The role of market makers in the Euronext milling wheat contract

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Abstract: The knowledge of transaction costs is important for market participants. Profits accrued while dealing in e.g. commodity futures do not just depend on the development of the futures or the underlying commodity, but on the transaction costs as well. In the commodity futures markets, transaction costs – usually addressed as the bid/ask spread – are influenced if not set by the market makers (liquidity providers) and other intermediaries that broker the contracts. This paper tests the assumption that liquidity providers have the ability to shift prices, and this ability is negatively correlated with the degree of competition. Using Roll's measure (1984) to estimate the bid/ask spread, the authors can show that liquidity providers do have an influence on prices. To put this result into context, the margin for market makers is calculated on the basis of transactions in wheat-futures at the Euronext Paris that took place in May 2012, ranges between 0.0047% and 0.0055%. It is within this margin that market-makers could influence market prices of the wheat contract.

Key words: market maker, milling wheat futures, roll's measure, transactions costs

Researchers devoted a vast amount of time to capture or anticipate the extent of transaction costs in the financial and commodity markets (e.g. Perrakis and Lefoll 2000). Transaction costs make a part of profitability and market volatility (Swidler and Diltz 1992); nevertheless, they are neglected in the most often used pricing model for (European) options, the Black-Scholes Model (Black and Scholes 1973). Transactions costs are usually addressed as the bid/ask spread, the difference between the price a market maker offers and the price he/she sells for (Bryant and Haigh 2002: 3). In general, transaction costs as measured via the bid/ask spread are expected to include the following components, (1) the costs of market making, (2) the costs for order processing, (3) adverse selection costs accrued when trading against the informed traders and the respective hedging costs to safeguard against such costs and, finally (4) the costs accrued for carrying an inventory (Engle and Neri 2010). Due to their rule over the bid/ask spread, some authors assume a market making position for liquidity providers that goes beyond the mere facilitating of dealing in a market (Rust and Hall 2003). In fact, they assume liquidity providers to have some power over prices.

This paper will test this assumption and exploit the fact that the market makers ability to influence markets and more important prices should be linked to trading volume as shown by Copeland and Galai (1983: 1467) who concluded from their early work on the bid/ask spread that the bid/ask spread is a positive function of the price level and return variance and a negative function of the measures of market activity, depth, and continuity, and that the bid/ask spread is negatively correlated with the degree of competition. Similar results can be found in Lin et al (1995). This result is straightforward in many ways, e.g., it is apparent that the influence of an individual market maker is a function of the number of liquidity providers in the market. Furthermore, it is obvious that with the increasing liquidity and trade volumes, the influence of market makers diminishes (Grossman and Miller 1988). Accordingly, it is to be expected that the bid/ask spreads in narrow markets with low trading volumes are higher than in the broad markets with high trading volumes. This hypothesis will be tested using the data from the wheat futures market.

Commodity futures markets harbour a higher share of informed or sophisticated traders and usually they exhibit a lower trade volume than, e.g., stock markets. Accordingly, the authors use tick-data for wheat (EBM) sampled from the Euronext futures exchange in May 2012. Therefore, calculations are based on the information covering the trading activity for an entire month. The remainder of this paper is structured as follows. The next chapter will give a brief introduction about market makers and their role in commodity markets. Chapter Measuring the bid/ask spread the theory for the empirical test, mainly the

way to calculate the bid/ask spread, since the spread cannot be observed easily. In the last chapters, the authors discuss the results of the empirical test and will draw some conclusions and provide an outlook into further research.

MARKET MAKERS

The typical strategy of a dealer is to buy (or sell) an instrument from (or to) a market user or another dealer and then sell (or buy) the replication portfolio or instruments to (or from) other market users or dealers so as to earn the bid-ask spread through buying low and selling high" (Tang and Li 2007: 49–50). Accordingly, profits gained by market makers mirror their ability to exploit arbitrage. Usually, they will buy from a public seller or from their inventory, reduce a long position or go short, to cover the risk attached to the deal. Vice-versa when they sell to a public buyer they will reduce a short position, go long or buy for their own inventory (Schwartz and Francioni 2004: 193). Accordingly, it can by hypothesise that their ability to influence prices, as described in chapter 1, depends on the number of well-informed traders. Despite this caveat, the number of authors who assign price setting powers to market makers is quite high. For example, Schwartz and Francioni (2004) equate market markers' attempts to rebalance their positions with influence on prices. Consequently a market makers ability to set prices will depend on the willingness of public buyers or sellers to follow his lead and, more so, it will depend on his buying and selling position relative to that of other sellers. Thus, it is possible to formulate two further expectations or hypothesis: A market marker's ability to influence prices depends on his relative position in the market as compared to other liquidity providers and on public traders' willingness to accept his price offers. Public trader's willingness to accept price offers, again, is a function of information and, hence, well-informed traders pose a risk to liquidity providers (Easley and O'Hara 1992: 206). Furthermore, liquidity providers are exposed by the publicity of their offers: Market makers posted publicly observable bid and ask prices, whereas the prices quotes by different middlemen are private information. Thus, they may fall victim to moral hazard as well, because middlemen will use the privacy of

their prices to undercut market makers' offers (Rust and Hall 2003: 355). Evidence gathered so far points to market makers rather being not able to influence market prices than the reverse. And, to make matters still worse, market makers due to their public scrutiny need to hide large positions from well-informed traders to avoid exploitation (Schwartz and Francioni 2004: 195). Furthermore, Rust and Hall (2003: 357) showed that liquidity provider can be successful only if transaction costs incurred are sufficiently high and lower than transaction costs incurred by middlemen. It is possible to treat middlemen like well-informed traders and model the problem of middlemen as a problem of adverse selection, hence, their success depends on the number of middlemen around and the transaction costs they charge (Glosten and Milgrom 1985: 77). The question, whether market makers are able to set or influence market prices,[1] thus, revolves around their ability to impose bid/ask spreads that do more than just cover the costs incurred by market makers and provide a rather handsome profit. Therefore a measure needs to be found that captures transaction costs as present in the bid/ask spread, to test the hypotheses that (a) their influence is rather low in commodity futures markets and (b) varies with trading volume.

MEASURING THE BID/ASK SPREAD

Transaction costs in commodity futures markets are not reported openly. This lack of data for the bid/ask spread leads to a number of measures aimed at estimating the bid/ask spread. The question, however, how to address the problem of estimating the bid/ask spread has not been answered unanimously. Some authors voted for a theoretical foundation to argue the case of a particular bid/ask spread estimator (Choi et al. 1988; Chu et al. 1996), some compared estimated patterns for bid/ask spreads to probability distributions in order to gain a sense of validity and reliability (Thompson and Waller 1988), others made use of newly developed simulation techniques, like Monte Carlo Simulations to provide some evidence for the reliability of a particular estimator of the bid/ask spread (George et al. 1991; Smith and Whaley 1994). Studies of authors which were able to compare estimators to effective bid/ask spreads showed a more or less poor performance of estimators.[2] However, this

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[1]This points to Copeland and Galai's result that a market maker's price impact is linked to trading volume; Copeland and Galai (1983: 1467).

[2]Locke and Venkatesch (1997) found unanimously poor performance among bid/ask spread estimators, Bryant and Haigh (2002) showed quite diverse performances that saw some estimators perform better than others when daily

is only a research impediment, if one will analyse the bid/ask spread as such. The present paper attempts no such thing. It is not interested in absolute terms but in relative terms, in the co-variation of trade volumes and bid/ask spreads which, if it were to be found, will be taken as an indicator for market makers' ability to influence market prices. Accordingly, a suitable estimator needs to be found.

Estimators range in complexity and with respect to the assumptions upon which they are based. Usually Roll's estimator (Roll 1984) provides some kind of starting point for the development of other estimators which is usually done by relaxing or abandoning one or more of the assumptions, made by Roll. In his paper, Roll makes the following assumptions (Roll 1984: 1128):

– Markets are information-efficient;
– Price changes follow a stationary probability distribution;
– All buyers or sellers in the market make use of liquidity providers and market makers maintain a constant spread;
– Successive transactions are sales or purchases with equal probability.

It is possible to dispute all assumptions made by Roll, however, since every estimator is a more or less good approximation to the real state, it is not necessary to start from more or less feasible assumptions if the aim is to analyse relations rather than absolute numbers. Hence, in this section the authors will briefly discuss some of the alternative estimators developed with reference to Roll, however, the authors will use Roll's estimator which has proven himself to have some really advantageous statistical properties that make it first choice for analysing relations between bid/ask spreads and trading volumes for example (Harris 1990).

Chu, Ding and Pyun suggest an estimator that is based on the relaxation of Roll's fourth assumption (Chu et al. 1996). Since the fourth assumption states that subsequent transactions will be sales and purchases with equal probability, Chu, Ding and Pyun need parameters to model deviating probabilities for sales and purchases. Accordingly, their estimator includes two new parameter, α and δ, that cover different probabilities for deviating successions of prices with respect to the previous transaction, δ and with respect to the next transaction, α (Chu et al.

1996: 22). This being the only difference to Roll's estimator and the qualification of the succession of prices being not important for this paper, Chu, Ding and Pyun's estimator will not be used.

Another estimator proposed by Thompson and Waller (1988) swaps the calculation of nominal bid/ask spreads for the calculation of effective bid/ask spreads. In this paper, however, nominal spreads are of little interest, accordingly, Thompson and Waller's estimator will not be used either. Finally, Smith and Walley provided an estimator for an effective bid/ask spread which also accounts for true price change effects (Thompson and Waller 1988: 187), because Smith and Walley start from nominal bid/ask spreads as do Chu, Ding and Pyun. To arrive at the intended result, Smith and Walley make a number of assumptions, amongst them the assumption that the expected value of true price changes is zero, while variance is not. In other words, they assumed a normal distribution which is, given the skewed distributions normally observed in commodity markets a rather courageous assumption (Thompson and Waller 1988: 186). And it is the criterion to not consider Thompson and Waller's estimator in this paper. Hence, calculations in this paper will be based on Roll's estimator which is a straight forward and easy to calculate estimator, which makes it all the more useful when handling large data sets.

Not only is the Roll estimator a useful estimator to investigate whether there is size-depending covariance between bid/ask spreads, it is an elegant estimator as well, because the "spread can be inferred from a sequence of price changes simply by computing and transforming the serial covariance. If percentage returns, rather than first differences of prices which are used in these calculations, we will obtain an estimate of the percentage bid-ask spread" (Roll 1984: 1130). Accordingly, the estimator for the effective spread is calculated as follows:

$$s_{j,t} = 2\sqrt{-\text{cov}(\Delta p_t, \Delta p_{t-1})}$$

To calculate the percentage bid/ask spread it is only necessary to increase the constant by 100.

$$s_{j,t} = 200\sqrt{-\text{cov}(\Delta p_t, \Delta p_{t-1})}$$

The next chapter will apply the Roll estimator to all traded Wheat futures contracts (Contract syntax: EBM), collected at the Euronext exchange for the entirety of May, 2012.

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averages had been estimated, while the other estimators performed better when weekly averages were computed. Taken together, the results show that there is no single estimator that recommends it above the others.

MARKET MAKERS INFLUENCE IN THE MARKET

To check whether liquidity provider do have an impact on market prices and if so, if this impact depends on the traded volume, a number of analysis have been performed using data from the Euronext commodity futures exchange for May 2012. That sample period was considered because monthly volatility was close to the average of a 36 month period. Altogether 71845 transactions have been included in the analyses, which is the entire amount of transactions for this time span. Analyses were designed to lead up to a coefficient that shows the correlation between Roll's Measure for the bid/ask spread and trading volume. Table 1 display the diverse steps of the calculation and provides a number of descriptive figures that lead to a clear cut result: trading volume does indeed and to a large extent influence transaction costs. Therefore, it can be assumed that the opportunity space for market makers decreases with trading volume. Put differently: with increasing volumes of trade, Roll's Measure decreases in value, which means, they lost their ability to charge higher transaction costs with increasing volumes of trade.

The first two rows of Table 1 report the average amount of change in prices that took place in May 2012 and its standard deviation. As can be seen, prices are quite volatile. Descriptive data for price per unit (volume/price) show even more volatility, while the average numbers of contracts concluded within a month do not deviate too much. Stepwise calculation shows the respective values for the calculation of co-variances and regression coefficients for the relation between price change and price per unit. It shows that bigger price changes tend to go along with bigger trade volumes,

which gives the first hint that there is a relationship between the bid/ask spread and the traded volume. RM provides results for Rolls estimator of the bid/ask spread. Looking at the values it has to be kept in mind that no standardization has been made. Hence, the numerical values do not tell too much. However, the main result displayed in Table 1 is telling. It shows a strong correlation between the extent of the bid/ask spread and the traded volume. The higher the volume, the lower the bid/ask spread. This result is a firm confirmation of the hypothesis tested in this paper. It means that market makers can exert more influence over prices when trading volumes are low. With increasing trading volumes liquidity providers' influence on prices seems to vanish. This result is based on data for a commodity futures market, that traditionally show lower transaction frequency and transaction volumes than stock markets. Hence, one can assume that their influence on prices is even lower in stock markets.

CONCLUSIONS

The influence on prices varies and is reversely related to trading volume. The correlation between trading volume and market makers' influence is quite strong and accounts to almost 20% of total variance. The fact that liquidity providers can exert a certain influence over prices can be attributed to their task of providing liquidity to a market (Grossman and Miller 1988; Comerton-Forde et al. 2010). The narrower the market, the more expensive the liquidity provided. However, to put this result into context, the margin for market makers as calculated on the basis of transactions in wheat-futures that took place in May 2012 ranges between 0.0047% and 0.0055%. It is

Table 1. Relationship between bid/ask spread and trading volume – step wise representation of results

		Month	Week 1	Week 2	Week 3	Week 4	Average per week
Price change	mean	587 274.87	604 825.26	539 797.90	558 416.50	628 437.93	582 869.40
	Stddv	910 192.20	883 269.31	890 741.94	922 667.95	923 604.81	905 071.00
Volume/ price	mean	782 894.37	736 276.28	765 866.77	850 756.42	850 909.02	800 952.12
	Stddv	910 192.20	730 362.85	749 598.02	804 468.63	809 904.30	773 583.45
Volume	mean	10.922939	10.004060	11.918936	11.283115	9.6123260	10.704609
	covariance	−1.93721E+11	−1.67698E+11	−1.77095E+11	−2.07534E+11	−2.41479E+11	−1.9845E+11
	regression b	−0.278056072	−0.259979242	−0.265249452	−0.279609499	−0.312104118	−0.27923558
	RM (Roll´s Measure)	880 275.58	819 018.56	841 654.26	911 116.90	982 810.08	890 957.76
	correlation	−0.41283388					

within this margin that market-makers can influence market prices. Accordingly, the results should not be overestimated. Furthermore, results have to be put into perspective insofar as only one of the three variables identified as those influencing market-makers ability to make the market have been tested for. It remains to be examined how competition and the number of market makers influence their ability to charge prices depending on the volume of trade. Finally, impact of well-informed traders could not be tested. Therefore it would have been possible to include random variables in the analysis and compare results, e.g., against a t-distribution to check for any kind of impact that can be attributed to adverse selection.

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