The Impact of Trading Party on the Execution Spread: Evidence from Futures Markets

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In this study, we examine the execution spread, i.e., the transaction cost for traders who demand liquidity. Using the transaction records of four futures contracts traded on the Chicago Mercantile Exchange, we calculate the execution spread to reflect the transaction costs incurred by customers and find that the cost of trading for customers is lower when they initiate transactions with floor traders than when they initiate transactions with other customers. We also examine the determinants of the execution spread. The findings indicate that trading volume reduces the execution spread, while market volatility increases it. The impact of competition in the pit varies depending on the execution spread measures. Competition among floor traders reduces the spread for transactions between customers and floor traders; however, competition does not affect the execution spread when customers trade with each other.

Introduction

The bid-ask spread is an important component of the overall transaction costs. Several studies have found that the size of the spread is a function of several factors. For example, Klock and McCormick (1999) find that competition among NASDAQ market makers affects the spread. Wang, Michalski, Jordan, and Moriarty (1994) show that besides market competition, price volatility and trading volume also explain the behavior of the intraday spread in futures markets.

In this study, we examine the execution spread incurred by off-exchange customers (hereafter customers) when they initiate a trade to buy or sell futures contracts. Using the transaction records of four futures contracts traded on the Chicago Mercantile Exchange (CME), we measure the customer execution spread (hereafter execution spread) relative to the principal behind the trade counter party.

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Specifically, we measure the execution spread when customers trade against floor traders and when they trade against other customers and look into the differences of these measures and their determinants.

We find that on average customers pay a larger premium when they trade against other customers rather than against floor traders. This finding might reflect the location advantage of futures floor traders who stand ready in the futures pits and are able to observe important market activities, such as order flows. We also find that trading volume, market competition, and price volatility affect the execution spread. Competition among floor traders, however, does not influence the size of the execution spread when customers trade among themselves.

Literature Review

The behavior and the determinants of the bid-ask spread in equity markets have been researched extensively during the last two decades. For example, Glosten and Milgrom (1985), and Chung, Van Ness, and Van Ness (1999), examine the spread behavior of New York Stock Exchange (NYSE) stocks; Stoll (1989) and Kandel and Marx (1997), study the determinants of spread for NASDAQ. The focus also has been extended to foreign equity markets; for example, Menyah and Paudyal (2000) find a marginal level of inventory holding costs for stocks traded on the London Stock Exchange (LSE).

One of the characteristics of the futures markets is that there are no bid and ask prices available to the public. This creates a challenge for researchers examining and analyzing the spread behavior in futures markets. Several studies rely on bid-ask spread estimators, e.g., Roll (1984), Smith and Whaley (1994), and Bhattacharya (1983), to examine the spread. Wang, Michalski, Jordan, and Moriarty (1994) examine the impact of competition among market makers, price volatility, and trade size on the realized spread of the S&P 500 index futures around the October 19, 1987 crash. They find that volatility increases the realized bid-ask spread around the crash.

On the other hand, the number of market makers reduces the spread. Wang, Yau, and Baptiste (1997) examine the impact of trading volume on transaction costs in futures markets. Using daily observations covering the period between January 1990 and April 1994, they uncover two main findings: first, the bid-ask spread and trading volume are jointly determined, and, second, there is a positive relationship between trading volume and price volatility and an inverse relationship between trading volume and the bid-ask spread. Laux and Senchack (1992) examine the bid-ask spread for four financial futures contracts: Deutschemark, Swiss franc, Treasury bill, and Eurodollar loan deposits between 1982 and 1986. They find a positive relationship between the spread and volatility and a negative relationship between the spread and trading volume. The study also finds that the spread follows a U-shaped pattern over the life of a contract.

With the availability of high-frequency data, researchers also focus on the intraday behavior of the bid-ask spread. Ding (1999) examines the factors determining the intraday and daily bid-ask spreads in the foreign exchange futures market. The dataset includes the Deutschemark and Japanese yen futures traded on the CME during 1990. The results show that bid-ask spread is negatively related to the number of transactions, but positively related to price volatility. Ma, Peterson, and Sears (1992) examine the intraday bid-ask spread for Treasury bond, silver, soy beans, and corn futures during 1980 and 1986. Their findings show the U-shaped pattern in the bid-ask spread during the beginning and the end of the trading day. They suggest that the larger bid-ask spread at the beginning and end of the trading day is inconsistent with higher trading volume because higher trading volume should reduce the spread rather than increase it. Ferguson and Mann (2001) examine the execution spread in futures markets. The data set includes 14 futures contracts traded during the first six months of 1992 on the CME. They find that the customer execution spread in general is small and below the tick size regardless of the counter party. The study also identifies the U-shaped spread pattern after controlling for the announcement effects.

Data and Methodology

Data

We use the dataset of Locke and Mann (in press). The dataset contains transaction records of four commodities traded on the CME in 1995: Deutschemark, Swiss franc, live cattle, and pork bellies. Each transaction is recorded closest to the minute, and a record contains commodity type, date, delivery month, buy-sell indicator, quantity, and price. In addition, the dataset also contains an indicator of the principal behind the transaction. The indicator is assigned by the Commodity Futures Trading Commission (CFTC). A transaction may be for the floor traders' personal account (CTI 1), in which they realize their own profits (losses), or for one of the three types of brokerage transactions, in which the floor traders receive a fixed amount of commissions per trade. A brokerage transaction could be for the floor trader's house account (CTI 2), for another floor trader's account (CTI 3), or for customer account (CTI 4). In this study, we focus on the floor traders' personal account trades (CTI 1) and customers' transactions (CTI 4). The distribution of trading across these trade categories is presented in Table 1. For all four markets, there are over 3 million transactions. The percentage of these transactions involving customers on both sides of the trade ranges from 4.11 percent for Deutschemark to 12.96 percent for live cattle. The transactions between customers and floor traders represent a larger proportion of the total transactions, ranging from 23.48 percent in Deutschemark to 30.37 percent in pork bellies. The customer-floor trader transactions account for 60.34 percent of overall trading volume (number of contracts) for pork bellies and for 39.81 percent for Deutschemark. The average prices per contract for pork bellies, live cattle, Deutschemark, and Swiss franc are \$18,919, \$26,404, \$87,546, and

$106,197, respectively. The last row of Table 1 presents the number of futures floor traders who trade for their personal account at least one time during 1995. For the four commodities, the number of floor traders ranges from 101 for pork bellies to as many as 281 traders for Deutschemark.

Table 1—Descriptive Statistics

The table is based on the distribution of trading across trade categories of Type 1 and Type 4. Type 1 and Type 4 refer to floor traders' personal account trades and customers' transactions, respectively. For all four markets, there are over 3 million transactions. The last row of the table presents the number of futures floor traders who trade for their personal account at least one time during 1995

	Futures Contracts			
	Pork Bellies	Live Cattle	Swiss Franc	Deutschemark
% of Transactions between Type 1 and Type 4	30.37%	25.87%	25.95%	23.48%
% of Transactions between Type 4 and Type 4	11.38%	12.96%	6.13%	4.11%
Total Number of Transactions	272,768	900,724	972,421	1,124,080
% of Total Volume of Type 1 Transactions	60.34%	58.42%	48.12%	39.81%
% of Total Volume of Type 4 Transactions	24.93%	24.78%	15.21%	14.94%
Average Price Level	18,919	26,404	106,197	87,546
Number of Floor Traders	101	219	224	281

Methodology

Customers lacking the privilege to make trades on the floor have to communicate their transactions to floor traders who execute them. A floor trader charges a fixed brokerage commission for the service provided. The counter party could be another floor trader picking up the trade for his personal account or it could be another customer having a different opinion about the market movement.

In our analysis, for every trade we identify an initiating party who demands liquidity to trade and thus pays a premium in return. Our goal is to examine whether there are any differences in terms of the premium paid by liquidity demanders relative to the principal behind the counter party. We define the execution spread as the difference between the customer-initiated buy and customer-initiated sell prices. Intuitively, the execution spread is the premium paid for an initiated round-trip transaction. We use the execution spread rather than other spread estimators such as Roll's estimator because Locke and Venkatesh (1997) demonstrate that the bid-ask spread estimators do not accurately represent the transaction costs in futures markets.[1]

We use the quote rule to determine whether a buyer or a seller initiates a transaction. The quote rule has been used for this purpose in equity and derivatives markets. Recently Savickas and Wilson (2003) show that the quote rule correctly predicts the initiating party of the transaction 83 percent of the time in options mar-

[1] Locke and Venkatesh (1997) find that Roll's estimator tends to underestimate the futures markets transaction costs, while the method of moments estimator tends to overestimate the futures markets transaction costs.

kets. The quote rule defines a trade as a buyer- (seller-) initiated trade if the transaction price is above (below) the mid-spread.[2] In other words, the initiating buyer (seller) would pay a premium by buying (selling) at a price higher (lower) than the average pit price. We then calculate the execution spread for transactions initiated by customers when they trade against floor traders, denoted by SPD41, and also when they trade against other customers, denoted by SPD44. We ignore the transactions involving house accounts (CTI2) and another floor trader's account (CTI3) because these transactions do not contribute substantially to trading volume.

We also examine the relationship between the execution spread and market wide factors. The following regression is estimated:

$$\mathrm{SPREAD}_t = \alpha_0 + \alpha_1 \mathrm{VOL}_t + \alpha_2 \mathrm{FT}_t + \alpha_3 \mathrm{SIG}_t + \alpha_4 \mathrm{D1} + \alpha_5 \mathrm{D2} + \varepsilon_t \tag{1}$$

where

SPREAD_t = SPD41 for transactions initiated by customers against floor traders;
SPREAD_t = SPD44 for transactions initiated by customers against other customers;
VOL_t = Customer volume;
FT_t = Number of floor traders;
SIG_t = Standard deviation of futures prices;
D1 = Dummy variable equal to 1 for the first 30 minutes of trading and 0 otherwise;
D2 = Dummy variable equal to 1 for the last 30 minutes of trading and 0 otherwise; and
t = Time subscript of a five-minute interval.

We analyze the determinants of the execution spread as a function of customer volume, competition among floor traders, price volatility, and time of the trade. We measure the customer volume as the number of contracts traded by customers during a five-minute interval. The sign of customer volume coefficient relative to the execution spread depends on the purpose of the transaction. For customer-initiated trades against floor traders, we expect the sign to be positive to reflect the larger adverse selection premium required by floor traders. On the other hand, when customers trade with each other, the volume may reflect the market liquidity and may have a negative impact on the execution spread.

We also use the number of active floor traders to proxy for market competition in the trading pits. We expect that the competition would reduce the execution spread when a floor trader is on one side of the transaction. For transactions between customers, however, the number of floor traders should have no effect on the execution spread because floor traders are acting as agents rather than as principals.

[2] Trades executed at spread mid-point are not classified as either buyer- or seller- initiated trades.

We compute the standard deviation of contract prices during five-minute intervals to measure market volatility. We anticipate a positive relationship between both measures of execution spread and the volatility because higher volatility implies a potentially greater adverse selection problem.

The regression also includes dummy variables for the first and last 30 minutes of the trading day to control for the time of trade effect which suggests that the execution spread is higher during the opening and closing periods.

Results

Execution Spread Decomposition

Table 2 reports the execution spread behavior by commodity and initiation criteria. For pork bellies, the execution spread is in the range of \$44.03 and \$61.31. For live cattle, the execution spread is consistently smaller than the pork bellies execution spread, ranging between \$20.22 and \$29.66. The execution spread is in the range of \$41.24 and \$57.48 and \$31.78 and \$47.60 for the Swiss franc and for the Deutschemark, respectively. Columns 2, 3, and 4 of Table 2 present the intra-day pattern of the execution spread. For agricultural markets, the execution spread exhibits a U-shaped pattern of all measures of trade initiation. We do not observe the U-shaped pattern with the currency markets. Figure 1 shows the intra-day pattern of the execution spread across contracts. The graphs clearly indicate a U-shaped pattern for pork bellies and live cattle futures, but not for the currencies.

Table 3 shows the results of differences in means tests of execution spread with different trade initiation measures across futures contracts. We find negative and significant differences in means between SPD41 and SPD44 in all cases, except live cattle. The results yield an interesting observation that there is an order of execution

Table 2—Execution Spread by Initiation Criteria and Futures Contracts

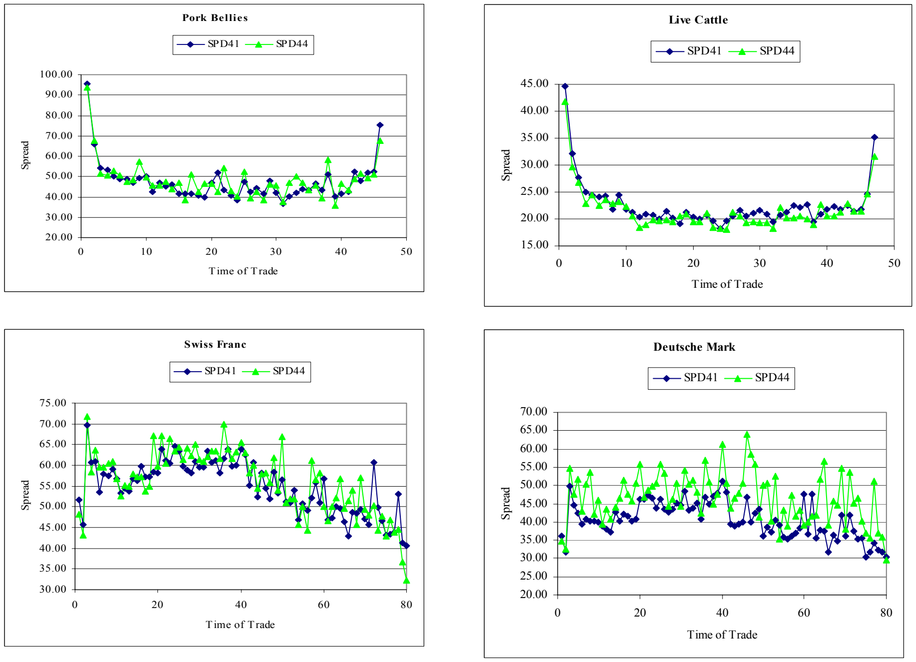
The execution spread is calculated as the cost of a transaction for the initiating party using each five-minute interval of trading. In this setting, the execution spread is the difference between the initiated buy and the initiated sell prices. The quote rule is used to identify the trade initiator. Quote rule defines a trade as a buyer- (seller-)initiated trade if the transaction price is above (below) the mid-spread

			Intra-day Spread		
Contracts	Initiation Criteria	Mean	Open	Mid-day	Close
Pork Bellies	SPD41[a]	47.54	61.31	44.03	53.71
	SPD44[b]	48.49	61.22	45.64	51.93
Live Cattle	SPD41[a]	22.57	29.66	21.01	24.58
	SPD44[b]	21.68	27.97	20.22	23.87
Swiss Franc	SPD41[a]	54.88	57.09	55.62	44.26
	SPD44[b]	56.08	57.48	57.27	41.24
Deutschemark	SPD41[a]	40.47	40.64	41.22	31.78
	SPD44[b]	46.58	44.03	47.60	37.63

[a] SPD41 refers to the execution spread for transactions between customers and dealers

[b] SPD44 refers to the execution spread for transactions between customers

Figure 1—Execution Spread by Initiation Criteria, Futures Contracts, and Time of Trades



SPD41 refers to the execution spread for transactions between customers and dealers
SPD44 refers to the execution spread for transactions between customers

costs in the market and that the counter party is an important factor for the magnitude of the execution cost. If customers initiate a trade, the execution spread is larger when they trade against another customer than when they trade against a floor trader. An explanation of the small execution spread for floor traders is that they have a competitive advantage over the customers in that they are present on the trading floor and are able to observe the market activities. Thus, when they are making market and responding to a customer-initiated trade, they require a smaller premium to protect themselves from trading against an informed trader. Customers, on the other hand, require a larger premium when they trade against another customer than when they trade against a floor trader because customers do not have the floor information that is available to floor traders.

Regression Analysis

In this section we examine, in a multivariate context, the relationships between the execution spread and market factors, i.e. customer volume, competition among floor traders, market volatility, and time of trade. Table 4 presents the characteristics of the variables examined in the regression analysis. For the agricultural markets, trading volume and the number of floor traders in the pits are higher for live cattle than for pork bellies. For the currency markets, the Deutschemark has higher trading volume as well as the number of floor traders than does the Swiss franc.

Table 3—Differences in Mean Execution Spreads

The table reports the differences in means tests of execution spread with different trade initiation measures across futures contracts

Commodity	Difference	Mean Difference	t-statistics
Pork Bellies	SPD41 – SPD44	-2.93	-3.33*
Live Cattle	SPD41 – SPD44	0.78	2.68*
Swiss Franc	SPD41 – SPD44	-1.17	-1.94**
Deutschemark	SPD41 – SPD44	-5.75	-9.52*

SPD41 refers to the execution spread for transactions between customers and dealers
SPD44 refers to the execution spread for transactions between customers
* Significant at the 5 percent level
** Significant at the 10 percent level

We estimate equation (1) for each type of trade initiations of the execution spread. The regression results are presented in Table 5. Adjusted R-squares range from 0.62 to 0.83. For the execution spread measure SPD41, the execution cost for customer-initiated trades against floor traders, we find an inconclusive result with the customer volume. Only agricultural futures contracts have significant coefficient estimates of customer volume (where one is positive and the other is negative). Although we find weak results with the customer volume, we observe that market competition, measured by the number of active floor traders, plays an important role in determining the magnitude of the execution spread. The coefficient estimates of the number of floor traders are significantly negative for most cases. This implies that floor traders compete for order flow and that reduces the execution cost for customers. This result is consistent with Wahal (1997), and Klock and McCormick (1999), who find that the number of market makers has a negative and significant impact on spreads for Nasdaq stocks.

The regression results for the other measure of the execution spread, SPD44 where customers initiate trades against other customers, yield an interesting finding. We observe that the coefficient estimates of the number of floor traders are statistically insignificant for all cases. This might imply that when customers trade among themselves with floor traders acting only as brokers, the competition among floor traders does not have an impact on the size of the execution spread.

For the two execution spread measures, we find that the coefficient estimates for volatility are positive and statistically significant in all cases. This result is consistent with Wang and Yau (2000), who find a positive relationship between spread and volatility in financial and metal futures markets.

We observe several interesting characteristics of transaction costs for customers. When customer initiate transactions with floor traders, the execution spread decreases with increasing number of traders in the pits which suggests that the competition among floor traders reduces the cost of trading for customers. The impact of customer volume on the execution spread is mixed. The results regarding the execution spread for transactions between customers generally are not affected by the customer volume and the competition among floor traders. This finding is consistent with the expectations because floor traders do not take sides in these transactions.

Table 4—Descriptive Statistics of Regression Variables

VOL refers to the customer volume. We measure the customer volume as the number of contracts traded by customers during a five-minute interval. FT is the number of floor traders in the pits during a five-minute interval. SIG is a measure of volatility. We compute the standard deviation of price during five-minute intervals

Agricultural										
	Pork Bellies					Live Cattle				
	Mean	Min.	Median	Max.	STD	Mean	Min.	Median	Max.	STD
SPD41[z]	49.20	10.00	40.00	1000.00	39.32	22.88	10.00	19.96	226.00	14.33
SPD44[b]	52.13	10.00	40.00	585.00	39.73	22.10	10.00	19.00	313.73	14.68
VOL	41.68	1.00	18.00	1178.00	68.92	191.57	1.00	111.00	3430.00	241.41
FT	9.68	1.00	9.00	29.00	4.81	18.99	2.00	18.00	49.00	7.96
SIG	21.07	0.00	17.89	441.72	18.30	11.55	0.00	9.77	188.24	7.79
Currencies										
	Swiss Franc					Deutschemark				
SPD41[a]	55.40	12.50	43.75	1664.41	49.73	40.72	12.50	30.40	1978.55	44.07
SPD44[b]	56.57	12.50	43.75	987.50	50.55	46.47	12.50	33.49	1035.71	49.65
VOL	173.34	1.00	110.00	2268.00	199.52	256.85	1.00	147.00	5806.00	327.98
FT	27.22	2.00	27.00	64.00	11.76	34.60	2.00	33.00	89.00	16.31
SIG	29.14	0.00	23.16	537.70	24.53	21.54	0.00	16.37	366.19	19.74

[a] SPD41 refers to the execution spread for transactions between customers and dealers
[b] SPD44 refers to the execution spread for transactions between customers

Conclusions

A futures pit is an interesting trading environment where participants trade simultaneously with multiple prices and quantities. In this study, we compute execution spread for customers who initiate trades relative to the counter party. We find that customers are better off when they initiate transactions with floor traders. These results are consistent with the notion that floor traders have an information advantage regarding the order flow. We also examine the determinants of the execution spread and find that trading volume reduces the execution spread, while volatility increases it. The impact of number of traders in the pit varies depending on the execution spread measures. The number of floor traders reduces the spread for transactions between customers and floor traders. It does not affect the execution spread when customers trade with each other.

Table 5—Determinants of the Execution Spread

The table is based on the following regression:

$$\text{SPREAD}_t = \alpha_0 + \alpha_1 \text{VOL}_t + \alpha_2 \text{FT}_t + \alpha_3 \text{SIG}_t + \alpha_4 \text{D1} + \alpha_5 \text{D2} + \varepsilon_t \quad (1)$$

where, SPREAD_t is the execution spread, VOL_t is the customer volume, FT_t is number of floor traders, SIG_t is standard deviation of futures prices, D1 is the dummy variable and the value is equal to 1 for the first 30 minutes of trading, and 0 otherwise, D2 is the dummy variable and the value is equal to 1 for the last 30 minutes of trading, and 0 otherwise, and t is the time subscript of a five-minute interval

		Initiation Criteria			
Commodity	Variables	SPD41[a]	p-value	SPD44[b]	p-value
Pork Bellies	Intercept	1.153	0.0986	3.652	0.0052
	VOL	-0.018	0.0001	-0.008	0.1670
	FT	-0.377	0.0001	-0.098	0.3915
	SIG	2.105	0.0001	1.695	0.0001
	D1	-0.212	0.7338	2.040	0.0441
	D2	-0.084	0.8995	0.020	0.9850
	Adjusted R^2	0.83		0.71	
Live Cattle	Intercept	3.344	0.0001	1.278	0.0011
	VOL	0.004	0.0001	0.000	0.4970
	FT	-0.037	0.0789	0.030	0.1798
	SIG	1.578	0.0001	1.574	0.0001
	D1	0.369	0.2506	0.322	0.3503
	D2	-0.391	0.2014	-0.197	0.5621
	Adjusted R^2	0.73		0.73	
Swiss Franc	Intercept	3.403	0.0001	1.350	0.1503
	VOL	0.001	0.3175	-0.003	0.0533
	FT	-0.141	0.0001	0.027	0.4420
	SIG	1.842	0.0001	1.635	0.0001
	D1	1.232	0.0823	0.788	0.3846
	D2	-0.126	0.8670	-2.521	0.0120
	Adjusted R^2	0.75		0.69	
Deutschemark	Intercept	2.505	0.0001	1.677	0.1346
	VOL	-0.001	0.1514	-0.002	0.0406
	FT	-0.080	0.0001	-0.016	0.5857
	SIG	1.852	0.0001	1.707	0.0001
	D1	1.367	0.0723	0.025	0.9821
	D2	-1.992	0.0118	0.451	0.7185
	Adjusted R^2	0.64		0.62	

[a] SPD41 refers to the execution spread for transactions between customers and dealers
[b] SPD44 refers to the execution spread for transactions between customers

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