The Magyar Nemzeti Bank's self-financing programme

April 2014 – March 2015

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Contents

Summary

Prior to the global financial crisis that broke out in 2008, the Hungarian economy accumulated high external debt, so its external exposure increased. During recent years, however, the external balance position of the country has improved considerably; external vulnerability has declined, allowing a targeted use of foreign exchange reserves. The concept of self-financing, supported by the central bank self-financing programme announced in April 2014 aims at reducing the risks stemming from the high external and FX government debt. Our publication presents how Hungary over the past more than one year was able to renew its maturing external FX debt from forints and how it was facilitated by the MNB's programme, i.e. the transformation of the main policy instrument and the introduction of the central bank interest rate swap tenders.

In 2014 H2 and 2015 Q1, Hungary refinanced the maturing external FX debt by increased forint bond issue and continued high sales of retail government securities, thus implementing the concept of self-financing. In this period, the Hungarian government repaid almost a total EUR 3.5 billion of external FX debt from forints; since April 2014, FX-denominated bonds for households have been the only FX-denominated issues. In addition to the strong household demand, this achievement was made possible by the cooperation of the Government Debt Management Agency, which ensured the increased forint issue, domestic banks that subscribed to the forint-denominated government securities and the Magyar Nemzeti Bank, which supported bank demand by active and passive means.

As a result of refinancing the government's FX maturities from forints, the ratio of FX debt to gross government debt declined from above 40 per cent in early 2014 to below 34 per cent by March 2015, while banks' share within government debt was up from 15 per cent to nearly 19 per cent. The residual maturity of banks' forint-denominated government securities increased from 2.8 years to 3.6 years, resulting in a decline in the renewal risk of the Hungarian government debt.

The MNB's self-financing programme announced in April 2014 made a material contribution to the implementation of the above concept by both amplifying domestic banks' earlier purchasing trend and increasing banks' government securities purchasing activity.

- *The programme resulted in more intense government securities purchases by banks; following the announcement of the central bank programme, the ratio of banks' purchases compared to the net forint issue increased in a perceptible manner.*

- *Both the programme itself and its individual instruments contributed to a decline in long-term government bond yields and thus to a fall in the financing cost of the general government.*

- *The transformation of the main policy instrument and the introduction of the central bank IRSs stabilised banks' government securities portfolios, as the conversion into deposits resulted in a permanent change in banks' balance sheets, while the interest rate swap instrument made banks' holding of government securities more secure and more predictable as a result of the condition undertaken by the banks.*

- *The effect of the MNB programme is shown by the fact that the increase in the banking sector's government securities holdings was greatly attributable to the banks that participated in the IRS tenders or faced a compulsion to adjust due to the conversion into deposits.*

The impact on monetary transmission of the self-financing programme (and of the conversion into deposits) may be considered moderate; bank adjustment was mostly completed by the autumn of 2014. At the same time, the excess liquidity that appeared in the banking sector may have reduced yields to some extent.

As a result of the concept of self-financing, the balance sheet of the MNB narrowed, which means significant savings for the Central Bank, the Hungarian state and the national economy as a whole. As the yield curve typically sank in the past one year, the value of central bank IRS holdings has increased from the MNB's point of view.

Introduction

The economic crisis and recent years' emerging market turmoil revealed that high external and foreign exchange debt constitutes an important source of external vulnerability. High external indebtedness – often accompanied by high FX-denominated debt – may be a problem because in a turbulent market environment the refinancing of external debt may run into difficulties or may become impossible. Therefore, it is a priority economic policy objective to strengthen the funding of government debt from internal sources and thus to reduce dependency on external sources.

Following an improvement in current balance indicators it became possible to improve stock indicators – external debt and government debt in particular. In recent years, Hungary has achieved significant improvement in current type balance indicators, and within that mainly in the current account. The improvement in position also allowed a material improvement of stock indicators. In this field the dynamics of change is inevitably slower, and in addition to fiscal discipline it can be facilitated with other economic policy measures as well, with particular regard to funding the government debt from internal sources and to the decline in dependency on external sources. At the same time, Hungary and the Hungarian state still have significant external and FX debts, entailing high dependency on external funds and strong dependence on foreign investors. This is one of the major causes of the vulnerability of the Hungarian economy.

A realistic and desirable way of mitigating external vulnerability is to reduce gross external debt, and within that to move in the direction of forint financing of the government (concept of self-financing). Net external debt, which is of particular importance in terms of vulnerability, is the result of the savings processes of domestic sectors, i.e. its reduction is possible only through real economic costs. Taking account of other economic policy objectives, mainly the growth target, it is the decline in gross external debt that can contribute to the reduction of the country's vulnerability most. The funding of government debt from domestic sources results in the reduction of gross external debt. The most suitable available tools for this are the restraining of FX issues, the refinancing of FX maturities from forints and a shift towards issuing forint-denominated government securities (negative net FX issue) – this is the concept of self-financing. Although self-financing does not have a direct impact on external debt, but as a large portion of FX debt is external debt, the reduction of FX financing actually reduces external debt. In addition to the reduction of external debt, the shift towards forint financing entails other positive effects as well. The currency composition of government debt improves, its sensitivity to exchange rates declines and the fluctuations in the exchange rate of the forint appear in debt indicators to a lesser extent.

For the success of the concept of self-financing, the Magyar Nemzeti Bank elaborated the self-financing programme. The basis of the central bank programme was that in international comparison the share of the domestic banking sector in the funding of government debt can be increased. The MNB can support this by facilitating the conversion of banks' receivables from the Central Bank (two-week sterilisation bonds) into government bonds by using its monetary policy instruments. If banks invested a part of their sterilisation holdings into government securities, they would finance a greater part of government debt, while their exposure to the Hungarian state measured at a consolidated level would remain unchanged.

The structure of this evaluation is as follows. Chapter 1 describes the concept of self-financing and its implementation in 2014 and 2015 Q1. Chapter 2 presents the contribution of the MNB's self-financing programme to the implementation of the concept of self-financing, with particular regard to the banking sector's demand in the government securities market and to the effect on long-term government securities market yields as well as to the announcement of IRS tenders and the consequences of the transformation of the main policy instrument. Chapter 3 shows how the programme influenced the MNB's balance sheet and its profit/loss. The evaluation is completed by references and a list of the literature used as well as two appendices containing technical descriptions.

1 The realisation of the concept of self-financing

1.1 SELF-FINANCING AS A TOOL FOR REDUCING EXTERNAL VULNERABILITY

The concept of self-financing fits into the set of economic policy measures launched in recent years to support the reduction of external vulnerability and the improvement of the debt structure. According to the experiences of the economic crisis that broke out in 2008, external vulnerability is essentially attributable to high external and FX debt. In recent years, several economic policy decisions were made that aimed at reducing external vulnerability and improving the structure of debt, or indirectly contributed to this. One of them was the concept of self-financing, which results in a strengthening of government debt financing from internal funds, a decline in gross external debt and a decrease in the dependency of government debt on external financing, while the share of FX debt falls.[1] It is justified, however, to stress that the concept of self-financing is not a centrally coordinated programme, but rather a series of government measures and decisions that complement one another.

Chart 1
Economic policy programmes aiming at the reduction of external vulnerability
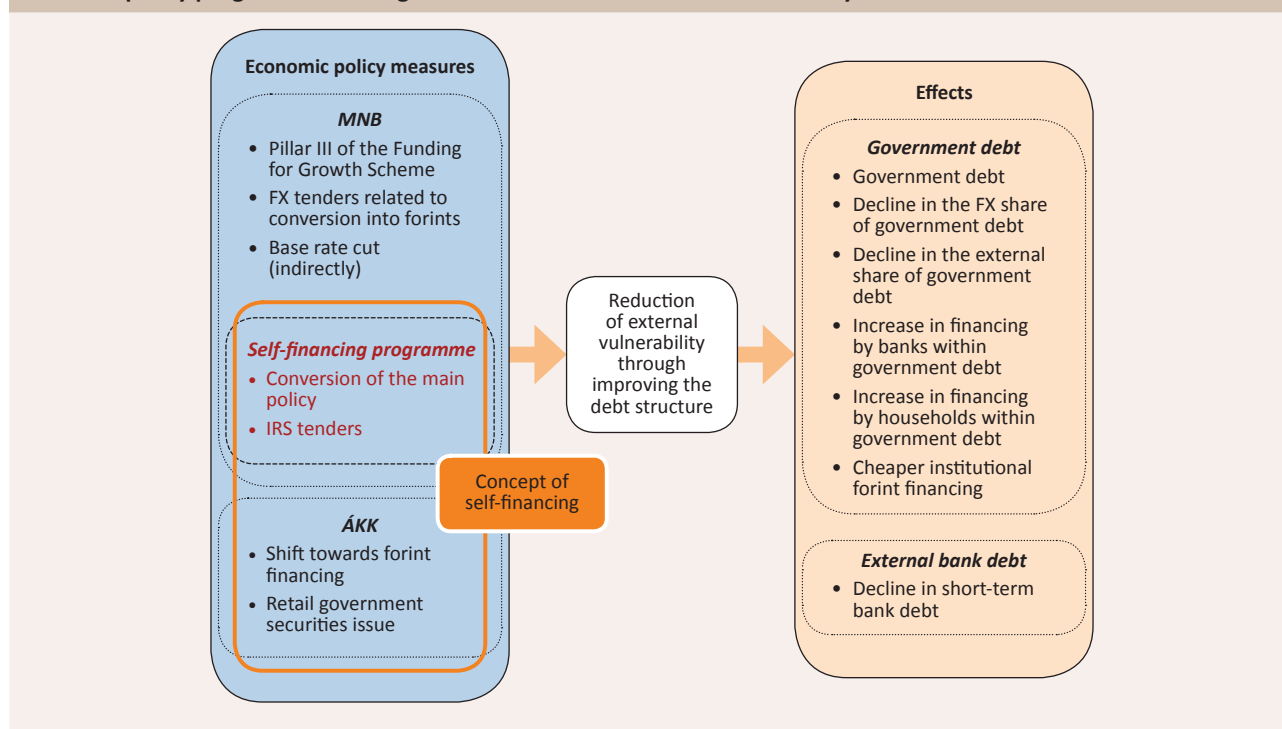
In addition to the concept of self-financing, in the past years several economic policy measures were taken that contributed to making the structure of government debt and external debt more favourable within the decline in the country's vulnerability. In a wider sense, these measures include the ones that stimulate not only the internal financing of government debt, but contribute in other – indirect or direct – ways to the

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[1] For details on the concept of self-financing see: MNB, 2014a.

reduction of gross external debt and within that to the reduction of debt with a maturity of up to one year. In the past years, primarily the following measures facilitated the reduction of the external debt of the national economy and of the external government debt:

1. **Shift towards retail government securities in the financing of government debt:** increasing the issue of retail government securities indirectly adds to households' government securities holdings, and through that it stimulates the internal financing of government debt. The value of government securities held by households amounted to nearly HUF 2500 billion at end-March 2015, which means an increase of HUF 1700 billion in three years.

2. **Series of base rate cuts:** the decline in forint yields resulting from the reduction of the central bank base rate made it easier for the Government Debt Management Agency (ÁKK) to refinance its maturing FX debt from new forint debt; the spread between forint- and FX-denominated bonds declined considerably during last year. The MNB's policy rate stood at 2.1 per cent at end-2014 and was 1.80 per cent at end-April 2015, compared to 7 per cent in early 2012.

3. **Pillar III of the Funding for Growth Scheme (FGS):** within the framework of Pillar III of the FGS, an explicit condition of having recourse to the FX swaps offered for credit institutions was that central bank counterparties had to reduce their short-term external debt at least up to the amount of the currency received from the MNB.[2] The reduction of banks' short-term external debt contributes to the decline in the vulnerability of the country. FGS FX swaps outstanding in March 2015 amounted to EUR 581 million, and almost all maturities fall on 2016.

4. **The FX sales programmes related to settlements and conversion into forints:** the FX sales tenders related to the phasing out of household foreign currency loans partly require the reduction of banks' short-term external debt, and thus reduce the gross external debt of the country. Of the instruments introduced as parts of the programme, in the case of the conditional instrument, participating banks undertook to reduce their short-term external debt at least to the extent of 50 per cent of the currency used, while in the case of the unconditional instrument also a decline in short-term external debt is expected in an indirect manner. In connection with the phasing out of the foreign currency loans, in the autumn of 2014 the MNB sold more than EUR 9 billion to banks, of which the shares of conditional and unconditional instruments amounted to approximately EUR 2 billion and EUR 7 billion, respectively.

As part of the concept of self-financing, the ÁKK moved in the direction of forint financing in 2014. The ÁKK's 2014 net FX issuance[3] was negative, and the debt manager refinanced this debt from forints (see Chapter 1.2.). As a greater portion of FX debt is in foreign hands compared to the forint debt, this measure resulted in a favourable change not only in the currency structure of government debt, but also in the resident–non-resident ownership structure. The ÁKK repaid external FX debt with a value of EUR 4.1 billion in 2014 and dollar bonds exceeding the value of EUR 1.2 billion in 2015 Q1 from forint issues and the issuance of retail FX bonds. As a result of these two effects, the FX debt refinanced from forints amounted to EUR 2.5 billion in 2014 and almost EUR 1 billion in 2015 Q1.

The Magyar Nemzeti Bank announced the central bank self-financing programme in April 2014. Its declared objective was to encourage banks to purchase forint-denominated government securities. The programme intends to achieve the target of reducing external vulnerability through stimulating the purchasing of forint-denominated government securities by the domestic banking sector. Banks' purchases of forint-denominated government securities, then converting the ÁKK's forint liquidity stemming from it at the MNB allows the repayment of (external) FX government debt, while the MNB's balance sheet also shrinks. The concept is based

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[2] The Monetary Council terminated the FX swap tenders related to Pillar III of the FGS as of 1 July 2014, but the MNB still has related receivables. The role of FGS FX swaps was taken over by the self-financing programme and later by the euro sales tenders related to the phasing out of foreign currency loans.

[3] FX issuance means the raising of FX funds (i.e. both bond issue and borrowing).

Chart 2
Flow chart of the central bank self-financing programme
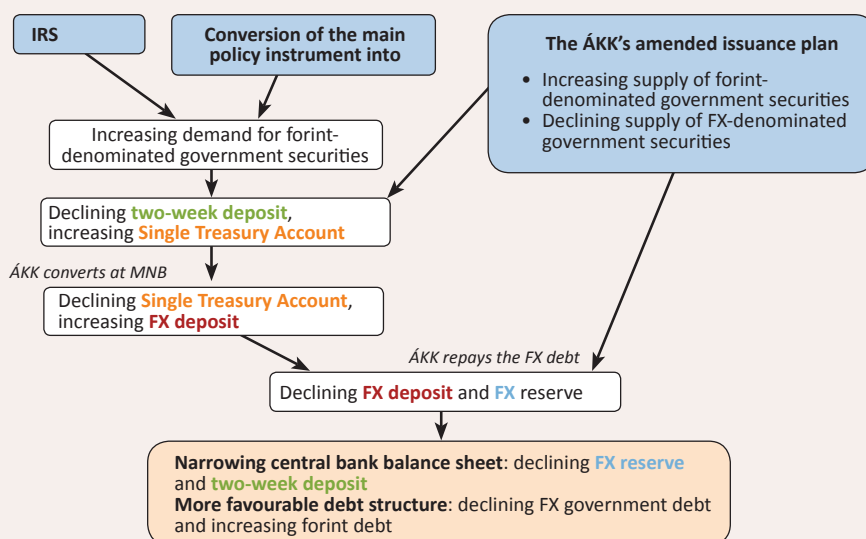
on the cooperation of three actors: the MNB, the ÁKK and the banking sector. The conversion into deposits of the central bank policy instrument in August 2014 and the introduction of the new interest rate swap (IRS) instrument were the two main instruments of the programme. Due to the less favourable liquidity properties, the conversion into deposits crowded out a part of bank funds from the main policy instrument of the Central Bank, whereas the IRS instrument played a role in driving these crowded-out funds towards the government securities market.

Together and complementing one another, the MNB's self-financing programme and the ÁKK's negative net FX issuance facilitate the realisation of the concept of self-financing. Thus, eventually, the share of foreign currency in government debt and the share of non-residents in the financing of government debt may decline, while the share of the domestic banking sector in financing the government debt and the share of government securities within the balance sheet of the banking sector may increase.

This evaluation focuses on the realisation of the concept of self-financing in 2014 and 2015 Q1. The importance of the year 2014 is explained by the fact that it was the only closed year in the period since the announcement of the self-financing concept and programme, but our evaluation also includes a brief outlook to 2015 Q1. Some of the time series presented in the analysis are longer, which helps the interpretation of the self-financing processes. The evaluation focuses on the realisation of the concept of self-financing, while, of course, there were several other ongoing developments (in particular, the favourable macroeconomic developments, the improvement in domestic real factors, the globally loose monetary conditions etc.) in the period under review that had a material impact on the domestic government securities market.

1.2 EVALUATION OF THE REALISATION OF THE CONCEPT OF SELF-FINANCING IN 2014

In 2014, the FX debt repaid by the ÁKK exceeded its FX borrowing by HUF 766 billion. A fundamental condition of self-financing is that the ÁKK should be able to refinance the FX debt from forints, which was achieved on the basis of last year's data. The ÁKK's financing plan issued in January 2014 envisaged only a minor negative net FX issuance, i.e. the original plan projected the renewal of a significant portion of the maturing FX debt from foreign currency.

Table 1
The ÁKK's financing plans for 2014
(original, amended and realised, HUF billion)

|	January 2014 plan	May 2014 plan	Realised
Net HUF issuance	1185	2126	1526
Net FX issuance	−243	−885	−766
Total	942	1 241	760

Source: ÁKK (2014a, 2014b)

However, the ÁKK's issuing plan approved in May 2014, i.e. following the announcement of the central bank self-financing programme, already envisaged a negative net FX issuance of HUF 885 billion, i.e. refinancing of this size of FX debt from forints. In the actual financing the net FX issuance was also negative, but the total net HUF issuance was HUF 600 billion below the May plan, mainly due to a greater than planned decline in the borrowing requirement.

In line with the concept of self-financing, the external debt of the central budget at nominal value stopped increasing, then started to decline in 2014. Non-residents' government securities holdings (net of revaluation[4]) amounted to HUF 9596 billion at end-2013 and HUF 9697 billion one year later. At the same time, the share of external government debt measured this way declined from 43.6 per cent to 40.6 per cent within the total gross debt of the central budget. Moreover, also taking account of the maturity of a EUR 2 billion loan last October, an even more significant decline in external debt can be taken into account. The decline in the share of external debt started in May 2013, when the debt path, which had been rising for years, changed course. Later, in September 2013, the share of external debt started to rise again, which was corrected in 2014.

Chart 3
Non-residents' end-of-month forint- and FX-denominated government securities holdings

Non-residents' government securities holdings net of revaluation
Non-residents' share in the financing of central government gross debt*
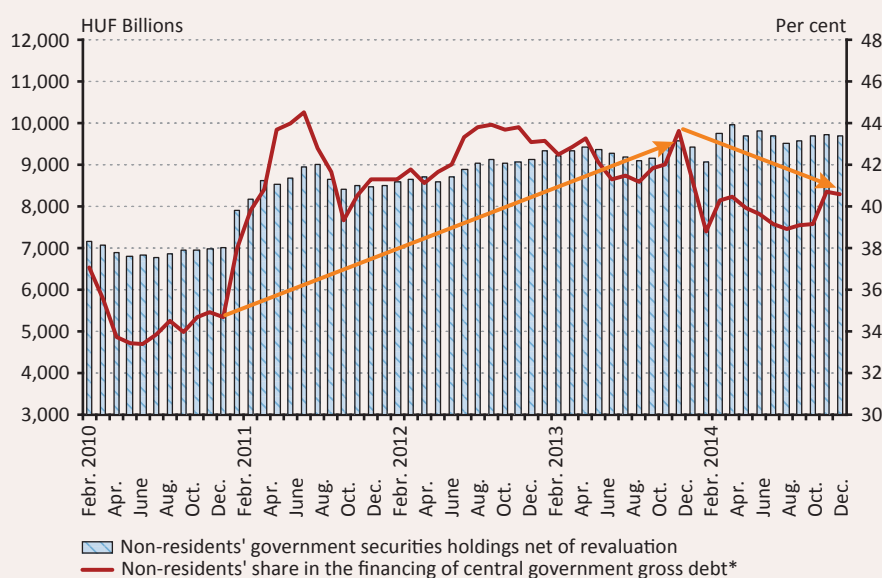
*Do not include credit granted by supranational organisations
Sources: MNB, securities statistics (market value, net of revaluation), ÁKK

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[4] It is justified to use the change in holdings net of revaluation, where only the transactions are taken into account, because this is the value that reflects the government securities purchasing and selling activities properly.

Chart 4
The banking sector's end-of-month forint- and FX-denominated government securities together
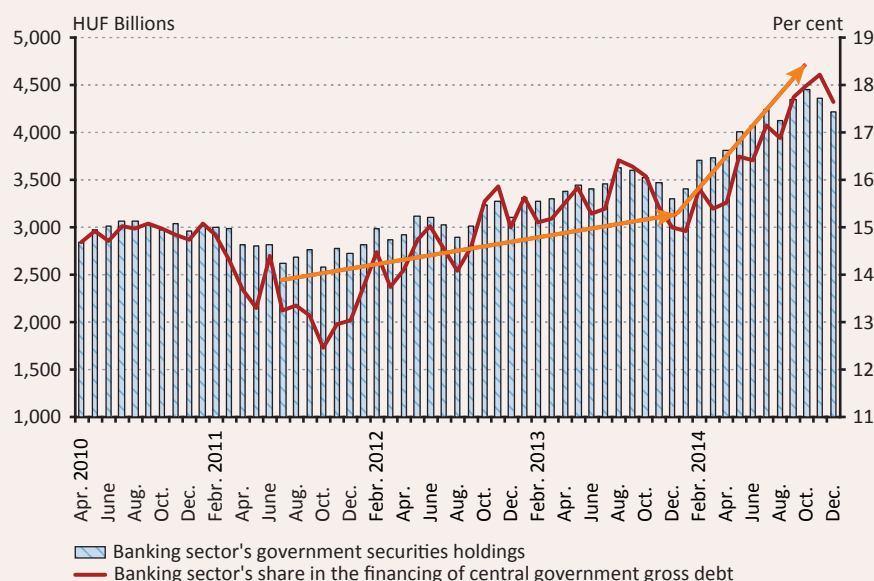
Sources: MNB, supervisory balance sheet (historic cost), ÁKK

All in all, government securities holdings of the domestic banking sector increased considerably in 2014. Banks' government securities holdings, which amounted to HUF 3298 billion in December 2013, reached HUF 4212 billion by end-2014, while their share within the total debt of the central budget also increased considerably (from 15 per cent to 17.6 per cent). The increase in the share of banks started in February 2014. The added value of the concept of self-financing is indicated by the fact that last year's increase exceeded the average increases of 2012 and 2013.
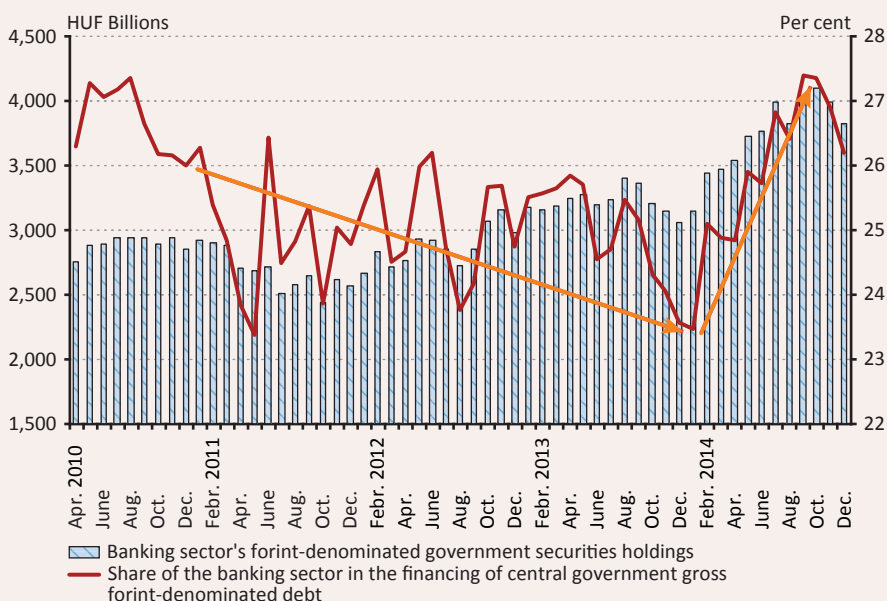
Chart 5
The banking sector's end-of-month forint-denominated securities holdings


Sources: MNB, supervisory balance sheet (historic cost), ÁKK

The effectiveness of the concept of self-financing is also corroborated by the fact that the position of the domestic banking sector strengthened in the market of forint-denominated government securities as well. While the value of banks' forint-denominated government securities amounted to HUF 3058 billion in December 2013, this holding was already HUF 3827 billion at the end of the year. It is true for forint-denominated papers as well that not only the nominal holding, but also the share of bank portfolio within forint-denominated government debt increased (from 23.6 per cent to 26.2 per cent). A rise in values was observed here as well already as of February 2014; then the share grew dynamically, except for the last months of the year.

Chart 6
Gross FX debt of the central budget at the end of each month
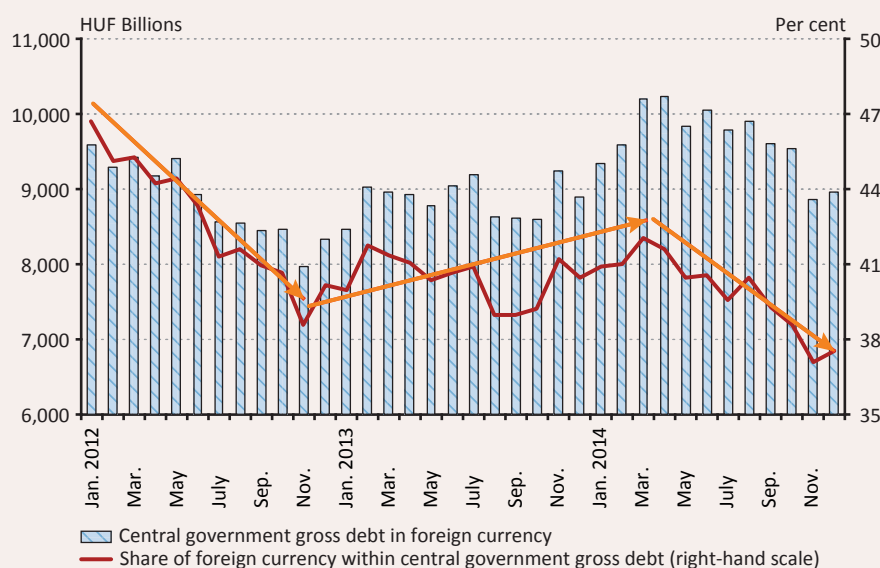

Source: ÁKK

In line with the negative net FX issuance, the share of the FX debt of the central budget declined. The ÁKK determined a maximum 45 per cent FX share within government debt in its January 2014 and May 2014 financing plans, and set the reduction of this share as an aim. The share of FX debt within total debt declined in 2012, before increasing slightly until March 2014. Starting from the spring of 2014, however, the FX share followed a declining trend again. Overall, this share decreased from 40.5 per cent to 37.5 per cent between December 2013 and December 2014. This took place in spite of the fact that the exchange rate of the forint against the euro rose in 2014 (at end-2013 the rate was 296.91, compared with 314.89 at end-2014), i.e. the FX debt expressed in forints increased. Excluding the exchange rate movements as well, in 2014 the share of FX debt within government debt declined to an even greater extent, by approximately 4.2 percentage points.

Banks' government securities holdings also increased, although to a lesser extent compared to the balance sheet total of the banking sector. The banking sector's government securities holdings as a proportion of the balance sheet total increased from 11.2 per cent in December 2013 to 13.4 per cent at end-2014. When evaluating the dynamics of the share within the balance sheet it has to be taken into account that in commercial banks' balance sheets the increasing government securities holdings show a smaller improvement in ratio than the nominally measured increment, which is partly due to the upswing in lending as a result of the Central Bank's Funding for Growth Scheme. Indeed, the ratio of banks' government securities holdings compared to the balance sheet total have grown steadily since end-2011. At the same time it is an important circumstance that banks' balance sheet total narrowed before 2014, but already expanded in 2014. Accordingly, prior to 2014, it was possible to maintain the share only by holding the government securities, while in 2014 active purchases of papers became necessary for that.

Chart 7
The banking sector's end-of-month forint- and FX-denominated government securities together

Banking sector's government securities holdings
Ratio of the banking sector's government securities holdings to total assets
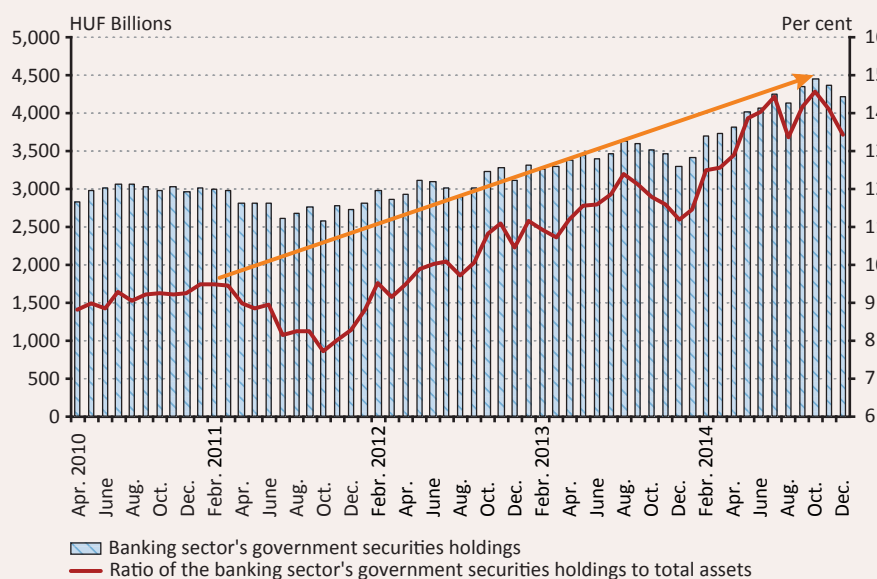
Sources: MNB, supervisory balance sheet (historic cost)

Chart 8
Average time to maturity of banks' forint-denominated government securities

Average time to maturity of banks' government securities holdings – 10-day moving average

Source: MNB, E04 data supply (nominal value)

In line with the concept of self-financing, the average time to maturity of banks' government securities became considerably longer in 2014. As the net issuance of discount Treasury bills was negative in 2014, a shift towards government bonds took place in the supply. Both the related central bank programme and the ÁKK's issuance strategy were optimised for the longer maturities, so a lengthening of the average time to maturity was also observed in the case of government securities held by credit institutions. The average time to maturity of banks' forint-denominated government securities increased from 2.8 years in December 2013 to 3.6 years in December 2014.

The realisation of the concept of self-financing is shown by the fact that in 2014 the role of the non-resident sector in the market of forint-denominated government securities was largely taken over by the banking sector. The favourable developments in demand in the government securities market observed in 2014 were coupled with advantageous changes in the structure of financing. Non-residents' share within forint-denominated government bonds fell temporarily from 45.9 per cent at end-December 2013 to below 43 per cent already in May, but in spite of the higher forint bond issues typical of the second half of the year it remained 41.1 per cent in December 2014 (in terms of the total forint-denominated government securities holding, non-residents' share shrank from 36.3 per cent to 34.1 per cent). In the period under review, the banking sector and the non-resident sector substituted one another in the government securities market; a decline in the portfolio of one of them was offset by an increase in the portfolio of the other one: between 2012 and 2014, the correlation between the time series consisting of monthly data of the forint bond holdings of the non-resident sector and the credit institution sector was -0.9. If the holding of credit institutions is reduced by the portfolio of mutual savings banks and money market funds, the correlation is -0.93 for the period of 2013-2014.

1.3 BRIEF EVALUATION OF THE DEVELOPMENTS IN 2015 Q1

The shift towards forint financing continued in January-March 2015. The shortage of available data does not allow an as detailed analysis of 2015 Q1 as that of 2014. Nevertheless, it is clear that the implementation of the concept of self-financing continues, as in the first three months of 2015 the ÁKK renewed a total FX debt corresponding to HUF 286 billion from forints (domestic FX bond issuance amounted to almost HUF 80 billion, while repayments reduced the FX debt by more than HUF 360 billion). As a result of the above, the share of FX debt within government debt continued to decline, from 37.5 per cent in December 2014 to 33.8 per cent at end-March. In parallel with that, the share of government securities held by the banking sector continued to increase slightly within the total government debt: from 17.6 per cent at end-2014 to 18.8 per cent in three months. The ratio of government securities holdings compared to the balance sheet total of the banking sector increased from 13.4 per cent in December to 14.8 per cent in March, and this increase is nearly the same as the one observed in the first two months of 2014.[5]

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[5] Stemming from the volatility of the indicators, the fundamental developments are seen primarily on the longer time series.

2 Contribution of the MNB's self-financing programme to the realisation of the concept of self-financing

2.1 THE MNB'S SELF-FINANCING PROGRAMME AND RENEWED INSTRUMENTS

A precondition for implementing the concept of self-financing is domestic investors' sufficient demand for government securities. Therefore, the MNB's self-financing programme aimed at stimulating domestic demand, and especially banks' demand for government securities. Even with the ÁKK's negative net FX issuance, foreign exposure can only decline if domestic actors buy the forint-denominated government securities by which the Hungarian state pays the maturing external debt. Of the domestic actors, households, which have become serious buyers in recent years, already took part in this process earlier as well, but domestic banks were active mostly at shorter maturities only, while financial stability would require their definite presence at longer maturities as well. Therefore, the renewal of central bank instruments first of all aimed at facilitating domestic banks' adjustment to the new financing environment of the increased net forint issuance in 2014. The Monetary Council of the Magyar Nemzeti Bank decided to renew its instruments at its meeting on 23 April 2014, which meant a four-point programme consisting of the following elements:

1. The form of the Bank's policy instrument changed: the two-week MNB bill was replaced by a two-week time deposit as of 1 August 2014.

2. As of 16 June 2014, a forint interest rate swap (IRS) instrument was introduced, in which the MNB pays variable interest against fixed interest.[6]

3. As of 16 June 2014, a 3-year secured forint loan (which has not been activated) became a part of potential central bank instruments.[7]

4. As of 16 June 2014, an asset swap transaction also became one of the potential central bank instruments. Within that, banks may receive FX-denominated securities in exchange for long-term forint-denominated securities (it has not been activated).[8]

The MNB's self-financing programme aimed at directing bank funds towards the government securities market, which – apart from the supply effects – may have resulted in an increase in banks' government securities portfolio and in a decline in government securities market yields. The renewal of central bank instruments facilitates the outflow of a part of bank funds from the main policy instrument, and indirectly encourages domestic banks to increase their share in financing the general government. Due to the deterioration in the liquidity of the Central Bank's main policy instrument, the conversion into deposits does it in a 'crowding-out' manner, while the IRS does it in a 'directing' manner stemming from the conditional nature.

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[6] The relevant product information is available on the MNB's website. For availability see the References.
[7] The relevant product information is available on the MNB's website. For availability see the References.
[8] The relevant product information is available on the MNB's website. For availability see the References.

Following the announcement of the MNB's self-financing programme, the ÁKK's 2014 financing plan changed in a way that allowed the implementation of the concept of self-financing. In January 2014 the ÁKK did not yet commit itself completely to use domestic funds, but following the announcement of the MNB's self-financing programme in April 2014, the debt manager modified its 2014 issue plan in May 2014. Compared to the January 2014 plan, the portion of maturing FX debt refinanced in forints increased. While this value was HUF 243 billion in the original plan, the amended one already included HUF 885 billion. Finally, in 2014 the ÁKK repaid FX debts amounting to a total HUF 766 billion from forints.

2.2 IMPACT OF THE CENTRAL BANK PROGRAMME ON THE GOVERNMENT SECURITIES MARKET ACTIVITY OF THE BANKING SECTOR

The concept of self-financing reshaped the balance sheet of the banking sector: there was a considerable increase in government securities holdings and in the main policy instrument, which is critical in terms of government securities purchases. Resulting from the distribution of the ÁKK's issue throughout the year, and from the relatively even course of purchases by banks, the share of banks' government securities holdings within their balance sheet total followed a rising trend throughout 2014 (Chart 7). In addition, a clear and direct effect of the central bank programme is that upon the conversion of the main policy instrument into deposits, i.e. in August 2014, the balance sheet total of the banking sector increased by some HUF 1400 billion,[9] of which even more than HUF 1100 billion could have been explained by the fact that credit institutions took over liquidity that had earlier been kept in the main policy instrument from actors outside the banking sector, i.e. from foreign investors and domestic non-bank, institutional investors. The increase in two-week holdings is favourable from the aspect that this is a precondition of banks' government securities purchases; namely, without an adequate amount of central bank liquidity, banks are unable to support the self-financing. After being crowded out from the two-week instrument, non-bank institutional investors also took a portion of the free liquidity to the government securities market, which also contributed to the implementation of the self-financing programme.
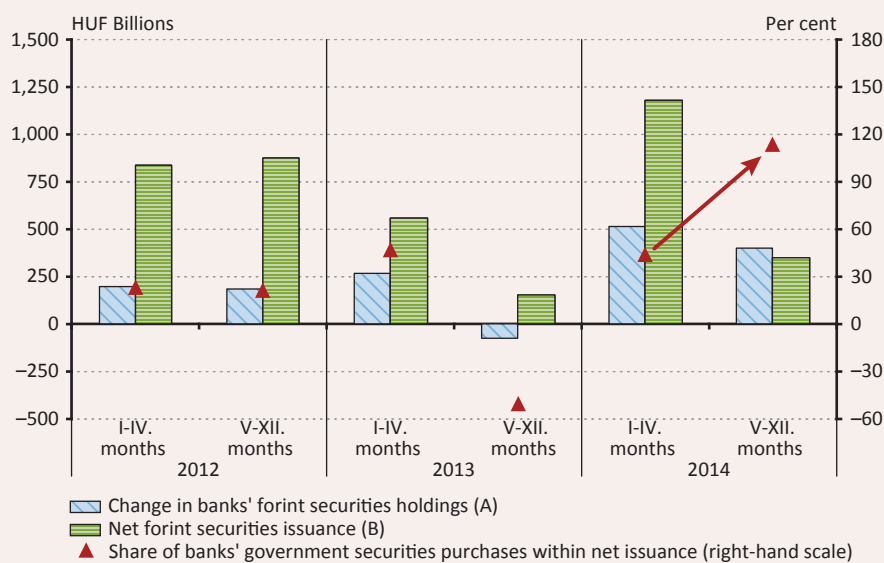
2.2.1 Banks' willingness to purchase government securities

The central bank programme entailed immediate and lasting demand stimulating effects as well in terms of banks' government securities market activity. It can be considered an immediate effect that there was significant demand at the government securities auctions held after the announcement of the programme; it was especially true in the case of fixed-rate bonds with a maturity of five years. Prior to the April announcement, the excess demand at the government securities auctions was 1.98-fold; following the announcement the average rate increased to 2.38-fold. This same ratio in this same cross-check increased from 1.99-fold to 2.25-fold in the case of Treasury bills.

The favourable effect of central bank instruments is shown by the fact that following the announcement of the programme banks purchased more government securities than before the programme. The ÁKK's net government securities issuance was concentrated to the beginning of the year, so the volume of significant government securities purchases carried out by banks at the beginning of the year needs to be taken into account accordingly. Due to the ÁKK's 'frontloaded' issuance, compared to the cumulative net government securities issuance the proportion of the cumulative increase in banks' government securities holdings since the beginning of the year followed a rising trend (the indicator increased from 18 per cent in January to 47 per cent in December). Although this ratio surged considerably in February, this proved to be temporary only, and the indicator started to follow a rising path after April. It is to be noted that in the previous years the above ratio declined continuously during the year, which also shows that the MNB's programme facilitated banks' government securities purchases.

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[9] Source: supervisory balance sheet data, excluding mutual savings banks.

Chart 9
Cumulative government securities issuance and government securities purchases by banks

Legend:
- Change in banks' forint securities holdings (A)
- Net forint securities issuance (B)
- ▲ Share of banks' government securities purchases within net issuance (right-hand scale)

Sources: MNB, supervisory balance sheet (historic cost), ÁKK

The banks involved in the self-financing contributed significantly to the increase in the banking sector's government securities holdings. At end-March 2015 the forint- and FX-denominated government securities holdings owned by banks were some HUF 810 billion higher than the average government securities holdings in 2014 Q1 (this is the base holding applied in IRS tenders). The increase was almost exclusively related to the banks that were connected to the self-financing programme through the central bank IRS directly or through the conversion into deposits indirectly (the latter group mainly covers the credit institutions that are active and carry out high volumes of payment transactions in the money market and were more strongly affected by the conversion into deposits). The added value of the programme is increased by the fact that the banks not connected to the self-financing programme reduced their holdings by a total HUF 75 billion.

The success of the self-financing programme and the increased activity of domestic banks is demonstrated by the fact that the share of FX debt within government debt started to decline after the announcement of the programme (Chart 6). This indicates that the programme may have contributed to the decline in FX debt. It is not unprecedented that the ÁKK repays FX maturities partly from forints, as it happened in 2012 as well. Nevertheless, it can be assumed that in 2014 the bank demand stimulating steps of the central bank programme could have a material contribution to the decline in the FX ratio. However, a significant difference is that in 2012 it was mainly non-resident investors that purchased the forint-denominated government securities, whereas in 2014 the resident sector was the determinant on the purchasing side.

2.2.2 The stability of banks' government securities portfolio

The MNB's programme contributed to making the banking sector's government securities purchase more stable. The two-week bill was converted into deposits as part of the central bank programme, which means a permanent change in the set of monetary instruments, requiring permanent adjustment from credit institutions as well. It also strengthens stability that the banks participating in the central bank IRS tenders undertake to hold in their respective balance sheets eligible securities increased by the IRS holding they had recourse to until the end of the term of their interest rate swaps concluded with the MNB (but at least for one year). This stabilising effect may have contributed to the fact that the increase in the share of banks' government securities holdings within government debt, which started in February 2014, remained steady during the year.

The examination of the figures at individual bank level as well reveals that where government securities holdings increased following the announcement of the programme, they typically remained at permanently high levels. Following the Central Bank's announcement in April 2014, the banks concerned by the conversion into deposits adjusted their government securities holdings between May and July, and this adjustment proved to be permanent.

Chart 10
Changes in government securities holdings owned by the banking sector compared to 2014 Q1
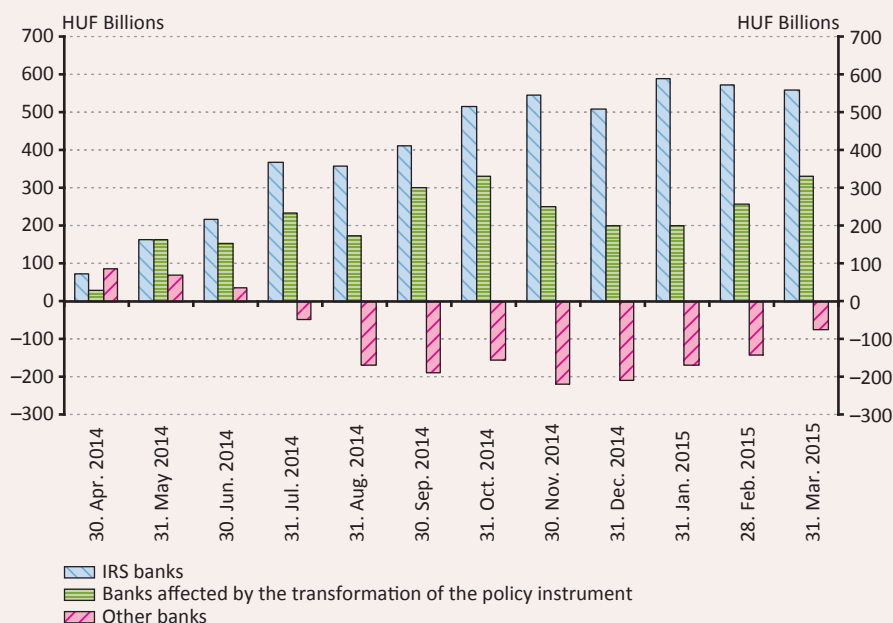
Source: MNB, data from government securities statistics (nominal value)

2.3 THE IMPACT OF THE CENTRAL BANK PROGRAMME ON LONG-TERM GOVERNMENT SECURITIES MARKET YIELDS

By stimulating banks' demand for government securities, the central bank programme had an impact not only on the size of banks' government securities holdings but also on market yields. The renewed central bank instruments stimulated banks' demand, which may have triggered adjustment both in terms of quantity and price in the market. In order to show the effect of the programme we examined the correlation between the self-financing programme and government securities yields with the help of regression equations. It needs to be emphasised, however, that the impact of the self-financing programme cannot be separated directly and in an evident manner from the other relevant factors; the econometric model that was set up is able to detect only the co-movement of individual variables.

The objective of our analysis was to identify the factors that influence government securities market yields and to test whether the self-financing programme had a significant impact on the 3- and 5-year government securities market yields. With regard to the self-financing programme, our analysis dealt with the effect of the announcement of the programme and the implementation of the conversion into deposits as well as the use of the central bank IRS. Of the control variables, we analysed the effects of the changes in the 3-month government securities market reference yield, the 3- and 5-year interest rate swap spread, the forint exchange rate, yields in the region, the risk indicator and FX swap market indicators (CIRS and implied forint interest rate) as well as of the developments in global tensions.

The announcement of the self-financing programme, and that of the central bank IRSs in particular, contributed to the decline in long-term government securities market yields. The regression results show that – although to a small extent – already the announcement of the programme had a reducing effect on the

3- and 5-year interest rates. In addition to this one-off, temporary impulse it can be established that the effect of certain other factors influencing the yields was lasting as a result of the announcement of the programme and the implementation of the conversion into deposits, leading us to conclude that the government securities market became more stable and external vulnerability declined. In addition, the model suggests that recourse to the central bank IRS tenders also contributed to the decline in yields. The model is described in Appendix I.

Around one third of the decline in yields observed since April 2014 may indirectly or directly be connected with the central bank self-financing programme. With the uncertainty of the estimation, based on the regression models, the announcement of the self-financing programme resulted in a slight shift in negative direction both in the case of 3-year and 5-year yields, while in the case of the central bank IRS instrument a continuous and permanent effect can be detected. According to the model, the EMBI indicator, which expresses the pass-through of international risks, became significant with a positive coefficient as expected, but following the announcement of the central bank programme a significant part of the influence of the indicator on government securities yields disappeared. In the model, of the control variables, the effect of the EUR/HUF exchange rate was outstanding, but in the case of the 5-year yield the effect of the change in the exchange rate weakened considerably after the conversion into deposits. The decline in the dependency on international risks, FX swap markets and the forint exchange rate may be connected with the more stable demand in the government securities market; the correlation is significant. Overall, the self-financing programme may have directly resulted in a 31–33 basis point decline in the 3- and 5-year government securities market yields, whereas the decline taking account of the indirect effects as well may have reached a total 71–79 basis points. Between the April 2014 announcement and March 2015 the total decline in yields was 230 and 214 basis points respectively, i.e. roughly one third of the total decline may be related in some form to the self-financing programme.

Table 2 Direct and indirect effects of the self-financing programme on the three- and five-year government securities yields		
Government securities market yield	**Three-year**	**Five-year**
Announcement of the self-financing programme	−3 bp	−5 bp
Central bank IRS tenders	−30 bp	−26 bp
Decline in the pass-through of global risks (EMBI)	−48 bp	−48 bp
Decline in exposure to the EUR/HUF exchange rate	−	+8 bp
Becoming independent of the FX swap market	+2bp	−
Aggregate effect of the self-financing programme	**−79 bp**	**−71 bp**
Total decline in yields (April 2014 – March 2015)	*−230 bp*	*−214 bp*

2.4 EVALUATION OF THE CENTRAL BANK INTEREST RATE SWAP TENDERS

2.4.1 The central bank interest rate swap tenders

The central bank IRSs allow the management of banks' interest rate risk; within the transaction, the MNB pays a variable interest in exchange for a fixed one. The objective of the self-financing programme is that banks hold government securities (preferably longer-term government bonds) instead of the MNB's instruments, which, at the same time, also means that banks' interest rate risk increases due to the longer maturity. In order to prevent the increasing interest rate risk from becoming an obstacle to banks' government securities purchases and through that to the implementation of self-financing, the MNB included an interest rate swap in its set of instruments that allows banks to swap the typically fixed interest rates of government securities for variable rates. The price of the central bank transaction can be captured with the fixed interest rate paid by the bank, as this is the price that the bank offers in exchange for the cash flow based on future variable rates. The difference between the market and central bank IRS prices can be considered as the fee paid to the banks

for meeting the central bank condition.[10] With the condition of having recourse to the interest rate swaps, the banks participating in the IRS tenders undertake to increase their own adjusted eligible securities holdings in line with the volumes of the interest rate swaps concluded. The holding of eligible securities is taken into account at nominal value and in forints, using the foreign-exchange rate of 31 March 2014. The holding does not include securities issued by the Central Bank, securities of own issue or issued by affiliated companies. In addition, own holdings are reduced by securities received in delivery repo and securities lending transactions as well as in sell&buy-back transactions, and increased by securities handed over in transactions of the same types.

Since 26 June 2014 the MNB has held interest rate swap tenders on a biweekly basis, and until end-March 2015 it accepted offers amounting to a total HUF 437 billion, compared to an announced amount of HUF 610 billion. As for the distribution by maturities, with the exception of three tenders, the demand for the 5-year instrument exceeded that of the 3-year one. IRSs amounting to HUF 159 billion and HUF 278 billion were allocated at the tenders for 3 years and 5 years, respectively. In addition to increasing their government securities holdings by HUF 437 billion, by concluding the transactions the credit institutions also undertook indirectly not to reduce their holding of eligible securities owned by them already in the base period and amounting to HUF 1200 billion (mainly forint-denominated government securities portfolio) until the end of the term, but at least for one year.

At the interest rate swap tenders held, higher demand was seen for the 5-year maturity than for the 3-year one. The asymmetry between maturities may be explained by the following reasons.

1. **With a longer-term transaction the bank is able to manage its interest rate risk over a longer period of time.** The investor treats its long-term government bond exposure with the central bank IRS. An argument for the longer-term IRS may be that a longer-term government bond carries higher interest rate risk stemming from the longer average time to maturity.

2. **A longer-term transaction allows higher coverage.** Of two IRSs of the same quantity the longer-term transaction allows higher coverage. A bank can cover the interest rate risk of a 3-year government bond with a 3-year IRS equalling the nominal value of the government security. However, if a bank does the same with a 5-year IRS, it has to conclude an IRS for a quantity lower than the nominal value of the government bond; approximate coverage is still feasible (but it has to undertake the central bank condition for a longer time).

3. **With a longer interest rate swap a bank can undertake the central bank condition for a longer period of time, and may use the central bank IRS over the longer term in exchange.** In terms of bank profitability it may be advantageous that the difference between central bank and market IRS measured in a given basis point may mean higher remuneration in 5 years than in 3 years. At the same time it also means that from the central bank counterparty's point of view the net present value of the 5-year IRS upon starting is higher than that of the 3-year one in the case of similar pricing.

4. **The MNB encouraged counterparties to use the longer maturity with its pricing.** In the first 5 tenders the maximum difference between the central bank and market IRS prices was greater at the 5-year maturity than at the 3-year one. At the same time, the amount placed by the MNB was higher at the 5-year maturity than at the 3-year one. Moreover, due to the 'frontloaded' nature of the programme, these tenders were determining for the programme as a whole.

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[10] In order to cover the credit risk, the MNB applies a margin in IRS transactions, i.e. upon concluding the transaction it deposits the amount corresponding to the negative net present value on the cover account of the counterparty.

2.4.2 Central bank IRSs and banks' demand in the government securities market

There was a considerable increase in demand in the primary market of government securities following the first IRS tenders. The central bank programme entailed immediate and lasting demand stimulating effects as well in terms of banks' government securities market activity. It can be considered an immediate effect that in June, in connection with the first announcement of the IRS tender, the demand for five-year fixed-rate bonds was nearly four times higher than the accepted quantity. In relation to the successful IRS tenders, in the case of the five-year bond – with the exception of the auction on 2 October – bids were received for at least the double of the accepted amount on every occasion. It can be regarded as a permanent effect that there was a material increase in demand at the primary market of government securities following the interest rate swap tenders. In the period preceding the first IRS tender the demand was 2.09-fold higher on average than the accepted amount in terms of the total government securities holding; in the subsequent period this ratio grew to 2.32-fold.

In the period under review, banks participating in the tenders increased their government securities holdings broadly in line with the size of the IRS they had recourse to. Compared to the basis of the self-financing programme, until end-March 2015 the banks having recourse to the IRS purchased forint-denominated government securities amounting to more than HUF 550 billion, while recourse to IRS was HUF 437 billion. As a result, banks' coverage ratio was 128 per cent, i.e. one unit of IRS purchase was associated with 1.28 units of government securities purchase. Assuming that the government securities purchase took place as a result of the recourse to the IRS or at least 'with the support' of the central bank IRS, it can be established that the central bank interest rate swaps were effective in the sense that they facilitated banks' government securities purchases. Although the condition related to the central bank interest rate swaps can be met not only with fixed-rate but also with variable-rate government securities, in an economic sense the IRSs can be used for the coverage of fixed-rate bonds. If we focus on the fixed-rate papers only, it indicates a somewhat lower effectiveness of the IRSs (coverage ratio: 75 per cent).

2.4.3 Pricing of central bank IRS transactions

The price of the central bank interest rate swap is the size of the fixed interest rate paid by banks, as the MNB pays a variable interest in exchange for the fixed rate. The price of the central bank IRS transactions is determined at the auctions; the MNB determines the lowest acceptable fixed interest rate at which it is willing to accept bids. When calculating the minimum interest rate, the MNB takes the relevant market developments and prices as a basis, with special regard to the markets of interest rate swaps as well as fixed- and variable-rate government bonds. During pricing the MNB also has to take into account that the central bank interest rate swap is a conditional instrument; therefore, conditionality also needs to be reflected in the price. It means that the price of the central bank IRS is justified to be below the price of the market IRS. In an economic sense, the difference between the two prices is the 'price of the conditionality' of the central bank instrument. The domestic, market IRS transactions to which the prices of the central bank IRS are compared are presented in detail by Kocsis et al. (2013).

The announced price of central bank IRSs were basically determined by market trends. In the IRS tenders held between 26 June 2014 and end-March 2015 the proposed premiums belonging to the announced minimum interest rate stayed typically within the no-arbitrage upper bound. The prices offered at individual tenders were mostly determined by the trends observed in the market; the MNB's discretionary decision typically affected the movement within the band designated by market developments. The primary objective of the possible differences observed in the pricing of individual tenders was the scanning of the market, the determining of the acknowledged fair price of the central bank IRS.

Box 1

Aspects of the pricing of the central bank IRS

The starting point of the pricing of the central bank IRS is that assuming efficient markets the price of market IRSs may fluctuate within a band between a determinable minimum level and a maximum that makes arbitrage impossible (about the calculation of the no-arbitrage upper bound see Appendix II). The pricing band and the announced price are based on the current prices, quotations and turnover data of the markets of interest rate swaps, fixed-rate government bonds and variable-rate government bonds. The pricing band also takes into account that the purchase of a fixed-rate government bond combined with central bank IRS should provide a yield similar to that of purchasing a variable-rate government bond. The pricing band measures the potential shift of the market IRS, i.e. it does not take into account that due to the stipulated condition the central bank IRS is not a market product. It means that in view of the conditionality the price of the central bank IRS does not necessarily fall into the pricing band.

The MNB determines the minimum fixed interest rate announced at the IRS tender taking account of the following:

(1) market developments and prices taken into account in the pricing;

(2) the price of the condition of holding government securities, the size of which is not evident due to lack of relevant market prices;

(3) the MNB's intention to stimulate or restrain demand, i.e. at what price the MNB's objective of stabilising the government securities market and facilitating the increase of banks' government securities holdings may be achieved.

As there is no conditional IRS in the market, it is difficult to determine the price of purchasing and holding government securities. Therefore, the MNB has to 'scan' at what premium banks are willing to undertake and meet the MNB's condition. It means that the minimum fixed interest rate determined by the MNB may change from tender to tender, as this is the only way for the MNB to approach the 'fair' price.

The price announced at the tenders may also alter depending on the current market conditions. In central bank IRS pricing both the premium (i.e. the difference between the IRS interest rate and the government security yield with the same maturity) and the price of conditionality (i.e. the difference between the prices of the central bank and market IRSs) are relevant, as bank strategies may optimise to both factors.

2.4.4 Bank strategies and central bank IRS tenders

When purchasing the instrument, the banks participating in the central bank interest rate swap tenders may have been led by different motives.

1. **The banks following the 'fixed government security + central bank IRS' strategy may have been motivated by the intention to cover their interest rate risk with the central bank instrument.** In order to cover the interest rate risk of the purchased fixed-rate government security, banks concluded interest rate swaps at the central bank tenders, and as they did not enter into further transactions with them, one may assume that they intended to cover the interest rate risk of the purchased government security. From these banks' point of view the premium on the central bank IRS, i.e. the difference between the yield on fixed-rate government securities and the IRS interest rate that evolved at the central bank tender may have been of special importance.

2. **The banks following the 'variable government security + central bank IRS' strategy may have been interested in the yield attainable on central bank interest rate swaps.** These banks may not have primarily been led by risk management considerations. Although the banks that follow this type of strategy have fixed rate bond

holdings as well, their size is below the IRSs used. Based on statistical data supplies, these banks may have immediately entered into further transactions on the basis of the IRS transactions concluded. This bank strategy does not contradict the MNB's objective, as these banks also had to accept the condition of the IRS.

3. **Banks following a mixed strategy may have been motivated by both risk management considerations and the aspects of yield maximisation.** Based on available statistical data, these banks used the interest rate swaps provided by the MNB for the management of the interest rate risk of their newly purchased as well as already existing fixed-rate government bonds. In addition, however, they may have used the instrument for a yield-oriented purpose as well, as they may have entered into further transactions with other actors using a portion of the IRSs.

In line with the spirit of the central bank programme, banks fulfilled the condition related to having recourse to the IRSs mostly by purchasing fixed government bonds. Nearly two thirds of the banks having recourse to the central bank interest rate swaps followed the 'fixed government security + central bank IRS' strategy. The banks that follow a mixed strategy driven by both risk management and yield realisation considerations accounted for one quarter of the total value, while the share of banks choosing the 'variable government security + central bank IRS' exceeded 15 per cent.

2.4.5 Control related to the central bank IRS tenders

Looking at the latest available data, i.e. the February 2015 adequacy, the holding of eligible collateral of banks participating in the tenders was HUF 560 billion higher on a three-month average than the base holding. With the participation in the tender, the banks participating in the MNB's interest rate swaps undertook to increase the stock of their eligible collateral with the amount of the IRS they had recourse to, compared to their average holding in the base period, i.e. at end-January, -February and -March 2014. Relative to the base, eligible collaterals of the banking sector as a whole rose by HUF 696 billion. During the checking of the February 2015 adequacy, the average of the end-January, -February and -March 2015 holdings were taken into account both in the case of IRSs used and the eligible collateral. Upon determining the eligibility threshold, the formula included in the terms and conditions of the instrument was applied.[11] The checked holding covers not only forint-denominated government securities, but also mortgage bonds and FX-denominated securities issued in foreign depositories.

Examining the February adequacy we concluded that each bank using the IRS complied with the conditions undertaken. Looking at the previous checks, it happened in August and September 2014 that there was a bank among IRS tender participants that did not meet the condition stipulated in the terms and conditions regarding the eligible collateral. Considering the circumstances, the negligible extent and temporary nature of the non-performance, the MNB did not deem it justified to impose any sanction. Upon checking the October adequacy and the subsequent periods all the IRS banks completely met the condition undertaken; the previously non-performing bank also increased its holdings sufficiently.

Table 3
Compliance of the banks participating in the IRS tenders with the conditions

Period under examination	Compliance	Non-compliance	Number of banks using IRS (total)
August 2014	5	1	6
September 2014	6	1	7
October 2014	7	0	7
November 2014	7	0	7
December 2014	7	0	7
January 2015	7	0	7
February 2015	7	0	7

[11] The relevant product information is available on the MNB's website.

2.5 EVALUATION OF THE TRANSFORMATION OF THE MAIN POLICY INSTRUMENT

2.5.1 Converting the two-week MNB bill into two-week MNB deposit

The transformation of the main policy instrument took place in the first half of August 2014; the changeover was free of technical problems. The MNB announced the first tender of the two-week deposit facility on 6 August 2014, resulting in an inflow of liquidity amounting to nearly HUF 3000 billion from banks replacing maturing MNB bills worth HUF 2600 billion. In the second tender – which, at the same time, also meant the end of the process of conversion into deposits – banks deposited a further HUF 1978 billion in central bank deposit, with total deposits increasing to HUF 4977 billion. As a result, the starting value of the MNB deposit was nearly HUF 260 billion higher than the closing stock of the two-week bill (at end-July, the two-week sterilisation holding amounted to HUF 4719 billion). This difference stems from the following:

– the crowding out of certain market participants does not entail a decline in the two-week holding, as the liquidity continues to appear in the MNB's balance sheet (the structure of the holding changes);

– according to the seasonality within the month, increasing the holding is typical at the beginning of the monthly reserve maintenance period, because banks then manage their liquidity less cautiously, while approaching the end of the month the overnight facility plays a greater role.

Chart 11
Impact of the transformation of the two-week MNB instrument on the portfolio
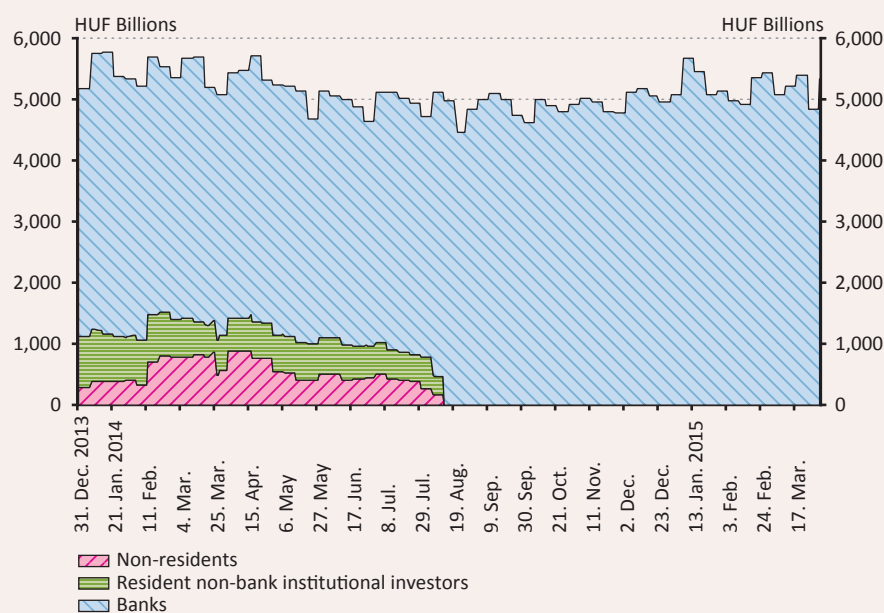


Source: MNB (nominal value)

2.5.2 Effect of the self-financing programme on monetary transmission

The monetary transmission mechanism indicates the process through which the monetary policy (or a central bank interest rate decision) has an impact on the ultimate goal of monetary policy, i.e. inflation (or on economic output). The first step of the transmission mechanism is the attainment of the operational objective of monetary policy. The operational objective is attained if money market yields reflect the level of the base rate and the related expectations well. The traditional task of monetary policy instruments is to facilitate the attainment of this operational objective. Therefore, it is justified to examine how the transformation of the instruments affected monetary transmission.

As a result of the conversion into deposits, the banking sector's demand for substituting liquid forint assets increased considerably, exerting downward pressure on money market yields. It was partly attributable to the fact that with the termination of banks' MNB bills outstanding the scope of banks' eligible collateral declined, and they wanted to make up for it. And it was partly attributable to the fact that following the conversion into deposits, other MNB bill owners placed short-term forint deposits in the banking sector, which strived to invest them into liquid assets. Accordingly, while the supply of liquid assets declined due to the termination of the two-week bill, the demand for liquid assets also increased in the banking sector. Consequently, the yield on liquid assets fell compared to that of illiquid assets. First, in July 2014, discount Treasury bill yields departed from the base rate, then, following the conversion into deposits in August other money market yields (HUFONIA, FX swap market implied forint yield) also declined. Meanwhile, the 3-month spot yield calculated from the FRA yields remained at the level of the base rate, suggesting that the yields were depressed by the banking sector's increasing demand for discount Treasury bills and its money market credit supply in general.

The frictions affecting monetary transmission typically remained temporary. In August and September 2014, monetary transmission deteriorated temporarily, which was reflected not only in the low money market yields but also in the increase in overnight central bank deposits. The situation became partly consolidated as of October 2014; overnight deposits returned to their earlier level. However, of the money market yields, the HUFONIA and the discount Treasury bill yield settled at a somewhat lower level than where they had stayed prior to the conversion into deposits (relative to the base rate and the related expectations). In contrast, throughout the whole period, the spot yield calculated from the FRAs reflected the expectations concerning the base rate well, while – apart from seasonal declines at the end of individual quarters – the FX swap market implied forint yield rose back close to the FRA yield as of October.

Chart 12
The HUFONIA in the interest rate corridor
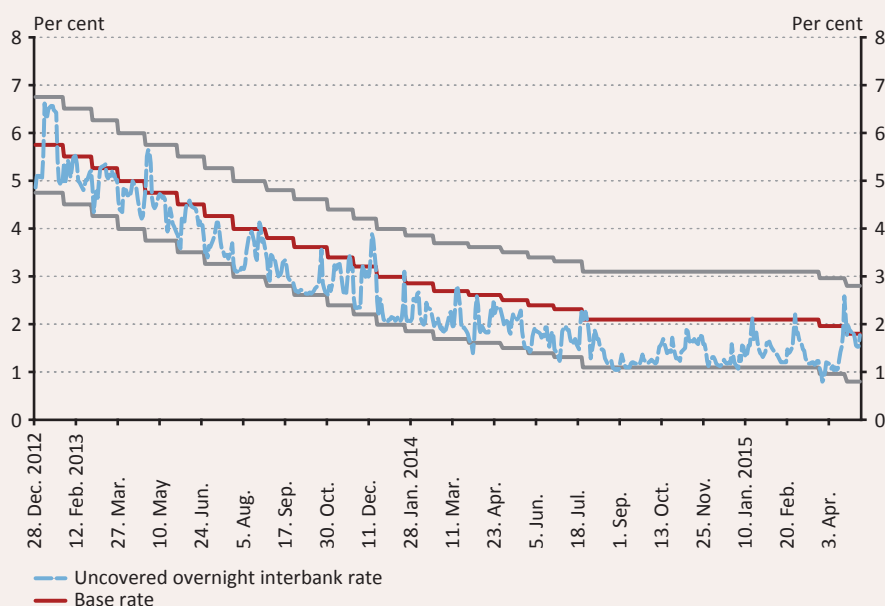
3 Impact of the self-financing programme on the MNB's balance sheet and profit/loss

As a result of the refinancing of foreign currency liabilities from forints, the concept of self-financing ceteris paribus narrows the balance sheet of the MNB. The ultimate source of the ÁKK's increased forint issuance in 2014 and of the refinancing of FX maturities from forints was the foreign exchange reserves: the government used the portfolio of treasury accounts increased from higher forint issues in a way that the extra forint issue was converted into foreign currency at the MNB, and the foreign currency acquired this way was used to repay the maturities of its FX debt, which, at the same time, reduced the foreign currency reserves as well. Ultimately, the increasing forint issue reduced the two-week deposits, and in parallel with the higher treasury deposits, the liquidity of the banking sector also deteriorated, while the government's conversion against the Central Bank did not affect the liquidity of banks.

The FX reserve adequacy allowed the reduction of FX reserves related to the self-financing programme. At end-March 2014, prior to the announcement of the MNB's self-financing programme, FX reserves amounted to EUR 36.2 billion; by end-2014, FX reserves declined to EUR 34.6 billion. The size of the decline approximately equals the amount by which the repayment of the EU loan reduced the reserves in the autumn of 2014 (EUR 2 billion). Other factors influencing the FX reserves broadly offset one another in this period. In parallel with that, in the same period the size of short-term external debt – which is an important indicator of reserve adequacy (Nagy – Palotai, 2014) – declined to a much greater extent (by some EUR 7 billion) than the reserves (from EUR 28.3 billion at end-March 2014 to EUR 21 billion at the end of the year). In addition to bond maturities, it played a major role in the decline that the repaid EU loan was a short-term one and also that non-residents' MNB bill holdings declined to zero in connection with the conversion into deposits.[12]

Within the framework of the concept of self-financing the Hungarian state repaid external FX debt of EUR 2.5 billion in 2014 and a further almost EUR 1 billion in 2015 Q1 from forints, i.e. ceteris paribus the MNB's balance sheet narrowed by this amount. The magnitude of balance sheet narrowing is defined as the extent to which the ÁKK repaid matured FX debt from forints: this value was EUR 2.5 billion in 2014, and somewhat less than EUR 1 billion in 2015 Q1. Several factors have an impact on the balance sheet of the MNB: of the balance sheet increasing items, the inflows of EU transfers and the FGS are outstanding, whereas the repayment of FX loans, the government's FX expenditures and the FX interest expenditures point to the narrowing of the balance sheet. Due to the other factors, the concept of self-financing alone is unable to actually narrow down the MNB's balance sheet. It can be stated, however, that – by definition – the concept of self-financing points to narrowing the central bank balance sheet. The ÁKK's net FX issuance amounted to HUF −766 billion in 2014 and HUF −286 billion in the first three months of 2015. Repaid external debt amounted to EUR 4.1 billion and EUR 1.2 billion, respectively. The difference is explained by the FX bonds sold to households (and thus not affecting the external debt) (such issues amounted to EUR 1.6 billion and EUR 250 million, respectively). As the central bank cost of funds is higher than the yield on foreign exchange reserves, the narrowing of the central bank balance sheet means an interest saving for the MNB.

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[12] Some of non-residents' MNB bills may have turned into bank deposits; therefore, the decline did not completely appear in the decline in short-term debt.

In the period since the beginning of the self-financing programme, the interest rate environment has been favourable for the MNB, resulting in positive revaluation of the central bank IRS portfolio. The value of central bank IRSs is changed by the shift in the yield curve. In the past almost one year, the decline in yields (the shift in the yield curve) 'reversed' the value of IRS transactions, which, on aggregate, already show a gain from a central bank point of view. If the yield curve permanently sinks during the term of the interest rate swap, the MNB has to pay a lower interest to its counterparties than the one calculated initially, i.e. the value of the transaction increases for the MNB. Following from the declining yield environment, the vast majority of the IRSs in the MNB's portfolio in connection with the self-financing programme had a positive net present value from a central bank point of view in March 2015.

In view of the peculiarities of pricing upon closing, a possible closure of the transactions would entail an even greater gain for the MNB than the current value. First it is possible to close the IRS transactions upon banks' initiatives following the passing of the 52nd week after the initial value date of the transactions. In this case, however, the transaction is evaluated with an interest that is less favourable for the banks than the original. It is important to emphasise that if the interest rate risks stemming from the IRS transactions and the balance sheet narrowing of the MNB are examined together, the programme, on the whole, did not add to the interest rate risk of the MNB. During a possible short yield increase the MNB would pay higher interest on the IRSs, but this is offset by the lower interest rate risk present in the decline in the outstanding two-week MNB facility. It is justified to examine these two factors together, as it was exactly the application of central bank IRSs and the generated bank demand that allowed higher forint issues by the ÁKK and thus the balance sheet narrowing as well.

Chart 13
The IRS yield curve between June 2014 and March 2015
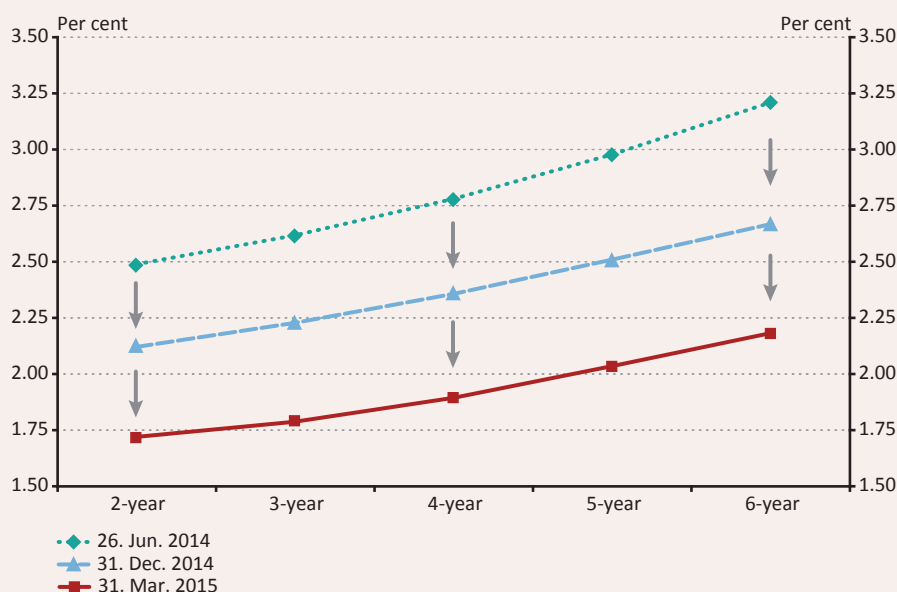
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Appendix I: The impact of the self-financing programme on government securities market yields

HYPOTHESES, DATA AND THE REGRESSION MODEL

The examination of government securities market yields is the subject of a number of studies. The study of the OECD (2009) expressly examines the sovereign risk premium and concludes concerning euro area countries that in addition to market reactions and the general risk aversion experienced during the crisis, the fiscal indicators of individual countries also determined the developments in premia. The study of the IMF (2012a) also examined the global risk aversion in the case of emerging countries. The IMF analysis (2012b) concerning developed countries found that government debt was the determinant in the developments in yields. The Fed (2010) verified the effect of government debt and budget deficit using the data of OECD countries. The paper by Bauer and Rudebusch (2013) calls attention to the impact of inflation expectations on the basis of the behaviour of US yields. Monostori (2012) examines the premium on Hungarian sovereign forint bonds, decomposing it to credit, liquidity, exchange rate and interest rate risks. Domestic interest rate expectations and the term premium are discussed by Horváth et al. (2014).

This analysis explores the factors that influence government securities market yields, with special regard to the effects of the self-financing programme. According to our assumption, the programme had a favourable impact on the developments in yields, reducing them and thus the funding costs of the government as well. Our analysis focused on the 3- and 5-year yields because they were the maturities on which the programme may have had a targeted impact.

The following hypotheses were formulated in the course of the study:

Hypothesis 1: The announcement of the self-financing programme had a reducing effect on long-term yields. The consideration behind this is that market participants expected an increase in demand in the government securities market and a decline in yields already as from the announcement.

Hypothesis 2: Recourse to the central bank IRS instruments reduced long-term yields. In this case it can be assumed that the recourse added to the demand in the government securities market directly, resulting in a decline in yields.

Hypothesis 3: The programme reduced the vulnerability of the government securities market. The more stable demand may result in a decline in the exposure of domestic yields to external effects.

The estimated multivariable linear regression models are based on daily frequency data series starting from 2013. The data series consisting of 519 observations includes the year of the announcement and introduction of the self-financing programme as well as the previous year for comparison. The result variables of the model are the 3- and 5-year government securities yields, whose time series stem from the data of the secondary market reference yield curve. The explanatory variables include those variables that capture the effects of the self-financing programme. Another group of independent variables is constituted by control variables, whose role is to prevent us from attributing effects to the programme that would have actually materialised even without the programme.

It can be established of the result variables that their level follows a unit root process (based on augmented Dickey–Fuller and Phillips–Perron tests); therefore, the differences between variables are examined below. Accordingly, the developments in regression functions are as follows:

$$\Delta 3y = \Delta X_p \beta_p + \Delta X_k \beta_k + \varepsilon$$

$$\Delta 5y = \Delta X_p \beta_p + \Delta X_k \beta_k + \varepsilon$$

where $\Delta 3y$ and $\Delta 5y$ indicate the changes in 3- and 5-year government securities market yields, ΔX_p indicates the change in the explanatory variables of the self-financing programme, ΔX_k indicates the vector of the change in control variables, $\beta_p + \beta_k$ indicate the vector of the coefficients of the explanatory variables, while ε indicates the error terms.

The elements of the variables explaining the self-financing programme (X_p): *the announcement of the programme (bejel), the date of conversion into deposits (betet) and the variable of having recourse to the central bank IRS (irs)*.

The group of control variables (X_k): the 3-month government securities market reference yield, the 3- and 5-year interest rate swap spreads, the forint exchange rate, the yields in the region, the risk indicator (JP Morgan EMBI Global index), FX swap market indicators (*CIRS* and *implied forint interest rate*), global tensions dummy.

In addition to the above listed variables, cross products were also tested, which express how the impact of individual explanatory variables on the dependent variable changed in the period following the announcement of the programme or the implementation of the conversion into deposits. The data are available in the databases of Bloomberg and Reuters as well as on the MNB's website or can be computed from them.

RESULTS

The results of the two models stated for the changes in 3- and 5-year government securities market reference yields are summarised in the table below. The estimation was carried out using the method of ordinary least squares (Maddala, 2004); upon the calculation of standard errors, heteroskedasticity and autocorrelation consistent Newey–West HAC correction was applied (Newey–West, 1987).

The explanatory power of the models is 67 per cent in the case of the 3-year yield and 65 per cent in the case of the 5-year yield. Of the cross products tied to the conversion into deposits, the result was not always significant, but the developments in the signs of the significant explanatory variables were in conformity with the expectations in each case.

Based on the results of the regression estimation, the self-financing programme caused a decline of 31–33 basis points directly, in addition to which the existence of indirect effects may also be assumed. Together with the indirect effects, the regression estimates indicate a total 79 basis points and a total 71 basis points decline in the case of the 3-year yield and the 5-year yield, respectively. Between the announcement and March 2015 the total decline in yield was 230 and 214 basis points respectively, i.e. roughly one third of the total decline may have been explained by the effect of the programme.

The robustness of the models was tested by changing the examined horizons. Our estimations for a one year longer horizon carried out on a sample starting from 2012 and using identical explanatory variables resulted in weaker models.

Table 4
Results of the model

Variable	d(3y)	d(5y)
d(3m)	0,18*** (0,060)	0,13** (0,059)
d(szpred3)/d(szpred5)	0,71*** (0,056)	0,76*** (0,049)
d(eur)	1,27*** (0,211)	1,59*** (0,226)
d(3ypol)/d(5ypol)	0,45*** (0,076)	0,38*** (0,059)
d(3yeur)/d(5yeur)	0,47*** (0,119)	0,53*** (0,107)
d(embi)	0,44*** (0,089)	0,50*** (0,115)
d(cirs)	0,21*** (0,064)	0,24*** (0,069)
d(impl)	0,13*** (0,021)	0,10*** (0,017)
d(glob)	19,08*** (5,557)	5,57*** (1,392)
d(bejel)	−3,04* (1,796)	−5,4** (2,018)
d(irs)	−0,07** (0,025)	−0,06* (0,032)
bejel*d(embi)	−0,41*** (0,099)	−0,41*** (0,120)
betet*d(eur)	−0,52 (0,470)	−0,79* (0,469)
betet*d(impl)	−0,11*** (0,021)	−6,36 (3,884)
adjusted R^2	67%	65%

Dependent variables: 3y, 5y
Method: ordinary least squares
Sample: 02.01.2013 - 06.02.2015.
Number of observations (adjusted): 441 and 446
Newey-West HAC standard errors and covariance

Parameters significant at 10 per cent, 5 per cent and 1 per cent were marked with *, ** and ***, respectively.

Appendix II: no-arbitrage upper bound of forint interest rate swap spreads

In the covered interest rate parity (CIP) model, the spot and forward exchange rates may deviate from one another only to an extent that is in line with the interest rates of the two currencies (Keynes, 1923). The main assumption of this model is that the interest rates of both currencies are risk-free. However, the global financial crisis revealed that the interest rates that had been considered nearly risk-free by market participants (e.g. interbank unsecured lending, government securities yields) may carry considerable counterparty risk.

Csávás (2014) presents an arbitrage model that dissolves the assumption regarding risk-free interest rates. According to the results of the model, the no-arbitrage criterion is not ensured by one single forward exchange rate but by a band. In order to eliminate the default risk, the model introduces CDSs. The main assumptions of the model are as follows:

• foreign and domestic banks are risky, they have access to loans only with risky interest rates,

• the default risk is the same in domestic and foreign currencies,

• FX swap and CDS market makers are risk-free, FX swap and CDS transactions do not entail any counterparty risk,

• non-resident and resident players may borrow in domestic as well as foreign currencies; the difference between interest rates is determined by the difference between their default risks,

• banks hold the assets until maturity.

One major amendment was made relative to the above model: in addition to unsecured deposit/loan transactions, banks may invest in forint-denominated government bonds as well. Similarly to unsecured loans, forint-denominated government securities may also be made risk-free by CDS purchases.

Four types of participants are distinguished in the model: domestic bank, foreign bank as well as CDS and IRS market makers. The model includes the following instruments: loans/deposits, forint/euro FX swap (CIRS), CDS, forint-denominated government bond and forint IRS. The maturities of loans, FX swaps, CDSs, IRSs and government bonds are identical.

The designations used in the models are as follows:

BUBOR: the interest rate on the forint loan borrowed by the domestic bank,

LIBOR: the interest rate on the FX loan borrowed by the foreign bank,

CDS: CDS of domestic bank and of the Hungarian government (we assume that these two values are identical),

CDS*: foreign bank's CDS,

LIBOR+CDS–CDS*: the interest rate on the FX loan borrowed by the domestic bank,

r^{IRS}: fixed interest rate on forint IRS,

$r^{ÁP}$: fixed interest rate on forint-denominated government bond,

SWS: the spread of the FX swap above LIBOR, at which the FX interest rate may be swapped for BUBOR,

$r^{ÁP}$–r^{IRS}: forint interest rate swap spread, the difference between the interest rates on the government bond and on the IRS.

Let us examine the round of arbitrage when a foreign bank concludes an FX swap with a domestic bank and receives forints (gives foreign currency) in the spot leg, and gives back forints (receives foreign currency) in the forward transaction (Chart 14, transaction 4). The foreign bank borrows the foreign currency from the domestic bank, at the LIBOR rate (transaction 5). The foreign bank lends the forints by purchasing government bonds from the domestic bank (transaction 3). So that such strategy can be risk-free from the non-resident actor's point of view, it has to conclude a CDS with a CDS market maker with which it covers the default risk of the forint-denominated government bond (transaction 2). Its cost – in line with the above designations – is the CDS; consequently, the non-resident can lend at a risk-free forint interest rate. On the other hand, the non-resident actor does not have to cover the risk of the FX loan borrowed by him from the resident player: it is the domestic bank that faces a default risk because of the transaction. In addition, it is necessary to conclude a forint IRS as well in order to be able to convert the cash flow of the fixed-rate government bond into variable rate, harmonising it with the changing cash flows of the FX swap. The domestic bank concludes an IRS that pays a fixed rate with an IRS market maker (transaction 1). The no-arbitrage criterion is met if the net income achieved by the foreign bank is not greater than zero (the formulas in the right bottom corner of Chart 14). This results in an upper bound for the interest rate swap spread.
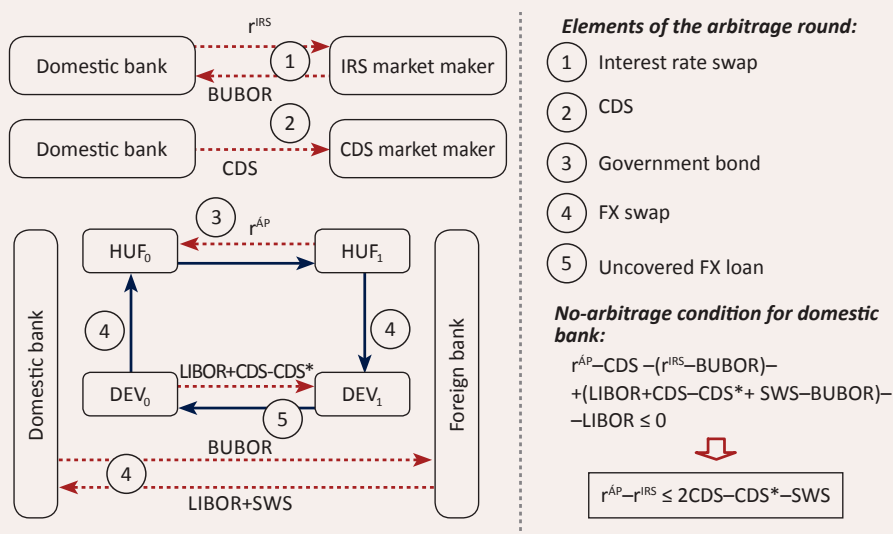
Chart 14
The no-arbitrage upper bound of the interest rate swap spread
(arbitrage round 1)
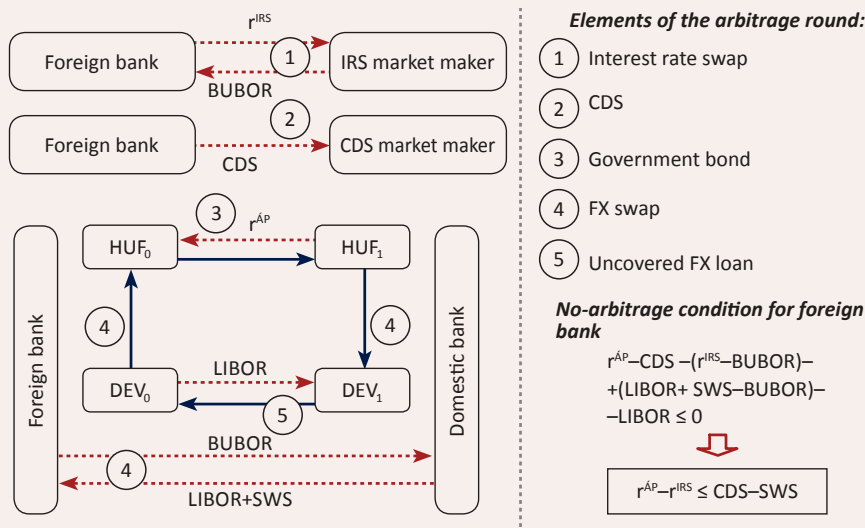
HUF and DEV denote the domestic and foreign currencies, respectively. The lower indices indicate the present amounts and the ones at maturity. The direction of the continuous arrows shows the flow of capital, whereas the horizontal arrows denote loan and deposit transactions, and the vertical arrows denote spot and forward transactions. The dotted arrows show the flows of interests and CDS fees.

Similar processes take place in the arbitrage round of the opposite direction, only the roles of the two banks are interchanged (Chart 15). Now the domestic bank receives forints in the spot leg of the FX swap and places the forints in government securities, and borrows foreign currency from the foreign bank. The only difference of substance is in the cost of the foreign currency borrowed: as the domestic bank's default risk may be different from that of the foreign bank, the rate applied is not the LIBOR. The interest rate on the loan borrowed by

Chart 15
The no-arbitrage upper bound of the interest rate swap spread
(arbitrage round 2)

HUF and DEV denote the domestic and foreign currencies, respectively. The lower indices indicate the present amounts and the ones at maturity. The direction of the continuous arrows shows the flow of capital, whereas the horizontal arrows denote loan and deposit transactions, and the vertical arrows denote spot and forward transactions. The dotted arrows show the flows of interests and CDS fees.

the domestic bank is (LIBOR+CDS–CDS*), as we assumed that the difference between bank lending rates is determined by the difference between their default risks. Overall, another upper bound is received concerning the interest rate swap spread (the formulas in the right bottom corner of Chart 15).

By aggregating the two upper bounds the following upper bound is generated regarding the value of the interest rate swap spread:

$$r^{ÁP}-r^{IRS} \leq MIN(CDS-SWS; 2CDS-CDS*-SWS) \tag{1}$$

Depending on whether the domestic or the foreign CDS is greater, other bounds become effective:

$$r^{ÁP}-r^{IRS} \leq CDS-SWS, \qquad \text{if } CDS \geq CDS* \tag{2}$$

$$r^{ÁP}-r^{IRS} \leq 2CDS-CDS*-SWS, \qquad \text{if } CDS \leq CDS* \tag{3}$$

The operation of the model is presented with regard to the 5-year forint interest rate swap spread. Relative to the model, only one further assumption is used: not only one foreign bank is examined, but the euro LIBOR panel banks, and it is assumed that an average LIBOR panel bank can have access to unsecured loans at the LIBOR. The results are presented on 5-day moving averages.

Except for a short period, the forint interest rate swap spreads fluctuated below the no-arbitrage bound throughout the past years. This finding is in line with the empirical results of Csávás (2014), who found concerning the developed currencies that the swap spreads move within the no-arbitrage bands. Within the whole period, starting from the autumn of 2012, we only found a nearly 2–3-month period when the interest rate swap spread stayed above the no-arbitrage bound. This is only a small part of the more than 6-year period under review, and even then the spreads were above the bound only slightly. The results of the model indicate that arbitrage-free profit could not be achieved in spite of the fact that the interest rate swap spreads increased significantly during the crisis; the attainable profit was reduced below zero if a player used a CDS to cover the default risk of the forint-denominated government paper financed with the help of the FX swap.

Chart 16
The five-year forint interest rate swap spread and the no-arbitrage upper bound
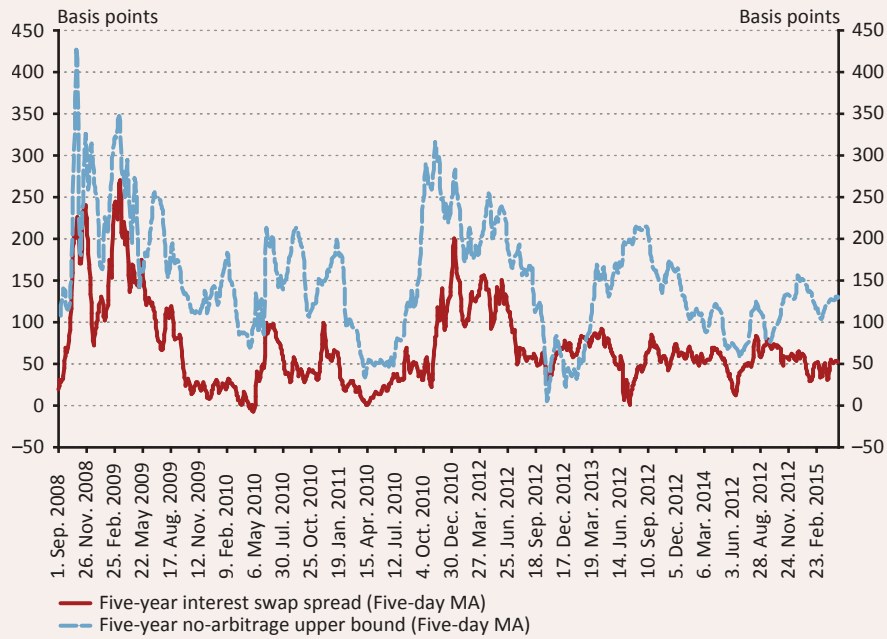
Sources: Reuters, Datastream and MNB