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MONEY MARKET TURBULENCES: TIMELINESS AND CREDIBILITY PROVED TO BE OF CRUCIAL IMPORTANCE

Turbulencije na tržištu novca – blagovremenost i kredibilitet od presudne važnosti

Abstract

Now that the global financial markets are highly volatile and vulnerable, and the world faces the Fourth Industrial Revolution that ushers in new technologies and potentially, with the growth of productivity, extends the period of low inflation and ultra-low interest rates, stability of the financial system is more important than ever. Technological innovation brings new uncertainty and the markets are extremely sensitive to sudden changes in the business environment, yet more so as they grew accustomed to ample liquidity in the prior period. Two episodes of similar characteristics in the money markets in two different countries, Serbia and the USA, have proven numerous patterns and demonstrated many commonalities. And yet, a somewhat different ambience, monetary measures applied to stabilise interest rates, the increase of which was driven by intensive withdrawals of liquidity from the banking system, as well as the initial signal sent to market participants, whose perception is what matters the most – proved that credibility, timeliness of response and proper choice of instruments are of crucial importance for success.

Keywords: *repo, short-term interest rates, uncertainty, Fed, NBS, FX swap auctions, liquidity, credibility, timeliness.*

Sažetak

U zamahu četvrte industrijske revolucije, koja sa sobom nosi uvođenje novih tehnologija i potencijalno, s rastom produktivnosti, produžava period niske inflacije i ultraniskih kamatnih stopa, u ambijentu pojačane volatilnosti i ranjivosti globalnih finansijskih tržišta – stabilnost finansijskog sistema postaje važnija nego ikada do sada. Tehnološke novine donose i novu neizvesnost, a tržišta su postala osetljivija na iznenadne promene poslovnog ambijenta, naročito ako se uzme u obzir da su u prethodnom periodu bila naviknuta na obimnu likvidnost. Dve slične epizode na novčanom tržištu u dve različite zemlje, u Srbiji i SAD, pokazale su brojne zakonitosti i zajedničke karakteristike. Ipak, nešto drugačiji ambijent, upotrebljene monetarne mere za smirivanje kamatnih stopa, čiji je rast izazvan izraženijim povlačenjem likvidnosti iz bankarskog sistema, kao i inicijalni signal poslat tržišnim učesnicima, čija je percepcija najrelevantnija, ukazali su na to da su kredibilitet, blagovremenost reakcije i pravilan odabir instrumenata od ključne važnosti za postizanje uspeha.

Ključne reči: *repo, kratkoročne kamatne stope, neizvesnost, Fed, NBS, devizne svop aukcije, likvidnost, kredibilitet, blagovremenost.*

Introduction

There are no final victories in monetary policy, as it needs to be constantly adjusted to the conditions in which economic agents operate. Global economic trends create or have a significant impact on the financial and economic environment and the business conditions in developing countries. As a result of the interplay of different factors – excessive reliance on central bank instruments and policies to ensure a recovery from the economic crisis in the absence of a more decisive and coordinated fiscal response and the volatility of global capital flows, we are faced with sluggish global growth, even though interest rates are negative or extremely low.

In advanced economies, inflation is not recovering as planned, remaining very low with wage inflation failing to provide a more significant contribution. The environment in which we operate is shaped by economic, but also (geo) political flows. Instant messages via social media (mainly Twitter) have made capital flows in recent years much more volatile than before. Cutting-edge technologies and fast transfer of information in the new technological era have greatly reduced the explanatory power of economic theories that are based on macroeconomic data and trends. Even decisions of the largest monetary institutions are to a significant degree conditioned by these phenomena and labelled as market-driven or news-driven, and stand as a significant addition (sometimes even being the decisive factor) to exact, verifiable and relevant data, i.e. to data-driven/dependent decisions.

The openness of economies has led to a fast spillover from advanced to developing and third world countries in almost all aspects. As Canadian Governor Stephen Poloz stressed repeatedly, the past three revolutions shaped the economic landscape and had implications for economic development and central bank activities – "Technological change represents a source of deep uncertainty for policy-making in an already-uncertain world" [20, p. 1]. In all three revolutions, technological advances produced similar effects – workers were replaced by machines (while some new types of jobs were created), increased productivity and rising aggregate supply led to a drop in prices and inflation, but also to higher borrowing (due to lower interest rate, as a response to low inflation), and financial bubbles were created (notably in the stock market), which burst more often than not.

A question arising logically in this context is that of the consequences of the Fourth Industrial Revolution for the monetary environment, monetary policy making, and money market in which short-term interest rates are determined. Poloz argues that technological change "also poses a very difficult problem for central banks, because it is very hard to measure, yet it affects output, labour markets, wages and inflation" [20, p. 1].

Having all of this in mind, it becomes clear that the Fourth Industrial Revolution brings many benefits, but at the same time urges caution. Technological progress makes peoples' lives easier, and yet it diminishes the need for their presence at workplaces, particularly in the process of production (becoming more and more automated) or even trade in global financial markets which increasingly boils down to algorithm and high frequency trading carried out by machines, not people.

However, this should by no means dishearten central monetary institutions. Continuous re-examining of the advantages and disadvantages of the said processes and a proactive approach by the regulatory authorities and economic policy makers have become a must. It is up to economic policy makers to demonstrate responsibility and to carefully weigh up the direction, speed and implications of new technologies and the fruits of Industry 4.0.

In the domestic economic environment, focus is placed on digitalisation and accelerated adoption of new technologies as the pillar of future economic development. With its activities and regulatory alignment, the NBS is at the forefront among Serbian institutions in applying tested and secure innovations and in developing new technologies, and to the greatest extent so when it comes to payments and payment services. Numerous projects paving the way for a new business paradigm were initiated in 2018 and 2019.

However, delivering stability – monetary and financial, remains the primary task and objective of the NBS. A prudent, measured and cautious approach of the central monetary authority is a prerequisite for any change in the economic environment, any new idea, method of business

or innovation to find fertile ground and to be sustainable in the long run. No matter how unlikely this may seem, the Fourth Industrial Revolution can have significant implications for monetary policy making and the level and dynamics of inflation, interest rates and the exchange rate. Even before Industry 4.0, stepped-up technological development contributed to higher productivity which, in the view of many theoreticians and economic experts, is one of the main reasons behind the extended period of low inflation and the low-for-long interest rate environment. Further accelerated technological advances and the use of machines might contribute to making this environment the new normal, although there are many arguing this is already the case.

On the other hand, the not-so-long-ago hard and painful crisis stirred up acute caution in financial system regulators, resulting in revised requirements for higher capitalisation, liquidity and overall soundness of global financial institutions. Quite a number of studies and research papers suggest that these requirements, even though they were not intended to do so initially, had an impact on the functioning of certain segments of the financial market, notably the money market, and resulted in increased volatility and a sudden rise in interest rates. Even in an environment of low interest rates, tightened regulatory requirements, which coincide with fiscal measures implemented by responsible countries so as to put their finances in order (which have a restrictive monetary effect on banking system liquidity) may lead to sudden disruptions in the money market and short-term interest rates that central banks are trying to keep stable and predictable with a view to ensuring effective implementation of their monetary policy.

In early 2019, the Serbian banking system was faced with reduced excess liquidity and potential money market segmentation (the existing excess liquidity distributed among merely a few banks). This had the potential to spark protracted instability in the money market – a rise in short-term interest rates, segmentation of cash flows in the market and dented efficiency of monetary policy implementation. Having in mind the optimality of the solution which had to accommodate the specificities of the local money market, as well as the importance of market psychology and the clarity of the signal that each monetary policy measure should send to market players, the NBS decided to implement FX swap auctions as a liquidity management instrument.

Similar to the abovementioned situation, the most influential central bank in the world, the Fed, faced a repo market shock in September 2019, when it needed to respond in order to quell a sharp spike in the short-term interest rates in the market it regulates. The rates, which up until that point fluctuated around 2% and were on a downward path due to slackening global economic growth, suddenly soared in certain transactions to over 10%, thus revealing irregularities in the functioning of the US money market. The Fed had to respond more intensively and with instruments guaranteeing a longer lasting effect compared to the NBS. First, it conducted overnight and then also longer-term repo operations through which it pumped in liquidity, and continued with more structural measures of liquidity injection through the purchase of securities – called by many people the new quantitative easing (QE 4 or QE-lite).

Are the causes of these problems similar, could the responses have been the same and is it possible to measure which of the central bank interventions was more efficient – these are some of the topics our paper seeks to explore. Besides the analysis presented in the December 2019 BIS Quarterly Review, to the authors' best knowledge, this is the first paper investigating the US repo market shock in September 2019. At the same time, this is the first paper comparing the situation in the US with similar ones in other countries, in this particular case – in Serbia.

Money market – A brief general overview

The money market is a vital part of a country's financial market. Financial institutions face liquidity needs on a daily basis, for its own sake as well as for the purpose of performing their clients' transactions. To meet their needs, banks which lack operational liquidity borrow funds from other banks (or other financial institutions) in the interbank money market.

The circulation of short-term liquidity takes place primarily in the form of repo transactions, which imply

granting collateralised loans (most often government securities), with the obligation of the borrowing party to return the funds within the agreed period of time, along with paying the agreed interest.

Some loans can also be unsecured, such as overnight and one-week loans in the Serbian money market. This usually implies the payment of a premium for credit or counterparty risk. After the global financial crisis, when these risks were greatly pronounced, unsecured loans in developed markets are losing significance, with the major portion of transactions performed in the repo market, notably in the overnight segment.

The money market is in the constant focus of central banks. Interest rates in the overnight money market are usually the operational objective of monetary policy, and move in line with the key (reference) interest rate of the central bank. The expectations of market participants regarding future movement in rates in the overnight money market (forward rates) are also an indicator of expectations of the movement in the key policy rate of the central bank, which has an important informational value in applying monetary policy.

Money market interest rates are benchmark rates for other instruments in the financial market, such as securities and financial derivatives. Given all of the above, it is exceptionally important that the money market functions efficiently and that interest rates are representative and credible. Over the last years, many central banks, together with other relevant institutions and market participants, have been involved in the reform of benchmark rates, taking special care of defining proper and detailed rules for their calculation and establishing precise supervision functions.

Money market in Serbia

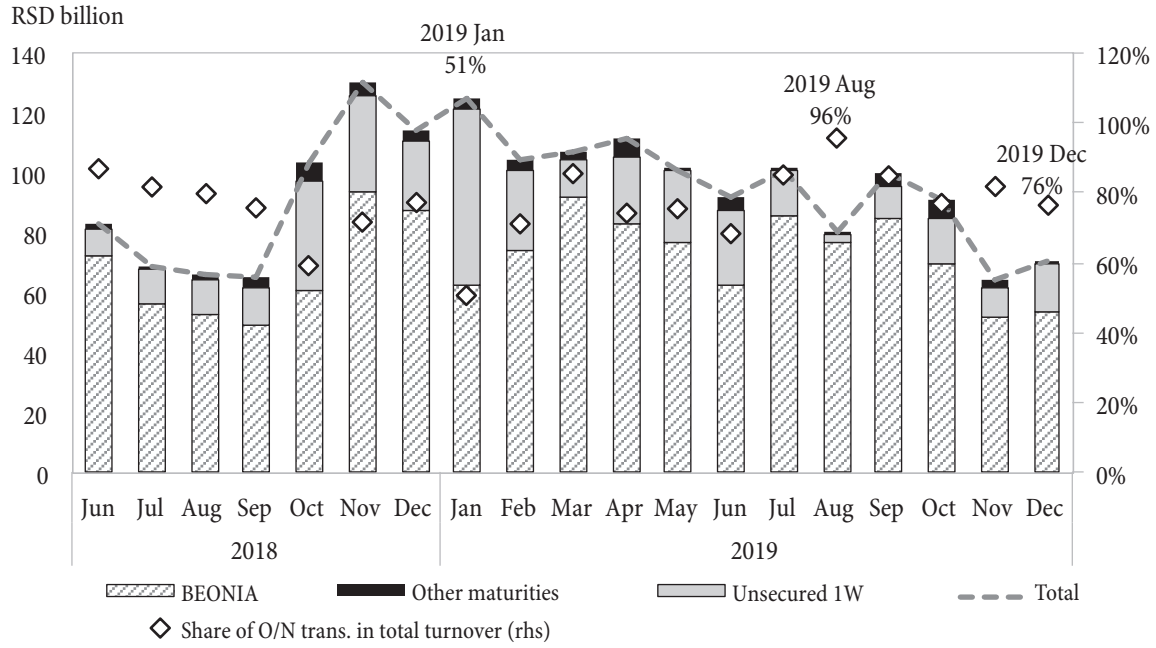
Serbian money market can be equated with the interbank money market, as there are practically no transactions of banks with other economic agents or between other market participants.

In the past years, there were almost no repo transactions in the Serbian money market. The most active segment of the interbank money market are overnight unsecured transactions based on which BEONIA (Belgrade OverNight Index Average), as one of the basic interest rates, is calculated. There is also an increasingly active market of one-week loans (Figure 1).

In the past year and a half (June 2018 – December 2019),[1] overnight transactions made up over three-quarters of total turnover on average (77%). With the exception of

1 In June 2018, the NBS began with the regular daily collection of data on money market transactions with maturities longer than overnight.

Figure 1: Turnover in the money market in the Republic of Serbia



Source: NBS.

October 2018 and January 2019, the share of overnight transactions was over 60% in each month. However, compared to earlier periods (when the NBS was collecting data on a monthly basis), the share of slightly longer-term transactions (mainly one-week) increased.

Just like similar interest rates in the world (formerly EONIA, now €STR in the euro area), BEONIA is the main interest rate through which monetary policy decisions are passed on first to the money market and then, through the transmission mechanism, to other segments of the financial market, loans and the real economy. That is why efficient functioning of the interbank money market is of crucial importance.

The main NBS monetary policy instrument is the key policy rate (KPR) applied in main open market operations – one-week reverse repo transactions (absorbing excess dinar liquidity from the banking sector). The interest rate applied in these operations (the weighted average repo rate) is the main interest rate that governs other interest rates in the interbank money market. Through main operations and other monetary policy instruments, such as FX swap auctions, the NBS influences the dynamics of interest rates in the interbank money market and enables its stable and efficient functioning.

With the entry into force of the Law on Financial Collateral in early 2019, adopted upon the NBS's proposal, the legal regulations for the performance of repo transactions were complemented. For the first time in Serbia, this Law regulates the matter of contracted financial collateral in a systemic way, by ensuring higher legal certainty and protection in the settlement of receivables, primarily of qualified market participants, which are the main entities in financial market turnover.

Among other things, the Law on Financial Collateral eliminated the last obstacles for the conclusion of interbank repo transactions, given that the Master Repo Agreement, which was actively developed by the NBS and other relevant institutions, was adopted back in late 2014. As a result of these regulatory activities, several interbank repo transactions were concluded in 2019, where government securities were used as collateral.

Relevant regulation for the performance of repo transactions is exceptionally important for the stability and normal functioning of the domestic money market. The experience of the latest global financial crisis has shown that repo transactions were the main method of short-term interbank financing, because due to enhanced risk and mistrust, market participants practically refrained from unsecured lending. Apart from this, as they are collateral-based, repo transactions also contribute to the development of other financial market segments.

Additional NBS FX swap auctions (January–June 2019)[2]

In early 2019, against the backdrop of reduced excess liquidity in the Serbian banking system, primarily reflecting the restrictive monetary effect of the fiscal policy[3], the main interest rates in the interbank money market went up.

The period of enhanced volatility of short-term interest rates (primarily BEONIA, which is the most active segment of the interbank money market) began in the last quarter of 2018. From an average of 2%, where it stood from August to mid-October 2018, BEONIA increased to over 2.50% in a short period of time. This was partly a result of an already established effect which was a characteristic of the start of the required reserve maintenance period,[4] but largely due to the vigorous liquidity withdrawal based on government activities, where the state withdrew RSD 257.2

2 FX swap auctions used for the said purposes are called "additional" so as to differentiate them from regular FX swap auctions organised by the NBS each Tuesday (three-month maturity) and Friday (two-week maturity) with the aim of encouraging the development of the interbank swap market.

3 Since 2015, government activities have mainly had withdrawing effect on banking sector liquidity. This has been particularly pronounced as of 2017, when the fiscal surplus was first recorded. In 2018 and 2019, liquidity withdrawal from the banking system based on government activities equalled RSD 226.5 bn and RSD 241.1 bn respectively. This effect is the result of positive fiscal trends, i.e. it was achieved due to two basic factors – higher public revenues in comparison to dinar public expenditures (accounting for between 80% and 90% of the effect) and the amount of issues exceeding the maturity of dinar government securities (between 10% and 20%).

4 The required reserve maintenance period starts on the 18th day each month in the year and ends on the 17th day in the following month. At the start of the required reserve maintenance period, banks apply the front-loading principle, i.e. higher allocation of dinar required reserves in their current accounts in the first days of the maintenance period, so as to timely ensure the fulfilment of obligations towards the regulator. For this reason, in the first days of the maintenance period, banks step up their borrowing in the interbank money market, which leads to a rise in short-term interest rates.

bn from the banking system in the first three quarters of 2019. However, fiscal policy cannot be blamed because two key factors which had a restrictive monetary influence – the balancing of the fiscal result, i.e. achievement of the surplus (higher revenue relative to expenditure) and the efforts to increase the dinar share in public debt (with the aim of reducing public debt and improving its currency structure, i.e. reducing exposure to the FX risk)[5] – resulted in overall positive effects on the Serbian economy.

It turned out, as explained hereinafter in more detail, that government activity was one of the key reasons for the significant liquidity contraction in the US banking system as well, which triggered a shock (a vigorous rise in interest rates) in the repo market in mid-September 2019. However, unlike the Serbian case and the above-explained positive effect, the liquidity in the US was affected by the government activities whose effect on the US economy was not favourable in the long run. These activities included liquidity withdrawal through intensive additional borrowing. Additionally, monetary and fiscal policies in Serbia acted complementary from the aspect of liquidity analysis, forecasting and management[6], as well. This was not the case with the US market having in mind that until the materialisation of the shock on the repo market, both the Fed and the Department of the Treasury impacted liquidity withdrawal from the market – the former through the normalisation of its balance sheet, the latter through the suspension of borrowing limits.

In the above-described domestic environment, banks' excess liquidity was gradually reduced and interest rates in the interbank money market fluctuated with stronger intensity – from October 2018 to 28 January 2019 BEONIA moved in the range of 1.89–2.54%, oscillating somewhat more than ±13% around the average range value, while the rate on one-week unsecured loans was somewhere in the range of 2.15–2.80% in December 2018 alone, oscillating almost ±15% relative to the average (Figure 2). These trends continued until mid-February 2019, when higher amounts of government dinar bonds fell due (on 22 February 2019, over RSD 90 billion worth of three-year dinar bonds fell due).

A potential risk has arisen for a further increase in short-term interest rates due to potential undesired market segmentation). In an environment where only several banks have excess liquidity, while the majority has to borrow liquidity in the interbank money market, banks with excess liquidity would be encouraged to require abnormally high interest rates on funds they lend.

Acting proactively and with the aim to ensure smooth functioning of the money market, on 28 January 2019, the NBS used an instrument that was already at its disposal, but this time – to regulate dinar and FX liquidity of the banking sector – FX swap auctions, where in the first leg the NBS took FX in exchange for dinars that it sold to banks – on a two-week term.

The use of this instrument proved to be optimal in the situation assessed by the NBS as a temporary reduction in excess dinar liquidity. It was of essential importance that the NBS's communication with all participants in the domestic financial market had been at a high level for several years already, which the NBS had publicly reiterated several times.

The main objective of the above-mentioned operations was a proactive approach of the NBS with the aim of maintaining a stable liquidity situation in the banking sector and continued unimpeded functioning of the interbank money market.

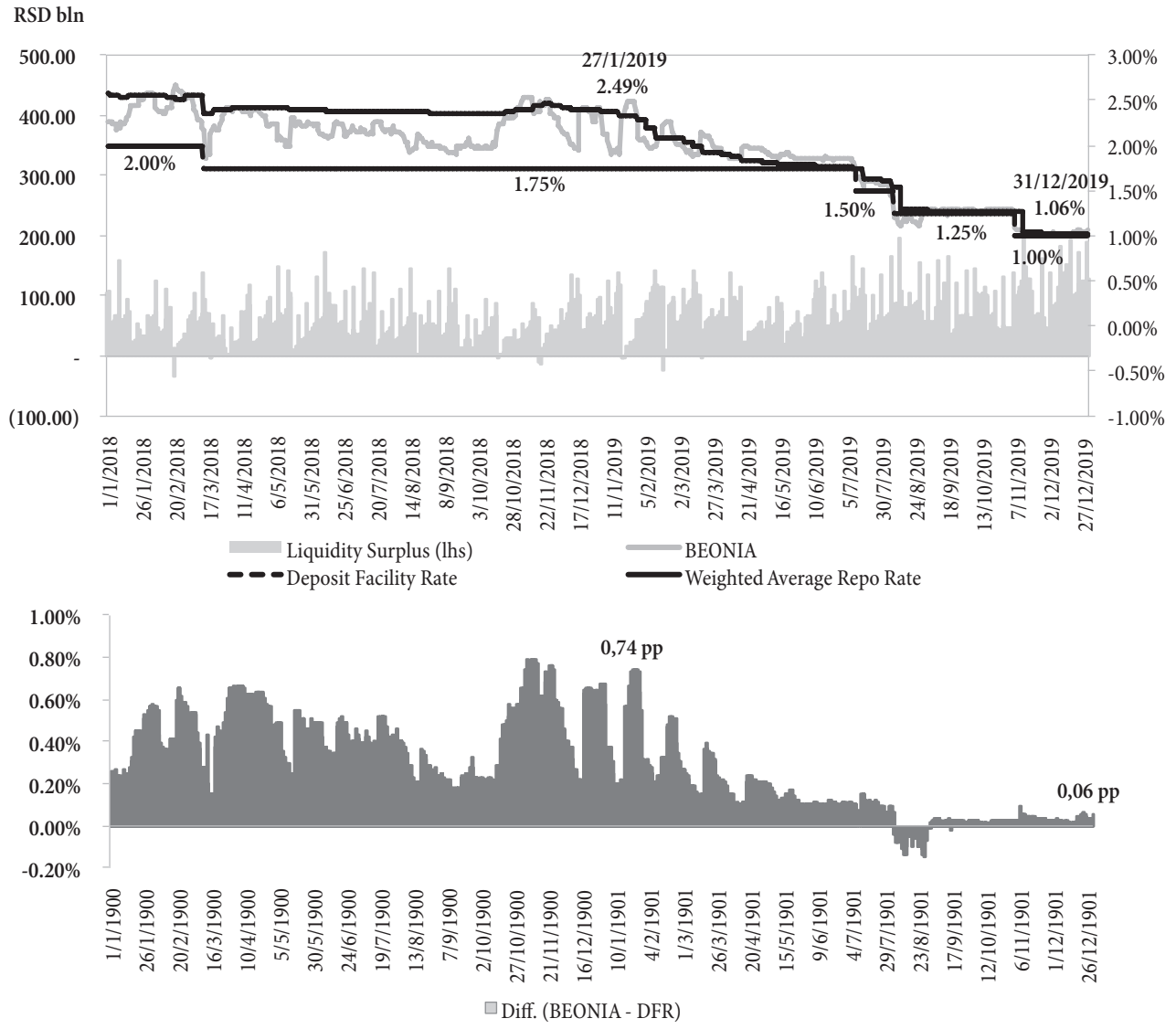
Of course, the NBS had at its disposal other instruments for pumping liquidity into the banking system. However, against the backdrop of the continued structural dinar excess liquidity in the banking sector, reverse repo auctions (withdrawing excess liquidity) remained the main instrument for the regulation of bank liquidity, as well as signalling the monetary policy stance and the movement of short-term interest rates in the market.

Therefore, changing the direction of repo operations or simultaneously introducing active repo operations to

5 At end-November 2019, the share of dinar debt in Serbia's total public debt was 27.9%, up by 7 pp compared to end-2016. In the same period, the share of dollar debt declined by 14 pp, from 33.9% to 19.9%. This largely reduces the exposure of public debt to the FX risk, particularly towards the dollar as the currency whose movement against the dinar cannot be influenced by the NBS (or its influence is only in regard to the dinar exchange rate against the euro – by maintaining its relative stability, while the EUR/USD exchange rate is rather volatile).

6 Monetary policy factors (primarily NBS interventions in the form of net FX purchases in the domestic FX market) acted with the aim of increase in dinar liquidity, i.e. as "a compensating factor" in terms of balancing banks' reserves.

Figure 2: BEONIA and excess liquidity in the banking system



Source: NBS.

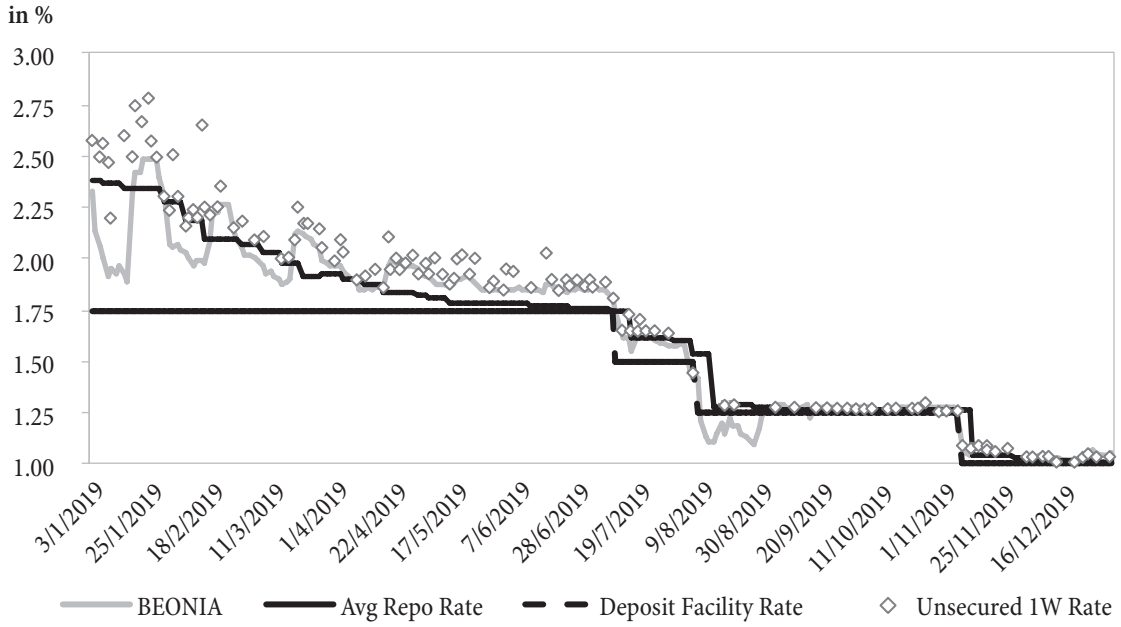
provide liquidity to banks was not the optimal solution along with the already existing reverse repo operations, as this could have sent an entirely unclear signal to money market participants about monetary policy, i.e. about what the NBS wishes to achieve with its repo operations.

The NBS reacted promptly to the first hints of such developments.

The very first additional swap auction, held on 28 January 2019, had a significant positive effect. Banks were provided with dinar liquidity for a period of two weeks, in the amount of RSD 22.5 billion (while EUR 190 million was withdrawn from banks as a form of financial collateral). BEONIA rate was lowered to around 2%, i.e. by almost 50 bp. Interest rate fluctuations in the interbank money market continued even after the first additional swap auction, meaning that liquidity in the banking sector was not yet fully balanced. Due to these reasons, the NBS organised six more additional FX swap auctions to enable the banking sector to gradually adjust to the improved liquidity in the money market. This resulted in considerably lower level and volatility of interest rates in the interbank money market (BEONIA, rate on one-week interbank transactions, average repo rate).

In addition to trimming interest rates, additional FX swap auctions enabled the NBS to achieve yet another goal – to reduce the oscillations in these rates, which were up until that point present in periods before the beginning of the new required reserves maintenance period. By organising a series of additional FX swap auctions, interest rates in the interbank money market were fully balanced, as was

Figure 3: Dynamics of the main money market rates in 2019



Source: NBS.

the banking sector liquidity, which allowed for a gradual mitigation of BEONIA volatility. A key contribution came from the NBS's decision to implement these operations, as well as from the clear and credible signal that was sent to market participants – that there is no alternative to stability.

Figures 2 and 3 clearly show the reduction of volatility of the market interest rates and their convergence to the deposit facility rate (considered a theoretical lower bound of money market interest rates), which is the result of improved liquidity in the banking sector owing to activities and measures taken by the NBS.

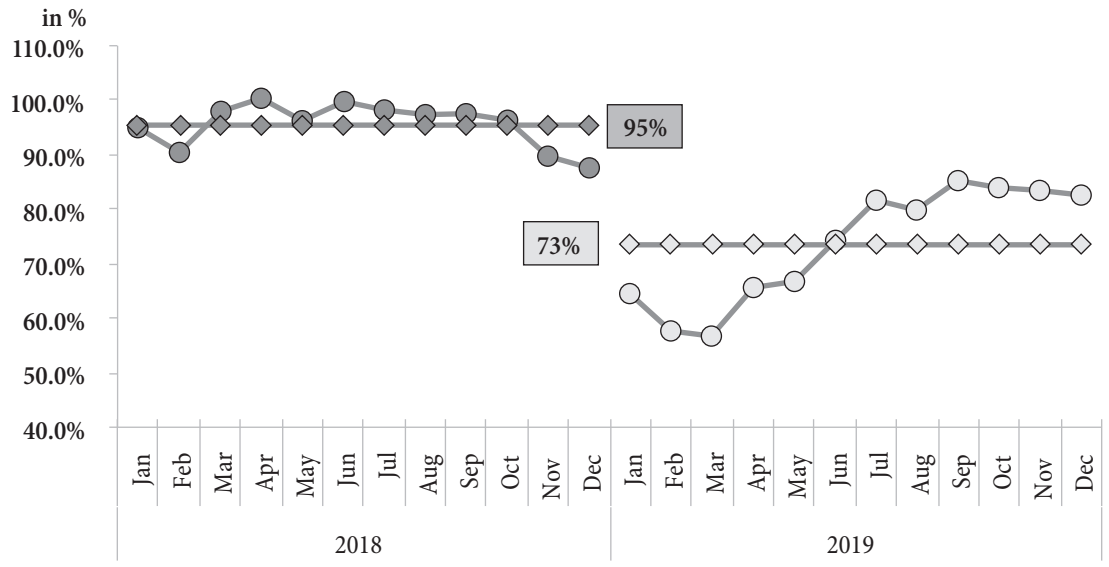
Concurrently with organising additional FX swap auctions, another important measure that contributed to the reduction of interest rates in the money market was the NBS's strategic decision to decrease the percentage of dinar liquidity it withdraws via reverse repo operations (relative to bank bids on repo auctions). This enabled the relaxation of monetary conditions without changing the main instrument (the weighted average rate was lowered, while the key policy rate remained unchanged). This specificity of the NBS's approach proved very efficient in making the implementation of monetary policy more flexible. At the onset of the situation with lower liquidity surplus, early in 2019, the NBS decided to decrease the volume of liquidity it withdraws through reverse repo auctions (Figure 4) in order to keep a somewhat larger amount of disposable reserves in the market (among banks), i.e. at the disposal of banks for their everyday operations, without threatening the normal functioning of the interbank money market.

Figure 4 shows that in 2018, the NBS accepted almost all bank bids in reverse repo auctions (95% on average). However, with a decrease of banks' excess liquidity and the need to pump dinar liquidity into the banking system through FX swap auctions, the NBS decided not to withdraw the entire bid of the banks in reverse repo auctions. On average, 73% of the offered amount was withdrawn in 2019. The difference is also noticeable when we compare the first and the second half of 2019 – in the first six months, the percentage of the withdrawn bidding amounts was 64%, while in the second half of 2019, when the liquidity of banks improved, the percentage also increased – to 82% on average.

These monetary policy measures, i.e. measures to regulate the banking sector liquidity, had an important effect on lowering market interest rates along the entire short-term yield curve (overnight lending and one-week loans, as well as BELIBOR interest rates[7]). From

7 BELIBOR (Belgrade Interbank Offered Rate) interest rates of certain maturities are benchmark interest rates for dinar assets offered by banks – participants in the BELIBOR Panel, in the Serbian interbank market. BELIBOR rates are banks' quotations and are not based on conducted transactions.

Figure 4: Percentage of bank bids accepted in reverse repo auctions (2018–2019)



Source: NBS.

25 January (right before additional FX swap auctions were organised) until 11 July (before the first decrease of the NBS key policy rate and rates on deposit and credit facilities, i.e. interest rate corridor in 2019), based only on the organised additional FX swap auctions and the decision to withdraw, via reverse repo operations, a somewhat lower amount of liquidity than the banks were willing to put in repo – interest rates along the short-term yield curve were lowered by 46 bp on average. At the same time, the largest effect was exhibited in market interest rates, i.e. rates based on real transactions (BEONIA, average repo rate and one-week (1W) interbank loans), which decreased during the respective period by 59 to 77 bp, on average by 70 bp (Figure 5, left panel). Quite expectedly, the effect on BELIBOR rates, which are based on bank quotations and are therefore more sensitive to changes in the main interest rates corridor, was much softer, and they were lowered by 24–37 bp, on average by 28 bp, in the said period.

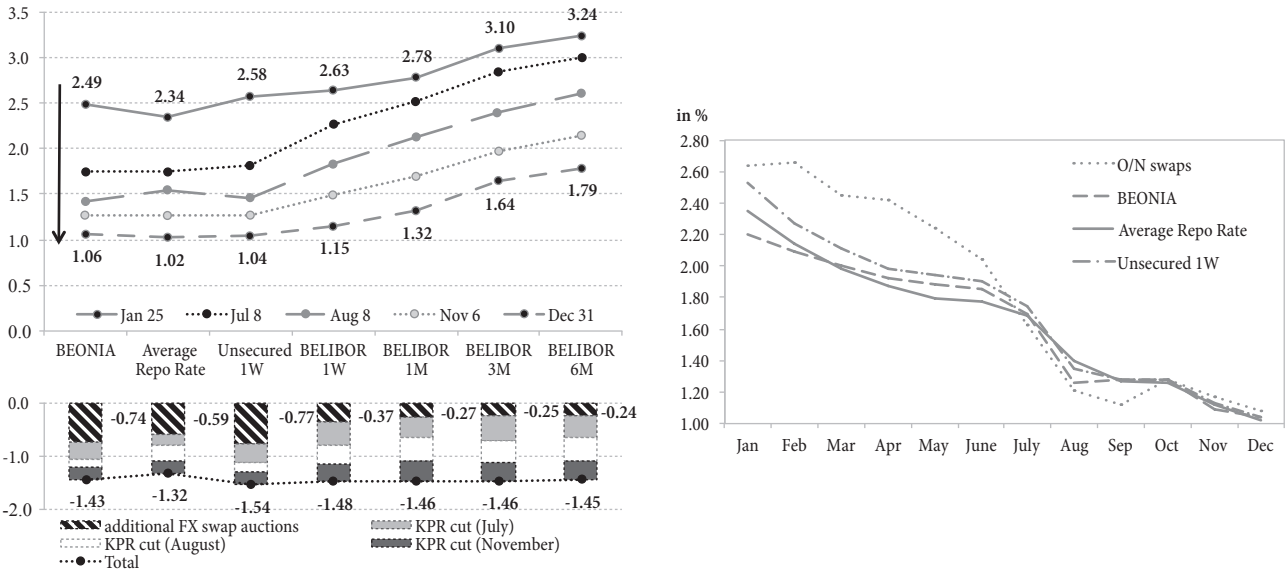
These interest rate cuts illustrate the efficiency of monetary policy measures which the NBS implemented in the first half of 2019 and which spilled over entirely onto the financial market.

Afterwards, in the second half of the year, the NBS lowered the main interest rates corridor in three instances – in July, August and November, each time by 25 bp. These measures spilled over entirely onto the market interest rates. The average decrease in rates along the entire short-term yield curve was almost 1 pp (more precisely, 99 bp), i.e. it was higher than the cumulative narrowing in the main interest rates corridor (which narrowed by 75 bp). However, the reactions here were structurally different than in the first subperiod – market interest rates were lowered by 73 bp on average, i.e. they fully reflected the narrowing of the interest rates corridor, while the quoted BELIBOR rates reacted with a sharper fall – by 118 bp on average. Taking both subperiods into consideration (from the additional swap auctions that were organised to the first narrowing of the interest rates corridor, and from the first lowering of main rates until the end of the year) – interest rates along the entire short-term yield curve dropped in cumulative terms virtually at the same intensity (by 145 bp on average).

Consequently, as a result of the NBS's monetary policy measures, short-term dinar rates declined to their all-time low levels around 1% – BEONIA, average repo rate and the 1W rate hovered slightly above 1% at the end of 2019. Additionally, not only did the monetary policy measures spill over entirely onto interest rates in the money market, but their movements were almost fully consistent, even when we take into account the implied interest rates in the overnight FX swaps transactions between banks and their clients[8] (Figure 5, right panel).

8 Non-residents borrow dinars through swaps and create dinar liabilities.

Figure 5: Movements in short-term interest rates in 2019 – impact of NBS measures



Source: NBS.

US money market – General overview

As recently reiterated by John Williams, President of the Federal Reserve Bank of New York – by controlling short-term market rates, the Fed seeks to achieve its main objectives – price stability and maximum employment. At the same time, the Fed determines its key policy rate (Federal Funds Rate – FFR), as the corridor (range) within which the rate on unsecured overnight loans between banks (EFFR – Effective Fed Funds Rate, such as the Serbian BEONIA rate) should oscillate. The current FFR target range is 1.50-1.75%, and during 2019 it was trimmed on three occasions,[9] each time by 25 bp. Like other central banks, the Fed strives to influence the interest rates in the money market by maintaining an optimal level of liquidity in the system,[10] through repo operations (repo/reverse repo) and by setting remuneration rates[11] and rates on overnight reverse repo operations.

A key segment of the US money market is the repo market, which provides liquidity and the basis for pricing transactions and instruments in other segments of the financial market (such as the financial derivatives market). Repo transactions, where securities are traded (for cash funds) with the obligation to be repurchased after an agreed period of time and at the agreed price (borrowed money plus agreed interest), regardless of its modality (bilateral or tri-party repo) – stands as the main source of liquidity for many market participants (banks, companies, insurance undertakings, hedge funds, money market funds). For the most part, repo transactions are of the shortest – overnight – maturity, but they are almost always rolled over, and US Treasuries and agency securities are most often used as financial collateral.

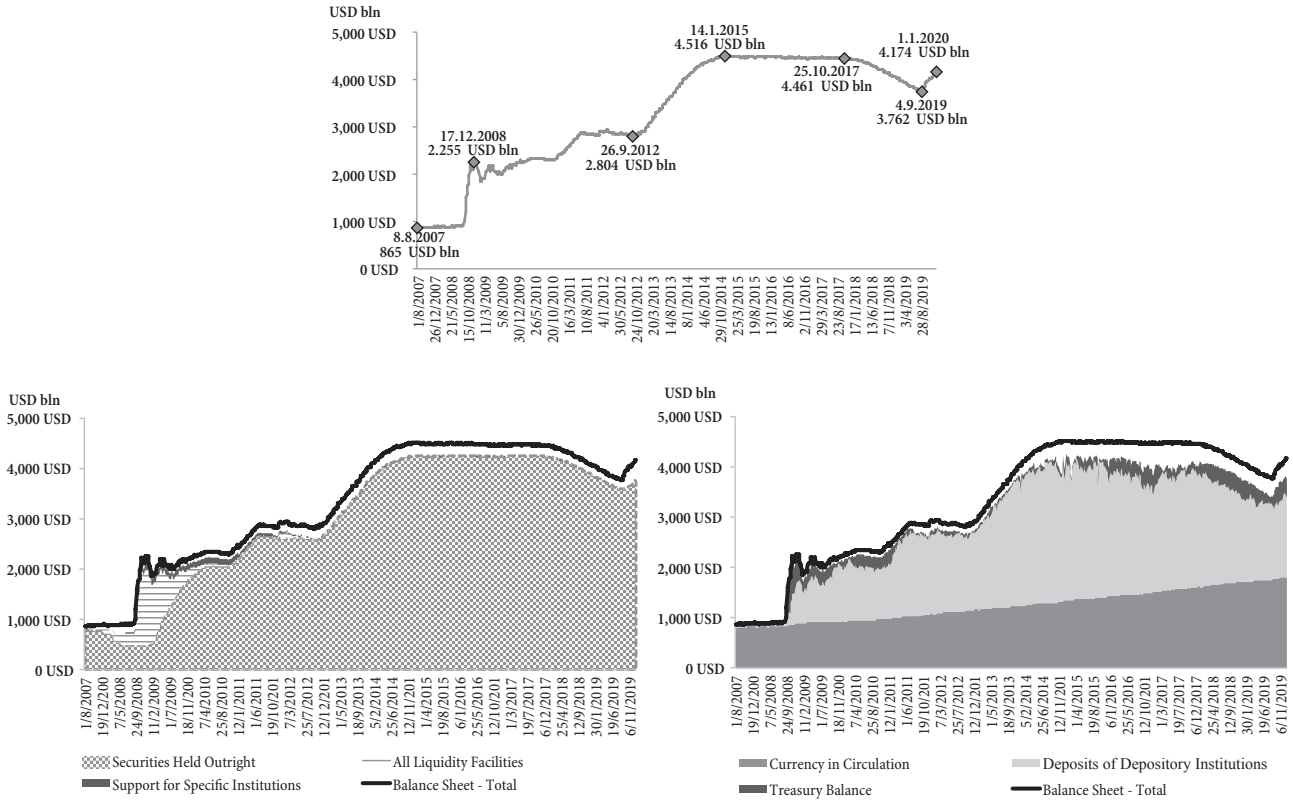
An analysis in the latest BIS Quarterly Review in December 2019 [1] indicates heavy reliance of the US repo market on four (unnamed) large banks which stand apart as net lenders. The review continues to point out a very important factor that led to growth in interest rates in the repo market, namely an indication of strong concentration of liquidity reserves in the market – although four big banks have been marginal net lenders since 2011, during 2018 and in particular during 2019 the amount of net loans from these banks to the repo market doubled to almost USD 300 billion around mid-year (June 2019). Concurrently, the non-banking financial sector's demand for monetary assets increased, and these institutions (such as hedge funds) financed it through repo transactions where US Treasuries were the collateral.

9 In August, September and October 2019.

10 When the system is in a state of optimal level of excess liquidity, interest rates are within the limits of the target range. When there is a deficit or an insufficient level of excess liquidity, an increase in market interest rates ensues.

11 The rate that the Fed pays to the banks for reserve liquidity kept with the Fed – on required reserves (IORR) and excess reserves (IOER).

Figure 6: Fed's balance sheet (August 2007 – January 2020)



Source: Fed, USA.

In response to the great financial crisis, after lowering the rates to zero level[12], the Fed launched a strong process via (so far) three official rounds of quantitative easing[13] (Figure 6). By purchasing US Treasuries and Agencies' securities, the Fed made room for the reduction in interest rates along the entire yield curve, as well as for a robust increase in its balance sheet, while banks accumulated a significant part of the reserves with the Fed. As of the escalation of the global economic crisis and until 2015, the Fed's balance sheet increased almost constantly (from USD 870 billion in August 2007 to USD 4.5 trillion in early 2015). This was followed by a period of refinancing of matured US Treasuries, and from October 2017 to September 2019, in accordance with the programme of balance sheet normalisation, the Fed's total assets went below USD 3,800 billion. After the latest shock in the repo market in September 2019, and as a result of the reaction to the Fed's measures implemented in order to stabilise the interest rates in the interbank money market, the Fed's financial assets again started to increase.

As the size of the Fed's balance sheet changed, so did its structure to a certain extent. Although the securities portfolio accounted for more than 90% of total Fed assets even before the global economic crisis, as it does now, its share was not constant, and it changed depending on monetary policy measures of the most influential central bank in the world. At the beginning of the global economic crisis, the level of securities dropped sharply, as did their share in total assets (to only 20%), because the Fed used the proceeds from their sale to finance loans approved through liquidity funds. As liquidity instruments decreased, the total amount and the share of the portfolio of securities began to increase again during 2009, and as of 2011 they again accounted for almost all of the Fed's assets (more than 90%). This was the result of a series of large asset purchase programmes within quantitative easing. The winding down of the Fed's balance sheet within monetary policy normalisation was accompanied by an identical reduction in the portfolio of securities whose maturity

12 On 16 September 2008, the target range for the federal funds rate was lowered to an all-time-low (0.00–0.25%).

13 QE – Quantitative easing programmes, began in December 2008 and, with occasional breaks, lasted until October 2014 in three stages – QE 1 (December 2008 – March 2010), QE 2 (November 2010 – June 2011) and QE 3 (September 2012 – October 2014).

was not rolled over. Hence their share remained above 90%, with the reduction of the total amount (Figure 7, left panel).

As for the other side of the balance sheet, i.e. liabilities, changes were somewhat different. Cash in circulation recorded gradual but constant growth. However, reserves (deposits) of deposit institutions with the Fed rose dramatically relative to the pre-crisis period, which is a result of the Fed's major liquidity injection in the system. Before the crisis, the reserves accounted for only 2–3% of the total balance sheet, whereas after the first monetary measures, i.e. the injection of liquidity as the crisis escalated, their share hiked to 40% and then gradually increased to more than 60% (Figure 7, right panel). At the onset of the crisis, a more important role was that of increased liquidity withdrawal by the Government, reflected through the higher share of the Treasury's account in total liabilities.

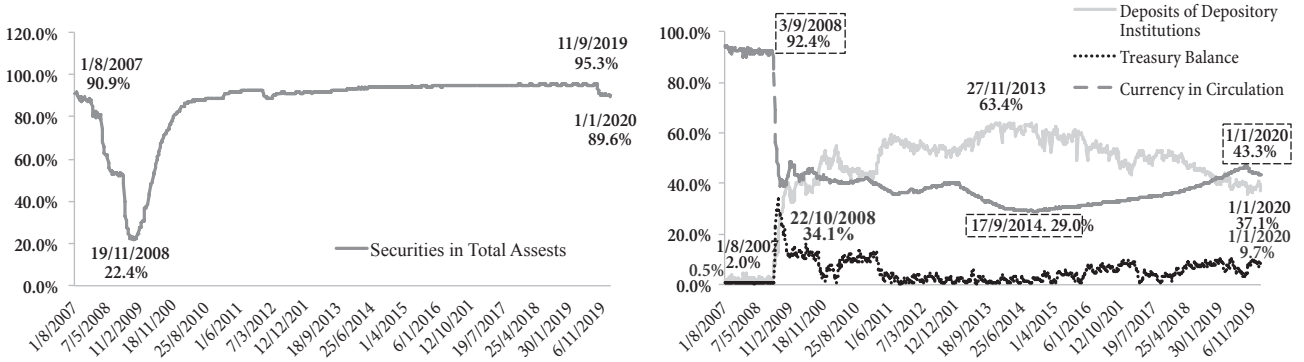
A very symptomatic and useful conclusion is derived from the analysis of data on the dynamics, i.e. change in the Fed's balance sheet composition. Banks' reserves with the Fed almost doubled from October 2012 (from a little more than USD 1,400 billion) to August 2014 (to around USD 2,800 billion). The main reason for this increase can be found in Fed asset purchases under the QE programme. However, in the last two years (from September 2017 to September 2019), bank reserves decreased considerably, by almost a trillion dollars – from around USD 2,400 billion to around USD 1,400 billion, which, according to some economists and analysts, is at or below the critical level of bank reserves [11]. This was one of the underlying reasons for the spike in repo market rates, as banks refrained from lending their liquidity. However, it was government activities that landed the final blow to banking sector liquidity. During the month preceding the spike in interest rates, bank reserves dropped by USD 166 billion, which is almost fully attributable to government's liquidity withdrawals – the Treasury account balance at Fed (TGA – Treasury General Account) went up by USD 170 bn (Figure 8).

Given the time span of the Fed's monetary easing measures in the post-crisis period, banks became largely accustomed to the abundant liquidity situation (hysteresis effect). This significantly aggravated market functioning once the Fed, after being the main source of liquidity for a number of years, decided to cut down its balance sheet. Banks got used to the high level of liquidity in the system and based their own and their clients' operations on such assumptions. Blake Gwinn, the NatWest Markets analyst, observantly noted: "The longer they go on as the major source of liquidity, the harder it's going to be to extricate themselves" [11].

As the Fed started to wind down its balance sheet in October 2017, there was a more durable decline in banks' reserves with the Fed. Given that the US is constantly increasing its public debt (Figure 9) through issues of US Treasuries[14], the rise in supply (coupled with the Fed's shrinking demand) pushed repo interest rates above the rate paid by the Fed on excess reserves (IOER) in mid-2018.

14 The US, in what is already a customary practice, raises the limit (ceiling) of its public debt, and occasionally even suspends the previously defined limit. The latest debt limit suspension was passed in August 2019 and was planned to stay in effect until end-July 2021. Since August until year-end, the US public debt rose by around USD 1,200 bn (by over 5%), increasing by two and a half times relative to the pre-crisis level.

Figure 7: The share of certain items in the Fed's balance sheet



Sources: Fed, USA and authors' calculations.

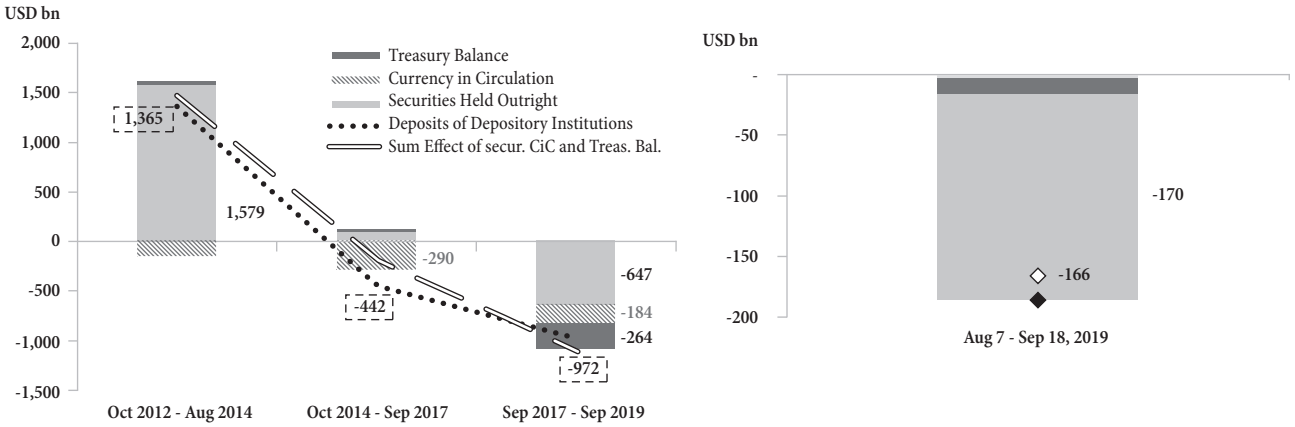
The US banking sector, which had up to that point been the net borrower in the repo market, now became the net lender, with two coinciding trends in place – the four largest banks which in the past acted as lenders for almost 10 years, doubled their loans in the repo market in the past two years, while the demand of other banks for financial resources in the repo market declined [1].

As lending in the repo market gained ground, the portfolio of US Treasuries in US banks increased, especially in the four largest banks, whose share of Treasuries in disposable liquid reserves[15] rose from around 25% to over 40% in just two years, while all other US banks experienced a slower rise in this share (from around 16% to around 24%). In mid-2019, the four largest banks held over one half of the total portfolio of US Treasuries in the banking sector, while the aggregate contribution of the following 26 banks was 40%. At the same time, according to data from the BIS analysis, these four banks accounted for merely one quarter of reserves, i.e. funds they could lend in the repo market; it therefore became clear that their ability to supply funding to borrowers at short notice in the repo market was diminished, which turned out to be one of the structural reasons behind the interest rate hike in mid-September [1].

The other structural reason was the increased withdrawal of bank reserves through government activities (similarly as in the case of Serbia), reflected through increased balances in the TGA, especially after 2015. A very important event that took place in early August 2019 was the debt ceiling suspension, allowing for additional government borrowing, i.e. withdrawal of liquidity from the banking system. This additionally reduced the banks' capacity to respond to the repo market demand. Once the reserves dropped below the level considered as optimal (or the minimum below which liquidity reserves in the US banking system should not fall), banks were no longer

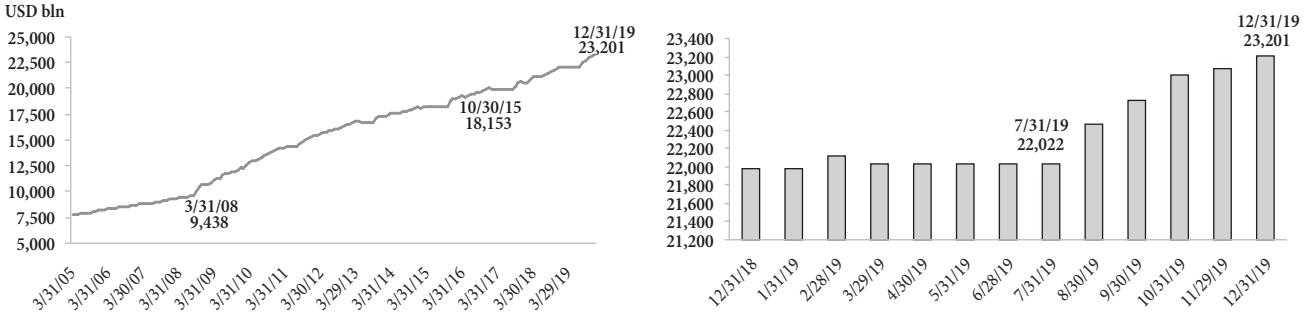
15 Disposable reserves = cash + Fed funds + reserves (account balances) + Treasury securities.

Figure 8: Impact of changes in individual Fed balance sheet items on changes in bank deposits with the Fed



Source: Fed, USA and authors' calculations.

Figure 9: US public debt (2005-2019 and during 2019, in US bn)



Source: Bloomberg.

ready to lend, which inevitably triggered an abnormal rise in repo market rates.

The importance of public debt increase, as a structural factor, is evidenced in the fact that over USD 120 billion of reserves were withdrawn from the banking sector in only one month, almost solely as a result of government activities (i.e. increased TGA balances). Surely, this factor cannot be viewed in isolation. Since the Fed started to wind down its balance sheet (by reducing the portfolio of US Treasuries and agency securities), bank reserves went down significantly (from 25 September 2017 until 14 August 2019, bank reserves declined by over USD 600 bn, almost entirely as a result of the above factor (reduced balances in the Fed's SOMA – Single Open Market Account) – Figure 10.

Hence, the conclusion is clear: the high level of liquidity reserves to which the banks were accustomed was initially reduced through the Fed's actions to cut down its balance sheet, whereas, once the level of reserves reached a critical limit, the decision on the suspension of public debt and the resulting greater liquidity withdrawals through government activities ultimately led to banks' aversion to lend in the repo market, which triggered a short-term cessation of its normal operation and a sudden hike in interest rates.

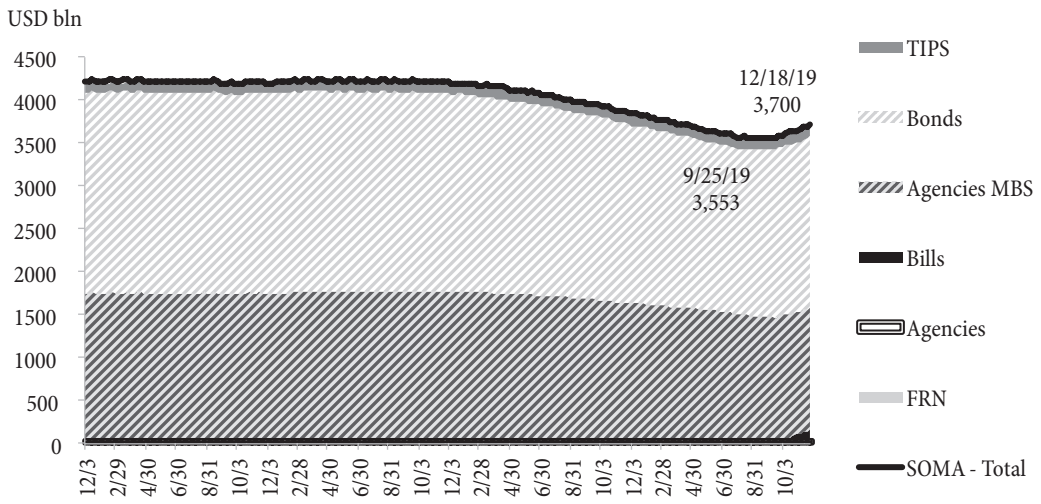
This should be viewed in combination with certain other factors that pushed up the banks' reserves floor, i.e. the reserves limit below which banks are reluctant to lend in the repo market. Many discussions of economists and market participants mention regulatory, i.e. supervisory requirements resulting from the global economic crisis, aimed at boosting financial system stability. One of such indicators is the LCR (Liquidity Coverage Ratio) which requires the holding of sufficient HQLA (High Quality Liquid Assets) to cover bank liabilities due in the next 30 days.

As also stated in the BIS study, although regulations stipulate that both account balances (bank reserves) and the portfolio of US Treasuries belong to the HQLA class, in practice, banks prefer to hold a somewhat higher reserve buffer, both for everyday operations and to ensure faster marketability in the event of disturbances in the secondary securities' market or the repo market, through which they can raise cash.

That the mid-September spike in interest rates was fuelled not only by liquidity supply factors, but also by increased liquidity demand in the repo market, is evident from the fact that hedge funds and other borrowers in the money market stepped up their demand in order to cover their arbitrage transactions. In an environment of limited money supply, where, in addition to banks, money market funds (MMFs) also cut down their role of liquidity distributors (which they had played since 2017, owing to good earning opportunities), the increased demand by hedge funds caused an indisputable halt in repo market operations [1].

The Fed had to respond to prevent a crisis spillover to other segments of the financial market which, to reiterate, largely depend on this lifeline and the main source of short-term liquidity. The combination of factors that led

Figure 10: SOMA account balance – Composition



Source: Federal Reserve System, US.

to the above described shock in the US repo market, also required a combination of measures to put interest rates under control.

The section below focuses in more detail on short-term and longer-term measures taken by the Fed to stabilise the repo market. The short-term measures included prompt initial response to put out the fire. Already after a few overnight repo auctions, it became clear that a more decisive response of monetary authorities was needed in order to convey the key message – one that emphasises the credibility of the applied measures as well as central bank's commitment to fix the new situation at its root. The demand at overnight auctions was, thus, swiftly replaced by demand in longer-maturity repo auctions (two weeks), after which the Fed adopted a series of structural liquidity-boosting measures, the most important of which was definitely the renewed buyback of US Treasuries, whereby at least two complementary objectives were met: direct increase in bank reserves and lowering of money market interest rates (directly and indirectly, through increased demand for US Treasuries).

US repo market crisis (September–December 2019)

On Tuesday, 17 September 2019, the US banking system saw a marked excess liquidity squeeze, sending shockwaves through the world's most liquid and most active repo market and triggering a surge in short-term interest rates.

Money market rates, which had previously hovered around 2%, increased dramatically to over 5% on average (Figure 11, left panel), while in some transactions they reached as much as 10%.

Analysts, economic experts and officials put forward different theories and opinions to explain the cause of such repo market developments in the US, but questions mostly boiled down to the following: Was this an incident or a problem that was more durable in nature? Was the response of monetary authorities well-calibrated? Can monetary policy resolve the issues causing such reaction in a market that is the basis of short-term liquidity, if they are not monetary in character but refer rather to fiscal and/or regulatory issues and requirements?

Two things are certain:

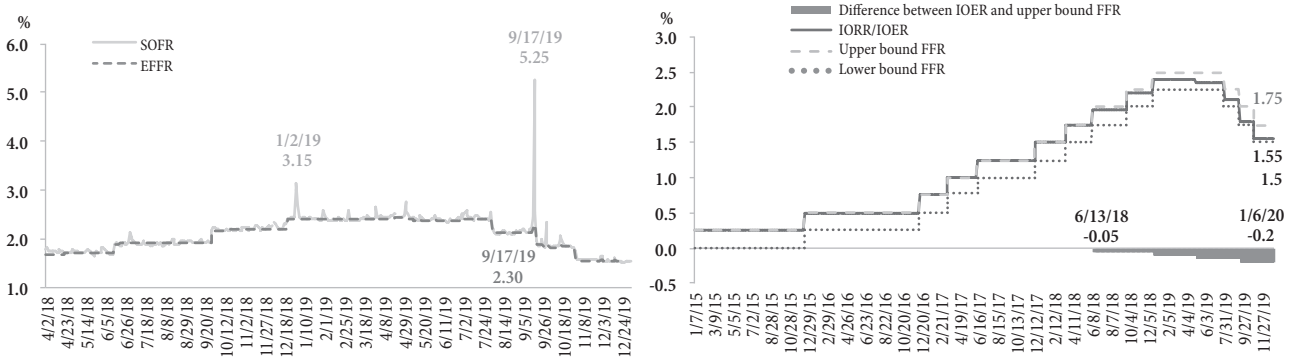
- First, monetary policy is not a panacea, and
- Second, the same monetary policy instruments produce different effects in different countries, even when applied to the same monetary phenomena. The specificities at the root of a problem determine the optimality of an approach and its success.

The factors behind the dip in liquidity are numerous and may even be said to represent a "confluence of events" [25]. Some of them were short-term, momentary and had the initiating effect of a "straw that broke the camel's back". However, a deeper analysis of causes which led to a situation where a momentary event was capable of setting off such a shock in the money market, reveals that there are structural, longer-term and more substantial reasons behind the problem at hand.

The following momentary events which led to liquidity withdrawal from the banking system in mid-September stand out in particular:

- Collection of quarterly taxes from the corporate sector;
- Settlement of a new issue of US Treasuries amounting to close to USD 80 bn.

Figure 11: Dynamics of short-term interest rates (SOFR, EFFR, IORR/IOER)



Source: Bloomberg.

Naturally, the question arises as to how it is possible that the two events, even if they coincided, could have triggered such a dramatic surge in market interest rates. Is something bigger at the root of the problem? Many economists rightly note that the factors behind reserves' drop below the "optimal level"[16] included a rise in the US public debt and a heavier issue of US Treasuries, which mop up liquidity from the system, all against a backdrop of the Fed's balance sheet decline. Another factor mentioned in a number of discussions relating to this topic, reflecting the structural character of the liquidity squeeze and the interest rate rise, are regulatory requirements, mostly relating to the LCR[17] which requires banks to hold a certain level of HQLA (High Quality Liquid Assets), resulting in a higher threshold for liquidity reserves which banks are required to hold as additional security (that is, capital requirement) against sudden outflows over 30 days.

In October 2019, Jamie Dimon, the chairman of JPMorgan Chase & Co., pointed out that one of the reasons why banks couldn't put their spare cash (reserves) to a "more profitable use" is that the rules adopted since the financial crisis stake too many regulatory requirements for banks. He said that bank deposits with the Fed were earmarked for "resolution and recovery, and liquidity stress testing" and that they could not be lent in the repo market although the banks "would have been happy to do it" [3].

Another post-crisis liquidity-related regulatory measure, which banks often cite as a factor limiting the liquidity available for investment in the repo market (whether justifiably so or out of a wish to seize upon this moment to blame the regulator), has to do with intraday loans which banks were able to take from the Fed before the global economic crisis. Goldman Sachs Group Inc. is one of the most vocal advocates of a more flexible approach by the Fed on this issue (reintroduction of these loans) [3].

Also interesting was the way officials responded to such banks' remarks. The US Treasury Secretary Steven Mnuchin supported these views by saying it was a reasonable question whether the US has "gone too far in the other direction in requiring the banks to maintain this excess liquidity for intra-day operations" [3]. The Fed did not remain indifferent either and expressed willingness to consider changing some of liquidity-related regulatory measures[18], thereby implying banks were right to complain.

Finally, another factor, among many others, dampening banks' readiness to lend in the repo market is the fact that the interest rate the Fed pays on required reserves (and excess reserves, IOER – Interest on Excess Reserves) was at similar level as repo market interest rates. Only after mid-June 2018 did the rate paid by the Fed on excess reserves and bank deposits drop below the upper bound of the FFR (Federal Funds Rate). Hence, this did not provide enough incentive for banks to lend to other participants in the money market, in view of declining total reserves and regulatory requirements calling for these reserves to be higher (Figure 11, right panel).

In the first half of September 2019, just before the shock in the repo market, the IOER rate was on average only 3–4 bp lower than the money market interest rates (SOFR and EFFR), which was not enough to make banks relinquish their security with the Fed for riskier transactions in the money market. By contrast to the US, the remuneration rate for required reserves in Serbia is at all times at least 25 bp lower than the lower bound of the deposit facility rate, while no interest is paid on excess liquidity in current

16 This is put at somewhere between USD 1,300 and 1,500 bn. It is considered that the Fed's goal is to create a more voluminous buffer in the form of excess liquidity in the banking system. Excess liquidity in the US banking system in mid-October, when additional measures were introduced by the Fed, came at around USD 1.3 trillion (USD 1.5 trillion of liquidity – USD 0.2 trillion of required reserves). However, regulatory tightening after the outbreak of the 2008 crisis calls for banks to hold much higher liquidity levels. Numerous financial and economic analysts believe that the required minimum reserve level is "not economically correct," as market structure and regulations together (including minimum RR, LCR – the requirement to hold a high share of liquid assets with financial institutions, and other regulations) pushed up liquidity requirements to around USD 1.5 trillion, which was their level during September. Analysts therefore believe that it is this amount (USD 1.5 trillion) which is the "realistic", i.e. economically relevant level for US banks' reserves at Fed.

17 LCR – Liquidity Coverage Ratio – ratio indicating banking sector's short-term resilience, particularly to the liquidity risk. This is the ratio of high-quality liquid assets (HQLA) and liabilities coming due in the next 30 days. It is the product of the Basel III standard, and came as a response to the liquidity crisis which emerged during the peak of the global economic crisis when even banks with sufficient capital adequacy found themselves short of short-term liquidity as liquidity demand increased. The minimum level of this ratio is 1 (or 100%).

18 In his press conference on 30 October, Jerome Powell highlighted the possibility of allowing "daylight overdrafts" (intraday loans), though pointing out that liquidity in the market is ample and that a rewrite of capital or liquidity requirements was unlikely.

accounts (deposit facility rate is currently 1%, while the remuneration rate is 0.75%).

The excess liquidity crunch early in the week before 17 September led to an increase in banks' financing needs in the overnight (O/N) repo market, which was followed by a sharp rise in money market interest rates.

- The SOFR[19] (Secured Overnight Financing Rate – formed on the basis of overnight secured loans) first edged up slightly on Monday, 16 September, from 2.2% to 2.43%, only to rise to 5.25% on 17 September, when volatility in the US money market reached its peak, which was as much as 300 bp above the upper bound of the FFR (Figure 11, left panel), while rates on a number of repo transactions performed on that day equalled as much as 10.00%[20].
- The EFFR (Effective Federal Funds Rate – formed on the basis of overnight unsecured loans) breached the upper bound of the FFR on 17 September for the first time since 2008. However, it rose much less than the SOFR, which could be attributed to the fact that the EFFR is much less representative than the SOFR, given the volume of transactions in their underlying markets (e.g. on 17 September, the volume of trading based on which the EFFR is formed was almost 20 times lower than the SOFR-related turnover).

In the face of heightened market volatility, the Fed had to intervene immediately to prevent jeopardising other financial market segments that rely on the money market, more specifically – the repo market. The initial reaction of the Fed was to organise overnight repo operation of supplying liquidity on 17 September (with USD 75 billion limit), and the objective was to keep the EFFR within the benchmark federal funds rate range (2.00–2.25% at that moment). This was the Fed's first overnight repo operation of supplying liquidity in the previous ten years.

The Fed continued with overnight repo operations in identical amounts in the remainder of the week (18, 19 and 20 September), announcing on 20 September a series of daily overnight repo operations from 23 September through 10 October 2019. On that occasion, the Fed stressed that in addition to the said operations it would also carry out operations of longer maturity (two-week).

The Fed's interventions produced the intended effect – the SOFR declined, but rose again just a few days later. A possible explanation might lie in the oversubscribed auctions held on 24 and 25 September 2019, where bank financing needs amounted to around USD 234 billion, while the Fed accepted bids in the amount of USD 180 billion[21], somewhat more than 75% of the total bids.

However, at the overnight repo auction held on 26 September, demand amounted to just around USD 50.1 billion (significantly below the offered USD 100.0 billion), while at the two-week repo auction (around USD 72.8 billion) it exceeded the Fed's supply (USD 60.0 billion). Already then this suggested a more durable liquidity problem, i.e. that the market needs for liquidity were of a longer-term character and that for the same reason banks focused on repo operations with extended maturity once the two-week auctions had been announced as additional.

It became clear thereafter that the Fed would have to implement liquidity-injecting repo operations, held for the first time in ten years, over a longer time horizon. A series of announcements ensued until the end of 2019, concerning repo operations where the amounts of overnight and term transactions were changed, but new instruments were also introduced, such as the repurchase of US Treasuries and agency securities. Though Fed officials noted that these high liquidity injections did not amount to a new round of quantitative easing (QE 4), but that they were reserve management transactions[22], it was obvious that the Fed

19 In 2017, the Alternative Reference Rates Committee (ARRC) identified SOFR as the benchmark rate that could replace, i.e. take over the function of USD LIBOR rates in the money market, as the SOFR is aligned with IOSCO principles. The ARRC finds the SOFR more resilient than the LIBOR, mostly because of the way in which it is formed; the transition from USD LIBOR to SOFR has been planned to be completed by end-2021.

20 Data sources: Bloomberg and the Fed, USA.

21 Ibid.

22 Fed Chairman Jerome Powell and other representatives of this institution repeatedly insisted that such balance sheet enlargements should not be confused with the previous QE programme. Namely, unlike the asset purchase in the wake of the 2008 crisis (QE programme), the new programme should not be observed as a monetary stimulus – in its announcements the Fed pointed out that these actions are purely technical measures to support the effective monetary policy implementation. However, many call the new purchase of US Treasuries "QE-lite".

would shortly have to go back to the previous balance sheet level which provided ample reserves.

On 11 October, the Fed decided on the purchase of US Treasuries in the coming period[23], to sustain the high liquidity level in the US banking system. The underlying logic was to prevent a new interest rate spike in the money market, such as the one recorded in September. In parallel with these additional measures, the Fed continued with overnight and term liquidity-supplying operations.

Finally, on 12 December, the Fed announced it would carry out repo operations (overnight and longer maturities) with greater intensity and inject around USD 500 billion of liquidity in the system, to ensure that the supply of reserves remains ample and to mitigate the risk of money market pressures around year-end that could adversely affect policy implementation.

Economists and analysts note that the SOFR rose by as much as 282 bp on 17 September, while the overnight USD LIBOR rate increased on the same day by only 5 bp, which is why they think that the Fed cannot claim with certainty that the SOFR is an adequate substitute for the USD LIBOR rate, bearing in mind a huge discrepancy in their trends in the previous days. They add that the SOFR credibility depends directly on the credibility of the Fed's measures and the capacity of this institution to mitigate volatility in the overnight repo market.

It is the credibility of signals that constitutes a major difference between the initial responses of the NBS and the Fed in two similar situations faced in 2019. The NBS responded instantly with operations with somewhat longer (two-week) maturity, showing that it is aware that liquidity is needed for a longer period than overnight. It was clearly communicated to market participants that there is no alternative to stability, and that liquidity will be monitored in the coming period as well in order to be able to respond timely. It took only seven additional FX swap auctions (in the period of six months – from January to June) for the market to entirely accept a new operating model providing sufficient liquidity, and for the NBS to make sure there is no volatility in short-term interest rates even at the beginning of the required reserve maintenance periods, which was common in the prior years.

In contrast to the NBS's approach, the Fed, though also responding promptly by conducting repo operations to stabilise market interest rates initially, introduced two critical differences which required the use of longer-term measures later on:

- First, overnight repo auctions were conducted, i.e. market participants did not know whether and for how long they would have the needed new liquidity, but they depended on the daily amounts injected by the Fed. The first signal was not sufficiently strong.
- Second, the Fed did not clearly communicate the causes that led to a rise in interest rates, i.e. liquidity shortages. Even when repo operations with maturities longer than two weeks were introduced, the markets and the public still did not know the root cause of the shock. This indicated that not even the Fed was fully assured what the reasons for the repo market shock were and that the future measures would depend on how accurately they assess the true causes. It was only in December, after the mentioned BIS study, i.e. more than a month after the shock, that the underlying causes were more clearly defined even though everyone assumed it was not only about the coinciding of tax payment and a large settlement of US Treasuries, but about longer-term, structural issues. Clear and doubtless communication lacked.

Some market participants, along with certain analysts, held the view that unless it did not wish to continue regular interventions via repo operations, the Fed needed to significantly reduce the IOER rate (Interest on Excess Reserves) to make holding reserves less attractive for banks. In the Fed's meeting on 18 September, the IOER rate was reduced by 30 bp, from 2.10% to 1.80%, which had been the sharpest decline in this rate so far. On 30 October, as part of additional Fed measures, this rate was brought further down to 1.55% (whereby it approached the lower end of the Fed funds rate target range of 1.50%).

23 On 15 October, the Fed started purchasing US Treasuries (shorter-term government securities) and will continue to do so at least into Q2 2020 with a view to maintaining a high level of reserves in the system, i.e. the level recorded in early September (before the heightened volatility in the repo market) or even higher (around USD 1,500 billion). Initial pace of US Treasuries purchases amounted to USD 60 billion per month starting with the period from mid-October to mid-November. After that, both timing and the quantity of purchases were adjusted to keep operating under a system of "ample reserves" (new pace of purchases is published on the 9th working day in a month).

Already at that time, ideas and suggestions emerged that in such circumstances the Fed should start buying US Treasuries before the end of the year in order to scale up its balance sheet and maintain a high level of reserves in the system. The question asked even then was the appropriate amount of reserves necessary for the smooth functioning of the money market. One gets the impression that the Fed itself had to explore and learn how to respond, which weakened the credibility of the implemented activities.

It seemed that the adopted measures were used to feel the pulse of the market. Overnight operations and then, after a while, two-week repo operations were followed by the introduction of the new-old instruments – purchase of securities. Even then the Fed was defending something that was difficult to defend (saying it was not a new round of quantitative easing, but a reserve management operation), which only enhanced the insecurity of market participants.

Positive experience of additional swap auctions – Potentially a basis for further activities?

The NBS constantly analyses trends in the domestic financial market with a view to maintaining relative stability in both money and the FX market. A good preparation for the potential occurrence of a negative scenario strengthens the response should the need for such response arise.

Having in mind the success of the additional two-week FX swap auctions conducted by the NBS in early 2019, it makes sense to analyse potential further steps. Given the somewhat steeper slope of the BELIBOR interest rates for maturities longer than two weeks (Figure 12, left panel), it is reasonable to analyse the possibility to support the flattening of the longer part of the BELIBOR curve at some point in the coming period (when liquidity and other factors allow it) by organising new additional swap auctions of supplying dinar liquidity (with somewhat longer maturities of three and/or six months).

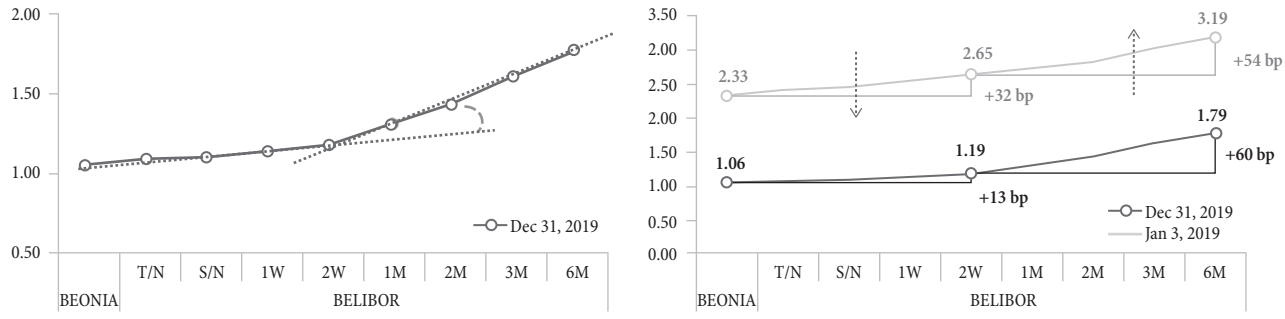
It can be seen that the average yield curve changed its slope in 2019, as well – the shorter-term part of the curve became flatter and the longer-term steeper (Figure 12, right panel). At the beginning of the year, the spread between 2W BELIBOR and BEONIA equalled 32 bp, only to drop to 13 bp at end-2019 (by more than two times). At the same time, the spread between 6M and 2W BELIBOR widened (from 54 bp to 60 bp), indicating an increased slope in the segment of longer maturities (2W–6M).

The said activities could significantly weaken the incentive for market participants to potentially compete in attracting greater amounts of deposits by offering unreasonably high interest rates, i.e. it would discourage potential formation of a parallel yield curve which could occur in that case. Furthermore, reducing the slope of the interest rate curve would also have a positive impact on cutting the costs of corporate and household borrowing, i.e. it would additionally contribute to the transmission of monetary policy effects onto the real sector.

Conclusion

All the past industrial revolutions had a significant impact on the macroeconomic environment. As a result of technological progress, they all brought about greater productivity and aggregate supply and, consequently, lower inflation and interest rates, as well as a stronger incentive to borrow. It is certain that the Fourth Industrial Revolution will produce similar repercussions, and this

Figure 12: Short-term yield curve slope (BEONIA and BELIBOR rates)



Source: NBS.

is what responsible monetary policy makers must be prepared for. As tempting and productive as it may seem to keep abreast of new tendencies and to be at the forefront of innovative solutions which facilitate business and life, we must consider all the advantages and disadvantages of the proposed changes.

Central banks have to keep in mind what their primary objective is, i.e. the preservation of monetary and financial stability. In a world of uncertainty where technological advances are changing the economic environment at an accelerated pace, decision-makers have to focus on ensuring the key conditions for the smooth functioning of the financial system. Recent crisis in the US repo market, as well as increased volatility of short-term interest rates in the Serbian money market, are examples that should not go unnoticed. We have to draw lessons from them and integrate normal market functioning in the oncoming system of innovation which can extend the current period of ultra-low interest rates and very low inflation. And one must not forget that there is a greater possibility for instability in the event of an even minor market shock on account of the hysteresis effect, but other factors, as well. As noted by Claudio Borio, this situation may compare to muscle atrophy [4]. Old habits die hard, and even the tiniest spark disrupting regular environment may lead to a major undesirable reaction.

The globalisation of financial flows facilitated the spillover effect from major central banks to developing countries. It transpired, however, that similar trends in different economies may be handled in different ways, taking into account the specific features of the local financial environment.

At the beginning of 2019, increase, as well as more volatile movements in the interbank money market interest rates were recorded, primarily amid reduced excess dinar liquidity on account of the restrictive monetary effect of fiscal policy, but also due to a certain level of excess liquidity concentration within a smaller number of banks. It was at that time, and especially at the start of RR maintenance periods, that somewhat stronger liquidity needs of other market participants were recorded as well, which increased the demand for dinar assets in the interbank money market and pushed BEONIA up.

Being proactive in such circumstances, the NBS soon stabilised the market conditions with its timely and appropriate measures and instruments, signalling to market participants that there is no alternative to stability. This prevented a potential segmentation of the domestic money market and indirectly, a longer-term and a more significant rise in interest rates. Additional FX swap auctions supplying the needed liquidity to banks, as well as the complementary measure of not withdrawing the entire liquidity surplus on offer in reverse repo auctions resulted in a decline in the interbank money market interest rates.

The central bank's timely and proactive response produced, first and foremost, a strong calming signal effect, and it helped interest rates settle at the desired lower level on a durable basis, without giving rise to major volatility that was typical for the start of the required reserve maintenance period before. The NBS used the "old-new" monetary policy instrument, i.e. instrument that was available, but was never before used for the purpose of regulating dinar liquidity. The instrument applied was appropriate to the needs and specificities of the local market and banking system that featured a sufficiently high level of disposable FX assets.

On the other side of the Atlantic, just a couple of months later (September 2019), the largest world economy faced a shock in the repo market, when interest rates rose multiple times in a single day (as many as five times in some transactions). This shock required the Fed to respond with much greater intensity than the NBS, as well as with the mix of measures, since those initially conducted did not produce the desired results.

When taking into account all of the above factors which produced a similar effect in both countries (interest rate increase due to liquidity shortage), it becomes clear that the credibility of institutions and adopted measures played the key role.

Just like the Fed in September, the NBS could have responded early in the year with some other measures, i.e. other than additional FX swap auctions (such as liquidity-supplying repo auctions, though reverse repo auctions are the main operations). But in that case, market participants would not have had a clear signal as to which monetary policy instrument is principal – reverse repo or repo

operations, and this would have only fuelled volatility in the interbank money market.

The introduced additional FX swap auctions turned out to be a significantly more efficient instrument in the described environment which, owing to its characteristics, remedied the defects without producing any negative side effects. Already the first swap auction was efficient in terms of both the effect and the signal, while others served to make the gradual transition of rates to more stable levels. In the run-up to the event, the NBS had kept a close eye on all relevant factors, their movement and impact, and sent a timely and credible signal that it would not relinquish its role of a regulator and a catalyst of market movements.

Some of the investors consider the Fed's response to dollar supply and demand mismatch slow in the period of tax payments and around quarter's-end. However, even though total liquidity of the banking sector was ample, creating the expectation that the interbank loan market would function well, a problem occurred because significant excess liquidity was concentrated in a few large banks, which in this case, failed to provide the necessary supply in the market.

Even though the decline in the US banking sector liquidity does not signal threat of a financial crisis, at one point the market expressed suspicion that the Fed might lose control over the market segment of short-term loans, which is an important monetary policy objective. Equally disconcerting was the fact that the events cited as the direct cause of interest rate spikes, i.e. as the "straw that broke the camel's back" (higher quarterly tax payments and securities settlement) were quite ordinary and predictable, i.e. they were not an unexpected shock, but something that takes place in regular time intervals. This only indicated that there were deeper and longer-term reasons behind the problem at hand which needed to be addressed.

In view of the experience in the domestic environment early in the year, but also by drawing lessons from the global financial market, it can be unequivocally concluded that timeliness and proper choice of instruments are key for success in implementing monetary policy measures. "It is all about credibility. Even if you announce some fancy new trains, you also have to make sure they run on time" [4].

According to a survey, small businesses in the US are not concerned about interest rates. "What they need is more customers and predictable government policies. In a world of trade wars and potential currency wars brought on by central bank manipulation, predictable is not a word that comes to mind" [16].

"Past performance is not indicative of future results. That has never been more true than for the coming decade." [16]. We have to view all events through a complex prism and be as proactive and forward-looking as possible. By doing so, we will be able to shape them to a certain degree. Our own actions are the only thing we can control.

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