Financial Market Index Reform Dilemmas

Summary: The aim of the article is to present the current state of efforts to reform financial market indexes, with a particular reference to how the proposed changes would affect the money market. Financial market indexes must be reform under a Regulation of the European Parliament on indices used as benchmarks in financial instruments. The article verifies the thesis about the existence of a conversion path for indexes that would not threaten the stability of the market and ensure legal continuity.

In order to verify the thesis, the author studies documents published by regulators and benchmark administrators in order to present the debate on possible opportunities and threats to the financial market resulting from specific solutions proposed by various stakeholders. The methodology applied in the article includes economic and legal research for the assessment of proposals regarding the liquidity and stability of the financial market. The author highlights the possible consequences of benchmark transformation on the reliability of financial indicators applied to the valuation of loans and derivatives.

The conclusions of the analysis cover two basic aspects. First, an optimal definition of the index and the related methodology is proposed. Second, the author identifies a conversion path that minimizes the risk of destabilizing the financial market. The index is optimally defined as based on actual transactions. In the absence of a sufficiently liquid underlying market, the definition requires the transaction base to be broadened. In the case of money market indexes, non-bank deposits need to be taken into account. The new index definition will lead to changes in the level and variance of the benchmark, which may threaten the stability of contracts concluded on the financial market. It is therefore necessary to ensure the parallel publication of indexes according to both the old and new methodology so that the continuity of valuation of existing financial instruments is maintained.

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Introduction

A financial market index is a benchmark defined on the basis of prices recorded in the financial market. The benchmark is informative and may be used to define an amount of financial flows during the settlement of transactions made in the financial market.

From the macroeconomic point of view, financial market indices constitute points of reference for financial instruments offered in the market. A relation between an index and a financial instrument is three-dimensional. First, the indices determine a size of flows of financial instruments (e.g. IBORs define interest rates for mortgage loans of variable interest rates, determine a size of a coupon in variable coupon Treasury bonds, determine flows in swaps, and a settlement amount for futures). Second, they influence portfolio valuation because they are used as price components that determine a value of financial assets. Third, they have an informative function as a kind of a market barometer that contains synthetic and objective information about, for example, interest rates in the economy.

The indices may be broken down by reference asset they apply to. There are the following types of indices:

- stock indices referring to the regulated market of equities and constituting a basic index that determines the present value of a given stock-exchange market;
- money market indices, which are based on unsecured time interbank deposits;
- currency market indices (currency fixings), which determine the present value of foreign currencies in relation to a domestic currency;
- merchandise indices, which define a reference value of defined goods (metals, raw materials, agricultural produce, etc.).

Given the size of the reference market, money market indices are the most important indices for the economy. They play important economic functions. First, they inform us about an objective level of interest rates for a strictly defined type of assets. Second, they enable to define a size of cash flows for index-based instruments (loans, bonds, swaps). Third, based on prices of index-based derivatives, they enable to define a direction and scope of changes in yield curves which are forecast by market players. Fourth, thanks to the unification of reference rates used in derivatives, they improve liquidity in the market of derivatives and, at the same time, enable to secure

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1 Interest rates for variable-interest loans are usually defined on the basis of IBOR-type indices. In derivatives, flows are mostly determined by indices, e.g. in an IRS contract, part of flows is defined by future IBOR-type indices. Thus, a change in an index translates into a change in flows for both counterparties.
against interest rate fluctuations.

What is important, the indices may be used to construct index-based instruments that minimise market players’ exposure to market risk. Market risk is connected with an unfavourable change in the value of balance-sheet and off-balance-sheet items. A value change may result from a change in expected flows or a change in the present net value of receivables and payables. For many financial market instruments, the value change is calculated on the basis of the present value of indices or index-based instruments. Financial market indexes can protect against market risk because they represent defined economic values. For example, a currency fixing defines a foreign exchange rate at a given moment of a business day and a LIBOR-type rate reflects the present cost of deposits in the interbank market. Thus, reference to indices enables to decrease variances of the economic result, which is determined by exogenous variables which are observed in the financial market [Hou, Skeie, 2014].

Taking the key role of indices in the economy into account, market users assume that the informative quality and reliability of indices are high. If, however, the indices are determined on the fragile basis (e.g. declarations and not actual transactions), they are prone to deformation or even manipulation. Therefore, it is important to set out principles based on which the indices are created and implement mechanisms responsible for a relevant quality of the indices to be published. This task has been taken by the European Union, which commenced work on developing the Regulation\(^2\) providing for index valuation principles. The purpose of those actions is mainly to protect consumers. To ensure fair economic trading, it is necessary to decrease asymmetry of information between financial institutions and other participants of the financial market. Thus, to eliminate appropriation in this area, we have to trust a method used to define indices based on which flows of customers’ payables and receivables are calculated.

Unfortunately, during the financial crisis of 2007-2009, financial and currency market indices often lost their basic functions. First, their reliability became questionable because of banks that provided data to calculate the indices were found to manipulate the data. The very index calculation process turned up to be non-resistant to attempts of changing the value of indices in favour of their contributors. That was visible in particular in the case of LIBOR and EURIBOR deposit rates and was mainly caused by money market indices being based on declarations and not actual transactions, which favoured manipulation and decreased manipulation costs for banks defining indices [Abrantez-Metz and others, 2012].

Second, money market indices became distant from their original economic sense. Theoretically speaking, IBOR-type indices\(^3\) should reflect a potential cost of fund acquisition in the interbank market through unsecured time deposits. In practice,

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\(^{2}\) Proposal for a Regulation of the European Parliament and of the Council on indices used as benchmarks in financial instruments and financial contracts, Brussels, 18.9.2013.

\(^{3}\) IBOR (Inter-Bank Offered Rate): a group of indices representing the cost of financing of the best banks in the wholesale market (e.g. LIBOR, EURIBOR, WIBOR).
these indices lost that feature because the interbank market for maturities longer than several days expired [ECB, 2014]. That resulted from loss of reliability of major market players after the fall of Lehman Brothers: drop in trust resulted in the reduction of credit lines, which meant the absence of unsecured financing with interbank deposits [Brousseau and others, 2009]. What is more, the balance-sheet financing model changed: given a need to stabilise the deposit base as a result of more restrictive liquidity regulations, banks focused on acquiring funds from the non-wholesale market at the cost that substantially exceeded IBOR-type rates. A premium in relation to the theoretical cost of interbank deposits resulted from a greater stability of funds acquired from customers and the fact that, in practice, that was the only meaningful source of financing in a long run [Mielus, Mironczuk, 2015].

The situation was additionally complicated by mass collateralisation of derivative transactions. Being afraid of pre-settlement risk (connected with the loss of a positive value of off-balance-sheet items), market players turned to money collaterals of derivatives.

That process was deepened by regulations improving trading security in the unregulated market, i.e. the Dodd-Frank Act (USA) and the EMIR Regulation (EU). In consequence, the cost of financing off-balance-sheet items was an interest rate on deposits established to secure exposures from derivatives. The interest rate was mostly based on an overnight ONIA-type rate, whose average cost is reflected in a long run by OIS contracts. Therefore, the value of derivatives became more dependent on OIS prices than IBOR-type rates, which further weakened the meaning of the existing money market indices [Bianchetti, 2010]. Thus, the instrument whose flows are defined on the basis of an index is not evaluated on the grounds of discount factors determined on the basis of the index [Whittall, 2010]. This contributes to difficulties in creating security strategies and market players being exposed to additional risk factors connected with a relation between yield curves, some of which are not represented by financial market indices [Contiguglia, 2016b].

Summing up, the money market indices neither reflected the cost of financing of the banking sector nor constituted an objective factor discounting future cash flows any more. On the other hand, volumes of “live” instruments based on IBOR-type rates were significant, which meant that the reform of indices might disturb a balance in the financial market. Thus, it was necessary to prepare a process of changes that would

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4 Collateralisation consists in counterparties in the financial market making a commitment to submit mutual deposits.
5 Pre-settlement risk is connected with a potential loss of the positive value of a derivative if the other counterparty in the unregulated market goes bankrupt.
6 Dodd - Frank Wall Street Reform and Consumer Protection Act, 21.07.2010.
7 European Market Infrastructure Regulation 4.07.2012.
8 ONIA (Over-Night Index Average): an index that represents the cost of overnight loans in the wholesale market (e.g. EONIA, POLONIA).
9 OIS (Overnight Index Swap): a derivative instrument that represents an expected average ONIA rate during the term of the contract.
not generate disturbances connected with adjusting the existing indices to new market realities.

The purpose of this article is to show the progress of work conducted by major market stakeholders with regard to the reform of indices and evaluate possible action paths that will enable to stabilise the financial market. Based on the literature and analysis of possible processes, the author verifies the thesis that there is a procedure that enables to reform the indices in a safe way and that the reform is necessary to make the financial market reliable and stable on a long-term basis.

The reform, on the one hand, is necessary because it stems from regulatory changes in the European Union, including a draft Regulation of the European Parliament on indices and recommendations of regulators. On the other hand, there is a risk that the reform will change the economic sense of published indices, which may bring about serious consequences for financial market players. Thus, finding an optimum conversion path is not an easy task.

The process has a great impact on the whole economy, which is dependent on published benchmarks [Duffie, Stein, 2015]. Any disturbance to the value, volatility or divergence of indices in relation to economic values they represent will distort information about actual assets, equity, liabilities and off-balance-sheet items. These items are important elements of the financial system and whole economy. Disturbances that had a negative impact on the reliability of the indices of the financial market in recent years are described in detail below.

**Genesis of the financial market index reform**

As described, the financial market indices are important elements of valuation for many related financial instruments. Therefore, the reliability and resistance of indices to manipulation are factors influencing the stability of the financial market. Unfortunately, after the outburst of the financial crisis of 2007-2009, many index manipulations were proven. These rates, if defined by a limited number of market makers, may be subject to caterilisation\(^{10}\), i.e. agreeing on optimum levels of the indices for entities generating input data.

The investigation conducted by regulators (in the USA and UK\(^ {11}\)) indicated that in the years 2005-2010, banks, operating in cartels and based on bilateral agreements, had manipulated IBOR-type indices. There were two types of reasons for those actions. First, the purpose of the procedure was to influence the index to achieve additional return from financial instrument portfolios. Second, in certain cases, the purpose was to hide actual (increased as a result of the crisis) financing costs [Gandhi and others, 2015].

In addition, the simultaneous investigation of the same regulators in 2013 proved

\(^{10}\) In the financial market, cartelisation means a price fixing in favour of market makers of a given financial market segment.

\(^{11}\) The investigation was conducted simultaneously by the CFTC (Commodity Futures Trading Commission) in the USA and the FCA (Financial Conduct Authority) in the UK.
that in the years 2008-2013, the most active banks in the foreign exchange market had manipulated currency fixing systematically. It was proven that the banks cooperated for the purpose of manipulating reference foreign exchange rates, shared information about their positions, and defined their own trading strategies on the basis of confidential information.

In consequence, local regulators charged the banks for many financial penalties, as presented in Table 1.

It must be noted that a reason for the manipulation was a substantial difference between manipulation cost and expected revenue. Given a declarative character of the rates, it is not difficult to fix the rates at an inadequate level. Costs of rate shifting exist only if the index is based on actual transactions. As, to shift the transaction index, transactions at large amounts must be made, which is exposed to risks and potential losses due to open exposure. In addition, in the narrow group of banks that contribute rates to the index, the banks can agree on the level of the rates, which is particularly easy if quotations are based on the banks’ declarations.

| Bank                     | Penalty (in million USD) |
|--------------------------|--------------------------|
| Deutsche Bank AG        | 2.8                      |
| UBS                      | 2.8                      |
| Barclays                 | 2.8                      |
| RBS & RBS Securities    | 2.2                      |
| Citigroup               | 2.0                      |
| JP Morgan                | 1.6                      |
| Rabobank                | 1.1                      |
| HSBC                     | 0.6                      |
| Lloyds Bank              | 0.4                      |
| Bank of America         | 0.2                      |
| **Total**               | **16.5**                 |

Source: Login, Strucka [2015].

In turn, if large instrument portfolios are based on an index, potential benefits from index shifting constitute a great temptation, which is in favour of that procedure. A slight change in the value of an index contributes to a significant change in the value or settlement amount of the transaction. The investigation proved a conflict of interest where entities quoting money market interests had been awarded for revenues in their interest-rate related portfolios.

The threat of index manipulation resulted mainly from the weakness of processes connected with quotation for fixing purposes and the absence of relevant control over the processes. At the same time, that was not in favour of the stability of the financial market because the informative value of indices weakened and the risk of bank customers’ losses increased. Unauthorised profits of the banks coming from index manipulation resulted from the asymmetry of information between market animators.
and bank customers and had an adverse impact on the reliability of the financial market.

Index manipulation had also consequences for the economy in the wider context. As far as a change in the value of derivatives applies mostly to financial institutions and large corporations, a change in the value of balance-sheet instruments (i.e. bonds and loans) may contribute to losses to be suffered by consumers and small enterprises. In that case, a negative change in the valuation and value of financial flows is fully allocated to the customer because the customer is a final product recipient and not an intermediary.

Index manipulation clearly reflects the ineffectiveness of financial market index determination. The ineffectiveness also results, however, from structural reasons. We have been observing structural changes in the money market since the outburst of the financial crisis. Before 2007, IBOR was a marginal cost for the banking sector, which financed its operations from the non-wholesale market below that rate. In addition, before the crisis, IBOR-type rates were close to OIS contract prices, which meant that market players found short-term credit risk and liquidity risk as relatively small. At present, the relation of those prices is different. First, banks finance their operations from the non-wholesale market at a cost that substantially exceeds IBOR-type rates. Second, OIS contract prices are much below IBOR-type rates because of high credit risk generated by banking institutions and an increased cost of term liquidity. The changes are presented in Table 2.

Table 2. Average deviation of prices of deposits and OIS contracts from an IBOR-type index in base points

| Country   | 2005-2007 Spread B2C | 2011-2014 Spread B2C | 2005-2007 Spread OIS | 2011-2014 Spread OIS |
|-----------|----------------------|----------------------|----------------------|----------------------|
| Germany   | -38                  | 14                   | -5                   | -20                  |
| Sweden    | -66                  | 51                   | -1                   | -31                  |
| Poland    | -79                  | 37                   | -16                  | -43                  |

*The calculations are based on a mean for 3M and 6M of Thomson Reuters, Bloomberg, Bundesbank, Riksbank, NBP, SMRP.
* B2C (Bank-to-Client): a market of customer deposits including a corporation and retail segment.

Source: Mielus, Mironczuk [2015].

The change in the banks’ financing cost does not result directly from index unreliability, but it is not in favour of the verification that the money market indices constitute the marginal financing cost of the banking sector. Before 2007, the IBOR-type index reflected the cost of interbank loans. Because of high creditworthiness of banks being members of the IBOR rate panel, the rate was much higher than retail financing and similar to the expected cost of overnight loans (represented by OIS contracts).

As a result of the outburst of the financial crisis, two simultaneous phenomena appeared. First, the reliability of financial institutions decreased, which was reflected by a growth in credit spreads. Second, the financing cost in a long run grew, which
contributed to an increase in liquidity premium (compare: Taylor [2009]; Michaud, Upper [2008]). As a consequence of these two overlapping processes, IBOR rates commenced being quoted at a level that diverged both from the financing cost of the banking sector (represented by deposits of corporations and deposits of retail customers), as well as the expected cost of overnight liquidity (represented by OIS contracts). Therefore, IBOR rates lost their informative value from before the financial crisis. At the same time, the formal definition of the rate did not change. It determined the theoretical level of prices of unsecured interbank deposits and was still used as a basic index for defining the stream of interest payments (for loans, bonds and derivatives).

Defining the size of an underlying market which the index results from and a reference market which is influenced by the index is an important element of the analysis of the meaning of financial market indices. The underlying market is a market of instruments based on which fixing participants determine the value of an index. For currency fixing, the underlying market is an interbank currency market and for money market indexes, this is an interbank market of unsecured deposits. In turn, a reference market is a market of instruments whose value is determined on the basis of an index. For the currency market, these will be, for example, currency forwards and for the money market variable-interest loans, variable-coupon bonds, and interest rate swaps.

In the money market, there is divergence between the underlying market, which is theoretically a source for determining an index level, and the reference market, i.e. a set of instruments that are evaluated on the basis of the index. For example, a 3M USD LIBOR is an index that determines an amount of flows in derivatives of USD 100 thousand million, and WIBOR (for all terms) is used as an index for around PLN 6.5 thousand million of derivatives and over PLN 600 billion of loans and bonds. At the same time, a relation between a daily turnover on derivatives index to 3M USD LIBOR to a daily turnover on 3M deposits is around 1000. For (1M, 3M and 6M) WIBOR, this relation is three times greater (compare: Table 3). Thus, the small underlying market determines the large reference market, as a result of which banks-panelists are tempted to influence the reference rate in order to optimise their result on the portfolio of derivatives.

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12 It is worth noting that in other markets (currency market, securities market, merchandise markets), divergence between the underlying market and reference market is much smaller because of higher liquidity of the underlying market. This is a result of a smaller credit risk in those market in comparison with the money market.

13 This means an amount equal to $10^{14}$, compare: Duffie, Stein [2015, p. 18].
The divergence weakens the reliability of the rates because of the loss of reference to economic values that the index represents. This allows for greater manipulation of index value and may translate into a change in the valuation of portfolios of loans and derivatives recorded in the balance sheets of banks and bank customers. At the same time, the value of the index that determines streams of payments in derivatives securing the market players’ risk is likely not to correspond to the value of the secured instruments. This results from the fact that the index based on declarations and not on data observed in the market is much prone to divergence from the actual economic value. The small underlying market limits the possibility of the verification of the declared rate\textsuperscript{14}. This is a problem not only for customers, but for banks-panelists, as well, as the banks do not have a relevant point of reference to declarations they make.

Thus, in the money market, we are observing three simultaneous phenomena:
1. Indices calculated on the basis of declarations and not actual transactions are not resistant to manipulation.
2. Indices based on interbank time deposits do not represent the financing cost of the banking sector any more.
3. There is divergence between the size of the underlying market, based on which the index is determined, and the size of the reference market, which is evaluated on the basis of the index.

This means that the indices must be reformed fast in order to bring their representativeness and reliability back. At the same time, the process of changes may not have a negative impact on the stability of the financial market.

Consequences of maintaining non-transparent indices are serious and have many aspects. We can break them down into four categories of risks:
1) influencing transactions between a bank and the bank’s customers;
2) influencing the interbank market;
3) influencing relations between banks and regulators;
4) influencing the market risk of financial institutions.\textsuperscript{14}

\textsuperscript{14} Rate verification is called backtesting, compare: Wibor Council [2015].

| Table 3. Turnover and volume of instruments indexed with IBOR-type rates |
|---------------------------------------------------------------|
| | USD LIBOR 3M (in USD) | WIBOR 1M, 3M, 6M (in PLN) |
| Daily turnover from interbank time deposits | 1 billion | 8.2 million |
| Daily turnover from rate-indexed derivatives | 1.15 thousand million | 23.5 billion |
| Nominal of open rate-indexed derivatives | 100 thousand million | 6.5 thousand million |

Source: IBnGR [2015].
In the first risk category, an interest of a retail customer that is subject to protection must be taken into account. If the index is manipulated or defined at an economically inadequate level, the customer may suffer losses (e.g. an increase in credit interest payments or a decrease in revenues from bond coupons). This exposes the bank to penalties to be imposed by the regulator (in Poland, the Office for Consumer and Competition Protection) and generates a litigation risk (if the customer files a claim with a court). In consequence, the reliability of the financial market may be questioned, which may threaten market stability. This is connected with the fact that the volume of retail index-based transactions has a significant share in the gross domestic product\(^\text{15}\).

In the second risk category, we have to take into account transactions between residents and non-residents made on the basis of ISDA master agreements\(^\text{16}\). Those agreements contain clauses based on which transactions may be terminated if their economic character is substantially changed. One of premises for applying such a clause is the violation of the continuity of a financial market index based on which transactions between parties are made. In the case of the Polish market, if such a risk materialised, this would bring about serious economic consequences. Polish banks secure their foreign exchange assets (connected mainly with CHF mortgage loans) with CIRS transactions\(^\text{17}\). The transactions are WIBOR indexed, among others. Thus, any violation of the reliability of WIBOR could result in terminating the transactions and the Polish banks being unable to refinance their currency portfolios, which would expose them to significant losses [Contiguglia, 2016a].

In the third risk category, banks taking part in index determination can be accused of manipulation by the regulator. The probability of such an accusation is high if indices are determined on the basis of an expert evaluation and not the actual transactions. In the case of the money market, in practice, there are no unsecured interbank time deposits based on which the value of the index could be verified. Thus, the cost of proving that the quoted index is correct is high. The probability of manipulation decreases if the index is based on actual transactions. To make such an operation, the definition of the index must be, however, widened, which will expose the financial market to perturbations connected with the changed economic character of the index [Contiguglia, 2016c]. The solution of that problem is discussed below.

The last risk category covers basis risk. Basis risk is defined as a risk of security mismatching resulting in fluctuations in the economic result. If money market indices are not adequate, the risk is reflected by a divergent rate of growth of the value of the bank’s assets and liabilities. The bank finances its operations with short-term fixed-

\(^{15}\) In Poland, retail loans based on WIBOR constitute around 16% of GDP.

\(^{16}\) International Swaps and Derivatives Association Master Agreement.

\(^{17}\) CIRS (Cross-currency Interest Rate Swap: a currency swap which enables to borrow an A currency based on a pledge on a B currency for a long term. In the market, CCBS (Cross Currency Basis Swap) prevails. In this variant of CIRS, interest on borrowed and invested currencies is based on a variable IBOR-indexed interest rate.
rate deposits. At the same time, the bank grants long-term loans based on a variable rate based on an IBOR-type index. The basis risk exists if the financing cost (i.e. interest rate of deposits accepted) is not equal to interest income from loans granted. This takes place if the IBOR-type rate does not represent the financing cost of the banking sector, which has been the case since the outburst of the financial crisis of 2007-2009 [Osborn, 2016].

The risks have an adverse impact on the stability of the banking sector and the reliability of the financial market. Therefore, despite of its relatively narrow scope, the reform of money market indices is important to ensure relevant conditions for the development of the national economy.

**Changes suggested by regulators and index administrators**

Simultaneously to the actions penalising manipulating the indices, the work on regulations aimed at preventing such a situation in future was commenced. The process of changes was commenced by the Wheatley Commission’s report [2012], which was followed by a document of a working group of the Bank for International Settlements [2013], and recommendations of the EBA/ESMA\(^{18}\) [2013] and IOSCO\(^{19}\) [2013]. The European Parliament prepared a draft Regulation on the reform of indices, as amended [2013], and the Financial Stability Board published a comprehensive report [2014] based on the work of the Market Participants Group [2014] and IOSCO [2014].

Thus, the regulators have made an attempt to reform the indices motivated by two basic goals. The first goal is to make the index more resistant to manipulations, which distorted the published rates in the past many times. The other goal is to make the rate more representative and adequate for the purpose of financial instrument valuation. All reformers believe that both weaknesses of the indices can be make up for if the character of the index is changed from declarative to transactional. In the currently used declarative method, index administrators collect declarations of quotations from banks which are panelists of a given index. The declarations do not need to be reflected in the actual transactions. In turn, the transactional method would be based on actual deposit prices, which would make a given index more reliable.

The most important question the reformers asked concerned the identification of economic variables that the index represents. These variables already changed in the past. For example, for LIBOR till 1998 the panelists indicated a rate that, in their opinion, was offered to banks of the highest credit ranking. After 1998, the banks started indicating an interest rate of a potential deposit opened with a contributor. Thus, the definition of the interest rate from “offered” to “hypothetically transactional” was changed, which did not change the purely declarative nature of the

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\(^{18}\) EBA (European Banking Authority): supervision over the banking sector in the EU; ESMA (European Securities & Markets Authority): supervision over the financial market in the EU.

\(^{19}\) IOSCO (International Organization of Securities Commissions).
rate. The present LIBOR administrator suggests that the rate should be determined on the basis of actual transactions made in the unsecured wholesale market [IBA, 2015c, p. 28-29].

In the case of money market indices, these actions aim at increasing the adequacy of the indices used to evaluate balance-sheet and off-balance-sheet items. The reformers call for creating new reference rates that would better match the economic character of contemporary instruments. This could be achieved through so called index bifurcation, i.e. splitting the currently quoted declarative IBOR-type indices into two transactional indices [Brousseau and others, 2013]:

1. IBOR+ based on the cost of funds accepted by banks, i.e. defining an implied cost of the bank’s liabilities, this index would be used to evaluate balance-sheet items (loans and bonds);
2. RFR (risk free rate) based on interest rates that are most close to risk free rates; this index would be used to evaluate off-balance-sheet items (derivatives).

The suggested bifurcation corresponds to the described structural changes that we are observing in the money market. Given deepening divergence between the actual financing cost of banks and reference indices, it is recommended to introduce a rate that would represent that cost. The rate would reflect an average cost of liabilities of a strictly defined type related to banking institutions that are credit homogeneous. Thus it would refer to the same panel of banks, but it would represent the actual interest cost of liabilities. This goal may be achieved through expanding the base of deposit prices based on which the index is determined with deposits opened by non-banking entities (mainly financial institutions, corporations and large customers of private banking). Such an action would be justified by the aforementioned disappearance of unsecured funding in the interbank market for terms longer than several days and an increasing share of non-wholesale funding in the banks’ balance sheets.

In addition, to reflect the value of off-balance-sheet instruments, it is recommended to implement a separate rate without a credit risk and liquidity risk component. In that case, an argument for introducing the free risk rate is common discounting of cash flows from derivatives with an OIS rate for the purpose of reflecting the actual financing cost of off-balance-sheet items. The free risk rate could be based on OIS transactions because their level represents an expected cost of overnight loans and deposits used to secure pre-settlement risk of derivatives bear an interest rate that is mainly based on the ONIA-type index.

In practice, the conversion of financial market indices is coordinated by index administrators. For two key benchmarks: LIBOR and EURIBOR, these are respectively: ICE Benchmark Administration Ltd. (IBA) and European Money

20 On 16 June 2010, the most important central counterparty, LCH Clearnet, announced that a swap discounting method would be converted from IBOR rates to OIS rates; http://www.lchclearnet.com:8080/member_notices/circulars/2010-06-15.asp

21 ICE adopted LIBOR on 1 February 2014 from the previous administrator, BBA.
Based on consultation documents published by the administrators, let’s have a look at major assumptions of the reform to be implemented thereby.

The first element in the reform is defining the index. The target definition is composed of two elements: representation and methodology. Representation (underlying interest) is defining a reference asset whose value is determined by the index. In turn, methodology refers to data collection and index calculation techniques.

Before the crisis, money market indexes were represented by unsecured time interbank deposits opened between institutions of top credit rating for defined amounts and standard maturities. In turn, the methodology was limited to calculating an arithmetical mean of declared quotations of banks being members of the panel (so called rate contributors), subject to cutting marginal quotations. As a consequence of events resulting from the financial crisis, both elements of the index definition became unreliable. The representation turned up inadequate because the underlying market of unsecured time deposits disappeared. In turn, the methodology was exposed to manipulation because the contributors could declare rates inconsistent with their actual financing cost and agree with other panelists on shifting quotations in accordance with the interest of banks-panelists.

To meet regulatory requirements set out in the draft Regulation of the European Parliament and many recommendations and publications of the regulators, the administrators started preparing details of conversion details related to the definition of indices. At the same time, they focused on the assessment of consequences of the suggested changes for financial market stability. The whole process is regularly consulted with market players and final solutions are developed through consensus based on the outcome of questionnaires and consultation with key stakeholders (i.e. not only contributors, but index users and regulators, as well).

Conclusions resulting from the analysis of documentation published by the administrators (IBA and EMMI) are as follows:

1. As a result of their declarative character, indices are exposed to manipulation and do not reflect market realities. The quality of indices can be improved if quotations are based on the actual transactions.

2. The problem of index conversion to indices based on transactions is the absence of a sufficient database of unsecured interbank deposits for 1M, 3M and 6M because this market segment has permanently lost its liquidity. An alternative is expanding the scope of the transactions. It is possible to widen the base of transactions with securities issued by banks (deposit certificates and commercial papers)23. As regards participants, it is recommended to incorporate funds from

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22 EMMI adopted EURIBOR on 20 June 2014 from the previous administrator, EBF.
23 In the opinion of market players, the database does not need to be widened with secured transactions (repos and currency swaps) because the economic character of those transactions is different; compare: EMMI [2015a, p. 6] and IBA [2015b, p. 40]. In turn, the base of entities must take into account the wholesale character of transactions (e.g. by introducing a minimum amount of
non-banking entities (financial institutions and large corporations).

3. The present definition of indices does not reflect the actual financing cost. To improve that, the base of prices should be expanded with interest rates of deposits from non-banking entities, which constitute the main source of liabilities for the banking sector\textsuperscript{24}. As a result of such a solution, the economic character of the rate can change (the rate may be shifted up because banks finance their market operations above the IBOR-type rate and variance may increase because of volatile liquidity needs of banks and bank customers). An advantage will be the reference index getting closer to the actual marginal financing cost.

4. The modified definition of the index means a change in the index calculation methodology. Declarations will be replaced with a waterfall mechanism, which consists in defining a rate on the basis of eligible transactions or, where there are no eligible transactions, expanding the file with other sources of data\textsuperscript{25}. In exceptional circumstances, if there are not transactions, a declaration of an implied rate based on a subjective and documented expert judgement will be admissible. The very value of the rate is to be determined on the basis of the VWAR (volume weighted average rate) method, i.e. as an average weighted by the nominal value of transactions used in index calculation. The use of transactional data means that the time of index publication will be postponed to the business day following the day on which the data is collected.

5. Data to the index may be contributed in two different ways. In the first method, (as preferred in the EMMI’s documents), panelist would provide quotations in the same way as today (banks would send one figure based on input data, which would be kept with the bank and would be available \textit{ex post} for verification purposes). In the second method (as promoted by the IBA), the administrator would be in charge of the whole calculation of the index based on transactions and other input data sent by panelists (which supports data consistency and reliability and enables \textit{ex-ante} verification).

6. The suggested change in the representation and method may result not only in shifting the rate, but to increasing rate variance and distribution function\textsuperscript{26}. Variance could be limited by eliminating marginal quotations, making input transaction parameters more flexible, and implementing smoothing techniques\textsuperscript{27}.

\textsuperscript{24} This is consistent with a demand reported by Brousseau and others [2013] for developing a TCPI (total cash pool index), which would reflect the total averaged financing cost of the banking sector.
\textsuperscript{25} The IBA suggests interpolation and extrapolation techniques, as well as yield curves correlated with the LIBOR curve; compare: IBA [2015b, p. 10-11].
\textsuperscript{26} In the opinion of the EMMI, a standard deviation of the new index will be 3-5 times greater than today; compare: EMMI [2015a, p. 23].
\textsuperscript{27} Some suggested solutions in this area are among others: a) a trimmed mean, which eliminates outliers or a median upon the removal of marginal percentiles; b) expanding the range of input deposit commencement and termination dates (i.e. fixing a wide range of maturities for a given tenor); c) using an rolling average of several business days of decreasing weights for more remote observations,
7. A key assumption is to maintain the credit homogeneous collection of contributors in order to ensure the optimum quality of the published rate.

8. The conversion should influence neither contracts made in the financial market nor the economic value of open transactions. The conversion should consist in modifying the present index by changing its methodology and not replacing the present index with a new index (so called seamless transition). A key aspect of the conversion is to avoid a substantial change that will interfere in terms and conditions of transactions made in the financial market, i.e. implementing the MAC (material adverse change) clause used in ISDA MA contracts, which define rights and obligations of counterparties in the market of derivatives.

These conclusions are based on the analysis of available time series and stakeholders’ opinions submitted during consultations [EMMI, 2015a; EMMI, 2015b; IBA, 2015a; IBA, 2015b; IBA, 2015c]. These are assumptions for the reform, which will be preceded with tests of the new methodology at the preproduction stage. The chance must be accepted by regulators, which, in the light of the Regulation of the European Parliament, licence the administrators and indices.

A discussion on opportunities and threats connected with the suggested conversion of indices in the financial market is presented below.

**Is there an optimum conversion path?**

Based on demands made by the regulators and proposals of changes planned by the administrators of key indices, let’s think what conversion path will ensure that the goals of the reform will be achieved without the risk of financial market destabilisation being generated. In order to respond to this question, we will define major goals of the reform and potential risks arising from inadequate index modification.

The major goal of the index reform is increasing the reliability of indices by decreasing their susceptibility to manipulation and by making them more connected with the basis market. This goal may be achieved if contributors connect index quotations with actual transactions. The problem is that there are no adequate transactions that meet the present definition of money market indices. Therefore, the transaction base must be expanded both with customer segments, as well as other types of instruments.

Expanding the base of customers would mean leaving the interbank market and incorporating prices of customer deposits in the bases of transactions used to determine an index. As the meaning of wholesale financing in the balance sheets of banks has been decreasing, such expansion would have to cover not only non-banking financial institutions, but non-financial customers, i.e. corporations and retail entities, which will reduce index volatility; compare: EMMI [2015a, p. 13].

An alternative is a “hard” bifurcation to completely new IBOR+ and RFR and maintaining the present IBOR as an index entailing from the above rates with a fixed spread; compare: EMMI [2015b, p. 5].
as well. As already mentioned, the cost of liabilities accepted from entities from outside the financial sector is greater because of a bigger stability of the deposit base (greater probability of deposit extension because of customer inertion).

In turn, expanding the base of transactions is connected with incorporating not only unsecured deposits, but debt securities (bonds, deposit certificates) and some secured deposits, as well (including a price correction stemming from a premium for smaller credit risk).

However, the change of the basis used to calculate the financing cost generates a risk of a change in the economic character of the index, which is reflected by the structural shift of index level and an increase in variance. As a consequence of the change of the economic character of the index, derivative transactions indexed to a reference rate may be terminated (for off-balance-sheet instruments, by the use of the MAC clause) and the interest of customers being borrowers based on a variable rate or investors in variable-coupon papers (i.e. balance-sheet products) may be violated. The violation of agreements with retail customers means a serious infringement of competition rules, which entails a negative reaction of the regulators (in Poland, KNF and UOKiK).

In the light of the present literature, there are two solutions protecting against such a scenario [Duffie, Stein, 2015]:
1. Evolution solution which consists in a moderate transformation of the definition of an IBOR rate to make it based, to a greater extent, on transactions without prejudice to legal continuity and stability of the economic character;
2. Creating an alternative index which would be quoted simultaneously to the present index.

The first solution is safe for the stability of contracts made in the financial market, but it may be infeasible if the change of the methodology has a material impact on the level and variance of the new index. In addition, if there are no relevant transaction bases which guarantee the stability of market parameters of the modified index, the evolution solution cannot be implemented. In turn, the second solution protects open contracts against a change in their economic character, but it delays the implementation of the reform because only new transactions can be based on the reformed index. Taking into account, however, the natural termination of open transactions based on the old index, in several years the majority of open positions will be already based on the reformed index. In addition, the new and old indices will converge, which will allow for stabilising a spread between them and, in a long run, implying the old index from the new one fully based on the modified methodology.

Index convergence may be compared to the replacement of currencies of the European Currency System with euro in the 90s of the twentieth century. Foreign exchange rates were then stabilised in the system and a fixed foreign exchange rate was defined and used as a basis for the conversion to euro on 1 January 1999. In the case of indices, a model where new indices will operate together with old ones can be developed and a spread (difference) between the indices can be monitored. In the longer period, the spread should stabilise, which will allow for evaluating the old
index on the basis of the new index in accordance with a strictly defined formula. Ultimately, the old index can be interconnected with market rates and banks being panelists will no longer have to contribute rates to the old index. At the same time, the legal continuity of the old index in open contracts (credit facility agreements, letters of issue for bonds, master agreements for derivatives) will be maintained and clauses stopping the transactions made will not be used. This will not stop voluntary conversion of an index set out in the contracts into new indices based on amendments to the contracts agreed by the parties.

Table 4 summarises open issues connected with the reform of money market indices.

Table 4. Problems to be solved in connection with the reform of money market indices

| Problem                        | Existing situation                                                                 | Issues to be solved                                                                 |
|-------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Change in index definition    | Most indices are based on declarations. Indices are planned to be based on prices of actual transactions. The change of the definition may change the level and variance of the index. | The old index may be converted into a new one in two ways: by replacing without prejudice to legal continuity or by quoting the old and new indices at the same time. |
| Disappearing underlying market | In the market, unsecured interbank deposits longer than 1 week are missing. The market finances its operations by the use of non-bank deposits and secured deposits. | Expanding the base market for the index increases the economic reliability of the index and, on the other hand, changes the present definition and influences the economic character of the index. |
| Decreasing number of panelists | For Euribor, in the years 2012-2015, the number of panelists decreased from 44 to 23. Declarations must be economically reasonable and adequately reported and archived, which generates risk and costs. | If the index is based on actual transactions, panelists' legal risk will decrease. |
| Change in the use of present indices | IBOR-type rates are not used to discount flows. | Introduction of RFR used both to calculate and discount flows in derivatives. |

Source: own study based on IBA and EMMI materials.

Summing up, market observers find open issues which delay the implementation of the reform, but they do not exclude the reform. Undoubtedly, the present construction of indices is not resistant to crisis and we have observed many evidence for that in recent years. Thus, we have doubts not about the reform of indices, but the detailed procedure and schedule of changes. Banks being panelists that quote the rates, index administrators, regulators and main index users must reach a consensus on the target shape of the reform. The purpose of the consensus is to develop a solution that will make the published rates reliable and connected with instruments they represent so that they effectively protect against market risk without generating additional threats [Becker, 2016].
Conclusion

The ineffectiveness connected the microstructure of the financial market can have a negative impact on the whole economy. In this context, the implementation of the Regulation of the European Parliament on indices used as benchmarks in financial instruments is a key issue for the stability of the financial market. The article highlights potential threats arising from the present imperfection of the money market and money market indices. The discussion on the suggested paths of the financial market index reform aims at counteracting negative processes, which constitute a threat both to the banking sector and customers.

Financial market indices play an important informative and stabilisation role for the economy. They constitute the basis for defining the stream of receivables and payables both for balance-sheet instruments (loans, bonds) and off-balance-sheet instruments (derivatives). These instruments provide financing (i.e. a tool to manage liquidity) or secure against market risk (hedging). Thus, the reliability and adequacy of the indices is a key issue for the stability and effectiveness of the financial market.

As a result of index manipulations during the financial crisis of 2007-2009, the regulators took initial actions to punish the perpetrators and tighten the system of quotations to make it more resistant to non-market distortions. Those actions focused on three areas that are crucial for indices: panelists, administrators, and the very construction of the index. As far as the repair of processes related to panelists and the reconstruction of administrators for most global indices are approaching to an end, the reform of the index consisting in the change of the index calculation method is still ahead of us. This change is enforced by the Regulation of the European Parliament, which will come into force soon.

The regulators stimulate the reform of indices because they realise that they are in the public interest of the economy and their correct operation determines the liquidity and reliability of financial instrument trading. As correctly indicated by Duffie, Dworczak and Zhu [2014], a good index offers three social benefits:

• decreases an asymmetry of information between banks and bank customers, which reduces a risk of abuse and a cost of market information acquisition;
• increases the effectiveness of the financial market through transparent evaluation of index-based financial instruments;
• contributes to the growth of the liquidity of the market based on homogeneous indices, which cumulate turnover and better protect against market risk.

Apart from benefits that are important from the point of view of legislators acting in the interest of customers, the reform is also in favour of banks. As indicated by Brousseau, Chailloux and Durre [2013], banks created a great risk of discrepancies between the published LIBOR and real financing cost, as a result of which asset and liability management is ineffective. On the one hand, LIBOR stopped reflecting the marginal financing cost of banks and, on the other hand, it did not match expected current financing cost. The marginal financing cost of banks reflects the cost of new deposits accepted for longer periods. In turn, the expected current financing cost
reflects overnight rates. As explained herein, after the financial crisis, both costs are beyond the curve of IBOR-type rates. As the reference rate is divergent in relation to the actual cost of balance-sheet and off-balance-sheet instruments, this generates an economic risk of the growth of uncertainty about net interest result. Interest result becomes unstable because of divergence between the index used to calculate interest on assets and the realised cost of liabilities. In the banking sector, this contributes to the basis risk, which results from a different rate of growth of the cost of liabilities, revenue from assets and instruments used to hedge the bank’s portfolio.

The index reform, consisting in recovering the economic sense of the index by changing the calculation formula, will minimise the basis risk. The index based on a wide spectrum of deposit transactions better reflects banks’ actual financing costs and becomes a representative of the marginal cost of money in the banking sector.

The above is particularly important for the Polish market, where most long-term loans are based on a variable rate. As since 2008 (because of the disappearance of the interbank market), banks have been financing their operations mainly from the non-financial market at a cost exceeding WIBOR, we have been observing divergence between revenue from assets (WIBOR-indexed loans) and liabilities (fixed short-term rate above WIBOR). This may contribute to the deterioration of net interest result, in particular in the environment of decreasing interest rates. The index conversion to an index based on actual deposit prices would eliminate the basis risk in the banking system and the volatility of the banks’ interest result.

Finally, it is worth pointing out that, although the construction of WIBOR makes this rate less susceptible to manipulation than in the case of LIBOR and EURIBOR [ACI, 2014], the index publication is based on declarations made by banks-panelists and not on actual transactions (which, as mentioned, practically do not exist in the interbank market for periods of more than 1 week). Therefore, if the index were based on actual transactions and the transaction base would be supplemented with non-banking transactions, the index would better reflect the actual financing cost of the sector.

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