et al. find that a more transparent setting results in greater price level efficiency, but that this is achieved at the expense of increase trading costs. However, Flood et al, use a comparable setting to examine the impact of transparency in a foreign exchange market find that prices actually become less efficient as the trading environment becomes more transparent and have lower trading costs.

Empirical evidence on transparency and its effects on liquidity and execution costs are limited and conflicting in its conclusions. Madhavan, Porter and Weaver (2005) document a reduction in liquidity on the TSE following the increase in order book

[10] Madhavan (1992) models a game where order quantities and beliefs are determined endogenously and finds that quote driven markets are more price efficient than order-driven markets. The cost to traders of this efficiency is reflected in higher information costs.

disclosure, providing support for their theoretical predictions. The authors report an increase in quoted and effective bid-ask spreads and conclude that market quality deteriorates post the event. In contrast, however, Boehmer et al (2005) document a reduction in effective bid-ask spreads on the NYSE following the introduction of Open Book, which allowed participants to observe much more information in the limit order book. The volume of contradictory findings leads to the following hypotheses.

H1: *Transparency reduction will lead to a change in quoted bid-ask spreads*

III. Data and Method

The Reuters data used in this study are provided by SIRCA and are captured in real time from SYCOM. The data extends from October 19, 2003 to October 19, 2005 for options contracts listed on SPI 200 Futures Index. Each record contains a date and time stamp, to the nearest second, as well as fields outlining the trade price, volume and prevailing quotes. Quoted spreads are calculated using the best bid and offer prices.[11] We additionally obtain trade and quote data for the S&P ASX 200 Options contract to create a control sample for testing whether observed spread changes are part of a general trend across markets. Consistent with prior event studies in derivative markets, this analysis is confined to daytime trading [eg. Aitken et al. (2004), Oetomo and Frino (2005)].

[11] Most recent studies of the spreads in the stock market have focused on the effective spread (See Chistie, Harris and Schultz (1994), Huang and Stoll (1994)). Effective spreads capture the actual cost of executing trades by calculating the deviation of the trade price from the true price. Trading on the SFE carried out via an electronic auction market. Thus, no transactions occur within the best quotes, and the effective spread will equal the quoted spread.

A series of standard filters are applied to these data. All records with time stamps outside of the range 09:50 to 16:30 are excluded and the opening and closing trades of the day are removed. We delete all quotes with a zero quote and exclude longer-term options as they are thinly traded making inferences difficult. [12] To construct the sample, we average across all trades in a given series per given day. This approach reduces the effects of intraday patterns. [13]

Table I reports averages for the quoted absolute spread, percentage spread, underlying spread and daily option volume for the sample period. Table I shows that without controlling for other determinants, average absolute and percentage spreads decline following trade pre-negotiation. Quoted percentage spreads are on average 15 percent lower, and this difference is statistically significant. Furthermore, we additionally show no discernable change in the quoted underlying spreads or daily volume in the sample period. This suggests that the change in quoted option spreads is not simply the result of a change in hedging parameters.

While these results provide some weak evidence to suggest that pre-negotiation leads to lower trading costs for market participants these results do not control for changes in other factors known to influence spreads. Accordingly we perform the following regression specified in Equation 1.1 to isolate the effect of pre-negotiation on percentage bid-ask spreads. We therefore expect that if quoted spreads are related to the introduction of pre-negotiation then the parameter estimate for the pre-negotiation be negative and significant. In the following regression model:

[12] We analyse these data across a range of periods with varying lengths and find that our results are robust to the removal of both shorter and longer term options.
[13] Reproducing this analysis using transaction level data provides evidence consistent with the finding reported.

$$Spread_{i,t} = \alpha_0 + \alpha_1 Delta_{i,t} + \alpha_2 Gamma_{i,t} + \alpha_3 Moneyness_{i,t} + \alpha_4 Maturity_{i,t} + \alpha_5 Volume_{i,t} + \alpha_6 \text{Prenegotiation}_{i,t} \quad \textbf{(1.1)}$$

$Spread_{t,i}$ is the quoted percentage bid ask spread for contract *i* on day *t*. Percentage rather than absolute spreads are used to consistently compare across option contracts.

$Delta_{i,t}$ is a proxy for hedging costs involved in setting up a delta neutral position and is defined in Equation 1.2 where;

$$Delta_{i,t} = Spread_{yi} \cdot S_t \cdot \Delta_t \quad \textbf{(1.2)}$$

S_t is the underlying percentage spread and Δ_t is the delta of the individual options in the portfolio. We expect to find a positive relationship between $Delta_{i,t}$ and the bid-ask spread.

To isolate the expected rebalancing costs we include $Gamma_{i,t}$. We proxy for the rebalancing costs a manner consistent with Petrella (2005) where;

$$Gamma_{i,t} = \Gamma \cdot \frac{S_t^{Max} - S_t^{Min}}{S_t^{Max} + S_t^{Min}} \quad \textbf{(1.3)}$$

Γ_t is the gamma of the individual options in the portfolio and $S_t^{Max}(S_t^{Min})$ are the daily maximum and minimum prices. We compute both Δ_t and Γ_t using the Black-Scholes

as outlined in Hull (2005). We expect to find a positive relationship between $Gamma_{i,t}$ and the bid-ask spread.

$Moneyness_{i,t}$ is defined as the relative difference between the current stock price S_t and the present value of the strike price $Xe^{-r(T-t)}$. We expect to find that a negative relationship between $Moneyness_{i,t}$ and the bid-ask spread which implies that the average percentage bid-ask spread is larger for out of the money options[14].

$Maturity_{i,t}$ is defined as the time to maturity measured in days. We expect the relation between $Maturity_{i,t}$ and percentage bid-ask spreads to be negative in accordance with Petrella (2005) and Anand and Weaver (2006). This implies that the percentage bid-ask spread is larger for options that are closer to maturity.

$Volume_{i,t}$ is a proxy for trading activity and is summed across all trades in the series per trading day. The relationship between $Volume_{i,t}$ is rather inconsistent in the literature. In line with order-processing arguments Petrella (2005) show that spreads decrease as the trading volume increase, however, Cho and Engle (1999) find no significant effect since liquidity in the underlying market can be tapped through the hedging behaviour of market makers.

Finally, $\text{Prenegotiation}_{i,t}$ is a dummy variable assigned a value of 1 if the observation occurred in the post pre-negotiation period and zero otherwise. We expect that if the

[14] George and Longstaff show that near maturity options exhibit wider spreads than long-maturity options. The difference in our expectations from the literature is related to the price level; that is the price of out-of-the money options is systematically lower options that are in the money.

percentage bid-ask spread is lower in the post period and this change is due to the introduction of pre-negotiation then the parameter estimate to be negative and significant.

IV. Results

4.1 Multivariate Analysis

Table II presents the coefficient estimates for the regression analysis outlined in Equation 1.1. The standard errors of the estimated coefficients are corrected for hetroskedasticity using White's (1980) method. In addition, all independent variables have been standardized to have zero mean such that the intercept represents the average bid-ask spread in the pre pre-negotiation period.

The coefficient estimate on the pre-negotiation variable strongly supports the hypothesis that pre-negotiation had a significant and negative effect on spreads.[15] We therefore conclude that the reduction in transparency, resulting from brokers being allowed to withhold order information from the market, results in lower trader execution costs.

Our regression analysis also indicates that hedging costs are highly significant and consistent with Cho and Engle (1999) and Petrella (2005). This suggests that market

[15] This analysis is repeated for quoted absolute results. These finding are no sensitive to the use of either quoted percentage or absolute spreads. These results are available upon request.

makers delta hedge their positions in the underlying market and that the bid-ask spread is related to the liquidity in the underlying market.[16]

Among our other control variables, option moneyness (*Moneyness*) and time-to-maturity (*Maturity*) and volume *(Volume)* exhibit statistically significant negative signs which is consistent both with our expectations. Both Petrella (2005) and Anand and Weaver (2006) show in the money options and options that are further away from expiry have lower percentage bid-ask spreads.

4.2 Additional Robustness Tests

To further test the robustness of our results we design a control market multivariate analysis. The S&P ASX 200 Index Options is a substitutable security traded on the Australian Stock Exchange. The underlying security is the S&P ASX 200 Index and similar to SFE SPI 200 Index Options, ASX index options are European cash-settled and trade on a quarterly expiration cycle. The total underlying value is the index multiplied by AUD$10.[17] To compare the bid-ask spread across exchanges we use the following specification outlined below, where;

$$Spread_{i,t} = \alpha_0 + \alpha_1 Moneyness + \alpha_2 Maturity + \alpha_3 Volume + \alpha_4 \text{Prenegotiation} + \alpha_5 SFE + \alpha_6 Post * SFE \quad \textbf{(1.4)}$$

$Spread_{t,i}$, $Moneyness_{i,t}$, $Maturity_{i,t}$ and $Volume_{i,t}$ are consistent with the regression specified in Equation 1.1; *SFE* is a dummy variable assigned the value 1 if the

[16] We also test for potential multicollinearity issues between our explanatory variables. According to our results, (not attached) there is no issue of multicollinearity amongst the explanatory variables. These results can be obtained from the authors upon request.
[17] The total value of the underlying index for SFE SPI 200 Index Options is multiplied by 25.

observation is based on SFE quotes and zero otherwise; and ***Post*SFE*** is an interaction dummy variable assigned the value 1 if the observation is based on SFE quotes and is in the post pre-negotiation period, zero otherwise. If the observed changes in trading costs are due to the introduction of pre-negotiation on the SFE, then we expect the estimate of the interaction variable to be negatively statistically significant.

Table III presents the results of the regression outlined in Equation 1.4. The parameter estimate for our variable of interest *Post*SFE* is negatively significant which provides complementary evidence that the decrease in percentage bid-ask spread in SFE spreads is related to the introduction of pre-negotiation.

V. Conclusion

Empirical research, to date, has provided limited and contradicting evidence regarding the issue of pre-trade transparency. Pre-trade transparency is an issue of considerable importance to regulators and investors and provides academics with an interesting conundrum for which they attempt to assess the impact on market quality through a variety of theoretical, experimental and empirical research designs. This study analyses empirically the impact of a decrease in pre-trade transparency and provides statistically significant evidence to indicate that this reduction is associated with a decrease in percentage bid-ask spreads.

Appendix

Table I

Summary Statistics

Table I describe sample characteristics for options on the SFE SPI 200 Futures Index prior to and following pre-negotiation. *Absolute Quoted Spread* indicates the best prevailing quotes available at the time of trade averaged over the sample period. *Percentage Quoted Spread* is measured as the quoted absolute spread relative to the midpoint of prevailing bid-ask quotes. Quoted Underlying spread is the prevailing absolute spread on the underlying contract at the time of option trade execution. *Daily Volume* describes average number of contracts traded per trading day. A double and single asterisk implies 99% and 95% levels of significance, respectively.

	Pre- Period	Post-Period	Mean Change	t-statistic for differences
Absolute Quoted Spread				
Mean	3.93	3.73	-0.20	-2.21*
Median	3.87	3.72		
Percentage Quoted Spread				
Mean	19.20	16.20	-3.00	-4.68**
Median	17.03	14.47		
Quoted Underlying Spread				
Mean	1.41	1.39	-0.02	-1.41
Median	1.32	1.34		
Daily Volume				
Mean	31.78	30.24	-1.54	-0.85
Median	29.31	26.81		

Table II

Determinants of Bid-Ask Spreads

This table shows reports the results from the following regression model:

$$Spread_{i,t} = \alpha_0 + \alpha_1 Delta_{i,t} + \alpha_2 Gamma_{i,t} + \alpha_3 Moneyness_{i,t} + \alpha_4 Maturity_{i,t} + \alpha_5 Volume_{i,t} + \alpha_6 \text{Prenegotiation}_{i,t}$$

Where $Spread_{t,i}$ is the quoted percentage bid ask spread for contract *i* on day *t*; $Delta_{i,t}$ is a proxy for hedging costs involved in setting up a delta neutral position; $Gamma_{i,t}$ is a proxy for the rebalancing costs of a delta neutral portfolio; $Moneyness_{i,t}$ is defined as the relative difference between the current stock price S_t and the present value of the strike price $Xe^{-r(T-t)}$. $Maturity_{i,t}$ is defined as the time to maturity measured in days. $Volume_{i,t}$ is a proxy for trading activity and is summed across all trades in the series per trading day. $\text{Prenegotiation}_{i,t}$ is a dummy variable assigned a value of 1 if the observation occurred in the post pre-negotiation period, zero otherwise. A single and double asterisk implies 99% and 95% levels of significance, respectively.

	Coefficient Estimate	Standard Error	t-statistic
Intercept	19.15	0.418	4.58**
Volume	-0.891	0.291	-3.05**
Delta	1.247	0.305	4.08**
Gamma	0.710	0.309	2.30*
Moneyness	-2.898	0.322	-8.99**
Days to Maturity	-2.173	0.335	-6.47**
Pre-Negotiation	-3.846	0.608	-6.32**
R-Square	22.60		

Table III

Determinants of Bid-Ask Spreads

This table shows reports the results from the following regression model:

$$Spread_{i,t} = \alpha_0 + \alpha_1 Moneyness + \alpha_2 Maturity + \alpha_3 Volume + \alpha_4 \text{Prenegotiation} + \alpha_5 SFE + \alpha_6 Post * SFE$$

Where $Spread_{t,i}$ is the quoted percentage bid ask spread for contract *i* on day *t*; $Moneyness_{i,t}$ is defined as the relative difference between the current stock price and the present value of the strike price; $Maturity_{i,t}$ is defined as the time to maturity measured in days; $\text{Prenegotiation}_{i,t}$ is a dummy variable assigned a value of 1 if the observation occurred in the post pre-negotiation period, zero otherwise; *SFE* is a dummy variable with a value of 1 if the observation occurred on the SFE, zero if its belongs to the ASX.; *Post*SFE* ***SFE*** is an interaction dummy variable assigned the value 1 if the observation is based on SFE quotes and is in the post pre-negotiation period, zero otherwise. A single and double asterisk implies 99% and 95% levels of significance, respectively.

	Coefficient Estimate	Standard Error	t-statistc
Intercept	0.219	0.51	0.43
Moneyness	-0.240	0.51	-0.46
Days to Maturity	-0.037	0.018	1.96*
Volume	-0.021	0.015	-1.31
Pre-Negotiation	-0.011	0.040	-0.29
SFE	0.099	1.02	0.1
Post*SFE	-0.27	0.06	-4.72**
R-Square	22.47		

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