The first two years of the Self-financing Programme

Volume of studies

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Published by the Magyar Nemzeti Bank

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Publisher in charge: Eszter Hergár

H-1054 Budapest, Szabadság tér 9.

www.mnb.hu

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Foreword

This volume presents four analyses of the Self-financing Programme announced by the MNB in the spring of 2014.

The first analysis provides an overview of the concept and impact mechanism of the Self-financing Programme. The ultimate goal of the Programme was to reduce the external vulnerability of the Hungarian economy. To that end, the MNB transformed its monetary policy instruments to encourage banks to invest their excess liquidity in liquid securities, which, due to the specificities of the Hungarian environment, primarily entailed a surge in the demand for government paper. The study gives an insight into the motivation behind the announcement of the Self-financing Programme and outlines its measures and impact mechanism. It explains, in particular, that the Self-financing Programme was not a centrally ordered series of steps, but rather the result of cooperation between the MNB, the Government Debt Management Agency (ÁKK) and banks.

The second study describes the macroeconomic achievements of the Self-financing Programme, with special regard to the improvement in Hungary's debt profile and the reduction of external vulnerability. According to the analysis, between its announcement in the spring of 2014 and the summer of 2016, the Self-financing Programme significantly increased banks' demand for government securities, doubling the government securities portfolio held by credit institutions in the span of two years. Under the Programme, the Hungarian government repaid more than EUR 9 billion of its foreign currency debt from forints, which generated a corresponding decline in the MNB's balance sheet, lowered the foreign currency ratio of government debt to below 30 per cent from the previous 50 per cent and reduced gross external debt. In addition, by mid-2016 domestic participants resumed financing the bulk of government debt, shifting Hungary towards a healthier debt structure. It is a clear recognition of the Self-financing Programme that Fitch Ratings referred specifically to the Programme as a key rating driver when it upgraded Hungary's sovereign debt rating to the investment grade category in May 2016.

The third analysis examines the impact of the Self-financing Programme on monetary conditions and on specific channels of monetary transmission. The Magyar Nemzeti Bank commenced its first easing cycle in the summer of 2012, which, combined with two subsequent easing cycles, resulted in a 610-basis point decline in the central bank base rate, with the key policy rate falling to 0.9 per cent by June 2016. The MNB complemented this step with the announcement of the Self-financing Programme in the spring of 2014. While the primary goal of the Programme was to reduce Hungary's external vulnerability, the measures were

also intended to facilitate the easing of monetary conditions through a number of unconventional instruments. The analysis found that it was only in some phases of banks' adjustment that the periodic transformation of central bank instruments caused temporary disturbances in monetary transmission; by mid-2016 monetary transmission returned to the level observed before the reform of the central bank instruments, while the Self-financing Programme achieved its goals. The study proposes a sound justification in support of its hypothesis that, by reducing both short-term and long-term government bond yields, the Self-financing Programme implemented its intended objective of unconventional monetary easing.

The fourth study analyses the impact of the Self-financing Programme on domestic financial infrastructures. It points out that the conversion of the MNB's main policy instrument in August 2014 (replacement of the MNB bill with a deposit instrument) removed a substantial part of payment liquidity from the portfolio of securities eligible as collateral in central bank operations, while for numerous banks, the elimination of the optional reserve ratio lowered the account balance serving the purposes of payment transactions. However, as a result of banks' adjustment to the central bank's measures, by the end of 2015 the liquidity available for payments returned to the level prevailing before August 2014, and liquid holdings stabilised at levels that were deemed safe by the participants concerned. The analysis describes in detail the ways in which participants of the payment system adjusted to specific measures of the Self-financing Programme and illustrates the impact of the series of measures on selected liquidity indicators.

Self-financing Programme – Concept and Impact Mechanism

Fatime Gór-Holecz – Pál Péter Kolozsi – Zsuzsanna Novák – Ádám Zágonyi

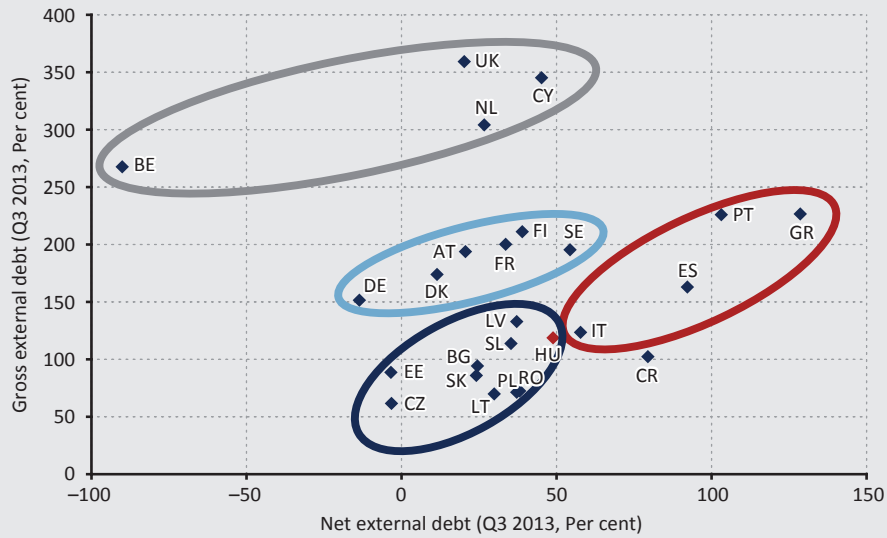
Abstract

The Magyar Nemzeti Bank announced the Self-financing Programme in the spring of 2014 with a view to reducing the external vulnerability of the Hungarian economy. By transforming the monetary policy instruments of the central bank, the Programme encouraged banks to invest their excess liquidity in liquid securities which, in the Hungarian environment, primarily entailed an increase in the demand for government paper. This study presents the motivation behind the announcement of the Self-financing Programme, as well as the measures and impact mechanism of the Programme. It explains, in particular, that the Self-financing Programme – which succeeded in easing monetary conditions amid the tightening of the central bank's balance sheet – was not a centrally ordered series of steps but rather the result of cooperation between the MNB, the Government Debt Management Agency (ÁKK) and banks.

1 Motivation behind the announcement of the Self-Financing Programme

Owing to Hungary's high public debt and substantial foreign currency exposure, the outbreak of the global financial crisis in 2008 hit the Hungarian economy in a vulnerable state. External vulnerability becomes a real economic policy problem when non-residents have a persistently dominating share in the financing structure of the economy and reliance on foreign financing carries a severe rollover risk, especially in crisis periods. Since external debt often means foreign currency debt, reliance on external savings and foreign exchange markets intensifies the volatility of exchange rates and interest rate spreads, which may undermine the economy's ability to raise funds. Consequently, it posed a key risk to Hungary's macroeconomic stability that the external debt of Hungary at the beginning of the 2010s surpassed the corresponding ratios of most of the countries of the region and even approached the GDP-proportionate values that capture the external indebtedness of the particularly risk-laden Southern European countries (Chart 1).

Chart 1
External debt of particular European Union Member States relative to GDP



Source: Eurostat, 2014

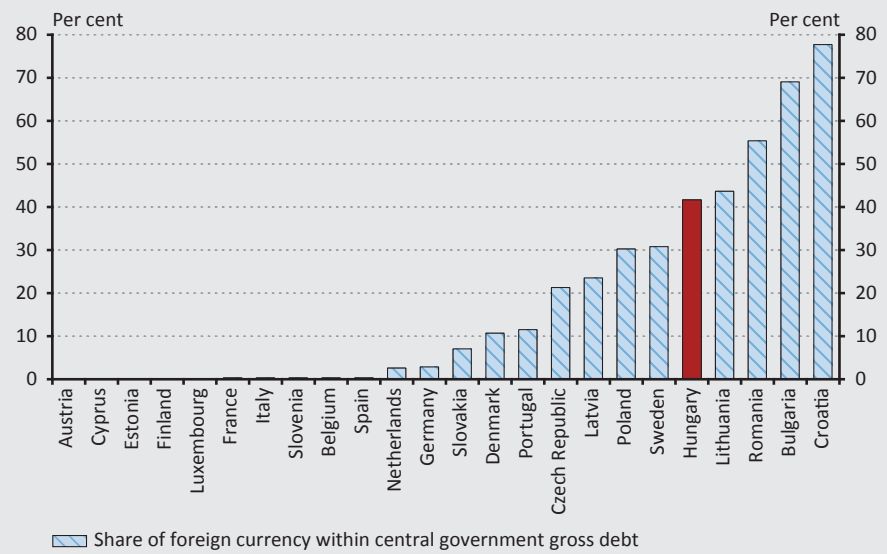
In terms of external vulnerability, Hungary was counted among the countries that were considered vulnerable by international standards at the outbreak of the crisis and in the years that followed. In Hungary, the steep rise in indebtedness to foreign countries was partly driven – in addition to the spread of foreign currency lending to households – by sovereign borrowing starting from the second half of the 2000s. While only 40 per cent of gross government debt was financed by foreign creditors at the beginning of 2004 and less than 50 per cent in early 2008, by the end of 2011 this value had risen to nearly 70 per cent. The grave risk of external vulnerability in international terms was underpinned by the 2015 survey of Moody's, which found that in 2014 only Peru and Indonesia recorded a higher share of non-residents in total debt than Hungary. It was also an outstanding problem in Hungary that the crisis aggravated the situation of an already indebted household sector: annual household savings were unable to cover the budget deficit (Baksay et al., 2013).[1] Along with households, the financial sector was gradually driven out of the Hungarian government securities market as well: while domestic financial enterprises held about 40 per cent of total government debt in 2009, by the end of 2011 their share had dropped to 30 per cent without any considerable increase until the end of 2013.[2]

[1] In 2012 and 2013, the gross nominal value of government debt accounted for more than one quarter of the aggregate (non-consolidated) gross financial assets of domestic financial enterprises and households, comprising around 70 per cent of the financial assets of credit institutions therein.

[2] In addition to the restrained risk appetite of Hungarian investors, participation in the Hungarian government securities market may have been influenced by the elimination of the mandatory private pension scheme in 2010.

The crisis distorted the foreign currency composition of public debt as well: the share of foreign currency debt surpassed the levels seen in most European Union Member States by a large margin. In 2011, the ratio of foreign currency denominated debt rose above 50 per cent reflecting, on the one hand, disbursements from the international credit lines provided by the European Union and by the International Monetary Fund (IMF) in 2008 and the significant issues of foreign currency denominated government securities on the other hand. It is partly due to the high level of external debt and foreign currency denominated debt that, at levels over 700 basis points by 2012, the Hungarian 5-year CDS spread significantly exceeded the Central and Eastern European average and the risk rating of all neighbouring countries, except Ukraine. Eventually, after a steep decline in the CDS spreads from mid-2012, by the end of 2013 the risk assessment of Hungary had improved both in comparison to the regional average and to Croatia. By the end of 2013, the foreign currency ratio of the central budget debt had fallen back to around 40 per cent, but this was still extremely high; indeed, in the European Union only four countries recorded higher values at the time (Chart 2). Importantly, of these four countries Bulgaria maintains a currency board system, which means that, for practical purposes, it does not face any exchange rate risk, while Lithuania's subsequent accession to the euro area practically eliminated its exposure to exchange rate risk.

Chart 2
Ratio of foreign currency debt to total central government debt in European Union Member States



Source: Eurostat, 2015

Similarly, analyses and reports on Hungary identified its high external vulnerability as a key risk, the reduction of which had become one of the primary objectives of Hungarian economic policy by 2014. In view of the country's high external exposure and excessive foreign currency debt ratio, external vulnerability grew to become one of the most critical economic policy challenges of Hungary in the years following the crisis. In 2013 and at the beginning of 2014, several international organisations (such as the European Commission and the IMF) and credit rating agencies (e.g. Standard & Poor's, Moody's) issued negative opinions on Hungary in view of its high debt ratio, excessive foreign currency debt ratio and its heavy reliance on foreign financing. The macroeconomic significance of the problem of external vulnerability was also reflected in the fact that Hungary's convergence programme for 2013 identified the reduction of high external debt – a major factor behind the financial vulnerability of Hungary at the time – as one of the four key economic policy objectives (Kolozsi–Hoffmann, 2016).

2 Facilitating the reduction of vulnerability through central bank instruments

The reduction of external vulnerability is not only a government objective, but also a relevant central bank objective. High external vulnerability, by definition, poses a risk to financial stability, and therefore, the reduction of vulnerability is fully consistent with the financial stability mandate of the MNB.[3] Similarly, taken together with all of the other objectives set out in the MNB Act, supporting the economic policy of the government is also an implicit obligation: by including the reduction of external vulnerability in the Convergence Programme, the government declared this to be one of its objectives. With regard to the primary objective of the central bank (to achieve and maintain price stability) it is a crucially important circumstance that in the years of crisis management – following 2010 and especially after 2013 – the Hungarian central bank faced a persistently low inflation environment, which prompted it to commence a policy of monetary easing. This primarily materialised in the central bank's easing cycles,[4] but non-traditional central bank instruments also played an important role in the easing of monetary conditions. Given the below-target inflation environment, any targeted unconventional measures aimed at monetary easing automatically supported the achievement of the price stability

[3] Pursuant to Act CXXXIX of 2013, the primary objective of the Magyar Nemzeti Bank is to achieve and maintain price stability; moreover, using the instruments at its disposal, the MNB supports the maintenance of the stability of the system of financial intermediation, the enhancement of its resilience as well as its sustainable contribution to economic growth, while also supporting the economic policy of the government. Therefore, without prejudice to its primary objective of price stability, the MNB performs numerous tasks that may contribute to mitigating the external vulnerability of the economy. The significance of these tasks increased during the crisis and especially during the strongly disinflationary post-crisis period starting in 2013, when the focus of central bank activities shifted, for lack of inflationary tensions, towards stimulating economic performance and facilitating a healthier financing structure.

[4] By the summer of 2016 the central bank base rate was cut to 0.9 per cent from 7 per cent in mid-2012.

objective as well. The Self-financing Programme is clearly among such measures. Although the monetary policy aspect of the Programme is not discussed in this study, the third analysis in this volume confirms that the Programme contributed to monetary easing; in other words, as a measure aimed at reducing external vulnerability, the Self-financing Programme is also clearly justified from the aspect of the price stability objective.

In the case of Hungary, external vulnerability can be best captured by external debt ratios, i.e. GDP-proportionate net and gross outstanding external debt. The external vulnerability of a country can be measured by a number of indicators, such as various indebtedness ratios relative to GDP or to the foreign exchange reserves, by index numbers showing the currency structure of debt, by the level of export revenues serving as the source of the repayment of the debt, by the trade balance, or by indicators calculated from foreign direct investment inflows (IMF, 2012; Supriyadi, 2014). In the case of Hungary, foreign currency debt and GDP-proportionate net and gross external outstanding debt are considered to be the most relevant external vulnerability indicators. Accordingly, international analyses focus on these indicators in their assessment of the Hungarian economy.

Net external debt can only be reduced at significant real economic costs, while gross government debt can be scaled back without incurring such costs. Changes in net external debt are a function of macroeconomic developments (current account, capital account). At the same time, with the globalisation of financial markets the increasing importance of gross debt ratios besides the net ratios was precisely one of the lessons of the crisis.[5] Exposure to refinancing risk is largely determined by gross public debt figures through the need for debt renewal. The dedicated goal of a government's economic policy programme may primarily be the reduction of gross external public debt, as the state can exert a direct influence and improve the external perception of a country without causing any ancillary macroeconomic damage.

The central bank can indirectly facilitate the reduction of gross external debt, and hence the moderation of external vulnerability, by adjusting the parameters of its monetary policy instruments. Central banks cannot influence gross external debt directly, but they can have an influence by encouraging banks to apply adequate adjustments. In economies characterised by a structural liquidity surplus, such as Hungary, the terms and conditions of deposit and credit transactions between the central bank and commercial banks (central bank counterparties) can influence banks' liquidity management and ultimately – through various channels – indebtedness and external vulnerability. Essentially, banks can choose to manage their liquidity in two ways at the banking sector level:

[5] Especially because it is gross external debt that determines a country's gross borrowing requirement. For the role of gross external debt in the assessment of the reserve adequacy, see: Csávás, 2016.

– with central bank liquidity absorbing instruments (central bank securities and deposits which, denominated in the domestic currency, mean a risk-free investment), or

– with central bank loans taken out against liquid, non-central bank securities.

It is primarily the characteristics of the central bank instruments and other relevant instruments that determine the extent to which banks prefer one solution to the other. By default, if the liquidity profile of the central bank's liabilities side instruments is deemed to be of high quality, banks will, *ceteris paribus,* prefer these instruments to liquid securities, and will hold their excess liquidity in central bank instruments. Of course, reducing the liquidity of central bank instruments may trigger the opposite reaction.

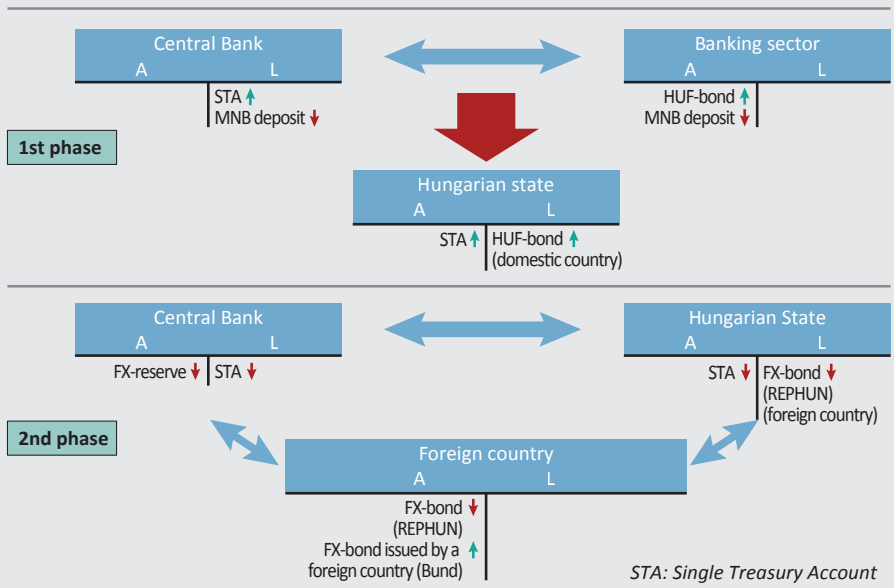
As an unwanted consequence, however, central bank instruments with a good liquidity profile may encourage banks to adopt a liquidity management practice that relies far less on liquid securities and indirectly, this might increase external vulnerability. Indeed, in this case, bank liquidity will wind up in the central bank's balance sheet, while public debt is mainly financed by other sectors, especially by foreign investors, which may raise the level of external debt and increase the foreign currency ratio. When the central bank's liabilities side instrument is less liquid, by steering excess liquidity into liquid securities markets the central bank can play a more prominent role in the financing of government debt, thereby increasing the weight of domestic sectors and decreasing external exposure. Another important aspect to consider is the fact that, if the external exposure entails increased foreign currency issuance, it may cause considerable sterilisation costs for the national economy due to the expansion of the central bank's balance sheet.

2.1 Impact mechanism of the Self-financing Programme

By transforming the liquidity profile of central bank instruments, the Self-financing Programme prompted banks to shift their funds towards liquid securities, specifically, the government securities market. Under the Programme, by modifying the central bank instruments the MNB raises, in a relative sense, the appeal of eligible non-central bank securities for banks and due to the specificities of the Hungarian securities market,[6] this primarily affects government securities. The chart below presents the phases of the impact mechanism of the Self-financing Programme (Chart 3).

[6] In the category of debt securities, government bonds have the most favourable risk profile. Owing to the rudimentary state of the Hungarian corporate bond and mortgage bond market, government securities dominate the credit market segment of the securities market as well, while market maker activities are also continuous in the government securities market. The key role of government securities in domestic securities trading is underpinned by the fact that in the first half of 2016 more than 90 per cent of the primary turnover of HUF-denominated debt securities was linked to government securities, while mortgage bonds and other bonds represented less than 5 per cent of the value of total issuance. Data on the secondary market turnover on KELER's trading platform point to an even stronger dominance of government securities: government papers account for more than 90 per cent of the daily average volume of spot transactions and they play a nearly exclusive role in other transactions (repo, delivery repo, fixed-price transactions, etc.).

Chart 3
Schematic illustration of the Self-financing Programme's impact mechanism



Source: MNB, own figure

Phase 1:

- The reduced appeal of the central bank's main policy instrument and the resulting relatively favourable shift in the terms of investment in government securities reduce banks' – and hence, the MNB's – holdings of the main policy instrument, with a parallel increase in banks' HUF-denominated government bond holdings and the balance of the Single Treasury Account (STA) managed by the MNB.

- Consequently, taking advantage of banks' heightened demand for government bonds, the Hungarian state refinances maturing foreign currency debt in forint, i.e. it issues additional HUF-denominated bonds in a volume corresponding to the volume of maturing debt. This generates an increase in bonds on the liabilities side of its balance sheet and simultaneously raises the STA balance on the assets side.

Phase 2:

- As foreign currency debt matures, the government converts the additional forint issues into foreign currency at the central bank, and then repays the foreign currency thus obtained to non-resident investors, which reduces the STA balance on the assets side of its balance sheet and the foreign currency bond debt on the liabilities side. Since there is a parallel decline in the foreign exchange reserves

on the assets side and in the STA balance on the liabilities side of the central bank's balance sheet, the Self-financing Programme, by definition, tightens the central bank's balance sheet. As regards the balance sheet of non-residents, on the assets side Hungarian foreign currency bonds will be replaced with foreign currency instruments issued by non-residents.

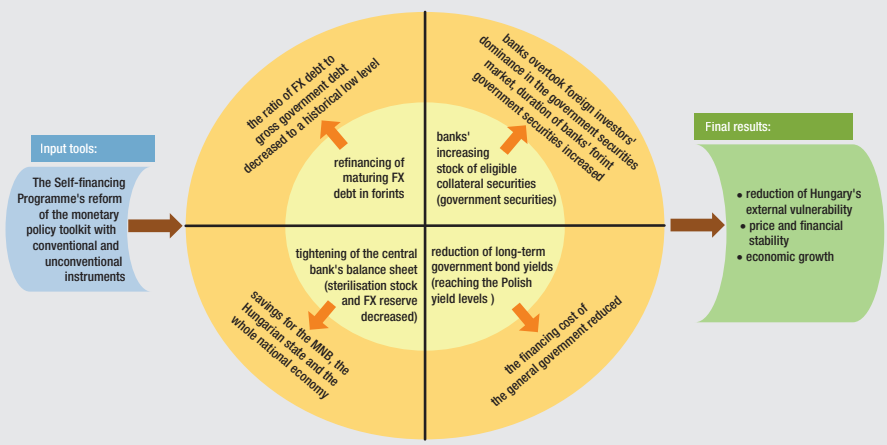
The impact mechanism of the Self-financing Programme has two potential alternatives:

(1) the government renews maturing foreign currency debt from foreign currency issues, which stabilises foreign currency debt at high levels and thus, perpetuates external vulnerability;

(2) the government renews maturing foreign currency debt from forint, but in the absence of sufficient domestic demand, forint issues are purchased by non-resident investors, which is consistent with high external debt and thus, high external vulnerability.

Through the impact mechanism described above, modifications to the monetary policy instruments under the Self-financing Programme (especially, altering the liquidity profile of the main policy instrument) facilitate the reduction of foreign currency debt and external debt and hence, the external vulnerability of Hungary.

Chart 4
Direct and indirect macroeconomic effects of the Self-financing Programme



Source: MNB, own figure

Indirectly and over the longer term, the Self-financing Programme supports price stability and financial stability, as well as economic growth (Chart 4), which is deemed to be the broadly interpreted social benefit of the Programme (Kolozsi–Hoffmann, 2016).

Of the effects presented above, those exerted on external vulnerability, monetary conditions, payment transactions and banks' liquidity management are discussed in separate analyses in this volume.

In light of the impact mechanism described above, ensuring foreign exchange reserve adequacy going forward is a prerequisite for commencing the Self-financing Programme. Ultimately, since it is the foreign exchange reserves of the central bank that serve as the source of increased forint issues – allowing for the financing of maturing foreign currency debt from forints – the Self-financing Programme was launched on the assumption that reserve adequacy was ensured going forward. The need to use the reserves arises from the fact that, in order to repay its maturing foreign currency debt, the government converts additional forint issues under the Self-financing Programme at the central bank, which, in parallel, depletes the foreign exchange reserves. Before the announcement of the MNB's Self-financing Programme, at the end of March 2014 the foreign exchange reserves amounted to EUR 36.2 billion, while short-term external debt – a key indicator of reserve adequacy (Nagy–Palotai, 2014) – stood at EUR 28.3 billion. The reserve adequacy recorded at the end of 2014 was more favourable: by then, the foreign exchange reserve amounted to EUR 34.6 billion, coupled with short-term external debt of EUR 21 billion. This means that the room for policy manoeuvre afforded by the reserve adequacy grew to more than EUR 13 billion by the end of 2014 from around EUR 8 billion in the spring of 2014, which, coupled with other central bank programmes,[7] enabled the MNB to launch the Self-financing Programme. The contraction of the central bank's balance sheet after the launch of the Self-financing Programme implied a positive change from two aspects: on the one hand, approaching the optimal level – i.e. lower than those observed before the launch of the Programme – the reduced level of the foreign exchange reserve implied lower costs for the MNB and for the national economy as a whole;[8] on the other hand, with a leaner central bank balance sheet the MNB can shift toward a potentially more efficient, liquidity providing monetary policy.

Self-financing as cooperation between the MNB, the Government Debt Management Agency (ÁKK) and banks

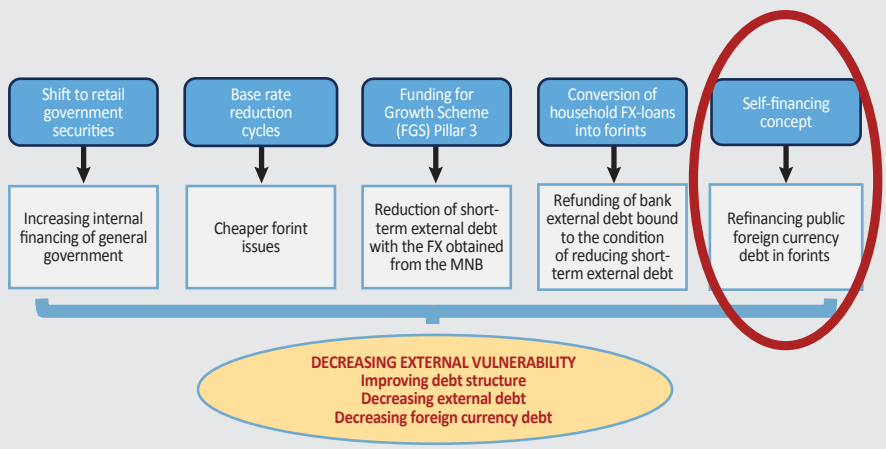
The self-financing concept is not an isolated initiative, but a series of steps that are aligned with other policy actions aimed at the reduction of external vulnerability. The outbreak of the economic crisis in 2008 demonstrated that one of the weaknesses of the Hungarian economy was its severe external vulnerability,

[7] The foreign currency sale tenders related to the settlement and conversion of foreign currency and foreign currency based household mortgage loans, as well as foreign currency non-mortgage consumer loans significantly depleted the foreign exchange reserves of the MNB.

[8] The costs associated with the holding of foreign exchange reserves can be attributed to the fact that, due to the difference between foreign currency and forint interest rates (risk premium), the MNB pays a higher interest rate on the sterilisation portfolio than the rate of return achieved by the central bank on the investment of the foreign exchange reserves.

which could be mainly attributed to high external and foreign currency debt. In recent years and especially after 2012, several policy decisions were made with a view to reducing external vulnerability and improving the debt structure or furthering the achievement of these goals (Chart 5). Such measures included Pillar III of the Funding for Growth Scheme,[9] which was designed to replace corporate foreign currency loans; the conversion of foreign currency household loans and the related central bank FX tenders;[10] the shift towards forint financing – specifically, the robust increase in retail government securities issuance – and, albeit indirectly, the easing cycles carried out in recent years.[11] The self-financing concept[12] fit into these series of steps, contributing to mitigating external vulnerability by reducing foreign currency denominated gross public debt.

Chart 5
Alignment of the Self-financing Programme with other measures aimed at reducing external vulnerability



Source: MNB, own figure

The self-financing concept is not a centrally coordinated programme, but rather a series of complementary measures and decisions. Refinancing the foreign currency debt of the government from HUF-denominated funds requires cooperation between public stakeholders – specifically the Government Debt Management Agency (ÁKK) and the MNB – and the banking sector. The success of self-financing depends, on

[9] See: Mátrai, 2014.

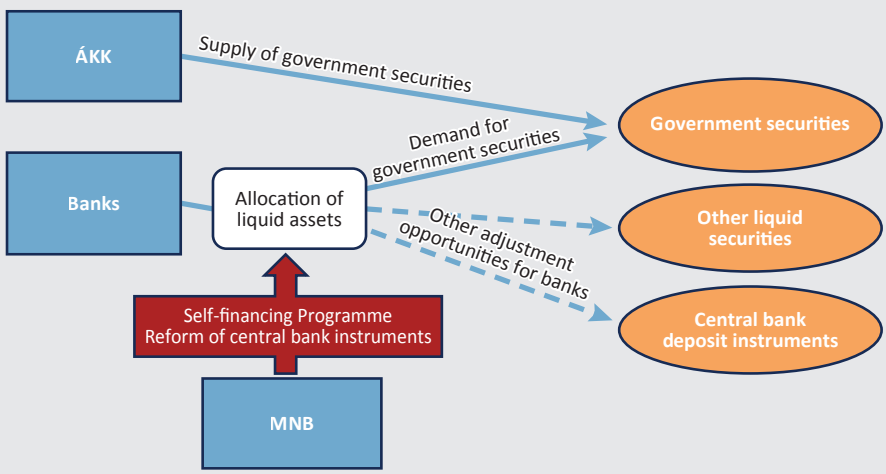
[10] See: Kolozsi et al., 2015.

[11] After the crisis, the MNB commenced its first easing cycle in 2012, as a result of which by July 2014, the key policy rate dropped to 2.1 per cent from the 6.75 per cent value recorded in August 2012. Amid persistently moderate inflation processes, the MNB launched another series of interest rate cuts in March 2015, which, by May 2016, had brought down the key policy rate to a historical low of 0.9 per cent.

[12] For more details on the self-financing concept, see: MNB, 2014; MNB, 2015; Kolozsi–Novák, 2016.

the one hand, on the ÁKK's issuance of an adequate volume of forint-denominated government securities and on the other hand, on the ability of domestic investors to ensure the necessary, sufficient demand for such papers – this involves, in particular, the banking sector, which has access to central bank instruments. The Self-financing Programme of the MNB, the negative net foreign currency issuance of the ÁKK and the banking sector's demand for government securities complement each other to facilitate the implementation of the self-financing concept. Thus, ultimately, the foreign currency ratio of public debt and the share of non-residents in the financing of public debt may decline, with a simultaneous increase in the domestic banking sector's participation in the debt financing of the government and in the share of government securities within the banking sector's balance sheet. It should be noted that, in addition to the natural consultation and cooperation between public stakeholders, individual members of the banking sector also voluntarily participated in the Programme. Designed to support banking sector demand, the Self-financing Programme fostered banks' adjustment to the reformed central bank toolkit through numerous channels, and the purchase of government securities was only one among several potential adjustment methods. Indeed, banks could also choose to adjust to the modifications of monetary policy instruments by purchasing other liquid securities or taking recourse to other central bank instruments.

Chart 6
Institutional framework of the Self-financing Programme



Source: MNB, own figure

The implementation of the self-financing concept was a combined result of stakeholders' institutional and banks' individual decisions, although obviously, these decisions were not independent of one another. The self-financing concept

aims to set up a framework in which the two main participants of the government securities market – in this case, the ÁKK that quotes the supply and the banking sector that ensures the bulk of domestic institutional demand – both have a vested interest in the cooperation (Chart 6). From this perspective, self-financing may be viewed as an iterative process, where all stakeholders adopt their own attitude based on the behaviour of other stakeholders and adjust their own behaviour to any changes.

Forint issuance, an indispensable part of self-financing, assumes the existence of sufficient institutional demand. This cannot be ensured without external incentives. This interconnectedness can be summarised by way of the following simplified model:

– it should be assumed that the government debt management agency carefully considers the level of demand for a given denomination in the given market; in other words, it will raise domestic currency issuance when it expects to have sufficient demand;

– banks appear in the given market with additional demand if this is facilitated or prompted by a negative or a positive incentive; otherwise it is safe to assume that, in line with their previous strategy, they will not be willing to increase their holdings (in net terms, they will show modest demand).

– since foreign currency issuance is typically cheaper than domestic currency issues, the behaviour of the debt manager and of the banking system will be "non-cooperative" without the support of an external actor; indeed, if banks do not generate additional demand in the given market, the debt manager will not refinance maturing foreign currency debt in the domestic currency.

The Self-financing Programme of the MNB facilitated the cooperation between the ÁKK and the banking sector by prompting banks to adjust. It was indispensable for the success of the self-financing concept that the ÁKK stepped up the issuance of government securities while correctly expecting considerable and increasing bank demand. At the same time, banks also needed to be incentivised to appear on the buyer side of the government securities market. This incentive was the Self-financing Programme of the MNB. Given that the Programme assumed the contraction of the central bank's balance sheet, the MNB needed a positive feedback to ascertain that the measures adopted did indeed increase forint issuance and that maturing foreign currency debt was being refinanced smoothly in forints. To sum up the process in a simplified model similar to the one described above (Chart 7):

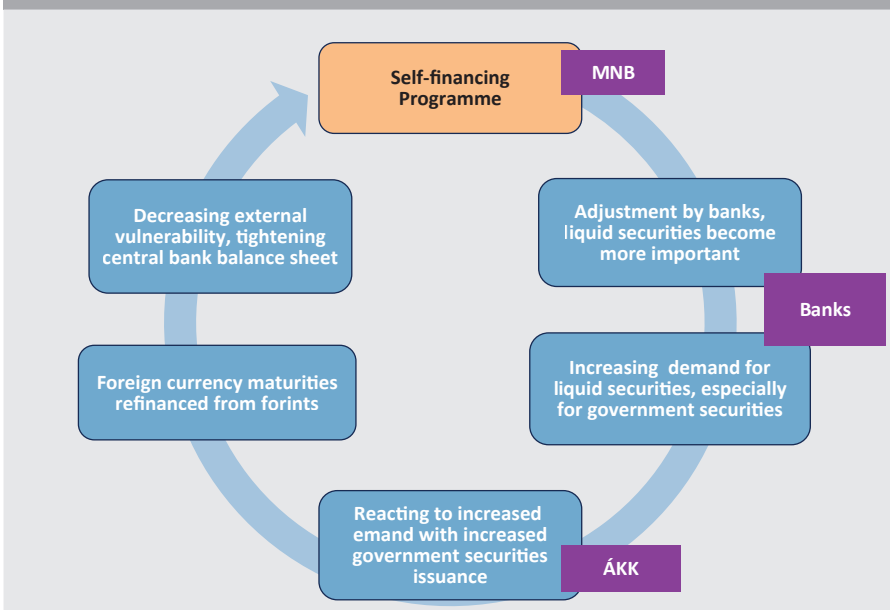
– by transforming the monetary policy instruments, the Self-financing Programme of the MNB prompts banks to adjust, in the context of which the MNB applies positive and negative incentives to shift bank liquidity from central bank deposits to the market of liquid securities;

– due to the specificities of the Hungarian securities market, central bank incentives primarily affect the government securities market (as government securities are the only liquid securities with a significant market and turnover), i.e. they generate additional bank demand;

– perceiving the additional demand, the debt manager raises forint issuance, which allows for the refinancing of maturing foreign currency debt with forint issues, without an increase in yields;

– refinancing with forint issues lowers foreign currency debt and external debt (and hence, external vulnerability) and reduces the central bank's balance sheet (cutting interest expenditures), which translates into a positive feedback for the central bank.

Chart 7
Self-financing Programme as cooperation between stakeholders[13]



Source: MNB, own figure

[13] The success of the self-financing concept assumes that the most important participants – the ÁKK, the banks and the MNB – maintain their cooperative attitude over the long term. Self-financing is a multi-player concept, which can only be successful if the stakeholders adopt and consistently maintain a cooperative attitude. It was the announcement of the Self-financing Programme in the spring of 2014 that set the stakeholders on a "path of cooperation", but subsequently all stakeholders needed to maintain their cooperative attitude as non-cooperation on the part of even a single participant could have diverted the economy to a sub-optimal path where refinancing foreign currency loans with forint funds was no longer an option.

3 Measures of the Self-Financing Programme

The specific measures of the Self-financing Programme were aimed at "crowding" bank liquidity out of the sterilisation instrument and "shifting" liquidity from the central bank to the market of liquid securities. Announced in the spring of 2014, the declared objective of the Self-financing Programme was to stimulate banks' purchases of domestically issued securities in order to contribute to lowering the external debt of Hungary and improving the currency structure of financing. In the context of the programme, the MNB worked to drive the excess liquidity of credit institutions out of the central bank and into the domestic securities market not only by introducing new, unconventional instruments, but also by reforming its existing, conventional instruments.[14]

3.1 Crowding bank liquidity out of the sterilisation instrument

First and foremost, the reform of the traditional monetary policy toolkit involved the modification of the key policy instrument both in terms of form and maturity. The transformation of the key policy instrument introduced the following changes:

– in August 2014, the two-week MNB bill was replaced by a two-week time deposit;

– in September 2015, the term of the main policy instrument was extended to three months.

The main policy instrument "absorbs" the bulk of banks' structural liquidity surplus and as such it plays a key role in banks' liquidity management. These two changes were intended to reduce the appeal of the main central bank sterilisation instrument, which increases – in a relative sense – the importance of non-central bank issued, eligible securities. This reduces the use of central bank instruments, while bank funds flow into non-central bank, liquid instruments. The conversion of the MNB bill to a deposit facilitated this outcome, because the central bank deposit is less liquid than the central bank bill for the following reasons: (1) it may not be broken before maturity, (2) it is not accepted as collateral in central bank operations, and (3) it can be held only by counterparties of the central bank, excluding all other domestic and non-resident investors. The three-month deposit is regarded less liquid than the two-week instrument because of the longer maturity: banks have no access to the liquidity deposited with the central bank for 91 days instead of 14 days. The restructuring of the main policy instrument facilitates banks' return to market investments, thereby improving the financing structure of the economy. In parallel with the modification

[14] Although the persistent tightening of liquidity requirements is outside of the scope of the Self-financing Programme, this measure also encourages banks to purchase non-central bank, eligible collateral. After the introduction of the LCR ratio, credit institutions may only consider items maturing within 30 days as liquid assets; consequently, the three-month main policy instrument improves the LCR ratio only in one third of its term on average. Given that the increased, 100 per cent LCR adequacy ratio came into force on 1 April 2016, credit institutions with liquidity constraints have been even more inclined to purchase non-central bank securities eligible as collateral (Nagy–Palotai, 2015).

of the main policy instrument, until April 2016 the MNB maintained the two-week deposit instrument as a tool to assist banks' liquidity management, but after September 2015 it imposed a cap on the bank funds accepted via this instrument.

The modification of the interest rate corridor and the announcement of central bank credit tenders with more flexible conditions helped banks' liquidity management and their migration to the modified central bank instruments. In September 2015, the MNB decided to change the previous ±100 bps interest rate corridor around the base rate into an asymmetric structure. At the end of May 2016, the interest rate on the overnight (O/N) standing deposit facility deviated by –95 bps, while the interest rate on the overnight (O/N) collateralised loan deviated by +25 bps from the central bank base rate. Relatively speaking, making the interest rate corridor asymmetric increased the appeal of borrowing from the central bank, as it appreciated non-central bank, eligible liquid securities, which was consistent with the self-financing concept.[15] Cutting the maturity of credit tenders by half in September 2015 and gradually adjusting the interest rate on the one-week loan sold at fixed rate tenders to the modified interest rate corridor also supported credit institutions' liquidity management, motivating banks to take recourse to the lending facility instead of central bank instruments available under the deposit facility, which encourages credit institutions to deposit their excess liquidity in longer term, non-central bank instruments.

Indirectly, the MNB's transformation of the reserve requirement system in December 2015 is also linked to the Self-financing Programme. In the framework of European Union harmonisation, the MNB modified the previous, optional reserve requirement regulation to a system prescribing a mandatory, 2 per cent reserve ratio, bringing the MNB's practice more in line with that of the European Central Bank. This modification was made possible by the fact that by the end of 2015 the consolidated liquidity position and considerable structural liquidity surplus of the banking sector no longer necessitated the maintenance of the optional rate system. The optional system allowed banks to adjust to the transformation of the central bank's toolkit by raising their reserve ratios, which would have been in conflict with the Self-financing Programme's objective to increase the appeal of non-central bank issued collateral. Instead, the introduction of the uniform reserve ratio ensured that banks adjusted to the changing liquidity management environment through purchases of non-central bank liquid securities (in particular, government securities).

3.2 Redirecting bank liquidity to the market of liquid securities

In addition to crowding out bank liquidity, the MNB also supported banks' adjustment via instruments channelling banks' funds to the desired direction. The main such channelling instrument of the Self-financing Programme was the

[15] This is confirmed by the fact that yields on short-term treasury bills – which had temporarily dropped below the interest rate on O/N deposits – reflected a premium compared to the O/N deposit once again after the interest rate corridor adjustment.

conditional interest rate swap instrument (IRS), which has grown to become the iconic element of the Programme.

Self-financing IRS tenders[16] provide the means for banks' interest rate risk management and, due to their conditionality, they effectively contribute to increasing banks' holdings of eligible collateral. Instruments accepted by the MNB as eligible collateral for the purposes of central bank credit operations are, for the most part, domestically issued securities, in which government securities play a dominant role, due to the specificities of the Hungarian securities market. The objective of the MNB's Self-financing Programme is to encourage banks to replace their holdings of central bank sterilisation instruments with eligible securities, which – due to their longer maturity – pose an increased interest rate risk. With a view to protecting banks which are adjusting to the reform of the central bank toolkit from this increased interest rate risk, the MNB offered a self-financing IRS instrument to enable credit institutions to replace the fixed interest rate on their securities with floating rates. Central bank interest rate swaps facilitate a shift toward domestic investors in the ownership structure of domestically issued securities through their favourable pricing, as well as the condition prescribing a commensurate increase in banks' security holdings. Initially, the MNB announced the IRS instrument with 3 and 5-year maturities, but in the summer of 2015 it supplemented the initial maturities with a 10-year maturity, and in September 2015 it allowed banks to choose between 2014 Q1 and the period of March to May 2015 in respect of the base portfolio against which adequacy is to be checked. Between June 2014 and July 2016 the MNB announced central bank IRS tenders every two weeks.[17] Details on the additional aspects of the measurement of the central bank's IRS instrument and banks' interest rate risks and on the expected effects of the adoption of international accounting standards are included in the Annex.

Restricting the availability of the three-month main policy instrument (July 2016)

As described in the summary above, in the first two years of the Self-financing Programme the MNB modified the main policy instrument on two occasions: in August 2014 the earlier two-week MNB bill was replaced by a two-week deposit, and from September 2015, the three-month deposit became the main policy instrument of the MNB.

[16] At the announcement of the Self-financing Programme in 2014, the MNB introduced three new (unconventional) instruments: (1) the central bank forint interest rate swap tender (central bank IRS), (2) the 3-year secured loan (3) and the asset swap transaction. The latter two instruments were designed to manage liquidity problems, and in the lack of any disturbances of this nature, these instruments were not used in the period covered by this study.

[17] On the phasing out of IRS tenders, see: Nagy, 2016.

These modifications to the main policy instrument, however, did not affect the instrument's availability; in other words, the MNB continued to offer full allotment to banks under the main policy instrument on a weekly basis. On 12 July 2016, the MNB decided[18] to restrict access to the main policy instrument in two steps. Once again, the purpose of these unconventional steps was to channel bank liquidity and hence, support the MNB's credit stimulus and self-financing programmes.

Restricted access to the central bank's main policy instrument

Restricting the access to the main policy instrument involved implementation of the following two complementary steps:

– Step 1: from August 2016, the MNB accepts central bank deposits under the three-month instrument once a month, instead of the previous weekly frequency. Each month, the tenders are announced on the first working day following the rate-setting meeting of the Monetary Council as scheduled in the calendar published on the MNB's website. By reducing the frequency of the tenders, the sterilisation portfolio is dispersed over 3 series instead of 13 series, which results in a concentration of deposits.

– Step 2: as of October 2016, the MNB imposes a limit on the amount of bank liquidity that can be placed in the three-month deposit.

By crowding excess bank liquidity out of the policy instrument, the steps described above are expected to facilitate a decline in market yields. Having been crowded out, excess liquidity may flow into the interbank market and into the government securities market beside the Bank's other deposit instruments; therefore, the resulting interest rate effect is likely to arise in these sub-markets, supporting the Bank's schemes to stimulate bank lending and the Self-financing Programme.

Targeted, unconventional instruments and persistently low key policy rate

The restriction of three-month deposits is based on the fact that, although the Magyar Nemzeti Bank acknowledges the value of the key policy rate's stability,[19] there is still room for the application of targeted, unconventional instruments. In the opinion of the MNB, the optimal interest rate is a low rate which is consistent with achieving the inflation target, even over the longer term. At the same time, fine-tuning may necessitate the use of unconventional instruments which, in this case, are targeted at market yield levels relevant to

[18] For more detail, see: MNB, 2016.

[19] See: Virág, 2016, and Kuti–Balogh, 2016.

the real economy. Short-term interbank yields play a key role in consumption and investment decisions.[20]

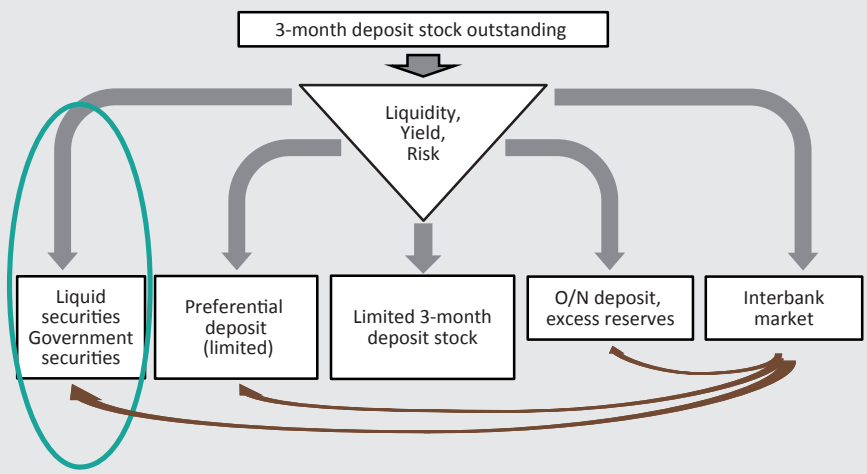
If banks are unable to place all of their excess liquidity in three-month deposits, they can choose from a number of different options (Chart 8):

– On the one hand, they may benefit from granting loans in the interbank market to participants with a liquidity shortfall. Excess supply in the interbank market may have a price-reducing effect, leading to a decline in interbank yields.

– Secondly, banks have additional central bank instruments at their disposal which can absorb from the interbank market any excess liquidity still remaining in the banking system after having been crowded out of the main policy instrument. This adjustment, however, might be costly, as the interest rate on the available central bank instruments is less favourable than that of the main policy instrument.

– Thirdly, some banks – presumably those with ample liquidity – may place their excess liquidity in government papers instead of the three-month deposit, which can be regarded as the continuation of the Self-financing Programme.

Chart 8
Instruments available for absorbing banks' excess liquidity



Source: MNB, own figure

[20] This means 3-month interbank yields in the pricing of household loans and 6-month yields in the case of corporate loans.

Reform of the BUBOR system

Restrictions on banks' access to the main policy instrument in terms of frequency and quantity may also have an impact on the credit market, but this necessitates the proper functioning of the interbank market, i.e. that it be a reliable point of reference for pricing. In Hungary, the pricing of a sizable portion of banking products (loans, derivatives) is pegged to BUBOR, and therefore it is of the utmost importance to ensure that the BUBOR rate is based on real transactions and reflects all information relevant to pricing.

In the years following the outbreak of the crisis in 2008, the main maturities experienced sticky BUBOR rates; i.e. BUBOR behaved as if it was pegged to the MNB base rate. In the aftermath of the crisis, panel bank trading virtually disappeared across the longer maturities of the unsecured interbank market, while counterparty limits sank to the vicinity of zero. It appeared that there were no actual transactions behind the most important reference rate for the Hungarian market.

At the MNB's initiative, the transformation of the BUBOR quotation system commenced in May 2016 with a view to improving the soundness of BUBOR fixings. As a result of the changes, a transaction obligation based price quotation system was set up, similar to the regional patterns in Poland and Romania. In line with international recommendations, it increases the role of real market transactions related to the quotation.[21] In the wake of the reform, the turnover of unsecured transactions between panel banks rose to levels unprecedented in the past few years, which ensures that the channelling of bank liquidity will support not only the Self-financing Programme but bank lending in general in the future.

Conclusions

The 2008 crisis brought into focus the external vulnerability of the Hungarian economy, and the key risk this vulnerability represented remained a recurrent element of investors' assessments of Hungary even years after the crisis. It was against this backdrop that both the government and the central bank identified the reduction of external exposure as a strategic objective.

The self-financing concept was designed with the reduction of external vulnerability in mind. It facilitates the reduction of foreign currency debt and hence, external

[21] According to the new regulation, panel banks are entitled to trade with each other at the interest rates corresponding to the BUBOR quotes submitted by them for a 15-minute period following the publication of the BUBOR fixing at 11 a.m. The transaction obligation is applicable to the 1-month and 3-month maturities, and it is valid up to HUF 100 million and HUF 50 million per counterparty on the given day, respectively. The interest rate of deposit acceptance is determined by using a fixed, 15-basis point spread, taking the submitted BUBOR quotation as a basis. The system was launched on 2 May 2016 with the participation of 9 BUBOR-quoting panel banks, with an additional 3 banks joining their ranks on 1 July 2016.

debt, through the refinancing of maturing foreign currency debt using forints. The self-financing concept is based on a mutual and enduring cooperation between the MNB, ÁKK and banks, and contributes to lowering the level of gross external debt without constraining the behaviour and adjustment of stakeholders, in particular, banks, with mandatory regulations.

As a central element of the concept, the reform of the monetary policy instruments of the Magyar Nemzeti Bank enabled Hungary to reduce its external vulnerability by crowding bank liquidity out of the central bank and channelling it into the desired direction. As a targeted instrument, the Self-financing Programme affected all elements of the central bank toolkit while also supplementing the MNB's instruments by an unconventional element, the conditional central bank interest rate swap. In the summer of 2016, the transformation of monetary policy instruments continued with the reduction of the frequency of three-month deposit tenders, which is to be followed by restricted bank liquidity acceptance via this instrument starting from October 2016.

The Self-financing Programme is unique in the sense that it achieved monetary easing while tightening the central bank's balance sheet: while numerous leading central banks managed to ease monetary conditions only through unprecedented expansions of their balance sheets (i.e. quantitative easing programmes), thanks to the Self-financing Programme, the MNB achieved this goal through a contraction of its balance sheet. The contraction of the MNB's balance sheet reduced the costs associated with holding reserves, and the MNB edged closer to the conditions of a potentially more efficient, liquidity-providing monetary policy. Meanwhile, the central bank's holdings of interest rate swaps accumulated in the context of the Self-financing Programme improved the stability of the government securities market and reduced banks' interest rate risk, which, besides the mitigation of external vulnerability, yielded further benefits to the national economy. Successfully channelling bank liquidity, the IRS instrument does not impose further expenses on the central bank either, as the contraction of its balance sheet offsets any increase in off-balance sheet holdings.

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Annex: Additional aspects of the Assessment of the central bank's IRS instrument and banks' exposure to interest rate risks

Announced in spring 2014, the Self-financing Programme achieved its declared objectives without binding provisions and regulations, via a transformation of the central bank's monetary policy instruments and the resulting adjustment of the banking sector. The adjustment prompted by the Programme had a considerable impact on banks' balance sheets. According to the impact mechanism of the Self-financing Programme – which is based on cooperation between the MNB, the Government Debt Management Agency (ÁKK) and the banking sector – the external vulnerability of the country declines as banks replace their central bank instruments (two-week bills before August 2014 and two-week and three-month deposits thereafter) with liquid securities, specifically, with government paper. In addition, the Programme strongly affected banks' off-balance sheet items: one of the iconic instruments of the self-financing concept was the conditional interest rate swap (IRS) instrument, which was offered to banks twice a week between June 2014 and July 2016 in support of their risk management. Although it is not related to the Self-financing Programme, the interest rate swap conditional on lending activity (LIRS) was also designed to support banks' interest rate risk management, and it was offered by the central bank at five tenders in 2016 Q1.

The MNB's interest rate swap instruments

The two interest rate swap instruments of the MNB are offered to banks under the following conditions.

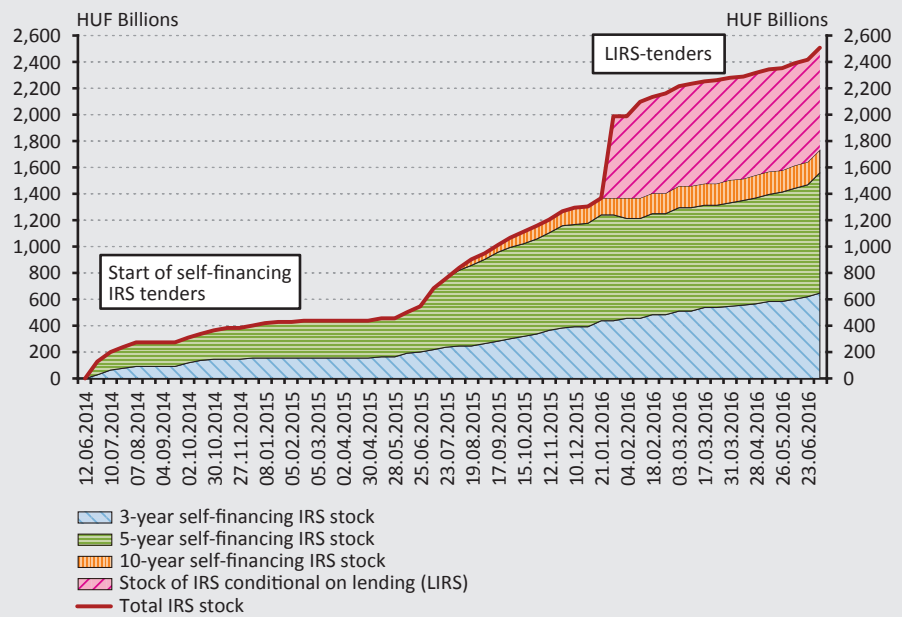
1. Banks participating in the MNB's conditional self-financing IRS transactions pledge to raise the value of their eligible collateral holdings at least by the value of their concluded interest rate swaps.

2. In the case of interest rate swaps conditional on lending activity (LIRS), banks undertake to raise the value of their SME loan portfolio by 25 per cent of the concluded LIRS transactions. Although the primary purpose of the LIRS instrument is to support lending by facilitating the management of the interest rate risk associated with bank lending, due to the 25 per cent expectation of the condition, 75 per cent of the instrument can be used to cover the interest rate risk of other fixed-rate instruments (including fixed-rate government bonds).

By July 2016, the portfolio of these two interest rate swap instruments of the MNB exceeded HUF 2,500 billion, representing more than 10 per cent of participating banks' balance sheet. Of this amount, the 3-year LIRS instrument amounted to HUF 780 billion, while banks' quotes for the 3-year, 5-year and 10-year IRS instrument

amounted to HUF 652 billion, HUF 904 billion and HUF 175 billion, respectively (Chart I). The section below presents the additional aspects to be considered with respect to government bond positions covered by central bank interest rate swaps.

Chart I
Consolidated portfolio of the MNB's IRS instrument



Source: MNB

Additional aspects of the measurement of banks' exposure to interest rate risks

Off-balance sheet derivative transactions are typically concluded in order to offset various on-balance sheet risks, while IRS derivative transactions are specifically intended to eliminate the interest rate risk. At the same time, in measuring the interest rate risk hedged by the IRS instrument the aspects described below should also be considered.

– Under the central bank IRS instrument, the MNB pays the bank the 6-month BUBOR rate, while the bank pays the MNB a pre-specified annual fixed rate. Assuming a perfect market, if the maturity of the fixed-rate government bond coincides with the maturity of the IRS, in the case of a shift in the yield curve the magnitude of the capital gain/loss realised on the government bond portfolio will

be identical[22] to the loss/gain realised on the IRS transaction.[23] If the shifts in the yield curves are not parallel with one another, the hedging will be incomplete, which may further increase the interest rate risk. Approximately, the expected loss (*EL*) will be the average remaining term of the government bond portfolio (average duration) (D_{GS}) multiplied by the shift in the securities market yield curve (ΔR_{GS}), reduced by the average IRS duration (D_{IRS}) multiplied by the shift in its yield curve (ΔR_{IRS}).

$$EL \approx D_{GS} * \Delta R_{GS} - D_{IRS} * \Delta R_{IRS}$$

– The central bank IRS instrument does not automatically guarantee that the maturity of the government securities portfolio is identical with the maturity of the IRS instrument; indeed, banks can meet the condition of the IRS instrument by purchasing eligible securities of any maturity (this only applies to the self-financing IRS, as there is no formal requirement applicable to the collateral portfolio in the case of the LIRS instrument). At the same time, this does not necessarily imply a risk: government securities (instruments) of various maturities and IRS transactions can be combined in such a way that the gain/loss on the (government bond) portfolio is offset by the loss/gain on the IRS transaction. This, however, assumes that the volume of the IRS (V_{IRS}) multiplied by the average remaining maturity of the IRS matches the product of the volume of the government bond portfolio (V_{GS}) and its remaining maturity. In case of shifts in different yield curves, this process may have to be adjusted continuously in order to ensure that the risk mentioned above – i.e. the duration gap (D_{GAP}) – comes to zero:

$$D_{GAP} = D_{GS} - D_{IRS} * \frac{V_{IRS}}{V_{GS}} = 0$$

Based on the above, a given (government bond) portfolio can be hedged with a smaller number of longer-term IRS transactions and vice versa, with a greater number of shorter-term transactions. In the case of a negative D_{GAP} value, the bank can reduce its hedging portfolio, while a positive D_{GAP} value requires an increase in the bank's portfolio.

– When measuring interest rate risks, it should be borne in mind that the bank may decide to resell its IRS contract, in which case the transaction risk will be replaced by counterparty risk. If banks resell their IRS contracts to their parent bank or to a group member, this will not pose a significant risk to the performance of the transaction. It should be also considered that the IRS transaction does not provide coverage for default events; therefore, an increase in the bank's government bond

[22] In case of a parallel shift, the difference stemming from the different convexity of the IRS and the bond portfolio will be low.

[23] The average duration of a floating-rate interest rate swap matches, with an opposite sign, the duration of a fixed-rate government paper. Source: Kocsis et al., 2013.

portfolio will increase the institution's sovereign exposure. This, however, is largely offset by banks' investment policy, which typically places a cap on the value of sovereign exposures. In addition, the Hungarian sovereign risk, as measured in the summer of 2016, stands at a historical low.[24]

Impact of the adoption of international accounting standards

In 2017, the Hungarian credit institution sector will commence migration from the Hungarian Accounting Standards (HAS) to the International Financial Reporting Standards (IFRS). The application of the IFRS will be optional from 2017 and mandatory for all credit institutions from 2018.[25]

During the changeover, the most significant changes will arise from the accounting principle of fair value measurement. The different accounting approach will alter balance sheet totals and specific balance sheet items both on the assets side and on the liabilities side. In comparison to the existing reporting standard, there will be differences in the evaluation of both the government securities portfolio and of the IRS transactions that are intended to hedge the interest rate risk of the portfolio.

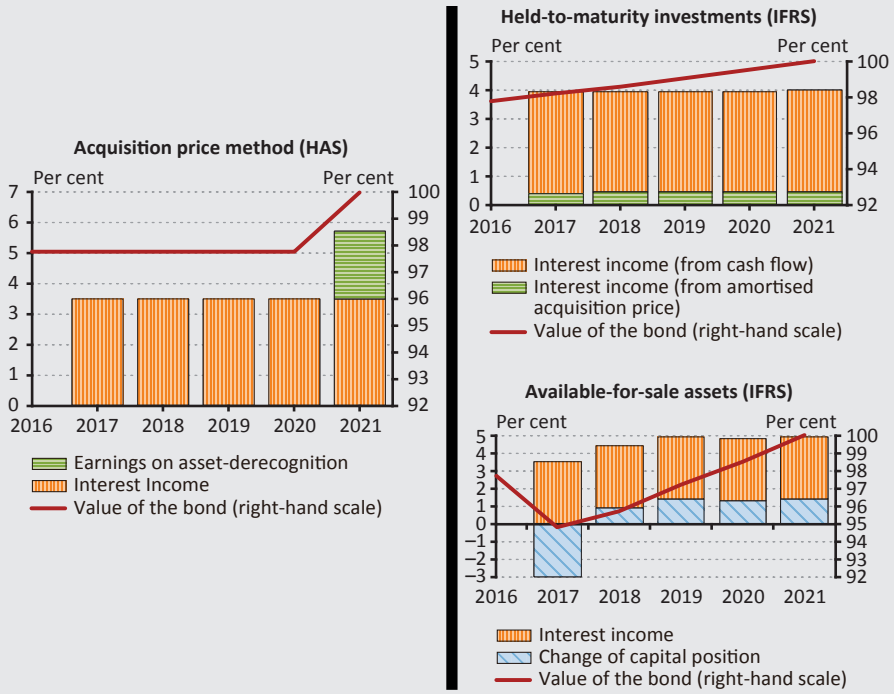
Based on the existing Hungarian Accounting Standards (HAS), the government securities portfolio is presented in financial statements at initial cost, and for the most part, its value changes only upon derecognition of the item. By contrast, the IFRS will bring fundamental changes insofar as different evaluation and impairment rules will be applicable to the government securities portfolio presented in banks' balance sheet and in some cases a portfolio revaluation approach will be applicable (Chart II).

The presentation of the government securities portfolio will change fundamentally compared to the existing short-term and long-term maturity breakdown. On the initial recognition of the assets in the financial statements, banks need to decide whether they wish to hold the given paper until it matures or whether they wish to sell the paper at a future point before maturity. Accordingly, the government bond needs to be classified under either the "held-to-maturity" or the "available-for-sale" category. It is a fundamental difference that assets or liabilities classified as "held-to-maturity" (long-term assets or liabilities in HAS) are to be presented in financial statements at amortised cost as opposed to the nominal value applied in HAS, and they will "regain their nominal value" proportionally during the term of the asset.

[24] In the summer of 2016 the Hungarian 5-year sovereign CDS spread was around 160 basis points.

[25] Although Hungarian credit institutions listed on the stock exchange (OTP Nyrt., FHB Jelzálogbank Nyrt.) have been required to publish their regular reports in accordance with the IFRS standards since 2005, at present, all domestic credit institutions perform their data supply obligations to the MNB according to the Hungarian Accounting Standards.

Chart II
Effect of the different accounting of securities on the profit and loss and on bond value



Note: The charts above illustrate the recognition of a bond of identical maturity and identical cash-flow in financial statements according to the different accounting standards and categories in case of a 1 percentage upward shift in the yield curve at the first interest payment. The left-hand chart simulates the measurement of the security under the Hungarian Accounting Standards by quantifying the effect of the annual interest revenue and the gain/loss realised upon derecognition on the bank's result. The right-hand charts, in turn, illustrate the two methods on the basis of which the security can be accounted for under the IFRS. In the upper chart, the "held-to-maturity" category can be interpreted as a floating-rate bond where, given that future cash flows are guaranteed, changes in the yield curve have no effect on the value. In the lower chart, the value of the bond categorised as "available-for-sale" is determined in accordance with market conditions, adjusted to changes in the discount rate.
Source: MNB, own figure

Under HAS, the profit or loss of a contract classified as a short-term transaction is essentially recognised (exceptions include, for example, impairment) upon closing the position, i.e. upon derecognition. By contrast, in the "available-for-sale" category of IFRS, the value of the prompt position underlying the transaction must be also recognised at the balance sheet date. This also means that the effect of the yield curve can only be presented in the "available-for-sale" category, while with respect to amortised cost

this cannot be recognised due to the virtual absence of interest rate risk[26] in the case of "held-to-maturity" assets. As opposed to HAS, the aforementioned two types of IFRS securities accounting have one thing in common: under interest revenue, in addition to actual interest cash flows, the maturity-proportionate differential of the historic cost and the face value is also presented at the balance sheet date.

Under the existing HAS regulation, when actually realised,[27] derivatives are recognised at the end of the derivative's term; therefore, the value of the swaps' position as at the balance sheet date is not presented beforehand. Under the IFRS regulation, the positions of all off-balance sheet derivative transactions are evaluated at the balance sheet date and quantified either in the profit and loss account or among capital elements.

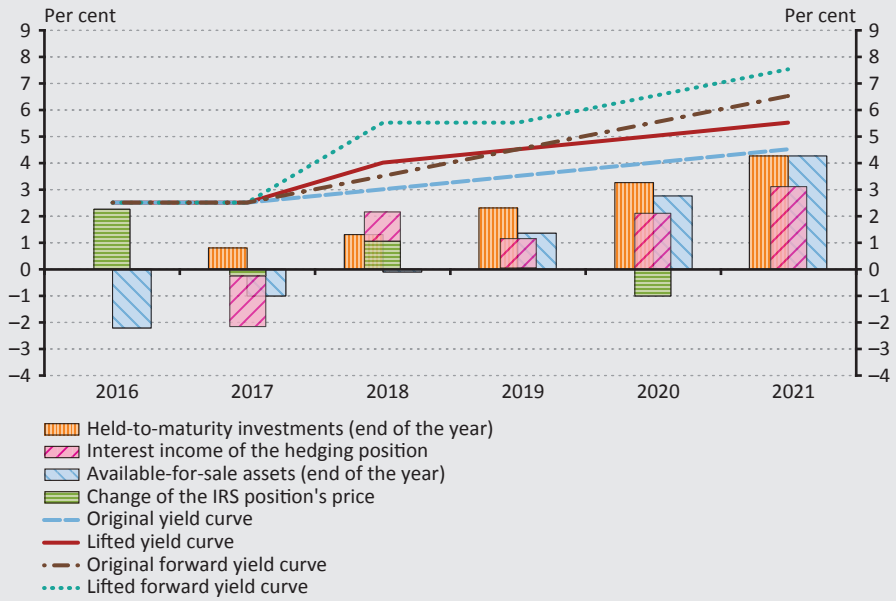
The current HAS standard does not allow for the presentation of individual financial risks; however, since the position value of off-balance sheet hedging items is not presented in the balance sheet, on-balance sheet positions "were not impaired". Under IFRS, the position of off-balance sheet items is presented in the profit and loss account or, in some special cases, on the liabilities side under equity. A condition for presentation under equity is for the transaction to be qualified as a cash flow hedge, which demands, among other things, that the specific hedged item is identified in the subledger at the opening of the position. As the Hungarian banking sector does not attach a cash flow hedge status to the vast majority of its hedging transactions, the position value of hedging transactions is recognised directly in the bank's profit/loss. Changes in the initial zero position of a derivative hedging product can be offset in the balance sheet if the hedged item can also be revalued. Upon initial recognition, the government securities portfolio can be classified either into the "available-for-sale" or the "held-to-maturity" categories. If the interest rate risk of government securities has been neutralised by off-balance sheet items, then the indirect[28] liability effect arising from the revaluation of the derivative product can only be neutralised on the assets side by revaluation of the "available-for-sale" category. This means that, if the government bond was classified as "held-to-maturity" and the underlying off-balance sheet interest rate risk was neutralised by hedging, then the effect of the yield curve shift will be lopsided in the balance sheet (Chart III).

[26] The "held-to-maturity" category can be interpreted as a floating-rate bond where, given that future cash flows are guaranteed, changes in the yield curve have no effect on the value. Obviously, amortised cost is not entirely unaffected by external events either; for example, in the case of accounting certainty, impairment must be recognised.

[27] Maturity is not a sufficient condition for options: in case of a negative position the option holder does not exercise his call option.

[28] In the case of non-cash flow hedging, a transaction that causes changes on the liabilities side through the profit and loss account.

Chart III
Effect of a shift in the yield curve on 5-year government securities, on the position of the hedging IRS and on the interest revenue



Note: A normal (up-sloped) yield curve will shift upwards by 1 percentage point immediately upon the initial recognition of the bond in the balance sheet. The chart illustrates the ceteris paribus historic cost proportionate time profile of bonds issued under par value after a one-off shift in the yield curve, as well as the effects of the underlying derivative's position and recognised interest revenue.
Source: MNB, own figure

When a fixed-rate government paper is hedged by IRS, the elimination[29] of the interest rate risk posed to interest revenues can be clearly tracked in the profit and loss account, and in the case of the "available-for-sale" category, the effects exerted by changes in the value of the government paper and by the revaluation of the hedging transaction typically[30] offset each other.

[29] In the case of a perfect hedge, the fixed interest rate received on the government paper and the interest rate paid on the IRS eliminate each other completely; in other words, the interest revenue presented in the financial statements has an average duration of zero, i.e. it is free of interest rate risk.

[30] Even in the case of perfect interest cash flow hedging a difference may arise due to the different convexities, and the interest rate risk of the two transactions might diverge from one another.

Results of the Self-financing Programme

István Bodnár – Csaba Csávás – Gabriella Csom-Bíró – Dorottya Eszes – Rita Lénárt-Odorán – Gábor Sin – Ádám Zágonyi

Abstract

Announced in the spring of 2014, the measures of the Self-financing Programme significantly raised banks' demand for government securities through banks' adjustment and as a result, in the span of two years the government securities portfolio of credit institutions doubled. Under the Programme, Hungary repaid more than EUR 9 billion of its foreign currency debt from forints, resulting in a corresponding decline in the MNB's balance sheet while the foreign currency ratio of government debt also dropped to below 30 per cent from 50 per cent and gross external debt decreased. In addition, by mid-2016 domestic participants resumed financing the bulk of government debt, shifting Hungary toward a healthier debt structure. It is a clear recognition of the Self-financing Programme that a major credit rating agency referred specifically to the Programme as one of the key rating drivers when it upgraded Hungary's sovereign debt rating to the investment grade category in May 2016.

1 Effects of the Self-Financing Programme

According to the impact mechanism[31] of the Self-financing Programme, the modifications to monetary policy instruments prompt banks to adjust, and by steering a part of the central bank's sterilisation stock into the government securities market, they allow for the refinancing of the country's foreign currency debt using forints and thus ultimately facilitate the reduction of external vulnerability. First and foremost, assessing the success of the Programme involves backtesting the actual developments in order to determine the extent to which they correspond to the impact mechanism described above.

In view of the complexity of the Programme, this assessment should be divided[32] into two parts, which, in this case, entails an examination of the following.

1. Was the Programme efficient in the operative sense? In other words, was the transformation of the central bank instruments capable of establishing the conditions necessary for the intended social impact, i.e. in this case, for the

[31] See: the first study of this volume entitled "Self-financing Programme – Concept and Impact Mechanism".

[32] Based on the conceptional model of Mandl–Dierx–Ilzkovitz (2008). See: Kolozsi–Hoffmann, 2016.

restructuring of banks' funds, for increasing collateral holdings and for contracting the balance sheet of the central bank?

- Did the renewal of central bank instruments prove to be efficient in driving out a part of banks' liquidity of central bank instruments and channelling the funds thus released into the market of liquid securities, specifically, government bonds?
- Did the ÁKK succeed in refinancing maturing foreign currency debt by raising forint funds through self-financing?

2. The declared purpose of the Self-financing Programme is to reduce external vulnerability; therefore, the effectiveness of the Programme primarily depends on whether or not this objective has been achieved.

- Did the gross external debt of Hungary, in particular, government debt, decline in line with the impact mechanism of the Programme?
- How did the Programme change the foreign currency debt ratio?
- How did it change the ownership structure of government debt?

This study focuses on examining these aspects. The review period is April 2014–May 2016.[1] With respect to the impact on the government securities market, this study concentrates on quantitative effects; yield effects are discussed in the third study, entitled "Effect of the Self-financing Programme on monetary conditions" of this volume.

2 Effect of the Self-Financing Programme on external vulnerability

2.1 Banks' activity in the government securities market

According to the impact mechanism of the Self-financing Programme, banks' increased activity and demand in the government securities market is indispensable for refinancing maturing debt from forint issues and thus for reducing external vulnerability.

2.1.1 Effect of the Self-financing Programme on banks' demand for government securities

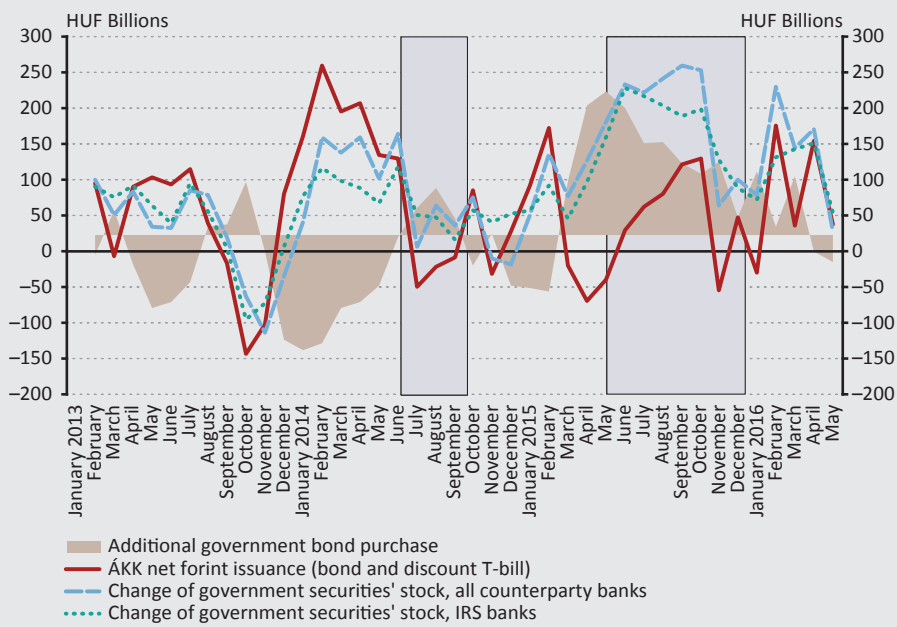
Before the announcement of the Self-financing Programme, banks' demand for government bonds was typically lower than the ÁKK's net forint issuance. Data available from 2013 on banks' government bond holdings – adjusted for repos – indicate that banks' demand for these securities picked up in periods when the ÁKK's net forint bond and discount treasury bill issuance also increased (for this purpose, retail government securities were disregarded). At the same time, in

[1] The occasional use of a different period due to data availability constraints will be noted specifically.

the period directly preceding the launch of the Self-financing Programme, banks' government bond purchases typically lagged behind the ÁKK's net forint issuance. The Self-financing Programme, especially its second phase, however, point to a lasting change in the relationship between government bond purchases and the ÁKK's net issuance.

Since the commencement of the Self-financing Programme, banks' government bond purchases have consistently exceeded the ÁKK's net forint issuance. The banking sector's demand for government securities increased to a lesser degree due to the adjustment needed for the transformation of the two-week bill into deposit (first phase of the Self-financing Programme), but rose so significantly in response to the introduction of the three-month deposit (second phase of the Programme) that the demand surpassed even the net issuance of the ÁKK[2] (Chart 1). From June 2015 to the end of the year, banks increased their government bond holdings by HUF 140 billion per month on average. Compared to the ÁKK's net

Chart 1
Changes in the ÁKK's net forint issuance and banks' total HUF-denominated government securities portfolio (three-month moving averages)*



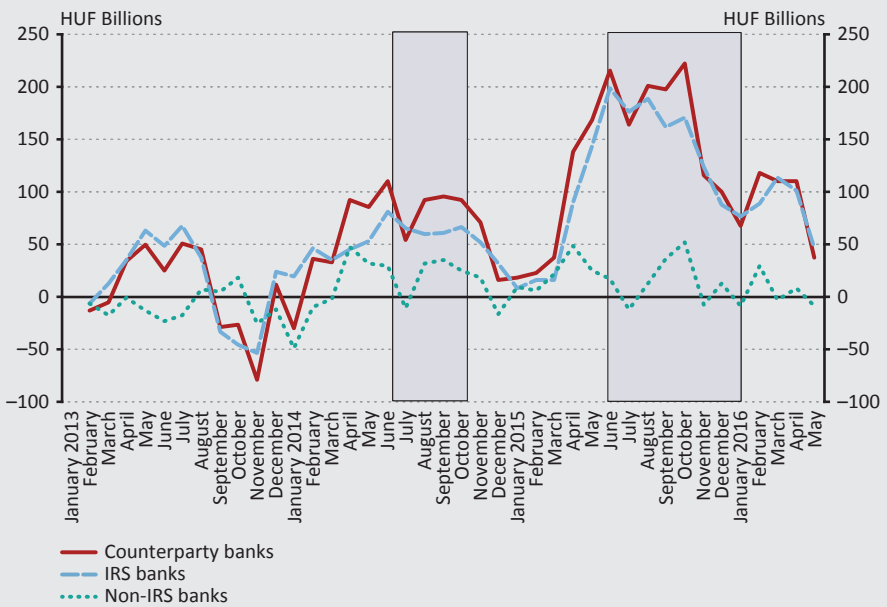
** The ÁKK's net forint issuance does not include retail securities; as with the time series of banks' government securities holdings, it only includes bonds and discount treasury bills.*
Source: ÁKK, MNB

[2] In the past two years, banks' behaviour was fundamentally determined by the reform of the standard instruments of the monetary policy toolkit. At the same time, a number of other factors also exerted an impact, such as the MNB's interest rate swaps, the central bank's easing cycles and regulatory steps, changes in the yield environment and in the behaviour of other investors (specifically, non-residents and households).

forint issuance amounting to approximately 250 billion HUF (including bonds and discount treasury bills, but excluding retail government securities issuance), banks' holdings of government securities rose by HUF 1,000 billion in the same period. Demand for government paper also exceeded the issuance in the third phase of the Programme, albeit to a lesser degree. This implies that banks' adjustment to the changes in the monetary policy instruments and in liquidity requirements was largely completed during this period. It is important to add that the volume of ÁKK issues may have also been influenced by the Programme: the issuance strategy of the ÁKK may have taken into consideration the intensive bank demand.

During the Self-financing Programme, the banking sector as a whole increased its demand for government paper, and the effect on banks participating in IRS tenders was especially remarkable. Developments in the banking sector's government securities portfolio largely reflect the purchases of banks taking recourse to the MNB's IRS instrument; however, non-IRS banks also reported positive flows. The two groups' different behaviour in the government securities market suggests that the central bank's IRS instrument was mainly used by banks, whose compliance with the announced modifications to the monetary policy instruments and to the liquidity requirements entailed a significant degree of adjustment and hence considerable extra demand for government securities. Disregarding banks' rather

Chart 2
Changes in banks' government bond holdings (three-month moving averages)*



** The time series in this chart do not include discount treasury bills.*
Source: MNB

volatile discount treasury bill transactions (which are less related to the Programme in any case) and focusing only on banks' fixed and floating-rate bonds reveals that IRS banks purchased far more government paper than non-IRS banks (Chart 2).

The Self-financing Programme and the government securities holdings of non-resident investors

In 2015, the period of intense demand for government securities coincided with the downsizing of foreign investors' forint portfolio (Gór-Holecz–Lakatos, 2015). Non-residents began cutting back their HUF-denominated securities holdings in April – even before the announcement of the second phase of the Self-financing Programme – and substantial sales of the securities continued throughout the Programme (for the most part, this involved the downsizing of a single, major investor's portfolio). Reducing the HUF-denominated government securities portfolio can essentially be regarded as an event independent of the Programme. In retrospect, however, the yield-stabilising nature of the Programme may have influenced the decisions of non-resident investors.

The bulk of non-resident sales can be attributed to a single investor's exit from the Hungarian market. The investor – a major player in government bond sales – also started to cut its holdings of Polish bonds (Bloomberg, 2016), during the same period, which confirms that its pull-out must have been part of a strategy applied to the entire region and the exit was not limited to the Hungarian market. There is one important difference between the Hungarian and the Polish capital outflows: in Hungary, thanks to self-financing, the typical buyers of government securities were domestic participants. In Poland, however, the portfolio was taken over by other non-resident investors; therefore, the share of non-residents in the domestic treasury market did not decrease overall (Ministry of Finance, Republic of Poland, 2015).

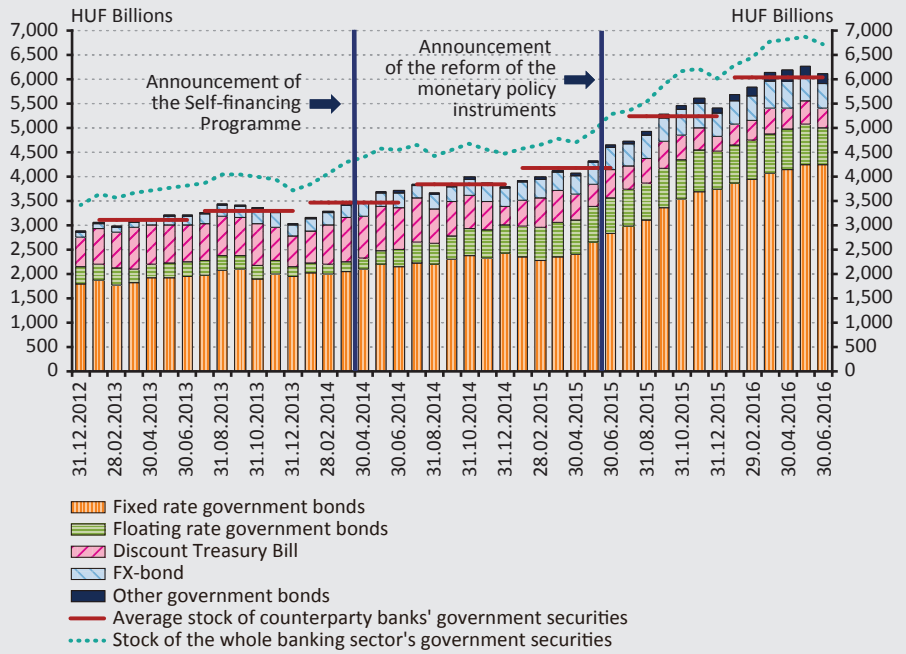
2.1.2 Changes in the government securities portfolio held by banks

The government securities portfolio of credit institutions constituting the central bank's counterparties rose by around HUF 2,660 billion[3] between the announcement of the Self-financing Programme at end-April 2014 and the end of June 2016. The increase in the holdings of the entire credit institution sector – which, besides counterparty institutions, includes banks outside of the group

[3] Relative to stock data at the end of March 2014. Increase in forint and foreign currency government securities calculated at nominal value.

of central bank's counterparties, as well as cooperative banks and credit unions – amounted to around HUF 2,400 billion[4] in the same period (Chart 3).

Chart 3
Breakdown of government securities held by central bank counterparties by security type vs. the portfolio of the entire credit institution sector



Source: MNB, securities statistics, nominal values

– Credit institutions began to increase their holdings after the announcement of the Self-financing Programme. Similarly, banks' demand grew significantly after the introduction of IRS tenders in June 2014 and after the conversion of the two-week MNB bill into a deposit in August 2014.

– Banks stepped up their government securities purchases after the MNB's announcement on the continuation of the Self-financing Programme and on the transformation of the main policy instrument on 2 June 2015, which – with the exception of a temporary decline typical of the end-of-year period – progressively boosted banks' holdings of government securities.

– Banks' demand for government securities in 2016 Q1 was driven by the announcement of the phase-out of the two-week deposit – which had been

[4] The growth recorded for counterparties exceeds the increase in the entire credit institution sector, which can be mainly attributed to a sharp decline in the portfolio of cooperative banks and credit unions.

announced for a limited quantity – and by the entry into force of the 100% LCR requirement in April 2016. The government securities holdings of counterparty institutions rose by more than HUF 1,900 billion compared to end-May 2015 and the increase calculated from the beginning of 2016 was close to HUF 700 billion.

Regarding type, the increase in the holdings of government securities can be attributed, nearly in full, to HUF-denominated, long-term, fixed-rate securities (Chart 3). Of the total increase recorded since the announcement of the Programme 90 per cent involves HUF-denominated government securities, a large share of which comprises fixed-rate bonds. The fixed-rate government bond portfolio of counterparties rose by almost HUF 2,200 billion during the period of the Self-financing Programme lasting until the end of June 2016, while the floating-rate securities portfolio rose by around HUF 540 billion. The counterparties' stock of government bonds issued in foreign currency increased by HUF 235 billion, while their portfolio of other securities issued by the government[5] rose by HUF 170 billion compared to the end of the period preceding the announcement of the Programme. This growth was mitigated by an almost HUF 480 billion decline in their stock of discount treasury bills.

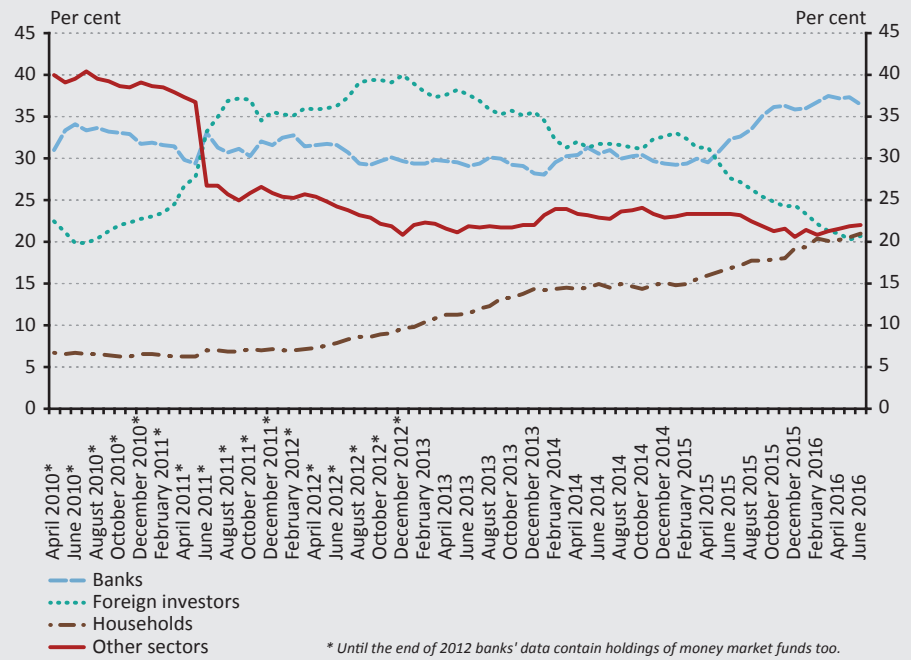
In June 2016, the 15 banks[6] with central bank IRS holdings raised their government securities portfolio by HUF 2,600 billion compared to their stock in the base period. For most IRS banks, the base period stock refers to data pertaining to 2014 Q1, but in some cases – as chosen by the banks concerned – it means the three-month average of the reference period of March–May–June 2015. In addition to IRS banks, credit institutions classified as counterparties but not using the IRS instrument also increased their holdings compared to the basis. In consideration of the above, the stock of government securities held by central bank counterparties rose by approximately HUF 2,950 billion compared to the stock recorded in the base period. Adjusted for concluded transactions, the IRS stock allocated so far amounted to HUF 1,731 billion after the conclusion of the last IRS tender in July 2016, which means that the increase in government securities holdings significantly exceeded the IRS portfolio of banks taking recourse to the IRS instrument.

Thanks to the Self-financing Programme, instead of non-residents, the domestic banking sector became the largest holding sector in the market of HUF-denominated government securities (Chart 4). Owing to changes in the institutional framework, in 2011 there was a sharp decline in the government securities investments of institutional investors (specifically, pension funds). As a result, non-resident participants took the leading role in the market of government securities issued in forints. From 2012, fast-growing retail demand for government securities

[5] Other bonds issued by the government mean treasury bonds and interest-bearing treasury bills.

[6] A total of 17 banks took recourse to the IRS instrument, but two banks concluded all of their IRS transactions with the MNB by mid-2016.

Chart 4
Share of holding sectors in the market of HUF-denominated government securities



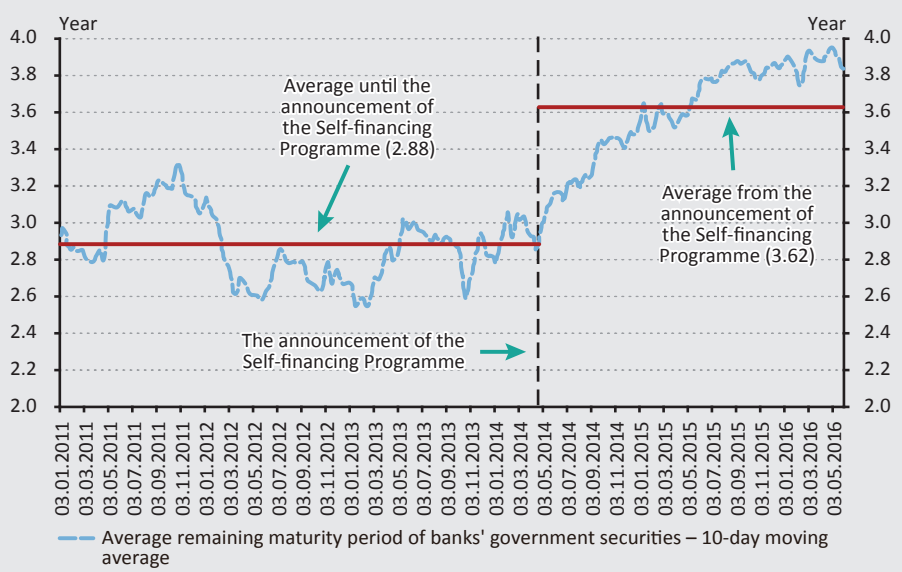
Source: MNB, securities statistics, nominal values

coupled with a continuous decline in the popularity of securities issued by credit institutions was the most important trend, mainly reflecting the fact that, besides households, the ÁKK's increased forint issues were typically purchased by non-resident investors. In 2014, amid the launch of the Self-financing Programme and the ÁKK's reduced foreign currency issues and increased government securities supply, domestic sectors began to purchase HUF-denominated government securities more intensively, but non-residents continued to dominate the holding sectors. The gradual increase in the share of credit institutions began with the announcement of the continuation of the Programme and the transformation of the central bank's set of monetary policy instruments. In April 2015, non-residents' stock of HUF-denominated government debt exceeded the portfolio of domestic credit institutions by almost HUF 250 billion, but in May 2015 this proportion reversed, and by the end of June 2016 the government securities portfolio of credit institutions surpassed the stock of non-resident investors by about HUF 2,700 billion. At the end of the first half of 2016, the share of domestic sectors and non-residents in the HUF-denominated government securities market was 79 per cent and 21 per cent, respectively, which, with respect to non-residents, roughly corresponds to the share of households. In the total debt securities portfolio – which includes foreign

currency issuance as well – the share of domestic sectors already exceeded that of non-residents from the beginning of 2015, and by the end of June 2016 it rose to 62 per cent, of which the share of credit institutions amounted to 28 per cent.

The share of longer-term securities in banks' government securities holdings increased during the Self-financing Programme, which improves the stability of government debt financing. As early as the end of 2014, the average remaining term of banks' HUF-denominated government securities rose to 3.6 years from 2.8 years in the previous year, and by the end of May 2016 it reached 3.9 years (Chart 5). The forint issuance strategy of the ÁKK was a significant contributor to this increase in duration. In 2014 and 2015, amid the negative net issuance of discount treasury bills, supply shifted to longer maturities and to retail government securities. The increased forint market bond issuance supported a debt management policy aimed at the refinancing of maturing foreign currency debt essentially using forint issues (negative net foreign currency issuance), which was largely made possible by banks' extra demand boosted by the measures of the Self-financing Programme. Based on the ÁKK's monthly reports[7] and the Debt Management Outlook published at the end of 2015 (ÁKK, 2015), as in previous years, the issuances have continued to be "front-loaded" in nature so far in 2016; consequently, the net issuance of forint debt may remain at the high levels seen in previous years.

Chart 5
Average duration of banks' HUF-denominated government securities

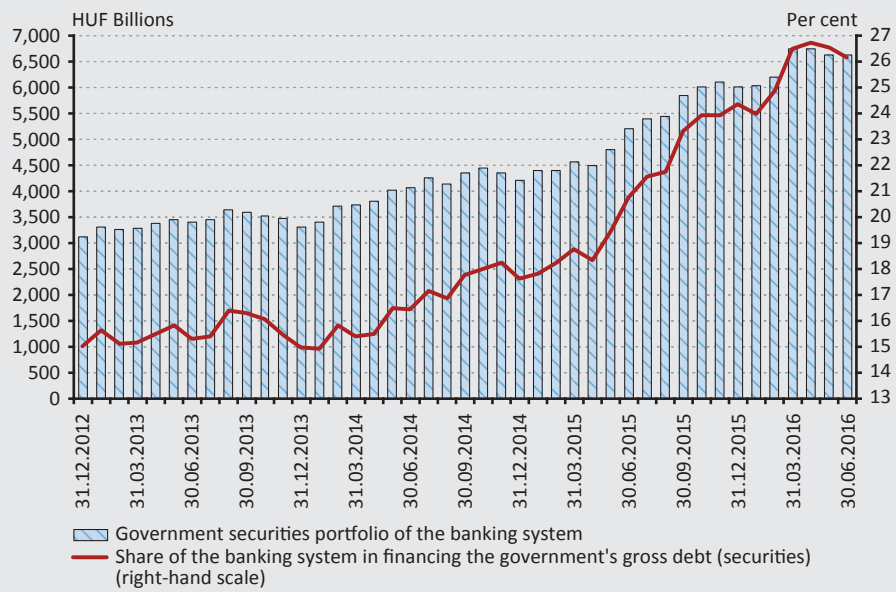


Source: MNB, E04 data supply, nominal values

[7] ÁKK monthly monitoring reports: Financing of the central government. January–June 2016. (available in Hungarian).

In parallel with the rise in the government securities holdings of the domestic banking sector, banks' share in the financing of government debt increased. The stabilising effects of the Self-financing Programme coupled with the central bank IRS tenders boosted banks' holdings of government securities, allowing for a sharp rise in the sector's share in government debt financing, which rose to 26 per cent from 15 per cent by the end of March 2014 in the span of slightly more than two years (Chart 6, at the end of June 2016, the corresponding ratio was 26.17 per cent). The growing share of bank financing further improved Hungary's debt profile: government debt was increasingly financed from internal funds, and reliance on external funding declined. The financing of government debt from internal funds is primarily achieved through the reduction of foreign currency issuance, the repayment of foreign currency bonds and maturing foreign currency debt using forints and increased forint debt issuance (negative net foreign currency issuance). All of this was made possible by domestic banks' additional demand for government securities.

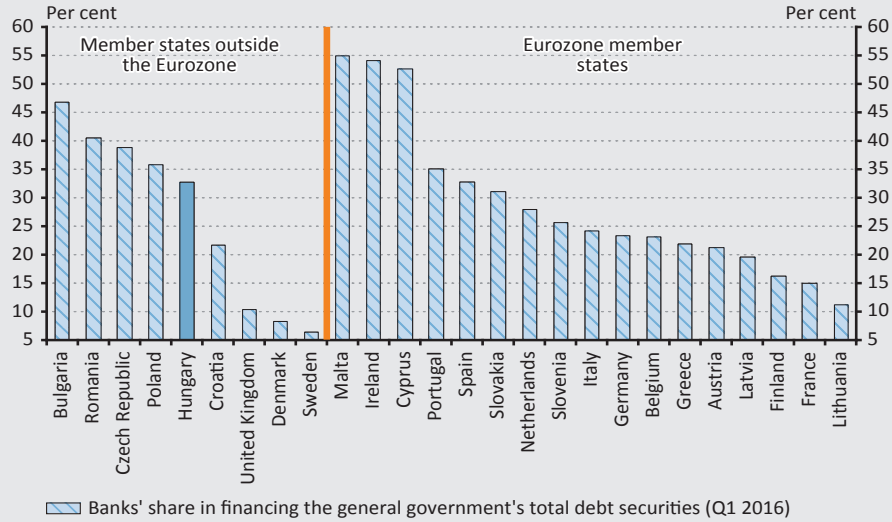
Chart 6
Government securities holdings of the banking sector according to the supervisory balance sheet



Source: MNB, monetary statistics, ÁKK

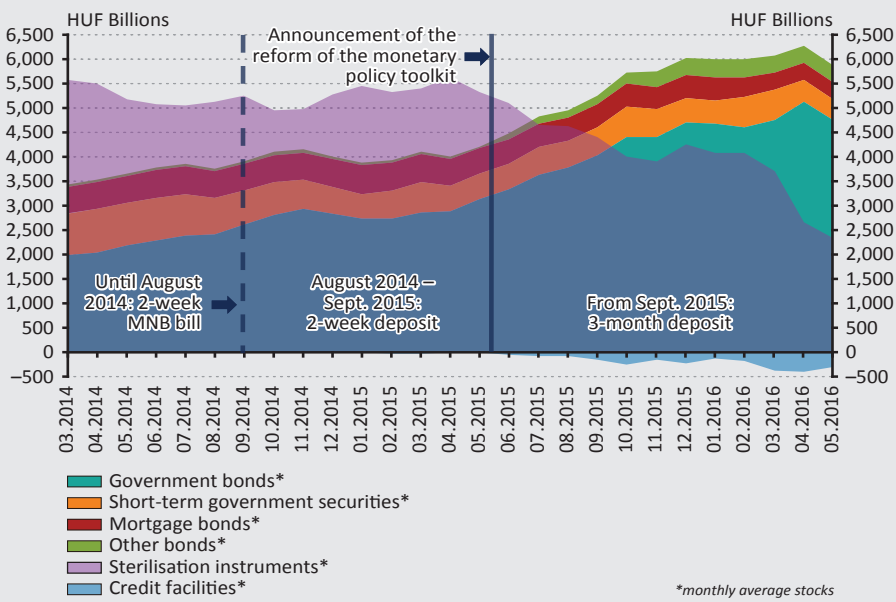
The share of Hungarian banks in the debt issuance of the general government is not considered extreme by European Union standards. Banks' share in Hungarian debt is in the middle range of the European Union values (Chart 7). Banks' share in their respective country's debt issuance surpasses the Hungarian figure in Poland,

Chart 7
Credit institutions' share in financing the total debt issuance of the general government – international comparison (EU26)



Source: ECB, Eurostat

Chart 8
Eligible collateral and central bank instruments held by counterparties



Source: MNB

the Czech Republic, Romania and Bulgaria in the region, and in Malta, Ireland, Cyprus and Portugal in the euro area.

The Self-financing Programme also restructured the range of securities accepted in central bank operations as collateral.[8] The conversion of the MNB bill into a deposit in August 2014, the extension of the maturity of the main policy instrument and other central bank measures typically encouraged banks to adjust to the new framework by increasing their collateral portfolio in view of the contraction of central bank liquidity. On the whole, banks responded to the decline in the sterilisation portfolio by raising the volume of their other liquid instruments, which generated a substantial increase in their eligible collateral (Chart 8).[9]

Developments of the Self-financing Programme and lending

According to the impact mechanism of the Self-financing Programme, the reform of the central bank's set of instruments has a neutral effect on lending to the private sector. The objective of the Self-financing Programme is to encourage credit institutions to purchase liquid securities eligible for central bank operations by channelling banks' excess liquidity towards the relevant markets. Consequently, the Self-financing Programme leads to a simultaneous decline in banks' central bank deposits and an increase in the banking sector's government securities holdings (Chart 9). Accordingly, the Self-financing Programme does not affect the level of banks' receivables from the consolidated public sector (general government and the central bank); it merely changes their structure. As a result, the Self-financing Programme has no effect on banks' lending activity, as the restructuring of liquidity does not influence credit supply.

In line with the impact mechanism described above, the Self-financing Programme restructured the banking sector's portfolio of liquid assets without exerting a perceivable impact on the size of the portfolio. Multiple modifications to the central bank instruments as part of the Self-financing Programme boosted the banking sector's demand for liquid instruments further, while banks' back-up liquidity continuously complied with regulatory expectations.

[8] The stock of eligible securities means securities meeting the requirements laid down in the document entitled "Terms and Conditions of the Operations of the Central Bank in Forint and Foreign Currency Markets", held by institutions eligible as counterparties on securities settlement accounts managed by KELER Zrt. and as such, these securities obviously do not cover the total volume of securities held by the counterparties.

[9] For more detail on the effect of the Self-financing Programme on banks' liquidity management, see the fourth study of this volume entitled "Impact of the Self-financing Programme on the domestic financial infrastructures"

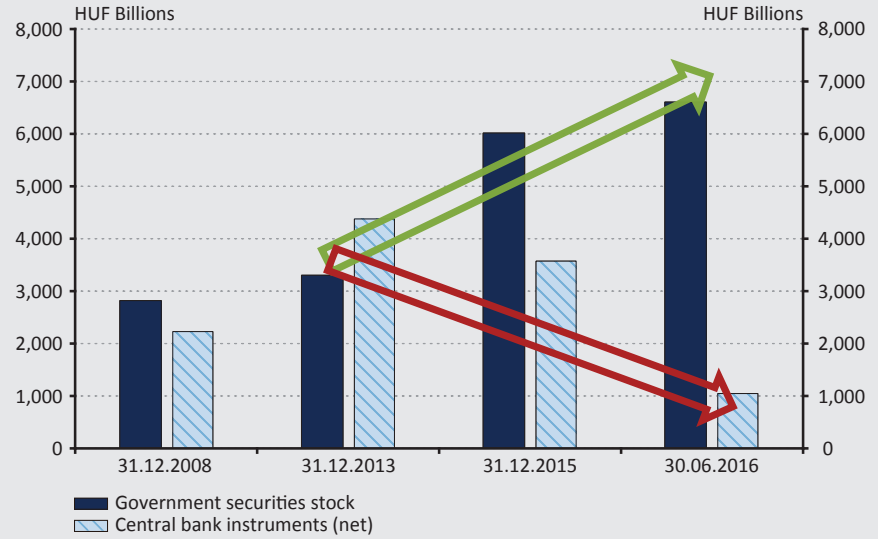
1. **In the first phase of the Self-financing Programme – from April 2014 to the end of August 2014 – the banking sector's liquid asset portfolio grew by HUF 1,500 billion.** The phase-out of the two-week MNB bill at the beginning of August 2014 restructured the liabilities side of the MNB's balance sheet, which was partly reflected in an almost HUF 900 billion increase in the banking sector's holdings of the central bank's two-week deposit. Crowded out of the deposit, the liquidity of non-resident investors and domestic, non-bank financial intermediaries moved to banks' balance sheets. In addition, the effect of the phase-out of the two-week bill on the banking sector's portfolio was offset by banks' strong purchases of government securities.

2. **Banks offset the liquidity-reducing effect of the introduction of the three-month deposit in September 2015 by purchases of government securities.** Since government securities are far more appealing than the three-month central bank deposit for liquidity management and regulatory reasons (LCR ratio) as well, the banking sector's holdings of central bank deposits with a maturity longer than overnight fell by more than HUF 2,300 billion overall in the period (which, in addition to the portfolio decisions of credit institutions, reflected factors reducing the stock of foreign exchange reserves). During the same period, the banking sector purchased government securities for more than HUF 800 billion.

3. **Similarly, banks adjusted to the phase-out of the two-week deposit in April 2016 in line with the central bank's objectives.** Upon introduction of the three-month central bank deposit, the MNB imposed a quantity restriction on the two-week deposits, and banks were only allowed to deposit their liquidity in this instrument through auctions. The quantity restriction enabled participants to downsize their holdings gradually; thus, the phase-out was implemented smoothly. Compliance with liquidity rules (LCR) was not affected by the exit of the two-week deposit; banks' compliance was ensured continuously.

From the announcement of the Self-financing Programme, the increase in the banking sector's holdings of government securities coupled with a parallel decline in the sterilisation portfolio was observable (Chart 9). Compared to HUF 3,735 billion in March 2014, by the end of June 2016 the government securities holdings on banks' balance sheets exceeded HUF 6,600 billion, while the stock of central bank instruments fell to nearly one quarter of its previous value. The liquidity-reducing impact of the transformation of the central bank's set of instruments was offset by the expansion of the government securities portfolio.

Chart 9
Changes in net central bank receivables and in the government securities portfolio

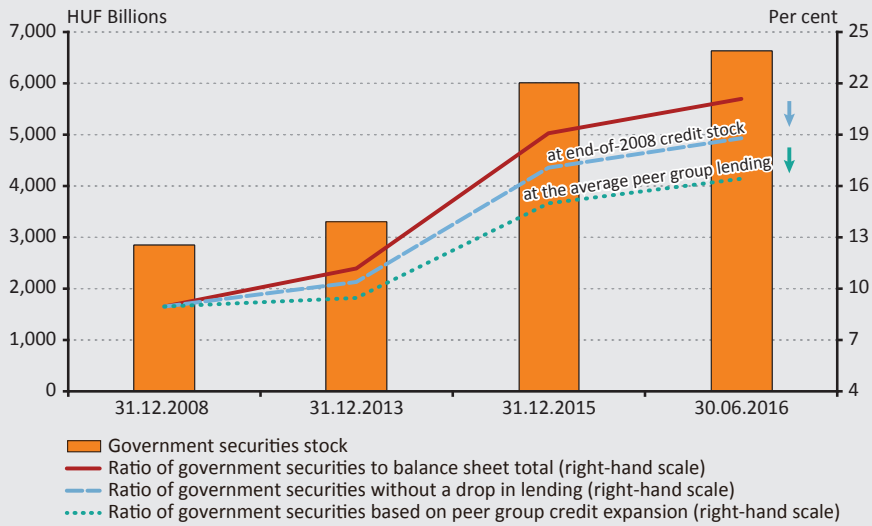


Source: MNB

The high ratio of banks' holdings of government securities to the balance sheet total can be largely attributed to the contraction in the banking sector's balance sheet total, in the context of the restrained lending activity of credit institutions. Banks restrained their lending activity in the aftermath of the economic crisis and simultaneously shed their loans outstanding and this accounts for around 2 percentage points of the 21-per cent ratio prevailing in mid-2016. Assuming that the dynamics of Hungarian bank lending was consistent with the regional[1] average in the past seven years, then this ratio would be 2.5 percentage point lower (Chart 10).

Based on the above, if bank lending begins to rise in the next few years, the ratio of government securities will decrease even without a parallel decline in the stock of government securities held by banks. Outstanding borrowing in the SME segment has grown sharply since the announcement of the MNB's Funding for Growth Scheme, while based on the HUF 780 billion recourse to the lending IRS (LIRS) instrument announced under the MNB's Growth Supporting Programme, lending to SMEs may increase by almost HUF 200 billion in the next 1-3 years, boosting banks' balance sheet total by a corresponding amount.

Chart 10
Ratio of government securities held by the Hungarian banking sector to balance sheet total

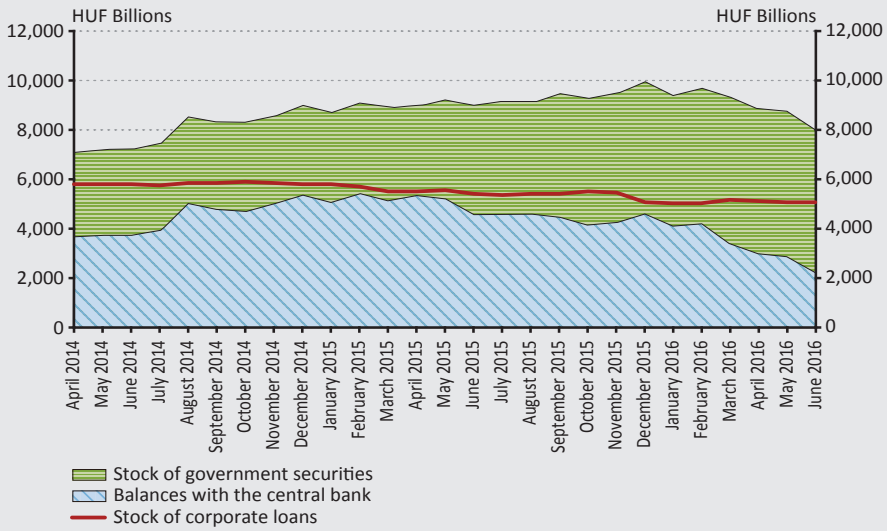


Source: MNB

The availability of sufficient liquidity is a prerequisite for lending, and this condition has been in place even after the transformations linked to the Self-financing Programme. In addition to sufficient demand and capital, lending requires bank liquidity. Although bank liquidity held in central bank instruments decreased in the wake of the Self-financing Programme, this decline was offset by the purchases of eligible securities (specifically, government securities). This means that even now, banks are capable of financing sound loan requests. The Self-financing Programme did not bring about any changes in this regard. In other words, the purchases of government securities (which are especially appealing from a liquidity standpoint) do not prevent banks from financing the real economy. Accordingly, neither the contraction of the sterilisation stock, nor the increase in banks' portfolio of government securities exerted any effect on the corporate loan portfolio in the past two years (Chart 11).

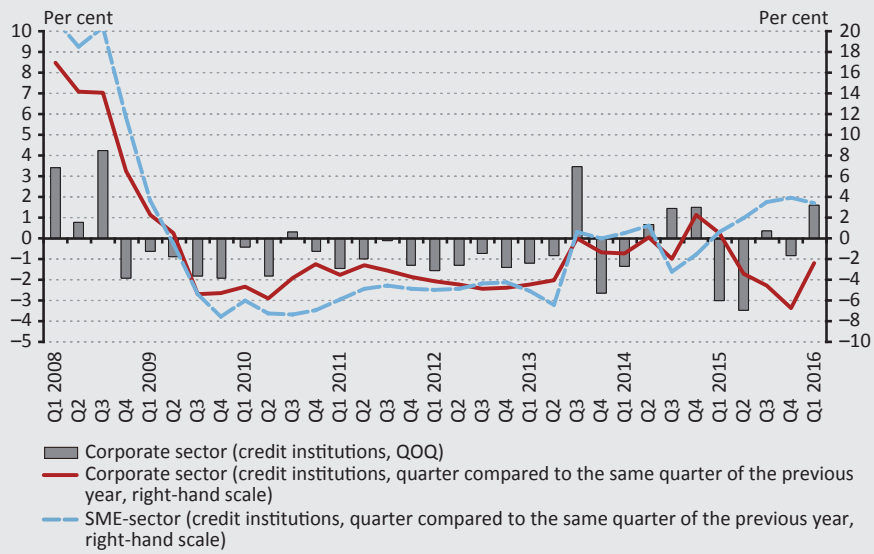
The downturn observed in corporate lending in recent years stems primarily from lending to large corporations and the effect of one-off items within this segment. Lending dynamics were unaffected by the measures of the Self-financing Programme. As shown above, the Self-financing Programme does not have any relevant and verifiable impact mechanism that could lead to a decline in lending. On the contrary, the Programme may lead to an acceleration in

Chart 11
Banking sector's exposure to the central bank and to the government and its loans outstanding in the corporate segment



Source: MNB

Chart 12
Expansion of lending to the total corporate sector and to SMEs



Source: MNB

lending dynamics indirectly, via the reduction in external vulnerability. Actual data clearly support the view that the underlying factor of the downturn in corporate lending was not the Self-financing Programme, but the effect of one-off items in the sector of large corporations.

1. Last year, outstanding loans in the corporate segment faltered primarily because of one-off factors affecting the outstanding borrowing of large corporations. While both short-term and long-term loans were affected by the contraction, most of the decline was linked to a few large-volume, one-off transactions of large corporations. Subsequently, in 2016 Q1 corporate credit embarked on a gradual increase.

2. As opposed to the segment of large corporations, in the past two years the outstanding borrowing of small and medium-sized enterprises showed signs of expansion. While the total corporate loan portfolio fell by 2.4 per cent per annum between 2015 and 2016 Q1, SME loans outstanding rose by almost 1.6 per cent, as the second phase of the Self-financing Programme coinciding with this period generated the strongest rise in banks' purchases of government securities.

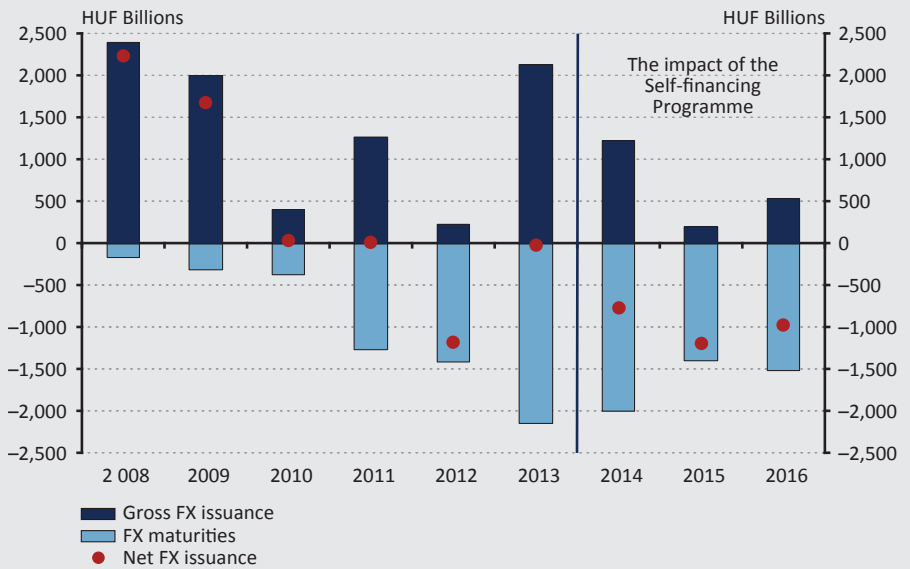
2.2 Net foreign currency financing of the general government

Through banks' increased demand for government securities, the foreign currency debt repaid by the Hungarian government from forint issues amounted to EUR 2.5 billion in 2014, EUR 3.8 billion in 2015 and EUR 3 billion in the first half of 2016. The higher supply of HUF-denominated government securities linked to the self-financing concept was made possible – in addition to the robust household demand – mostly by banks' heightened demand, which was supported by the different phases of the MNB's Self-financing Programme from spring 2014. The net foreign currency issuance of ÁKK (i.e. the difference between foreign currency borrowing and repayments) stood at HUF –766 billion in 2014 and HUF –1,185 billion in 2015 (Chart 13). This represents a sharp change compared to previous years: in the years preceding the announcement of the Self-financing Programme, the net foreign currency issuance of the government was either positive or close to zero.[10] In 2014, net foreign currency issuance turned strongly negative despite the issuance of sovereign US dollar bonds amounting to EUR 2.2 billion in March 2014, which increased annual net issuance. Net foreign currency issuance declined further in 2015 and the government repaid most of its maturing debt from forint funds. During 2015, in addition to rising bank demand, households'

[10] The only exception was 2013, when due to the crisis erupting in the periphery countries of the euro area, the issuance of foreign currency bonds would only have been possible under unfavourable conditions. The annual report of the Government Debt Management Agency (ÁKK, 2013) explained the absence of international foreign currency bond issuance partly with the prolonged IMF/EU negotiations.

sharply increasing demand for government securities also contributed substantially to the fact that the bulk of maturing foreign currency debt was refinanced from forint funds. In the first half of 2016, government financing from internal funds continued: net foreign currency issuance fell to HUF –950 billion, reflecting, for the most part, the last instalment of the IMF/EU credit facility.

Chart 13
Foreign currency issues and redemptions of the government



Source: ÁKK, the ÁKK's Debt Management Outlook for 2016, published in December 2015

Owing to increased forint issues, in addition to its maturing foreign currency debt, the government prepaid a portion of its foreign currency debt maturing at a later date. The surge generated by the Self-financing Programme in the demand for forint issues not only enabled ÁKK to finance maturing foreign currency denominated bonds and loans, but also facilitated the prepayment of foreign currency debt maturing in later years. In 2014, besides maturing foreign currency debt, the Hungarian government prepaid foreign currency debt worth EUR 0.8 billion, and in 2015 the foreign currency debt repaid by ÁKK was HUF 2.1 billion higher than the originally maturing foreign currency debt. This amount includes Hungarian foreign currency bonds purchased in the secondary market in relation to the Self-financing Programme, which were repurchased by ÁKK from the MNB at the end of the year in a total amount of EUR 1 billion.

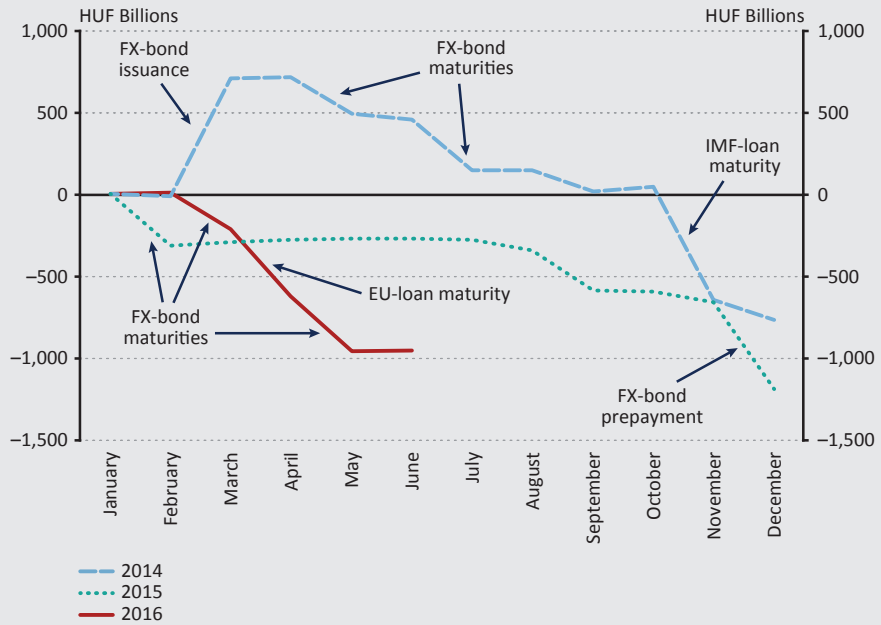
It is a testimony to the success of the Self-financing Programme that the government has limited the issuance of international foreign currency bonds to a minimum since the announcement of the Programme in April 2014. The last significant issuance of ÁKK was in March 2014; since then, it has made one issuance of renminbi FX bonds in April 2016, amounting to approximately EUR 140 million. Thus, the refinancing of maturing foreign currency debt was covered, nearly in full, by the issuance of HUF-denominated government securities and retail foreign currency bonds. According to the ÁKK's 2016 Debt Management Outlook published at the end of 2015, net foreign currency issuance will amount to around HUF –1,000 billion throughout the whole year; thus self-financing will continue in 2016 (ÁKK, 2015). If the planned international issuances fail to materialise, net foreign currency borrowing may remain in the negative range in the second half of 2016 as well.

The FX redemptions of the government and the forint issues designed to provide the underlying collateral are separated in time. The ÁKK does not necessarily borrow the forint funds required for the repayment of maturing foreign currency debt at the time when the foreign currency debt is repaid. Typically, in the case of major maturities, the ÁKK prepares for the forint issues ahead of time. Stepped-up forint issuance is reflected in the rising balance of the Single Treasury Account (STA) and in the declining stock of sterilisation instruments. At the date of the foreign currency repayment, the ÁKK converts forint to foreign currency at the MNB to cover the repayment, which, by reducing both the foreign exchange reserves and the STA balance, constricts the balance sheet of the MNB.

The effects of the individual phases of the Self-financing Programme are evident in within-year changes in the net foreign currency financing of the government. The intra-year time profile of foreign currency debt shows the foreign currency financing processes in greater detail than the annual aggregate data. Even though net foreign currency financing was negative throughout 2014, owing to USD-bond issuances at the beginning of the year, the government was still a net borrower (Chart 14). The spring issuance ensured the funds required for maturing foreign currency debt in the middle of the year; consequently, net foreign currency financing only turned negative in the autumn. With respect to foreign currency financing, the Self-financing Programme was of key significance in 2014 also because of the fact that debt maturing at the end of the year could be refinanced from the forint issues that were increased during the year. Net foreign currency borrowing remained negative throughout 2015 and accelerated especially from the autumn with the transformation of the main policy instrument and the restriction of the two-week deposit in the second phase of the Self-financing Programme. Owing to the maturing of debt in the spring, in the first half of 2016 the sharp decline in net foreign currency issuance was even more pronounced than in previous years, partly due to the maturity structure of foreign currency debt. Announced in January

2016, the third phase of the Self-financing Programme also contributed to the fact that the government was capable of financing foreign currency debt maturing in the first half of the year without any significant foreign currency bond issuance.

Chart 14
Short-term cumulative net foreign currency borrowing of the government

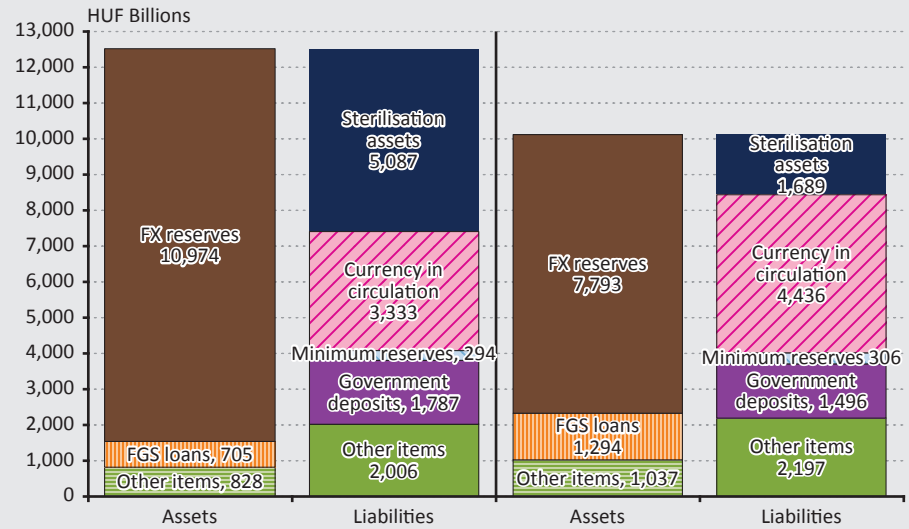


Source: ÁKK

2.3 Contraction of the central bank's balance sheet

Over the past two years, the Self-financing Programme contributed significantly to the contraction of the central bank's balance sheet. The central bank's balance sheet is affected by numerous factors (especially inflows of EU transfers, the repayment of foreign currency debt, the foreign currency expenditures and foreign currency interest expenditures of the government, the MNB's Funding for Growth Scheme), and these effects cannot be separated from those of the Self-financing Programme. In addition, the impact mechanism of the Self-financing Programme reduces the sterilisation portfolio on the liabilities side and the foreign exchange reserves on the assets side of the MNB's balance sheet, i.e. it constricts the central bank's balance sheet by definition. The Self-financing Programme contributed to the fact that by the end of June 2016, the central bank's balance sheet shrank to HUF 10,124 billion from HUF 12,507 billion recorded at the end of March 2014 (Chart 15).

Chart 15
Changes in selected balance sheet items at the end of March 2014 and at the end of June 2016



Source: MNB

The refinancing of maturing foreign currency debt from forint funds, *ceteris paribus*, constricted the central bank's balance sheet by around HUF 2,900 billion, generating a corresponding decline in interest-bearing central bank funds. The balance sheet contraction triggered by the Self-financing Programme can be captured by the ÁKK's net foreign-currency debt issuance. From 2014 to the end of June 2016, thanks to the Self-financing Programme, the Hungarian government repaid EUR 9.4 billion in foreign currency debt from forint funds. This means that, due to the negative net foreign currency debt issuance, the MNB's balance sheet total – *ceteris paribus* – decreased by about HUF 2,900 billion. The decline in the foreign exchange reserves also entailed a decline in the sterilisation portfolio on the liabilities side. The sterilisation portfolio bears interest rate which is identical to the key policy rate, and therefore the MNB's interest expenditures vis-a-vis banks also decreased.

Self-financing Programme and the MNB's foreign exchange reserves

While the continuous adequacy of the foreign exchange reserves was ensured going forward, the Self-financing Programme played an important role in the targeted utilisation of foreign exchange reserves in the past two years. Owing to the Self-financing Programme, the foreign currency debt of the government declined, which also entailed a fall in foreign exchange reserves. Between

end-March 2014 and end-June 2016, the MNB's foreign exchange reserves fell by around EUR 11.4 billion to EUR 24.8 billion. The targeted utilisation of the reserves was primarily linked to the conversion of households' foreign currency loans into forints and to the Self-financing Programme (Chart 16). Before the announcement of the Self-financing Programme and following the ÁKK's international foreign currency bond issuance of USD 2.2 billion, at the end of March 2014 the MNB's foreign exchange reserves amounted to EUR 36.2 billion. In 2014, the contraction in foreign exchange reserves was mainly attributable to the repayment of EUR 2 billion worth of EU loans in the autumn of 2014, while all other factors affecting the foreign exchange reserves more or less offset each other. By the end of 2015, the MNB's foreign exchange reserves fell by around EUR 4.3 billion from a level of EUR 34.6 billion at the end of December 2014, and by the end of June 2016 a further decline of EUR 5.5 billion was recorded mainly in relation to the MNB's programmes. In addition to the significant reserve-reducing effect of the foreign currency transactions linked to the conversion of foreign currency household loans, which totalled EUR 3.8 billion both in 2015 and until the end of June 2016, the ÁKK's foreign currency debt repayments[11] amounted to a gross total of EUR 4.6 billion in 2015 and EUR 3.2 billion in the first half of 2016 without any considerable international bond issuance.[12] The last instalment of the Hungarian government's loan from the EU – which matured in early April and amounted to EUR 1.5 billion – accounted for nearly half of the redemptions in 2016. The inflow of European Union transfers (EUR 4.4 billion in 2015 and EUR 1.4 billion in the first six months of 2016) pointed to an increase in the reserves along with a number of additional factors – such as the one-week swap designed to provide EUR liquidity to banks maturing at the beginning of the year and the expiries and closures of CIRS transactions linked to Pillar III of the FGS – which, however, only partly offset the decline in the foreign exchange reserves in relation to other MNB programmes. **Even after the first two years of the Self-financing Programme, the foreign exchange reserves significantly exceeded the level defined by the short-term external debt rule (Guidotti rule) which is monitored continuously both by investors and the MNB.** According to the Guidotti rule, the level of the foreign exchange reserves should at least equal the country's short-term external debt, which, based on the latest data release, totalled EUR 20.2 billion at the end of March 2016.[13] As of March 2016, when the foreign exchange reserves stood

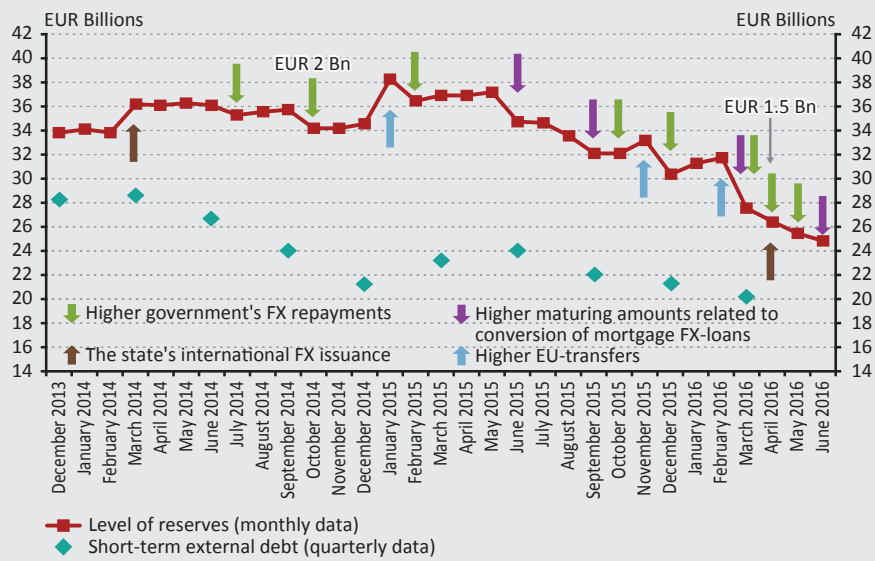
[11] These figures reflect maturing debt and redemptions only; issues are not included.

[12] Hungary was the first country in the region to issue renminbi bonds in the Chinese offshore bond market in April 2016. The issuance foreseen in the ÁKK's Debt Management Outlook for 2016 is a negligible amount of EUR 140 million.

[13] The MNB publishes reserve adequacy information on a quarterly basis in its Report on the Balance of Payments. At the cut-off date of this study, the latest available time series pertained to 2016 Q1.

at EUR 27.6 billion, the margin above the ratio was EUR 7.4 billion. Short-term external debt decreased considerably in the review period, dropping to EUR 21.2 billion by the end of March 2016 from a level of EUR 28.6 billion at the end of March 2014. In 2014, the downward shift in short-term external debt was largely attributable to the fact that the repaid EU loan was a short-term loan and that non-residents' holdings of the MNB bill dropped to zero as a consequence of the conversion of the main policy instrument to deposit. The short-term external debt of the general government rose almost by EUR 1 billion in 2015, primarily because the last instalment of the EUR loan turned into amortising debt, but this was offset by a decline in the short-term external debt of corporations and the banking sector. As a result, at the end of the year the level of short-term external debt was consistent with the value recorded in December 2014. In 2016 Q1, the general government and the banking sector reduced Hungary's short-term external debt. With respect to reserve adequacy, it should be noted that the decline in the reserves in the context of the MNB's programmes and efforts aimed at the reduction of short-term external debt were the results of pre-planned processes; therefore, the contraction of the foreign exchange reserves does not jeopardise reserve adequacy (Csávás, 2016).

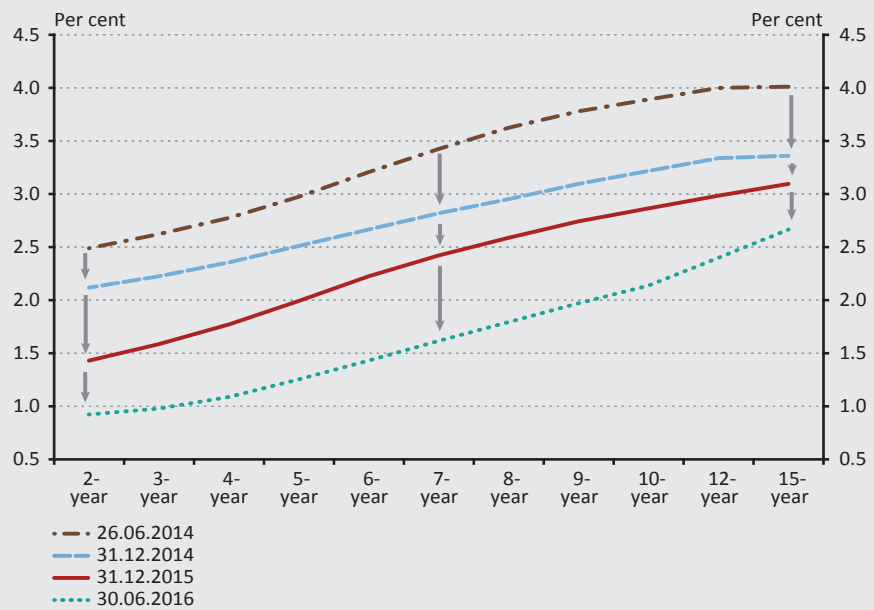
Chart 16
Changes in the MNB's foreign exchange reserves



Source: MNB

Although the Self-financing Programme increased the MNB's off-balance sheet IRS portfolio, on the one hand, this was more than offset by the contraction of its balance sheet and, on the other hand, the yield declines observed in recent years also resulted in the positive revaluation of the IRS portfolio. The central bank's interest rate swap instrument was the iconic channelling tool of the Self-financing Programme, which effectively facilitated banks' adjustment to the reform of the monetary policy instruments by the purchases of liquid securities (government securities). Parallel to the increase in banks' holdings of government securities, their IRS portfolio also increased. As a result, upon the exit of the IRS instrument in July 2016, an IRS stock of HUF 1,731 billion remained among the off-balance sheet items of the central bank. However, this stock, on the one hand, is far smaller than the MNB's balance sheet contraction (HUF 2,900 billion) under the Self-financing Programme; i.e. regarding interest expenditures, the balance is positive. On the other hand, yield developments in recent years (Chart 17) have resulted in the positive revaluation of the MNB's IRS portfolio. After the introduction of the central bank interest rate swap tenders, the MNB lowered the key policy rate on one occasion in July 2014 and 8 more times during the easing cycles commencing in March 2015 and March 2016. As a result of the interest rate cuts, the central bank base rate dropped from 2.3 per cent to 0.9 per cent. Through the lower interest

Chart 17
IRS yields between June 2014 and June 2016



Source: Reuters

environment, the MNB may realise a positive revaluation effect on the IRS contracts concluded before the interest rate cuts, even though the pricing of the instrument, due to its conditional nature, is not consistent with market prices. In the case of interest rate swap transactions, this means that the participating credit institution pays the MNB the higher, fixed interest rate defined upon the conclusion of the contract, while the MNB pays the credit institution a floating rate lower than the initially defined interest rate.

2.4 Effect of the Self-financing Programme on external debt and foreign currency debt

At the level of the macro economy, the Self-financing Programme facilitates the reduction of the government's foreign currency debt and strengthens the role of domestic sectors in debt financing. Assuming that non-resident investors hold the bulk of foreign currency public debt owed to sectors other than households, any decline in foreign currency debt inevitably lowers the gross external debt of the government.

2.4.1 Effect of the Self-financing Programme on the foreign currency debt ratio

The self-financing concept reduces the foreign currency ratio of public debt as it refinances foreign currency debt with forint debt. The financing of government debt from internal funds is primarily achieved through the reduction of foreign currency issuance, the repayment of foreign currency bonds and maturing foreign currency debt from forint funds and increased forint debt issuance (negative net foreign currency issuance). All of this was made possible by domestic banks' additional demand for government securities.

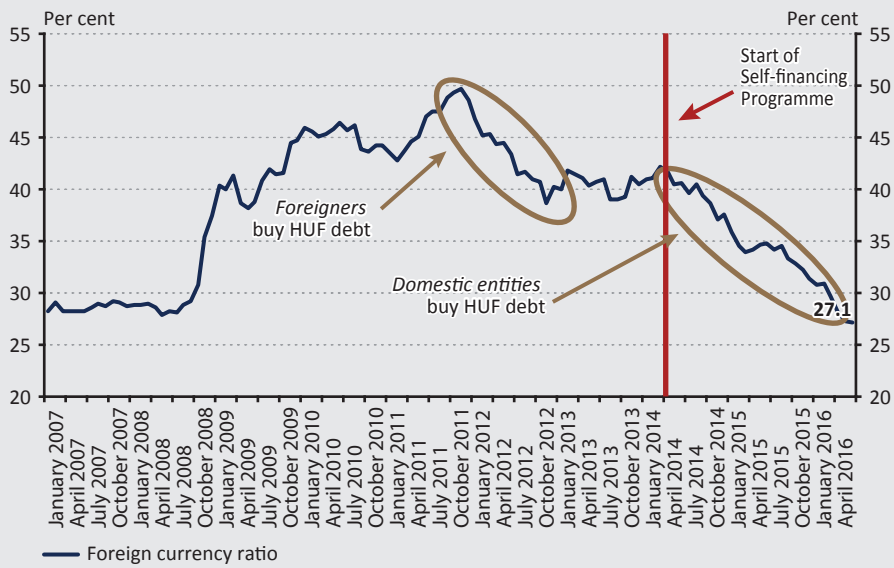
The downward effect of the Self-financing Programme on external vulnerability is directly reflected in the change in the composition of government debt. Accumulated in the aftermath of the 2008 crisis due to the loans granted by international institutions, Hungary's external debt began to decline in 2012 thanks to the commencement of instalments in relation to the IMF/EU credit facility. However, in parallel with the decline, non-residents' contribution to forint financing began to increase; moreover, from 2013 foreign currency issuances resumed. Owing to the Self-financing Programme, from mid-2014 the Hungarian government no longer needed to borrow,[14] in net terms, foreign currency for performing its instalments of international loans and for the refinancing of maturing foreign currency bonds, as sufficient forint funds were available to finance the general government.

After the implementation of the self-financing concept, by the end of June 2016 the ratio of foreign currency debt to central government debt shrank to 27 per

[14] Although retail foreign currency government securities were issued both in 2014 and 2015 (Premium Euro Hungarian Government Bonds, "PEMÁK"), net foreign currency financing was nonetheless negative.

cent.[15] In the context of the Self-financing Programme, the foreign currency debt of non-residents decreased, but the forint debt of domestic sectors (primarily domestic banks and households) increased; accordingly, Hungary's external vulnerability declined. Compared to 42 per cent in March 2014, the foreign currency debt ratio dropped to below 30 per cent in March 2016 before falling to 27.1 per cent in June. This value is in the lower half of the 25–35 per cent target band determined by the ÁKK and it is consistent with the values recorded in 2008 before the outbreak of the crisis (Chart 18). Foreign currency government debts maturing in 2016 correspond to a large sum of around HUF 1,520 billion, the majority of which will be refinanced with forint debt, bringing down the foreign currency debt ratio even further to the vicinity of pre-crisis ratios.

Chart 18
Foreign currency ratio of central government debt[18]



Source: ÁKK, 2016

2.4.2 Effect of the Self-financing Programme on gross external debt

The reduction of external debt accelerated during the Self-financing Programme, and the decline observed in recent years in the gross external debt of the national economy continued. While the decline in external debt previously reflected the

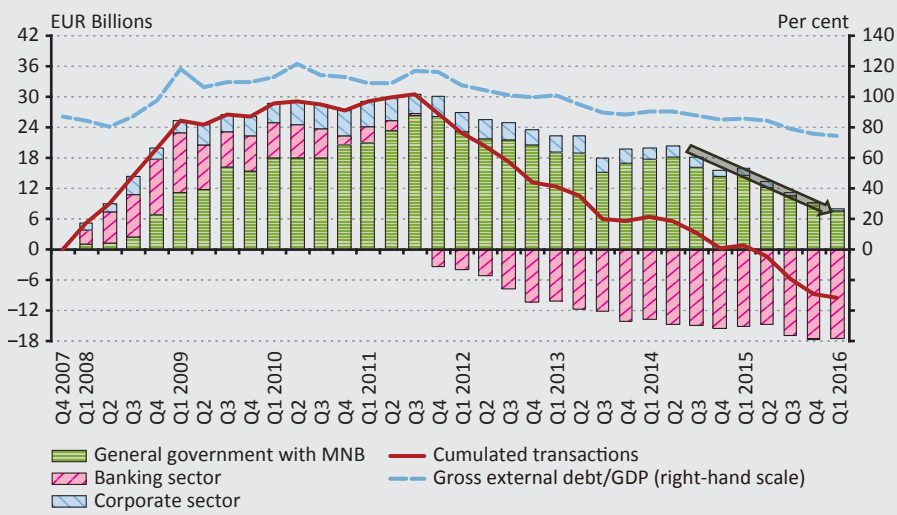
[15] The ratio of the forint debt of the central government to total government debt, excluding mark to market deposits.

[16] Based on the time series on central government debt published on ÁKK's website.

banking sector's balance sheet adjustment and net repayment of its external funding, from mid-2014 it was the external debt of the general government which demonstrated the most significant decline. During the period of the Self-financing Programme, by the end of 2016 Q1 the gross external debt of the economy fell below 75 per cent of GDP from a level of 90 per cent, of which the gross external debt reduction of the consolidated government amounted to EUR 10 billion based on transactions excluding the revaluation effect stemming from exchange rate movements. At the same time, the adjustment of the banking sector continued, driven by the banking sector's muted demand for foreign currency in the context of the conversion of FX mortgage loans into forints and by additional macroprudential measures.[17] The banking sector contributed to the reduction of gross external debt by an additional EUR 4 billion in the past one and a half years (from 2014 Q2 to 2016 Q1).[18]

The Self-financing Programme enabled the government to reduce external foreign currency debt and forint debt simultaneously. The gross external debt of the general

Chart 19
Decomposition of gross external debt (cumulative transactions from end-2007 excluding inter-company loans)

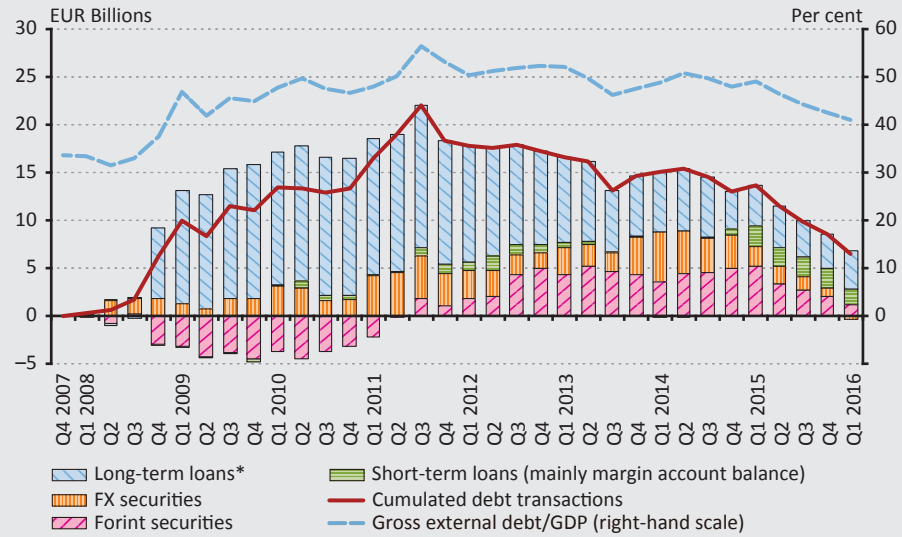


Source: MNB

[17] The introduction of FXBR (Foreign Exchange Balance Ratio) and the tightening of FFAR (Foreign Exchange Funding Adequacy Ratio) as of 1 January 2016. The FXBR is intended to limit currency mismatches on the balance sheet to 15 per cent of the balance sheet total, thereby reducing banks' excessive reliance on the swap market. Under the tightening of the FFAR ratio, outstanding swap contracts cannot be taken into account as stable funding, and the required FFAR level rose to 100 per cent.

[18] For more detail on external debt developments, see the 2016 June Report on the Balance of Payments (MNB, 2016b).

Chart 20
Decomposition of the gross external debt of the general government (cumulative transactions from end-2007)



** Long-term loans also include EU/IMF loans.*
Source: MNB

government began to decrease in 2014, with the decline accelerating in 2015. The net repayment of external foreign currency debt continued, while non-residents (specifically, a major investor) also began to reduce their forint government securities portfolio. Nevertheless, the financing of the general government remained unimpaired with domestic participants' unprecedented surging demand for government securities stemming from banks' increased interest in such securities in the context of the MNB's Self-financing Programme and from heightened household demand for government securities (Report on the Balance of Payments, 2016 March). The government, therefore, succeeded in reducing external foreign currency debt and forint debt simultaneously. During the period of the Self-financing Programme, gross external government debt dropped from 50 per cent to nearly 40 per cent of GDP.

Conclusions

In line with the central bank's objectives, since the announcement of the Self-financing Programme in spring 2014, banks have adjusted to the multiple phases of the transformation of monetary policy instruments by downsizing their sterilisation portfolios and by increasing their holdings of securities eligible as collateral, specifically, government securities. This enabled the government to refinance its

foreign currency debt with forint issues and to reduce gross external debt along with the foreign currency debt ratio, which led to a significant reduction in the external vulnerability of Hungary between 2014 and the spring of 2016.

Of course, in designing the reform of the central bank's toolkit within the framework of the Self-financing Programme, the MNB considered the specificities of the Hungarian economy. Nevertheless, the measures adopted in the past two years are also consistent with international trends in that central banks worldwide tend to intervene more actively in the operation of economies and unconventional measures are increasingly often added to the set of traditional central bank instruments.

It can also be regarded as an important external feedback that the Self-financing Programme contributed significantly to the improvement in the external perception of the Hungarian economy. The launch of the Self-financing Programme and the announcements of additional modifications to the central bank instruments were received positively by numerous international investors[19] and international organisations.[20] In their analyses, institutions primarily emphasised Hungary's reduced reliance on non-resident investors, improved resilience to external shocks, the favourable restructuring of Hungary's debt profile and the strengthening of internal financing. The improvement in external balance achieved as a result of the Self-financing Programme played a key role in the upgrade of Hungary's debt rating into the investment grade category in May 2016.[21]

Besides the improvement in external balance and macroeconomic indicators, the fact that the Self-financing Programme shifted the holdings of Hungarian government securities from non-resident investors to banks operating in Hungary should be mentioned among the most notable effects strengthening financial stability. It is an important lesson of post-crisis years that the parent banks of domestic banks are committed to the stability and sustainable growth of the Hungarian economy and as such, they continue to represent a group of stable investors even in times of restrained risk tolerance to external finance. In assessing the growing participation of domestic banks in the government securities market, it should be borne in mind that the increase in the government securities portfolio of the banking sector coincided with the accumulation of banks' central bank IRS portfolio. The importance of this factor lies in the fact that, under the conditionality

[19] See: Goldman Sachs, 2016; Nomura, 2016.

[20] IMF, 2016.

[21] Improving Hungary's sovereign debt rating one notch (from BB+ to BBB–) with stable outlook, Fitch Ratings reupgraded Hungary's long-term foreign currency-denominated debt rating to the investment category on 20 May 2016. The statement issued by Fitch emphasised that the key driver of its decision was the combination of a sharp improvement in Hungary's external balance and the reduction of its external vulnerability, driven, among other factors, by the Self-financing Programme and the conversion of foreign currency mortgage loans.

of the central bank IRS instrument, banks participating in the tenders pledge to raise their portfolio of securities eligible as collateral (specifically government securities) in central bank credit operations in proportion to the increase in their central bank IRS portfolio, which also contributes to the stability of the government securities market. The contraction of the central bank's balance sheet, declining liquidity[22] and the tightening of liquidity adequacy requirements also encourage domestic banks to hold a larger portfolio of securities eligible in central bank credit operations which, in turn, also improves the shock resilience of the government securities market.

The MNB held the last central bank IRS tender – an iconic element of the Self-financing Programme – on 7 July 2016. Termination of the instrument was justified by a decline in structural bank demand and by the depleted added value of IRS tenders,[23] but this does not imply that the goals of the self-financing concept, i.e. the reduction of foreign currency debt and external vulnerability, are rejected. This is confirmed by the fact that the MNB reduced the frequency of the three-month deposit instrument from August 2016 and imposed a quantity restriction on the instrument from October 2016, thereby supporting the Self-financing Programme while stimulating lending.

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[22] For more detail, see: MNB, 2015.

[23] For more detail, see: Nagy, 2016; MNB, 2016c.

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Effect of the Self-financing Programme on monetary conditions

Csaba Csávás – András Kollarik[1]

Abstract

The Magyar Nemzeti Bank commenced its first easing cycle in the summer of 2012, which – combined with two subsequent easing cycles – resulted in a 610-basis point decline in the central bank base rate, with the key policy rate falling to 0.9 per cent by June 2016. The MNB complemented this step with the announcement of the Self-financing Programme in spring 2014. While the primary goal of the Programme was to reduce Hungary's external vulnerability, the measures were also intended to facilitate the easing of monetary conditions through a number of unconventional instruments. This study assesses the impact of the Self-financing Programme on monetary conditions and on specific channels of monetary transmission. The examination of interbank and government bond yields and selected items on the MNB's balance sheet led to the following main conclusions: (i) Rendering the interest rate corridor asymmetric improved monetary transmission in the overnight interbank market. (ii) There was no significant competition at the auctions of the limited two-week deposit instrument; thus the average accepted interest rate remained close to the central bank base rate. (iii) By reducing both short-term and long-term government bond yields, the Self-financing Programme achieved its intended objective of unconventional monetary easing.

Introduction

Between August 2012 and June 2016, the Magyar Nemzeti Bank (MNB) cut the policy rate by a total of 610 basis points. With three easing cycles, the MNB lowered the key policy rate from 7 per cent to 0.9 per cent in 32 steps. The rate cuts were justified and indeed, made possible, by the low inflation environment, subdued medium-term inflationary pressures, the amount of surplus capacity in the economy and, in the context of declining external vulnerability, improving risk assessment.

In order to reduce Hungary's external vulnerability, on 23 April 2014 the MNB announced the Self-financing Programme. Essentially, the goal was to convert

[1] The authors wish to thank Zalán Kocsis for his valuable assistance in writing this study and Mónika Mátrai-Pitz for developing an earlier version of the model explaining long-term yields.

the bulk of foreign currency government debt vis-à-vis non-residents into HUF-denominated debt held by domestic participants. At the same time, the central bank balance sheet would contract, and net receivables from non-residents would decline in line with the sterilisation portfolio.[2] Steering the banking sector towards domestic securities (especially HUF-denominated government bonds) eligible as collateral for central bank instruments, the Self-financing Programme may also point to monetary easing by contributing to a decline in government bond yields. This is how the Self-financing Programme fits in with the central bank's interest rate cut policy.

This study sets out to examine the extent to which the Self-financing Programme effectively contributed to the easing of monetary conditions and its impact on monetary policy transmission. Our hypothesis is that crowding liquidity out of the main policy instrument and steering banks towards the government securities market eased monetary conditions and may have influenced recourse to the monetary policy instruments and monetary policy transmission. With that in mind, in order to gauge the efficiency of the two channels of monetary transmission, we analysed the different maturities of interbank and government bond market yields and specific balance sheet items of the MNB. The study is structured as follows: Section 1 presents a definition of certain concepts relevant to monetary policy; Section 2 provides a brief overview of the easing cycles of the MNB; and Section 3 summarises the Self-financing Programme. The backbone of our analysis is Section 4, which describes our findings with respect to the transmission process and monetary conditions. Finally, we sum up the main conclusions of our study.

1 Monetary policy stance, monetary conditions and monetary policy transmission

Monetary policy stance **is understood as the combined application of specific elements of monetary policy and the definition of their characteristic features, which allow monetary policy to contribute to economic, financial and monetary developments.** The stance is primarily determined by the key policy rate (a relatively high interest rate: tight monetary policy; a relatively low interest late: loose – accommodating – monetary policy). At the same time, if the set of monetary policy instruments consists of several elements, they collectively determine the monetary policy stance. The MNB's traditional monetary policy instruments not only comprise the key policy rate but also, for example, the overnight interest rate corridor. Accordingly, the central bank base rate and the position of the interest rate corridor relative to the base rate jointly express the MNB's stance.

[2] For more detail about the impact mechanism of the Self-financing Programme see the first study of this volume.

Monetary conditions **are financial variables that are affected by monetary policy but also influence the target variables of monetary policy, i.e. inflation and output.** Such financial variables include interbank and government bond market yields and the exchange rate. Since macroeconomic performance is primarily influenced by real variables, changes in real interest rates and the real exchange rate are of key significance. A linear combination of the real interest rate and the real exchange rate is referred to as the *monetary conditions index* (Bofinger, 2001, p. 416). A lower real interest rate or a weaker exchange rate points to looser monetary conditions.

Monetary policy transmission **bridges the gap between the monetary policy stance and monetary conditions.** The transmission mechanism captures the transition between the monetary policy stance and monetary conditions and the ultimate objective of the central bank. Transmission is deemed efficient when monetary conditions and the ultimate objective adjust to the stance. Transmission is efficient when a higher key policy rate (tighter stance) is coupled with higher interbank interest rates while (sufficiently lagged) inflation is also subdued. Transmission takes place in several steps: in the first step, the stance triggers a response from financial markets; secondly, financial intermediaries define prices and other conditions for clients; and finally, macroeconomic variables react to monetary policy. This study focuses on the impact exerted by the MNB's Self-financing Programme on two key channels of monetary transmission: interbank and government bond market yields.

2 Monetary easing cycles of the MNB since 2012

"The primary objective of the MNB shall be to achieve and maintain price stability. Without prejudice to its primary objective, the MNB shall support the maintenance of the stability of the financial intermediary system, the enhancement of its resilience and its sustainable contribution to economic growth; furthermore, the MNB shall support the economic policy of the government using the instruments at its disposal."

(Article 3 of Act CXXXIX of 2013 on the Magyar Nemzeti Bank)

The primary objective of the MNB is to achieve and maintain price stability. Since 2001, Hungary has pursued an inflation targeting monetary strategy. In other words, the central bank sets an explicit inflation target as the ultimate goal without defining any intermediate target (or inflation forecast might be considered as an intermediate target). Since 2007, the inflation target of the MNB has been 3 per cent. It is a direct, operational target of the MNB to ensure that short-term (specifically, three-month to six-month) market rates are in line with the key policy rate and with the expectations surrounding the base rate.

With a view to achieving the inflation target and providing sufficient stimulus to the real economy, between August 2012 and June 2016 the MNB lowered the central bank base rate from 7 per cent to 0.9 per cent (Chart 1). While the consumer price index had previously exceeded the MNB's inflation target, in the autumn of 2012 it embarked on a decline. By early 2013, it had dropped to the central bank's 3 per cent target value and has resided below the target ever since. Meanwhile, the MNB carried out three easing cycles (between August 2012 and July 2014; between March and July 2015; and between March and May 2016). As a result of the rate cut carried out in March 2016, the overnight central bank deposit rate sank into slightly negative territory, at –0.05 per cent. The rate cuts were justified – and indeed, made possible – by the low inflation environment, subdued medium-term inflationary pressures, the amount of surplus capacity in the economy and, in the context of declining external vulnerability, Hungary's improving risk assessment.

3 The MNB's Self-Financing Programme

In order to reduce Hungary's external vulnerability and reduce the sterilisation portfolio, on 23 April 2014 the MNB announced the Self-financing Programme. Essentially, the goal was to convert the bulk of foreign currency government debt vis-à-vis non-residents into HUF-denominated debt held by domestic participants. At the same time, the central bank balance sheet would contract, and net receivables from non-residents would decline in line with the sterilisation portfolio.[3]

The measures adopted within the framework of the Self-financing Programme between 2014 and the summer of 2016 can be divided into three phases. In the following, we provide a brief summary of central bank steps important and relevant as regards monetary policy effects.

First phase of the Self-financing Programme

On 23 April 2014, the MNB announced that:

a) the form of its main policy instrument would be changed: the two-week MNB bill would be converted into a two-week time deposit (effective from 1 August 2014);

b) as of 16 June 2014, a forint interest rate swap (IRS) instrument would be introduced, in which the MNB would pay a floating interest rate against a fixed rate.

Second phase of the Self-financing Programme

On 2 June 2015, the MNB announced the second phase of the Programme. In the second phase:

[3] For more detail on the unconventional Programme, see the other studies in this volume.

a) from 23 September 2015, the three-month, fixed interest central bank deposit became the MNB's main policy instrument replacing the two-week deposit, available to banks without quantity restrictions;

b) the two-week deposit facility remained a part of the MNB's instruments primarily for liquidity management purposes, but from the end of 2015 the MNB limited the amount to be held in the instrument to HUF 1,000 billion;

c) the MNB continued to announce the central bank interest rate swap tenders to facilitate banks' liquidity management and to channel banks' demand from shorter toward longer-term securities.[4]

2.1 Also in the context of the second phase, on 24 September 2015 the MNB made two additional announcements:

a) effective from 25 September 2015, the previous ±100-basis points interest rate around the base rate available on the overnight standing facilities was made asymmetric: the interest rate available on the overnight central bank deposit equalled the base rate –125 basis points and the rate on collateralised loans equalled the base rate +75 basis points;

b) as of 30 September 2015, the MNB also modified the terms and conditions of traditional loan tenders: their maturities were reduced to a half (two-week loans were replaced by one-week loans and a three-month loan was introduced to replace the six-month loan). At the same time, the pricing of one-week loans became more favourable (the previous base rate +50 basis points interest rate was reduced to base rate +25 basis points).

2.2 As a continuation of the second phase, on 6 October the MNB announced that the optional reserve ratio system introduced in 2010 would be terminated from the maintenance period of December 2015 (Varga, 2010), and a uniform required reserve ratio of 2 per cent would be applicable to all credit institutions.

Third phase of the Self-financing Programme

The MNB announced the third phase of the Programme on 12 January 2016. In this phase, in April 2016, the MNB phased out the two-week central bank deposit in two steps.

3.1 On 10 May 2016, the MNB announced the termination of IRS tenders as of 7 July 2016.

[4] From April 2016, the MNB raised the liquidity coverage ratio (LCR) requirement imposed on banks to 100 per cent. This step was implemented outside of the scope of the Self-financing Programme.

The declared purpose of the Self-financing Programme was to complement the MNB's easing cycles, aligning its measures with the trajectory of conventional monetary policy.

4 Effect of the Self-Financing Programme on monetary policy transmission

In the following, we examine the effects of the Self-financing Programme on the transmission of Hungary's monetary policy and on monetary conditions. This study focuses only on two transmission channels: the reaction of (nominal) interbank and government bond yields and market conditions (liquidity of the overnight interbank market, recourse to central bank instruments). To strike an optimal balance between scientific soundness and clarity, certain transmission channels (e.g. shortest yields) are analysed by qualitative methods, while quantitative methods are used for other channels (e.g. longer-term yields).[5] For the purposes of this study, the exchange rate channel of monetary policy transmission and the pass-through of market rates to bank rates are disregarded.

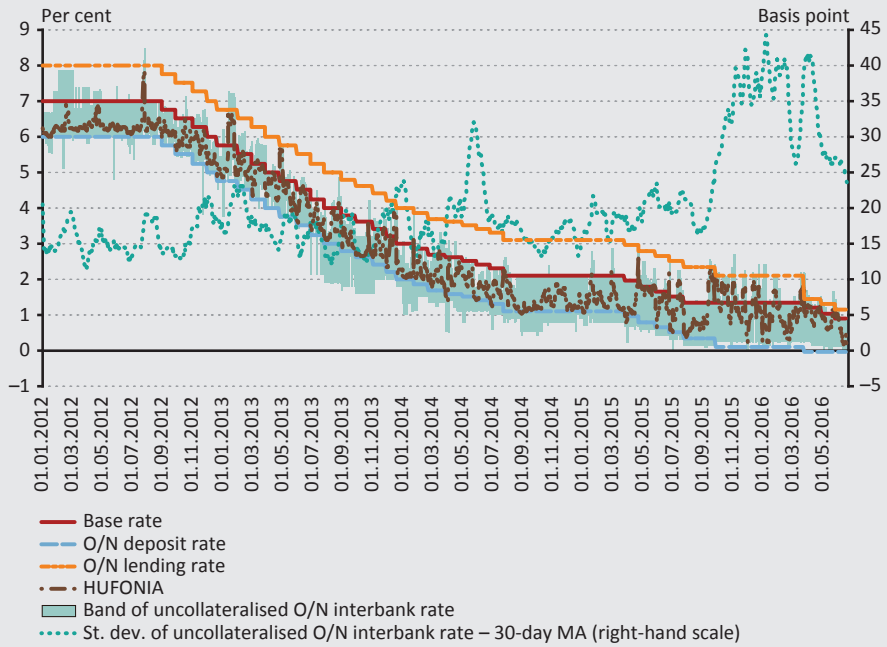
4.1 Developments in short-term yields

While the overnight unsecured interbank interest rate, the HUFONIA, had previously resided in the lower range of the interest rate corridor, from September 2015 it rose close to the base rate, which, in this segment, points to an improvement in transmission (Chart 1). Thanks to banks' more cautious liquidity management (i.e. accumulation of overnight central bank deposits), the HUFONIA had fluctuated in the lower range of the interest rate corridor since the 2008 financial crisis. In September 2015, however, as a result of the asymmetric interest rate corridor, overnight borrowing from the central bank became relatively more favourable than taking recourse to the overnight deposit facility, which reduced the net holdings of overnight central bank instruments (overnight deposits minus overnight loans). The decline in net overnight deposits, in turn, raised the HUFONIA to the vicinity of the base rate, which is favourable from the point of view of monetary policy transmission.

The intraday standard deviation of the overnight interbank rate increased after September 2015 and declined once again with the narrowing of the interest rate corridor in the spring of 2016. Whereas in the past the intraday standard deviation of the interest rates of daily transactions had fluctuated in a range of 10–20 basis points for years, the indicator rose to around 40 basis points in autumn 2015. Higher

[5] For the most part, the time series included in the charts or used for our analyses pertains to the period between 1 January 2012 and 17 June 2016.

Chart 1
The overnight unsecured interbank interest rate



Note: The overnight (O/N) unsecured interbank interest rate's band and standard deviation refer to the intraday distribution of the interest rates of transactions.
Source: MNB

standard deviations point to a temporary liquidity deterioration in the overnight interbank market.

- **The increase in the standard deviation can be partly attributed to the introduction of auctions for the allotment of the two-week deposit:** the standard deviation of overnight interest rates may have increased in line with the increase in the dispersion of the two-week deposit rate (Chart 4).

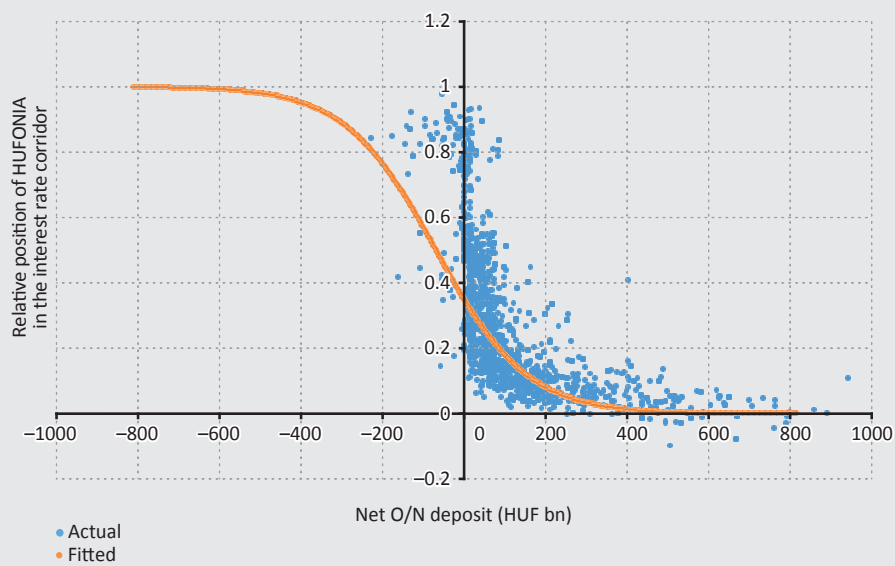
- **On the other hand, the very fact that the HUFONIA departed from the edge of the interest rate corridor may have pointed to an increase in the standard deviation.** This might be attributed to a phenomenon similar to the "S-curve" typical of exchange rate band regimes (Krugman, 1991). Essentially, the S-curve means that, due to the central bank's intervention at the edges of the band, the exchange rate (here: the interbank rate) is less susceptible to changes in fundamentals. This, however, means that the effect of the fundamental's one unit of deviation will be less than a unit of deviation at the edges of the band.

In June 2016, the intraday standard deviation of the overnight interbank interest rate edged close to the band observed in previous years. In June 2016, the standard

deviation fluctuated around 25 basis points, which was close to the previously observed values of 10–20 basis points. Therefore, the rise observed in the standard deviation in 2015 was a temporary phenomenon. The decline in the spread in spring 2016 may be explained by the reduced width of the interest rate corridor.

In the context of depleting forint liquidity in the banking system (Chart 3), transactions have seldom been concluded below the interest rate corridor since April 2015, which also benefits transmission. In theory, due to the no-arbitrage principle, the interest rate corridor restricts interbank rates. In practice, however, arbitrage has certain constraints, and transactions outside the bounds of the interest rate corridor may occur. Transactions are concluded below the interest rate corridor typically in cases where the bank with excess liquidity is unable or unwilling to place its liquidity into the overnight deposit facility. This might occur when the given bank is not a counterparty of the MNB, or when its counterparty limits on the MNB are exhausted. Transactions are concluded above the interest rate corridor when the borrower does not have a sufficient amount of collateral to be pledged to the benefit of the MNB or when the participant concerned is not a counterparty of the MNB.

Chart 2
Correlation between the relative position of the HUFONIA inside the interest rate corridor and net overnight central bank deposits



Note: The HUFONIA's position inside the interest rate corridor will take the value of 0 if the HUFONIA is identical with the central bank overnight deposit rate, and it will be 1 if it coincides with the central bank overnight lending rate. The estimated value is a logistic function described as $y = \frac{1}{\exp(\beta_0 + \beta_1 x)}$, *where x is the net overnight deposit portfolio, y is the HUFONIA's position inside the interest rate corridor,* $\beta_0 = 0.620595$ *and* $\beta_1 = 0.008973$.
Source: MNB

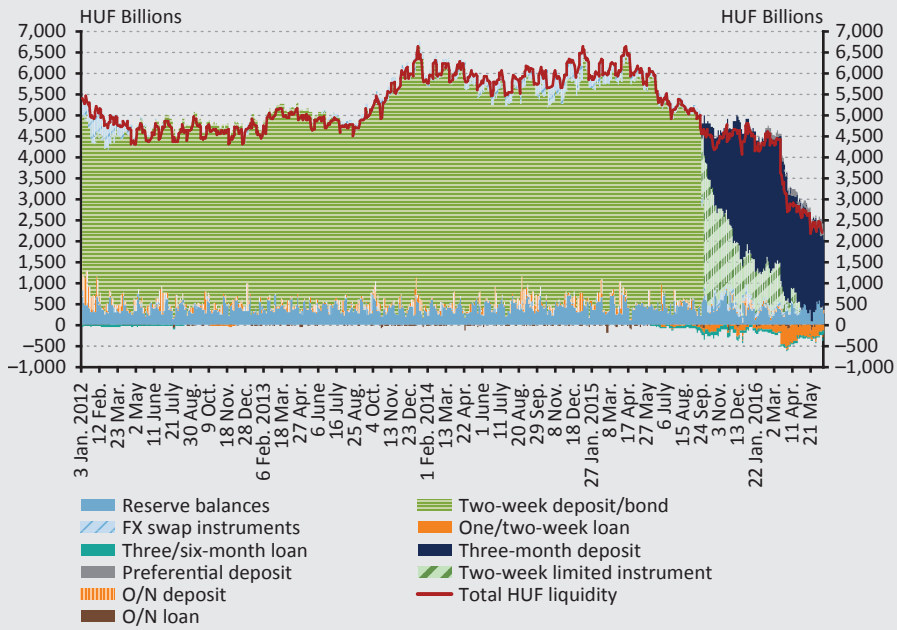
Although some transactions outside the bounds of the interest rate corridor did occur in the unsecured interbank market in the review period (e.g. below the interest rate corridor between July–November 2013 or above the corridor in November 2015), this was not a typical phenomenon overall (Chart 1). Moreover, since April 2015 – i.e. the contraction of the banking sector's forint liquidity partly owing to the Self-financing Programme – transactions below the interest rate corridor have been even more rare. This can be partly because of the fact that, due to the depletion of liquidity, limit constraints applicable to the MNB could ease somewhat. It should be noted that, although the overnight deposit rate has been negative since March 2016, there were no negative interest transactions in the interbank market in the review period. **Although the net overnight deposit portfolio was typically positive in the review period, it has dropped to close to zero since September 2015 and has often resided in negative territory since then.** With the increase in the net overnight deposit portfolio, the interbank rate edges closer to the overnight deposit rate (Bindseil, 2014, pp. 54–59). Accordingly, the correlation between the net overnight deposit portfolio and the HUFONIA's position inside the interest rate corridor is described by a logistic function (Chart 2). For Hungarian data, however, the fit is not entirely symmetrical: the HUFONIA hovers somewhat below the key policy rate even when the net overnight deposit takes a value of zero. This might be because the HUFONIA's position also depends on a number of other factors (e.g. on cumulated excess reserves, free reserves or its own lagged value; Erhart, 2004).

By June 2016, the total central bank liquidity of the banking sector had fallen to HUF 2,200 billion from its previous level between HUF 4,500–6,500 billion (Chart 3). Total liquidity[6] has been on the decline since April 2015, partly reflecting the Self-financing Programme, the MNB's foreign currency tenders related to the settlement and conversion of household foreign currency loans, and the increase in currency in circulation. While previously the two-week bill dominated the items affecting central bank forint liquidity with minimal recourse to the central bank's lending facilities, by the end of the period the new main policy instrument – the three-month deposit – represented the biggest weight while recourse to the lending facilities picked up. In September–December 2015, the stock of two-week deposits declined gradually to HUF 1,000 billion, and in April 2016 the portfolio was eliminated altogether.

The increase in the stock of overnight deposits in the first phase of the Self-financing Programme was only temporary and practically disappeared over the longer term. Between August and September 2014, the stock occasionally rose above HUF 400 billion, while previously it had typically resided below HUF 200 billion. This confirms that developments were in line with the targeted objective of the Self-financing Programme, as the liquidity driven out of the main policy instrument

[6] Total liquidity is understood as the structural liquidity position increased by swaps. The structural liquidity position is identical to the central bank's net liabilities vis-à-vis the banking sector (Balogh, 2009).

Chart 3
Selected items of the MNB's balance sheet affecting forint liquidity



Source: MNB

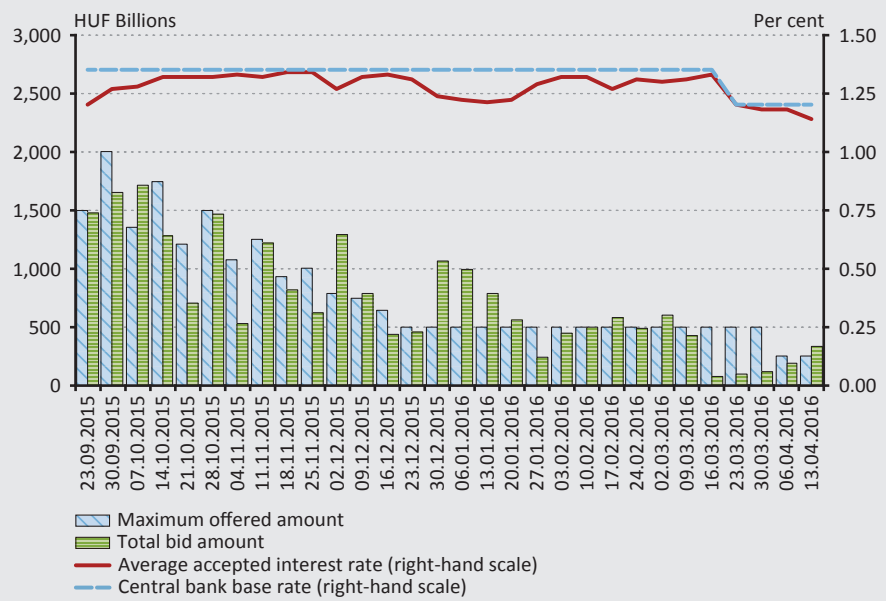
remained in the central bank's balance sheet only temporarily. After the introduction of the negative overnight deposit rate in March 2016, new overnight central bank deposits practically disappeared, as the MNB pays (or, in case of a negative rate, charges) the same interest rate on excess reserves as the overnight deposit rate; consequently, it is not worth placing excess liquidity in a different deposit.[7]

Since competition was typically subdued at the auctions of the limited, two-week deposit introduced in the framework of the Self-financing Programme, the average accepted interest rate bid remained close to the base rate (Chart 4). Between September and December 2015, the stock of two-week deposits gradually declined to HUF 1,000 billion, and subsequently the MNB allotted HUF 500 billion via the instrument per week until March 2016. Auction overbidding and the average accepted bid suggest that competition for the two-week deposit, in general, was subdued. As expected, on the rare occasions when overbidding did occur, the average accepted interest rate shifted downward compared to the base rate. The

[7] At the end of the period there were some overnight deposit placements ranging between HUF 70–100 billion on some days, presumably because certain participants tried to separate required reserves from free reserves in their internal reports.

greatest difference between the two interest rates was 15 basis points, which occurred at the first tender when banks may have been uncertain about the expected competition for the instrument. The average difference between the two interest rates amounted to 5.3 basis points at the 30 tenders announced for the limited two-week deposit. Owing to the maturing foreign currency swaps related to the MNB's foreign currency sale tenders, in March 2016 the banking sector was hit by a strong negative forint liquidity shock, which was managed for the most part through the two-week tender (underbidding). In April 2016, the instrument was phased out in two identical steps and by the end of the month the stock was terminated.

Chart 4
Results of the limited two-week deposit tenders

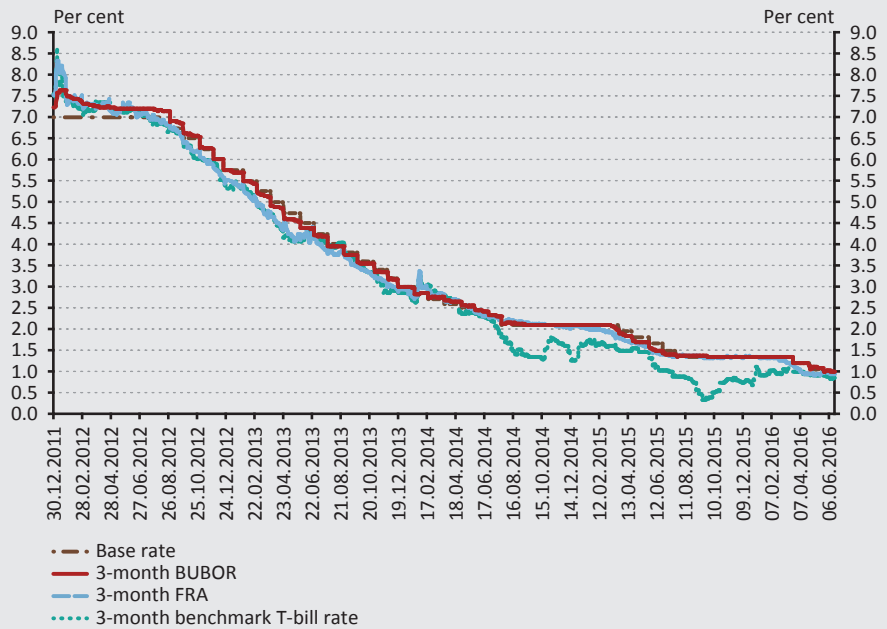


Source: MNB

On the whole, the three-month benchmark yields moved in tandem with the easing cycles and were largely in line with base rate expectations (Chart 5). Due to low liquidity levels and the specificities of the previous quotation system, the three-month BUBOR has traditionally been identical to the key policy rate (Kuruc–Pintér, 2009). At the same time, thanks to the BUBOR reform in 2016, liquidity increased in the longer-term unsecured interbank market, and consequently, the BUBOR now shows a more realistic picture of interbank lending conditions. After May 2016, the BUBOR shifted slightly upwards from the base rate: it is, after all, an offered rate and the counterparty risk of commercial banks may be larger than that of the MNB. By contrast, the three-month point of the spot yield curve ("FRA yield") estimated

from the two-week BUBOR and various forward rate agreements (FRA) captured expectations about the base rate fairly well: its path was smoother than that of the base rate and the BUBOR and it predicted the easing cycles.

Chart 5
Three-month forint yields



Note: The FRA yield is the three-month point of the spot yield curve calculated from the two-week BUBOR and various FRA maturities.
Source: MNB, Bloomberg, ÁKK

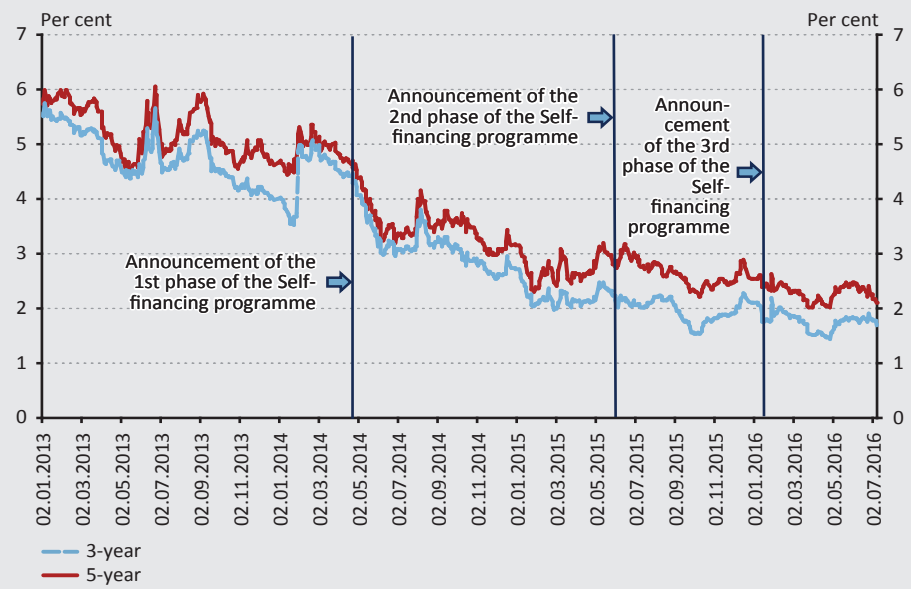
In the review period of 2014–2016, the yield on discount treasury bills (DTB yield) shifted downward relative to the rest of the yields on two occasions. The DTB yield had been identical to the FRA yield until June 2014, but after two subsequent downward shifts it temporarily deviated from the FRA yield. We estimated a regression to explain the FRA–DTB yield spread, where specific phases of the Self-financing Programme were used as explanatory variables (dummy variables and the maturity of the main policy instrument, see Appendix A). We found that the spread followed a strongly autoregressive process; in other words, a significant part of its development is explained by its history. In addition, however, the effect of the different steps of the Self-financing Programme was also evident: almost every phase of the Programme raised the spread; i.e. it reduced short-term government bond market yields both in the absolute and in the relative sense, which is consistent with our intuitions. At the same time, despite our expectations, other potential explanatory variables had no effect on the spread (liquidity of the secondary DTB market relative

to the secondary market liquidity of the MNB bill, overbidding at DTB auctions, VIX index). The temporary increase in the FRA–DTB yield spread did not imply the lasting erosion of transmission; by spring 2016 the two yields coincided again.

4.2 Long-term yields

After the announcement of the different phases of the Self-financing Programme, long-term government bond yields decreased significantly (Chart 6). After the announcement of the Self-financing Programme in April 2014, long-term forint government bond yields decreased significantly. A decline was observed, albeit to a lesser degree, after the announcements in June 2015 and January 2016 as well. At the same time, this coincidence in time does not necessarily imply causation; therefore, in this Section we also apply empirical tools to quantify the effect of the Self-financing Programme on long-term yields.

Chart 6
ÁKK benchmark yields

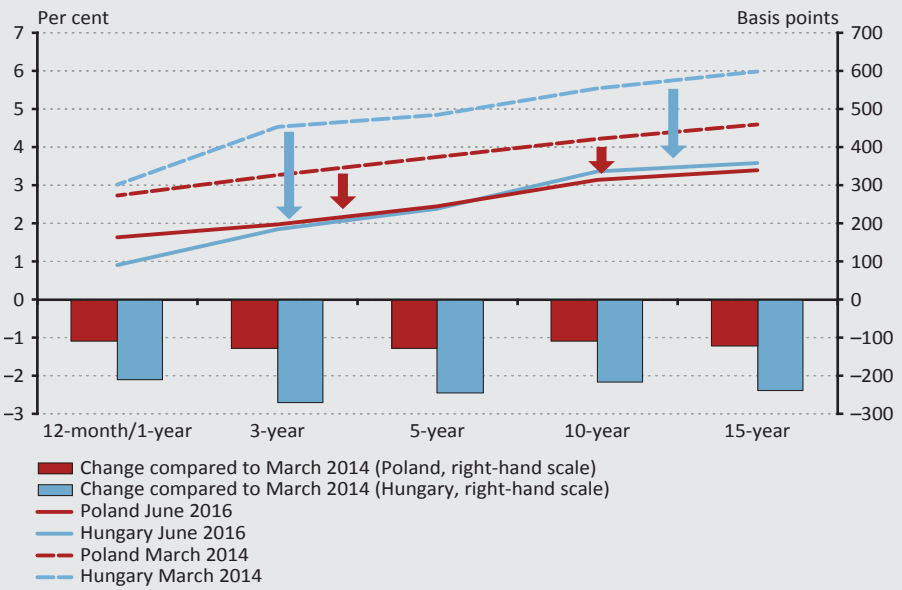


Source: ÁKK

Hungarian benchmark yields have declined more sharply across all maturities since the announcement of the Self-financing Programme than the Polish benchmark yield serving as a point of reference (Chart 7). While the Hungarian yield curve had been above the Polish yield curve before the announcement of the Programme, by the end of the period it reached the level of the Polish yield curve and for shorter maturities the Hungarian yield curve even fell below the Polish curve. Meanwhile, the slope of the Hungarian curve also flattened somewhat. The decline in short-term

yields can be primarily attributed to the base rate cuts and to the Self-financing Programme, while the fall of long-term yields may have reflected, among other things, the effect of the central bank IRS tenders.

Chart 7
Polish and Hungarian government bond market benchmark yields



Note: The two dates under review are 31 March 2014 and 17 June 2016. In the review period, the Polish key policy rate was lowered by 100 basis points while the Hungarian interest rate cut amounted to 170 basis points.
Source: Thomson Reuters Datastream, ÁKK

The Self-financing Programme contributed to the decline in government bond yields directly through IRS transactions and indirectly by moderating risks. Between the announcement of the Self-financing Programme and the termination of the IRS tenders, long-term government bond yields fell by 260–280 basis points. We estimated the impact of central bank IRS transactions and numerous other control variables on 3, 5 and 10-year government bond yields by way of regression models (for more detail, see Appendix B). We also examined the sensitivity of government bond yields to global factors such as the EMBI spread, or to domestic variables such as the EUR exchange rate or the Hungarian CDS.

– We found that the first phase of the Self-financing Programme produced the most significant yield-reducing effect. Depending on maturity, the direct impact of the IRS tenders on long-term government bond yields varied between 30–60 basis points in the first phase of the Programme, which lasted until summer 2015.

– The abovementioned model quantifies a negligible impact both in the second and the third phase, which may be explained by several factors. On the one hand, the non-resident sector (in particular, one major participant) sold a substantial amount of government bonds during the period, which, *ceteris paribus*, pointed to an increase in yields. This hard-to-quantify yield-increasing effect of the Self-financing Programme may have been offset by the fact that the actual yield-decreasing effect of the Programme may have been higher than the calculated data. Another possible explanation may be the fact that, being aware of the Self-financing Programme, the market may have priced in the effect of the central bank IRS tenders in advance and therefore, it did not materialise on the tender days that played a key role in the model.

– In addition, the Programme had important and significant indirect effects. In the period following the announcement of the Self-financing Programme the sensitivity of government bond yields to global factors – the EMBI spread and long-term EUR yields – declined relative to the previous period. In the case of the EMBI spread, this translated into a 10 to 15-basis points decline throughout the Programme.

– It is also important to take note of other indirect effects: through improving external vulnerability, the Programme may have reduced the default risk of government securities, and the more stable financing provided by domestic participants may have improved the liquidity of government bonds as well. Depending on the extent to which the Programme reduced these latter premia, the total indirect yield-reducing effect may have been as high as 20–60 basis points throughout the Programme (but the magnitude of the effect is uncertain).

– Beyond the quantifiable yield effect, it should be stressed that, according to our estimates, the sensitivity of government bond yields to specific variables (EMBI spread, EUR/HUF exchange rate) declined and remained close to zero in all three phases of the Programme, which suggests that the Programme also contributed to the stability of government bond yields: the government securities market became more resilient to external shocks, and this effect proved to be persistent in the subsequent phases of the Programme as well.

According to our regression, the Self-financing Programme certainly reduced the observed yields by 30–60 basis points, but the total effect could have been as high as 75–90 basis points. Meanwhile, the base rate cuts amounted to 170 basis points (from 2.6 per cent to 0.9 per cent); in other words, the Self-financing Programme supplemented the yield-effect of central bank interest rate cuts with a magnitude of one half or one quarter of their effect. For more detail regarding the methodology and quantifiable effects, see Appendix B.

Table 1
Estimated effect of the Self-financing Programme on government bond yields (basis points)

	Direct effect			Indirect effect	Total
	1st phase	2nd phase	3rd phase		
3-year yield	–35	–	–	–57	–92
5-year yield	–50	–15	–	–27	–92
10-year yield	–56	–	–	–19	–75

Direct effect: the effect of the quantity allocated at central bank IRS tenders. Indirect effect: the effect of moderating sensitivity to the EMBI spread and to long-term EUR yields, supplemented with the effect of the change in the IRS spread and the CDS (the two latter factors were used to estimate the change in liquidity and default premia).

Conclusions

In this study, we examined the effects of the Self-financing Programme on monetary policy transmission and on monetary conditions in Hungary.

1) Monetary policy transmission improved overall in the overnight interbank market. Between August and September 2014, the stock of overnight deposits rose substantially, but this proved to be only a temporary phenomenon. Since September 2015 – after introduction of the asymmetric interest rate corridor – the stock of net overnight deposits has fluctuated around zero and accordingly, the HUFONIA rose close to the level of the key policy rate. The standard deviation of the interbank interest rate increased temporarily until the reduction of the width of the interest rate corridor in spring 2016, which generated a downward shift in the standard deviation. In line with depleting liquidity, transactions below the interest rate corridor became increasingly infrequent from April 2015.

2) Competition at the limited two-week deposit tenders was subdued and accordingly, the average bid rates accepted at auctions generally remained close to the base rate.

3) Of the three-month benchmark yields, the FRA yield has been a fairly accurate indicator of the expectations about the base rate even after the announcement of the Self-financing Programme, while the DTB yield temporarily departed from the FRA yield on two occasions. This suggests that the Self-financing Programme exerted a monetary easing effect on the discount treasury bill market.

4) The downward shift in long-term government bond yields has been stronger for all maturities than that of Polish yields since the announcement of the Programme. Moreover, we found that the decline in long-term yields was partly attributable to the Self-financing Programme.

In summary, the Self-financing Programme eased monetary conditions in the government bond market. Supplementing the easing cycles of the MNB, the Programme generated a decline in both short-term and long-term government securities yields. Over the long term, the Programme did not deteriorate monetary policy transmission and supported, overall, the efficient implementation of the monetary policy stance.

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Appendix

A Explanation of the FRA–DTB yield spread

Table I
Estimated regression

Dependent Variable: _3M_FRA_DTB_DIFF
Method: Least Squares
Date: 08/07/2016 Time: 14:26
Sample (adjusted): 06/01/2012 17/06/2016
Included observations: 1103 (after adjustments)
Accessing convergence after 29 iterations
HAC standard errors & covariance (Bartlett kernel,
Newey-West fixed bandwidth = 7.0000)
MA Backcast: 04/01/2012 05/01/2012

Variable	Coefficient	Std. error	t-statistic	p-value
C	8.862522	9.733077	0.910557	0.3627
TURNOVER_DIFF_MA	–0.007338	0.081165	–0.090414	0.9280
POLICY_TENOR	0.194402	0.074049	2.625312	0.0088
LOG_BID_TO_AUCTION	–0.120467	1.322514	–0.091089	0.9274
VIX	0.150497	0.103948	1.447812	0.1480
DUMMY1	5.932937	3.496046	1.697042	0.0900
DUMMY2	10.55657	4.372092	2.414535	0.0159
DUMMY3	12.18237	4.802011	2.536931	0.0113
DUMMY5	4.904097	1.951504	2.512984	0.0121
DUMMY6	1.575774	2.168363	0.726711	0.4676
DUMMY7	7.308024	2.305504	3.169817	0.0016
AR(1)	0.663885	0.081038	8.192292	0.0000
AR(2)	–0.456854	0.086741	–5.266851	0.0000
AR(3)	0.602668	0.088616	6.800875	0.0000
AR(4)	0.14776	0.043494	3.397227	0.0007
MA(1)	0.156806	0.065882	2.380096	0.0175
MA(2)	0.790797	0.087370	9.051095	0.0000
R-squared	0.963499	Mean dependent variable		19.61188
Adjusted R-squared	0.962961	S.D. dependent variable		27.08363
S.E. of regression	5.212382	Akaike info criterion		6.155243
Sum of squared residuals	29505.45	Schwarz criterion		6.232395
Log likelihood	–3377.617	Hannan-Quinn criterion		6.184426
F-statistic	1791.654	Durbin-Watson stat.		1.983400
Probability of F-statistic	0.000000	Wald F-statistic		22.74881
Probability of Wald F-statistic	0.000000			
Inverted AR roots	0.98	–0.06+0.86i	–0.06-0.86i	–0.20
Inverted MA roots	–0.08+0.89i	–0.08–0.89i		

The dependent variable is the three-month FRA–DTB yield spread, expressed in basis points. (FRA means the three-month point of the spot yield curve derived from the two-week BUBOR and FRAs. Essentially, it captures the average base rate expected three months from now).

Explanatory variables:

- Constant. Does not deviate significantly from zero.
- TURNOVER_DIFF_MA: 30-day moving average of the difference between the DTB secondary market daily turnover and the MNB bill's secondary market daily turnover, expressed in HUF billion (source: KELER). In our hypothesis, the higher this value, the more liquid the DTB market is, in a relative sense, and thus, the higher the MNB bill's liquidity premium, i.e. the FRA–DTB yield spread. The coefficient does not deviate from zero significantly.
- POLICY_TENOR: the maturity of the main policy instrument, expressed in days (source: MNB). In our hypothesis, the longer the maturity, the less liquid the main policy instrument is and the higher its liquidity premium, i.e. the FRA–DTB yield spread. The coefficient is consistent with this (significant both from a statistical and an economic perspective). A main policy instrument with a maturity 100 days longer justifies a 19-basis points higher spread.
- LOG_BID_TO_AUCTION: Sum of bids offered at 3-month DTB auctions divided by the pre-announced allotment ("bid-to-auction" ratio, source: ÁKK). Given the weekly frequency of the auctions, the value of the latest auction was assigned to the remaining days of the week. We took the natural log of this value (i.e. this denotes a percentage value of overbidding). Theoretically, it might be an endogenous variable (it might point to simultaneity; i.e. that the demand for discount treasury bills may cause the LOG_BID_TO_AUCTION and the FRA–DTB spread at the same time). Employing a Hausman test, however, we found that it is not an endogenous variable. (For testing purposes, the instrument was the one-week lagged value of the LOG_BID_TO_AUCTION variable.) In our hypothesis, the greater the overbidding, the lower the DTB yield and the higher the FRA–DTB spread. However, we received an insignificant coefficient.
- VIX: the VIX index (expressed in percentage points, source: Thomson Reuters Datastream). In our hypothesis, the higher the VIX, the greater the risk aversion in the DTB market, which elevates the DTB yield and thus, reduces the FRA–DTB spread. The coefficient, however, is not significant.
- DUMMY1: self-financing dummy that takes the value of 1 between 23 April 2014 and 5 August 2014 (announcement of the first phase of the Self-financing Programme). Consistent with our hypothesis, it is significantly positive (the announcement of the Programme steered banks toward discount treasury bills).

- DUMMY2: self-financing dummy that takes the value of 1 between 6 August 2014 and 1 June 2015 (conversion of the MNB bill to deposit). It raises the spread significantly. Consequently, the introduction of the central bank deposit may have increased demand in the DTB market.

- DUMMY3: self-financing dummy that takes the value of 1 between 2 June 2015 and 22 September 2015 (announcement of self-financing 2.0). It raises the spread significantly. Consequently, consistent with our hypothesis, the announcement of the second phase of the Programme also exerted downward pressure on DTB yields.

- (DUMMY4: self-financing dummy that takes the value of 1 between 23 September 2015 and 11 January 2016 (introduction of the three-month deposit). It strongly correlates with the POLICY_TENOR variable, and thus it was not included in the regression.)

- DUMMY5: self-financing dummy that takes the value of 1 between 12 January 2016 and 5 April 2016 (announcement of the third phase of the Self-financing Programme). It raises the spread significantly, which is also consistent with our hypothesis.

- DUMMY6: self-financing dummy that takes the value of 1 between 6 April 2016 and 9 May 2016 (phase-out of the two-week deposit). It is insignificant.

- DUMMY7: self-financing dummy that takes the value of 1 from 10 May 2016 (announcement of the phase-out of IRS tenders). It raises the spread significantly. This might be consistent with our intuition in that the MNB no longer encourages long-term government securities purchases, steering the demand toward discount T-bills.

- Autoregressive and moving average terms: all of them have significant coefficients. We included maximum 4 of the AR and MA terms, and out of the thus estimated regressions, ARMA (4;2) proved to be the best (according to the Bayesian information criterion, as well as based on adjusted R^2 and on the out-of-sample forecast).

As the remainder term was heteroscedastic, we estimated the equation with the HAC (Newey–West) method. The adjusted R^2 is 96%, which means a good fit.

Chart I
The FRA–DTB spread

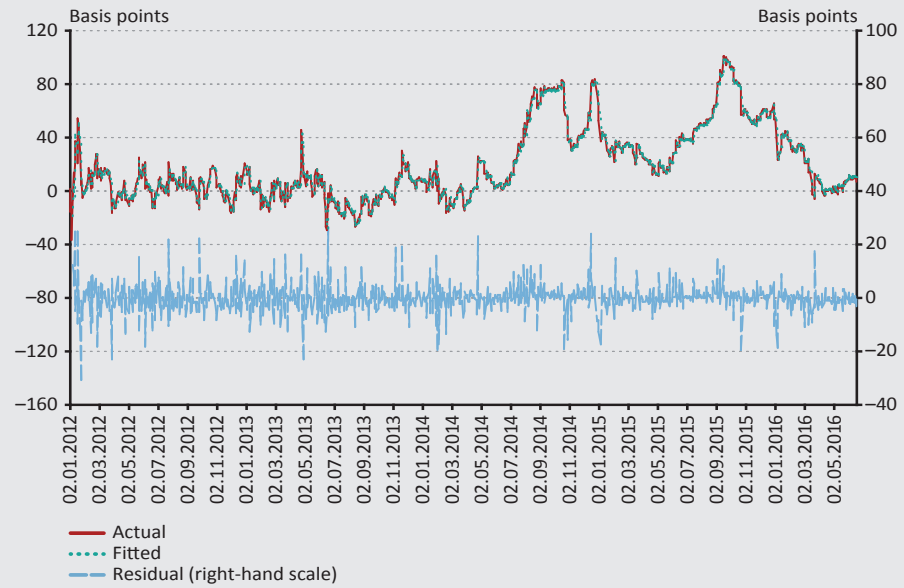
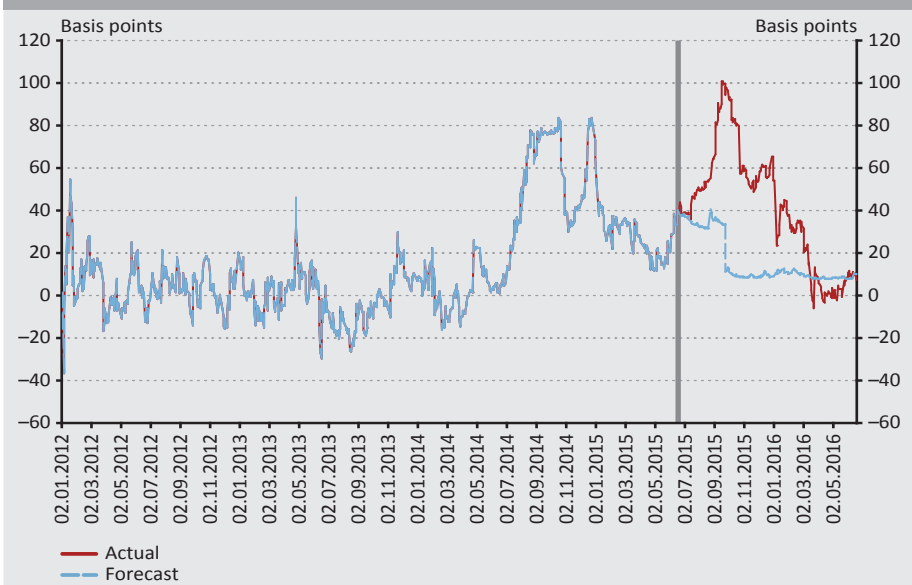


Chart II
Out-of-sample forecast of the FRA–DTB yield spread for the last one year



Note: RMSE = 35.81232.[8]

[8] RMSE = root mean squared error.

B Explanation of the change in long-term government bond yields

The dependent variables denote daily changes in the 3, 5 and 10-year benchmark forint government bond yields expressed in basis points. The analysis of all three maturities is justified by the MNB's announcement of IRS tenders with the same maturities. The beginning of the sample period is 1 January 2013, which provides a sufficiently long control period preceding the announcement of the Self-financing Programme. The end of the sample period is 7 July 2016, i.e. the date of the last IRS tender.

Explanatory variables under review and the motivation behind their use:

- IRS: volume allocated at central bank IRS tenders by trade date (source: MNB). We do not distinguish between maturities, given that there is no specific requirement regarding the maturity of the individual assets within the securities portfolio held for the purpose of meeting the condition of the IRS instrument.

- EMBI: JP Morgan Emerging Market Bond Index as the proxy of risk acceptance (Source: Thomson Reuters Datastream). Similarly, Gadanecz et al. (2014) uses this indicator as an explanatory variable of yields denominated in the domestic currency.

- 3YEUR/5YEUR/10YEUR: proxy of 3, 5 and 10-year AAA-rated euro area government bond yield, as a proxy for the risk-free return (source: ECB). E.g. Ebeke – Lu (2015) used developed market bond yields to explain emerging market local currency bond yields.

- 3M: 3-month benchmark DTB yield, which can be used to control for the base rate and for expectations about the base rate (source: ÁKK). Ebeke–Lu (2015), for instance, used the policy rate in a quarterly frequency; in our view, market yields are more appropriate in a daily frequency.

- IMPL: implied forint interest rate on 6-month EUR/HUF FX swap quotes. An increasing implied interest rate increases the costs of hedging with FX swaps. We use the six-month maturity as it is less noisy than shorter maturities (source: Bloomberg).

- 3YSPREAD/5YSPREAD/10YSPREAD: 3, 5 and 10-year interest rate swap spread, the spread between government bond yields and interest rate swap yields (source: Bloomberg). Consistent with Aussenegg (2016), it is used to approximate the liquidity premium of government bonds.

- EUR: EUR/HUF exchange rate fixing (source: MNB). Parallel to the depreciation of the exchange rate, non-residents may expect higher returns. Among others, Gadanecz et al. (2014) use the foreign exchange rate as the exchange rate risk premium of bonds.

- CDS: 5-year Hungarian sovereign CDS. The proxy indicator used as the default premium of government bonds (source: Thomson Reuters Datastream). It is applied by Ebeke–Lu (2015) to model Polish yields.
- 3YPOL/5YPOL/10YPOL: 3, 5 and 10-year Polish government bond yield, which can be used to control for regional factors (source: Thomson Reuters Datastream).
- SFP1: First phase of the Self-financing Programme; its value is 1 between 24 April 2014 and 1 June 2015.
- SFP2: Second phase of the Self-financing Programme; its value is 1 between 2 June 2015 and 11 January 2016.
- SFP3: Third phase of the Self-financing Programme; its value is 1 between 12 January 2016 and 7 July 2016.

For variables derived from yields, we use the same maturity used for the dependent variable; in all other cases for the comparability of parameters, a special dedicated maturity is used.

Table II
Estimated regression

Dependent Variable: 3/5/10-year yield
Method: Least Squares
Sample: 03/01/2013 - 07/07/2016
Included observations: 784 / 782 / 831
HAC standard errors & covariance (Newey-West)

	3-year yield	5-year yield	10-year yield
Policy variables			
SFP1*IRS	–0.077*** (0.028)	–0.11*** (0.025)	–0.123*** (0.036)
SFP2*IRS	–	–0.018* (0.01)	–
Global variables			
D(EMBI)	0.248*** (0.074)	0.294*** (0.095)	0.344*** (0.101)
SFP1*D(EMBI)	–0.282*** (0.09)	–0.286*** (0.108)	–0.294** (0.119)
SFP2*D(EMBI)	–0.186** (0.084)	–0.224** (0.106)	–0.241** (0.111)
SFP3*D(EMBI)	–0.358*** (0.081)	–0.37*** (0.108)	–0.471*** (0.116)
D(3YEUR) \ D(5YEUR) \ D(10YEUR)	0.455*** (0.114)	0.635*** (0.099)	0.546*** (0.095)

The table is continued on the next page

Continuation of Table II

	3-year yield	5-year yield	10-year yield
SFP2*[D(3YEUR) \ D(5YEUR) \ D(10YEUR)]	–0.333** (0.13)	–0.296** (0.116)	–0.212** (0.106)
SFP3*[D(3YEUR) \ D(5YEUR) \ D(10YEUR)]	–	–0.513** (0.231)	–0.441*** (0.169)
Domestic variables			
D(3M)	0.18*** (0.036)	0.128*** (0.038)	–
D(IMPL)	0.362*** (0.072)	0.236*** (0.042)	0.25*** (0.053)
SFP1*D(IMPL)	–0.312*** (0.088)	–0.118* (0.069)	–0.122* (0.074)
SFP2*D(IMPL)	–0.335*** (0.08)	–0.155** (0.065)	–0.149** (0.072)
SFP3*D(IMPL)	–0.222** (0.094)	–	–
D(3YSPREAD) \ D(5YSPREAD) \ D(10YSPREAD)	0.657*** (0.062)	0.68*** (0.043)	0.716*** (0.032)
SFP1*[D(3YSPREAD) \ D(5YSPREAD) \ D(10YSPREAD)]	0.183** (0.081)	0.17*** (0.065)	–
SFP3*[D(3YSPREAD) \ D(5YSPREAD) \ D(10YSPREAD)]	–	–	–0.196* (0.106)
D(EUR)	1.132*** (0.189)	1.521*** (0.242)	1.654*** (0.276)
SFP1*D(EUR)	–	–0.576* (0.329)	–0.66* (0.361)
SFP2*D(EUR)	–0.893*** (0.277)	–1.214*** (0.364)	–0.91** (0.41)
SFP3*D(EUR)	–	–1.393** (0.686)	–1.417** (0.642)
D(CDS)	0.202*** (0.035)	0.224*** (0.046)	0.253*** (0.047)
SFP2*D(CDS)	–0.195* (0.115)	–	–
Regional variable			
D(3YPOL) \ D(5YPOL) \ D(10YPOL)	0.391*** (0.076)	0.296*** (0.061)	0.356*** (0.075)
Adjusted R-squared	0.669	0.657	0.673

*Standard errors are displayed in brackets. ***,**,*: coefficients significant at 1, 5 and 10 per cent. The D() operator designates the daily change. Unit of measure is basis points, except IRS (HUF billion) and EUR (forint).*

Interpretation of the results:

- In the first phase of the Programme, yields declined across all maturities in parallel with the volumes allocated at the IRS tenders. In the second phase, the effect was only significant for the 5-year yield.
- All parameters of the global, domestic and regional variables are significant and, as expected, their sign is positive.
- For most variables and in most phases, the cross product of global/local variables and dummy variables yielded a negative value. This means that the parameters estimated for individual phases of the Self-financing Programme (the sum of the two parameters with and without the given cross product) were smaller than in the period preceding the introduction of the Programme.[9] The estimated value of most parameters fell to the vicinity of zero in the individual phases of the Self-financing Programme; therefore, sensitivity to risk factors, for the most part, dissipated. In the case of some variables, the magnitude of the decline was greater in the second and the third phase than in the first phase, in other words, the effect strengthened.
- The 3-month DTB yield was found significant in the regression of the 3 and 5-year government bond yield; presumably, due to the longer maturity, it was not significant in the case of the 10-year yield.
- The explanatory power was around 2/3 in each regression, and among the variables the interest rate swap spread had the strongest explanatory power.

Estimation of the Self-financing Programme's yield effect:

- The direct effect is quantified with the product of the IRS variable and the estimated parameters. The volume of the IRS tenders allocated in the first phase was almost HUF 450 billion, compared to HUF 860 billion in the second phase.
- The indirect effect is estimated based on the values of four variables (EMBI, EUR government bond yield, interest rate swap spread and CDS) and the parameters estimated for the different phases of the Self-financing Programme.
- In the case of EMBI and the EUR government bond yield, we assume that the decline in the parameters observed in the individual phases of the review was caused by the Self-financing Programme. We based this assumption on the fact that, estimating the same regressions for Polish yields, the cross products were found to be insignificant in the vast majority of the cases; therefore, the decline

[9] Excepting the coefficient of the interest rate swap spread, which increased in the first phase relative to the previous periods.

in the parameters may have been induced by a country-specific factor. The most significant change affecting the Hungarian government bond market was the introduction of the Self-financing Programme.

- Based on the decline in the parameters relative to the period preceding the Self-financing Programme and based on changes in the EMBI and the EUR government bond yield, we can estimate the extent to which the government bond yield would have changed without any changes in the parameters.[10] The EMBI increased in the first and the second phases; therefore, the estimated yield effect is negative. It declined, however, in the third phase, and thus the estimated yield effect is positive. The EUR government bond yield decreased in all phases, but the change in the parameter was only found to be significant in the second and the third phases.

- In the case of the interest rate swap spread and the CDS, the basis of the estimation was the fact that these two factors reflect the liquidity and default risk of government papers. The reason why we assume that the decline in the liquidity premium or the interest rate swap spread was linked to the Self-financing Programme is because it was observed in the review period that the substantial government bond sales of non-resident investors had a smaller yield effect than before. Domestic participants stabilised bond rates, which points to an improvement in market liquidity (for more detail on non-residents' activity in the government securities market, see the second study in this volume). In the case of the CDS, the impact of the Programme is indicated even more clearly by the fact that one of the main reasons cited by Fitch in its statement on the upgrade of Hungary's debt rating in May 2016 was the external vulnerability reducing effect of the Self-financing Programme (FitchRatings, 2016). The decision had been priced in by the markets earlier, which reduced the Hungarian sovereign CDS spread.

- We quantified the effect of the interest rate swap and the CDS by multiplying the decline in the variables by the parameter pertaining to the review period (the sum of the two parameters with and without the given cross product) in the phases where the variables decreased. However, in phases where the value of these two variables increased, we do not assume that it was due to the Programme. For example, following a 20–40 per cent decline in interest rate swap spreads in the first phase, the spreads rose by 30–45 basis points during the second phase, while the volume sold at the IRS tenders was even larger than in the first phase and the average deviation of the interest rates emerging at the IRS tenders from the market rates was similar in both periods.

[10] We cannot apply a similar assumption in the case of the rest of the variables because only the global variables – the EMBI and the EUR government bond yield – can be assumed to be exogenous from the perspective of the Programme – all other variables must have been affected by it. In the EMBI index the share of Hungarian government bond yields is negligible (about 5 per cent), Hungarian developments, therefore, exert only a minimal impact on the index.

- Depending on maturity, the estimated value of the total indirect effect deriving from the 4 factors is 19–57 basis points. In the quantification we also considered that the direction and magnitude of the effect may have varied in the different phases. Although in the second and the third phase we received effects with a positive sign, in interpreting the results we should focus on the effect of the Programme as a whole; indeed, the effects of each individual phase cannot be separated from one another and the phases should only be handled separately for quantification purposes.

- The estimated effect is linear; in other words, if the Self-financing Programme had contributed only by half to the decline in the parameters and to the moderation of the premia, the estimated effect would have been reduced to one half as well; as such, the estimate can be viewed as an upper limit.

Table III
Decomposition of the estimated indirect effect (basis points)

	EMBI		
	1st phase	**2nd phase**	**3rd phase**
3-year yield	–17	–18	25
5-year yield	–17	–22	26
10-year yield	–18	–23	33
	euro yield		
3-year yield	–	6	–
5-year yield	–	5	27
10-year yield	–	1	37
	interest rate swap spread		
3-year yield	–35	–	–
5-year yield	–18	–	–8
10-year yield	–24	–	–1
	CDS		
3-year yield	–17	–	–1
5-year yield	–19	–	–1
10-year yield	–22	–	–1

	3-year yield	**5-year yield**	**10-year yield**
Total	**–57**	**–27**	**–19**

In the case of the EMBI premium and long-term EUR yields, the estimate was calculated as the product of the change in the given variables in the individual phases and the change in the estimated parameter. In the case of the interest rate swap and the CDS, the estimate was calculated as the product of the change in the given variables in the individual phases (if negative) and the parameter estimated for the given phase.

Impact of the Self-financing Programme on the domestic financial infrastructures

László Bodnár – Dr. Miklós Luspay

Abstract

The measures of the Self-financing Programme launched by the MNB in 2014 affected the liquidity management of RTGS participants through several channels. By changing the MNB's main policy instrument in August 2014 (converting the MNB bills into deposits), a substantial part of the payment liquidity was excluded from the range of eligible collaterals, while the cancellation of the discretionary reserve ratio reduced the account balance available for payments for many banks. However, as a result of the adjustment to the central bank's measures, by the end of 2015 the liquidity available for payments once again reached the pre-August 2014 level, stabilising a safe level of liquidity in the system. In our analysis, we provide a detailed presentation of the methods the RTGS participants applied to adjust to the individual steps of the Self-financing Programme and also how key indicators changed as a result of the measures.

1 Components of payment liquidity[1]

In our analysis, the effects of the Self-financing Programme (launched by the MNB in 2014) on payments is examined. We present the instruments and methods which RTGS participants used for adjustment, as the individual steps of the Self-financing Programme affected the entire payment liquidity and generated a change in each element thereof. However, before coming to the specific impact assessment, we deem it important to present the individual components of payment liquidity.

In order for the credit institutions to be able to fulfil their payment orders in the payment and settlement systems,[2] they must have sufficient liquidity. VIBER (the Hungarian RTGS) is a key component in the domestic payment systems, as the majority of money and securities market transactions are carried out here. In the case of VIBER participants, payment liquidity consists of two components: 1. *current account balance* on the payment accounts held with the MNB, and 2. the *intraday credit line* backed up by collateral with the MNB as the beneficiary. Payments are

[1] Partly: based on Bodnár et al. (2014).

[2] For details on the domestic financial infrastructures, see the MNB's publications entitled Payment Systems Report. Website: http://www.mnb.hu/en/publications/reports/payment-systems-report

primarily executed using the VIBER participant's account balance; however, if the balance on the payment account of the VIBER member held with the MNB is not sufficient for executing its payment turnover, it may automatically use the intraday credit line (i.e. "overdraft") provided by the MNB, if sufficient eligible collateral has been previously allocated and pledged by the VIBER participant. Various securities, such as government securities, mortgage bonds and certain corporate bonds with proper rating may serve as collaterals. The intraday credit line available for the banks is free of charge – in fact the price thereof is the opportunity cost of the pledged collateral – however, if it is not settled by the end of the day, it is automatically converted into an *overnight* loan, which does have a cost, thereby generating extra expenses for the respective bank. The intraday overdraft forms part of the intraday liquidity and primarily serves payment purposes, while the central bank overnight loan is already part of the longer than one day liquidity, thus it might not be exclusively related to payments.

The cover of intraday credit line is essentially served by the pledged securities where the MNB is indicated as beneficiary. However, it is important to differentiate between the full *pledged* portfolio of securities and the sub-portfolio that may be effectively *used for payment purposes.* This is because the full pledged securities portfolio serves as collateral not only for the intraday credit, but also – among others – for the MNB's monetary credits and also for part of the loans disbursed under the Funding for Growth Scheme (FGS). Hence, the full pledged holding is a broader, larger set, and only a part thereof effectively serves as collateral for the intraday overdraft loan (Chart 1). The domestic collateral management practice is based on the *pool* approach, which means that all securities acceptable for the central bank – serving as collateral for the given bank's borrowing – are collected in a single pool, that is, the individual pledged securities are not "labelled" separately based on the purpose of their use. Thus, it is not possible to pledge securities for a certain purpose, but rather the entire holding itself serves as collateral. From the central bank's perspective, the main criterion is that the collateral holding should reach the required total collateral value. For example, if the monetary transactions and the FGS tie up 20 per cent of the bank's pledged securities holding, then only the remaining 80 per cent is available for securing intraday and longer loans.

There are significant differences between banks' liquidity management practices at the individual level. Some participants are practically able to execute their payments smoothly using solely their account balance, while for others the account balance is not sufficient and hence they need to draw down the intraday credit line provided by the MNB. The extent to which RTGS participants rely on their account balances and intraday credit lines in the course of executing payments depends on the participants' individual liquidity management strategy and balance

sheet total, as well as on their eligible securities holdings in their balance sheet. The intraday credit line is typically used by banks with smaller balance sheets which simultaneously generate large turnover. It can be stated generally that since payment turnover exceeds the individual credit institutions' start-of-day payment liquidity[3] several times, the credit institutions must exercise active, efficient liquidity management to ensure that a potential liquidity shortage does not cause stoppages in their payments. For this reason, central banks all over the world (and in Hungary as well) support liquidity management using several instruments to ensure that the liquidity necessary for the smooth execution of payments is available for the banks at every moment in time. Such instruments include granting overnight loans or providing the opportunity to use the RTGS monitor. However, there are other "endogenous" instruments with which a VIBER participant can also actively modify its liquidity available for payment, e.g. through pledging additional securities, modifying the credit line or flexible timing of transactions.

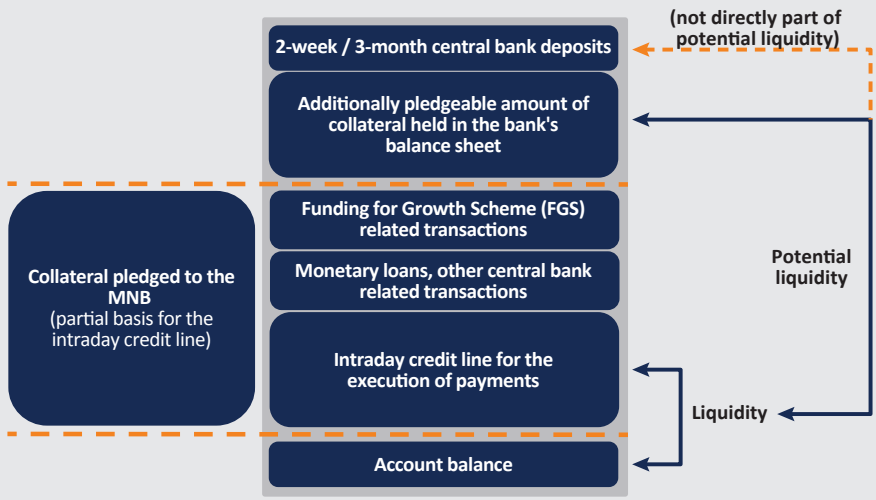
In terms of payments, the additional securities portfolio included in the individual banks' balance sheet that has not been pledged yet (with the MNB indicated as beneficiary) is referred to as potential liquidity. For the purpose of payments, potential liquidity includes the balance of the VIBER participant's payment account held with the MNB, the intraday credit line received in return of the securities pledged for the benefit of the MNB and the other, additionally pledgeable amount of collateral included in the balance sheet of the credit institution. For example, certain instruments that are currently not part of liquidity available for payments, can be converted so they directly become part of this set (if the bank decides so). In the case of securities, it is obvious why it can be considered as part of potential liquidity. By pledging these securities, liquidity is modified instantly. However, after August 2014, by converting the MNB bills into deposits, both the share and the overall value of all the deposit-type instruments substantially increased. These instruments cannot be regarded as direct part of either liquidity or so-called potential liquidity; but can be easily converted into a form (if the bank decides so) that already permits their use for payment purposes.

In addition to amending the credit line, banks may influence their payment liquidity by changing the level of the other crucial factor, the account balance. The account balance is essentially determined by the central bank's reserve rules, i.e. the required level to be held at the account and whether any interest is paid on balances exceeding the reserve requirement. Prior to 1 December 2015, a discretionary reserve requirement system was operated, where banks could decide on the reserve rate – 2, 3, 4 or 5 per cent – which defined the required reserve level that the banks had to meet on a monthly average by multiplying it with the given credit institution's reserve base. The participants may also keep a higher account balance than the

[3] For example, annual VIBER turnover amounted to 44 times the amount of annual GDP in 2015.

account balance level calculated on the basis of the rate; however, no interest is paid on this surplus balance; moreover, since April 2016 the MNB charges negative interest on such balances, and thus this option lost most of its attraction.[4] It is typical that in the beginning of the month the banks run a reserve surplus (keep a higher account balance than required), while at the end of the month they run a reserve deficit (keep a lower account balance than required), satisfying the required reserve ratio in this way.

Chart 1
Components of the payment liquidity of a given credit institution



Source: MNB, own figure

2 Central bank measures influencing liquidity available for payments between 2013 and 2016

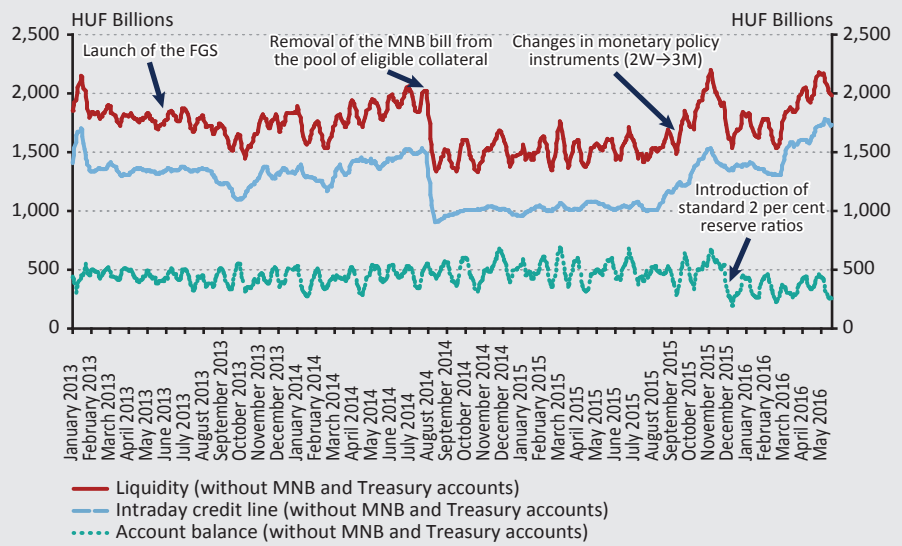
2.1 Measures of the Self-financing Programme

After the 2008 crisis, the participants of the payment system defined the level of sufficient liquidity at systemic level in such a manner that it should be abundantly sufficient for executing payments, and thus each central bank measure impacting liquidity is followed by an adjustment. As regards the impact of the Self-financing Programme on payments, it is the systemic change in liquidity for payments that should be first analysed, and for this we used the time series between 1 January

[4] Earlier, the MNB paid no interest on the "reserve surplus" but this has changed in accordance with the following formula: MIN [O/N deposit rate; 0 per cent]. That is, when there is a reserve surplus, the lower of the prevailing O/N deposit rate and the 0 per cent interest will apply; i.e. under the present interest rate corridor it will be -0.05 per cent. See more details later.

2013 and 31 May 2016. Based on historic data it can be stated that at aggregate level the participants of the system strived to maintain a "comfortable" level of their payment liquidity, under which they can smoothly comply with their payment obligations. This means that the payment liquidity in the system is roughly HUF 2,000 billion, of which HUF 500 billion is available in the form of account balance, while the remaining HUF 1,500 billion is the intraday credit line. This breakdown of payment liquidity developed and stabilised after the 2008 financial crisis. Since then, if any major change was introduced to the central bank's set of monetary policy instruments, banks always returned to this safe level after a certain period (Chart 2).

Chart 2
Changes in payment liquidity (broken down by account balance and credit line)
(2013–2016)



Source: MNB

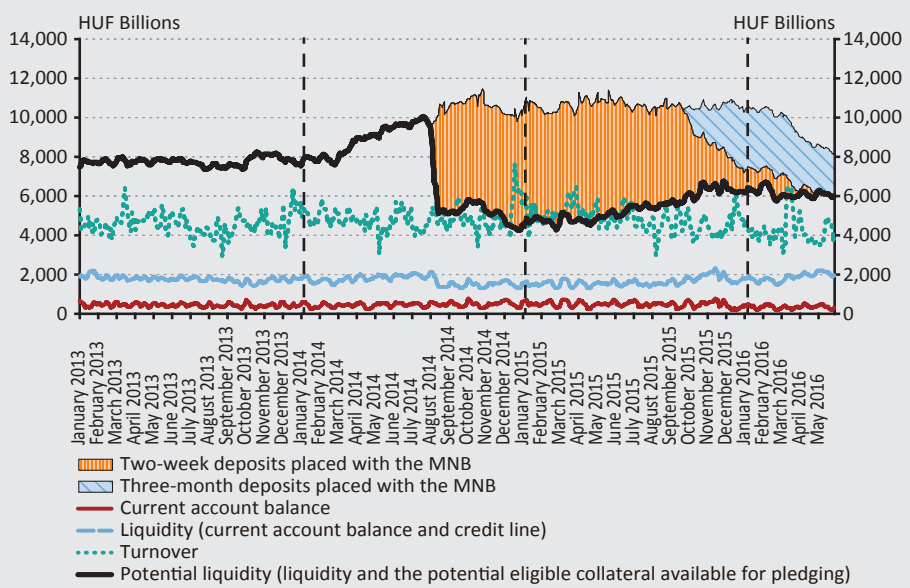
2.1.1 Converting the two-week MNB bill into a deposit (August 2014)

In August 2014, as a result of the conversion of the MNB bill into a deposit, VIBER participants commenced buying and pledging government securities in large volumes. The most important measures of the central bank which had an effect on liquidity in recent years are all reflected by the changes in payment liquidity and the components thereof. In August 2014, as part of the Self-financing Programme, the two-week MNB bill was removed from the scope of eligible collateral, and the two-week deposit replaced the bill as the MNB's policy instrument. Earlier, the MNB bill had accounted for a large part of the collaterals at an aggregate level (43 per cent on average), thus the change forced a large part of the banking system – almost

40 per cent of banks – to adjust, as turnover did not change materially, whereas the range of collateral became narrower. As a result of the conversion, payment liquidity at the systemic level fell from HUF 2,000 billion to roughly HUF 1,350-1,700 billion. In addition to the liquidity available and usable in the payment system, potential liquidity also declined to the level of the systemic VIBER turnover (Chart 3). Thanks to the effective communication of the central bank, the adjustment process on behalf of the banks started well before bill conversion itself actually took place. In order to compensate for the removal of the MNB bills from the pool of eligible collateral banks started to purchase significant amount of government bonds to maintain a safe level of payments liquidity that they used to. Thus, the liquidity freed resulting from conversion had to be diverted elsewhere, which materialised primarily through the purchase of government securities. Consequently, between January 2013 and May 2016, holdings of government securities pledged to the benefit of the central bank increased by roughly HUF 1,800 billion (see later, Chart 6, upper graph).

Conversion into a deposit significantly changed the composition of the pledged securities holdings, significantly increasing the share of government securities. Whereas in the past government bonds had accounted for 15–25 per cent of the pledged securities holdings, after the modification of the policy instruments in

Chart 3
Changes in the account balance and liquidity, potential liquidity and turnover of VIBER members
(2013–2016)



Source: MNB

August 2014 this share rose to 45–50 per cent. As regards the liquidity of the payment systems, the higher government securities ratio is much more favourable in terms of available liquidity, as these are long-term instruments – in contrast to the earlier two-week bill – and thus the overall liquidity level is less volatile and much more predictable. On the whole, despite the quick adjustment, the payment liquidity available for the payment turnover contracted in 2014 (Chart 3), but was nevertheless sufficient both at the systemic and individual bank level.

Although the two-week deposit did not directly form part of payment liquidity, upon maturity it became available as collateral for payment turnover. The conversion of the two-week MNB bill into a deposit did not terminate the demand for the central bank instrument, as VIBER participants actively used it until its phase-out at the end of April 2016.[5] The deposit was no longer part of the portfolio qualifying as collateral for payment turnover, but remained part of potential liquidity, since after maturity it could be converted into eligible securities. There were always two series running simultaneously, which meant that one of the series expired every week. This also implies that part of the fixed deposit portfolio became available each week as collateral for payment transactions. If the aggregate level of MNB deposits is added to participants' potential level of liquidity, we find that the level of potential liquidity increased even after August 2014 (Chart 3).

2.1.2 Extending the maturity of the main policy instrument

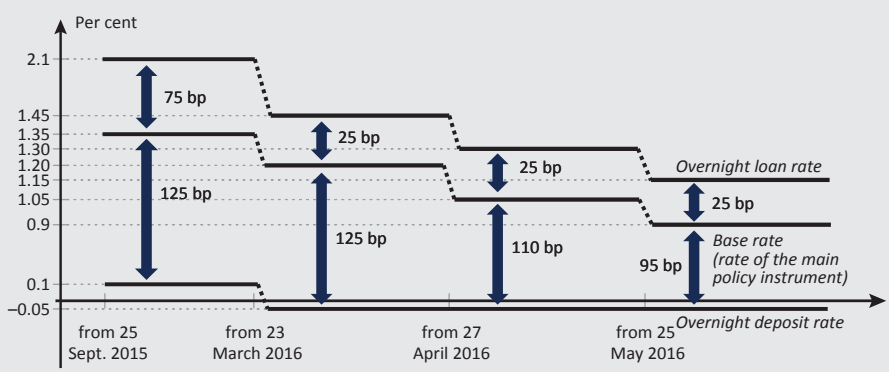
As part of the Self-financing Programme, in September 2015 the maturity of the central bank's main policy instrument was extended from two weeks to three months. Consequently, the purchase and also the pledging of government securities to the benefit of the MNB further increased. In summer 2015, the MNB announced that it once again planned to transform the set of monetary policy instruments. On 23 September 2015, the three-month deposit replaced the earlier two-week deposit as the MNB's main policy instrument, and a cap of HUF 1,000 billion was set for the two-week deposit portfolio by the end of 2015. Similarly to the two-week deposit, the three-month deposit also does not qualify as eligible central bank collateral, and thus it cannot cover ad-hoc, immediate liquidity needs. By the end of 2015, the two-week deposit portfolio fell below the target cap of HUF 1,000 billion, as participants placed the freed liquidity partially into the new, three-month instrument, and partially into government securities. As a result of the large volume of government securities purchased by banks, by the end of 2015 payment liquidity at systemic level exceeded HUF 2,000 billion (which was a typical value of payment liquidity before the conversion of the MNB bill into deposits) (Charts 2–3).

[5] After transformation of the main policy instrument, from 23 September 2015 the central bank announced the two-week deposits with a limited volume at auctions until their complete phase-out at the end of April 2016.

2.1.3 Modification of the interest rate corridor

As a result of the base rate cuts and restructuring of the interest rate corridor, the interest rate on the central bank overnight loan decreased substantially, making the loan instrument significantly cheaper. The structure of the interest rate corridor was changed in several steps within the framework of the Self-financing Programme. Earlier, the bounds of the interest rate corridor were the central bank base rate ±100 basis points. After the transformation of the set of monetary policy instruments in September 2015, the interest rate corridor became asymmetric, with its lower bound being 125 basis points and its upper bound being 75 basis points. In March 2016, the change in the base rate was once again accompanied by the change in the structure of the interest rate corridor. The lower bound of the interest rate corridor remained 125 basis points, while its upper bound was reduced from the former 75 basis points to 25 basis points. As a result of the changes, the overnight deposit rate became negative and the interest rate on the central bank's overnight loan also fell, making the overnight loan instrument substantially cheaper. Later, the structure of the interest rate corridor was also changed during the interest rate cuts in April and May 2016: while the interest rate on the collateralised central bank overnight loan followed the change in the base rate, the interest rate on the overnight central bank deposits did not change and remained in the negative band (Chart 4). The restructuring of the interest rate corridor made the central bank overnight loan cheaper for banks and thereby the financing difference between the intraday and longer-than-one-day loan decreased. Under such interest conditions, banks may decide more easily that at the end of the day they do not top up their account balance to zero (e.g. by taking an O/N loan from the interbank market), but rather bear the costs of the overnight central bank loan, which are now substantially lower than before.

Chart 4
Restructuring of the interest rate corridor



Source: MNB, own figure

2.1.4 Introduction of the standard, fixed 2-per cent required reserve ratio applicable to all members

As a result of introducing the standard, required reserve ratio of 2 per cent in December 2015 both the number of pledges and also the usage of intraday credit lines increased. In December 2015, the MNB introduced the mandatory, fixed 2-per cent required reserve ratio. Consequently, VIBER participants which had earlier opted for a higher reserve ratio started to set a lower account balance on their payment accounts held with the MNB, as the MNB paid no interest on the balance exceeding the required reserve,[6] and thus the holding of excess reserves would generate losses for them. Due to the lower account balance resulting from the cancellation of the discretionary required reserve ratio, the pledging of securities and the drawdowns of credit lines both increased in the last months of 2015, and thus banks were able to adjust to the liquidity shortfall. The reduced required reserve ratio impacted 16 participants, the majority of which raised their credit line as part of the adjustment.

2.2 Other impacts affecting payment liquidity in addition to the Self-financing Programme

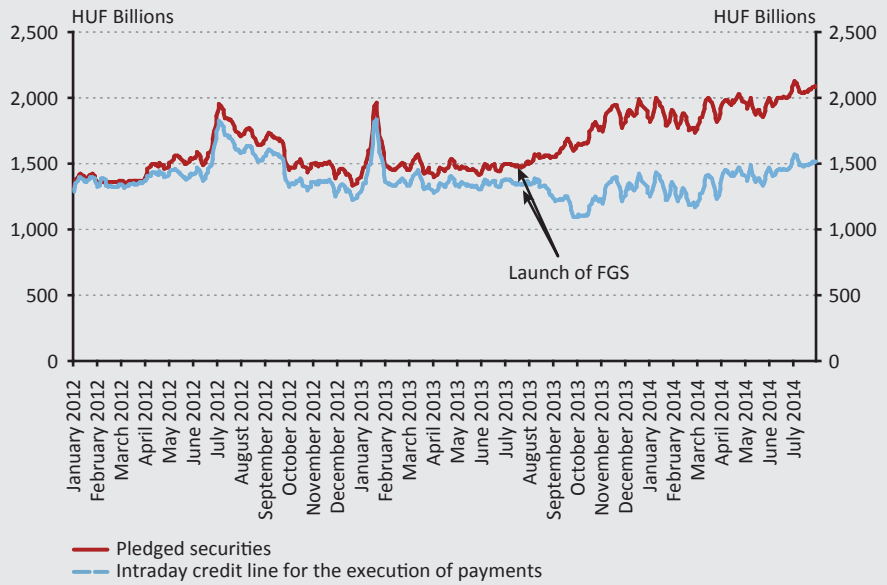
During the period under review, the Self-financing Programme was accompanied by several other measures that also affected banks' payment liquidity. In the following, we outline the Funding for Growth Scheme (FGS) and the increased frequency of the ICS cycles.

2.2.1 Launch of the Funding for Growth Scheme from 2013

After the launch of the FGS, the ratio of the credit line available for payment purposes within total pledged holdings gradually decreased in the second half of 2013. The central bank introduced its lending incentive package in mid-2013, which is available for banks if they provide an adequate amount of eligible collateral, but the disbursed loans themselves may also be offered as collateral. As mentioned before, the securities holdings pledged in favour of the central bank operate on a "pool" basis, and thus practically the FGS (partially) uses the same liquidity as payments. In the second half of 2013 – as the larger part of the pledged holdings was tied up as collateral for FGS loans – the share of the credit line available for payments within the pledged securities holding gradually decreased. While 90–95 per cent of the pledged collateral was actually available for payment purposes in the first half of the year, by the second half of the year this rate dropped to 60–65 per cent following the introduction of the FGS. (Chart 5).

[6] Furthermore – as mentioned before – since April 2016 the MNB charges negative interest on the balance exceeding the reserve requirement.

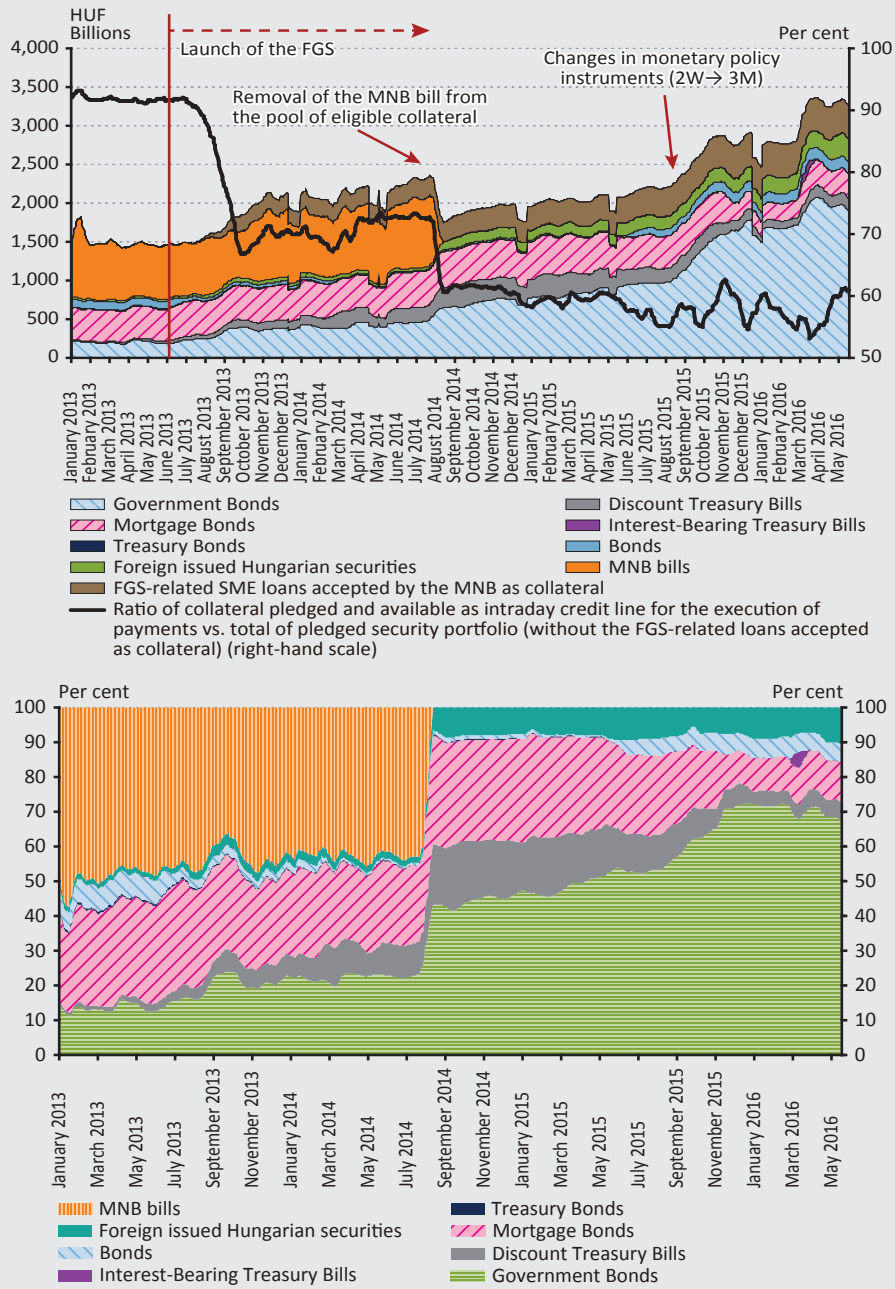
Chart 5
Relation between the credit line available for payments and total pledged securities collateral
(2012 – July 2014)



Source: MNB

In order to maintain the earlier level of liquidity, from August 2013 onwards banks started increasing their pledged security levels, primarily by pledging discounted treasury bills and government bonds (Chart 6).

Chart 6
Ratio of the credit line available for payments to the pledged securities collateral (upper chart), trends of the pledged securities holding and the distribution of its composition (both charts)
(2013 – May 2016)



Source: MNB

2.2.2 Increasing the frequency of the ICS cycles

As a result of the increase in the frequency of the ICS cycles introduced in September 2015, turnover per cycle decreased, thereby helping the banks manage their intraday liquidity. From 7 September 2015, the number of intraday clearing cycles increased from 5 to 10, as a result of which the liquidity requirement related to the ICS clearing is distributed more evenly during the day. While earlier the average turnover per cycle was HUF 54 billion, from 7 September 2015 this was almost halved, i.e. since then the value of transactions settled per cycle is around HUF 34 billion on average. As a result of the higher frequency of the ICS cycles, the liquidity requirement affecting a given participant per cycle in connection with the intraday clearing fell, also causing intraday liquidity shocks to decrease.

2.3 Presentation of the impact of the Self-financing Programme on the payment systems through certain payment indicators

The analysis of the impacts of the Self-financing Programme on payments requires the examination of indicators which clearly reflect the processes in the payment system. In its capacity as supervisory authority, the central bank uses a number of indicators that help to clearly understand the processes in the payment systems and see how risks of the systems develop. Based on the changes in payment indicators and the utilisation of the various tools that support liquidity management (provided by the MNB), it can be easily noticed when liquidity is insufficient for the management of turnover. For example, the number/value of intraday pledges may increase, tracking of liquidity via the so-called VIBER monitor may become more active, certain transactions may be executed through the MNB's gridlock resolution algorithm, the priority of the submitted transactions may change or the participants may utilise the credit line for a longer time, etc. In the following sections, we present how banks adjusted to the Self-financing Programme, by examining trends in these indicators and also analysing the usage of liquidity management tools provided by the MNB.

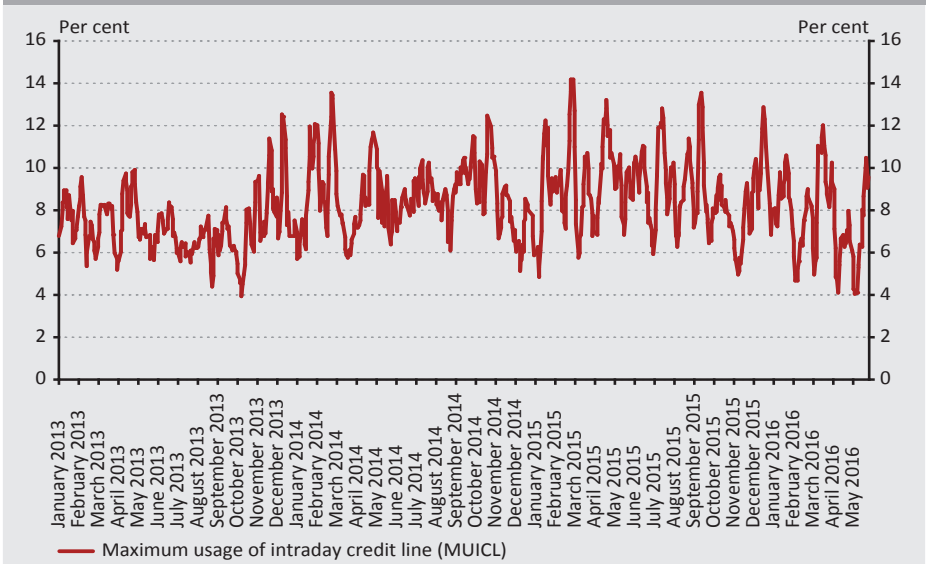
2.3.1 Changes in the trend of maximum usage of intraday credit line (MUICL)

The maximum credit line utilisation shows when, within the day, a bank utilises its securities holdings pledged in favour of the MNB to the greatest degree for the execution of its payment turnover. One of the most important indicators, which reflects the liquidity position of payment system members, is the *maximum credit line utilisation*, which indicates at most what portion of its intraday credit line a particular bank has used within a day. For example, if the lowest intraday account balance of a credit institution is +2 units, the MUICL is 0 per cent, i.e. the credit line was not utilised. On the other hand, if the lowest account balance of a credit institution on the given day is –3 units, while its credit line is 10 units, the MUICL is 30 per cent, i.e. during the execution of its payment turnover there was a moment when the bank used 30 per cent of its available credit line. Since the indicator compares the *lowest* intraday account balance to the credit line available at that moment, this could be regarded as a snapshot. It observes that very moment

when the bank's available liquidity was burdened to the highest degree by the payment turnover, i.e. it examines the liquidity *bottleneck.* It should be noted that the maximum credit line utilisation indicator does not reflect the yet unpledged securities holdings in the bank's balance sheet, which potentially can be pledged.

During the transformation of the central bank's set of monetary policy instruments, implemented as part of the Self-financing Programme, a minor rise was observed in the MUICL value at systemic level, but there was no significant change in this indicator between 2014 and 2016 (Chart 7). A large part of banks (roughly 70 per cent on average) did not use their credit line, or used it rarely for the management of their payments, and thus transformation of the monetary policy instruments did not have any effect on them. Usually, these include financial institutions with a relatively lower balance sheet total, generating lower turnover. In the case of members that typically manage high turnover or have higher balance sheets compared to other participants – which previously also actively used the credit line provided by the central bank – the MUICL increased due to the lower credit lines resulting from the removal of the two-week deposit from the range of collaterals. However, this growth may be deemed moderate, as the MUICL level fluctuated between 6 and 14 per cent at aggregate level throughout the period under review.[7]

Chart 7
Changes in maximum credit line utilisation at systemic level
(2013–2016)

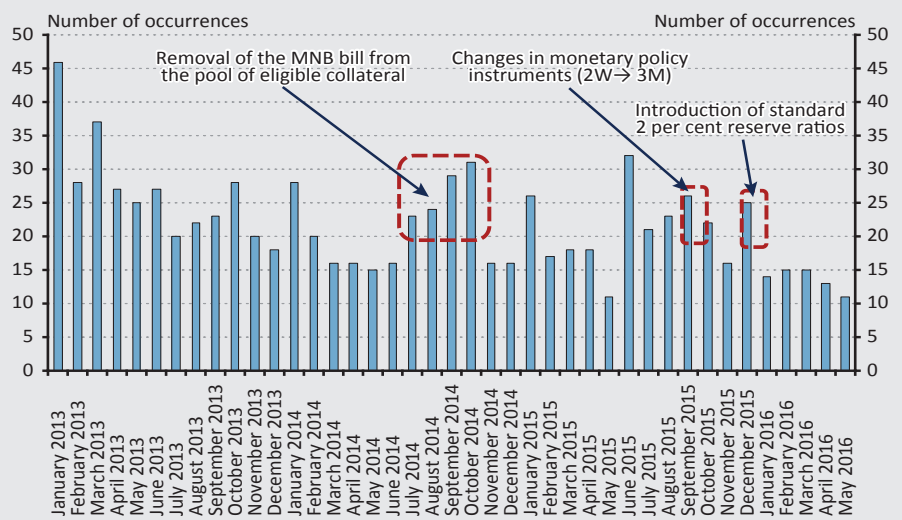


Source: MNB

[7] These are average values, and thus there could be days when the actual credit line utilisation exceeded these figures.

As a result of certain steps in the transformation of the monetary policy instruments, the number of cases when the MUICL exceeded 90 per cent slightly increased, but it quickly adjusted to the previous levels. When the MUICL value is persistently high (e.g. over 90 per cent) at a credit institution, it may suggest that there could be situations when no sufficient volume of liquidity will be available for the execution of its payment turnover. The number of cases when the MUICL exceeded 90 per cent increased slightly as a result of certain measures taken in the framework of the Self-financing Programme. In the period directly preceding the phase-out of the MNB bill in August 2014 and also in the post-August period, the number of occurrences when the MUICL exceeded 90 per cent increased, meaning that more such events took place when a VIBER participant used its credit line in excess of 90 per cent during the day. However, by November 2014 some adjustment can be noticed; as a result of banks' continuous adaptation, the number of cases when the MUICL exceeded 90 per cent appears to fall back to the earlier levels. Growth of similar degree can also be perceived when the monetary policy instruments were transformed in September 2015, but it is also clear that due to the adjustment these values quickly reversed. Furthermore, from January 2016 the frequency of their occurrence is lower than any time since 2013 (Chart 8).

Chart 8
Number of cases when maximum credit line utilisation exceeded 90 per cent in the period under review



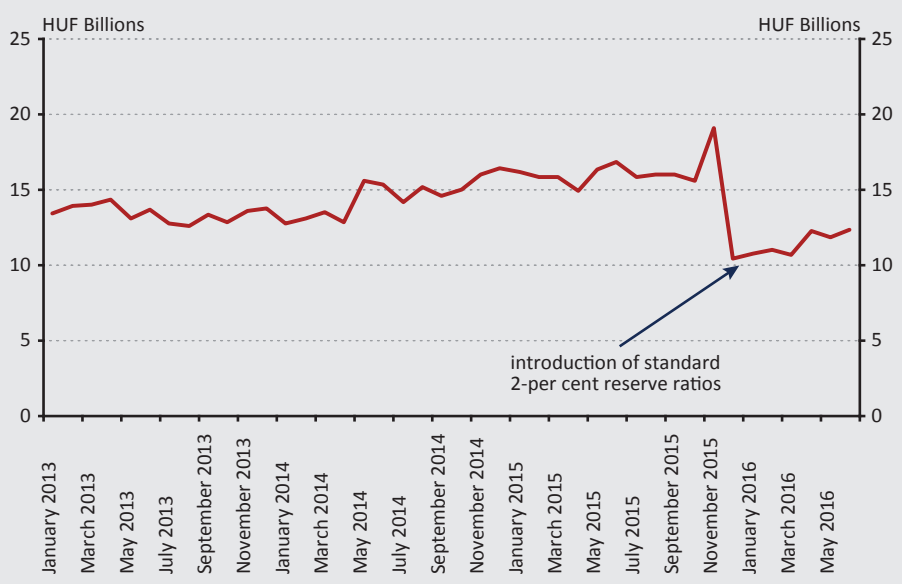
Source: MNB

In the period under review, there were altogether 28 members whose MUICL exceeded the critical 90 per cent threshold at least once. However, the 28 participants did not contribute to the over-90 per cent MUICL cases to an equal degree: the two participants that manage the highest VIBER turnover utilised the

credit line in excess of 90 per cent in more than 50 per cent of the examined cases. These two members can be typically allocated to the group of banks managing the highest payment turnover and conducting active liquidity management; in the case of the other members the number of occurrences when the MUICL was above 90 per cent did not increase substantially.

Since the credit institutions operating with high MUICL also generate high turnover in the RTGS, changing the required reserve ratio rule in December 2015 affected these banks the most. Out of 28 RTGS participants, 12 had to significantly decrease the required reserve ratio, as in the discretionary required reserve ratio regime they defined the level of their monthly average account balance stipulating a reserve ratio higher than 2 per cent. Hence, in their case introduction of the mandatory 2 per cent rate clearly narrowed their liquidity, so for the management of their payments they had to resort to the intraday credit line to an even greater degree than before. It was not worth for them to keep a higher account balance than what was necessary for complying with the reserve requirement, hence their account balance decreased substantially[8] (Chart 9).

Chart 9
Average VIBER account closing balance of the members with credit line utilisation rate exceeding 90 per cent, aggregated by month
(2013–2016)



Source: MNB

[8] This is indicated by the fact that the number of cases when the MUICL exceeded 90 per cent increased in December 2015.

As a result of the modification of the required reserve system, not only the value of the maximum utilisation of the credit line, but also the time of the intraday credit line utilisation increased. However, due to the banks' continuous adjustment (purchase of government securities, increasing the credit lines through pledging of securities, etc.), the number of cases when the MUICL exceeded 90 per cent once again decreased in spring 2016.

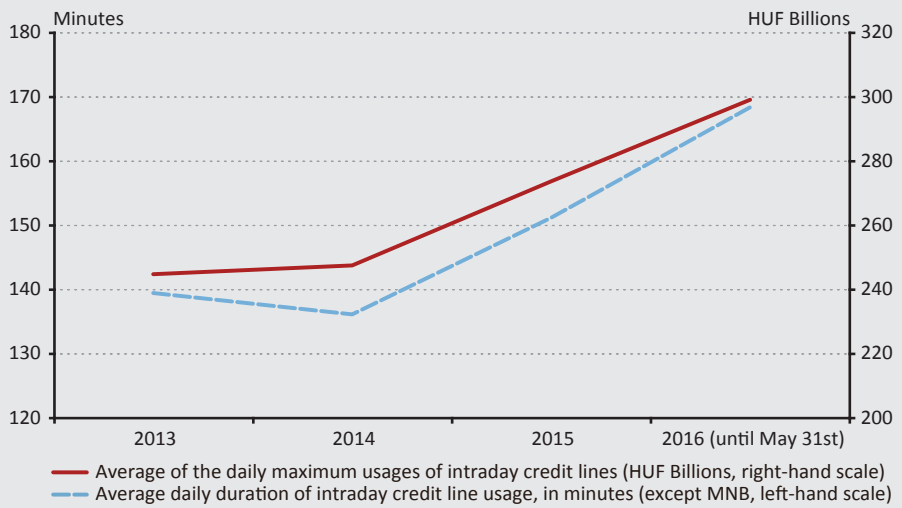
2.3.2 Changes in the trend of average credit line utilisation

In addition to the maximum credit line utilisation, the *average credit line utilisation rate* is also an important liquidity indicator, which shows the length of time when the banks' account balance was negative during the execution of their payment turnover. The MUICL shows an intraday "bottleneck", i.e. the moment when the utilisation of the system's and of an individual bank's liquidity peaks, while the average credit line utilisation provides a general view of the operation and practice of bank payments, i.e. *how often, to what degree on average and how long* the banks utilise their credit lines on the given value date.

As a result of the Self-financing Programme, the value and duration of the intraday credit line increased slightly. The average of the maximum value of the intraday utilisation of the credit lines in 2013–2014 was around HUF 245–250 billion at the systemic level, and participants used this instrument for almost 2.5 hours per day on average.[9] After 2014 a slight change can be observed in credit line utilisation practices. Participants used their credit line more actively in their liquidity management in 2015, as the value of the credit line utilised at the daily level increased by 11 per cent (roughly HUF 26 billion) compared to 2014, and an increase of a similar degree could be observed in spring 2016 as well. In addition to the fact that the average value of the credit lines increased, credit institutions also relied on it for a longer time during the fulfilment of their payment obligations. Projected on a one-day time window, utilisation of the credit line increased by roughly 20 minutes in 2015 compared to 2014, followed by an increase of a similar degree between 2015 and spring 2016. However, on the whole, transformation of the monetary policy instruments had no significant effect on the credit line utilisation, which is primarily attributable to the quick adjustment by the banks (Chart 10).

[9] These values only apply to the banks that effectively used their credit line for managing their payments.

Chart 10
Average daily duration of the intraday credit line utilisation in minutes, and average value of the maximum credit line amounts utilised during the day, projected on the given year
(2013–2016)

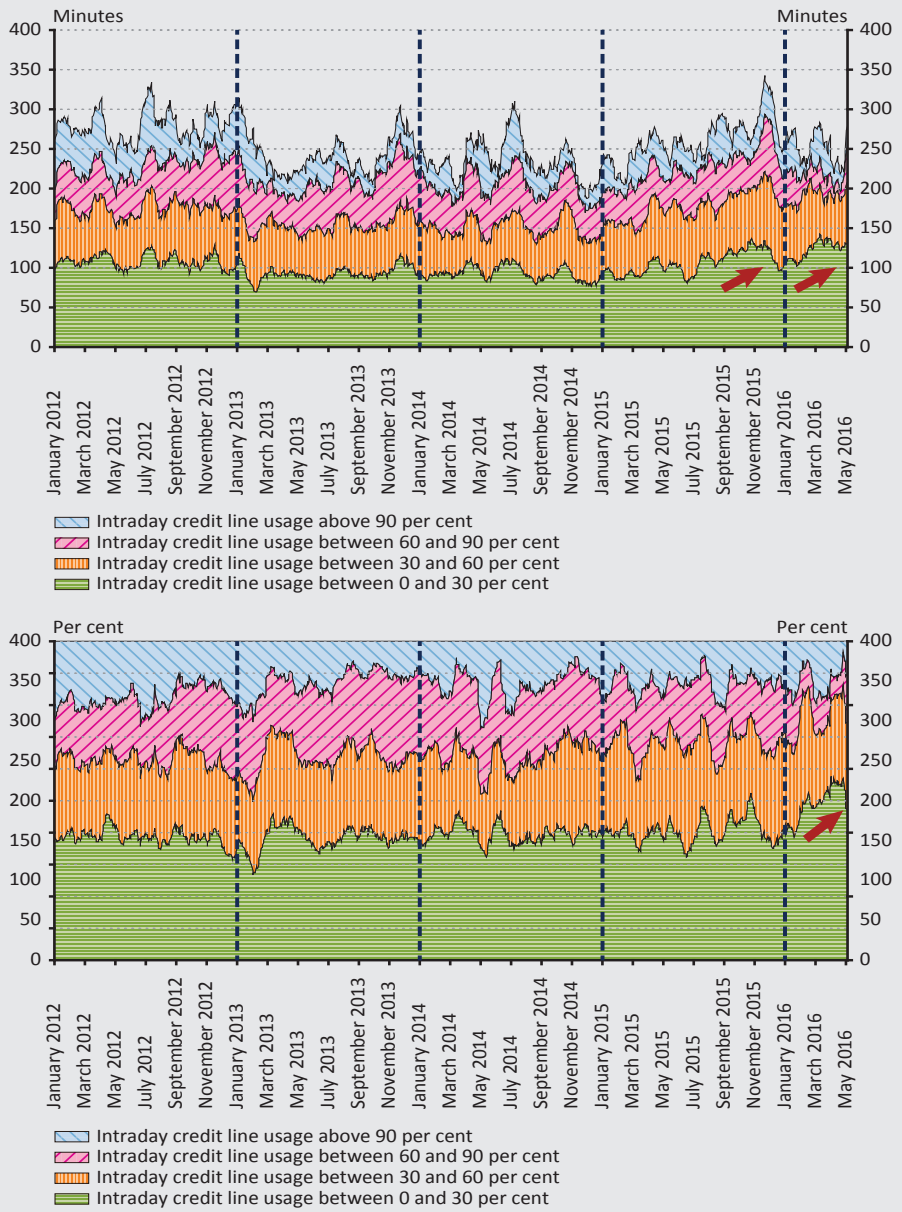


Source: MNB

The length of the time when the credit line was utilised to a high degree did not change substantially as result of the Self-financing Programme or the run-up of FGS. For the interpretation of the average credit line utilisation, it is advisable to break down the various credit line utilisation levels into bands. Based on this, we can differentiate credit line utilisation of 30 per cent or lower as moderate; between 30–60 per cent as medium; between 60–90 per cent as high; and over 90 per cent as strained liquidity situations. With this breakdown of credit line utilisation, it is possible to examine in detail how long a given member is in a certain credit line utilisation status on an average day. Naturally, what really matters is the critical credit line utilisation level, i.e. over 90 per cent, which shows that the member may easily reach the maximum of its pledged securities holdings. After converting the two-week deposit into a three-month deposit, in the second half of 2015, the duration when the VIBER participants used their credit line up to 30 per cent at most, increased by 40 minutes on average. On the whole, at the systemic level, the duration of the credit line utilisation in the 30–60 per cent band increased by about 20 minutes in 2015, although it appeared to have adjusted by spring 2016. The length of the time spent in the status of very stretched credit line utilisation, i.e. *90 per cent and higher*, did not change significantly in recent years, and thus on the whole it can be stated that the change in the central bank's monetary policy

instruments and the increase in the FGS disbursements did not cause any substantial change in the utilisation of credit lines (Chart 11).

Chart 11
Average daily time spent in the status of a given credit line utilisation level (without the MNB, upper table in minutes, lower table in per cent, 2012–2016)



Source: MNB

As a result of the lower pledged securities holdings following the conversion of the central bank's main policy instrument into a deposit and the modification of the required reserve ratio regulation, banks started to utilise their credit line to a higher degree, but it never reached the critical levels. The higher utilisation of the credit line is a natural consequence of the measures taken within the framework of the Self-financing Programme, as the value of the total pledged holdings decreased after the conversion into a deposit, and thus the only reasonable consequence of this – with unchanged turnover – could be that the banks are forced to resort to their credit line to a greater degree for executing their payments. The required reserve ratio, which was modified as part of the Self-financing Programme, also encouraged banks to utilise the credit line, as this measure caused the other component of payment liquidity, i.e. the account balance, to decrease, which – with unchanged turnover – also led to an increase in credit line utilisation. Banks are able to further reduce or "fine tune" their credit line utilisation by better harmonisation of their transactions and "playing around" with transaction timing. In addition, in August 2015 the VIBER operating hours also changed: the system opens 1 hour earlier, i.e. at 7 a.m. instead of 8 a.m., which also means that members have more time to execute the same turnover, which may also ease the tightness of the members' liquidity management, thereby exerting a positive impact on credit line utilisation.

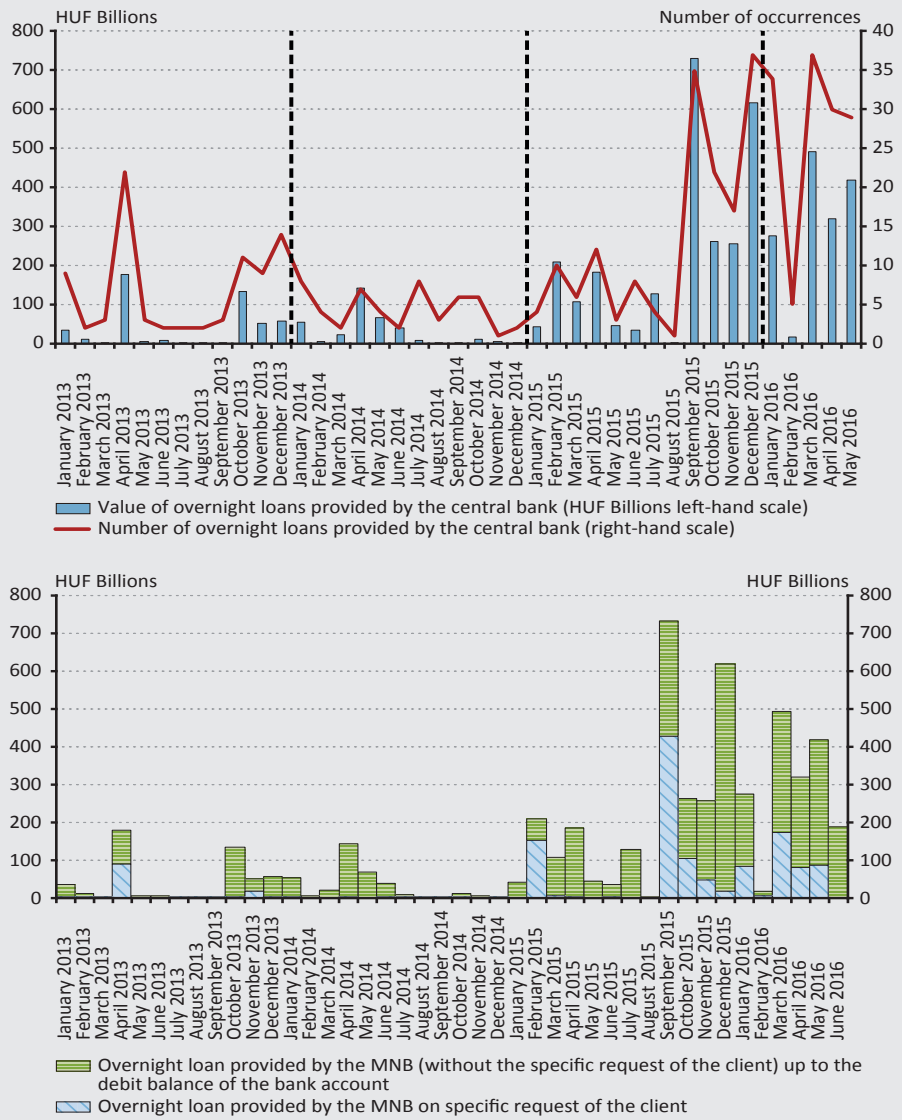
2.3.3 Changes in the borrowing of central bank overnight loans[10]

If a VIBER member closes the day with negative account balance, it automatically receives an overnight loan from the central bank. If a bank executes its payments using its intraday credit line, it must "top up" the resulting negative account balance to zero by the end of the day at the latest. Therefore, VIBER participants strive to close the credit line used up during the day. Optimally, if a sufficient amount of incoming items are received by the credit institution by the end of the day, the financing impact may be sufficient for the bank to settle the credit line utilised during the day. If a VIBER participant does not expect a sufficient volume of incoming items, it may take an O/N unsecured loan in the interbank market to meet its payment obligations, and accordingly this may also be an option for obtaining the required liquidity. If the credit institution is still unable to find funding in time, it receives the central bank's automatic, collateralised loan. In the case of exogenous tax payment shocks (when a large volume of funds flows out of the system to the Hungarian State Treasury), the members have less opportunity to access an unsecured overnight loan in the market; hence in such periods the number and amount of overnight collateralised loans provided by the central bank typically increases.

[10] Partially based on Bodnár et al. (2015).

In addition to the automatically provided central bank overnight loan, VIBER members also have the opportunity to take an overdraft loan *on special request*. When the account balance is negative at the end of the day, the central bank

Chart 12
Volume/value of the central bank O/N loans, (upper table), distribution of the central bank overnight collateralised loans based on whether they were granted automatically due to operational reasons (top up negative end-of-day account balance resulting from the utilisation of credit line) or on special request (lower table)



Source: MNB, based on data between 2013 and 2016

automatically provides an overnight collateralised loan, which must be settled by the respective member the next day, at the latest. This is part of the "normal" standard banking procedure. However, in addition to this automatic loan, banks may also resort to the overnight loan instrument *on special request.* This means that although the bank's end-of-day liquidity position does not justify the drawdown of the automatic central bank loan, the bank still uses it due to other considerations (e.g. to comply with the reserve requirement or other business reasons).

After the restructuring of the interest rate corridor in September 2015, the volume and value of both the automatic and separately requested central bank overnight loans increased substantially. In September 2015, the modification of the interest rate corridor implemented as part of the Self-financing Programme may have made a substantial contribution to the increase in the frequency and value of the O/N loans drawn down (Chart 12, upper graph). The more active utilisation of the instrument can be attributed to eight VIBER participants. As a result of the modification, the overnight loan granted by the MNB became substantially cheaper, and due to the more favourable pricing of the central bank's loan instruments, the members could manage their liquidity more efficiently (Nagy–Hoffman, 2016), which simultaneously made market-based borrowing less attractive. In terms of payments, the lower interest on O/N loans encouraged VIBER participants to pursue less tight liquidity management, as the cheaper cost of funds represents a smaller burden for the individual institutions. Thus, due to the cheaper overnight loan instrument, VIBER participants do not necessarily make efforts to repay the overdraft loan taken during the day. However, aside from automatically granted overnight collateralised loans, the volume and value of the central bank's on-request overnight loans also rose substantially in September 2015 and in the months thereafter (Chart 12, lower graph). The drawdown of these loans was not necessarily justified by the normal payment turnover – contrary to the pre-2015 period – but may have been attributable mostly to other business decisions. While in the past O/N borrowings could be typically justified by payment reasons (the bank did not estimate its end-of-day turnover correctly, other unexpected external factors emerged, due to which the bank had a negative account balance by the end of the day, which could be zeroed through the automatic central bank loan), with the transformation of the monetary policy instruments and making the interest rate corridor asymmetric, this aspect became less important (central bank loans were also drawn down when the member closed the day with a positive account balance). Typically, two thirds of the loans are drawn down toward the end of the month, which is in line with the earlier trends and the exogenous impact (related to the tax payment dates) appearing in ICS, and with the practices of fulfilling the reserve requirements (holding excess reserves at the beginning of the month and running a reserve deficit at the end of the month).

2.3.4 Payment queue

If an RTGS participant does not have sufficient liquidity at a given moment, the transactions waiting for settlement are queued. If based on the account balance and the credit line (= liquidity) a bank has no sufficient cover for the execution of a given transaction, VIBER queues the orders until the bank obtains sufficient liquidity. The coverage check is performed after the submission of the transactions and that is when it turns out whether the liquidity of the bank provides sufficient cover for settlement. A bank may face the problem that it cannot provide adequate cover for its outgoing transactions, and thus the payment cannot be settled immediately. When the necessary cover is available, the system starts to settle the transactions. The sequence of queued transactions may also be modified by the member (e.g. through active priority management, see later). Queuing alone does not necessarily generate problems, as this is a normal attribute of large-value payment systems. It is rather a kind of an indicator showing how banks operate at the individual level and what kind of liquidity management practice they prefer. Queuing essentially causes a problem only when it develops at systemic level for several participants. In order to avoid *gridlocks*, VIBER continuously monitors queued transactions. A gridlock resolution algorithm automatically runs every ten minutes, which can prevent stoppages in the payments of a credit institution if another credit institution fails to execute its transactions in time, due to the absence of sufficient liquidity.[11]

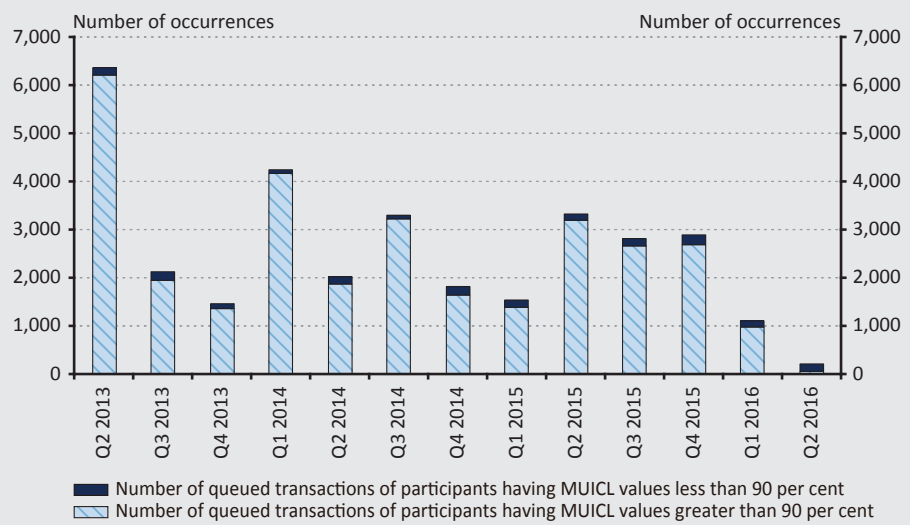
There are major differences between the credit institutions based on the length of time their transactions are stuck in the queue, which is essentially due to the various liquidity management practices instead of the specific liquidity situation of a bank. Extreme cases of queuing, i.e. 7-8 hours, are not unusual for some banks. This occurs primarily at financial institutions that manage small turnover and have less professional liquidity management, where unexpected, large-value transactions could cause the problem. On the other hand, in the case of credit institutions with more advanced risk management and large turnover, transactions rarely stay in the queue for more than two hours. At the majority of banks, payment turnover is executed immediately, without queuing. If transactions are queued after all, this situation typically lasts for a short time.[12] The queuing (and resolution) of individual payments often depends on the bank's individual decision, i.e. how critical the bank regards fulfilment of the given payment transaction.

[11] After the 2008 crisis, due to the major uncertainty and turbulence in the money markets the MNB increased the runtime frequency of the gridlock resolution algorithm to facilitate the smooth execution of the payment turnover in a liquidity crisis.

[12] The majority of queuing could have been avoided by comprehensive use of the liquidity supporting instruments provided by the MNB and VIBER.

No substantial change can be observed in the queuing statistics of the large-value payment system as a result of the measures of the Self-financing Programme. Although during the period under review the level (and composition) of liquidity changed substantially, liquidity at systemic level was still abundant for payment purposes. This is well demonstrated by the fact that in the last 3-year time window the queued transactions amounted on average merely to 0-3.5 per cent of the total turnover executed in VIBER, which does not represent significant growth compared to previous periods. As a result of the banks' adjustment and professional liquidity management practice, the number of queued transactions did not rise significantly in the system due to the measures of the Self-financing Programme. The quarterly breakdown also shows no material change (Chart 13), and in the first quarter of 2016 the number of queued transactions even dropped to its record low in the time window of the last 3 years. A substantial part (over 80 per cent) of the queued transactions related to a small group of VIBER participants. In the vast majority of cases, queuing was attributable to a treasury error, as the banks' balance sheet contained sufficient eligible securities for the smooth execution of their payments, but they failed to pledge them.

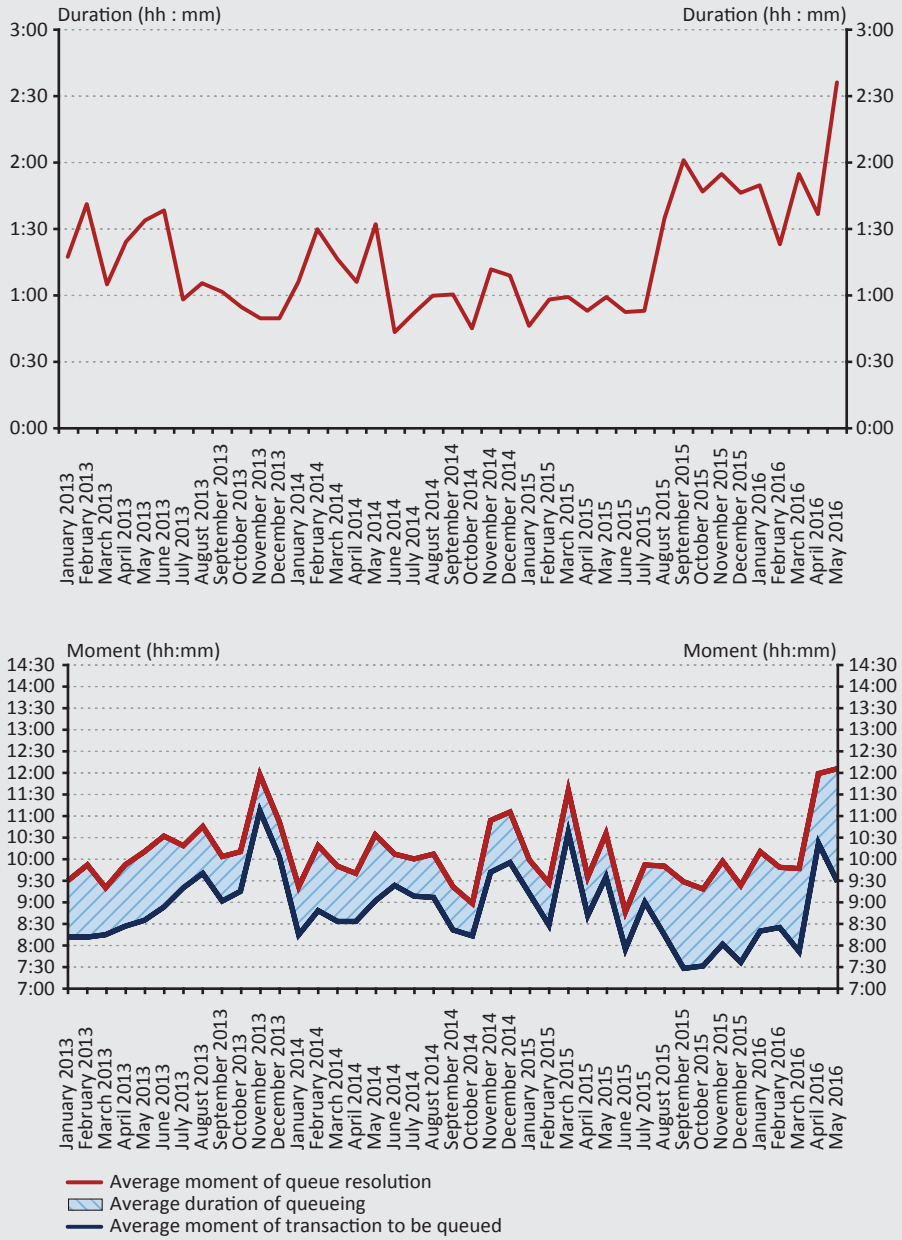
Chart 13
Number of queued VIBER transactions by quarters



Source: MNB

Gridlock occurred in a minimum number of cases, and the duration of the queues did not cause any stoppage in payment turnover. In addition to the number of queued transactions, the time that an individual transactions spends in the queue before it is executed due to a liquidity shortage, is also an important indicator. Prior

Chart 14
Average time spent by a VIBER transaction in queue (upper table), average intraday moment of the queuing and resolution (lower table)



Source: MNB

to August 2015, the time spent by a VIBER transaction in the queue on average was about 1-1.5 hours at systemic level, whereas after August this level increased by roughly 50 minutes (Chart 14). The phenomenon is presumably attributable to the prolongation of VIBER operating hours in August 2015. Making the Hungarian forint a settlement currency in CLS necessitated the extension of the operating hours of the domestic large-value funds transfer system, and thus the system opens one hour earlier in the morning, i.e. at 7 a.m. instead of 8 a.m. Certain participants – although they have strained liquidity conditions – might still submit their transactions for execution early in the morning, expecting that due to the financing effect of the transactions received later during the day they will have sufficient liquidity for the settlement of their payment transactions. However, their transactions submitted in such manner will be in the queue longer. In the majority of cases, there was no actual liquidity shortage (as the potential liquidity typically well exceeds the given participant's payment obligations arising from the payment turnover), hence the aforementioned increase in time should in no way be interpreted as a systemic problem, but rather as a consequence of the individual bank's decision. In the period under review, gridlocks only developed in a minimum number of cases (which then would have justified the running of the gridlock resolution algorithm). In summary, the number and duration of the queued transactions did not cause any systemic stoppage in the operation of payments.

2.3.5 Changing of priorities

Another tool in banks' active liquidity management may be to change the priorities of payment transactions. In the case of queuing, changing the priority of a transaction may be an active solution by the participant. When a bank submits a payment transaction to VIBER for settlement, it must allocate a priority number to it, which essentially designates the importance of the transaction. The priority in VIBER may range between 0 and 98, but the choice is not purely discretionary, as values between 0 and 10 are reserved for the central bank,[13] and the settlement of those transactions enjoys priority compared to normal payment transactions. Hence, a participant may allocate a priority number between 11 and 98 to its payment transaction, where settlement of the payment order with a lower priority number enjoys priority compared to the payment orders with a higher priority number.[14] Changing the priority mainly plays a significant role in the settlement

[13] Central bank receivables of monetary purpose, transfers to public authorities, ICS multiple intraday clearing, other central bank transactions, etc.

[14] Let us suppose that a bank's transaction for HUF 5 million with priority 20 is queued, as there is no sufficient cover for it. This may cause problems, because it may block the settlement of all other transactions with lower priority (let's say priority 50), (which may be for much smaller amounts, e.g. for HUF 1 million, thus they could even be fulfilled and there would be sufficient cover for them, but as their priority number is 50, they cannot be settled earlier than the item with priority number 20). However, the bank may change this situation by modifying the priority of the items with priority 50 to 15, or "weakening" the priority 20 transaction, which "got stuck" at the front of the queue, to priority 50, thereby facilitating the settlement of those transactions which it has sufficient liquidity to fulfil.

of time critical transactions, or when an unplanned large-value transaction blocks the settlement of several, smaller-value transactions. If priorities are changed in large volumes in the payment system, it may suggest that liquidity is insufficient at the systemic level / individual bank level, due to which the VIBER participant must exercise active liquidity management to ensure the settlement of the payments.

Successful adjustment to the Self-financing Programme is reflected by the fact that the number priority changes has not changed since the launch of the programme. According to our analysis, the priority was changed on 2 occasions in 2013, and on a total of 5 occasions between April 2015 and May 2016. That is, the situation when a bank had to resort to this solution occurred only rarely. This also means that the banks did not get into a situation when their liquidity was insufficient, or the liquidity-supporting instruments provided by the MNB and VIBER would have not been enough for the settlement of certain time critical transactions. Priority management is a tool, which can be used by the bank for changing the importance of its submitted transactions, i.e. it may give preference to the settlement of certain transactions to the detriment of other transactions. For this very reason, it suggests that the situation is critical if the number of priority changes increases substantially. This is true even if it may be deemed normal, or even useful, in a payment system, if there are priority changes, as this demonstrates that the participants consciously use the central bank's liquidity-supporting instruments and pursue calculated liquidity management.

2.3.6 End-of-day cancellations

After the introduction of the Self-financing Programme, there was no significant increase in the number and value of the transactions cancelled at the end of the day. At the end of the day, VIBER automatically cancels unsettled transactions, and participants must resubmit these the next day. The cancellation of items at the end of the day may increase VIBER's clearing and settlement risk, if the quantity and individual value of the items is high, or the cancellation of transactions often occurs at the same participant. Thus, an increase in these indicators may suggest that the payment liquidity is not sufficient in the system. A high concentration of the end-of-day cancellation of transactions at a given bank may also suggest a liquidity problem or bad liquidity management practice at the level of the individual participant. In the period under review, cancellations of transactions in VIBER were usually one-off events, and mostly occurred for participants with small turnover, representing a small weight in terms of systemic risk. It is important to note that these participants – partially due to their low turnover – typically do not pursue such professional liquidity management as the larger actors, and thus they also do not monitor their intraday payment turnover. In the case of the participants that are significant in terms of the payment turnover, the number of end-of-day cancellations did not increase, and the majority of the occurred events is attributable to treasury errors, rather than to any actual liquidity shortage.

Conclusion

Since the announcement of the Self-financing Programme, several measures were taken that had a fundamental impact on the liquidity of the domestic payment systems. The individual steps of the transformation of the monetary policy instruments affected the fundaments of the entire payment liquidity, substantially altering banks' former practice. The MNB, in its capacity as the institution responsible for the oversight of payment systems, continuously monitored the consequences of the adjustment on payments.

Banks' adjustment to the Self-financing programme occurred quickly, without any major turbulence. Within pledged securities holdings available for the settlement of payments, government securities holdings increased to a level unseen before, which led to a more stable and predictable liquidity situation. As a result of the changes in the reserve requirement rules, the lower account balance was properly offset by the increase in the securities pledged in favour of the MNB (and hence by the increase in collateral). For the purpose of managing their payments, banks used their intraday credit line to a higher degree and for longer time than before, but this level was not extreme either at the systemic or the individual bank level. The number and duration of intraday credit line utilisations in excess of 90 per cent also did not increase significantly. The smoothness of the adjustment to the Self-financing Programme is well reflected by the fact that by pledging securities and flexibly modifying the timing of transactions, banks were able to manage their payment turnover successfully, and thus the alternative liquidity-supporting instruments provided by the MNB and VIBER (priority change, gridlock resolution) were applied only on rare occasions.

Taken together, it may be stated that by the end of 2015 the liquidity available for payments rose to and stabilised at a safe level that was typical before the conversion of MNB bills into deposits in August 2014.

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Print: Prospektus–SPL consortium

H-8200 Veszprém, Tartu u. 6.