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Pricing on low-liquidity exchanges, problems and solutions

Abstract
This article examines the technology of futures supply, which includes three directions in its structure: trading, clearing (clearing organization, position calculations), supply process (non-deliverable contracts, deliveries of goods at a specific elevator, electronic warehouse document management, electronic digital signature system). The schemes of application of futures instruments at grain elevators have been singled out. It was found out that the domestic system of grain accounting at grain elevators loses much in comparison with the system of custodial (depositary) accounting, in centralization, in the presence of unified rules, as well as in other parameters. It is proposed to use market makers to provide a continuous flow of exchange liquidity (that is, to provide liquidity to both buyers and sellers at the same time). *Methodology*. The scientific research is based on the developments of domestic and foreign economists, as well as own observations and conclusions. *Results*. It turned out that, in theory, every trader can become a market maker by placing a pending limit order in the trading blotter. Specific examples are given, with figures, of how exactly the same product can be traded on a low-liquid and a high-liquid exchange. Three scenarios are proposed and it is concluded that the probability of the third scenario is quite high. *Practical implications*. It is proved that the Last Look system is one of the methods for solving the problem of market maker risk. It is shown that the main data transfer protocols between the exchange and its institutional participants can be Fix and Fast Data Protocols. The advantages and disadvantages of Fix and Fast data protocols are highlighted. It was found that the Fast protocol is actively implemented on trading floors, but it is still inferior in prevalence to the "classic" protocol Fix. *Value/originality*. Ensure the use of futures instruments in elevators. It is proposed to use market makers to provide a continuous flow of exchange liquidity.

Keywords
Exchange instruments, exchange activity, Market maker, Fix, Fast

JEL: A10, G13, L11

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1 Introduction

Due to the reduction of trade turnover and the reduction of exchange participants, the load on the exchange infrastructure has also decreased. However, there are certain opportunities, namely the use of exchange technologies, which will ensure the further development of commodity exchanges. In Ukraine there is no exchange instrument that could be used for pricing in the local market.

The experience of foreign markets of developed countries shows, firstly, the presence of their own price indicators; secondly, the possibility of using global instruments, for example, for farmers, to protect themselves in the future from adverse changes in the prices of agricultural products.

Prices of domestic producers are necessarily linked to corresponding prices on foreign exchanges. Liquidity will not only give an opportunity to conclude contracts on the exchange and hedge risks, but also provide a reference point for creation of new products, including over-the-counter ones. Currently, local grain prices can only be traced through over-the-counter quotations.

The purpose of the study is to examine a number of problems associated with the process of pricing on a low-liquid exchange, and to propose ways to solve them.

2 Research methodology

The methodological foundations of scientific research are presented in the form of scientific works of both domestic and foreign scientists and practitioners. The study used such general scientific and special methods of knowledge: theoretical generalization (to systematize and further develop the theoretical foundations of the pricing process), cause-and-effect analysis (in determining the various factors of negative impact on the process of pricing in exchanges), method of comparison and analogy (in developing options, taking into account the experience of disparity regulation), comparative analysis (to determine comparability and difference of characteristics).

3 Analysis of recent research and publications

William C. Dudley chairman of the Committee on the Global Financial System and president of the Federal Reserve Bank of New York is sure that market makers serve a crucial role in financial markets by providing liquidity to facilitate market efficiency and functioning (William, Dudley, 2014). Changes in the behavior of market makers as well as other liquidity providers and their impact on liquidity in fixed income markets are of particular interest to policymakers, given the importance of these markets for monetary policy and financial stability (William, Dudley, 2014).

Fender Ingo and Lewrick Ulf claim that recent bouts of volatility remind that liquidity can quickly evaporate in financial markets (Fender Ingo and Lewrick Ulf, 2015). In sovereign debt and, to an even greater degree, corporate bond markets, liquidity hinges in large part on whether specialized dealers ("market makers") (Fender Ingo & Lewrick Ulf, 2015; Tierney & Thakkar, 2015; Duffie, 2012).

All manipulative strategies can be divided into three categories: action-based, information-based, and trade-based. The focus is on trade-based manipulation (Thoppan, 2021).

In the publication "A Background to the Market and Market Makers" it is stated that market makers act as sellers of stock items and put up their prices during business hours. Prices can change (sometimes significantly) throughout the day depending on a number of factors (A Background to the Market and Market Makers, 2021).

4. Structure and mechanism of normative resolution

In terms of development the leading position is now occupied by derivatives on commodity assets, as well as derivatives, which may be demanded by banks. The UAH-USD futures, which require gradual liberalization of currency regulation, should become the largest instrument in our market. However, currently there is unfairly low interest in UAH-USD futures, and there is virtually no liquidity.

The launch of such an instrument as futures contracts for grain (in particular, it is not about non-deliverable futures, but deliverable futures), positively affects the development of the relevant futures market. Futures delivery technology, if looking at its structure, includes three directions:

- trading;
- clearing (clearing organization, position calculations);
- delivery process (non-deliverable contracts, deliveries of goods at a specific elevator, electronic warehouse document management, electronic digital signature system) (Tkachenko, 2017).

In turn, the heads of the "Ukrainian Exchange" JSC in 2017 filed documents to the National Commission on Securities and Stock Market (NCSSM) to register the specification of futures contracts on wheat and corn. The contract specifies that a certain class of grain at a certain elevator should be launched as a separate futures instrument according to the following schemes (Figure 1).

That is, if the selected elevator receives grain of one class, then one futures instrument is used. However, if that elevator receives grain of a different class, a different futures instrument will be used. If another elevator appears, the new futures should also be used (Tkachenko, 2017).

The leaders of the "Ukrainian Exchange" JSC believe that the process of unified pricing and a master contract is promising. In this case, producers will be able to conclude contracts to sell grain at pre-fixed prices.

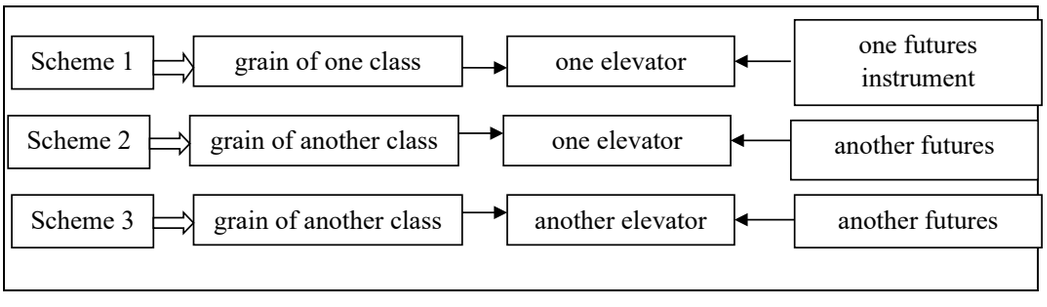

FIGURE 1 Schemes of application of futures instruments on grain elevators

Since the number of elevators in Ukraine is increasing every year, the competition between them is intensifying.

The domestic system of grain accounting at grain elevators loses much in comparison with the system of custodial (depositary) accounting, in centralization, in the presence of unified rules, as well as in other parameters (Tkachenko, 2017).

For an exchange to have sufficient liquidity, it requires market makers. Market makers (MM) are creators of the market or its participants. Dealing institutions, large banks and funds can also be major market participants.

The task of market makers is to provide a continuous flow of liquidity. That is, market makers must simultaneously provide liquidity to both buyers and sellers. If there are not enough market makers on the exchange, there will not be enough liquidity, so neither traders, nor hedgers, or other market participants will come to the exchange.

On the other hand, if the exchange has a small number of traders, the market makers are not interested from a financial point of view to participate in such an exchange. Thus, there is a vicious circle dilemma: for traders to come to the exchange, this exchange should have sufficient liquidity, and for the exchange to have liquidity, it should have market makers, and for there to be market makers, it needs traders. The question is, how this problem to be solved?

Theoretically, every trader can become a market maker by placing a pending limit order in the trading blotter. But is it really that simple?

For example, imagine that there are two exchanges: a low-liquid (L) and a high-liquid (H), trading the same goods. In order to become a market maker on the exchange "L", it is necessary to create a computer program that will take quotations from the exchange "H", convert them into currency of the exchange "L", add to the price its additional costs and transfer this quotation in the form of a pending limit order to the exchange "L".

Consider the above description using a concrete example with some numbers. Suppose that at time T the purchase price of one corn futures contract on the CME (Chicago Mercantile Exchange) is $665.

The program converts this price into UAH at the exchange rate, which at time T is equal to, for example, 26.75 UAH and it turns out 665 × 26.75 = 17,788.75 UAH.

Then the program adds additional costs of 1% to this price and receives a price equal to 17,966.64 UAH per futures contract.

Then there is a pending limit order to sell one futures contract for corn on the "Ukrainian Exchange" (UE) at the price of 17,966.64 UAH.

The UE takes the order and publishes it in a digital order record (trade blotter) for other market participants. The above example is not real since UE has no futures contracts for corn. Therefore, from this point on, the following options of events are possible:

Option 1: There was no trader on UE who bought limit sell order and the price on CME changed. In this case, the sell limit order is deleted and the transaction is repeated.

Option 2. There was a trader at UE who bought sell limit order, the price at CME did not change, and after the execution of order at UE it was possible to buy a futures contract of the same size at CME at the price of $665. Thus, as a result of this transaction there is a 1% profit (177.89 UAH).

Option 3. There was a trader on UE who bought sell limit order, but the price on CME changed the moment after order was executed on UE. Thus, there was no time to buy a similar-sized futures contract on the CME at a favorable price.

The probability of Option 3 is quite high, since the transmission time of a simple network packet (ping) of 56 bytes from Chicago (where the CME is located) to Kyiv takes on average 134 milliseconds.

To summarize all of the above, there is one important problem when a market maker's trade is executed on an exchange and at that point in time the price on the hedged exchange changes, the market maker bears the financial risk. Solving this problem creates more favorable conditions for attracting market makers to the exchange and, as a consequence, creates a more competitive environment for the most efficient pricing, which ultimately attracts more traders, investors, speculators and hedgers to the exchange.

One method of solving the market maker's risk problem is presented in the form of the Last Look system. The essence of this system is to give the market maker time, which can be used to decide whether or not he/she will execute the order placed in the trade blotter.

Consider an example. In the above example the market-maker put a quote to buy one futures contract for corn on the CME at $655 per contract and placed a sell order on the UE at 17,966 UAH.

Imagine that the UE has a trader who wants to buy this futures contract. The trader sends an order to buy, from his/her account is deducted 17,966 UAH. The market maker is notified that sell order is about to be executed and is given 300 milliseconds (for example) to make a decision. The market maker sends a buy order to the CME and if the order executes on the CME, the market maker confirms the trade on the UE. If the market maker's order does not execute at the required price, a rejection is sent to the UE and the trader receives a cancellation of the order and a refund of the money withheld.

The main protocols for data transfer between the exchange and its institutional participants can be Fix and Fast Data Protocols.

The UE currently has a FIX protocol but no FAST protocol. Below is a description of these protocols and an explanation of the difference between them. For market makers, it is necessary to provide the FAST protocol.

The name FIX is derived from Financial Information eXchange. FIX protocol is the oldest protocol used to transfer financial data and has been in use since 1992. Today, it is an industry standard.

FIX messages are text messages, they consist of ASCII characters and are a stream of tag-value fields separated by special delimiter characters.

The structure of the FIX message is defined by the protocol and necessarily contains the following:

– headline of the message;
– length of the message body;
– message type;
– message body;
– checksum.

The original FIX uses standard reserved tags to transfer information. The flexibility of the protocol is extended by "user defined fields" (UDFs), which can be defined and reserved at the standard's official website.

The FIX protocol is distributed in an open format, and its advantages include:

– industry standard for transmitting financial data. Since 1999, it has been implemented in XML format (FIXML);
– it is easy to implement, the use of a text format for transmitted data makes it easy to read messages;
– it has an open format;
– there are numerous libraries and development tools for FIX.

The disadvantages of FIX are as follows:

– the text format of messages forces the use of recognition (parsing) of its elements, which dramatically increases the processing time;
– the message structure is overloaded with service fields, which have no useful information, but are necessary for the operation of the protocol. This "extra" data slows down the transmission and recognition of messages. The data in the message also carries redundant service text information, which slows down the transmission and parsing of messages. As a result, data processing lags behind the speed of its receipt, which leads to delays in decision-making by traders, hampers or makes it impossible to create adequate trading strategies;
– as a result of the evolution from relatively simple variants to a complex protocol with many additions, the operation of the different implementations of FIX varies greatly, up to and including incompatibility.

The name FAST protocol comes from FIX, adapted for streaming, which was designed to increase the speed of processing the flow of information generated in the stock market to process it in real time. After all, significant delays in using the FIX protocol were causing losses for traders.

The main effort in developing the FAST protocol was aimed at eliminating the possibility of such delays.

The main changes made to the FAST protocol, aimed at reducing the volume and increasing the speed of processing the data transmitted are as follows:

FAST messages are created within one standard template. Special and service characters, field names/numbers and delimiters are excluded;

the message fields are arranged in the same order as the template tags;

FAST does not transmit all data, but only the changed data.

In the process of improvement, the FAST algorithm evolved to version 1.2, which is the most common version used by most financial market participants. It is a standardized protocol for exchanging market information. There are also several open-source versions of the protocol (OpenFAST, OpenFAST.NET and QuickFAST).

FAST advantages include:

– the volume of transmitted data is significantly reduced by excluding service information and delimiters from the transmission;
– the amount of data transmitted has been reduced by transmitting only data changes;
– the processing speed of the received information is increased by eliminating the parsing (recognition) of the text message, FAST messages are fully digital;
– the use of a common message template in the FAST protocol makes it possible to process messages in real time;
– protection against unauthorized viewing of FAST messages by humans has been strengthened (although at a low level), without a template they cannot be as easily understood as FIX messages;

FAST disadvantages include:

– FAST uses a shift away from human-readable syntax toward purely computer-based message processing;
– increased requirements for message generation accuracy. Deviation from the template by one bit will make the whole message unreadable.

The FAST protocol is actively being implemented on trading floors, but it is still inferior in prevalence to the "classic" FIX protocol.

Thus, the advantages of FAST appear only in conditions of significant data flow.

5 Conclusions

Thus, the technology under study of futures supply, which includes three directions in its structure: trading, clearing (clearing organization,

position calculations), supply process (non-deliverable contracts, deliveries of goods at a specific elevator, electronic warehouse document management, electronic digital signature system).

The schemes of application of futures instruments on grain elevators were highlighted:

1) if the selected elevator is supplied with grain of the same class, one futures instrument is used;

2) if this elevator receives a different class of grain, a different future will be used;

3) if another elevator appears, a new future should also be used.

The domestic system of grain accounting at grain elevators loses much in comparison with the system of custodial (depositary) accounting, in centralization, in the presence of unified rules, as well as in other parameters.

It is proposed to use market makers to provide a continuous flow of exchange liquidity (i.e., to provide liquidity to both buyers and sellers at the same time). It turns out that theoretically every trader can become a market maker by placing a pending limit order in the trading blotter.

It is proved that the Last Look system is one of the methods for solving the problem of market maker risk. It is proved that the main data transfer protocols between the exchange and its institutional participants can be Fix and Fast Data Protocols. It was found that the Fast protocol is actively being implemented on trading floors, but it is still inferior in prevalence to the "classic" protocol Fix.

The prospect of further research in this area will be the study of Fill ratio control as a tool to meet interests of traders.

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