

VESNA MARTIN¹

E-mail: martinV0803@hotmail.com

INTEREST RATE BENCHMARK REFORMS IN EURO ZONE AND UNITED STATES²

JEL CLASSIFICATION: D47, E43, E58, G21

ABSTRACT:

The aim of this paper is to analyze the process of implementing reforms in the bank lending market and its consequences. During the global financial crisis of 2007/2008, there was a decrease in confidence and thus a decline in the turnover in the bank lending market. Consequently, the benchmark interest rates did not present the conditions for lending funds between banks, but were a reflection of manipulative actions by participants. This reduced liquidity in the bank lending market, as well as the unreliability of the methods of calculating benchmark interest rates, became a source of financial vulnerability and endangering the stability and security of operations for all participants in the financial market. For this reason, in 2012, the process of reforming benchmark interest rates at the global level began, which represents the most significant change in the global financial market in recent history. The reforms were implemented with the aim of increasing transparency in the calculation of benchmark interest rates, which increases their reliability of calculation and prevents the possibility of manipulation while protecting investors and users of all financial services. Of great importance is the analysis of the consequences of benchmark reforms and the impact on all participants in the financial market.



KEYWORDS:

BENCHMARK INTEREST RATES, INTERBANK LENDING MARKET, CENTRAL BANK, CREDIT ACTIVITY

1 National Bank of Serbia, Kralja Petra 12, 11000 Belgrade, Serbia

2 The views expressed in this paper are those of the author, and do not necessarily represent the official view of the National Bank of Serbia

1. INTRODUCTION

The interbank lending market is a market in which banks lend money to each other for a certain period of time, whereby lending can be unsecured or secured. The term of transactions can be from overnight borrowing (transaction where the repayment period is until the end of the next working day from the day of its granting) to loans with longer maturities (a transaction that has a longer repayment period than the repayment period of the overnight loan). A panel of first-class banks that offer loans in a certain currency participate in the work of the interbank lending market. The central bank publishes data on benchmark interest rates from the interbank lending market on its website every working day, as well as on the electronic services Reuters and Bloomberg in order to inform all interested parties.

The importance of monitoring the movement of benchmark interest rates on the interbank lending market stems from the timeliness of noticing potential instabilities. Namely, any increase in benchmark interest rates on the interbank lending market may indicate a lack of liquidity in that part of the market and give a clear signal that the central bank should act with monetary policy instruments to provide the necessary liquidity. This can be achieved through the organization of direct repo operations for the purchase of government securities, bilateral operations for the purchase of government securities, as well as through the approval of loans to maintain the daily liquidity of banks. The rise in benchmark interest rates may also be due to the bank's perception of potential financial instability, which may be reflected in the decision of the bank to retain excess liquidity and thus not participate in lending these funds on the interbank lending market. The opposite happens in the case of lowering benchmark interest rates on the interbank lending market when there is an excess of liquidity and the need for the central bank to withdraw that excess liquidity by applying reverse repo operations. Thus, the central bank has the necessary flexibility in the use of monetary policy instruments in order to ensure the smooth transmission of the monetary policy mechanism, while maintaining adequate liquidity for the banks. Commercial banks use benchmark interest rates from the interbank lending market to form the price of loans for individuals and legal entities, and thus the movement of these rates also affects lending activity. The central bank uses the short-term interest rate as the main instrument in conducting monetary policy, with the aim of achieving price stability (Kosanović, 2021), and by adjusting the rate the central bank changes the market interest rate on loans (Mihajlović and Marjanović, 2019).

The aim of this paper is to present the reform of benchmark interest rates in the euro area and the United States. In the period before the global economic crisis of 2007/2008, there was a decline in confidence in the interbank lending market and a decrease in liquidity, which reduced the volume of turnover in this market. Thus, the benchmark interest rates to a lesser extent reflected the situation in that part of the market and were to a greater extent the subject of manipulative actions of its participants. Through the reforms of benchmark interest rates, efforts are being made to achieve greater transparency in the publication and calculation of these rates, to reduce the possibility of their manipulation, and also to protect investors and consumers of the financial services.

This paper is structured as follows. The introduction is followed by a review of the literature. The third part of the paper analyzes the reasons for the reform of reference interest rates, while the fourth and fifth parts of the paper are dedicated to the reform process in

the euro area and the United States, respectively. The sixth part of the paper deals with the consequences of the benchmark interest rate reform, while the main points of this paper are summarized in the conclusion.

2. LITERATURE REVIEW

There are numerous papers published on the subject of benchmark interest rate reforms and the reasons which had led to rates manipulations in interbank lending rates. During the global financial crisis, no bank wanted to be less creditworthy compared to its competitors, because that would increase its financing costs. On the other hand, the reason for the manipulation of benchmark interest rates was the effort of banks to make a profit in derivative positions that are tied to those rates. In this way, bankers mutually agreed and provided biased data related to benchmark interest rates (Duffie and Stein, 2015).

The process of implementing reference interest rate reforms and designing those rates is not an easy task. According to Schrimpf and Sushko (2019), a well-designed reference interest rate should have several features, among which stand out: (1) to provide an accurate calculation of money market interest rates; (2) to represent benchmark interest rates for financial contracts outside the money market and (3) to be used as benchmark interest rates for term lending and financing. When it comes to modeling interest rates there are two types. The first is the model of short-rate, which represents the modeling of interest rates in a short period of time, and the second is the model of the whole term structure, which refers to the entire maturity structure of interest rates (Vojtek, 2004).

In February 2013, the Financial Stability Board (FSB) received mandates from the G20 to promote the process of reforming benchmark interest rates, while in July 2014 the FSB published recommendations related to strengthening interbank offered rates (IBOR), especially in linking these rates to real transactions, as well as to identify risk-free rates (RFRs) as an alternative to IBOR rates (Scaringi and Bianchetti, 2020). For the reform of benchmark interest rates to be successful, according to Guggenheim and Schrimpf (2020), there needs to be a broad acceptance of RFRs, especially in the credit market. The mentioned authors analyzed the reform of LIBOR (London Interbank Offered Rate) and pointed out that for the reform of that interest rate it is better to use RFRs themselves, and not RFRs based on derivative products. However, it is necessary to point out the differences that exist between IBORs rates and RFRs. Bos (2019) indicates that the maturity of these rates is different - while RFRs are overnight interest rates, IBOR rates have maturities of up to one year. There is also a difference in the risk premium. While RFRs are almost risk-free interest rates because they are calculated on the basis of market transactions, IBOR rates are quoted on the interbank market where credit risk is present, which is one of the components of the total risk premium. Another alternative for IBORs are alternative reference rates (ARRs). Köllmann (2020) points out that there is a difference between IBOR rates and ARRs. Both rates are based on historical data, but there is a difference in the significance of these historical data for calculating rates. While IBOR rates are based on panel bank quotations, ARRs are based on concluded transactions.

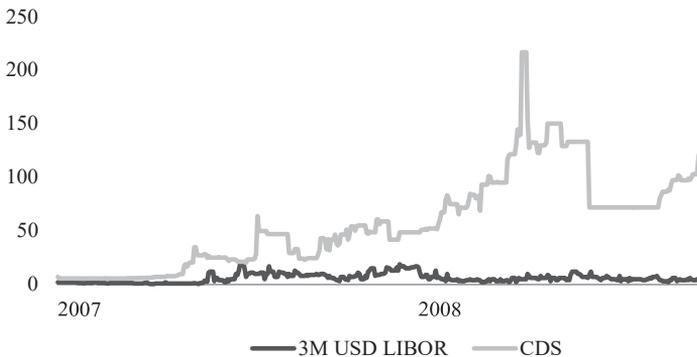
According to Siboulet et al. (2018), the transition of benchmark interest rates should include an assessment that refers to the consideration of all financial instruments affected

by these interest rates, then to analyze the financial exposure, as well as the impact on systems and work processes and define a risk reduction strategy. Apart from this Albanese, labichino, and Mammola (2021) indicate that the reforming benchmark interest rates need to be implemented in order not to jeopardize the financial stability or resilience of the financial system. The next part of this paper is going to analyze the reasons for benchmark interest rate reforms.

3. REASONS FOR BENCHMARK INTEREST RATE REFORMS

During the global financial crisis of 2007/2008, many banks manipulated the value of interest rates at which they were willing to borrow or lend funds in the interbank lending market. Thus, benchmark interest rates reflected the manipulative actions of bank representatives, rather than market movements. As a result, the representativeness of their calculation is threatened, and these rates have become unreliable and have affected the reduced liquidity in the international financial market. Regulation (EU) 2016/1011 of the European Parliament and of the Council of 8 June 2016³ indicate that benchmark interest rates are vital in the valuation of cross-border transactions, thus affecting the efficient functioning of the market in which a large number of financial instruments and services are traded. Many benchmark interest rates are used in financial contracts, especially in mortgage loans.

▶ **GRAPH 1. SPREAD BETWEEN HIGHEST AND LOWEST 3M USD LIBOR CONTRIBUTIONS AND HIGHEST AND LOWEST SHORT-TERM CONTRIBUTOR CDS SPREADS - IN BASIS POINTS**



Source: International Monetary Fund, Global Financial Stability Report October 2008

In April 2008, the Wall Street Journal published several articles⁴ expressing doubts about the integrity of the LIBOR settlement, which the British Bankers' Association (BBA) denied. Namely, during 2007 and 2008 there was a significant increase in credit default swap (CDS) spreads, which maintains the price of risk that the buyer pays to protect its position. The growth of CDS in this period is justified given the impact of the global

3 <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R1011&from=EN>

4 See for instance <https://www.wsj.com/articles/SB120831164167818299>

financial crisis. However, what represents doubt is the fact that the value of CDS was not transferred to the value of LIBOR, which can be explained by the fact that CDS has little or almost insignificant impact on the movement in day-to-day short-term lending decisions (*Graph 1*). The Bank for International Settlement published a Quarterly Review, released in March 2008, in which it pointed out that there was little evidence that there was manipulation and that the available data did not support the hypothesis that contributing banks manipulated their quotations to profit from their positions. Since many banks are contributors to both USD LIBOR and EUR LIBOR, there is no evidence that quotations have been manipulated in that part of the market either⁵. A similar conclusion was announced by the International Monetary Fund, which stated in the Global Financial Stability Report, published in October 2008, that US LIBOR is an adequate measure of unsecured financing in US dollars⁶.

In November 2008 Mr. Mervyn King, then Governor of the Bank of England said that “in terms of LIBOR, but it is not a rate at which anyone is actually borrowing⁷” and this was one of the first public statements by central banks that they were aware lack of LIBOR. Regulatory investigations started in early 2012 when the manipulation of LIBOR by banks such as Deutsche Bank, Barclays, UBS, Rabobank, and the Royal Bank of Scotland (but also many others) was discovered and during the investigation, it was revealed that these banks negotiated interest rate quotes rate since 2003, creating mistrust in the financial system. Regulators from the USA, the EU, and the UK have launched an investigation against the mentioned banks and prescribed a fine of more than US 9 billion. These banks profited from derivative transactions that were related to the movement of LIBOR rates. The traders of these banks provided LIBOR quotations that suited them depending on their positions in derivative transactions, instead of those quotations reflecting the rates at which banks are willing to borrow funds. Thus, the LIBOR movement represents an agreement between banks, not from market movements. From all of the above, the reform of reference interest rates has begun, with the EURIBOR interest rate continuing to exist but calculated according to a new (hybrid) methodology, while from the beginning of 2022 LIBOR for all currencies (dollar, euro, British pound, Japanese yen, and Swiss franc) will be replaced by new rates.

4. EURO ZONE BENCHMARK INTERST RATE REFORM

Although risks have always existed, increased business uncertainty and complexity, financial scandals and the financial crisis have imposed the need for greater transparency⁸. Scandals at the global level caused by manipulation of the main reference interest rates, as well as sanctions imposed on a large number of financial institutions have led to a decrease in the number of institutions that voluntarily submit data for calculating these rates, thus reducing the representativeness of their calculation. In Europe, in addition to the manipulation of LIBOR, the number of institutions that were willing to send data for

5 Bank for International Settlement, Quarterly Review March 2008, https://www.bis.org/publ/qtrpdf/r_qt0803.pdf

6 International Monetary Fund, Global Financial Stability Report, <https://www.imf.org/en/Publications/GFSR/Issues/2016/12/31/Financial-Stress-and-Deleveraging-Macro-Financial-Implications-and-Policy>

7 Examination of Witnesses, <https://publications.parliament.uk/pa/cm200708/cmselect/cmtreasy/1210/8112503.htm>

8 Pobrić (2019), p. 57

the calculation of EURIBOR and EONIA rates on a voluntary basis decreased, which affected the decline in the volume of turnover on the interbank money market⁹.

In order to identify and make recommendations on risk-free interest rates in the euro area that will be alternative to EURIBOR and EONIA, a working group on euro risk-free rates was formed in 2018 by the European Central Bank (ECB), the Belgian Financial Services and Markets Authority (FSMA), the European Commission (EC) and the European Securities and Markets Authority (ESMA). This working group is a private sector working group, while public institutions have an observer role. The secretary of the group was ECB from the establishment of the group in 2017 until May 11, 2021, when ESMA took over that role.

EURIBOR stands for Euro Interbank Offered Rate and is one of the most important reference interest rates in the European money market. EURIBOR rates represent the average interest rate at which a panel of European banks lends funds from each other. When calculating 15% of the highest and lowest quotations are eliminated and the remaining quotations are averaged and rounded to three decimal places. The EURIBOR announcement is made every day around 11 am Central European Time. There are currently five maturities for EURIBOR (1 week, 1 month, 3 months, 6 months, and 12 months), while until 1 November 2013 there were fifteen different maturities. This rate is used as a basis for valuing various financial products such as savings deposits, interest rate futures, interest rate swaps, and mortgage loans. EURIBOR is administered by the European Money Markets Institute (EMMI), which in October 2015 published a consultation paper summarizing plans to reform the EURIBOR methodology, as well as to make calculations based on realized transactions¹⁰. In March 2018, EMMI organized the first public consultation on the hybrid methodology, and in October 2018 the second, while the results of the public hearings were published in June 2018 and February 2019, respectively. The hybrid methodology itself will continue to apply euro money market conventions, while in terms of the number of days it will apply an Actual / 360 rate count convention. The EMMI indicates that the current level of liquidity in the unsecured interbank lending market is low and that it is not sufficient for the calculation of EURIBOR to be based only on realized transactions. As a consequence, the hybrid methodology requires that each bank participating in the EURIBOR maturity panel follows a hierarchical approach consisting of three levels (*Table 1*).

▶ **TABLE 1. HYBRID EURIBOR DETERMINATION METHODOLOGY**

Level 1	Submission based solely on transactions in the underlying interest at the Defined Tenor from the prior TARGETday, using a formulaic approach provided by EMMI.
Level 2	Submission based on transactions in the underlying interest across the money market maturity spectrum and from recent TARGET days, using a defined range of formulaic calculation techniques provided by EMMI.
Level 3	Submission based on additional transactions in the underlying interest, excluded from Level 1 and Level 2 submissions, and/or other data from a range of markets closely related to the unsecured euro money market, using a combination of modelling techniques and/or the Panel Bank's judgment.

Source: European Money Markets Institute, Consultation paper on a hybrid methodology for EURIBOR, https://www.emmi-benchmarks.eu/assets/files/D0083-2018%20Consultation%20Hybrid%20Euribor_full.pdf

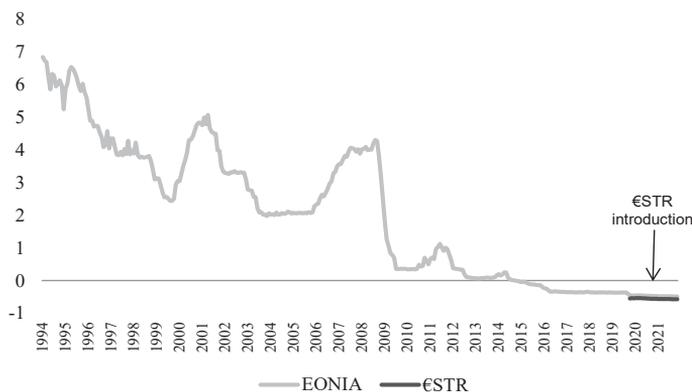
9 López and Lago Perezagua (2020), p. 125

10 European Money Markets Institute, Consultative Position Paper on the Evolution of EURIBOR, https://www.emmi-benchmarks.eu/assets/files/Euribor_Paper.pdf

This means that the bank will send its quotations if it meets the conditions from the first level, otherwise, it will consider the conditions from the second level. In case it does not meet the conditions from the first two levels, the quotation is sent on the basis of the third level. In May 2019, EMMI announced that it had started the transition of the EURIBOR calculation from quote-based to the hybrid one and for that, it applied for authorization under the European Benchmark Regulation (BMR). In July 2019, EMMI received authorization for the calculation and publication of EURIBOR under a new methodology by the FSMA¹¹.

EONIA stands for Euro Overnight Index Average and represents the weighted average of all overnight unsecured loans on the interbank lending market between banks in the euro area. Working group on euro risk-free rates in September 2018 proposed to use the €STR (Euro Short-Term Rate) rate instead of EONIA¹². EONIA is published on daily basis between 6.45 p.m. and 7.00 p.m. (CET)¹³. €STR represents the interest rate at which banks in the euro area lend euros without collateral in the overnight market. The simple replacement of EONIA with the €STR would result in a change in the valuation of the transactions and contracts tied to the rate¹⁴. The ECB started publishing €STR for the first time on 2 October 2019 and this rate reflected trading data for 1 October 2019 (*Graph 2*). The first fixed rate of €STR was -0.549%. The EONIA will continue to exist until January 3, 2022, calculated as €STR increased by a fixed spread (8.5 basis points). During the transition period, it should be ensured that all financial contracts and products that were based on the EONIA interest rate are now based on the €STR rate.

▶ **GRAPH 2. EONIA AND €STR RATES - AVERAGE OF OBSERVATIONS THROUGH PERIOD (%)**



Source: European Central Bank

11 Priem and Van Rie (2021), p. 59-60

12 European Central Bank, How should the market transition from EONIA to the €STR?, https://www.ecb.europa.eu/paym/interest_rate_benchmarks/WG_euro_risk-free_rates/html/transition.en.html

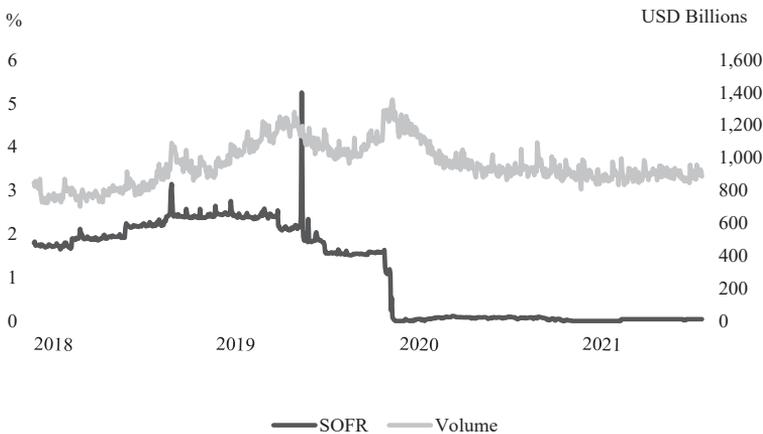
13 Schianchi and Verga (2006), p. 8

14 Hlásková Murphy (2021), p. 69

5. UNITED STATES BENCHMARK INTERST RATE REFORM

LIBOR (London Interbank Offered Rate) is a benchmark (reference) interest rate for a large number of loans, securities, derivatives, and other products. The British Bankers' Association (BBA) calculated USD LIBOR during the 2007/2008 global financial crisis, while Thomson Reuters published the data. Based on a panel of 16 banks from around the world, the BBA collected contributions, then rejected the four highest and four lowest contributions, and the average eight USD LIBOR rates for fifteen different maturities were published from contributions of the remaining eight banks, and these data were published every day at 11:30 am¹⁵. Two main factors caused the LIBOR transition. The first is the financial crisis of 2007/2008, which showed that LIBOR is not an adequate risk-free interest rate, and the crisis itself showed that further application of LIBOR could cause the re-creation of the credit risk bubble. Another reason is the bad reputation of LIBOR after the discovered manipulations of dealers in 2012¹⁶.

▶ **GRAPH 3. SECURED OVERNIGHT FINANCING RATE DATA**



Source: The Federal Reserve Bank of New York

In order to transition USD LIBOR to a new alternative reference interest rate, the Alternative Reference Rates Committee (ARRC) was established in December 2014. ARRC members are representatives of the private sector, each of which has a significant presence in the markets that affect USD LIBOR, but also includes representatives of financial sector regulators and banking, as well as ex-officio members. In 2017, the ARRC identified the Secured Overnight Financing Rate (SOFR) as an alternative USD LIBOR rate that represents an interest rate based on realized transactions and which is an almost risk-free interest rate (*Graph 3*).

SOFR thus represents the overnight borrowing rate collateralized by U.S. Treasury securities. The SOFR calculation includes the broad general collateral rate, as well as bilateral

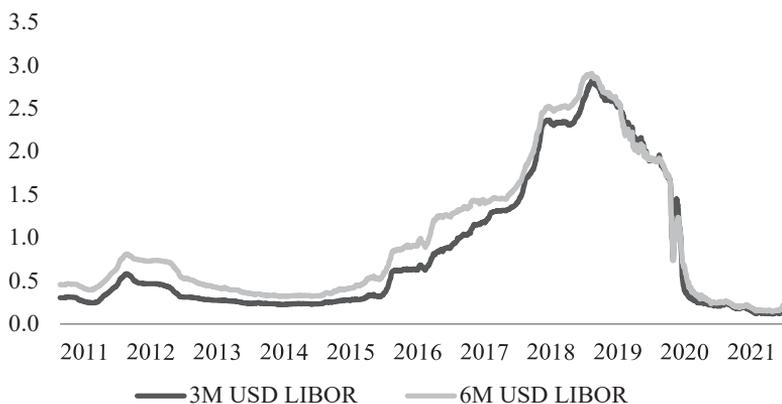
15 Taylor-Brill (2020), p. 2

16 Kansal and Melatur (2020), p. 1

US Treasury Department repo transactions where clearing is performed on a delivery-versus-payment (DVP) basis offered by the Fixed Income Clearing Corporation (FICC)¹⁷. In April 2018, the Office of Financial Research in cooperation with the Federal Reserve Bank of New York began publishing SOFR. In replacement of USD LIBOR rates, which are applied in business loans, the Federal Reserve Bank of New York also publishes SOFR averages, daily compounded SOFR in arrears, daily simple SOFR in arrears, and forward-looking term SOFR. ARRC for syndicated and bilateral business loans suggests the use of forward-looking terms SOFR and SOFR averages because both rates are known in advance of the interest period, which is similar to the current application of LIBOR rates, and also most of the loan conventions are similar to LIBOR loan conventions¹⁸.

At the beginning of 2021, two things happened that together clearly show that LIBOR will no longer be available for new contracts after the end of 2021. First, the Financial Conduct Authority (FCA)¹⁹ of the United Kingdom, which regulates LIBOR, and second the ICE Benchmark Administration (IBA)²⁰, which administers LIBOR, have announced final completion dates for the release of data for LIBOR. No USD LIBOR maturities will be available after June 30, 2023 (*Graph 4*). The one-week and two-month USD LIBOR, as well as GBP LIBOR, EUR LIBOR, CHF LIBOR, and JPY LIBOR, will cease to be published on December 30, 2021. IBA will stop publishing all remaining maturities USD LIBOR (O/N, 1M, 3M, 6M, and 12M) after June 30, 2023.

▶ **GRAPH 4. 3M USD LIBOR AND 6M USD LIBOR - DAILY DATA, NOT SEASONALLY ADJUSTED (%)**



Source: Federal Reserve Bank of St. Louis

The LIBOR transition was also made in currencies other than the US dollar. Instead of GBP LIBOR, SONIA (Reformed Sterling Overnight Index Average) is used, whose admin-

17 Progress Report: The Transition from U.S. Dollar LIBOR, <https://www.newyorkfed.org/medialibrary/Microsites/arrc/files/2021/USD-LIBOR-transition-progress-report-mar-21.pdf>

18 Forward Looking Term SOFR and SOFR Averages (Applied in Advance) Conventions for Syndicated and Bilateral Business Loans, https://www.newyorkfed.org/medialibrary/Microsites/arrc/files/2021/Term_SOFR_Avgs_Conventions.pdf

19 Announcements on the end of LIBOR, <https://www.fca.org.uk/news/press-releases/announcements-end-libor>

20 ICE Benchmark Administration Publishes Feedback Statement for the Consultation on Its Intention to Cease the Publication of LIBOR® Settings, <https://ir.theice.com/press/news-details/2021/ICE-Benchmark-Administration-Publishes-Feedback-Statement-for-the-Consultation-on-Its-Intention-to-Cease-the-Publication-of-LIBOR-Settings/default.aspx>

istrator is the Bank of England, while instead of CHF LIBOR, SARON (Swiss Average Rate Overnight) is used, whose administrator is SIX Swiss Exchange.

6. CONSEQUENCES OF THE BENCHMARK INTEREST RATE REFORM

Economic data are the basis for decisions and choices in the functioning of the economic system²¹. Important economic data, both for corporates and households, are benchmark interest rates. The reform of benchmark interest rates represents the most significant change in the global financial market in recent history. For that reason, it is necessary to consider the consequences of these reforms, bearing in mind that these interest rates are the basis for determining the prices of various financial contracts, such as mortgages, overnight loans, but also more complex financial instruments such as derivatives. As the start of the application of the new benchmarks approaches, all market participants assess their product portfolio and accordingly choose an appropriate replacement rate and make contract changes²².

Benchmark interest rates also indicate the success of the monetary policy implementation through the interest rate channel. Namely, any change in the reference interest rate, which is the main instrument of monetary policy for most central banks, should be transferred to interest rates on the interbank money market. At the same time, the movement of these benchmark interest rates gives a signal to the central banks about the situation in that part of the market, but also about the perception of banks regarding the movement of interest rates on loans to businesses and households. This is eventually transferred to the price level and to the ultimate goals of the central bank, which is to achieve and maintain price and financial stability.

This practically means that any change in the ECB key interest rate should be transferred to the movement of the interest rate on the interbank lending market, and consequently to the credit conditions of banks in the euro area towards the economy and households. With the cessation of the publication of EONIA, it is necessary to make adjustments in the presentation of prices of various financial contracts, which should be based on €STR. Instead of EONIA-indexed instruments on the OTC derivatives market from January 3, 2022, €STR-indexed instruments such as €STR Futures, €STR Forward Rate Agreements and others will be used²³. The same challenges stand for financial derivatives which are linked for LIBOR and the proposal is that the US Treasury issue floating-rate notes linked to SOFR in order to have a smooth transition from LIBOR to SOFR²⁴.

21 Abrantes-Metz, Villas-Boas and Judge (2013), p. 3

22 Forrester and Miller (2020), p.6

23 Scaringi and Bianchetti (2020), p. 3

24 Klingler and Syrstad (2020), p. 35

Banks from the EU and the European Economic Area (EEA) are mostly exposed to LIBOR and EURIBOR interest rates. According to the European Banking Authority (EBA) report²⁵ published in October 2021, close to EUR 5.2 trillion of loans are tied to benchmark interest rates, of which EUR 3.6 trillion is tied to EURIBOR, almost EUR 1 trillion to LIBOR (mostly to USD LIBOR) and about EUR 0.5 trillion for EONIA. In its analysis, EBA points out the risks that arise during the transition of existing to new benchmark interest rates and highlights legal risks (refers to the obligation of banks to change interest rates in their credit agreements), then IT risk (change in trading system, payment system, as well as the system related to the valuation of various banking products) and internal market risk models (changes in benchmark interest rates indicate the need for banks to validate and calibrate internal models). In order to adequately implement the benchmark interest rate transition, all participants in the financial system (1) need to assess the impact and plan the interest rate transition on all their products in a timely manner; (2) develop an adequate model and manage all transition risks; and (3) manage related tax and accounting implications. All these changes need to be implemented without compromising security and business continuity while maintaining the trust of all market participants and preserving price and financial stability.

7. CONCLUSION

The reform of benchmark interest rates represents the most significant change in the global financial market in recent history. During the global financial crisis of 2007/2008, reference interest rates were manipulated by dealers of commercial banks, who thus wanted to make a profit on derivative instruments. Thus, these interest rates reflected the manipulative actions of the banks that participated in the panel, rather than market movements. As a result, there was a decrease in liquidity in the interbank lending market, as well as the withdrawal of banks that, in order to preserve their reputation, take out from the panel of banks that submitted quotations for the calculation of these rates. Reforms of benchmark interest rates have been implemented in order to increase reliability and transparency in the calculation of these rates, to prevent their further manipulation while protecting all users of financial services.

The EURIBOR reform process began in October 2015 when the European Money Markets Institute, which administers the rate, published a consultative paper summarizing plans to reform the rate calculation methodology. The decision was made to calculate EURIBOR according to a hybrid methodology, which means that each bank participating in the EURIBOR maturity panel follows a hierarchical approach consisting of three levels. When it comes to EONIA a decision was made to replace with the €STR (Euro Short-Term Rate) from 3 January 2022, which the ECB started publishing on 2 October 2019. EONIA will continue to exist until 3 January 2022 and will be calculated as €STR increased by a fixed spread (8.5 basis points).

25 European Banking Authority, Benchmark Rate Transition Risks Analysis Of The EU/EEA Banking Sector's Exposures Linked To Benchmark Rates And Transition Risks Relating To Interbank Offered Rates, https://www.eba.europa.eu/sites/default/documents/files/document_library/Risk%20Analysis%20and%20Data/Risk%20reports%20and%20other%20thematic%20work/1021964/Final%20Thematic%20Note%20on%20benchmark%20rates%20transition%20risks.pdf

Regarding the reform of the reference rate in the United States, the Alternative Reference Rates Committee (ARRC) in 2017 identified the Secured Overnight Financing Rate (SOFR) as a suitable alternative rate for USD LIBOR. SOFR represents an interest rate based on realized transactions and which is an almost risk-free interest rate and from April 2018 the Office of Financial Research in cooperation with the Federal Reserve Bank of New York began publishing SOFR. After June 30, 2023, no USD LIBOR maturities will be available. The one-week and two-month USD LIBOR, as well as GBP LIBOR, EUR LIBOR, CHF LIBOR, and JPY LIBOR, will cease to be published on December 30, 2021, while all remaining maturities USD LIBOR (O/N, 1M, 3M, 6M, and 12M) will stop publishing after June 30, 2023.

It is very important to assess all the consequences of the reform of benchmark interest rates, bearing in mind that these rates affect the price of a large number of financial contracts such as mortgages, derivative contracts, overnight loans, and many others. Benchmark interest rates directly affect the smooth functioning of the financial market and these rates are used by banks and other market participants. Through the transmission of monetary policy, central banks influence the movement of benchmark interest rates through interest rate channels. The transition of benchmark interest rates is a challenge for all financial market participants who face a number of risks (IT risk, legal risk, and internal market risk) while striving to maintain security and business continuity.

REFERENCES

Abrantes-Metz, R., Villas-Boas, S. and Judge, G. (2013), "Tracking the Libor Rate", UC Berkeley, CUDARE Working Papers, March 2013

Albanese, C., Iabichino, S. and Mammola, P. (2021), "Risk Managing the LIBOR Transition", Pp. 1-15. <https://doi.org/10.2139/ssrn.3746939>

Announcements on the end of LIBOR, <https://www.fca.org.uk/news/press-releases/announcements-end-libor>

Bank for International Settlement, Quarterly Review March 2008, https://www.bis.org/publ/qtrpdf/r_qt0803.pdf

Bos, K. (2019), "The Libor Rate Transition - On the implementation of transition approaches from Interbank Offered Rates to Risk-Free Rates and the corresponding value impact", *Master Thesis*, University of Twente, Financial Engineering & Management, Pp. 1-53

Duffie, D. and Stein, J. (2015), "Reforming LIBOR and Other Financial Market Benchmarks", *Journal of Economic Perspectives*, Volume 29, Number 2, Pp. 191–212. <https://doi.org/10.1257/jep.29.2.191>

European Banking Authority, Benchmark Rate Transition Risks Analysis Of The EU/EEA Banking Sector's Exposures Linked To Benchmark Rates And Transition Risks Relating To Interbank Offered Rates, https://www.eba.europa.eu/sites/default/documents/files/document_library/Risk%20Analysis%20and%20Data/Risk%20reports%20and%20other%20thematic%20work/1021964/Final%20Thematic%20Note%20on%20benchmark%20rates%20transition%20risks.pdf

European Central Bank, How should the market transition from EONIA to the €STR?, https://www.ecb.europa.eu/paym/interest_rate_benchmarks/WG_euro_risk-free_rates/html/transition.en.html

European Central Bank, <https://www.ecb.europa.eu/home/html/index.en.html>

European Money Markets Institute, Consultation paper on a hybrid methodology for EURIBOR, https://www.emmi-benchmarks.eu/assets/files/D0083-2018%20Consultation%20Hybrid%20Euribor_full.pdf

European Money Markets Institute, Consultative Position Paper on the Evolution of EURIBOR, https://www.emmi-benchmarks.eu/assets/files/Euribor_Paper.pdf

Examination of Witnesses, <https://publications.parliament.uk/pa/cm200708/cmselect/cmtreasy/1210/8112503.htm>

Federal Reserve Bank of St. Louis, <https://fred.stlouisfed.org>

Forrester, P. and Miller, M. (2020), "Eye On IBOR Transition", *Mayer Brown*, Pp. 1-8

Forward Looking Term SOFR and SOFR Averages (Applied in Advance) Conventions for Syndicated and Bilateral Business Loans, https://www.newyorkfed.org/medialibrary/Microsites/arrc/files/2021/Term_SOFR_Avgs_Conventions.pdf

Guggenheim, B. and Schimpf A. (2020), "At the crossroads in the transition away from LIBOR: from overnight to term rates", Bank for International Settlements, BIS Working Papers No 891, October 2020

Hlásková Murphy, S. J. (2021), "Benchmark rate transition and continuity of contracts: EU developments", *ESCB Legal Conference 2020*, Pp.66-80

ICE Benchmark Administration Publishes Feedback Statement for the Consultation on Its Intention to Cease the Publication of LIBOR® Settings, <https://ir.theice.com/press/news-details/2021/ICE-Benchmark-Administration-Publishes-Feedback-Statement-for-the-Consultation-on-Its-Intention-to-Cease-the-Publication-of-LIBOR-Settings/default.aspx>

International Monetary Fund, Global Financial Stability Report October 2008, <https://www.imf.org/en/Publications/GFSR/Issues/2016/12/31/Financial-Stress-and-Delivering-Macro-Financial-Implications-and-Policy>

Kansal, S. and Melatur, G. (2020), "IBOR Transition – A more in-depth look", Pp. 1-7. <https://doi.org/10.2139/ssrn.3585460>

Klingler, S. and Syrstad, O. (2020), "Life After Libor", *Journal of Financial Economics*, Pp. 1-60

Köllmann, S. (2020), "The IBOR Reform - A study on the basis spread between ARR and IBOR", *Master Thesis*, University of Twente, Financial Engineering & Management, Pp. 1-99

Kosanović, N. (2021), "New Neoclassical Synthesis and Economics Policy After Great Recession 2008", *Ekonomске идеје и пракса*, Vol. 42, Pp. 31-45. <https://doi.org/10.54318/eip.2021.nk.304>

López, Á. and Lago Perezagua, P. (2020), "Euro risk-free interest rates: the transition from EONIA to €STR", *Banco De España*, Financial Stability Review, Issue 38, Pp. 125-145

Mihajlović, V. and Marjanović G. (2019), "Post-Keynesian Criticism Of The New Consensus Macroeconomics and Lessons for Transitional Economies", *Ekonomске идеје и пракса*, Vol. 34, Pp. 21-32

National Bank of Serbia, <https://nbs.rs/en/indeks/index.html>

Pobrić, A. (2019), "Risk Reporting In Companies' Financial Statements", *Ekonomске идеје и пракса*, Vol. 32, Pp. 57-74

Priem, R. and Van Rie, W. (2021), "The Euribor and Eonia reform: achieving regulatory compliance while protecting financial stability", *International Journal of Business, Economics and Management*, Volume 8, Number 2, Pp. 50-69. <https://doi.org/10.18488/journal.62.2021.82.50.69>

Progress Report: The Transition from U.S. Dollar LIBOR, <https://www.newyorkfed.org/medialibrary/Microsites/arrc/files/2021/USD-LIBOR-transition-progress-report-mar-21.pdf>

Regulation (EU) 2016/1011 of the European Parliament and of the Council of 8 June 2016, <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R1011&from=EN>

Scaringi, M. and Bianchetti, M. (2020), "No Fear of Discounting: How to Manage the Transition from EONIA to €STR", Pp. 1-23. <https://doi.org/10.2139/ssrn.3674249>

Schianchi, A. and Verga, G. (2006), "A theoretical approach to the EONIA rate movements", *University of Parma*, Pp. 1-11. <https://doi.org/10.2139/ssrn.906793>

Schrimpf, A. and Sushko, V. (2019), "Beyond LIBOR: a primer on the new reference rates" *BIS Quarterly Review*, Pp. 29-52

Siboulet, F., Kumar, R., Douady, R. and Crepey, S. (2018), "LIBOR Inside Out Transition and Challenges", *Deloitte Development LLC*, Pp. 1-50

Taylor-Brill, S. (2020), "LIBOR Manipulation and the Transition to SOFR", *CMC Senior Theses*, Pp. 1-31

The Federal Reserve Bank of New York, <https://www.newyorkfed.org/>

Vojtek, M. (2004), "Calibration of Interest Rate Models - Transition Market Case", Charles University, Center for Economic Research and Graduate Education, Academy of Sciences of the Czech Republic, Economics Institute, Working Paper Series 237, September 2004. <https://doi.org/10.2139/ssrn.843425>

Wall Street Journal, <https://www.wsj.com/articles/SB120831164167818299>
