Áron Gereben and Norbert Kiss M.: A brief overview of the characteristics of interbank forint/euro trading

This study offers some insight into indirect interbank forint/euro trading through transaction-level data from the dominant electronic trading platform used on this market. We provide an in-depth view of the structure and liquidity of interbank foreign exchange trading by using simple, descriptive statistics. Where feasible, the results are placed into an international context. According to our findings, the key structural attributes of the Hungarian foreign exchange market are similar to those of the more advanced markets, despite the significantly lower level of trading volume and other indicators of market liquidity. Trading intensity and liquidity show large variations, both intra-day and between days. Our statistics suggest that the market has become more advanced, more liquid and has grown deeper during the period under review.

INTRODUCTION

This article focuses on one of the most important channels of interbank forint/euro trading by using data from the Reuters D3000 Spot Matching electronic trading system. The purpose is to derive descriptive information on liquidity and other characteristics of the interbank currency market using this novel data-set.

Our results reveal that the key structural attributes of the Hungarian interbank foreign exchange market are similar to those of the more advanced markets, despite the fact it is much smaller in terms of volume and liquidity. Trading intensity and liquidity show large variations, both at daily and intra-day frequencies. In 2004, when the currency market was relatively calm, market indicators show less variability, whereas data from 2003 is more volatile, due to the extraordinary market events of that particular year. Data for these two years also show that the market became more liquid and deeper over the period under study.

From the point of view of monetary policy, the exchange rate is a variable of particular significance. Understanding and monitoring the foreign exchange market thus carries special importance for the central bank. The novelty of this analysis relative to previous work on the subject lies in the database, which describes a previously "uncharted" segment of the Hungarian foreign exchange market, and that in many cases it provides a more detailed, 'higher resolution' picture on market developments than the data used in earlier studies.[1]

HOW DOES THE INTERBANK FOREIGN EXCHANGE MARKET WORK?

Price-making banks on the foreign exchange market[2] trade with each other through two main channels: directly (on a bilateral basis), or indirectly through mediators (brokers).

Bilateral trading traditionally used to take place over the phone, meaning that a trader looking to make a deal called another trader on the phone, asked for a quote and decided whether to accept or reject it. Since the end of the 1980s traders have increasingly switched over to the electronic trading system of Reuters designed for this particular purpose (Reuters D2000-1, followed by Reuters D3000 Direct), where phone conversations are replaced by an exchange of electronic messages.

The traditional channel of indirect trading takes place through voice brokers. Banks can monitor the quotes conveyed to the brokers through a public announcement system. Recently, electronic systems for indirect trading have rapidly gained popularity. During the last couple of years, electronic bilateral trading has also lost some ground, and today the majority of interbank transactions are conducted through electronic brokering systems.[3] Two main platforms are competing on the market: EBS (Electronic Broking Services) and Reuters D3000 Spot Matching (the successor of Reuters D2000-2). As far as forint/euro trading is concerned, Reuters enjoys wider popularity: the majority of

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[1] This article is based on a study by Gereben and Kiss M. (2006), which provides a more detailed discussion of the issues presented here.

[2] Price makers are key participants of the foreign exchange market. They contribute to the market's liquidity by providing two-way (buying and selling) quotes, which are binding up to a certain amount to other market participants.

[3] According to the triennial survey of foreign exchange markets conducted by the Bank for International Settlements (BIS), 50 to 80 per cent of all interbank trading in the USA, UK and Japan was conducted on an electronic broker platform in 2001, up from 12 to 17 per cent in 1995, with the majority of the transactions being conducted directly over the phone or going through the Reuters 2000-1 messaging system (Source: Rime, 2003).

trading in the Hungarian currency is conducted through this channel.

THE REUTERS D3000 SPOT MATCHING SYSTEM

The Reuters D3000 Spot Matching trading system is an *electronic limit order book.* It is similar in many aspects to the electronic trading systems used by stock exchanges. A limit order book contains buy and sell orders for a given financial instruments – in our case for foreign exchange – in an order of priority. Under this system, foreign exchange dealers post Euro purchase and Euro sale offerings at limit prices, also known as *limit orders.* When specifying the order, dealers provide the volume they intend to buy or sell, and the price at which to buy or sell it. Limit Euro buy orders are also referred to as a *bid,* and sale orders are known as an *ask.* The order is kept in the system until a corresponding order is posted for a similar volume and price, or until revoked by the initiating dealer. Limit orders ensure the system's overall liquidity.

Dealers may also submit orders at market prices, i.e. *market orders,* for which the price is not specified. Market orders are paired immediately with the best available limit order for the given quantity. Euro buy market orders are also called as *take,* and Euro market sells are known as a *hit.* The system automatically pairs up the appropriate offers.

To follow the development of the market, dealers are able to constantly monitor the best (limit) buy and sell orders the book – the exchange rate quoted and the quantity offered at this rate – and the details of the last few transactions.

A transaction thus occurs when two limit orders – a *bid* and an *ask* – are matched up, or if a market order is paired by the system with the best limit order on the opposite side.

In the process of pairing offers, it may occur that a market order is made for a quantity that exceeds the best limit order, meaning that a single hit or a *take* can only be satisfied by striking several *ask* and *bid,* respectively. Naturally, the same scenario may apply where a limit order for a larger amount overlaps with other limit orders. As a consequence, the orders behind a final deal may feature numerous varieties.

Our database covers transactions from two full years, 2003 and 2004. It includes all limit and market orders that were processed through the system, and all the final deals that were actually transacted, with the related information concerning quantities and exchange rates. Using this data, we are able to obtain an overall picture of the developments on various aspects of the liquidity in this particular market segment. Given that the Reuters D3000 Spot Matching is the key platform of interbank trading, most of our findings can be considered representative of the market as a whole.[4]

MEASURING MARKET LIQUIDITY

The liquidity of financial markets, including currency markets, may be assessed along several different dimensions. The different aspects of liquidity call for different indicators.

The simplest approach is to use volume indicators, which describe the size of a market. Volume indicators include the *number of transactions,* the *number of orders posted,* the *total market turnover,* and the *average value of the transactions.* The greater the volume and the average size of the transactions, the more certain it is that dealers are able to quickly execute major transactions without any large shift in market prices.

Apart from volume indicators, however, many other aspects of liquidity can be measured. One of the most important indicators is the price difference between the best buy and sell orders, known as the bid-ask spread. The narrower the *bid-ask spread,* the lower the cost of trading.

The order book contains further information on liquidity. In addition to transaction costs, another important aspect is that sizable transactions should be conducted at a good price, and transactions should be made in the shortest time possible.

The amounts available at the best bid and ask prices – commonly referred to as the *depth* of a market – clearly display the volume of transactions the market is able to handle without prompting any shift in prices. The combined total volume of buy and sell orders in the order book – the *width* of the market – shows the size of the largest transaction that

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[4] According to a survey conducted among currency market operators (ECB, 2005) approximately 60 to 70 per cent of all spot deals on the Hungarian interbank currency exchange market are conducted through Reuters D3000 Spot Matching system, which makes it the largest and fastest growing interbank trading platform.

can be conducted at a given time. The average slope of the demand and supply curves – defined by the prices and quantities offered on both sides – indicates *"price sensitivity"*, by showing the average price shift for a given amount of volume traded, provided that the book were to be 'cleaned out' completely. The average *transaction time* of deals illustrates the dynamics of the market. [5]

LIQUIDITY INDICATORS ON THE HUNGARIAN FOREIGN EXCHANGE MARKET

In 2003, approximately two hundred thousand forint/euro orders were posted in the Reuters Spot Matching system. This figure approached two hundred fifty thousand by 2004, representing 836 orders per day on average over the entire period. In 2003, the daily number of orders varied between 250 to 1,000; in 2004 the typical daily number shifted up to 500 to 1,250.

As for the order types, limit orders are the most prevalent: dealers posted five to six times more limit orders than market orders in the system. In 2003, the relative share of market orders increased on turbulent trading days, when a high number of offers were posted. The increased use of market orders on these days can be attributed to changes in the behaviour of market participants, who are likely to use more aggressive trading strategies when the market is considered turbulent, and tend to sell or buy at any cost in certain situations in an effort to dump their excess positions onto the market. Such events call for the use of market orders in large amounts.

While market orders practically always result in an immediate deal, limit orders are only concluded with a transaction if an appropriate opposing order is posted. They may also be withdrawn as an alternative. Of the orders posted, in 2003 about forty-four thousand, in 2004 a total of over fifty-five thousand actually resulted in a deal, averaging at 193 transaction per day for the entire period. During both of these years, days with exceptionally high number of transaction (350 and up) were relatively frequent.

The historical trend of orders posted and transactions concluded mirror the most hectic periods of 2003, namely the speculative attack against the strong side of the exchange rate band in January, the shift of the exchange rate band in June, and the massive increase in the central bank's key policy interest rate in December. The relative tranquillity of the market in the subsequent year,

2004, is also reflected in the data (see Chart 1). At the same time, in both years there were significant day-to-day fluctuations in the number of orders and the number of transactions. In 2003, apart from the periods characterised by extreme market conditions, the number of orders and the number of transactions fluctuated within a relatively narrow margin, while in 2004 this margin became wider throughout the year, yet without any overly dissonant periods.

As illustrated in Chart 1, volume figures do not show much seasonality over the course of the year. There is no sign of any 'summer slump', as sometimes referred to in market analyses. On the other hand, in the second half of December a substantial decline appears in the volume indicators. We can also conclude that trading in 2004 was steadier and more balanced compared to 2003.

Chart 1

Daily number of orders posted and transactions concluded (5-day moving average)
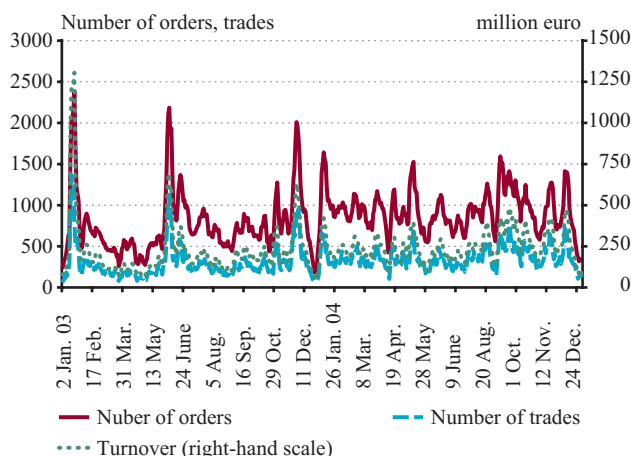
In the Reuters Spot Matching system, the base unit of the transactions is 1 million euros, and the majority of deals consist of transactions worth of a few million (85 per cent of all transactions valued at 1 million euros, with another 10 per cent valued at 2 million euros). Due to the standard size of transactions, market turnover and number of transactions show practically the same dynamics. On a daily basis, average market turnover for the entire period amounted to 235 million euros.

The average value of the bid-ask spread in 2003 was 0.3 forint, or 0.110 per cent of the average price; 11 basis points. In 2004 it was 0.26 forint, or 9.5 basis points. In tur-

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[5] In this analysis we used the methods for liquidity assessment presented by Csávás and Erhart (2005). Their study contains a detailed description of the indicators used here, and explains how the different aspects of liquidity are inter-related.

bulent times, for instance when the exchange rate band was shifted, and during the days that followed the 300 basis point hike in the policy rate in December of 2003, the spread increased to exceptionally high values. From the middle of 2004, the bid-ask spread became relatively stable, floating between 0.15 to 0.25 forint – 6 to 10 basis points –, increasing only occasionally (Chart 2).[6]

Chart 2

The bid-ask spread (5-day moving average)

- - - Bid-ask spread   —— Relative bid-ask spread (right-hand scale)
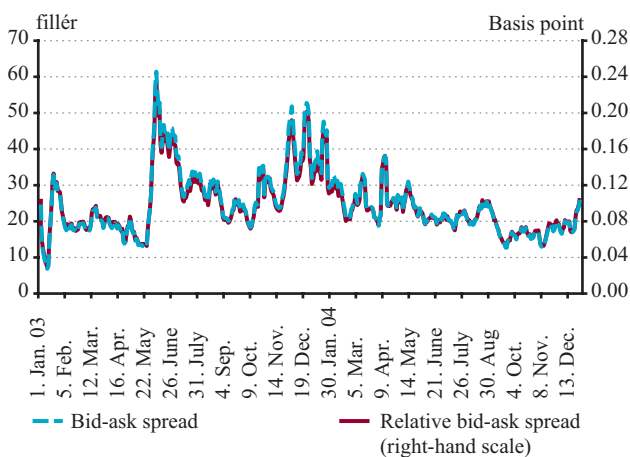
In general, statistics indicate an improvement of market liquidity from 2003 to 2004. The number of orders and transactions increased by about 25 per cent, and the bid-ask spread decreased, although the drop in the latter may be attributed to some extent to the less turbulent market conditions.

Comparing the characteristics of the forint/euro trading with the similar indicators of other foreign exchange markets shows that liquidity, in terms of size and spreads, is very similar in the CEE regions' other emerging markets. At the same time, substantial differences exist relative to the currency pairs of developed countries. The volume of trading on more developed markets can be as much as 100 times higher, and, as opposed to the relative spread of 10 basis points, typical of emerging currency markets, the spread for developed countries' currencies generally fluctuates between 1 to 5 basis points.

INTRA-DAY AND WEEKLY PATTERNS OF LIQUIDITY

The intra-day course of the number of orders and transactions follows a recognisable pattern (see Chart 3). After minimal act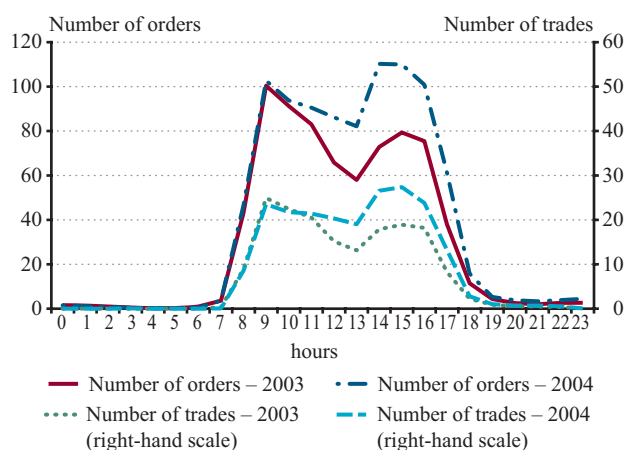ivity outside the official business hours, the number of orders and transactions quickly rises between 9 a.m. and 10 a.m., during the first hour when Hungarian banks' trading desks officially open for business. The number of orders and transactions gradually decreases during the next couple of hours, reaching a local minimum between 1 p.m. and 2 p.m. After that the market recovers, and by 3 p.m. and 4 p.m. the level of activity rises to the second daily maximum, only to fall back to a minimum level by the end of office hours.[7] The daily pattern of trading intensity corresponds to the results found in other countries, where the early afternoon setback is a common occurrence, generally attributed to the lunch break.

The intra-day analysis of the number of orders and transactions indicate that majority of the indirect interbank foreign exchange trading occurs within Hungarian banking hours. The reason for the activity after closing being somewhat higher than the activity before opening hours may be sought in the business hours of the US market.

The bid-ask spread appears to be steady during the course of the day: it is practically constant throughout local banking hours, rising only during the first and the last hour of trading. However, it rises significantly outside of business hours. A minimal increase can also be observed in the early afternoon, around 1 p.m., in the 2004 data. This is consistent with the drop in trading activity during the same period, as both indicators point towards somewhat lower liquidity during lunch hours.

Chart 3

Intra-day trends in the number of orders and transactions

—— Number of orders – 2003   - - Number of orders – 2004
· · · Number of trades – 2003 (right-hand scale)   - - - Number of trades – 2004 (right-hand scale)

There is less of an evident pattern in the weekly activity. Dealers post more or less the same number of orders and

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[6] Csávás and Erhart (2005), relying on different data sources, reached similar conclusions in terms of size: according to their calculation the average spread in 2003 was 9.5 basis points, which dropped to 8.2 basis points in 2004, while developments in spread in terms of time show significant similarities.

[7] The afternoon maximum may be related to the beginning of business hours in the US market.

transact the same number of deals on every day of the week, and as a result turnover is also similar for each weekday. Apparently, Monday is the slowest and Thursday is the busiest day of the week in terms of the number of offers posted, similar to the number of transactions conducted, however, the differences are not significant. The number of offers posted and transactions conducted on Fridays remains little behind the other days. As far as the spread is concerned, a slight, insignificant increase can be observed on Mondays and Fridays.

THE STRUCTURE OF THE ORDER BOOK

'Snapshots' of the order book, showing the state of the market at a given moment, may also be helpful in the assessment of liquidity, and in the analysis of market structure. To illustrate, it may be worthwhile to look at the order book under normal market conditions, and also in times of market turbulence.

Chart 4 shows a snapshot of the book taken on 9 October 2003, at 1 p.m.; this can be considered as a typical state of the market. Large numbers of offers are accumulated on both the buy and the sell side, and they are distributed almost evenly over the price range. There is no sharp difference between the buy and the sell side of the book.

In contrast to the previous case, the snapshot for 15 January 2003 may serve as an example for a turbulent market. This was the first day of the speculative attack against the strong side of the exchange rate band, when large quantities of euro buy offers accumulated in the immediate vicinity of the strong side of the exchange rate margin, in a very narrow price spectrum. The proximity of the edge of the exchange rate band – and hence the limited scale of a potential shift in the exchange rate – presented an opportunity for the price makers to leave orders for substantial quantities in the system without taking any major risk. With a minimal spread, euro sale offers for smaller, yet significant quantities were positioned on the other side, but on a much broader price range.

The quantities offered at the best buying and selling prices (buy-side and sell-side depth) varied between 1.4 and 2 million euros on the average over the two years examined. In other words, in most cases limit orders with the best price were insufficient to cover market orders larger than 2 million euros. Orders any larger would have generated a shift in prices. Besides the order with the best price, an additional 5 to 10 orders were present on average on both side of the system.

Most of the time during normal trading hours, the total amount of the limit orders in the book were enough to cover
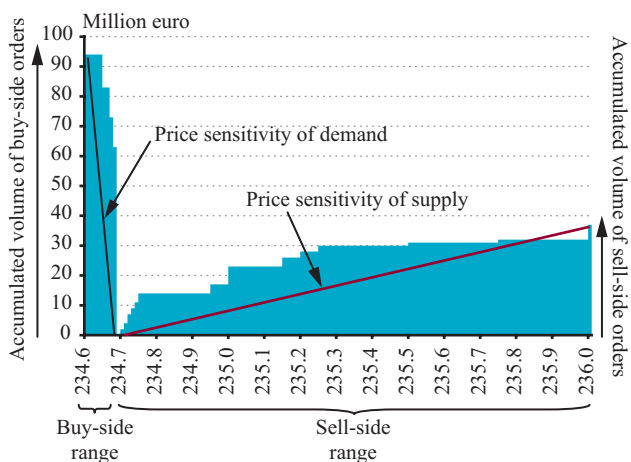
Chart 4

Depth and width of the order book (example, 9 October 2003, 1 p.m.)
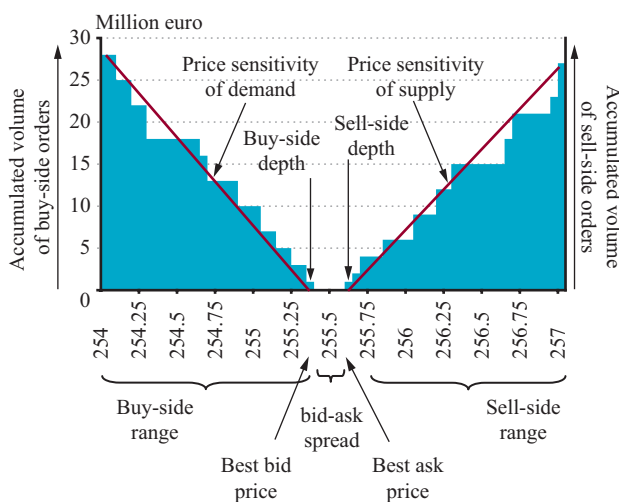
Chart 5

Depth and width of the order book during the speculative attack - example (15 January 2003, 1 p.m.)

market orders worth 9 to 16 million euros on the sell side, and 17 to 30 million euros on the buy side. Given the distributions of transaction and order sizes, it is very likely that besides the orders with the best prices, most of the time there are orders of sufficient quantity in the system to satisfy a large order, if it were necessary.

Interestingly, the average cumulative value of buy-side and sell-side orders is asymmetric: the amount of euro sell orders comes to about half of the amount of euro buy orders. This may be due in part to the fact that the strong edge of the exchange rate band restricts the appreciation of the forint, providing thus a limit to potential losses for the price makers, should they get stuck in an open position. Thus on the euro buy side, especially if the exchange rate is close to

the edge of the band, large orders can be posted in the system without taking any substantial risk. This is supported by our observation that buy orders become dominant once the exchange rate approaches the edge of the band.

Limit orders posted during normal Hungarian business hours – between 9 a.m. and 5 p.m. – spent an average of 11 and 13 minutes in the system. If we consider only those limit orders that resulted in a transaction, the average time spent in the system was only 5 minutes during local business hours. On the other hand, orders posted outside the local business hours took significantly more time to be concluded.

The price difference between the worst and the best orders, known as the price spectrum, is between 1 and 2 forints. This can be considered high given the daily average changes in the exchange rate for the period observed, which is under 1 forint in absolute terms. The price sensitivity of supply and demand varies between 0.09 and 0.22 forint/million euro. In other words, if we were to 'clean out' the book at a given time with a market order sufficient size, it would result in a marginal price change at these rates for each one million euro transacted.

Most indicators suggest the development of the trading platform over time, and point towards improved liquidity conditions from 2003 to 2004. The number and the cumulative quantity of the orders in the system have grown, while the price spectrum on which the orders were distributed became narrower, which in turn indicates a decrease in price sensitivity, and thus an increase in liquidity.

As seen from the examples, the structure of the order book may vary depending on the prevailing market conditions; moreover, it also may change from time to time without any particular market turbulence. Due to the variability of the order book, it is not always easy to grasp its information content through simple descriptive indicators. Consequently, when evaluating the results, it should be kept in mind that in addition to – and instead of – the absolute value of the indicators, it is often more informative to consider their relative changes and their development over time.

CONCLUSIONS

Liquidity indicators derived from high frequency trading data can be used to assess previously unseen dimensions of the interbank foreign exchange market. Furthermore, the particular market segment we analysed in this article plays an increasing role in the process of foreign exchange trading and exchange rate determination. Therefore, it is espe-

cially important from the central bank's point of view to study and continuously monitor its development and basic structure. In Hungary, the exchange rate channel plays a strong role in the monetary transmission mechanism. Exploring the behaviour of the key foreign exchange market participants could help decisions-makers in formulating exchange rate policy, and monetary policy in a broader sense.

Our main findings are the following. Liquidity indicators clearly reflect the turbulences of the foreign exchange market in 2003, and the relative tranquillity of 2004. An important conclusion from the central bank's point of view is that the market has become more liquid and deeper during these two years: the volume of transactions has increased, and the role of the Reuters D3000 Spot Matching has been increasing. The basic features of the indirect interbank forint/euro market, the structure of the order book and the intra-day patterns of trading show similar characteristics compared to the most developed foreign exchange markets. In terms of size and the bid-ask spreads, it is still well behind these markets, while it is similar to other emerging currencies within the region.

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