

Szilárd Erhart, Imre Ligeti and Zoltán Molnár: Reasons for the LIBOR review and its effects on international interbank reference rate quotations*

In 2012, news related the manipulation of LIBOR¹ directed the attention of authorities and the general public to interbank reference rates. International reviews made it clear that a reform of LIBOR and the numerous reference rates that follow the methodology of LIBOR is necessary, because changes in reference rates influence the payment terms of thousands of billions in loans and other financial agreements. Rapid and at the same time radical changes cannot be expected in the short run, because preparation of the changes poses a regulatory challenge that requires complex, international cooperation. In order to restore confidence, as of 2013 the British authorities intend to strengthen LIBOR by the introduction of a statutory regulation, and they are also planning to designate a new, independent administrator and to drastically cut the number of quotes. Overall, our study confirms the findings of earlier analyses prepared by the Magyar Nemzeti Bank, according to which BUBOR² shows the real market conditions as an average of longer periods, but at present its ability to provide a short-term forecast of interest rate steps is limited.

INTRODUCTION

LIBOR and similar interbank reference rates were originally created in the 1980s in order to facilitate the pricing of syndicated dollar loans. Prior to that, US Treasury bill rates had been used for pricing, but fluctuations in issued quantities and risk appetite diverted the Treasury bill rates from banks' real costs of funds. Later, LIBOR, which satisfied market needs to a high degree, and other reference rates that followed the methodology of LIBOR, gradually became increasingly popular. In 2011, the value of contracts based on LIBOR was close to USD 270 trillion (almost the quadruple of the total GDP of the world).

However, due to tight market liquidity, the setting of interbank rates has been difficult since 2008, which may hinder the precise pricing of loans and derivative contracts. At the same time, in the summer of 2012, confidence in interbank reference rates continued to decline due to the manipulations of LIBOR and EURIBOR.³ All of this made it necessary to review the international rate quotation methodology and BUBOR, which is determined in line with that.

Our analysis presents the role of LIBOR and BUBOR in financial markets. We describe the reasons for and consequences of the LIBOR affair, as well as the questions and conclusions of international reviews formulated to date. There is agreement among the domestic and international professional audience that due to interbank market constraints as well as the anomalies of quoting procedures and the LIBOR affair, a review of the reference rates is necessary, and the reforms following the investigations will have to be implemented in an internationally coordinated manner. In connection with that, we summarise the LIBOR regulation proposals set out in the Wheatley Review (2012b) and entering into effect in 2013, which relate to the designation of a new, independent administrator and the introduction of quotes based on transaction data in order to eliminate distortions stemming from expert estimates. A further plan is a drastic reduction of the number of LIBOR currencies and tenors.

The review of the BUBOR setting methodology started in recent months, in parallel with the international reforms. In terms of both monetary policy and financial stability, it is of key importance that the BUBOR quotes remain

* The views expressed in this article are those of the author(s) and do not necessarily reflect the official view of the Magyar Nemzeti Bank.

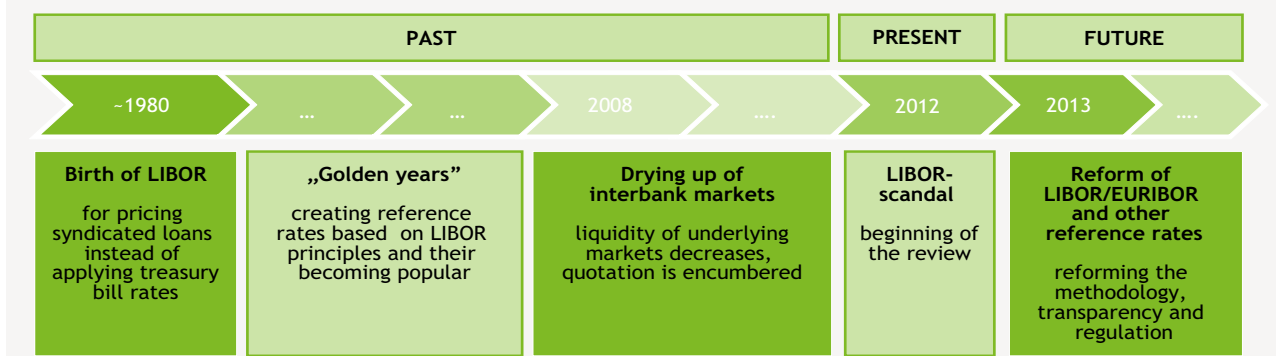
¹ LIBOR: London Interbank Offered Rate.

² BUBOR: Budapest Interbank Offered Rate, a forint-denominated Budapest interbank reference rate.

³ EURIBOR: Euro Interbank Offered Rate, an interbank reference rate denominated in euro.

Chart 1

Past, present and future of LIBOR and interbank reference rates



reliable indicators of interest rate conditions. Our current study confirms the findings of earlier published analyses prepared by the Magyar Nemzeti Bank, according to which BUBOR quotes show the real market conditions as an average of longer periods, but since 2009 their ability to provide a short-term forecast of interest rate steps has been limited.

THE ROLE AND QUOTATION METHODOLOGY OF INTERBANK REFERENCE RATES

The role of LIBOR and BUBOR in money markets and the economy

LIBOR, as a reference rate quoted for the leading currencies of the world for various maturities, influences the pricing of financial products amounting to approximately USD 300

trillion (300×10^{12}) (Table 1). Within that, interest rate swaps (IRS) account for a dominant share.

In Hungary, starting from the introduction of BUBOR in 1996, banks have essentially priced their corporate and mortgage loans on the basis of BUBOR. According to the MNB's estimates, the majority of corporate forint loans, which presently amount to HUF 2,700 billion, have variable interest rates tied to BUBOR, while the share of such rates in household forint loans,⁴ which amount to HUF 4,000 billion, is low, and has started to increase only recently.⁵ In the past decade, BUBOR played an important role in determining the contract terms and conditions of derivative products (forward rate agreements, interest rate swaps etc.) as well. While no highly reliable data on the BUBOR exposure of domestic banks' loans are available, based on the central bank K14 statistics we have detailed data on the interest rate swaps recorded off-balance-sheet. Of the

Table 1
Value of contracts based on LIBOR
(USD trillion)

Instruments	Value
Exchange-traded interest rate futures and options	30
Floating rate notes	3
Forward rate agreements (FRA)	28
Interest rate swaps (IRS)	198
Syndicated loans	10
Total	269

Source: Wheatley Review, 2012b.

⁴ Reference is made to BUBOR, inter alia, in Act CXII of 1996 on Credit Institutions and Financial Enterprises, Act LXXV of 2011 on the Fixing of Exchange Rates Used for Repayments of Foreign Exchange-denominated Mortgage Loans and the Administration of Forced Sales of Residential Property, Act IV of 2009 on Government Guarantee on Non-performing Home Purchase Mortgage Loans, Act CVI of 2007 on State-owned Assets, Government Decree No. 250/2000. (XII. 24.) on Special Provisions Regarding the Annual Reporting and Book-keeping Obligation of Credit Institutions and Financial Enterprises, Government Decree No. 215/2000. (XII. 11.) on the Special Provisions Regarding the Annual Reporting and Book-keeping Obligations of Investment Funds, Government Decree No. 251/2000. (XII. 24.) on the Special Provisions Regarding the Annual Reporting and Book-keeping Obligations of Investment Enterprises.

⁵ The above values are from the publication 'MNB (2012)'.

Table 2
Domestic interest rate derivative turnover and contract sizes

(January 2009–September 2012)

	FRA			IRS			CIRS		
	Total	BUBOR (3 month)	BUBOR (6 month)	Total	BUBOR (3 month)	BUBOR (6 month)	Total	BUBOR (3 month)	BUBOR (6 month)
Value of transactions (HUF Bn/year)	13,630	9,268	4,361	5,716	1,180	4,536	1,679	1,617	62
Number of transactions per year	900	540	360	1,475	150	1,325	161	157	4
Average value of a transaction (HUF Bn)	15	17	12	3.9	7.9	3.4	10.4	10.3	15.1
Average number of transactions per day	3.5	2	1.5	5.9	0.6	5.9	0.6	0.6	0.01
Total value (HUF Bn, 30 June 2012)	10,050			19,600			5,420		

products based on BUBOR, FRA transactions,⁶ and within that the 3-month ones tied to BUBOR, have the highest turnover; in terms of the amount, however, interest rate swaps (IRS) are determining.⁷

Interbank reference rates are of key importance for the central bank, not only in terms of the pricing of financial products but also as indicators of short-term interest rate expectations. This is due to the fact that the initial step of monetary policy intervention is the influencing of market interest rate conditions and interest rate expectations. (Regarding the role of BUBOR in measuring interest rate expectations see the part entitled *Market functioning constraints and the impact of the LIBOR affair on interbank reference rates* below.)

Current international practices in the setting of reference rates

Starting from the 1980s, the appreciation of the London market and LIBOR have been facilitated by both the position

of the London time zone between the major markets and the development of the euro financial markets. Later, interbank reference rates relying on the LIBOR methodology were introduced in very many countries.

The most important features of interbank quotes: the term of the interbank transaction they apply to, the institutions whose quotes are used and the applied calculation methodology. Another important aspect in comparing quotes is whether the quote relates to the lending or borrowing of interbank funds and whether there is an obligation to contract in connection with the quotes.

LIBOR – by definition – gives the costs of funds of market maker banks, whereas other interbank reference rates provide information about the interest rates of interbank deposits of market makers (see the box below). A further difference is that in some countries the transactions between the best, premium banks have to be taken into account (euro area, Japan), whereas in other cases the transactions of the market maker bank are taken into account.

Definition of interbank interest rate quotations

BUBOR (Hungarian Forex Association): the interest rate an interbank loan offered by the reporting agent.

EURIBOR (European Banking Federation): EURIBOR is the rate at which euro interbank term deposits are being offered within the EMU zone by one prime bank to another at 11:00 a.m. Brussels time ("the best price between the best banks"). It is quoted for spot value (two Target days) and on actual / 360 day basis.

LIBOR (British Bankers' Association): At what rate could you borrow funds, were you to do so by asking for and then accepting inter-bank offers in a reasonable market size just prior to 11 am.

⁶ FRA: forward rate agreement.

⁷ An analysis by Kocsis et al. (2012) is expected to be published in the *MNB Occasional Papers* series in 2013.

MATURITIES: The banks of the contributor panel submit the quotations for numerous maturities (15 maturities from O/N to 12-month in the case of LIBOR/BUBOR/EURIBOR). In some countries, however, the reference interest rates apply only to fewer, 8–10 maturities of up to one year (Table 3). During quoting, the most frequent maturities are the 1-week, 1-month, 3-month, 6-month, 9-month and 12-month maturities, as the majority of the underlying financial products (loans, derivatives etc.) are priced according to these maturities. International surveys suggest that usually the 3-month and 6-month maturities are the most important.

PANEL BANKS: In setting the quotations, a large sample (of 8–45 banks) is usually taken, compared to the size of the given market. Fundamentally, the banks are selected on the basis of their market turnover. Quoting is always carried out with the involvement of domestic banks. However, quotes of foreign banks are also often taken into account. Theoretically, a larger sample has better statistical properties. However, due to the market concentration, taking account of the quotes of inactive banks in the calculation of the mean value is not necessarily advantageous. The composition effect may greatly influence the value of interbank reference rates – especially in the interbank market, which becomes segmented in stress situations. For example, during EURIBOR submission, market makers have to give account of the pricing of premium banks' depositing, while non-premium banks, which face higher credit risk premiums, constitute an increasing portion of the euro area financial system. In the case of LIBOR, submitting banks have to give account of their own costs of funds. The definition of BUBOR is very similar to that of EURIBOR, as in both cases it is the given market maker's offer rate for unsecured lending.

TRIMMING: Most quoting procedures ignore the extremely low and high quotes during the setting of the interest rate (trimming), which reduces the possibility of manipulation and the pass-through of the volatility of individual banking transactions. If the number of market makers is low, the institution that coordinates the quoting also has less room for manoeuvre to apply trimming. Therefore, in Sweden and some Asian countries they calculate non-trimmed averages, and the extent of the trimming depends on the number of market makers.

ONSHORE AND OFFSHORE MARKETS: In the case of LIBOR, in addition to the domestic currency, quotes for foreign currencies are also published. In the cases of the euro, the Japanese yen and the Swedish crown, domestic as well as

foreign quotes exist, with different market makers. In certain countries, the offshore London market has even become more important. For example, the operational interest rate target of the Swiss National Bank (SNB) refers to the LIBOR CHF interest rate quotations. An advantage of the offshore market may be that it is less exposed to regulations (capital constraint, minimum reserve, etc.), and it is easier to leave or enter (Gyntelberg and Wooldridge, 2008).

CONTRACTING OBLIGATION: Considering that the quoting is not based on real market transactions, certain regulations impose a contracting obligation on the partners. Pursuant to the quotation rules of the Polish (WIBOR) and Romanian (ROBOR) reference rates, the quoting obligation amounts to HUF 120–2,100 million (WIBOR: PLN 5–30 million; ROBOR: RON 2–5 million). The amount of the quoting obligation declines as a function of the tenor.

QUOTING DIRECTION: Quotes in the case of certain reference rates indicate how much it would cost the given bank to borrow (LIBOR), whereas in other countries they show the price of its lending (BUBOR, CIBOR,⁸ EURIBOR and NIBOR⁹). The Czech, Polish and Romanian reference rates are quoted in both directions (borrowing and lending rates), and the Polish and Romanian Central Banks require a 20–75 basis point maturity-dependent maximum spread as well.

REFERENCE: Market participants' choices in certain cases may show how liquid they consider individual segments of the money market to be. In the case of IRS products, for the largest currencies the interbank quotes mean the reference rate. At the same time, this role is played by other interest rates in the Asian and Pacific region, the expected interest rate of bank bills in Australia, the implied interest rate of FX swaps in the Philippines, Singapore and Thailand, while in China the reference is the interest rate of repurchase agreements (Gyntelberg and Wooldridge, 2008).

Chart 2 depicts the four main stakeholders of the quoting of reference rates and its six-step process. Stakeholders in the quoting are (I) the issuer of the reference rate (the Hungarian Forex Association (MFT) in the case of BUBOR), (II) the members of the contributor panel, (III) the institution that carries out the calculation and the publication (the MNB in the case of BUBOR) and (IV) the users of the reference rate (financial market participants, households and corporations that rely on the reference rates upon elaborating the conditions of financial contracts). The issuer is responsible for the development of the methodology

⁸ CIBOR stands for Copenhagen Interbank Offered Rate, i.e. the Copenhagen interbank reference rate denominated in Danish crowns.

⁹ NIBOR stands for Norway Interbank Offered Rate, i.e. the Norwegian interbank reference rate denominated in Norwegian crowns.

Table 3
Interbank interest rate quotes in international comparison

Instrument	BUBOR	LIBOR	PRIBOR	EURIBOR	WIBOR	ROBOR	CIBOR	NIBOR	STIBOR	TIBOR
Country	Hungary	United Kingdom	Czech Republic	Eurozone	Poland	Romania	Denmark	Norway	Sweden	Japan
Currency	HUF	10 currencies (JPY, USD, GBP, EUR, CHF, CAD, AUD, NZD, DKK, SEK)	CZK	EUR	PLN	RON	DKK	NOK	SEK	JPY
Size of panel (Sep. 2012)	16	8-16 (depends on the currency)	8	44	13		9	6	6	16
Type	quotation	quotation	quotation	quotation	quotation can be transacted (between 5 and 30 PLN million depending on the maturity)	quotation can be transacted (between 2 and 5 RON million)	quotation	quotation	quotation**	quotation
Number of maturities	15	15	9	15	9	8	14	10	8	13
Key maturity*	3 month	3 month		6 month			6 month	6 month	3 month	3 month
Trimming	~ Lower / Upper 25%	~ Lower / Upper 25%	depends on the number of quoters	Lower / Upper 15%	~ Lower / Upper 25%	-	Lower / Upper 15%, average if number of quoters is less than 11	Lower / Upper 25%, average if number of quoters is less than 5	if difference between maximum and minimum is more than 25 bp	Lower / Upper 12,5%
IRS reference rate	yes	depends on the currency	yes	yes	yes		yes	yes		no (reference rate is JPY LIBOR)
Sanctions	disqualification		disqualification	disqualification	disqualification	disqualification	disqualification	the case is proposed to the bank association		
Lending or borrowing	lending	borrowing	borrowing / lending	lending (among premium banks)	borrowing / lending (spread is maximised)	borrowing / lending (spread is maximised)	lending	lending	lending	transaction between premium banks

* Based on Gyntelberg and Wooldridge (2008).

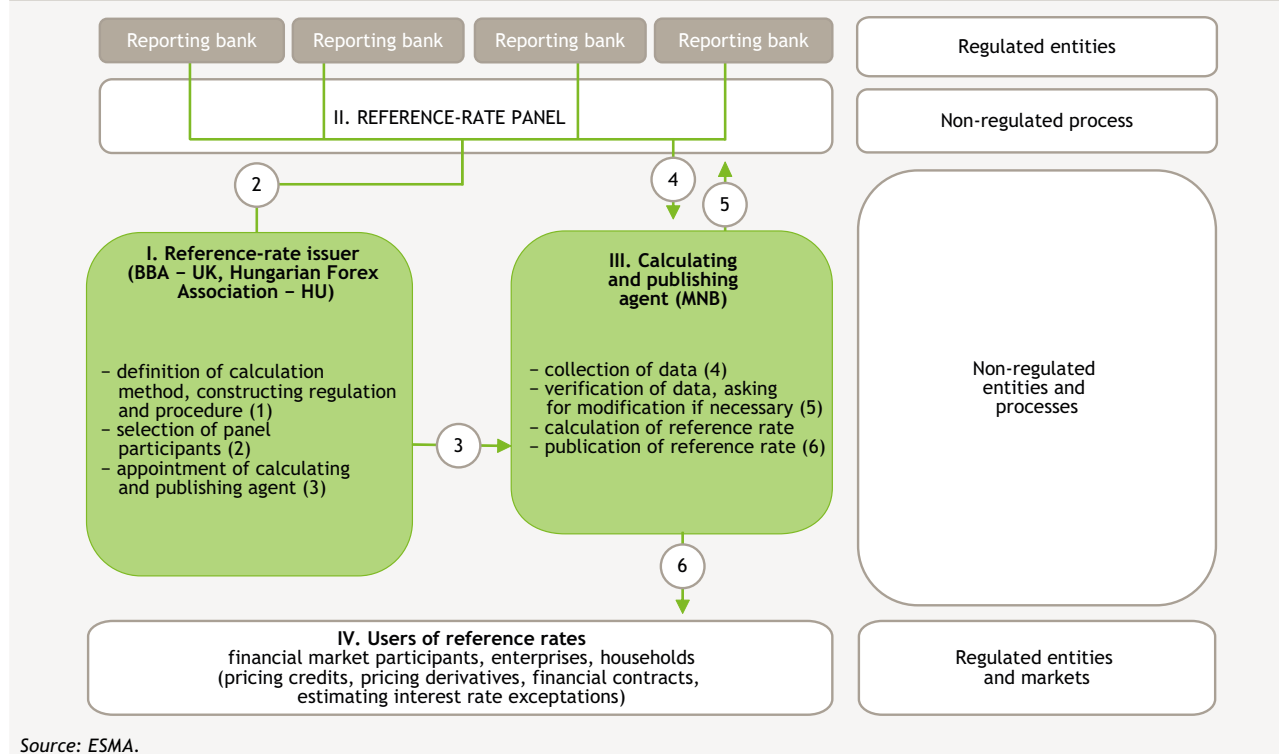
** Quoting obligation was in force until 29 October 2008 (SEK 500 million up to 6-month maturity; SEK 100 million for maturities of 9-12 months).

Sources: Banking associations, central banks, BIS.

(step 1) as well as for the selection of the contributor panel and the institution that does the calculation and the publication (steps 2 and 3). The market makers are responsible for the submission of the interbank interest rate quotes that comply with the regulation (step 4), while the institution that performs the calculation is responsible for the completion of the necessary calculations and the formal control of the quotations (step 5) as well as for the

publication of the reference rate (step 6). In international practice, the work of the contributor panel as well as the work of the issuing institution and the calculating institution are usually unofficially regulated. In Hungary, the regulation prepared by the MFT, which works as an NGO, contains the rules of procedure. However, in the opinion of the European Securities and Markets Authority (ESMA), it may be necessary to regulate the process of quoting in provisions of law –

Chart 2
Stakeholders and flow chart of quoting



reacting to the criticism expressed in connection with the LIBOR affair.

MARKET FUNCTIONING CONSTRAINTS AND THE IMPACT OF THE LIBOR AFFAIR ON INTERBANK REFERENCE RATES

In an optimal situation, in addition to the expected central bank interest rate path, reference rates similar to BUBOR/LIBOR are also influenced by other factors that arise during interbank market transactions (counterparties' credit risk, liquidity and term premiums) and by the quotation procedure¹⁰ (rate-setting methodology, transparency, etc.).

At the same time, the bias-free setting of LIBOR/BUBOR is hindered by several factors in the procedure:

- limited market liquidity and mobility between markets,
- manipulations, LIBOR affair.

Market liquidity and mobility between markets are limited

Especially since the 2008 crisis, the liquidity of interbank markets relevant in terms of the setting of BUBOR/LIBOR has been concentrated on maturities shorter than 1 month¹¹ (Table 4). In the 2008–2009 stress period, the intermediate role of interbank markets was taken over by central banks by changing their liquidity management instruments, and although the functioning of markets has been re-established, the role of central bank liquidity management instruments has remained more important compared to the pre-crisis period. The preparation of quotations has also become more difficult by the fact that passage between markets has become more hindered. As a result, 'expert estimates' have become increasingly important in the preparation of quotations, especially in the case of maturities longer than 1-2 months, and the risk of distortion of the reference rate has increased considerably. All of this limits the reference rates in meeting market needs, because the related financial pricing activity is tied to the 3–6-month maturity.

¹⁰ The quotation procedure is described in detail in the previous section.

¹¹ In Hungary, overnight transactions dominate, 99 per cent of which are shorter than 2 weeks.

Table 4
Transactions underlying LIBOR and BUBOR in 2011

	O/N	1 week	2 week	1 month	2 month	3 month	4 month	5 month	6 month	7 month	8 month	9 month	10 month	11 month	12 month
USD															
GBP															
EUR															
JPY															
CHF															
CAD															
AUD															
NZD															
SEK															
DKK															
BUBOR (HUF)															
		low activity			moderate-low activity				moderate activity			high activity			

Source: Wheatley Review, The (2012b), MNB.

Manipulations, LIBOR affair

Interest rate quotations were especially unfavourably affected by the eruption of the scandal related to LIBOR and EURIBOR quotes in the summer of 2012. The British Financial Services Authority (FSA) fined Barclays Bank because it breached several Principles for Businesses of the former:

- 1. taking account of derivative positions:** during setting its quotations, the Barclays took into consideration the revaluation of derivative positions in the period between early 2005 and mid-2008;¹²
- 2. fear of stigma, distorting the quotes in order to improve the reputation of the bank:** as the LIBOR quotes are based on the costs of funds of the market maker bank (see the definition of LIBOR in the previous section), in the crisis situations between September 2007 and May 2009 Barclays attempted to paint a better picture of its credit risk than the real one by reporting lower borrowing costs than the actual costs (this risk does not exist in the case of EURIBOR and BUBOR, because banks report the interest rates of the loans they extend and not of their costs of obtaining funds);
- 3. intention to influence the pricing of other market makers:** the misdemeanour of abuse was exacerbated by the fact that the bank instigated other market makers as well to behave unethically;

- 4. lack of risk management controls:** according to the findings of the FSA, Barclays did not have effective risk management controls upon setting LIBOR and EURIBOR.

THE FIRST STEPS OF THE REVIEW OF REFERENCE RATES

There is agreement among the domestic and international professional audience that, due to the anomalies of interbank market constraints and quoting procedures as well as the LIBOR affair, a review of the reference rates is necessary, and that the reforms following the investigations will have to be implemented in an internationally coordinated manner. The primary objectives are to eliminate the possibility of manipulation and to increase the transparency and accountability of the process in order to restore confidence in interbank interest rate quotes.

Of the international investigations conducted to date, the Wheatley Review concerning the LIBOR affair is summarised and the first steps of the BUBOR review are described below. Further reviews were initiated by the European Commission, the European Banking Authority (EBA), the European Securities and Markets Authority (ESMA) and the Bank for International Settlements (BIS). No information on the findings of these ongoing reviews has been published to date, but the objective of the reviews is basically similar to that of the LIBOR review; they raised the issues of the functions and methodology of reference rates as well as supervisory and regulatory issues related to them.

¹² In December 2011, the Citigroup and UBS were condemned for similar reasons by the financial supervisory authority in Japan. In their case, the punishment was less severe; they were only excluded from quoting for 1 and 2 weeks, respectively.

The Wheatley Review

The draft of the Wheatley Review aiming at the independent review and reform of the LIBOR quoting system was made available for public consultation in August 2012 (Wheatley Review, 2012a), in order to assess the money market role of LIBOR, explore the deficiencies of the current quoting system and identify alternative reference rates that are suitable for replacing LIBOR. The public consultation conducted with the involvement of the market makers and those concerned by the quotes was closed on 7 September, and the final report (Wheatley Review, 2012b) on the findings of the review was published on 28 September; it also defined a 10-point reform plan (see below).

An important conclusion of the review was that a comprehensive reform of LIBOR is necessary. However, LIBOR cannot be replaced in the near term or it would entail considerable financial stability risks.

Those who expressed their opinions during the consultation clearly argued for the continuation of LIBOR quotes, referring to the legal challenges of a change,¹³ to the international coordination difficulties stemming from the global role of LIBOR and to the lack of an alternative. In the future, the writers of the Wheatley Review intend to base LIBOR more on transaction data instead of expert judgement. However, there are clear market constraints to it over the short run.

The 10-point LIBOR reform plan of the Wheatley Review

1. **Introduction of statutory regulation** for mandatory submission, the selection of the persons of market makers (Approved Persons), civil and criminal sanctions as well as the provision of credible and independent supervision in the British Financial Services and Markets Act (2000) – as of 2013, if approved by the British legislator.
2. **Selection of a new administrator instead of the British Bankers' Association (BBA)¹⁴ to issue the reference rate**; it would be responsible for compiling and distributing the rate as well as for providing oversight. The new entity should be selected through a tender process to be run by an independent committee designated by the regulatory authorities.

3. In order to ensure transparency and non-discriminatory access to the benchmark, **the new administrator is responsible for** the surveillance, review, statistical examination and periodic monitoring of submissions so that LIBOR can meet market needs effectively and credibly.

4. **Expectation concerning the use of transaction data** in line with the submission guidelines of the Wheatley Review presented below. Based on their interbank experiences, submitters have to determine the submissions based upon the following hierarchy, primarily relying on transaction data:

- **contributing banks' transactions in**
 - the unsecured interbank deposit market;
 - other unsecured deposit markets (CD, CP);
 - other markets (OIS, repurchase agreements, FX forwards, interest rate futures and options and central bank operations);
- **contributing banks' observations of third-party transactions in the same markets;**
- **quotes by third parties offered to contributing banks in the same markets;**
- **expert judgement, in the absence of transaction data.**

5. **The new administrator is obliged to introduce a new code of conduct**, which includes guidelines for the use of transaction data, systems and controls for submitting firms, transaction record keeping responsibilities (submitting firm's name, communication with other partners, transaction data) and a requirement for regular external audit of submitting firms.
6. **Suspension of tenors and currencies.** The BBA is obliged to cease the compilation and publication of LIBOR for those tenors and currencies for which there are insufficient trade data. The changes must be implemented within 1 year. The Wheatley Review recommends the discontinuation of the AUD, CAD, DKK, NZD and SEK quotations as well as of the publication of LIBOR for the 4-, 5-, 7-, 8-, 10- and 11-month tenors. Continued publication of 1- and 2-week as well as 2- and 9-month

¹³ Changing the reference rate, which is widely used in private law contracts as well, is difficult.

¹⁴ British Bankers' Association, the organisation currently responsible for LIBOR quotations.

tenors would be re-considered. As a result, the number of LIBOR benchmarks published daily could be reduced from 150 to 20. Immediate consultation with the submitters on the issues of implementation should be launched.

7. **Publication of individual LIBOR submissions after 3 months**, to reduce the risks stemming from the stigma effect of quotations. (The stigma effect is described in the chapter entitled *Current international practice in the setting of reference rates* of this article.)
8. **Increasing the number of submitters**, if necessary through new powers of regulatory compulsion as well, in order to increase the representative character of the contributor panel.
9. **Encouragement of LIBOR users** to examine – in view of their economic objectives – whether LIBOR is the most appropriate benchmark in the given legal relationship or the use of alternative reference rates would be justified, and whether they should prepare for a possible ceasing of LIBOR quotations.
10. **Consultation with European and international authorities**. UK authorities should discuss the future of LIBOR as an international benchmark and the principles for effective global benchmarks in close cooperation with international institutions.

Questions of introducing alternative reference rates

The draft of the Wheatley Review contained a detailed list of the requirements that reference rates must meet (representativeness, coverage of the short end of the yield curve, being up-to-date, credit risk, standardisation, deep and liquid markets, long time series, interest in participation, etc.). Of the possible market segments suitable for producing an alternative reference rate (unsecured lending, treasury bills, repurchase agreements, interest rate on central bank instruments, CDs and CPs), in the draft of the Review mainly treasury bills and OIS (overnight indexed swap) markets were considered to be market segments that may serve as possible alternatives to the unsecured interbank market.

During the consultation, the OIS market¹⁵ was considered a possible reference rate by most of the participants. Credit

risk is much lower in the case of OIS transactions, thus interest rate quotes are lower. At the same time, for the pricing of interest rate derivative contracts, which are perhaps the most important of the financial contracts that refer to LIBOR, the reference rate does not need to contain the credit risk as well. In connection with this, it is worth to call attention to the amendments carried out in Denmark in September 2012: namely, for the pricing of mortgage loans the authorities recommended the use of an OIS type reference rate (CITA) instead of the interbank reference rate (CIBOR). In Denmark, the supervisory inspections in September 2012 excluded the possibility of manipulation, but at the same time they found it a serious deficiency that market quotations are not adequately confirmed due to lack of concrete transactions. The role of market maker will be taken over from the Danish Bankers Association by the Danish Financial Supervisory Authority, if the regulatory proposal receives the green light. In Denmark, there are actual transaction data behind the CITA, as opposed to the HUFONIA OIS swap, which is based on quotations.

First steps of the revision of BUBOR

Thematic investigation launched by the HFSa in September focuses on internal controls and BUBOR exposure

Reacting to the criticism related to the LIBOR quotations, the HFSa launched a thematic investigation of the BUBOR quotations on 10 September 2012. The thematic investigation is expected to take a few months.

BUBOR follows real market conditions, but does not forecast short-term central bank interest rate steps

Several empirical central bank analyses have been prepared on the BUBOR quotations in recent years. In 2009, at the Money Market Consultative Forum the MNB discussed its analysis related to the developments in the liquidity of interbank forint markets and in the information content of interbank reference rates with the liquidity managers of commercial banks. The analysis covered the turnover of various market segments and the comparison of their yields. In addition, due to the effects perceived in connection with BUBOR, the MNB also raised the possibility of a transacting obligation. (The discussion material for the Consultative Forum is available in Kuruc and Pintér, 2009; the minutes of the Forum are available in MNB, 2009.)

¹⁵ Detailed analysis of the international trends of OIS markets and of the forint-denominated HUFONIA swap market is provided in the study by Erhart and Kollarik (2011).

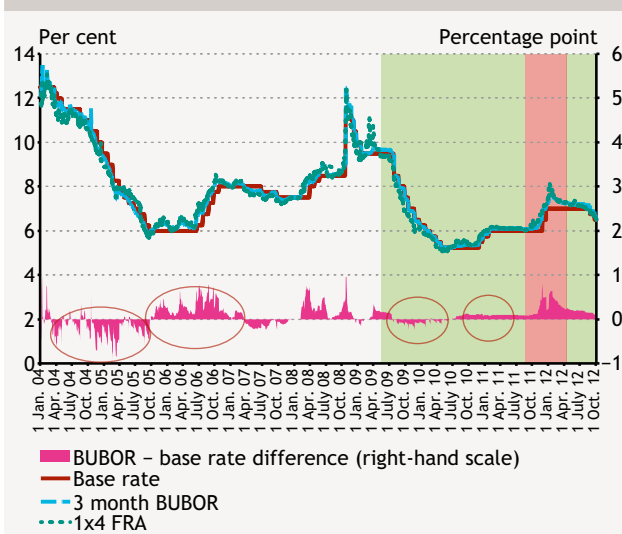
The article by Pintér and Pulai (2009) published in the MNB Bulletin compared the BUBOR quotations to other market yields, government securities market, swap and analyst expectations in relation to the quantification of market interest rate expectations. The analysis concluded that the result of the limited information content of BUBOR is that the yield curve estimated from the yield of interbank market instruments provides a more precise picture of expectations if the data of the BUBOR quotations are not used.

In addition to being strongly embedded in the pricing of financial products, BUBOR plays a key role in terms of market interest rate expectations as well. Therefore, the reliability of the quotation procedure of BUBOR and through that the undistortedness of the information content of BUBOR are important issues for the MNB in formulating the monetary policy as well.

Due to the peculiarities of domestic money market instruments,¹⁶ the use of BUBOR and the interest rate derivatives based on it has become the most accepted in the central bank practice of capturing short-term market interest rate expectations. Until December 2008, in addition to the effect of the counterparty and liquidity risk premium, BUBOR did contain market participants' expectation regarding the central bank base rate. During the cycle of interest rate cuts between 2004 and 2006, amid strong volatility, the spread between the 3-month BUBOR and the current base rate stayed in the negative domain, which was a good indicator of the expectation of a cycle of easing. Similarly, in the period of tightening that started in mid-2006 and during the preceding nearly three-quarter period of maintaining the base rate also mostly the expectations influenced interbank lending rates; this is shown by the strongly fluctuating positive BUBOR-base rate spread (Chart 3).

This period ended around the extraordinary interest rate increase that took place in the autumn of 2008, and as a result of the crisis – as well as the decline in liquidity and the elevated counterparty risk – the reliability of BUBOR in terms of short-term interest rate expectations declined considerably. Due to lack of a benchmark, submittals indicated participants' expectations to a decreasing degree. Following the turbulent period, BUBOR actually followed the changes in the base rate; the fluctuation in the BUBOR-base rate difference observed earlier shrank to a minimum. The disappearance of the interest rate expectations contained in BUBOR is spectacularly illustrated by the fact that starting from mid-2010 the spread between BUBOR and

Chart 3
Changes in the base rate and related financial market variables



the base rate became practically smooth; the constant minimum difference can be considered a kind of stuck liquidity risk (Chart 3, first green band).

The correlation observed since 2009 changed temporarily at end-2011, when BUBOR departed from the base rate in a spectacular manner. This period coincided with the cycle of interest rate hikes that started in early December; the elevated level of the BUBOR-base rate difference remained in place following the January maintenance as well (Chart 3, red and second green band). All of this showed that the information content of BUBOR had changed compared to the period that had lasted since 2009.

Following the two interest rate hikes of 50 basis points each and the turbulence in early January 2012, the 3-month BUBOR declined gradually, until finally the BUBOR-base rate difference became stable around 20-25 basis points at the beginning of April. This difference can rather be interpreted as a liquidity premium that consolidated at a higher than earlier level than the pricing of a new interest rate hike, as in this period other money market instruments (FRA, discount treasury bill) did not indicate any expected change in the interest rate environment.

The latest 'test' of the interest rate expectation information contained in BUBOR was around the time of the August and September interest rate cuts, when at the end of the summer the participants of the FRA market started to price monetary easing for the second half of the year, and the

¹⁶ In the discount treasury bill yields, the sovereign risk premium and the market liquidity premium hinder the reliable determination of interest rate expectations, while the OIS market is a relatively fresh segment in Hungary and trading therein cannot be considered active.

Table 5

Result of the OLS regression for the level of the 3-month BUBOR, where the explanatory variables are the first-order lag value of BUBOR and the also first-order lag of the change in the interest rate level

Sample period	Dependent variable	Explanatory variables		Estimation statistics	
	BUBOR (3 month)	BUBOR (3 month) (1st lagged)	Interest rate step	Modified R 2	F statistics
November 2004–October 2008	Coefficient	0.996	0.111	0.998	0.00
	P value	0.000	0.000		
November 2008–October 2012	Coefficient	0.998	0.770	0.999	0.00
	P value	0.000	0.000		

number of those who expected a cut increased among analysts as well. By contrast, practically no interest rate cut expectation was shown in BUBOR. BUBOR reacted to the interest rate cuts in August and September by immediate changes each time, as had been seen in the period between 2009 and 2011 (first green band). This is well illustrated by the fact that there was only a minimum change in the BUBOR-base rate difference, and it continued to include the constant premium.

Overall, BUBOR in itself still cannot be considered a suitable short-term market interest rate expectation indicator, and in recent months its behaviour has been similar to that between 2009 and 2011. Against this background, the extremely moderate decline in interest rate fixing makes it somewhat more difficult to interpret the FRA based on the reference rate, as it is not excluded that the declining quotations also reflect the interest rate expectations to a certain extent. It is also not excluded that this rather reflects an easing of the liquidity tension of the interbank market.

Quantitative analysis of the different BUBOR quoting practices of the two long periods presented above (preceding and following the 2008 global money market turbulence) also leads to a similar conclusion. The time series of the 3-month BUBOR shows strongly autoregressive properties; accordingly, an AR(1)¹⁷ process captures the changes in the level of the reference rate well. If the one-day lag of the change in the level of the central bank base rate is also included in the OLS¹⁸ regression, it can well be seen that in the period before October 2008 the variable takes a much lower coefficient than in the still ongoing period following the Lehman bankruptcy. All of this shows that in the pre-crisis period actual interest rate decisions had a much lower effect on the level of BUBOR than as of November 2008, i.e. the 3-month BUBOR priced the

expected interest rate steps to a greater extent. In Chart 3, in the hatched green periods, the extent of BUBOR fixing typically changed gradually on the basis of the interest rate decisions, i.e. the expectation effect was much less dominant (as indicated by the 0.77 coefficient of the interest rate step in Table 5).

Overall, our current study confirms the findings of earlier published analyses prepared by the Magyar Nemzeti Bank, according to which BUBOR quotations show the real market conditions as an average of longer periods. However, since 2009 – in the period of central bank rate cuts and hikes – their ability to provide a short-term forecast of interest rate steps has been limited.

REFERENCES

- EUROPEAN COMMISSION (2012), *Consultation Document on the Regulation of Indices*, 5 September 2012, [URL](#).
- ERHART, SZILÁRD AND ANDRÁS KOLLARIK (2011), "The launch of HUFONIA and the related international experience of overnight indexed swap (OIS) markets", *MNB Bulletin*, April, [URL](#).
- GYNTELBERG, J. AND WOOLDRIDGE, P. D. (2008), "Interbank Rate Fixings during the Recent Turmoil", *Quarterly Review*, March, BIS, [URL](#).
- HORVÁTH, CS., J. KREKÓ AND A. NASZÓDI (2004), "Interest rate pass-through: the case of Hungary". *MNB Working Paper*, 2004/8. [URL](#).
- KOCSIS ZALÁN, CSÁVÁS CSABA, MÁK ISTVÁN AND PULAI GYÖRGY (2012), *Kamatderivatíva piacok Magyarországon 2009 és 2012 között a K14-es adatszolgáltatás tükrében*, [Interest rate derivative markets in Hungary between 2009 and 2012 in

¹⁷ The AR(1) is an autoregressive process, where the time series is explained with its previous day value. In this case, $X_t = c + \lambda X_{t-1} + \varepsilon_t$, where X_t is the t^{th} observation, λ is the related coefficient, c is constant, ε_t is the error term of the equation.

¹⁸ The OLS (Ordinary Least-Squares Regression) is a linear regression method in which the sum of the squares of the error terms is minimised.

the light of the K14 data reporting], manuscript, Magyar Nemzeti Bank.

KURUC EMESE AND PINTÉR KLÁRA (2009), *A bankközi forintpiacok likviditásának és a bankközi referenciakamatok információtartalmának alakulása*, [Developments in the liquidity of interbank forint markets and in the information content of interbank reference rates], Pénzpiaci Konzultatív Fórum, 2009. október 1., [URL](#).

MAGYAR FOREX TÁRSASÁG (2012), *Hivatalos BUBOR szabályzat*, [Official BUBOR Regulation], 2012. dec. 1., [URL](#).

MAGYAR NEMZETI BANK (2009), *Emlékeztető a Magyar Nemzeti Bank Pénzpiaci Konzultatív Fórumáról*, [Reminder on the Money Market Consultative Forum of the Magyar Nemzeti Bank], [URL](#).

MAGYAR NEMZETI BANK (2012), *Report on Financial Stability*, November, [URL](#).

MUTKIN, L. AND E. LIN (2012), *What Future for Libor?*, Morgan Stanley Research, London, [URL](#).

PINTÉR, K. AND GY. PULAI (2009), "Measuring interest rate expectations from market yields: topical issues", *MNB Bulletin*, July, [URL](#).

WHEATLEY REVIEW, THE (2012a), *The Wheatley Review of LIBOR: Initial Discussion Paper*, August, [URL](#).

WHEATLEY REVIEW, THE (2012b), *The Wheatley Review of LIBOR: Final Report*, September, [URL](#).