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Summary

DEAR READER,

The Magyar Nemzeti Bank attaches great importance to making central bank analyses on various current economic and financial trends of general interest available to the wider public. The October 2013 issue of the MNB Bulletin discusses topics as diverse as the Hungarian debt rule, the indicators of the early warning system introduced by the European Commission, the measures of underlying inflation used by the MNB, the Bank's profit/loss and Hungarian banks' limit setting practices.

In their article, Gergely Baksay and Gábor P. Kiss analyse the Hungarian debt rule. The authors find that the debt formula may result in procyclical fiscal policy at some points of the economic cycle. In other words, compliance with a fiscal rule in certain periods requires procyclical fiscal policy, and consequently fiscal policy may amplify cyclical fluctuations of the economy, i.e. it is unable to perform its stabilisation function. In this respect, an essential element of the rule is that it does not prohibit general government from using financial assets for forming the debt differently from the deficit. This flexibility allows the avoidance of procyclical fiscal policy, but at the same time it may reduce the enforceability of disciplined fiscal policy.

Orsolya Csortos and Zoltán Szalai examined the set of indicators of the early warning system used within the framework of the new Macroeconomic Imbalance Procedure introduced by the European Commission. The primary objective of the procedure is to call the attention of member countries to dangerous developments that may result in macroeconomic imbalances. First, the authors' findings cast light on the fact that it is not expedient to use the same thresholds for all EU member countries and the newly joined countries. Second, the authors conclude that in many cases, alone the indicators applied by the Commission do not prove to be good early warning indicators. However, if a narrower group of them is examined, there is considerable improvement in the forecasting ability of the set of indicators, although this group may be different across countries. Their findings corroborate what the Commission itself also indicated: it is not expedient to apply the indicators mechanically, and deeper analysis is necessary in each case prior to launching an Excessive Imbalance Procedure.

The article by Péter Gábriel, György Molnár and Judit Rariga provides an overview of the Magyar Nemzeti Bank's inflation measures. Under the MNB Act, the primary objective of MNB is to achieve and maintain price stability. The Bank defines its 3 per cent inflation target in terms of the consumer price index (CPI). However, this indicator is quite volatile, and many of its components are sensitive to temporary shocks. Consequently, the CPI also captures price changes that monetary policy should generally look through. In this context, the need has arisen to develop measures of inflation which can provide a more precise picture of medium-term underlying inflationary pressures in the economy by eliminating these effects. Most central banks, including the MNB, use several alternative measures to capture underlying inflation. These measures have increasingly become an important part of the decision-making process and communication with market participants. With regard to the domestic measures of inflation, the set of underlying inflation indicators developed and used by the MNB are in line with international best practices. Movements in the various underlying measures of Hungarian inflation are significantly less volatile than those in the consumer price index, and the indicators have a robust predictive power for expected future movements in inflation. At the same time, the average value of underlying measures is different from average inflation over the long run, which makes the quantitative assessment of the indicators more difficult.

In their article, Mihály Hoffmann, Zsuzsa Kékesi and Péter Koroknai present the factors of developments in the Bank's profit/loss. In its monetary policy decision-making, the Magyar Nemzeti Bank primarily focuses on the achievement of price stability. Without prejudice to this objective, it supports the maintenance of financial stability and the economic policy of the Government. While the low inflation environment resulting from the Bank's operation and the sound functioning of financial markets and the financial

intermediary system can be considered benefits at the society level, direct costs appear in a concentrated form, in the profit/loss of the Bank. The recent significant increase in the MNB's interest expenditure is primarily attributable to economic developments related to the crisis. First, the state was compelled to borrow foreign exchange, while maintenance of higher-than-earlier foreign exchange reserves became justified due to the external vulnerability of the country. As a result of the two factors, the MNB's balance sheet total doubled, and a much greater part of the foreign exchange reserves had to be financed from MNB bills than before. Second, in view of the deterioration in risk assessment, the forint-foreign exchange interest rate spread increased following the crisis and made the holding of foreign exchange reserves more expensive than earlier. At the same time, the Bank's loss was reduced by the depreciation of the exchange rate of the forint and the exchange rate gain realised on the foreign exchange sales transactions with the Government Debt Management Agency (ÁKK) and on the foreign exchange sales related to the early repayment programme. In parallel with the deterioration in central bank interest income, a considerable amount of interest was saved in the budget, partly offsetting the Bank's interest loss. In the forecast, which is consistent with the September issue of the Quarterly Report on Inflation, it is expected that the Bank's interest loss may be offset by the profit on foreign exchange sales this year again. Consequently, the MNB's 2013 profit/loss may be close to zero. Over the medium term, with a decline in Hungary's external indebtedness and a gradual return of the state to forint financing, the Bank's balance sheet may shrink. At the same time, this process may be decelerated by the Funding for Growth Scheme launched by the MNB, as a result of which, in parallel with an improvement in the SME sector's access to financing, the Bank's balance sheet total will increase, ceteris paribus. If the forint policy rate also remains at a low level, the Bank may have a close-to-zero profit/loss in the coming years as

well, also taking into account the costs of the economic stimulus programme.

The article by Dániel Homolya, Melinda Lakatos, Róbert Mátrai, Judit Páles and György Pulai presents Hungarian banks' limit setting practices. During the financial and economic crisis, non-price type restrictive factors came to the fore in financial markets as well; these mainly consist of limits and margin requirements. Specific relevant signs were observed in the domestic financial markets in late 2011 and early 2012. Following the downgrade of Hungarian sovereign debt to the non-investment grade category, the average interest rate on overnight unsecured interbank forint money market transactions (HUFONIA) left the interest rate corridor for a short time as a result of the constraints on limits among participants and their limits set to the MNB, and recourse to central bank swap facilities surged. The authors present the findings of a survey examining the limit setting practices of the most important banks in the Hungarian financial markets and an analysis of market data relevant from the aspect of limits. All of this is important in terms of the analysis of the efficiency of the interest rate transmission mechanism and of central bank instruments as well. Limit amounts are mainly influenced by the counterparty's (or its country's) external credit rating, financial indicators and CDS spreads. The banks surveyed perceive counterparty limits to be the most restrictive. In recent years, however, maturity limits have also appeared, in addition to limit amounts. In the interbank unsecured money market, the tightening of limits was reflected in a decline in daily turnover and a shortening of maturity, while in the currency swap market the shortening of maturities was observed only in the more turbulent period, as a result of the increasingly widespread use of margin requirements and the introduction of the foreign exchange funding adequacy ratio (FFAR).

The Editorial Board

Gergely Baksay and Gábor P. Kiss: Second Act – second thoughts: the Hungarian debt rule[1]

If compliance with a fiscal rule in certain periods requires procyclical fiscal policy, it means that fiscal policy does not mitigate the cyclical fluctuations of the economy, but rather may amplify them, i.e. it is unable to perform its stabilisation function. On the basis of the analysis of the Hungarian debt rule, we found that the debt formula may result in procyclical fiscal policy at some points of the economic cycle. In this respect, an essential element of the rule is that it does not prohibit the general government from using financial assets for forming the debt differently from the deficit. This flexibility allows the avoidance of procyclical fiscal policy, but at the same time it may reduce the enforceability of disciplined fiscal policy.

INTRODUCTION

In Hungary, the Fundamental Law that entered into force in 2012 and Act CXCIV of 2011 on the Economic Stability of Hungary (hereinafter: Stability Act) created a new fiscal framework, which focuses on the annual change in debt and grants stronger authority to the restructured Fiscal Council. Our analysis intends to show that sometimes the strictness of the rule may result in procyclical fiscal policy, and focusing on debt may cause problems, because the change in debt can be a consequence of factors that are independent of the fiscal policy.

In an optimal case, the rules that limit fiscal policy cover all the factors that are influenced by fiscal decisions, but do not pertain to factors that are external to fiscal policy (Odor and P. Kiss, 2011). In other words, they hinder the cycles of fiscal policy in such a manner that they do not react to the effect of the economic cycle, i.e. the stabilisation function of fiscal policy prevails. In our opinion, fiscal rules that focus on debt are basically unable to comply with these criteria, or only under conditions that are disproportionately complicated and difficult to quantify. Therefore, they cannot be considered the best practice. Nevertheless, several countries and the European Union (EU) as well apply fiscal rules relating to the level of or change in debt, but in many cases only as a supplementary

rule and within a relatively flexible framework. Other studies have also noted that in certain cases the Hungarian debt rule does not react to the economic cycle properly (does not mitigate its impact) and may thus further amplify the cycle and may have a procyclical effect.[2] This is also presented in our article.

Fiscal analyses by the Hungarian central bank perform the necessary corrections at the level of the deficit, to be able to show the effects of fiscal decisions as precisely as possible (P. Kiss, 2011). First, they augment the official balance with the effect of the quasi-fiscal activities, and second, they exclude the impact of the economic cycle on tax revenues. At the level of the debt, however, it is problematic to exclude external factors, and so this is not done.

In terms of the feasibility of fiscal rules, it is important whether the uncertainty surrounding the forecasts can also be assessed. The deficit and the changes in debt may be different, for example as a result of fiscal measures taken in the future, but this cannot be taken into account in a rule-based projection. However, the deficit and the changes in debt may be different even under the current set of measures. The main underlying reason is developments in external factors (e.g. growth and inflation), but there is an uncertain 'grey zone' between fiscal measures and external

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[2] Balatoni and Tóth (2012), P. Kiss (2012).

factors as well, such as the financial management of local governments, where fiscal measures do not prevail automatically. Earlier, the uncertainties surrounding the deficit were presented by the central bank in its fiscal fan chart. External factors have a significantly stronger impact on debt (P. Kiss, 2012), so the uncertainty bands are also much greater. The relevant methodology is being elaborated, but we cannot yet present it in this article.

The leeway that can be identified in the managing of certain financing items (e.g. deposits) represents an uncertainty that does not affect the deficit, but influences gross debt. Our article deals with the impact of this factor, because it may create an opportunity for the avoidance of procyclical fiscal policy occasionally stemming from the debt rule.

Further on in the analysis we present how the change in debt can be decomposed into factors and what debt rules may result from this. Then we discuss the deviation of the Hungarian debt formula from the above and the resulting procyclical effect. Finally, we present to what extent the leeway appearing on the financing side may offset this effect.

DECOMPOSITION OF THE CHANGE IN DEBT

In terms of the responsibility of fiscal policy, there are three clearly distinguishable groups of factors that have an impact on the change in the debt ratio.

1. **Group of external factors that are independent of fiscal policy.** This includes changes in interest to be paid on government debt, revaluation of foreign currency debt, the economic cycle, economic growth and the effect of deflators. The joint influence of these factors may result in significant fluctuations in the debt ratio, which is not dealt with in our article.

2. **Discretionary fiscal policy.** This can be captured through developments in the cyclically adjusted primary balance (CAPB), an indicator that excludes the impact of inflation and other external factors as well.

3. **Change in financial assets.** In addition to financing the deficit and maturing debt, government debt management involves numerous discretionary operations. The consequence of these may be that the change in gross debt deviates from the deficit, and the difference is reflected in the change in financial assets (ΔFA). As a result of the possible differences between the changes in

deficit and debt, emphasising gross debt may be misleading in the assessment of fiscal policy.

Before discussing the stabilisation function of fiscal policy (i.e. the mitigation of the fluctuations of the economic cycle) and the factors determining the debt ratio over the medium term, first we briefly present how the actual change in debt in a given year can be decomposed into factors.

Factors influencing annual changes in the debt ratio

The fiscal balance and corresponding changes in debt can be determined according to two kinds of approaches. The first one sets out from the cash-based balance; this is typical of the Hungarian framework. The second one regulates the accrual-based balance, as done in the fiscal framework of the EU.

The *cash-based* deficit is consistent with the change in debt, in the sense that both take into account the transactions at the time of actual payment. The change in net government debt excluding revaluation equals the cash-based balance of the government sector calculated according to the earlier statistical system of the IMF (GFS86), which contains the sale and purchase of equities (shares) as well. However, according to the currently widespread definition of the cash-based balance, which is applied in Hungary as well, the change in financial assets is not a part of the deficit. Accordingly, it modifies debt in addition to the deficit. Moreover, the difference between gross debt and net debt is that the government deposit and loans extended by the state are not part of the former.

The change in gross debt-to-GDP ratio can be stated as follows:

$$\frac{D_t}{GDP_t} = \frac{D_{t-1} + F_t + \Delta FA_t + \Delta FX_t}{GDP_{t-1}*(1+g_t+\pi_t)} \tag{1}$$

where:

D = gross debt (in domestic currency)

GDP = nominal gross domestic product

F = net financing requirement of the general government (cash-based deficit)

ΔFA = within the change in financial assets, the changes in deposits and loans extended

ΔFX = effect of the revaluation of foreign currency debt (in domestic currency)

g = economic growth in real terms (per cent)

π = deflator of gross value added (per cent).

Although changes in debt are more closely related to the cash-based deficit, it is worth presenting its deduction from the accrual-based balance as well, which is the focus of the general government statistics of the European Union. In contrast to the cash basis, the *accrual* basis takes into account all transactions at the time when economic value is produced, transformed, exchanged, transferred or such value is destroyed, and thus the time of accounting of the debt does not harmonise with the change in debt. In addition to the liabilities and assets in formula (1), the accrual-based balance also contains liabilities and assets *(OFA)* that do not have any effect on actual cash-flow of the budget, e.g. increasing accounts payable due to unpaid invoices (thus $B = F + \Delta OFA$).

$$\frac{D_t}{GDP_t} = \frac{D_{t-1} + B_t + \Delta FA_t + \Delta FX_t + \Delta OFA_t}{GDP_{t-1}{}^*(1+g_t+\pi_t)} \qquad (2)$$

where:

B = accrual-based budget deficit

ΔOFA = the change in financial assets calculated without the ΔFA; in other words, the change in assets other than deposits and loans extended and in liabilities other than debt.

Formulas (1) and (2) show that the change in gross debt *(D)* cannot exclusively be explained by developments in the deficit categories *(F, B),* because several other factors also change the debt *(ΔFA, ΔFX).* Jointly they are called *deficit-debt adjustment (DDA).* At the same time, it can be established that in terms of fiscal policy these accounts usually have no additional information content compared to the balance. Accordingly, the change in gross debt does not reflect fiscal policy well, as it is also affected by revaluation and financing transactions, and the changes in non-debt liabilities (trade accounts, wages and taxes payable) do not appear in it. Consequently, upon formulating the numerical rules, it is more appropriate to focus on the balance instead of the change in debt, because the simultaneous application of the debt and balance rules results in inconsistency instead of additional information (P. Kiss, 2012).

However, experiences suggest that it is worth carrying out a further decomposition of deficit in order to separate the impact of external factors (economic cycle, yields) from the changes taking place due to the fiscal policy.

$$B \ = \ i\overline{D} + CAPB + C \qquad (3)$$

where:

i = implicit nominal interest rate, annual interest expenditure divided by the average annual debt $(\overline{D})$

CAPB = cyclically adjusted primary balance (excluding interest expenditure)

C = cyclical component of the fiscal balance (the effect of the economic cycle on the primary balance).

If we concentrate on the effect of the economic cycle when we examine the stabilisation function of fiscal policy, the deficit-to-GDP ratio of a given year can be stated as follows:

$$\frac{CAB_t + C_t}{GDP_t} = \frac{CAB_t + c\ \dfrac{GDP_t - GDP^*}{GDP^*}}{GDP_t} \qquad (4)$$

where:

GDP* = the potential level of the nominal gross domestic product

$\dfrac{GDP_t - GDP^*}{GDP^*}$ = the output gap

c = sensitivity of the primary balance to the output gap, i.e. cyclical component C divided by the output gap.

If the cyclically adjusted balance is constant, the deficit fluctuates around this value in line with the changes in the cyclical component, and thus the stabilising function of fiscal policy is effective. In this case, fiscal policy can be prevented from being procyclical, i.e. from adding to the cyclical fluctuation in the economy. (Due to subsequent revisions of potential GDP, procyclicality is not necessarily avoidable *ex post* in this way either.)

Determinants of the debt rate over the medium term

In international practice, it is the medium-term debt dynamics that enjoy special attention and not formulas (1) and (2), which describe the annual fluctuations in the gross

debt ratio. Over the medium term, the potential level of GDP *(GDP*)* prevails, while the average growth rate equals the trend growth *(g*)*. In this case, the cyclical component of the primary balance is zero, i.e. *CAPB = PB*. Over the medium term, the interest expenditure component of the deficit also becomes stable in the sense that, depending on the maturity and renewal of the debt borrowed at the earlier yield level, the effect of permanent yield changes appears in the expenditure. Correcting the interest expenditure projected onto the debt with inflation results in the real interest rate *(r*)*. If the change in financial assets and the revaluation of the foreign currency debt do not have a trend, the medium-term effect of these factors is zero. Under these simplifying conditions, the size of the primary balance necessary for stabilising the debt can be stated.

$$\frac{PB_t}{GDP_t^*} = \frac{D_{t-1}}{GDP_{t-1}^*} * \left(\frac{1+r^*}{1+g^*} - 1\right) \tag{5}$$

However, it is not at all easy to determine the values shown in formula (5). This requires estimation of the potential level of GDP and the trend of the growth rate as well as of the cyclically adjusted primary balance; and the level of real yields thought to be permanent is also needed. The frequent revision of these estimates is a good indication of their inherent uncertainty.

By connecting formulas (4) and (5), a debt-stabilising cyclically adjusted primary balance can be established, around which the cyclical component fluctuates and as a result of which debt also moves around a stable level. In practice, many indebted countries cannot be satisfied with stabilising the debt; therefore, it is necessary to achieve a higher cyclically adjusted primary surplus than the one that would result from formula (5). Chart 1 compares a case like this with the hypothetical path stemming from the Hungarian debt rule.

THE HUNGARIAN FISCAL RULE

Description of the rule

The fiscal framework currently prevailing in Hungary was created by the Fundamental Law and the Stability Act. Pursuant to the rule, the gross government debt-to-GDP ratio may not be higher than 50 per cent, or if it exceeds this upper limit, the Parliament may only adopt a budget bill that contains a reduction of the debt ratio. It is the Fiscal Council's responsibility to examine whether the bill is in compliance with the rule. The Council has a right of veto, if it forecasts that the debt rule would be breached. Pursuant to the Fundamental Law, any deviation from the expected debt reduction is possible only during a special legal order or if there is a significant, prolonged national economic recession.[3] The Stability Act identifies a significant, prolonged recession as being a decline in real GDP in the given year.

The Stability Act contains the so-called debt formula, which determines the highest allowable size of debt and deficit depending on economic growth and inflation, i.e. it defines the fiscal path complying with the rule numerically as well. According to our simulations, fiscal policy that can be obtained from the debt formula depending on economic growth has procyclical effects (e.g. exacerbating the downturn) in some cases (P. Kiss, 2012), which is a disadvantageous feature in the case of a fiscal rule.[4] It would be possible to transform this formula into a cyclically neutral one only if the Fundamental Law did not contain the requirement of a steady decline in the debt ratio – in the case of positive economic growth.

Based on a numerical example below (Chart 1), we examine whether the Hungarian framework is able to prevent procyclical fiscal policy. Formula (4) that presents a neutral fiscal policy is used as a base of comparison.

Procyclical nature of the Hungarian debt rule

The Hungarian debt formula determines the maximum allowable nominal debt level and the deficit that can be deduced from it on the basis of the growth rate and inflation in the given year:

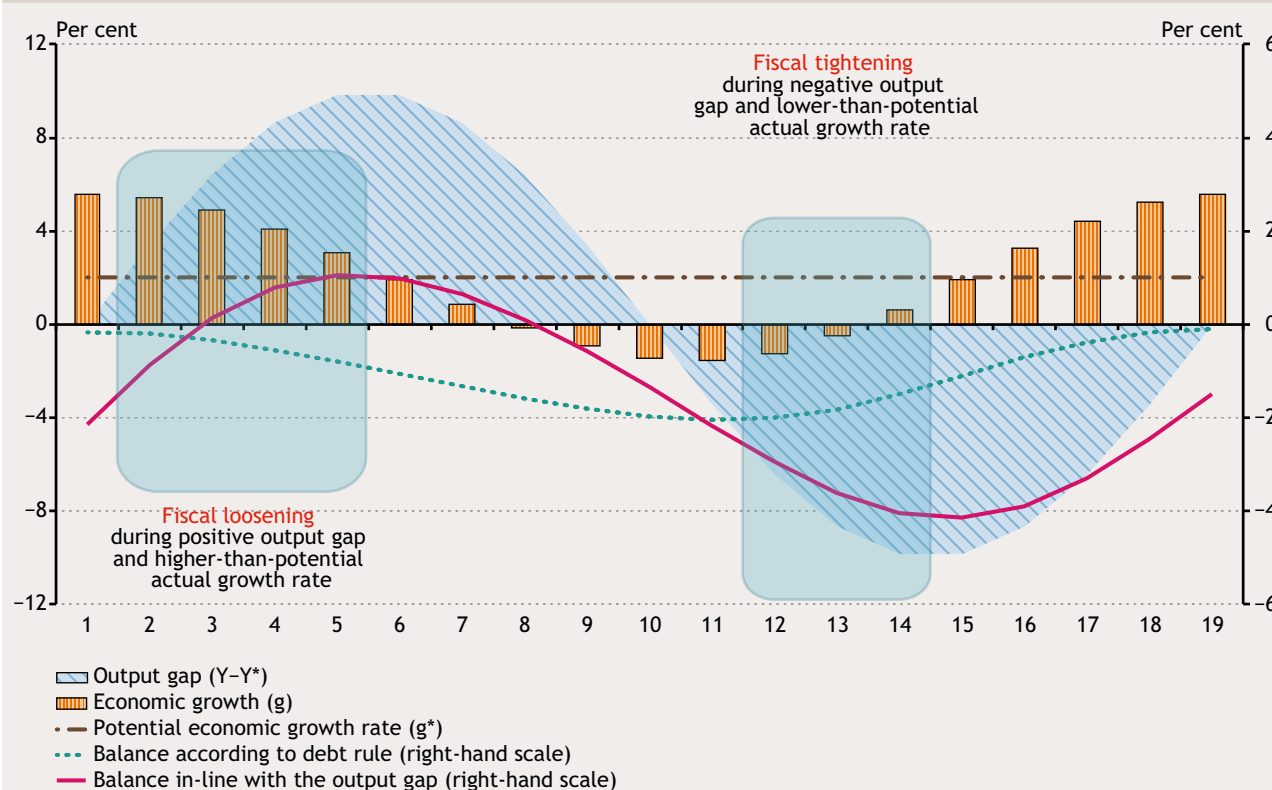$$D_t = D_{t-1} * \left(1 + \pi_t - \frac{1}{2}g_t\right) \tag{6}$$

There are important consequences of the fact that formula (4) and formula (6) were stated for the output gap and for the economic growth rate, respectively. Our numerical example shows that while formula (4) results in a cyclically neutral fiscal policy, i.e. the cyclically adjusted balance (CAB) is constant, the CAB changes on the basis of formula

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Chart 1
Comparison of debt formulas based on the output gap and the growth rate

Legend:
- Output gap (Y–Y*)
- Economic growth (g)
- Potential economic growth rate (g*)
- Balance according to debt rule (right-hand scale)
- Balance in-line with the output gap (right-hand scale)

(6), and in some cases it leads to procyclical fiscal policy (Chart 1).

Procyclical periods occur when, in the case of a positive output gap, the growth rate exceeds the potential rate (periods 1–6 in Chart 1) and also when the growth rate is below the potential at a time of a negative output gap (periods 11–15 in Chart 1). This has an unfavourable effect, and is contrary to the flexibility criterion and the EU regulations entering into force as of 2014. Continuous countercyclical path results only from formula (4). From this, in turn, it can be deduced that there is no annual debt dynamics formula that could simultaneously ensure a steady decline in the debt ratio as well – this is required by the Fundamental Law for every year. In order to resolve this contradiction, the requirement of continuous debt ratio improvement should be changed in the Fundamental Law, for which there may be various possibilities.[5]

The Hungarian rule applies an explicit and an implicit tool against the harmful procyclical fiscal reaction. The explicit escape clause prevents procyclicality if economic growth is below zero, but not in other phases of the economic cycle. For instance, in periods 11–13 of the numerical example, the rule is suspended due to the negative growth rate. The other tool is included in the rule only in an implicit manner: the budget is able to fine-tune the changes in debt with financial transactions in excess financing the deficit. The increase in gross debt can be avoided not only by changing the CAB, but also by changing the stock of financial assets *(ΔFA)*, i.e. in parallel with rising net debt. However, this flexibility exists in the other direction as well, and may even allow for fiscal loosening, irrespective of the economic situation. This is mostly discussed in the next chapter.

THE IMPACT OF FINANCIAL TRANSACTIONS ON DEBT

If there is a difference between the size of the deficit and the net government debt issuance serving as cover for the former, the difference is reflected in the change in the financial assets (financing reserves) of the budget *(ΔFA)*. In

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[5] The effect of the cycle emerging through the denominator can be excluded by doing the division with the potential output instead of the current output. However, the cyclical adjustment of the deficit should also exclude the effect emerging through the numerator. The simplest would be if not the Fundamental Law regulated the debt path leading to the 50 per cent, as this path is determined by the relevant EU rules anyway.

general, any two of these three factors determine the third one.[6] Changes in gross government debt depend on financing and the newly issued debt components, and not only on the deficit.

The Hungarian fiscal framework allows financing effects as well to be taken into account in the expected developments in government debt.[7] Therefore, during the approval of the budget bill prior to the final voting, the Fiscal Council faces the dilemma that in addition to the fiscal balance it must make assumptions regarding its financing or the changes in financial assets, which is equivalent to the former (for example, that net debt issuance equals the cash-based deficit, and thus the stock of financial assets remains unchanged).

There are numerous examples from the past years that the change in debt may deviate considerably from the deficit. Based on their magnitude, two factors may be highlighted: the borrowing and utilisation of EU/IMF loans and restructuring of the private pension fund system.[8]

In 2008, the Hungarian state drew down a higher amount from the credit line provided by the international organisations than it used over the short run. As a result, gross government debt increased by more than 5 per cent of GDP compared to what was justified by the deficit.[9] Subsequently, when the state spent the foreign currency deposits on financing the deficit, it had to issue less new debt than the deficit. Accordingly, compared to the fiscal balance, gross government debt increased to a lesser extent in 2009 and 2010.

Restructuring of the fully funded private pension pillar reduced government debt in two phases compared to the path determined by the budget deficit. On the one hand, the debt management agency withdrew the Hungarian securities that had belonged to the portfolio of the funds but were transferred to the state; as a result, government debt declined by their sum immediately. In addition, prolonged effects are also perceived stemming from the use of other securities received by the Pension Reform and Debt Reduction Fund. The Fund has gradually sold these securities since 2011; the receipts have increased the deposits. The

debt manager can finance the deficit from this, and achieve debt issuance that is lower than the deficit. The extent of using this instrument is at the discretion of the Government Debt Management Agency (ÁKK), and the decision is primarily based on the debt management principles and market circumstances.

In addition to the deficit, numerous recurring and one-off elements have an effect on debt. They include the prefinancing of grants received from the European Union by the budget, the use of privatisation revenues for debt reduction or the replenishment of the central bank's revaluation reserves, if such become necessary. Finally, with its net issuance the ÁKK may depart from the fiscal deficit by using government deposits if it is suggested to be favourable by market circumstances or debt management considerations.

From the aspect of our analysis, it is of special importance that the developments in debt and deficit may deviate from one another for the sake of complying with the debt rule as well. If, for example, the debt rule resulted in procyclical developments in the deficit, compliance with the rule would also be possible by changing the financing side (e.g. utilisation of deposits).

Chart 2
Deposit accounts of the central budget held with the MNB and the portfolio of the Pension Reform and Debt Reduction Fund

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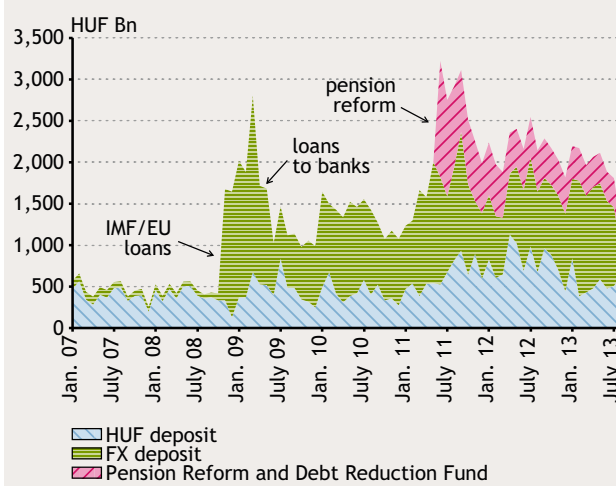
[6] Excluding the effects of the revaluation of government debt and the – typically less significant – effects of items that appear in the debt differently from the deficit.

[7] Pursuant to Article 36(4) of the Fundamental Law, 'As long as state debt exceeds half of the Gross Domestic Product, Parliament may only adopt a State Budget Act which contains state debt reduction in proportion to the Gross Domestic Product.' Pursuant to the Stability Act, the value of the central subsystem of general government, the local government subsystem of general government and the debt of other organisations classified into the government sector planned for the last day of the fiscal year shall be determined numerically in the State Budget Act.

[8] For more details see: MNB (2013).

[9] At the same time, net government debt increased to a lesser extent, because a considerable portion of the loan taken in 2008 was placed in foreign currency deposits on the accounts of the state.

By using the deposits of the budget and the assets of the Pension Reform and Debt Reduction Fund, the ÁKK can also presently achieve a lower increase in debt than the fiscal deficit would imply. This leeway is determined by the sum of forint and foreign currency deposits as well as the assets of the Debt Reduction Fund. Foreign currency deposits surged as a result of international borrowing, whereas the Debt Reduction Fund was established during the restructuring of the pension system. As a result of these two effects, deposit accounts owned and securities held and to be sold by the central budget increased severalfold compared to the pre-crisis level. On 30 July 2013, deposits worth nearly HUF 1,500 billion and securities worth HUF 350 billion were available for the central budget. The pre-crisis level indicates the minimum financing reserve that the ÁKK presumably intends to maintain in the future as well. However, the level of reserves at the end of July 2013 exceeded it by at least HUF 1,000 billion. In addition to deposits and the portfolio of the Debt Reduction Fund, the government has other marketable securities and shares as well, but they are not used for debt management purposes. Their stock rather depends on the government's economic policy and ownership role (privatisation reduces, whereas the purchase of equities adds to this stock).

CONCLUSIONS

The aim of the Hungarian debt rule is to reduce the debt ratio every year, except when economic growth is negative. It can be illustrated with a numerical example that this may lead to procyclical fiscal policy in certain phases of the economic cycle. This means that instead of mitigating, fiscal policy may exacerbate the cyclical fluctuations of the economy, and is thus unable to perform its stabilisation function.

Our article has also discussed another important element of the debt rule. Namely, it allows flexibility in the application of the rule that, using financial assets, debt may be changed differently from the level of deficit. As a result, procyclical fiscal policy becomes avoidable. In parallel with that, however, the enforceability of a disciplined fiscal policy may decline.

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Orsolya Csortos and Zoltán Szalai: Assessment of macroeconomic imbalance indicators

This study examines the set of indicators of the early warning system used within the framework of the new Macroeconomic Imbalance Procedure introduced by the European Commission. The primary objective of the procedure is to call the attention of member countries to dangerous developments that may result in macroeconomic imbalances. First, our findings cast light on the fact that it is not expedient to use the same thresholds for all EU member countries and the newly joined countries. Second, we came to the conclusion that in many cases, the indicators used by the Commission do not in their own right prove to be good early warning indicators. However, if a narrower group of them is examined, there is considerable improvement in the forecasting ability of the set of indicators, although this group may be different from country to country. Our findings corroborate what the Commission itself also indicated: it is not expedient to apply the indicators mechanically, and deeper analysis is necessary in each case prior to launching an Excessive Imbalance Procedure.

PRESENTATION OF THE MACROECONOMIC IMBALANCE PROCEDURE

The financial crisis exposed several weaknesses in the governance of the European Monetary Union. In response, the European institutions created the so-called "six-pack" at the end of 2011. Prior to the crisis, economic governance mechanisms had primarily focused on monetary stability and fiscal sustainability, and determined institutionalised solutions accordingly (monetary policy, fiscal rules and related sanctions aiming at price stability). The crisis revealed that even if the above is achieved, serious macroeconomic imbalances may still emerge, which must be monitored, prevented or perhaps managed in an institutionalised framework. This is why the Macroeconomic Imbalance Procedure (MIP) directed by the European Commission was created. The MIP is a surveillance, preventive and corrective Early Warning System (EWS), which is designed to call attention to emerging macroeconomic imbalances. The procedure is a two-step one. First, the European Commission examines the indicators, which are described in detail below, for each member country every year, and prepares the Alert Mechanism Report, the most important objective of which is to call member countries' attention to the risks that might result in macroeconomic imbalances. As a second step, if serious risks are identified for some countries in the first report, an in-depth review is prepared for them. It contains a detailed analysis of the factors that have played a role in the emergence of these risks.

In the first step, the Commission examines 11 *scoreboard* indicators, which correspond to the most important vulnerability indicators identified in the literature (Table 1). It may be a sign of the build-up of macroeconomic imbalances if several of these indicators give signals, i.e. exceed a specific threshold. This threshold was defined on a purely statistical basis (at the lower or upper quartile of the variables under review), and according to the European Commission (2012a), it is consistent with the values found in the empirical literature. In addition, this is how they wanted to avoid excessive numbers of false alarms and too frequent failures to alert. At the same time, the indicators should never be applied mechanically; a deeper analysis and understanding of the underlying developments is always necessary. Furthermore, the Commission also emphasises that the set of indicators, the thresholds and the methodology must be treated in a flexible manner. Therefore, they will be continuously examined to enable the procedure to call attention to evolving imbalances as efficiently and precisely as possible. In part, this paper endeavours to highlight such possibilities of development.

Table 1
Scoreboard indicators

Type	Abbreviation	Variable	Indicator	Threshold
EXTERNAL	CAB	Current account balance	as a percentage of GDP, 3-year retrospective moving average	+6%/−4%
	NIIP	Net international investment position	as a percentage of GDP	−35%
COMPETITIVENESS	REER	Real effective exchange rate	3-year change, HICP-deflated	±5% (EA)*/±11% (NEA)**
	EMS	Export market share	5-year change	−6%
	ULC	Unit labour cost	3-year change	+9% (EA)*/+12% (NEA)**
INTERNAL	HPI	House price index	annual change	+6%
	PSCF	Private sector credit flow	as a percentage of GDP	+15%
	PSD	Private sector debt	as a percentage of GDP	+160%
	GGD	General government debt	as a percentage of GDP	+60%
	UR	Unemployment rate	3-year retrospective moving average	+10%
	TFSL	Total financial sector liabilities	annual growth	+16,5%

* EA: euro area member countries.
** NEA: non euro area member countries.

One direction of development that may make operation of the Macroeconomic Imbalance Procedure more efficient is if member countries are examined with differentiated thresholds. In the set of indicators recommended by the Commission, different thresholds are applied only in the case of two indicators for the examination of euro area and non-euro area countries. In our opinion, the different levels of development of the countries under review justify the application of different thresholds in the case of the other indicators as well. In order to prove this, our analysis separately examines how the indicators perform in the case of all EU countries and in the case of the 10 countries that joined in 2004 (hereinafter: EU10). We found that the indicators behave significantly differently in the newly joined countries, which are at different levels of development, confirming the European Commission's statement that the early warning system cannot be applied mechanically.

This issue is relevant for Hungary in several respects. In February 2012, upon preparing the first Alert Mechanism Report, the European Commission was of the opinion that macroeconomic imbalances were present in Hungary. For their precise identification and understanding, an in-depth review of Hungary was also compiled. These developments are relevant for monetary policy as well. Firstly, because for the sake of efficient cooperation or debate with the European Commission, prior to the evolution of even more serious problems, an understanding of ongoing macroeconomic developments is a must, and secondly,

central banks strive to attenuate income fluctuations even in parallel with their normal operation. This is the case because the financial crisis showed that even the central banks operating in an inflation targeting framework have to pay special attention to the build-up of financial imbalances, as they may evolve in a stable inflation environment as well, and may result in overheating followed by recession (Csermely and Szalai, 2010).

ESSENCE OF THE SIGNALLING METHODOLOGY

There are several methods that allow the assessment of an economy in terms of financial balance (banking sector balance sheet indicators, financial market prices, combined stress indices, multi-module stress tests, VAR models, methods applied by credit rating agencies and developed for individual institutions). Borio and Drehman (2009) examined the advantages and disadvantages of various methods. They came to the conclusion that at present the signalling method is the most suitable one for the task. Their conclusion is based on the fact that the signalling method is sufficiently forward-looking to take into account the time requirement of the transmission of monetary policy as well as to capture the endogenous developments between the indicators and the macroeconomic cycles (upswings and downswings). Another advantage of the method is that it is simple, so based on that, economic policy decision-makers can also easily comprehend and tell the 'stories' behind macroeconomic developments.

Table 2 Categories in the signalling method			
		Event	
		Occurs	Does not occur
Indicator	Issues a signal	A	B
	Does not issue a signal	C	D

Taking account of these factors, we decided to evaluate the early warning system developed by the European Commission with the help of the signalling methodology. The method was developed by Kaminsky et al. (1998) as well as by Kaminsky and Reihart (1999). Its essence is that an indicator gives a signal if it exceeds a certain threshold, and there is an event if the explained variable also exceeds a given threshold. Accordingly, the signals can be classified into the four groups shown in Table 2.

Based on the table, each outcome at a point in time can be classified into one of the groups below:

- A: true positive
- B: false positive
- C: false negative
- D: true negative

In the evaluation of early warning systems, interpretation of the indicators that measure the accuracy of the forecast is not trivial. The adjusted noise-to-signal ratio (aNtS) is the most widely used indicator, which can be calculated as follows:

$$aNtS = \frac{\frac{B}{B+D}}{\frac{A}{A+C}}$$

According to the literature, an around 0.3 noise-to-signal ratio is already considered expressly good; a similar value is shown in the aforementioned study by Kaminsky and Reihart (1999) as well, which is one of the best-known studies. In addition to this indicator, we also examine what percentage of the events an indicator is able to predict and also the proportion of false alarms given by the indicator. It is easy to understand that if the threshold of the indicator is low, there will be many signals, and thus the proportion of false signals will increase. However, if the threshold of the indicator is high, the indicator will fail to issue signals in many cases, resulting in deterioration in the prediction

ratio, i.e. the two types of errors can be corrected to the detriment of one another.

In addition to the above, there are several indices that can be used for the evaluation of the performance of an indicator. One of them, for example, is the loss and usefulness function applied by Alessi and Detken (2009) as well, with which it is possible to take into account economic policy makers' preferences regarding the costs caused by type I and type II errors.[1] In addition, the latest literature on the subject highlighted that the aforementioned indicators assume in an implicit manner that the various outcomes occur with the same probability. Sarlin (2013) remedied this problem in a way that the usefulness and loss functions developed by him take into account the relative probability of the occurrence of events in an explicit manner as well.

Similarly to the noise-to-signal ratio, the expectation regarding the real value of indicators is not clear either. Assuming that there may be various reasons for individual events (crisis types or greater recessions), it is natural that an indicator capturing one specific type of risk does not forecast the majority of events, only the ones that are directly related to the risk captured by it. This means that a high ratio of predicted events is not necessarily the right requirement. It is also difficult to decide what the optimum ratio of false signals is, because it is conceivable that these signals are really false, i.e. economic policy does not have to react. At the same time it is also possible that in spite of the high risks, a lucky outcome materialised, or economic policy measures were taken that prevented the development of more serious problems, and thus the signal cannot even be considered false.

In order to have a comparison basis for these indicators as well, we examined other authors' results in applying the signalling method. According to the findings of Borio and Lowe (2002),[2] over the various time horizons an indicator was able to predict some 45–75 per cent of events. When they examined a combination of several indicators, which

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[1] Type I error: event occurring, but no signal issued, as share of all events; type II error: the share of false alarms compared to all the periods when there is no event.

[2] At the same time, these figures cannot be directly compared to our results either, as the predicted event (bank crisis) is different in the study by Borio and Lowe (2002).

we will also do later, this figure declined to some 25–45 per cent. Using the signalling method, Alessi and Detken (2009) examined more than 80 variables, which were able to predict 60–85 per cent of the events,[3] while the ratio of false signals was also around 65–75 per cent.

PERFORMANCE OF THE INDICATORS ON THE BASIS OF THE SIGNALLING METHOD

This chapter presents how efficient the indicators recommended by the European Commission[4] can be in identifying the emergence of imbalances according to the early warning system. Although we applied the early warning system to several thresholds of the indicators and to several time horizons (0, 1, 2 and 3 years), we only present here the findings relating to the threshold recommended by the Commission and the time horizons relevant for monetary policy (1 and 2 years).[5] Among other things, excessive negative deviation of GDP from the trend may be a sign of a build-up of imbalances. Therefore, 'events' were defined as follows: we examined the GDP of each country, then we applied the HP trend, which is often used in the EWS literature as well, to it.[6] Then we took the difference between the basic time series and trend (cyclical position or gap).[7] We determined the threshold of the critical difference at the first quartile (–2 per cent), similarly to the early

warning system of the European Commission.[8] (The Commission did not define 'events', only indicators.)

The first indicator, the **current account balance** captures the changes in the net lending position of a country during a given period (e.g. 1 year); therefore, it captures important information about the developments in economic relations between a country and the rest of the world. Both a current account deficit and a surplus may indicate the emergence of macroeconomic imbalances, as a persistent deficit may lead to unsustainable external indebtedness, whereas a surplus may be a sign of subdued domestic demand. As opposed to the current account deficit, weak domestic demand does not result in a major downturn within a given country. However, it is an important indicator in an integration when we assume that a symmetrical adjustment of imbalances is the optimum adaptation among participating countries. A current account deficit with a 4 per cent threshold proved to be an efficient indicator. An indication of this is the below 1 noise-to-signal ratio and the fact that significant current account deficits were observed prior to more than half of the events. This applies in particular to the newly joined countries, where 72–78 per cent of the events were preceded by a current account deficit, and the ratio of false signals was also below 60 per cent. In view of the above reasons, it is unreasonable to examine the current account surplus with our method (Table 3).

Table 3
Current account deficit

Indicator	Current account deficit			
Recommended threshold	−4%			
	EU		EU10	
	1 year	2 years	1 year	2 years
Noise-to-signal ratio	0.62	0.51	0.90	0.81
Prediction ratio	51%	59%	72%	78%
False alarms/alarms total	69%	64%	59%	54%

[3] These results cannot be compared directly either, because the costly asset price booms considered by Alessi and Detken (2009) as result variables entailed relatively serious real-economy consequences.

[4] The description of the indicators is based on the European Commission's study (2012a).

[5] At the same time, it needs to be seen that various indicators may be able to issue signals efficiently over various time horizons, and it is worth keeping in mind that among the indicators there are typically forward-looking ones (e.g. house price), simultaneous ones (e.g. export market share) and ones that react with a delay (e.g. unemployment).

[6] Annual nominal GDP time series published by Eurostat. For calculating the cycle, we used the longest available time series (data are typically available as of approximately the 1980s for the developed countries and only as of the 1990s in the case of the Central East European countries), then during the application of the signalling method we monitored the data uniformly, starting from 1990.

[7] It is known in the literature that the endpoint uncertainty of the HP filter is very high, i.e. with the receipt of new data, the simultaneously estimated output gap may change considerably. There are better filters than the HP filter, which cause smaller errors, but due to country-specific factors, their use would require too much work, and nor is any generally accepted methodology. Accordingly, for the comparability of the results, we used the HP filter. In our case, the simultaneous error is of lesser importance, because it is not the size of the output gap in itself that is important, but rather the sudden significant fall in the GDP growth rate, irrespective of the exact size of the output gap.

[8] Accordingly, one quarter of all observations can be considered 'events', and thus not only the 2008 financial crisis became an event (we typically identified events in the early 1990s, at the time of the 2001 dotcom bubble and at the bottom of the financial crisis).

Table 4
Net international investment position

Indicator	Net international investment position			
Recommended threshold	−35%			
	EU		EU10	
	1 year	2 years	1 year	2 years
Noise-to-signal ratio	0.60	0.60	0.94	0.93
Prediction ratio	42%	40%	52%	48%
False alarms/alarms total	67%	68%	58%	58%

Table 5
Real effective exchange rate

Indicator	Real effective exchange rate			
Recommended threshold	−5%		−11%	
	EU		EU10	
	1 year	2 years	1 year	2 years
Noise-to-signal ratio	0.93	1.09	0.00	0.00
Prediction ratio	11%	10%	2%	2%
False alarms/alarms total	76%	79%	0%	0%

Indicator	Real effective exchange rate			
Recommended threshold	5%		11%	
	EU		EU10	
	1 year	2 years	1 year	2 years
Noise-to-signal ratio	0.85	0.70	1.54	1.24
Prediction ratio	43%	53%	34%	43%
False alarms/alarms total	75%	71%	71%	64%

The **net international investment position** also captures the net external position of a country; it corresponds to the stock counterpart of the current account balance as flow variable. Similarly to the previous indicator, this one also has better performance in the case of the EU10 countries (Table 4).

The **real effective exchange rate** captures the price and cost competitiveness of a country vis-à-vis its trading partners. Outliers for this indicator may indicate a disengagement of prices from productivity without entailing adjustment of the nominal exchange rate. The Commission determined positive and negative thresholds for this indicator as well. They differ across all EU Member States and non-euro area countries (EU10 in our case). The decline in the real effective exchange rate performed very weakly in both cases, while in the case of an increase in the indicator it can be considered an acceptable indicator considering the EU as a whole. At the same time, the application of the 5 per cent threshold could be more efficient in the case of the EU10 countries as well; it would have preceded 57–69 per cent of the events, with a 67–60 per cent false alarm ratio (Table 5).

The competitiveness of a country is influenced not only by price factors such as the real effective exchange rate. Therefore, the European Commission considered it justified to include the **export market share** in the set of the indicators. This indicator measures to what extent a country's exports are able to keep up with the changes in the global export volume. However, the performance of this indicator was very weak in every respect (Table 6).

The price and cost competitiveness of exports is captured by the **labour cost** per unit of output. An increase indicates that the growth in production costs exceeds the rise in labour productivity. In this context, an increase in the indicator – especially if it is accompanied by a rise in the current account deficit or a decline in the export market share – reflects considerable erosion in the competitiveness of the given country. The threshold recommended by the Commission is proving good for the member countries collectively on the basis of the noise-to-signal ratio and the prediction ratio, but for the EU10 countries this is only partly true. If a 9 per cent (i.e. stricter) threshold was applied for this group of countries as well, both the noise-

Table 6
Export market shares

Indicator	Export market shares			
Recommended threshold	−6%			
	EU		EU10	
	1 year	2 years	1 year	2 years
Noise-to-signal ratio	3.14	3.11	0.60	0.64
Prediction ratio	12%	11%	5%	6%
False alarms/alarms total	91%	90%	40%	40%

Table 7
Unit labour cost

Indicator	Unit labour cost			
Recommended threshold	9%		12%	
	EU		EU10	
	1 year	2 years	1 year	2 years
Noise-to-signal ratio	0.72	0.68	1.44	1.16
Prediction ratio	57%	59%	48%	58%
False alarms/alarms total	71%	68%	65%	58%

to-signal ratio and the ratio of false alarms would decline, while the prediction ratio would rise significantly, to 71 and 75 per cent, respectively (Table 7).

Changes in **house prices** may also be efficient as an early warning indicator. Numerous studies have already discussed the aspect that they have an effect on real economy through several channels and may also be the source of the evolution of macroeconomic imbalances. For example, asset prices and house prices usually move closely together with monetary and credit aggregates, which may jeopardise financial stability as well. Nevertheless, our findings suggest that house prices only rarely exceeded the threshold recommended by the European Commission; therefore, it cannot be said that – in their own right, without the credit aggregates – they called attention to the development of imbalances or 'events' (Table 8).

Among other things, the 2008 financial crisis also revealed that **high private sector indebtedness** jeopardises both economic growth and financial stability, and it is also generally believed that an economic crisis is a greater shock for more indebted countries. However, the threshold recommended by the EU does not prove to be too efficient, since the ratio of false alarms is very high for the EU countries collectively, and only a small portion of 'events' is preceded by the exceeding of the threshold. Moreover, while there is no false alarm in the EU10 countries, the threshold is too high (there are only 4 and 5 signals, respectively), and thus the prediction ratio is even lower than in the case of all the EU member countries. With a lower (80 per cent) threshold, the prediction ratio would improve significantly (to 53–52 per cent) in the EU countries, while the ratio of false alarms would remain nearly unchanged (83–84 per cent). Even the lower threshold does not help in the EU10 countries: although the prediction ratio would improve to 37–35 per cent, the ratio of false alarms would also increase significantly (to 50–47 per cent) (Table 9).

The flow counterpart of the above stock variable, i.e. the **private sector credit flow,** may also be a good predictor

Table 8
House prices

Indicator	House prices			
Recommended threshold	6%			
	EU		EU10	
	1 year	2 years	1 year	2 years
Noise-to-signal ratio	6.14	–	6.09	–
Prediction ratio	3%	0%	5%	0%
False alarms/alarms total	96%	100%	88%	100%

Table 9
Private sector loans outstanding

Indicator	Private sector loans outstanding			
Recommended threshold	160%			
	EU		EU10	
	1 year	2 years	1 year	2 years
Noise-to-signal ratio	1.75	1.73	0.00	0.00
Prediction ratio	17%	16%	8%	7%
False alarms/alarms total	86%	86%	0%	0%

Table 10
Private sector credit flow

Indicator	Private sector credit flow			
Recommended threshold	15%			
	EU		EU10	
	1 year	2 years	1 year	2 years
Noise-to-signal ratio	1.62	0.98	1.52	1.09
Prediction ratio	19%	30%	19%	25%
False alarms/alarms total	85%	78%	69%	61%

of financial and/or bank crises both in emerging and developed countries, as rapid increases in loans are usually accompanied by an easing of credit conditions, resulting in the vulnerability of the banking sector. However, this variable in itself cannot be considered a good early warning indicator either, as the prediction ratio is low in both country groups, while the ratio of false alarms is well above 50 per cent (Table 10).

The financial tensions experienced in recent years highlighted that not only the indebtedness of the private sector, but also **government debt** plays a significant role in a country, because an increase in government debt adds to the vulnerability of the given country and limits the room for manoeuvre of the country/government in crisis management. However, the 60 per cent threshold, which is applied during the excessive deficit procedure as well, has a low prediction ratio and very high false alarms/alarms total ratio, similarly to the aforementioned indicator (Table 11).

High **unemployment rate** may also indicate a build-up of imbalances, as it may point to inefficient allocation and weak utilisation of resources available in the economy as well as to lack of adaptability of the economy. Compared to other indicators, unemployment rate as early warning indicator performs very well, as the prediction ratio is above 50 per cent, while the ratio of false alarms is well below that in the case of the EU10 countries. Accordingly, the noise-to-signal ratio is also favourable (Table 12).

The last indicator – which was included in the macroeconomic imbalance procedure subsequently – is related to the **financial sector,** and captures the relations between the real economy and the financial sector well. This indicator must comply with various requirements,[9] based on which the choice finally fell on the increase in the liabilities of the financial sector. This indicator may be able to capture the risks to the financial sector, which is important, because experiences show that financial crises are often preceded

Table 11
Government debt

Indicator	Government debt			
Recommended threshold	60%			
	EU		EU10	
	1 year	2 years	1 year	2 years
Noise-to-signal ratio	1.60	1.93	2.65	1.77
Prediction ratio	24%	20%	5%	7%
False alarms/alarms total	84%	87%	81%	73%

[9] For details see: European Commission (2012b).

Table 12
Unemployment

Indicator	Unemployment			
Recommended threshold	10%			
	EU		EU10	
	1 year	2 years	1 year	2 years
Noise-to-signal ratio	0.33	0.42	0.44	0.64
Prediction ratio	51%	45%	59%	51%
False alarms/alarms total	52%	60%	35%	42%

Table 13
Liabilities of the financial sector

Indicator	Liabilities of the financial sector			
Recommended threshold	16.5%			
	EU		EU10	
	1 year	2 years	1 year	2 years
Noise-to-signal ratio	0.89	0.77	1.39	1.37
Prediction ratio	27%	32%	35%	38%
False alarms/alarms total	76%	74%	68%	66%

by turbulences evolving in the financial sector. It is emphasised, however, that the assessment of this variable cannot be mechanical or isolated from the other indicators either. In spite of the relevance of the variable, the results were weaker than expected, as the prediction ratio is around a mere 30 per cent, while the ratio of false alarms is above 60 per cent (Table 13).

ON THE PRINCIPLES OF PROPER APPLICATION OF THE INDICATORS

Based on the previous chapter, with the given thresholds, the majority of the indicators recommended by the European Commission do not prove to be good early warning indicators by themselves. Only in the cases of the current account deficit and the unemployment rate do we see results where the prediction ratio is better than the ratio of false alarms to alarms total, or where the results received are at least as good or are in conformity with the findings of the aforementioned studies by Borio and Lowe (2002) or Alessi and Detken (2009). In addition to the above, perhaps the net investment position, the real effective exchange rate and the unit labour cost provide more or less acceptable results. On the basis of the signalling method, many of the variables under review cannot be applied efficiently as early warning indicators (current account balance surplus, export market share, house prices, private sector credit flow and outstanding debt, government debt, liabilities of the financial sector). At the same time, we

came to the conclusion that it would be possible to apply some of the above variables as well, but not with the thresholds recommended by the Commission (application of another threshold is proposed for the real effective exchange rate and the unit labour cost in the case of the EU10 countries, and for private sector debt in the case of all the countries).

This is in line with the findings of the study by Csortos and Szalai (2013), which points out that indicators by themselves perform weakly, but an adequate combination of indicators (e.g. if at least 2 of 4 indicators issue signals) may efficiently call attention to the development of imbalances. Accordingly, we examined how many of the 11 indicators recommended by the European Commission have to give signals so that the early warning system can operate well.

The fourth rows of partial tables 14 show at least how many of the indicators (and the relevant thresholds) recommended by the European Commission generate signals simultaneously. Accordingly, the results improved in both country groups. For the EU countries collectively, if at least two indicators generate signals, the prediction ratio is already around 60 per cent, although the ratio of false alarms is still high (above 70 per cent). The results are more favourable in the case of the EU10 countries, where if at least two indicators generate signals, the prediction ratio is already close to 70 per cent, while the ratio of false alarms is only around 60 per cent. Although there is no guideline or rule of thumb for the

Table 14
Combined performance of indicators

Indicator	Indicators jointly				
Time horizon	1 year				
	EU				
	1	2	3	4	5
Noise-to-signal ratio	1.08	1.04	0.92	0.95	1.13
Prediction ratio	75%	60%	46%	31%	17%
False alarms/alarms total	77%	76%	74%	74%	77%

Indicator	Indicators jointly				
Time horizon	2 years				
	EU				
	1	2	3	4	5
Noise-to-signal ratio	1.04	0.99	0.91	0.81	0.97
Prediction ratio	75%	59%	45%	34%	18%
False alarms/alarms total	76%	75%	73%	71%	75%

Indicator	Indicators jointly				
Time horizon	1 year				
	EU10				
	1	2	3	4	5
Noise-to-signal ratio	1.06	1.02	0.91	1.02	1.54
Prediction ratio	75%	68%	54%	35%	14%
False alarms/alarms total	61%	60%	57%	60%	69%

Indicator	Indicators jointly				
Time horizon	2 years				
	EU10				
	1	2	3	4	5
Noise-to-signal ratio	0.92	0.93	0.77	0.80	1.49
Prediction ratio	79%	68%	59%	41%	14%
False alarms/alarms total	58%	59%	54%	55%	69%

optimum value of these indicators, the results presented here are much better than the ones described in the previous chapter and provided by individual indicators, and in many cases they are even better than the results in the studies considered to be references.[10] It is possible to evaluate the indicators on the basis of the noise-to-signal ratio as well. In this case, a signal from 3 indicators could be guiding, because this is when this indicator reaches its minimum value. These results may be important because the European Commission has not determined the total number of indicators whose signals suggest the existence of macroeconomic imbalance; the Commission only expressed that the signals of several indicators provide more information.

It should be noted that when the results that can be considered the best were received, the same 2-3 indicators which were also found to be suitable for indicating imbalances in the previous chapter always generated signals. Nevertheless, the Commission compiled a comprehensive set of indicators on purpose, because experiences show that crises occurring over time are not identical. A wider set of indicators may facilitate the timely identification of new imbalances as well. Moreover, an argument for the application of the comprehensive set of indicators may be that various types of indicators issue signals in various countries and country groups (e.g. indicators related to competitiveness or developments in

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[10] At the same time, in many cases the indicator combinations presented in the study by Csortos and Szalai (2013) had even better results than that; for example, in certain cases they showed prediction ratios exceeding 90 per cent.

lending). At the same time, the Commission is also aware of the disadvantages of too many alarm signals. The Commission's task is to continuously monitor the experiences related to the set of indicators and the thresholds chosen,

and to propose changes if and when it is necessary.[11] Our findings show that different thresholds according to level of economic development may be justified in the case of less developed and developed country groups.

Changes in indicators in Hungary

We have examined the indicators recommended by the European Commission for the case of Hungary in detail as well, as shown in Table 15.

Table 15
Forecasting ability of indicators in Hungary

Indicators	GDP	CAB	NIIP	REER	EMS	ULC	HPI	PSCF	PSD	GGD	UR	TFSL	Total
Threshold	−2	−4	−35	11	−6	12	6	15	160	60	10	16,5	
1997	7.0	−3.7	−65.6	2.9				8.4	46.2	62.9		15.6	2
1998	7.2	−3.5	−65.7	6.9		60.6		4.9	46.3	60.9	9.2	15.3	3
1999	2.4	−4.9	−75.1	6.8	115.9	40.6		9.3	52.5	60.8	8.2	12.8	4
2000	1.7	−7.1	−72.6	2.9	55.1	32.1		19.6	67.2	56.1	7.3	12.4	4
2001	3.1	−7.5	−66.3	12.2	65.0	31.1		10.3	67.3	52.7	6.2	6.5	4
2002	4.0	−7.2	−65.2	20.6	43.0	34.2		15.3	71.1	55.9	5.8	5.7	5
2003	2.8	−7.0	−78.1	20.1	43.0	27.4		18.3	84.9	58.6	5.6	19.8	6
2004	3.5	−7.8	−85.4	17.7	33.7	19.8		12.8	86.4	59.5	5.8	16.7	5
2005	2.1	−7.8	−94.4	9.3	30.9	13.3		17.4	102.2	61.7	6.3	21.1	6
2006	2.6	−7.6	−102.8	3.0	16.9	9.3		18.0	110.8	65.9	6.9	18.0	5
2007	2.2	−7.3	−105.1	8.0	20.8	11.3		22.0	125.7	67.0	7.3	13.4	4
2008	3.3	−7.3	−106.0	9.3	13.9	13.1		29.2	155.7	73.0	7.5	14.6	5
2009	−4.5	−4.9	−117.2	8.0	6.6	14.0	−9.8	5.4	170.6	79.8	8.4	8.2	5
2010	−4.7	−2.2	−112.8	−0.4	1.4	6.4	−6.4	−21.6	154.0	81.8	9.7	3.2	2
2011	−3.7	0.6	−105.9	−3.3	−2.8	3.7	−4.1	6.4	167.3	81.4	10.7	−2.6	4

The second column shows that in terms of the changes in GDP, there was excessive negative deviation (more than -2 per cent) from the trend in 2009-2011. In the period presented, however, at least two indicators (marked in red) always issued signals. Therefore, it would not have been appropriate to apply the threshold of 2–3 recommended above, because we would have faced false alarms practically during the whole period. Ex post, it can be said that the third quartile (5) of the indicator signals could have been a good threshold: in 2008 and 2009 five indicators issued signals that could have called attention to the imbalances that unfolded in 2009, 2010 and 2011. (Three of these five indicators are identical with the ones that were found suitable for forecasting in the previous chapter as well. They are the current account deficit, the net investment position and the unit labour cost.) At least five indicators issued signals between 2002 and 2006 as well. In these cases, it is questionable whether all of them were false alarms or economic policy measures that finally prevented GDP from departing from the trend in a negative direction were implemented.

CONCLUSIONS

Our article evaluated the efficiency of the indicators of the early warning system applied by the European Commission. It presented the purpose, course and the motive of the macroeconomic imbalance procedure as well as the methodology that allows the assessment of the indicators used in the procedure. We discussed the results provided by

the methodology in detail, and made a proposal for a more efficient application of the set of indicators. Finally, we mentioned how they could have been or could be applied appropriately in Hungary.

This subject is relevant for the Magyar Nemzeti Bank in several respects. Firstly, it is important that in parallel with the analysis prepared annually by the Commission, for the

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[11] European Commission (2012a), pp. 4–5.

sake of efficient cooperation or debate with the Commission, we also need to be aware of potentially hazardous developments. Secondly, as an inflation targeting central bank, the MNB must pay special attention to the build-up of financial imbalances, because they may also evolve in a stable inflation environment and may result in overheating or unwanted excessive income fluctuations followed by recession.

According to our current knowledge and experiences, the signalling method is the most suitable one for the evaluation of early warning systems. Using the method, we examined the noise-to-signal, prediction and false alarms/alarms total ratios shown by individual indicators. Firstly, our findings highlighted that due to different levels of development and macroeconomic characteristics it may be justified to apply different thresholds for all the EU member countries and the newly joined ones. Secondly, we came to the conclusion that the indicators applied by the Commission often do not prove to be good early warning indicators by themselves. However, the forecasting ability of the set of indicators may improve considerably if different types and numbers of indicators are applied for each country and different thresholds are used according to level of development. In addition, our results are able to provide a numerical guideline as well, suggesting how many indicators in total may point to a build-up of macroeconomic imbalance. All of this confirms the statement of the European Commission that the early warning system cannot be applied mechanically.

In summary, only some of the variables of the set of indicators applied by the European Commission are able to efficiently call attention to the build-up of imbalances. Our results show that there are variables that are not suitable at all for the above purpose, while other variables may be, but not with the threshold applied by the Commission. Accordingly, one of our main conclusions is that it would be possible to improve the forecasting ability of the set of indicators if the applied threshold was differentiated according to level of development in the case of several indicators. In addition, if the indicators are examined together, i.e. in certain combinations, the results are much better than the ones shown by individual indicators, and in many cases they are even better than the results of the studies that are considered to be references. All of this, in turn, may indicate that in individual countries groups of various types of indicators (e.g. indicators related to competitiveness or developments in lending) may be able to

generate efficient signals, although this would require a country-specific analysis. Consequently, a differentiation of thresholds according to level of development and an appropriate grouping of indicators may provide efficient help in preventing the build-up of macroeconomic imbalances and excessive income fluctuations.

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Péter Gábriel, György Molnár and Judit Rariga: Measures of underlying inflation

The primary objective of Magyar Nemzeti Bank is to achieve and maintain price stability. The central bank of Hungary defines its 3 per cent inflation target in terms of the consumer price index. However, this indicator is quite volatile, and many of its components are sensitive to temporary shocks. Consequently, the CPI also captures price changes that monetary policy should generally look through. In this context, the need has arisen to develop measures of inflation which capture medium-term underlying inflationary pressures in the economy. Most central banks, including the MNB, use several alternative measures to capture underlying inflation. These measures have increasingly become an important part of the decision-making process and communication with market participants. In respect of the domestic measures of inflation, our results can be summarised as follows. The set of underlying inflation indicators developed and used by the MNB are in line with international best practices. Movements in the various underlying measures of Hungarian inflation are significantly less volatile than those in the consumer price index, and the indicators have a robust predictive power for expected future movements in inflation. At the same time, the average value of underlying measures is different from average inflation over the long run, which makes the quantitative assessment of the indicators more difficult.

INTRODUCTION

Achieving and maintaining price stability is central to the mission of central banks in developed countries. Under an inflation targeting regime, central banks typically use the consumer price index (CPI) to define their target for inflation. However, this measure of inflation can be temporarily influenced by a number of highly volatile items, and consequently it cannot provide a sufficiently reliable picture of underlying inflationary pressure in the economy, particularly over the medium term, which is the relevant horizon for central bank decision making. In many cases, monetary policy generally need not react to such temporarily fluctuations in the price level. Moreover, since it can only influence inflation with a time lag, in the face of unforeseen and temporary shocks to the price level, monetary policy will be less effective and might cause excess volatility in real economic variables. For this reason, a more precise picture of developments in medium-term inflation, relevant from the point of view of inflation targeting, can be obtained by eliminating volatile items and the effects of policy measures which only have temporary effects on inflation. This implies the calculation of measures reflecting persistent trends in inflation. Using a less volatile indicator to capture trend inflation in central bank communications may help economic agents to better understand underlying movements in inflation and central banks to explain their decisions.

There are various methods in the literature to construct measures of underlying inflation. Ideally, such measures should meet the following criteria. First, a key requirement to be met by underlying inflation measures is smoothness: they must be less volatile than the consumer price index. Second, the long-term average value of a measure of underlying inflation is ideally equal to the average rate of inflation, which may help improve central bank communication with the general public. Third, an important requirement is that the various measures can contribute to the projections of future inflation. In addition, they should be relatively easy to calculate and should preferably not be subject to significant revision when new data comes in. This may also facilitate central bank communication.

Simple measures, excluding the prices of certain large product groups, mainly energy and food prices, are the most

widely used measures in international practice and central banking communication, but more complex measures also play a role in the communication of several central banks. In recent years, the MNB has placed increasing emphasis on constructing measures of underlying inflation, to complement the use of the more traditional measures.[1] Consequently, these measures have been playing an increasing role in monetary policy decision-making and analysis.

The purpose of this article is to present international practice and to compare the inflation trend indicators[2] developed and used by the MNB with those in use in various other countries. First, the methods used to construct inflation measures are summarised, then we review how much central banks rely on these measures in decision-making and communications. Subsequently, the measures used by foreign central banks and the MNB are examined from a statistical point of view. Finally, we summarise our results.

TYPES OF MEASURES OF UNDERLYING INFLATION AND THEIR USE IN CENTRAL BANK PRACTICE

There are several definitions of underlying inflation in the literature: according to Eckstein (1981) it must show the trend increase in the cost of factors of production; Blinder (1997) defines trend inflation as the persistent component of inflation; while Velde (2006) defines it as the (unobserved) common component to a large number of individual price series.

There are a number of ways to measure underlying inflation. Based on the method used, measures of inflation can be categorised into three groups. The first group generally comprises measures that exclude energy prices and food prices from the consumer price index. One great advantage of these measures is that they are easy to calculate and communicate; and therefore they are the most commonly used measure of underlying inflation. In the case of measures falling into the second group, the items to be excluded from the inflation index are chosen at the level of individual products or narrowly defined product groups. Some of these measures are calculated by removing outliers from price changes in a given month. This concept is based on the assumption that outlying price movements are presumably affected by one-off shocks, and therefore have no significance for medium-term price developments. An example for this measure is the trimmed mean. In the case of trimmed means, changes in the prices of CPI components are arranged in descending order, and the new measure is constructed by taking the average of disaggregated price changes after removing the upper and lower 10 per cent–15 per cent of the distribution of price changes in a given period. In the case of another type of measures in this group, individual components of the CPI are weighted on the basis of the volatility of product prices, or components displaying the greatest volatility are removed. The volatility-weighted measure of inflation belongs to this group. In re-weighting the items, components displaying greater volatility are assigned lower weights when calculating the measure.[3]

The third group is comprised of the results of model-based estimates. In this case, in addition to inflation, other macroeconomic variables and the theoretical relationships between the variables are used to define the underlying inflation rate. Structural VARs or factor models are commonly used to estimate these types of measure.

In practice, central banks ascribe different degrees of significance to the use of underlying inflation measures.

Table 1
Hungarian measures of underlying inflation

Core inflation excluding indirect taxes	This measure is derived by excluding the effect of changes in VAT, excise duties and other indirect taxes from the core inflation rate published by the Central Statistical Office (KSH).
Sticky price inflation	The sticky price index shows the prices of components of the consumer price index which are slow to change, and therefore are good predictors of medium-term developments in headline inflation. In calculating the index, only those groups of products of the consumer price index are used where maximum 15 per cent of the individual, shop level prices tend to change on average monthly. Administered prices have been excluded from the product groups in advance, as they are set by a government authority. The effects of indirect taxes have also been filtered out from the measure.
Demand sensitive inflation	The demand-sensitive price index excludes processed food prices from tax-adjusted core inflation as well. This may be justified by the fact that price changes of processed food are greatly dependent on typically highly volatile movements in unprocessed food prices. Consequently, the demand-sensitive price index shows the inflation of tradable goods, market services, and alcoholic drinks and tobacco, excluding the effects of indirect taxes.

[1] See Bauer (2011), Reiff and Várhegyi (2013).

[2] This article focuses on measures capturing the medium-term outlook for inflation. For more details on measures capturing the short-term outlook for inflation, see Bauer (2011).

[3] For more details on short-run measures calculated on the basis of cross-section data, see Bauer (2011).

Some central banks primarily use the consumer price index in their communications, while others also take into account underlying inflation measures in explaining their decisions. The majority of measures of underlying inflation are estimated by excluding large product groups; however, more sophisticated methods (e.g. re-weighting of inflation items) are also commonly used. Tables A1 and A2 in the Appendix provide a brief summary of the methods used in calculating underlying measures of inflation. Table 1 presents an outline of the measures of underlying inflation used by the MNB.

The inflation targets of the *European Central Bank (ECB)* and the *Bank of England* are specified in terms of the headline consumer price index, and they do not put much emphasis on developments in underlying inflation. Although the ECB also calculates measures excluding food and energy prices, the Harmonised Index of Consumer Prices is dominant in the ECB's monetary policy decisions. The Bank of England ceased publishing underlying inflation measures in the years prior to the crisis, motivated by the thought that stripping out energy prices from the inflation measure did not give a true picture of developments in inflation when oil prices exhibited a rising trend as a result of globalisation (Wynne, 2008).

Most of the examined central banks, however, use multiple measures of underlying inflation and publish these regularly in their inflation reports. In its Monetary Policy Reports, *Sveriges Riksbank* regularly publishes inflation measures. The most often cited of these excludes households' mortgage interest expenditure, in addition to indirect taxes. *Norges Bank* publishes inflation measures which exclude indirect taxes and energy prices. In their monetary policy reports, Norges Bank and Sveriges Riksbank also publish forecasts of underlying inflation measures. *Narodowy Bank Polski* calculates measures of underlying inflation excluding food, energy and regulated prices, in a similar way as the Magyar Nemzeti Bank does. All three central banks also produce statistical measures of inflation.

The *US Federal Reserve (Fed)* actively refers to the trend inflation measure excluding volatile components in conducting its monetary policy. The measure used by the Fed (core personal consumption expenditure inflation) excludes food and energy components. Similarly to the Scandinavian central banks, the Fed also produces a forecast for the underlying inflation measure. At the *Bank of Canada,* underlying measures also play an important role. Although the inflation target of the Bank of Canada is also expressed in terms of the consumer price index, movements in the core inflation measure are taken into account in monetary policy decision-making. In addition to the traditional/standard measures, i.e. those excluding energy and food prices as well as the effects of changes in indirect taxes, another measure (CPIX) used by the Bank of Canada attempts to make up for the shortcomings of the traditional measures arising from the fact that not all of the food components excluded are volatile (e.g. the price of food purchased from restaurants), and thus the traditional measure may disregard components important in terms of trend inflation. Of the 182 goods and services in the consumer price index, the CPIX excludes the eight most volatile components for which historical data are available on a comparable basis[4] (fruits, vegetables, gasoline, diesel fuel, natural gas, tobacco, mortgage interest costs, and intercity transportation). The examples of the Czech National Bank and Norges Bank are presented in detail in Box.

Inflation measures relevant for monetary policy in the Czech Republic and Norway

Czech Republic

It may be useful to highlight the example of the *Czech National Bank,* which until the end of 2001 defined its inflation target in terms of 'net inflation' (consumer price index excluding regulated prices and changes in indirect taxes), instead of the consumer price index. The reason for this was that in the 1990s the level of regulated prices was significantly below the level considered justified by the government, but the Bank did not have information on the schedule of regulated price increases. Regulated price inflation had become more predictable by the 2000s. This made it possible to use the consumer price index to set the inflation target, a more common measure of inflation, with a greater impact on economic agents' decisions. This in turn makes its use by the central bank as a target variable easier to explain to the outside world, which facilitates central bank communication. Although since 2002 the inflation target has been defined in terms of the consumer price index, changes in taxes are still removed from the measure relevant to monetary policy decision-making.

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[4] Over the period from 1986 to 1998.

Chart 1
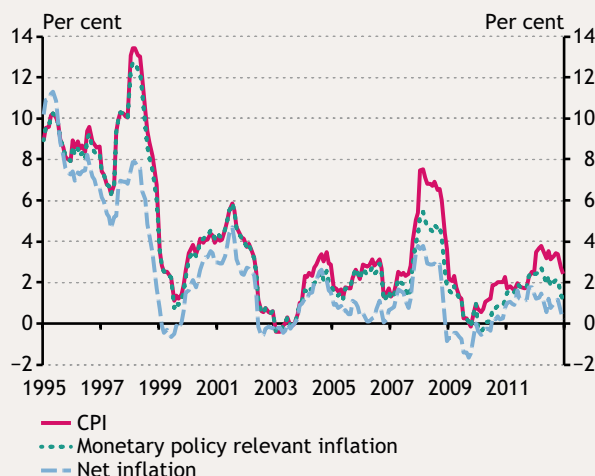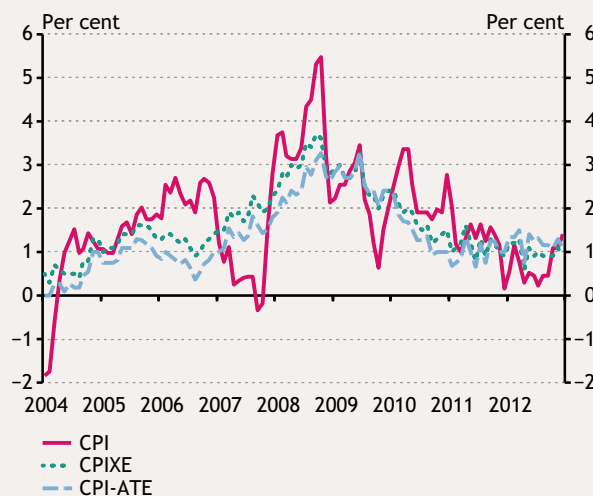
Measures of underlying inflation: Česká národní banka

CPI
Monetary policy relevant inflation
Net inflation

Chart 2

Measures of underlying inflation: Norges Bank

CPI
CPIXE
CPI-ATE

Norway

Using underlying inflation measures to explain monetary policy actions is easiest when the measure of underlying inflation and the headline consumer price index do not, on average, deviate from each other over the longer term. In this case, the deviation between the trend measure and the inflation target can be a good predictor of medium-term movements in inflation and can be used easily in communications. In practice, however, the averages of the two measures may deviate from each other even over the longer term. The CPIXE, a measure used by *Norges Bank,* seeks to address this problem. In contrast to the measure previously used by the Bank (CPI-ATE), only one-off changes are removed from this measure, whereas trend changes in the volatile items (mainly energy prices) remain included.[5] As a result, the difference between the expected values of inflation and the underlying measure has ceased to exist.

The authors of an external study assessing the performance of Norges Bank every year ('Norges Bank Watch', published by the Norwegian School of Management) consider that the price index (CPI-ATE) used by the Bank earlier was a better indicator of underlying inflation. The background to this criticism is that the oil price forecast used in the analyses and the trend rise in energy prices may be subject to significant revision.

EMPIRICAL ANALYSIS OF INFLATION MEASURES BASED ON INTERNATIONAL DATA

Statistical considerations

Level difference between inflation and the underlying inflation measure

Ideally, the longer-term average of the underlying measure is equal to the average rate of inflation. In this case, the difference between the trend measure and the inflation target can be an unbiased predictor of medium-term movements in inflation, greatly facilitating the use of the

measure in external communications. If there is a significant difference between the averages of an underlying measure and inflation over the longer term, then not only one-off, but also persistent price changes have been stripped out in calculating the measure. A biased measure can also provide useful information, but it is more difficult to interpret the value of the measure, and therefore it should be used with greater care in external communications. If the difference is explained by tax changes, then that difference poses a relatively small challenge for communications. If, however, after taking account of tax changes, the difference remains significant, then it may be more difficult for the outside world to interpret the measure. In such cases, the central bank may try to publish a different value from the inflation

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[5] Trend energy prices and temporary components are captured using the Hodrick–Prescott-filter.

Table 2

Differences in levels between inflation and the underlying measure

(percentage points)

	Hungary	Czech Republic	EA	Canada	Poland	Norway	Sweden	USA
CPI	5.2	2.7	2.1	1.9	3.0	1.7	1.4	2.3
Key underlying measure	2.5	2.0	1.7	1.8	1.7	1.6	1.5	1.9
Alternative measure	3.1	0.9		1.4		1.4	1.3	
Difference:								
(CPI – Key underlying measure)	**2.7**	**0.7**	0.4	0.1	**1.3**	0.1	−0.2	**0.4**
(CPI – Alternative measure)	**2.1**	**1.7**		**0.5**		**0.3**	0.1	

Note: Estimation is carried out over the 2004 january to 2012 december period. Differences significant at the 5% level are indicated by bold letters.
Key underlying measure: Hungary: Demand sensitive inflation; Czech Republic: CPI adjusted for first-round effects of indirect taxes; EA: HICP excluding unprocessed food and energy; Canada: CPI net of 8 most volatile CPI components and effect of changes in indirect taxes; Poland: CPI net of food and energy prices; Norway: CPI adjusted for tax changes and excluding temporary fluctuations in energy prices; Sweden: CPI with a fixed mortgage rate; USA: PCE excluding food and energy.
Alternative measure: Hungary: Sticky price inflation; Czech Republic: CPI net of administered prices and first round effects of indirect taxes; Canada: CPI excluding food, energy and the effect of indirect taxes; Norway: CPI adjusted for tax changes and excluding energy products; Sweden: CPI with fixed mortgage rate and excluding energy prices.

target, against which the value of the underlying measures could be compared, or it may place the emphasis in its communications on the dynamics of the indicator rather than the specific value for the underlying measure.

In order to assess this statistical feature, the significance of the differences between annual average indices was tested (see Table 2) in selected countries using an inflation targeting regime, the euro area and the US. In the cases of Canada, Norway and Sweden, the expected values of the most frequently cited underlying measures in central bank communications equal those of headline inflation. Measures used in the euro area and the US exhibit a slight bias, whereas the expected values across the countries in Central and Eastern Europe differ to a significant degree. (Differences that are statistically significant at the 5 per cent level are marked in bold.) As regards Hungary, the average rate of headline inflation during the period under review stands at 5.2 per cent. The average rate of the key underlying measure of inflation is 2.5 per cent, compared

Table 3

Standard deviation of inflation and the underlying measures

	Hungary	Czech Republic	EA	Canada	Poland	Norway	Sweden	USA
CPI	1.7	1.8	0.9	0.9	1.2	1.2	1.4	1.1
Key underlying measure	1.0	1.3	0.4	0.3	0.9	0.8	0.6	0.4
Alternative measure	1.2	1.2		0.5		0.8	0.6	
Difference:								
(CPI – Key underlying measure)	−40.8%	−26.4%	−49.5%	−64.4%	−25.9%	−35.5%	−53.4%	**−63.2%**
(CPI – Alternative measure)	−26.3%	−34.7%		−47.1%		−35.9%	−59.4%	

Note: Estimation is carried out over the 2004 january to 2012 december period.
Key underlying measure: Hungary: Demand sensitive inflation; Czech Republic: CPI adjusted for first-round effects of indirect taxes; EA: HICP excluding unprocessed food and energy; Canada: CPI net of 8 most volatile CPI components and effect of changes in indirect taxes; Poland: CPI net of food and energy prices; Norway: CPI adjusted for tax changes and excluding temporary fluctuations in energy prices; Sweden: CPI with a fixed mortgage rate; USA: PCE excluding food and energy.
Alternative measure: Hungary: Sticky price inflation; Czech Republic: CPI net of administered prices and first round effects of indirect taxes; Canada: CPI excluding food, energy and the effect of indirect taxes; Norway: CPI adjusted for tax changes and excluding energy products; Sweden: CPI with fixed mortgage rate and excluding energy prices.

with that of the alternative measure, which stands at 3.1 per cent.[6] While 0.9 per cent of this notable difference could be attributed to tax changes, the size of the remaining differential still remains significant.[7] Also contributing to this discrepancy is the fact that the trend of the price indices of excluded items has been higher than that of the underlying measures, causing the latter to be a biased indicator of inflation in the longer term. This discrepancy may hinder the quantitative interpretation and use in external communications of such measures.

Volatility of measures of underlying inflation

The use of underlying measures of inflation is desirable due to their ability to remove the effects of temporary shocks on inflation. Accordingly, a measure of underlying inflation should ideally have significantly lower volatility than inflation. To assess this attribute, variance is measured using the standard deviation of annual indices. On the basis of this variance, underlying measures are significantly less volatile than inflation. As far as countries in this region are concerned, the reduction in volatility is generally less pronounced. Of the Hungarian measures of trend inflation, demand-sensitive inflation tends to exhibit the largest drop in standard deviation in relative terms. With respect to domestic inflation measures, changes in taxes raised not only the level of inflation but also contributed significantly

to the variance of inflation. It is therefore useful to examine the size of the decrease in the variance of underlying measures against the variance of inflation following the removal of the effect of tax changes. The differential remains relatively high (with a decrease of 32.7 per cent for the key underlying measure and 16.2 per cent for the alternative measure).

Comparison of underlying measures with the moving average of inflation

Underlying measures should ideally produce a smoother series than headline inflation, and provide a reliable picture of inflationary trends. Given that the underlying trend in inflation cannot be observed, the measurement of the latter characteristic requires the setting of a benchmark. In this paper, the centred moving average[8] of the consumer price index is used as a benchmark to compare the performance of the various measures. This comparison is consistent with the definition by Bryan et al. (1997) for underlying inflation. Using the annual indices of the reviewed measures, the mean square errors (MSE) are compared with the reference value calculated from inflation.

$$\frac{\sum_{t=1}^{T}(\pi_t^i - \pi_t^{ma})^2}{T}.$$

Chart 3
Moving average of inflation and the underlying measures

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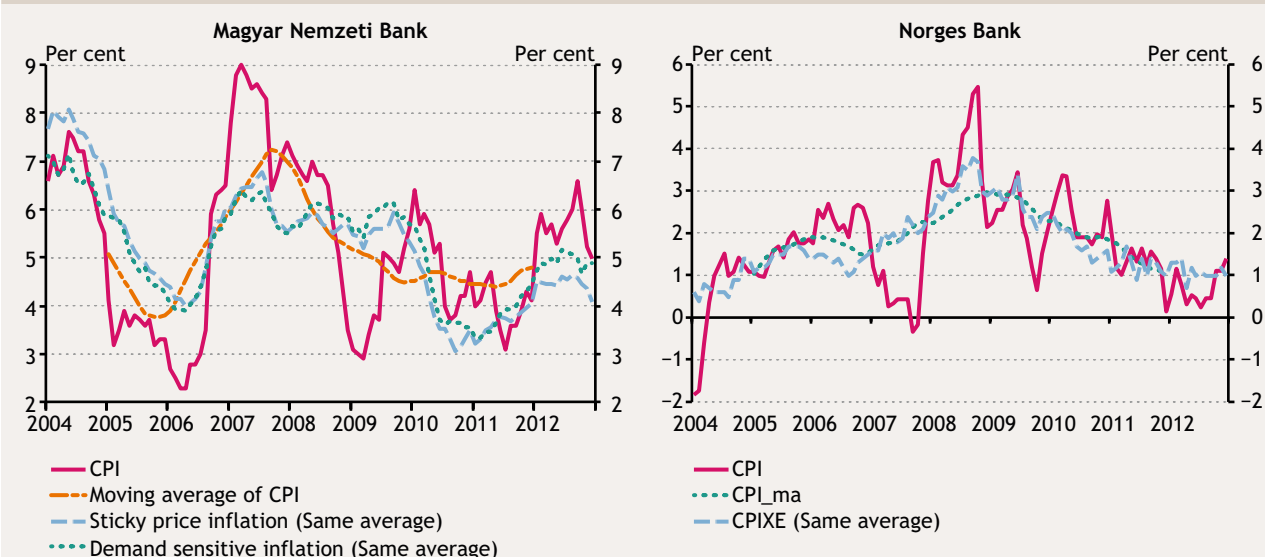
[6] Offering fewer benefits from a statistical point of view and providing a less forward-looking measure of trend inflation, the core inflation rate excluding taxes is not discussed in this analysis.

[7] Recent changes in indirect taxes have not only been common in Hungary. It holds true in the international environment that there has been a shift towards consumption-type taxation, which could have contributed to the emergence of such discrepancies between the levels.

[8] A 25-month central moving average is calculated for the annual indices.

Table 4

Comparison of underlying measures and the moving average of inflation

(average square error)

	Unadjusted	Mean adjusted		Unadjusted	Mean adjusted
Hungary			**Poland**		
CPI	**1.40**	1.40	CPI	**0.42**	0.42
Key underlying measure	8.40	**0.67**	Key underlying measure	1.90	**0.24**
Alternative measure	5.70	**0.66**	**Norway**		
Czech Republic			CPI	0.85	0.85
CPI	1.63	1.63	Key underlying measure	**0.14**	**0.13**
Key underlying measure	**1.34**	**0.77**	Alternative measure	0.36	0.16
Alternative measure	4.28	0.79	**Sweden**		
EA			CPI	0.86	0.86
CPI	0.45	0.45	Key underlying measure	0.67	**0.64**
Key underlying measure	**0.32**	**0.14**	Alternative measure	**0.66**	**0.64**
Canada			**USA**		
CPI	0.57	0.57	CPI	0.97	0.97
Key underlying measure	**0.33**	**0.31**	Key underlying measure	**0.33**	**0.21**
Alternative measure	0.52	0.34			

Note: Estimation is carried out over the 2004 january to 2012 december period.
Key underlying measure: Hungary: Demand sensitive inflation; Czech Republic: CPI adjusted for first-round effects of indirect taxes; EA: HICP excluding unprocessed food and energy; Canada: CPI net of 8 most volatile CPI components and effect of changes in indirect taxes; Poland: CPI net of food and energy prices; Norway: CPI adjusted for tax changes and excluding temporary fluctuations in energy prices; Sweden: CPI with a fixed mortgage rate; USA: PCE excluding food and energy.
Alternative measure: Hungary: Sticky price inflation; Czech Republic: CPI net of administered prices and first round effects of indirect taxes; Canada: CPI excluding food, energy and the effect of indirect taxes; Norway: CPI adjusted for tax changes and excluding energy products; Sweden: CPI with fixed mortgage rate and excluding energy prices.

The problem with this analysis is that the MSE cannot only be high because of the high noise in a measure, but also because the expected value of the reviewed series differs from that of inflation. At the same time, a biased measure can also provide information on the direction of trend inflation. To adjust for this bias, an MSE adjusted for the average differential[9] was also calculated (see Chart 3).

The performance of the measures reviewed varies significantly. In the vast majority of countries, the best measures in terms of following trend inflation perform significantly better than the consumer price index. While Poland and Hungary are exceptions, the underlying measures for these countries on the basis of the MSE adjusted for mean deviation do perform better than consumer price index. Demand-sensitive inflation and sticky price inflation reflect the trend of the consumer price index relatively well.

Underlying measures are forward-looking indicators of inflation

For the purposes of monetary policy, it is a key requirement that underlying measures should be able to contribute to forecasting future inflation. Using a simple approach, the following section reviews the performance of the trend measures of inflation used by a number of central banks to forecast future rates of inflation, as well as the ability of such measures to signal future changes in inflation.

In accordance with Catte and Slok (2005), we test whether the difference between the consumer price index and the current value of the underlying measure has a significant impact on the difference between current and future (expected in 6, 12 18, 24 months) rates of inflation.[10]

[9] The expected values of the series under review are equated, followed by the calculation of the MSE.
[10] *Ex-post* estimation is used.

The following equation has been estimated:

$$\Pi_{t+k}^{CPI} - \Pi_t^{CPI} = \alpha + \beta(\Pi_t^{CPI} - \Pi_t^c) + \varepsilon_t, \qquad (1)$$

where

Π_t^{CPI} represents the consumer price index,

Π_t^c stands for the trend measure, and

k refers to 6, 12, 18 or 24 months.

If the consumer price index exceeds the underlying measure of inflation due to a temporary shock, then inflation is expected to decline in the subsequent period. Consequently, the coefficient β in the regression presented above is expected to be negative and significant. Ideally, the value of the coefficient β equals –1, which implies that if inflation diverts from the underlying measure, the difference between the consumer price index and the underlying measure will completely disappear over the next k periods.[11] With regard to a number of central bank inflation measures in selected countries, Table 5 illustrates to what extent the gap between the consumer price index and the trend measure explains the development of inflation over various time horizons.

For the majority of the countries reviewed, the coefficients estimated are negative and significant, and lie close to the value of –1, seen as ideal. This means that underlying measures are relatively good predictors of changes in inflation. This statement also holds true for Hungary, where the values of the estimated coefficients imply that the gap between the underlying measure and the consumer price index closes at a relatively fast pace (within roughly one year). As the time horizon expands, the explanatory power

Table 5
Estimates for coefficient β and explanatory powers for selected time horizons

Underlying measure	6 months		12 months		18 months		24 months		Average R²
	β	R²	β	R²	β	R²	β	R²	
Sweden									
CPIF	−0.474***	0.16	−1.157***	0.4	−1.653***	0.6	−1.867***	0.68	0.46
CPIF excluding energy	−0.462***	0.21	−1.077***	0.5	−1.304***	0.56	−1.325***	0.54	0.45
Norway									
CPI-ATE	−0.911***	0.43	−1.554***	0.68	−1.073***	0.37	−0.656**	0.15	0.41
CPIXE	−1.092***	0.52	−1.735***	0.76	−1.216***	0.43	−0.814	0.21	0.48
Canada									
CPIX	−0.582***	0.25	−1.172***	0.6	−1.206***	0.63	−1.202***	0.54	0.51
CPI-XFET	−0.577***	0.24	−1.024	0.45	−1.025***	0.43	−1.094***	0.39	0.38
USA									
Core PCE	−0.847***	0.31	−1.611***	0.63	−1.311***	0.51	−1.204***	0.44	0.47
Eurozone									
HICPex	−0.472*	0.12	−1.239***	0.36	−1.374***	0.39	−1.178***	0.3	0.29
Poland									
CPI net of food and energy	−0.391	0.04	−1.203***	0.21	−1.613***	0.32	−2.094***	0.47	0.26
Czech Republic									
Monetary policy relevant inflation	−1.173***	0.2	−2.841***	0.48	−3.359***	0.57	−3.174***	0.54	0.45
Net inflation	−1.081***	0.44	−1.991***	0.59	−1.869***	0.44	−1.298***	0.22	0.42
Hungary									
Demand sensitive inflation	−0.635***	0.2	−1.119***	0.31	−1.315***	0.36	−1.573***	0.49	0.34
Sticky price inflation	−0.506***	0.13	−0.911***	0.21	−1.074***	0.24	−1.371***	0.38	0.24

Note: Estimation is carried out using monthly data for the 2004 january to 2012 december period.
* Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level.

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[11] As long as the difference between the average values of the measures equals zero. In any other case, the difference between the measures readjusts to the average differential between the levels.

Table 6

Sensitivity test: mean deviations between the inflation of demand-sensitive products and HICP across EU member states

(percentage points)

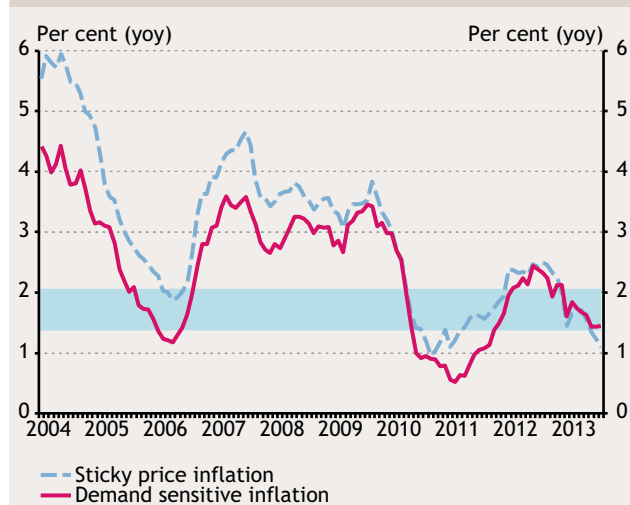|	Full sample average	Regional average
2004–2013	1.0	1.5
2004–2009	1.3	1.8
2009–2013	0.7	1.1

Chart 4

Range of price changes for demand-sensitive products consistent with the 3 per cent inflation target

(January 2004–July 2013)

Sticky price inflation
Demand sensitive inflation

Chart 4 shows the adjusted target value, calculated[12] as the average difference between the measures of HICP inflation and demand-sensitive inflation based on historical data of EU member states. The average rate of inflation of demand-sensitive items in the countries under review is typically lower that the rate of change of the HICP.

The range presented reflects a high degree of uncertainty concerning the corrected target measure. The difference varies both across countries and over time, and is usually lower in developed EU-countries and higher in Central and Eastern European countries (see Table 6). Based on the differentials calculated using the period following the economic crisis of 2008–2009, the hypothetical range would shift up (see Table 6). Given that the corrected target measure is strongly influenced by the time horizon used in the calculation, one should focus on the range constructed on the basis of the longer time horizon.

CONCLUSION

Central bank decision-making and communication is strongly facilitated by the availability of measures capturing underlying trends in inflation. First, the use of underlying measures is expedient, thanks to their ability to filter out from inflation the effects of temporary shocks and thereby convey a reliable picture of recent inflationary trends. Second, they are relatively good predictors of changes in inflation. In an ideal scenario, the average rate of the underlying measure equals that of headline inflation over the long term. This property facilitates the use of such measures for the purpose of public communications, as the difference between the underlying measure and headline inflation is a good proxy of current inflationary pressure.

(R^2) of the right-hand side variables increases. Countries where the performance of underlying measures is relatively higher in terms of the average explanatory power for all time horizons, do in fact pay more attention to these measures.

Ranges consistent with the inflation target

In addition to the dynamics of the measures, another key question for monetary policy regarding the use of the underlying measure is the identification of the level consistent with the inflation target defined in terms of the consumer price index. Answering this question requires identification of the typical size of the gap between the consumer price index and the underlying measures. Correcting the CPI target for this gap yields a hypothetical target value, which helps to determine if the underlying measure of inflation is consistent with price stability.

This article has determined the typical gap level on the basis of international experience. The range displayed on

With regard to the Hungarian indicators, the results can be summarised as follows. The measures developed and used by the MNB are in line with international best practice. The volatility of the Hungarian underlying measures of inflation is significantly lower than that of the consumer price index, and the measures possess substantial predictive power for

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[12] Hypothetical target value = inflation target – average difference between HICP and demand sensitive inflation.

inflation over a 4–6-quarter horizon. No measure is capable of best performance with respect to all of the criteria. As a result, robust statements can only be made on the basis of assessing a combination of multiple measures.

At the same time, the largest hindrance to the domestic use of underlying inflation measures is the significant and long-term discrepancy between the average of the consumer price index and that of the underlying measures. This discrepancy hinders both the quantitative assessment of the measures and their application in public communications. This situation may prompt the central bank to publish a value different from the inflation target, a kind of reference value for the underlying measure, or else place the emphasis in its communication on the dynamics rather than the specific value of the measure. Given that the reference value, consistent with the target in the medium term, may change with the business cycle, and over time as the inflation environment changes, for the time being the MNB opts for the latter practice in its communication regime.

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APPENDIX

Table A1
Key measures derived by excluding product groups characterised by volatile price changes

Central Bank	Underlying measures
Magyar Nemzeti Bank	Demand sensitive inflation
	Sticky price inflation
	Core inflation excluding indirect taxes
Reserve Bank of Australia	CPI net of fruit, vegetables, and fuel prices
Bank of Canada	CPIX: net of 8 most volatile CPI components and changes in indirect taxes
	CPI-XFET: CPI excluding food, energy and the effect of indirect taxes
Česká národní banka	CPI adjusted for first-round effects of indirect taxes
	CPI net of administered prices and first round effects of indirect taxes
	CPI net of food prices, administered prices, indirect tax changes and fuels
European Central Bank	HICP excluding energy
	HICPex: HICP excluding unprocessed food and energy prices
	HICP excluding food and energy prices
Federal Reserve	PCE excluding food and energy
Narodowy Bank Polski	CPI net of administered prices
	CPI net of food and energy prices
Norges Bank	CPI-AT: CPI adjusted for tax changes
	CPI-AE: CPI adjusted for energy products
	CPIXE: adjusted for tax and temporary fluctuations in energy prices
	CPI-ATE: CPI adjusted for tax changes and excluding energy products
Sveriges Riksbank	CPIX: excluding mortgage interest expenditure and indirect tax effects
	CPIF: CPI with fixed mortgage rate

Table A2
Measures filtering or re-weighting products or narrowly defined product groups

Central Bank	Underlying measures
Reserve Bank of Australia	15% trimmed mean
	Weighted median
Bank of Canada	MeanSTD: Trimmed to exclude values further than 1.5 standard deviations from the average
	Weighted median
	CPIW: CPI weights adjusted for the components variability and excluding the effect of indirect taxes
Narodowy Bank Polski	15% trimmed mean
	CPI net of most volatile prices (standard deviation of previous year)
Norges Bank	CPI-FW: CPI adjusted for frequency of price changes
Sveriges Riksbank	UND24: Product groups are weighted using the variance in the difference in the rate of change between the respective component and the total CPI for the last 24 months.
	TRIM85: 7.5% trimmed mean
	Median

Mihály Hoffmann, Zsuzsa Kékesi and Péter Koroknai: Changes in central bank profit/loss and their determinants[1]

In its monetary policy decision-making, the central bank of Hungary primarily focuses on the achievement of price stability. Without prejudice to this objective, it supports the maintenance of financial stability and the economic policy of the Government.[2] While the low inflation environment resulting from the central bank's operation and the sound functioning of financial markets and the financial intermediary system can be considered benefits at the society level, direct costs appear in a concentrated form, in the profit/loss of the central bank. The MNB strives to achieve the monetary policy objectives at the lowest possible cost. Therefore, it continuously monitors developments in the factors that determine the central bank profit/loss. The recent significant increase in the MNB's interest expenditure is primarily attributable to economic developments related to the crisis. Firstly, the state was compelled to borrow foreign exchange, while maintenance of higher-than-earlier foreign exchange reserves became justified due to the external vulnerability of the country. As a result of the two factors, the MNB's balance sheet total doubled, and a much greater part of the foreign exchange reserves had to be financed from MNB bills than before. Secondly, in view of the deterioration in risk assessment, the forint-foreign exchange interest rate spread, which increased following the crisis, and made the holding of foreign exchange reserves more expensive than earlier. At the same time, the loss of the central bank was reduced by the depreciation of the exchange rate of the forint and the exchange rate gain realised on the foreign exchange sales transactions with the Government Debt Management Agency (ÁKK) and on the foreign exchange sales related to the early repayment programme. It is also important to emphasise that, in parallel with the strong deterioration in central bank interest income as a result of the foreign exchange financing substituting for the issue of forint-denominated government securities, a considerable amount of interest was saved in the budget, and this saving offset the central bank interest loss to some extent. In our forecast, which is consistent with the September issue of the Quarterly Report on Inflation, we expect that the central bank's interest loss may be offset by the profit on foreign exchange sales this year again. Consequently, the MNB's 2013 profit/loss may be close to zero. Over the medium term, with a decline in Hungary's external indebtedness and a gradual return of the state to forint financing, the central bank's balance sheet may shrink. At the same time, this process may be decelerated by the Funding for Growth Scheme launched by the MNB, as a result of which, in parallel with an improvement in the SME sector's access to financing, the balance sheet total of the central bank will increase, ceteris paribus. If the forint policy rate also remains at a low level, the central bank may have a close-to-zero profit/loss in the coming years as well, also taking in account the costs of the economic stimulus programme.

THE RELATIONSHIP BETWEEN MONETARY POLICY AND CENTRAL BANK PROFIT/LOSS

The statutory primary objective of the Hungarian monetary policy is the achievement and maintenance of price stability. In addition, the central bank also safeguards financial stability. The central bank develops and applies its monetary policy instruments in order to achieve these objectives.[3] The Monetary Council's decisions on the level of the central bank policy rate, on individual elements of the set of monetary instruments or on the desired level of foreign exchange reserves are primarily determined by developments in inflation, the efficiency of monetary transmission and aspects of financial stability. At the same time, the Magyar Nemzeti Bank as a responsibly

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[2] For more details on the primary objectives of the MNB, see Article 3 of Act CXXXIX of 2013 on the Magyar Nemzeti Bank.
[3] For more details on the monetary policy framework and instruments, see: MNB (2012).

operating state institution must ensure the achievement of monetary policy objectives at the lowest possible costs, as the profit/loss of central bank operation influences fiscal developments as well.

Changes in central bank profit/loss are primarily determined by the structure of the central bank balance sheet, the domestic policy rate, the forint exchange rate and yields on foreign exchange investments. Compared to these factors, the role of operating profit/loss is negligible. It is clearly visible from the above list that the most important variables of monetary policy influence changes in profit/loss the most. Accordingly, central bank profit/loss is partly a consequence of monetary policy decisions. Items that influence profit/loss, but are not determined by monetary policy instruments are externalities for the central bank. They include factors that change the size of foreign exchange reserves (foreign exchange borrowing by the state, amount of EU transfers), external interest rates and largely the exchange rate as well, due to the floating exchange rate regime. All of this also means that while striving to achieve its primary objective, the central bank has relatively limited room for manoeuvre to influence its profit/loss.

It is also important to emphasise the asymmetry in considering benefits and costs: while the low inflation environment resulting from the central bank's operation, sound functioning of financial markets and of the financial intermediary system as well as the maintenance of a favourable external risk assessment can be considered benefits at the society level, possible costs first appear in a concentrated manner in the central bank profit/loss and then in the state budget. In this sense, a central bank loss in an amount which is justified from the perspective of monetary policy can also be considered a kind of 'insurance premium'. One of the reasons why the MNB covers the additional costs stemming from holding foreign exchange reserves is that if investors believe that the level of foreign exchange reserves is sufficient, it may be reflected in a decline in the country risk premium and thus in lower yields of forint investments as well.

The structure of the central bank balance sheet and central bank profit/loss reflect the results of numerous domestic and international economic developments. Therefore, the central bank balance sheet may also be considered as a sensitive indicator that indicates the state of the economy. In an optimal case, the foreign exchange reserves in the central bank balance sheet are a good indicator of the size of external vulnerability of a given economy: higher reserve requirement indicates greater vulnerability and higher external indebtedness. Changes in reserves are closely related to general government financing and international financial trends as well, because the MNB – as the bank of the state – conducts the debt manager's foreign exchange transactions, and the EU transfers received by Hungary are also converted in the central bank. The stock of instruments that absorb the structural excess liquidity typical of the Hungarian economy (two-week bill, overnight deposit, settlement account) indicates the current liquidity situation in the banking sector, while the changes in the forint and foreign exchange deposits of the budget reflect the current liquidity situation of the state. Central bank liabilities also include the volume of cash in circulation, which shows the extent of economic activity, the expected developments in inflation or the extent of confidence in the banking sector well. The difference between domestic and external interest rate levels, which is a determinant in terms of the profit from interest, may provide a picture of developments in inflation as well, in addition to risk assessment. The central bank has a significant open FX position, and consequently exchange rate movements may have a considerable impact both on the structure of the balance sheet and developments in profit/loss.

The structure of our article follows the train of thoughts described below. As developments in central bank profit/loss are fundamentally influenced by the structure of the central bank balance sheet, first the structure of the MNB's balance sheet is analysed. This is followed by a presentation of the main items of central bank profit/loss and the factors that influence such items. Then comes a brief summary of the economic developments that determined the past and expected developments in certain factors of central bank profit/loss. A box also discusses how the method of financing the general government affects central bank profit/loss. This is followed by a description of how the central bank's realised and unrealised profit/loss affects the fiscal deficit and government debt.

STRUCTURE OF THE CENTRAL BANK BALANCE SHEET

Developments in the MNB's balance sheet in recent years were driven by the rise in foreign exchange reserves and the stock of MNB bills, which increased in parallel. One of the most important tasks of the MNB is to hold an adequate quantity of foreign exchange reserves.[4] At the same time, the central bank only has a limited direct influence on

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[4] About the objectives of holding foreign exchange reserves, see: Antal and Gereben (2011).

foreign exchange reserves; their amount is primarily determined by inflows of EU transfers and the net foreign exchange borrowing of the state.[5] In parallel with the rise in foreign exchange reserves, the government deposit – typically temporarily – increases on the MNB's liabilities side, while over the longer term the two-week MNB bill issued by the central bank offsets the increase in reserves (for a more detailed description of this mechanism, see the section presenting the changes in the MNB's profit/loss in recent years). It is also important to note that in addition to transactions, the developments in the MNB's balance sheet may also be influenced by the revaluation of already existing stocks in the event of shifts in exchange rates; the former affects the realised profit/loss of the central bank, whereas the latter affects the unrealised profit/loss (see later).

The MNB typically finances the relatively low-yield foreign exchange reserves from forint sources whose interest rates considerably exceed the foreign exchange yields. If, in addition to the main factors influencing the current changes, we also wish to know what the central bank uses to finance the foreign exchange reserves on the assets side of the balance sheet, the most important items are as follows (Chart 1).

- The *cash* issued by the central bank provides interest-free funds; therefore, it is a very cheap way of financing foreign exchange reserves. The amount of cash in circulation is determined by the cash demand of the economy.

- Of the central bank's *foreign liabilities*, the foreign exchange loan taken from the IMF during the crisis to increase the foreign exchange reserves is worth mentioning; the MNB prepaid this in August 2013. Based on an agreement with the state, the central bank is not allowed to borrow from abroad, i.e. apart from the IMF programme, the MNB cannot finance the foreign exchange reserves from foreign sources.

- The state holds its account with the central bank; therefore, both the *foreign exchange and forint deposits placed by the state* represent sources of financing for the MNB. As the government deposit, which depends on the financing situation of the budget, is a permanently available (practically sight) deposit, the central bank pays a relatively low interest rate on the state's foreign currency deposit and pays the central bank policy rate on its forint deposits.

Chart 1

Changes in the main elements of the MNB's balance sheet as a proportion of GDP (annual average values) and interest realised on the balance sheet items
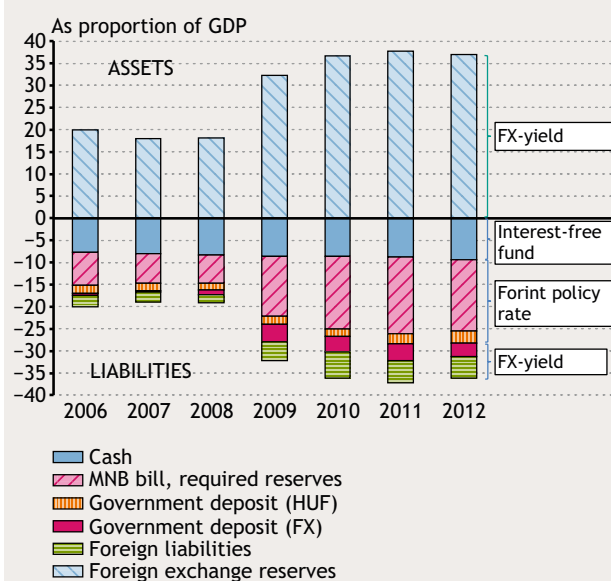
- Based on the deposits placed with them, banks build *required reserves,* on which the MNB also pays the policy rate. It is true for both cash and required reserves that their size is a given condition for the central bank, as the result of the portfolio decisions of economic agents is reflected in the central bank balance sheet (Komáromi, 2007). The amount of and interest on required reserves are also considered given conditions because their system cannot be modified without changing the current monetary policy strategy.

- The remaining financing of *foreign exchange reserves* originates from the sterilisation holdings and within that primarily from the MNB bill, which pays the policy rate. As the asset side and the other liability-side items are external conditions, ultimately it is the MNB bills held by economic agents that are determined on the basis of the 'residual principle', financing the portion of foreign exchange reserves that is not covered by any other source. Accordingly, due to balance sheet identity, the sterilisation holdings mainly constitute the item that offsets the changes in foreign exchange reserves, and in the prevailing monetary policy framework the central bank has no influence on the related developments. The central bank can primarily have an effect on the structure of the sterilisation holdings, i.e. on how the excess liquidity is distributed between the two-week MNB bill and the overnight deposit.[6]

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[5] The foreign exchange auction accompanying the early repayment was the most significant FX market action taken by the central bank in the recent years.

[6] For more details on the role of the MNB bill, see: Balogh (2009).

COMPONENTS OF THE CENTRAL BANK PROFIT/LOSS

The presentation of the main characteristics of the balance sheet structure is followed by an analysis of central bank profit/loss below. From an accounting perspective, central bank profit/loss consists of realised[7] and unrealised profit/loss. Realised profit/loss consists of three basic components. They are: (1) net interest income and realised gains/losses arising from financial operations, (2) net income arising from exchange rate changes, and (3) operating costs and expenses. The components of profit/loss and the main factors affecting the profit/loss are summarised in Chart 2.

The central bank interest balance is one of the most important factors of profit/loss and is primarily influenced by the balance sheet structure and the interest margin. Net interest income is the difference between interest expenses on the liability-side interest-bearing liabilities (e.g. liquidity absorbing instrument, required reserves, central government deposits) and the interest income realised on foreign exchange reserves. While the MNB pays central bank policy rate on the two-week bills and fiscal deposit accounts, it realises lower foreign exchange receipts on the foreign exchange reserves than the forint interest rates.[8]

Realised gains/losses arising from financial operations are closely related to the profit from interest and contain the profit/loss from changes in market prices of securities. The yield realised on securities is reflected in interest income as well as changes in market prices of securities. The importance of the latter item has increased significantly in the recent past, because in the global low yield environment it is typically possible to purchase only government securities whose purchase price is higher than the nominal value. When these securities are sold or mature, a loss is produced: the difference between the purchase price and the nominal value is a profit-reducing item, as current sovereign yields are lower than the ones upon issue. However, this effect is offset by the higher foreign exchange interest income received on securities in earlier years. Consequently, on the whole, this only means a regrouping of the profit/loss between years.

Another important item in the MNB's profit/loss is net income arising from exchange rate changes, which mainly depends on the changes in the foreign exchange position and the exchange rate of the forint. The central bank has a considerable open foreign exchange position, as the counterparts of foreign exchange assets are mainly forint liabilities, and thus changes in foreign exchange rates may significantly influence the MNB's profit/loss through revaluation effects and currency conversion. However, realisation of the profit/loss requires a change in the foreign exchange position as well. A transaction like this can be a forint-euro conversion by the state or transactions with market participants. Whether the result is a profit or loss, the determinant is the relationship between the official exchange rate on the given day and the average cost rate. At present, the cost rate is lower than the current rate; consequently, the central bank realises an exchange gain upon the selling of foreign exchange.[9]

Regarding the objectives and instruments of monetary policy as given conditions, the central bank only has a material influence over the third profit/loss factor, i.e. operating cost and expenses, while this profit/loss item is of the lowest importance, accounting for some 4-5 per cent of all expenses. In terms of the components that determine profit/loss the ones presented above are primarily related to the operation of monetary instruments, whereas the third item is less related to this. The most important items related to operation are the costs of coin, banknote and commemorative coin production, provisions, and material and staff expenditures relating to banking operation.

Although the above three factors constitute the central bank's profit/loss for the year, from an accounting perspective unrealised profit/loss items are also distinguished. Their emergence stems from exchange rate changes and the resulting revaluation effects. Firstly, if the forint exchange rate changes, foreign currency-denominated assets are revalued, but the mostly forint-denominated items on the liabilities side are not. However, balance sheet identity requires a change in equity, and within that in the *revaluation reserves due to exchange rate changes*. Accordingly, the open foreign currency position of the central bank has an impact not only on the profit/loss for the year, but also on the unrealised exchange rate gain. Secondly, unrealised profit/loss may also emerge if the price of foreign currency

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[7] Realised profit/loss basically means the profit/loss for the year. It is worth noting, however, that the profit/loss for the year contains elements of unrealised profit/loss as well (e.g. accruals and deferrals, provisioning).

[8] Besides, the MNB pays forint interest corresponding to the bottom of the interest rate corridor on overnight deposits and foreign exchange interest on foreign currency deposits of the state.

[9] In the accumulation of foreign exchange reserves, individual items contributed to the increase in the reserves at different points in time and at different exchange rates. The average of these exchange rates weighted by the stock is the average cost rate.

Chart 2
Components of profit/loss and the main factors affecting profit/loss
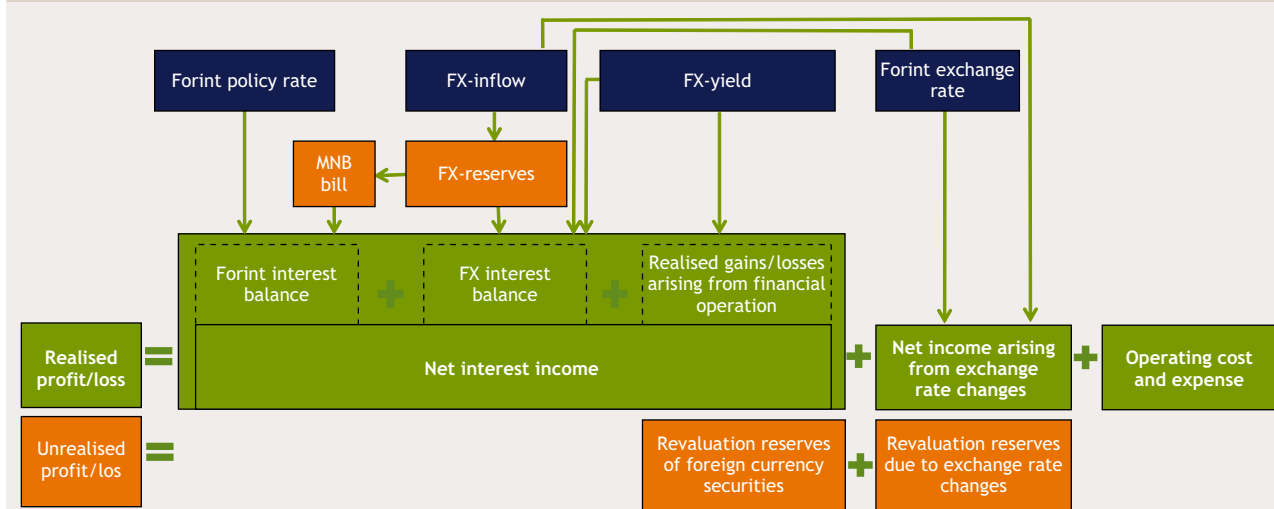
securities changes. The unrealised profit/loss item originating from this is the *revaluation reserves of foreign currency securities,* which contains the profit or loss stemming from changes in securities prices.[10]

PROFIT/LOSS OF THE MNB IN RECENT YEARS

In the following, we present a brief overview of the past and possible changes in the profit from interest and in the exchange rate gain, which are the most important items of the central bank's profit/loss. These profit/loss items are primarily determined by the monetary policy instruments used for the sake of price stability and financial stability as well as by economic developments. In terms of central bank profit/loss, three fundamental stages can be distinguished: (1) the period prior to the financial crisis, (2) the years following the crisis, when the central bank balance sheet swelled, and (3) shrinkage of the central bank balance sheet. The chapter ends with a brief overview of the changes in the MNB's operating profit/loss. Although it is not closely related to the central bank's activity carried out in order to achieve its primary objective, we still consider its presentation necessary to provide a complete picture of the central bank's profit/loss.

The pre-crisis period

Until the beginning of the crisis, the central bank's balance sheet total did not change significantly, because the general government was mainly financed by issuing

forint-denominated government securities (Chart 1). Following the issuance of forint-denominated government securities, only the liabilities side of the MNB's balance sheet temporarily shifts, while the balance sheet total and the stock of MNB bills remain unchanged. This is because economic agents may ultimately raise the money necessary to purchase government securities by reducing their bank deposits, and banks reduce their MNB bill holdings due to their declining forint liquidity. In parallel with the decline in MNB bills outstanding, the forint deposits of the state increase in the MNB's balance sheet, as a result of the proceeds from the securities sold. At the same time, the state issued the government securities to be able to effect payments (e.g. pension payments, salaries to civil servants) from the funds raised this way; in parallel with that, its forint deposits held with the MNB decline. As a result of these disbursements, the liquidity of the economy grows again (economic agents deposit the money received at banks and the money spent by them is deposited at banks by those agents who receive it), which eventually adds to the funds of the banking sector. The liquidity increased in this way is placed by banks with the MNB in the form of two-week bills, i.e. among the liabilities of the MNB, the decline in the deposits of the state is offset by an increase in the MNB bills outstanding. Accordingly, both the forint deposits of the state and the MNB bills outstanding return to their earlier levels (Chart 3, left panel). At the same time, it is worth mentioning that the ratio of foreign exchange debt within government debt started to increase already prior to the crisis: growing from around 25 per cent in 2002, it already exceeded 30 per cent in 2008.

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[10] If these securities mature or are sold, the relevant profit/loss effect is transferred from the unrealised profit/loss to income from financial operations.

In the 2000s, the MNB's average loss was around zero, which – in addition to the low balance sheet total – was also attributable to the relative stability of the forint exchange rate or its favourable shift in terms of the exchange rate gain in this period. Although the interest balance of the MNB showed a loss in most of the period under review, the size of the loss was negligible due to the relatively low balance sheet total. The negative interest balance was a result of the balance sheet structure (liquidity absorbing sterilisation) and the high level of the forint-foreign exchange interest margin. On the whole, no cumulative loss was produced in the pre-crisis years, as the profit due to realised exchange rate gains usually exceeded the loss due to net interest income and net income from financial operations. This was because the central bank typically recorded a profit on foreign exchange operations, due to favourable changes in the exchange rate in terms of profit/loss.

The years following the outbreak of the crisis, expansion of the central bank balance sheet

The EU/IMF loan borrowed at the outbreak of the crisis due to the increasingly unfavourable financing position of the general government resulted in a rise in foreign exchange reserves. Although the sale of Treasury bills with a maturity of up to one year continued, the crisis that broke out in 2008 reduced investors' willingness to take risks to an extent that the Hungarian state could not sell government bonds in the market, and it became difficult to finance government debt, which amounted to 66 per cent of GDP.

In this situation, Hungary applied for help to the international institutions, from which it borrowed nearly a total EUR 13 billion in several instalments. As a first step, the state placed the foreign currency loan drawn as a foreign currency deposit with the central bank, which also resulted in an increase in the country's foreign exchange reserves.[11] At the same time, an increase in foreign exchange reserves was necessary as well, because following the outbreak of the crisis the demand of the Hungarian economy for foreign exchange reserves grew significantly. Due to the government debt and the external debt ratio (and within that the banking sector's significant short-term external debt), which are considered high in international comparison as well, and to the financing risks of the general government deficit, foreign investors and credit rating agencies expected Hungary to have much higher foreign exchange reserves than before. The reserve requirement was also increased by the fact that in parallel with the outbreak of the crisis the maturity structure of external debt also changed in an unfavourable direction, and the weight of short-term debt elements increased considerably.

When the state spends the foreign currency loan on forint disbursements, foreign exchange reserves are not financed by the government deposit any longer, but by the stock of MNB bills purchased by economic agents (mainly banks). The deficit and some of the maturing government bonds were financed by the central budget from the foreign currency loan. However, the state needed forints for these payments, and so it converted the foreign currency into forints at the MNB. In doing so, the state

Chart 3
Effect of forint and foreign exchange financing of the state on the MNB's balance sheet
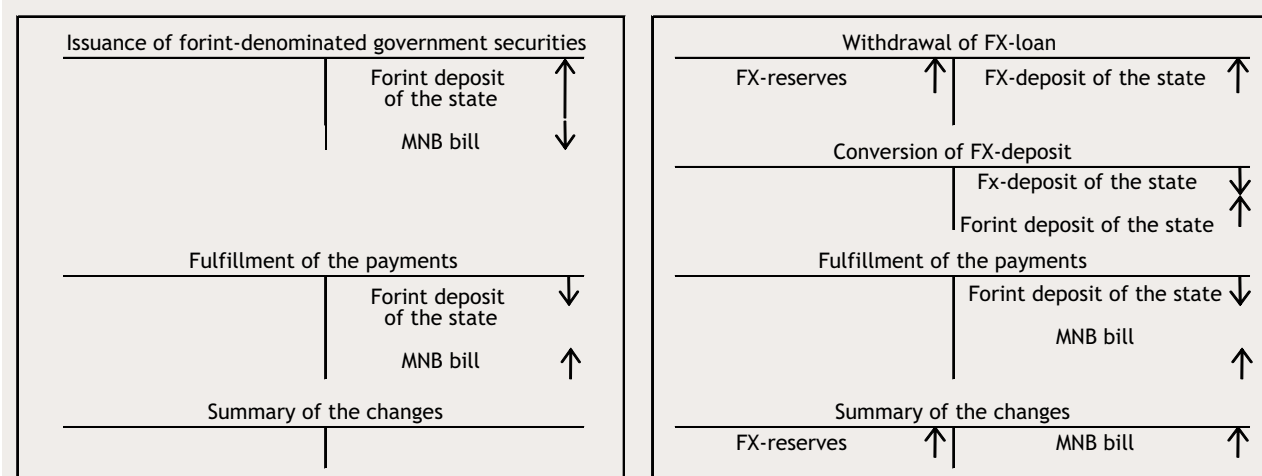
[11] It is worth making a distinction between the expansion of the balance sheets of developed country central banks and of the MNB. While the central banks of developed countries (e.g. ECB, Fed, Bank of England, Bank of Japan) basically obtained considerable amounts of receivables from securities in their own currencies (which are sterilised at a low cost) within the framework of asset purchase programmes, in the case of the MNB the level of foreign exchange reserves rose significantly, and it is financed from higher-interest forint liabilities.

Chart 4

Foreign exchange reserves, MNB bills outstanding and the net foreign exchange debt of the ÁKK*
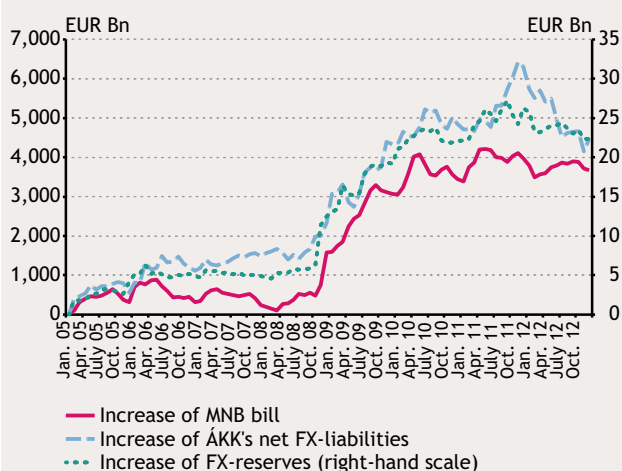
* The net foreign exchange debt of the ÁKK means the difference between the foreign exchange debts of the state (foreign currency loans, foreign currency-denominated bonds) and its foreign exchange assets (foreign currency deposits, foreign exchange receivables from banks). Note: The widening gap between the state's net foreign exchange debt and its foreign exchange reserves observed in late 2011 and early 2012 was caused by the depreciation of the exchange rate.

Chart 5

Changes in central bank profit/loss

converted its foreign currency deposit into a forint deposit, while the MNB's foreign exchange reserves remained unchanged. When the state effected payments, among the MNB's liabilities the decline in government deposit was substituted by an increase in MNB bills outstanding, through the mechanism presented earlier. Eventually, the foreign currency loan borrowed by the state added to the balance sheet total of the MNB, increasing the foreign exchange reserves on the assets side and the MNB bills outstanding on the liabilities side (Chart 3, right panel).[12]

Due to the above described process, the changes in MNB bills outstanding were similar to those of foreign exchange reserves, which typically increased because of the state's net foreign currency borrowing (Chart 4).

Although foreign exchange reserves had already risen in 2008 and 2009, no major deterioration in profit/loss was observed in the past years, despite an increase in net interest expenditures (Chart 5). In addition to the high level of foreign exchange reserves, the increase in the difference between forint and euro yields also contributed

to the growing loss on interest following the crisis. This was also attributable to a decline in euro yields as well as to the rise in the central bank policy rate as a result of the crisis. The loss was temporarily reduced by the fact that, due to the global low-yield environment, securities purchased by the MNB above their nominal value (at a higher coupon) also became included in the foreign exchange reserves. Due to holding high-coupon securities, higher foreign exchange interest income was observed, thus improving the profit from interest. However, a loss is produced upon the maturity of these securities, as approaching the maturity, the market price gradually sinks back to the nominal value. Therefore, the purchase of these types of papers eventually only results in a regrouping of profit/loss between years, and postpones the impact of the changes in market interest rates on the profit/loss to a later point in time.[13]

Following the outbreak of the crisis, in parallel with the depreciation of the forint exchange rate, the central bank realised a considerable profit on the change in the foreign exchange position, which also offset the deterioration in the profit from interest. In addition to the weak exchange rate, another possible explanation for the exchange rate gain is that the considerable increase in foreign exchange reserves took place at the beginning of the crisis, when the exchange rate of the forint was relatively strong, and thus the average cost rate of the foreign exchange reserves was

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[12] Since the outbreak of the crisis, the deposits of the budget with the central bank also increased significantly compared to the pre-crisis level. This means that some of the MNB's interest expenditures are directly included in the budget, i.e. the deterioration in central bank profit/loss appears directly as well in the increase in the interest balance of the ÁKK. On the whole, however, as the MNB pays the policy rate on both the forint deposit of the state and the two-week bank bill, this is only a liability-side rearrangement, without any effect on profit/loss.

[13] Complying with Government Decree 221/2000 (XII. 19.), the MNB does not defer the difference between the purchase price and the nominal value. The difference between the two is taken into account in the profit/loss only upon maturity or selling, as realised gains/losses from financial operations.

also relatively low. As a result of the crisis, however, the exchange rate depreciated considerably, by some 10-15 per cent, and thus the central bank made significant profit on the foreign exchange operations.

The major increase in the exchange rate gain observed in 2011 and 2012 is mainly attributable to a one-off item, namely the central bank instrument (foreign exchange auction programme) introduced due to the early repayment scheme. At the foreign exchange tenders, the central bank sold foreign currency to commercial banks at a higher rate than the average cost rate of the foreign exchange reserves, and this resulted in profit for the central bank. At the auctions, the MNB sold foreign exchange amounting to some EUR 2.5 billion, realising a total exchange gain of nearly HUF 100 billion in the aforementioned two years.[14]

In spite of the increased balance sheet total, the central bank's 2013 profit/loss may be around zero, which is mainly attributable to stabilisation of the exchange rate gain at a high level. As a result of the high level of foreign exchange reserves and the declining but still significant interest margin, the interest balance may show a loss this year as well. At the same time, the exchange rate gain may become stable at a high level as a result of a possible major contribution by the ÁKK-organised repayment of the IMF loans borrowed by the Hungarian state and the exchange rate gain on foreign exchange sales due to the maturing of foreign currency-denominated bonds. Accordingly, the exchange rate gain that can be realised on foreign exchange transactions may offset most of the interest loss. Therefore, the central bank profit/loss is not expected to affect the deficit of the 2014 budget. All of the above factors (purchase of high-coupon securities, depreciation of the exchange rate, foreign exchange auction programme and

foreign exchange sales organised with the ÁKK) contributed to the fact that the expansion of the central bank balance sheet and the yield difference due to high risk spreads did not result in a major central bank loss.

The central bank interest loss is evolving in parallel with an improvement in the profit from interest of the Government Debt Management Agency (ÁKK). Therefore, at the level of the consolidated general government[15] the expansion of the central bank balance sheet results in an additional cost stemming only from the maintenance of higher foreign exchange reserves, which entails other advantages. There is a close relationship between the financing of the debt of the budget and central bank profit/loss. Therefore, it is worth analysing and presenting the developments jointly as well, at the level of the consolidated general government. Numerous studies have already been conducted on this subject, including Rocha and Saldanha (1992) in the international literature, or Barabás et al. (1998) as well as Czeti and Hoffmann (2006) in the domestic literature. The basic idea is that it is necessary to examine the parts of general government taken in a wider, economic sense in a consolidated manner, and not one by one separately. It means that it is worth analysing the central bank profit/loss as well together with the interest expenditures of the state, at a consolidated level (for more details, see the box). Accordingly, at a consolidated level, additional cost is caused by the fact that – due to the vulnerability of the country and the crisis – the central bank has kept higher foreign exchange reserves, which entails costs. However, this may be considered as a kind of insurance premium, and by maintaining the required foreign exchange reserves the central bank ultimately contributes to minimising the risk premium on Hungarian government securities and to the reduction of the funding costs of the national economy as a whole.

How does foreign exchange borrowing by the government influence the MNB's profit/loss?
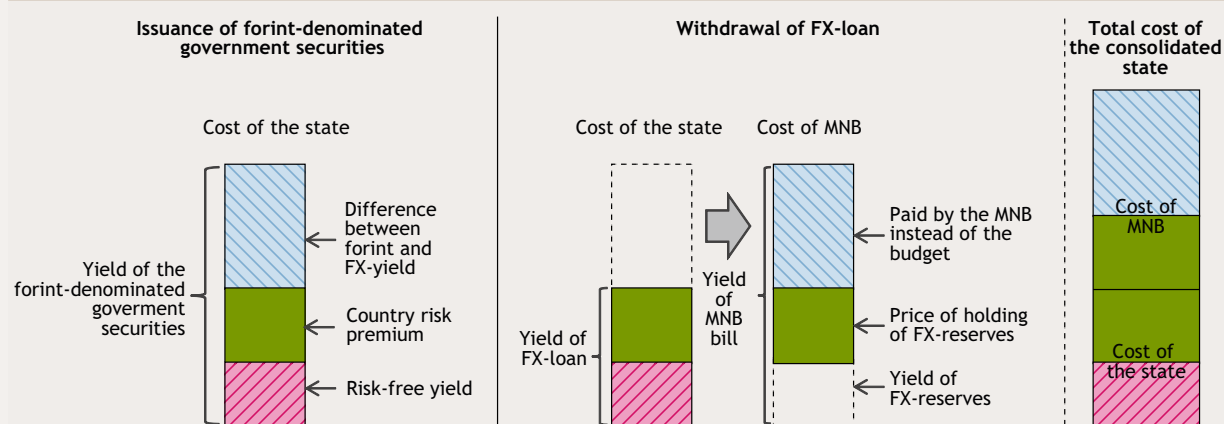
If the state finances the deficit and the debt from foreign exchange loans instead of forint-denominated government securities, the difference between the costs of forint and foreign exchange financing is paid by the MNB. When forint-denominated government securities are issued, the cost to the state is the interest on the government security, and this cost can essentially be decomposed into three parts (Chart 6, left panel): (1) risk-free yield paid by every country, (2) country risk premium to be paid because of the riskiness of the instruments issued by the Hungarian state, and (3) the difference between the sovereign forint and foreign exchange yields (which may, for example, evolve due to the exchange rate risk premium). However, when foreign exchange loans are issued, the state only pays the interest on the FX loan, i.e. it saves the difference between the Hungarian forint and foreign currency yields (Chart 6, middle panel). As seen in the previous chapter, the stock of MNB bills also increases in parallel with the issuance of

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[14] For more details on foreign exchange auctions, see: Pulai and Reppa (2012).

[15] In our analysis, the concept of consolidated general government is used in an economic sense. In statistical terms, the budget and the MNB are separate units. Our box is basically a comparison of central bank profit/loss and the budget in an economic sense, which is a good illustration of the consolidated costs.

Chart 6
Diagram of the distribution of the cost of deficit financing from forints or foreign exchange

Issuance of forint-denominated government securities	Withdrawal of FX-loan	Total cost of the consolidated state

Cost of the state

Yield of the forint-denominated government securities

- Difference between forint and FX-yield
- Country risk premium
- Risk-free yield

Cost of the state Cost of MNB

Yield of FX-loan

Yield of MNB bill

- Paid by the MNB instead of the budget
- Price of holding of FX-reserves
- Yield of FX-reserves

Cost of MNB

Cost of the state

foreign exchange loans, resulting in an interest cost for the MNB as well. Decomposing the interest of the MNB bill into the aforementioned three parts, the following can be established.

- The risk-free yield paid in the interest of the MNB bill is offset by the yield of the foreign exchange reserves, which increased due to the foreign exchange loan borrowed. As the foreign exchange reserves are held by the central bank for safety purposes, the reserves mainly consist of low-interest, but risk-free securities.

- Ultimately, the country risk premium can be considered the consolidated cost of deficit financing from foreign exchange loans, which, at the same time, is also the price of holding higher foreign exchange reserves. Because if the MNB intended to increase its foreign exchange reserves, it could – theoretically – do so by foreign exchange borrowing, i.e. the country risk premium should be paid in any case. It is important to note that this cost is compared to the higher foreign exchange reserves: if the level of such reserves meets investors' expectations, it may have a mitigating effect on the country risk premium as well as on developments in forint yields.

- Ultimately, the third part of the interest on the MNB bills is paid by the MNB instead of the budget. While the budget saves the difference between the sovereign forint and foreign exchange yields by the borrowing foreign exchange, the MNB pays a similar portion of interest on the MNB bills outstanding, which increased due to the higher foreign exchange loan.

Accordingly, while in the case of financing covered by government securities issues the only cost is the interest on forint-denominated government securities, in the case of foreign exchange borrowing, the consolidated general government including the MNB pays the interest on the foreign exchange loan (state) as well as the interest on the MNB bill (MNB). In other words, at the whole-economy level, foreign currency borrowing is more costly than issuing forint-denominated government securities. It is important to emphasise that in the case of foreign currency loans not only is the financing of the state ensured (as in the case of issuing government securities), but foreign exchange reserves also grow. This implies that the higher cost is attributable to the holding of foreign exchange reserves, which reduce the vulnerability of the country.

The higher-than-earlier foreign exchange borrowing resulted in considerable interest saving for the general government. However, no saving was achieved at whole-economy level, as the cost for the central bank was higher. Due to risk considerations relating to the volatility of the foreign exchange rate, foreign exchange debt typically accounted for 25-30 per cent of general government financing prior to the crisis. Consequently, the implicit interest[16] paid on average on the debt by the state was closer to the developments in forint interest rates. The difficulties in the government securities market following the outbreak of the crisis led to foreign exchange borrowing from international organisations and thus to a considerable increase in the share of foreign exchange

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[16] For more details on the implicit interest rate, see: MNB (2013).

debt (close to 50 per cent). As a result, lower-interest foreign exchange loans took on a greater weight in the average implicit interest rate paid on the government debt. Thus, for example, the implicit interest rate on government debt in 2012 was some 1 percentage point below the level that would have prevailed if the state had maintained the 30 per cent foreign exchange ratio that had been typical previously. At the same time, the interest saving thus attained appeared only at the level of the budget. The increase in MNB bills outstanding as a result of the borrowing of foreign exchange and spending it in forints, led to a rise in the central bank's interest expenditures.

Compared to government securities issuance, saving at the level of the consolidated general government may have originated from the fact that – due to the maturity premium – the policy rate was typically lower than the yield on longer-term government securities (since early 2009, the average size of the difference has been close to 0.9 percentage points). It is also important to note that the lower interest rate is coupled with a shorter maturity, which adds to the interest rate risk of the debt. This is true because if a major increase in interest rates took place, the longer-term securities issued earlier could mean a generally lower interest cost over the entire maturity than the originally lower-cost MNB bill, whose interest rate might grow considerably in the meantime.

Shrinkage of the balance sheet

Interest loss is expected to decline, and then to disappear, in parallel with the shrinkage of the central bank balance sheet. In parallel with ongoing external financing capacity (followed by its slow decline), there may also be favourable developments in the level and maturity composition of gross external debt, which is a key indicator in terms of the vulnerability of the country (and thus in terms of the level of foreign exchange reserves). Accordingly, in relation to future changes in the MNB's balance sheet, it is assumed that foreign exchange reserves may decline over the longer term. In line with that, the sterilisation holdings may also decline. Therefore, gradual improvement is expected in the central bank's profit from interest, which constitutes a significant portion of the MNB's profit/loss. Against the background of declining foreign exchange reserves, this process is supported by the low forint-foreign exchange interest margin and the liability-side restructuring of the MNB's balance sheet as well as the increase in the share of non-interest-bearing cash within the balance sheet.

According to our forecast, over the longer term the central bank profit/loss may be around zero as a result of changes in the balance sheet structure. External equilibrium developments point to a contraction in the central bank balance sheet. At the same time, through the targeted support to the SME sector, the Funding for Growth Scheme (FGS) launched by the MNB increases the balance sheet total of the central bank. As the central bank is providing a preferential loan with a below-policy-rate interest rate, this involves a cost for the MNB due to sterilisation of the excess liquidity at the policy rate. Compared to the underlying developments, it results in some deterioration in the expected profit/loss, but the expected benefits of the programme will presumably exceed the costs that arise at the central bank in a concentrated manner. As a result of the measure, the level of economic growth may be higher, which is favourable for economic agents in the private sector, while higher growth entails higher tax revenues for the state as well. Accordingly, on the whole, as was described in connection with the holding of foreign exchange reserves, in the case of the FGS it can also be said that while the costs appear in a concentrated manner in the balance sheet of the central bank, the expected benefits may improve the situation of the private sector and the financing position of the state budget.

Changes in the operating costs of the MNB

The operating profit/loss of the MNB has been relatively stable in the past years and only slightly contributed to the loss of the central bank. As presented above, the central bank's profit from interest and its exchange rate gain are primarily determined by the objectives and instruments of monetary policy as well as by market developments. Therefore, the central bank only has significant influence on costs related to its operation. These operating costs, which account for some 4-5 per cent of all expenses, resulted in only a slight loss in the period under review. In connection with the changes in operating costs, it is worth noting that nominal costs remained at a nearly unchanged level in the 2000s. This was, inter alia, attributable to the introduction of the 200-forint coin and the withdrawal of the 1- and 2-forint coins.

FISCAL EFFECTS, ACCOUNTING ISSUES

Accounting rules[17]

As the main rule, monetary movements due to transaction-related, so-called realised, profit/loss (for the year) appear in the budget deficit and in the debt as well, while government payments related to the revaluation of the reserves and due to the unrealised profit/loss are recorded only in the debt. Conducting monetary policy may influence developments in the general government as well, but the accounting rules are different in terms of the statement of the realised and unrealised profit/loss in the fiscal deficit and in the government debt. The previous year's realised profit/loss is added to retained earnings, and if the sum is negative, the loss must be reimbursed from the central budget up to the amount of the subscribed capital in such a manner that it increases both the deficit and the debt. If there is a profit, the ESA balance (fiscal deficit), which also serves as a basis for the Maastricht criterion, and the debt are reduced only by the payment of the profit from interest (less the operating profit/loss), while the net income arising from exchange rate changes does not reduce the deficit.

Unrealised effects stemming from the revaluation of reserves appear in the individual revaluation reserves. The MNB Act contains the exact rules of the reimbursement of the loss on revaluation reserves.[18] In the event that a payment obligation of the government arises due to these reserves, the disbursement does not add to the budget deficit. At the same time, government debt increases due to the financing requirement. The accounting is asymmetrical in the sense that in contrast to a realised exchange rate gain, an unrealised exchange rate gain cannot reduce government debt, as the positive revaluation reserve cannot be appropriated. The effects of central bank profit/loss on the budget are shown in detail in Table 1.

It is also important to emphasise that possible fiscal effects typically appear in the year following the emergence of the central bank profit/loss. In a favourable fiscal situation, the budgetary decision may be an earlier replenishment of the retained earnings (even before the emergence of a possible

Table 1

Schematic* rules of monetary movements owing to central bank profit/loss and their effects on the fiscal position

	Profit/loss (~realised profit/loss)			Unrealised profit/loss	
	⬇			⬇	
	Retained earnings			Revaluation reserves ([1] reserves of foreign currency securities [2] reserves due to exchange rate changes)	
	⬇	⬇		⬇	⬇
	If negative	If positive		If negative	If positive
	⬇	⬆ ⬇		⬇	⬇
		Profit from interest	Realised exchange rate gain		
Budget deficit	Increase	Decrease	Not change	Not change	Not change
Public debt	Increase	Decrease	Decrease	Increase	Not change

* The chart only provides a schematic indication of the branches: footnotes 13 and 14 must also be taken into account for the exact accounting rules.
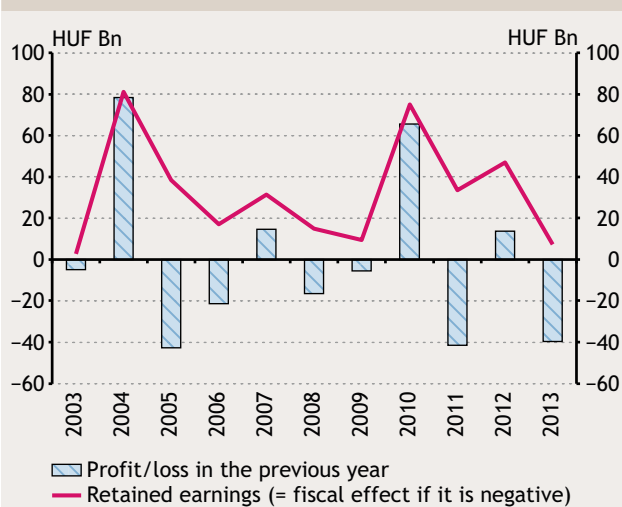
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[17] This chapter basically presents the statistical aspects of the fiscal accounting of central bank profit/loss. It is important to emphasise that profit/loss has a fiscal effect only if there are real monetary movements between the budget and the central bank. Accordingly, the emergence of central bank loss or profit is not enough; statistical accounting also requires that the budget actually recoup the loss or appropriate the profit in the form of a dividend disbursement.

[18] Article 147 of Act CXXXIX of 2011 on the Magyar Nemzeti Bank exactly says the following: 'In the event that (...) the balance of the sum of the equalisation reserves is negative, and this negative balance exceeds the sum of the positive amount of the accumulated profit reserve and the balance sheet result, the central budget shall, by 31 March of the year following the subject year, make a direct cash disbursement to the accumulated profit reserve up to the level of negative balance that exceeds the positive sum of the accumulated profit reserve and the balance sheet result, i.e. in case of a negative balance of the profit reserve and the balance sheet result, up to the extent of the negative balance of the equalisation reserves, to be accounted for in the balance sheet in the subject year.'

Chart 7

Realised profit/loss and retained earnings between 2003 and 2013

and HUF +45 billion in past years. Prior to the change in the relevant regulation in 2011, this meant that in some years the central budget had a replenishment obligation, as this type of revaluation reserve could not be combined with the revaluation reserve of the forint exchange rate. On the whole, between 2004 and 2011, when it became possible to combine the revaluation reserves, the replenishment obligation emerging as a result of an unfavourable change in securities prices represented a government debt effect of some HUF 70 billion. By the end of 2012, as a result of the loss on high-coupon bonds discussed in the previous chapters, the value of the revaluation reserve of the bond price dropped to minus HUF 30 billion. However, due to the new regulation (and the exchange rate revaluation reserve amounting to hundreds of billions of forints), this did not result in any reimbursement obligation for the central budget.

In the past ten years, the central budget did not have any reimbursement obligation because of changes in the exchange rate of the forint, which was attributable to the continuously depreciating exchange rate. In connection with the unrealised profit/loss the volatility of the revaluation reserve of the forint exchange rate is much more determining, while the losses stemming from bond price movements are much lower. In the past ten years, the revaluation reserve of the forint exchange rate fluctuated between HUF 0 billion and HUF 1,300 billion, as the exchange rate of the forint against the euro was either stable or depreciated after 2005.

Looking ahead, it is primarily forint exchange rate movements that may continue to determine changes in revaluation reserves. At the same time, in line with our current assumptions, we do not expect any central budget reimbursement obligation. Our forecast basically assumes a stable exchange rate, which means that the cost rate will gradually catch up with the currently presumed level, and thus the exchange rate gain may also decline gradually. In the event that changes in the exchange rate differ from the assumption, both the exchange rate gain and the reserve replenishment obligation may change. In an extreme case, an appreciation of the exchange rate may even result in negative revaluation reserves. At the same time, *ceteris paribus,* appreciation also reduces the value of government debt expressed in forints, because at present nearly half of the government debt consists of foreign currency-denominated securities and loans. This means that appreciation of the exchange rate reduces the value expressed in forints of these debt elements. Accordingly, while the reserve replenishment due to the revaluation reserve's turning negative adds to government debt, the foreign exchange part of government debt

loss), and thus the fiscal effect does not necessarily appear following the emergence of the loss.

Realised profit/loss and central budget reimbursement obligation

Between 2002 and 2012, the central bank's profit/loss fluctuated between HUF −40 billion and HUF +70 billion, but retained earnings always remained positive, and thus the central budget did not have any reimbursement obligation because of this. In the years around 2000, the central bank still had some profits, allowing dividend disbursement as well. After 2002, however, the central bank did not pay dividends to the budget. Retained earnings declined close to zero in 2003, then, in parallel with varying central bank profitability, they fluctuated between HUF 5 billion and 70 billion. This meant that the central budget did not have any reimbursement obligation as a result of loss-making operations, although dividends were not paid either. Over the medium term, the central bank balance sheet is expected to contract and the interest margin is expected to decline. Therefore, no loss is expected in the future either, i.e. the central budget will presumably not have any reimbursement obligation.

Unrealised profit/loss and reserve replenishment requirement

The loss not realised in the last ten years and changes in bond prices resulted in a total replenishment obligation of around HUF 70 billion for the central budget, affecting the developments in government debt as a financing item. The revaluation reserve of foreign currency-denominated securities fluctuated between HUF −25 billion

declines as a result of the revaluation. However, this effect is asymmetrical, because depreciation adds to the value of government debt, while the positive exchange rate revaluation reserve cannot be appropriated from the central bank.[19]

CONCLUSIONS

In making its monetary policy decisions, the MNB primarily focuses on the achievement of the inflation target and the adequate amount of foreign exchange reserves for the sake of financial stability, while attempting to meet these objectives with the most favourable central bank profit/loss possible. At the same time, central bank profit from interest deteriorated considerably in the past years, reflecting the fact that during the crisis the difficulties in financing the budget and Hungary's increased foreign exchange reserve needs resulted in foreign exchange borrowing from international organisations. As a result, the central bank's balance sheet expanded, leading to a considerable rise in the central bank's interest loss, together with an increasing forint-foreign exchange interest margin. At the same time, this loss was broadly offset by an increase in the exchange rate gain, which is attributable to the relatively weak exchange rate, the foreign exchange auctions related to the early repayment scheme and the foreign exchange sales organised with the ÁKK. Over the longer term, in parallel with a contraction in the central bank balance sheet (and a decline in interest loss), the central bank's profit/loss may be close to zero. According to one of the most important findings of our article, in the past years, in parallel with an increase in central bank interest loss, the general government achieved savings, as a result of foreign exchange financing, which was cheaper than the forint interest rates. Accordingly, at the whole-economy level, a portion of the financing cost of the state emerges at the central bank, while savings are realised by the central budget. Similarly to that, the costs of the Funding for Growth Scheme also result in a slight increase in the MNB's interest expenditures, but at whole-economy level it is offset by the expected improvement in the financing situation of the private sector and the growing tax revenues stemming from the expected higher economic growth.

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[19] The accounting is also asymmetrical in terms of the debt rule that is included in the Fundamental Law, as the rule does not take into account the decline in government debt stemming from the appreciation of the forint, but does take into account the additional debt resulting from a possible replenishment of the revaluation reserve of the forint exchange rate.

Dániel Homolya[1], Melinda Lakatos, Róbert Mátrai, Judit Páles and György Pulai: Limit setting practices of banks in Hungary: Focus on counterparty limits

During the financial and economic crisis, non-price type restrictive factors came to the fore in financial markets as well; these mainly consist of limits and margin requirements. Specific relevant signs were observed in the domestic financial markets in late 2011 and early 2012: following the downgrade of Hungarian sovereign debt to the non-investment grade category, the average interest rate on overnight unsecured interbank forint money market transactions (HUFONIA) left the interest rate corridor for a short time as a result of the constraints on limits among participants and their limits set to the MNB, and recourse to central bank swap facilities surged. This article presents the findings of a survey[2] examining the limit setting practices of the most important banks in the Hungarian financial markets and an analysis of market data relevant from the aspect of limits. All of this is important in terms of the analysis of the efficiency of the interest rate transmission mechanism and of central bank instruments as well. Limit amounts are mainly influenced by the counterparty's (or its country's) external credit rating, financial indicators and CDS spreads. The banks surveyed perceive counterparty limits to be the most restrictive. In recent years, however, maturity limits have also appeared, in addition to limit amounts. In the interbank unsecured money market, the tightening of limits was reflected in a decline in daily turnover and a shortening of maturity, while in the currency swap market the shortening of maturities was observed only in the more turbulent period, as a result of the increasingly widespread use of margin requirements and the introduction of the foreign exchange funding adequacy ratio (FFAR).

METHODOLOGICAL FRAMEWORK OF THE SURVEY

During the analysis of the financial and economic crisis that started some years ago, non-price factors (limits, margin requirement agreements, etc.) increasingly came to the fore, in addition to price factors. During the market tensions emerging after the downgrade of Hungarian sovereign debt to the non-investment category in late 2011 and early 2012, not only the price factors deteriorated, but the limits consistent with the new rating category and set for the Hungarian sovereign, the central bank and market participants also became restrictive at certain credit institutions.

Although we had discussed issues related to limit setting and limits applied in the market at our Market Intelligence meetings[3] led earlier by the MNB's Financial Stability unit, we considered it important to analyse this topic within the framework of a targeted survey as well. The current survey was motivated by the intention to obtain a more precise picture of limit setting practices, which have been growing considerably stricter since the outbreak of the crisis, according to both market data and anecdotal information.

All of this is important in terms of the efficiency of the interest rate transmission mechanism and of central bank instruments as well. Accordingly, in August and September 2012 we forwarded our questionnaire to 12 banks operating in Hungary and conducted interviews with them. The sample surveyed included institutions with domestic management and no strategic ownership, domestic subsidiaries of foreign bank groups and foreign banks' domestic branches which are important in terms of financial markets. Therefore, by connecting the findings of the survey to available market transaction data, we can obtain a comprehensive picture of recent years' changes in limit setting relevant from the aspect of the Hungarian banking sector.[4]

Our questionnaire included questions regarding the organisational framework and features of banks' own limit setting practices and the factors influencing such practices, the presumed determinants of the limits set for the given bank by counterparties as well as the effects of recent years' market events in terms of changes to limit management. Personal interviews with treasury business and risk management experts allowed the formulation of explanatory questions and the clarification of which limit types are the most restrictive and how market events influence these. The application of qualitative survey techniques was justified as banks treat their respective limit systems as extremely sensitive information.

REGULATING THE LIMIT SETTING PRACTICES IN THE HUNGARIAN BANKING SECTOR

In the examination of the limits applied by Hungarian commercial banks, the mapping of the decision-making mechanisms related to the limits and the methodologies providing the environment of limit setting were considered as starting points. In addition to gathering general information, the importance of such mechanisms and methodologies is underlined by the fact that the committees that decide on the methods of setting the limits and on the adoption of specific limit levels strongly influence the limit setting practices of the banks participating in the survey. In connection with the applied methodologies, our questions aimed at understanding the limit setting principles valid for transactions as well as the characteristics of limit revisions. Regarding limit setting practices, the responses concerning the possibility and treatment of exceeding the limits also

facilitated comprehension of the functioning of the limit systems, which constitute the framework of commercial banks' activities.

Decision-making mechanisms related to limits: typically centralised decisions

In line with our preliminary expectations, the role of a given bank within a banking group is key in terms of decision-making related to limits. For proper orientation in analysing the limits applied by banks, we had to assess the decision-making mechanisms at the level of individual institutions and had to understand the authorisation levels, powers and competency.
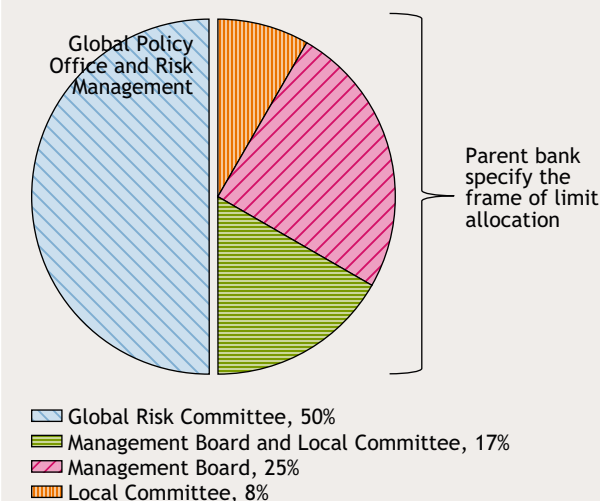
Two typical types of banks were outlined by the responses relating to the decision-making bodies: banks conducting global risk management covering the whole banking group and institutions that operate on the basis of group-level guiding principles within the framework set up by the parent bank.

Where there is *global risk management,* dedicated bodies working at the group level are entitled to set limits in every case. Risk management policy at these banks is centrally determined; the methodology of risk management and the setting of specific limit levels are the responsibility of banking group level bodies. Subsidiaries and branches do not have any direct influence on the formulation of the methodology; most of the limits they receive are pre-determined.

In the event that the *parent bank provides a regulatory and methodological framework,* the decision-making levels show a more varied picture, and typically multi-level decision-making is implemented. The parent bank plays a less dominant role. Although it declares the regulatory and limit setting frameworks, within those bounds it provides more leeway at the regional and local levels. In this case, banks determine the decision-making levels depending on the weight represented by the given limit, in line with the strategic and business policy capabilities as well as the owner's ability to take risks. Local decision-making bodies (board of directors and local committees: asset/liability committee, credit and limit committees) are competent in decisions of lesser importance, mostly concerning local issues. At the regional level, business branch-specific

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[4] It is worth calling attention to the fact that reviews concerning limit setting practices appear relatively rarely in international literature as well (although there are exceptions; see e.g. Sungard, 2008), and to date we have not encountered any survey regarding the Hungarian banking sector.

Chart 1

Decision-making bodies at institutions performing global risk management and operating within regulatory frameworks set up at the parent bank level

Global Policy Office and Risk Management

Parent bank specify the frame of limit allocation

▨ Global Risk Committee, 50%
▨ Management Board and Local Committee, 17%
▨ Management Board, 25%
▨ Local Committee, 8%

Source: MNB.

committees decide on more complex issues that concern the bulk of the banking group. The highest-level, strategic limits, which typically apply to the banking group as whole, are set globally.

Global risk management is used at some 50 per cent of the domestic institutions surveyed. In parallel with the parent bank's regulatory framework, independent decision-making mechanisms also exist in the other half of the participating banks (Chart 1).

Irrespective of their bank type, almost all respondents reported that they can apply for limit modifications following a specific procedure, usually with the involvement of several decision-making levels. Moreover, 25 per cent of respondents stated that up to a certain limit amount the local business and risk management organisational units have competence to set the limits or to raise a limit within certain bounds. At the same time, there are banks where initiatives from subsidiary or branch office levels can take place only in specific periods, typically once a year. During the interviews several respondents said that the annual one-off limit revision possibility might reduce the room for manoeuvre of business areas. The tightening of limits becomes apparent when it does not allow for the satisfaction of a business need arising vis-à-vis a potential counterparty. Relationships with counterparties often fail to be established because the parties are able to provide limits to one another only at different times. As unutilised limits are typically lowered during the annual revision, a typical case mentioned several times was that while one of the parties

is setting up the limit enabling the transaction, the other party terminates it. Having a usual, reliable range of counterparties may help to ease these constraints.

Limit setting methodology, limit types applied: focus on counterparty risk

Analysis of bank limits requires the classification of the applied limit types and some knowledge of the methodology of limit setting. In respect of transactions, we asked questions about four typical groups of limits and the types of other limits that cannot be classified into these groups. In line with our expectations, the vast majority of the banks participating in the survey apply the limit types given by us (counterparty limit, country risk limit, settlement limit and transaction type limit).

Limit types indicated by banks (with the ratios of mentioning in brackets)

- *counterparty limit (100%)*
- *country risk limit (100%)*
- *settlement limit (100%)*
- *transaction type limit (75%)*
- *other limit (33%)*

Of the limit types indicated by individual banks, without exception, all participants set counterparty limits, and based on the responses and interviews, this limit type can be considered the most restrictive in terms of transactions. The size of the allocated counterparty limit basically depends on counterparty risk, i.e. the credit risk perception of the counterparty is authoritative. In addition, the banking group's willingness to take risks and the demand of the business area play a significant role. Banks typically give their counterparty limits in absolute value, and the limit is usually determined in the currency corresponding to the parent bank (euro or US dollar) or in forint. If the limit is not forint-denominated, a general clearing rate is used in the course of monitoring. There are considerable differences in counterparty limit methodologies upon the breakdown of limits by entities. Some of the respondents allocate limits to whole banking groups and have free room for manoeuvre for limit utilisation within the banking group. At other banks each counterparty – in extreme cases even the various branch offices – has separate limits. The most general solution is that within the banking group level limit, separate limits are allocated to the legally independent entities on the basis of the credit risk assessment of the entity.

Every bank uses country risk limits as well. However, not everybody considers the limits for the investment target country as determinant. If the general business policy limits

transactions to investment grade countries, the limits regarding the exposure by countries may fall into the background. At the same time, due to the turbulences attributable to the crisis experienced in financial markets, differentiation between investment target countries has intensified. The limit allocated to a country mainly depends on the credit risk rating of the given country, its role in international economy, the bank's ability to take risks and business requirements.

Settlement limit[5] was also mentioned in the responses of all banks. Settlement risk is managed through this limit, which means limiting the exposure that the two payments (of opposite directions) of the transaction are not harmonised in time, and the counterparty may experience liquidity problems or (in a worse case) solvency problems during settlement. Several respondents mentioned that they basically derive the settlement limit from the counterparty limits, and thus the influencing factors that dominate upon the determination of the amounts include, for example, the counterparty's solvency. The respondents usually use risk-reducing settlement techniques for the management of the settlement risk. For example, one of them is the *Delivery versus Payment* (DvP) practice applied in securities transactions.[6]

Compared to the above, the setting of transaction type limits shows a more varied picture. Several banks mentioned the transaction type limit because, for example, the impact of the counterparty limit is different for each transaction. A typical methodology is that banks use weighting in line with the risk of the type of transaction upon calculating the limit. Some respondents stated that there is no typical transaction type limit, and they only make a distinction between permitted financial instruments defined by business policy and forbidden ones. Some banks classify the types of transactions into asset groups (fixed income instruments, derivatives, FX transactions) and allocate separate limits for them. Market and liquidity risks were the most important factors mentioned in connection with the setting of the transaction type limit.

Various types of limits were mentioned in the category of other limits; they are typically used for the management of other risks as independent limits. Limits calculated on the basis of VaR[7] are often set up for market risk management.

The controlling of the interest rate risk appears separately as well. Liquidity limits serve the purpose of avoiding liquidity problems, and several banks highlighted the limits in the case of open currency position and the pre-settlement[8] limit regarding pre-settlement risk.

Other limits

- *maturity limit*
- *VaR-based limits*
- *interest rate risk limits*
- *limit for open currency position*
- *liquidity limits*
- *pre-settlement limit*

Several parameters influencing the limit amount appear in the methodology of the various limit types, but time to maturity is a factor that needs to be highlighted separately. The classification of the given transaction according to maturity (tenor) is often an additional factor in the impact of individual limits. Tenor is typical as an independent limit as well, usually the maximum term of transactions, depending on the regulated type of transaction and the counterparty's credit rating.

Limit revision characteristics

In the practice of limit setting, in addition to the limit types applied, we also considered it relevant to analyse the characteristics of the revision procedures related to them, as several conclusions can be drawn from these, for example with regard to reactions to market turbulences. In relation to this subject matter, we asked the participants in the survey about the frequency of the revision of the limit setting methodology and limit levels, about the influence on limit modification in the case of subsidiaries as well as about the possibilities of expanding the limits, including – inter alia – the lending/borrowing of limits.

Limit setting methodology and the frequency of limit level revisions

In the questions about the frequency of limit revisions, we made a distinction between needs for changes in the limit setting methodology and the specific limit levels.

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[5] Settlement risk is an uncertainty stemming from the fact that the system of paying for the values that are the subjects of the transaction does not ensure that the payment order concerning the selling initiated by the bank is executed only if the countervalue has already been paid (the paying agent or the bank itself has already made sure of it).

[6] For more details, see: BIS (1992).

[7] VaR is the abbreviation of the expression 'value-at-risk'. For example, the 1-year, 99.9 per cent VaR is the figure that shows the value at which one cannot lose more in a year with a probability of 99.9 per cent.

[8] Pre-settlement risk stems from the case if following the entry into the transaction, but prior to starting the performance the transaction fails for some reason, and then it has to be entered into again in the market at current prices. The main risk in this case is the shift in market prices.
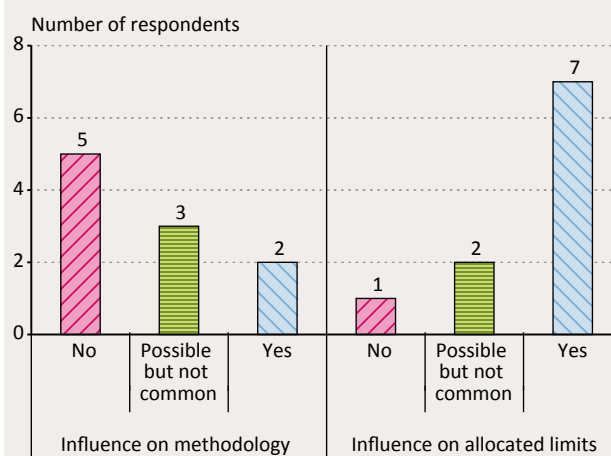
Chart 2

Frequency of the revision of the limit setting methodology and limit levels by the number of respondents

Number of respondents
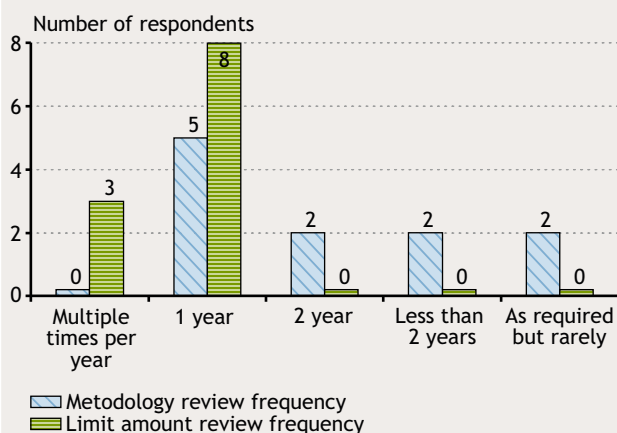
Source: MNB.

Chart 3

Involvement of affiliate banks in the methodology of limit setting and in limit levels

Number of respondents

Source: MNB.

Methodological revisions typically do not have a specific schedule; in many cases they are put on the agenda pursuant to supervisory rules, bank directives or as a result of market events. Minor methodological amendments and renewals of related rules/regulations are more frequent; these revisions take place at least every two years. From participants' responses, we came to the conclusion that major methodological changes take place less often and are mainly connected to market crisis related events and the development of risk management techniques.

The revision of specific limit levels is much more regulated than that of the methodology. Banks carry out a comprehensive limit amount checking at least once a year, but some of the respondents do this even more often. While it is not typical, it does occur that the dates and in certain cases the frequencies of revisions are different in the various limit categories (for example, country risk limits are revised more often, on a quarterly basis).

In addition to regular revisions, ad hoc checking of limit levels is also typical. For example, a typical circumstance resulting in an ad hoc check is the deterioration in a counterparty's creditworthiness or market events affecting riskier clients. Revisions related to market turbulence end with limit reductions almost without exception. Demand for limit amendment in a positive direction is usually received from the business area. In cases of business requests to expand limits, banks require corroboration with strong professional arguments and consultation with the risk management organisational unit.

Influence of subsidiaries and branches on limit revisions

One question that also arose in connection with limit revision was how great the influence of domestic players was in the area of limit setting, especially in the case of institutions operating as a subsidiary or branch office of the banking group. From the responses, we can draw the conclusion that methodological issues exclusively belong to the competence of the parent bank; local entities' input is limited, even if theoretically it is possible. In the case of limit levels, however, local banks have more influence, which is reflected, inter alia, in the ad hoc limit modification requests. Several respondents reported that during the annual revision the parent bank asks the opinion of the local business and risk management organisational unit, mainly with regard to domestic counterparts.

One of our questions was whether there were differences within the banking group in terms of the limit system applied. For example, whether there were obvious regional differences in the limits dedicated by the parent bank. The answers reveal that in the vast majority of cases there are no unique, affiliate bank-specific modifying factors, but normative rules are applied.

Judgement and handling of exceeding the limits and lending/borrowing of limits

The limits represent strong constraints at the responding banks, and the possibility of deviation from the limits is

restricted. Breach of limits as a result of negligent transaction is theoretically ruled out in the case of most institutions. Limits are typically exceeded temporarily, in cases of market revaluation or limit reductions. It is mandatory to report such cases, and they are subject to strict judgement by the parent bank or a dedicated committee. There was an institution among the respondents where exceeding the limit is allowed with the consent of local decision-makers (e.g. head of the business area), under pre-determined rules.

Every bank strictly checks the observance of limits. The monitoring function gives a signal not only when the absolute limit is reached, but also warns at certain pre-determined levels (for example, when 90 per cent utilisation of the limit is reached).

According to banks' reports, no fire sales occurred in their practices. There is adequate time interval for closing above-limit exposures originating from market revaluation and limit reductions. In most cases, these assets can be held until maturity, but no new exposure can be undertaken from them.

Techniques that ease counterparty limits that might become tight were mentioned during the interviews. Several respondents reported that they are able to expand the strictly allocated limits through the so-called limit lending activity. The essence of this is that subsidiaries and branch offices may lend unutilised limits to one another through the parent bank (or directly in one or two cases) for a pre-determined period of time.

DETERMINANTS OF LIMIT LEVELS – OWN LIMITS VS. LIMITS SET BY NON-RESIDENTS ON DOMESTIC BANKS

Following the survey of the general methodology of limit setting, in the next part of the questionnaire we asked about the factors that influence the fixing of specific limit levels with regard to various money, FX, bond and stock market transactions (10 institutions completed this part of the questionnaire). As shown in Chart 4, based on banks' responses, the most important influencing factor is the credit rating of the counterparty or of the issuer, in the case of securities transactions. In many cases, taking account of the credit rating means the application of a rating system based on an internal methodology elaborated by the bank or banking group, but usually containing numerous elements that are similar to the methodology applied by major credit rating agencies. At about one third of the banks that take into account this factor, the counterparty's or issuer's credit rating appears as a barrier

Chart 4
Ranking of determinants of limit amounts and other types of limits
(ratio of mentions)
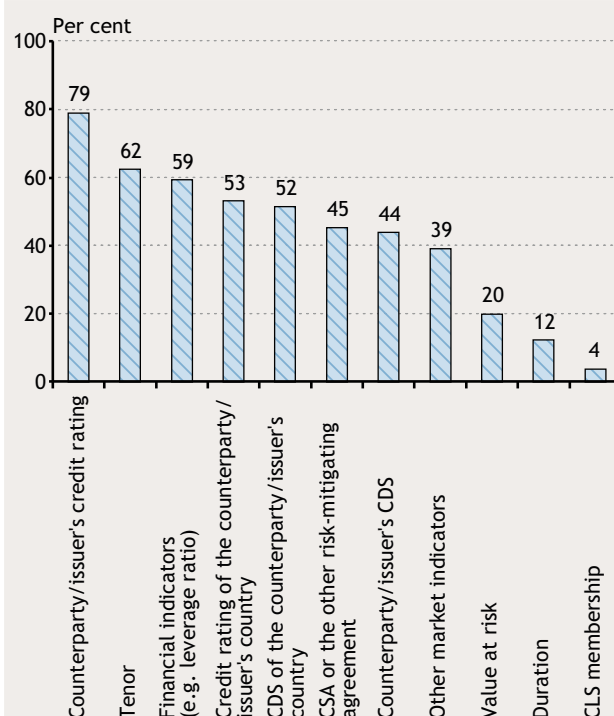
Note: The chart presents the roles of individual factors in determining the limit levels on the basis of 13 types of transactions and the responses of 10 banks, i.e. on the basis of a total 130 responses. For a summary of the number of mentions by transaction types, see Annex 1.
Source: MNB.

to transactions as well. Accordingly, these banks cannot enter into transactions with counterparties whose credit rating is below a certain pre-determined level. At the rest of the credit institutions, credit rating is only one component of the factors that affect creditworthiness.

In determining the limit levels, the majority of credit institutions take into account not only the credit rating of the counterparty (or issuer), but also the sovereign credit rating of its country, although often it is not a separate factor, but plays a role in determining the counterparty's credit rating – similarly to the CDS spread of the counterparty (or issuer) or its country. When evaluating creditworthiness and determining limit levels, banks that use internal rating systems usually take into account counterparties' or issuers' various financial indicators as well. Depending on the scope of activity of the assessed financial institution and the availability of data, these financial indicators reflect a varied picture. They usually include indicators concerning the profitability, capitalisation, liquidity and asset quality of the counterparty or issuer. In addition to financial indicators, less than half of the responding banks use other market

indicators in determining the limit levels. Typical indicators are ones determined on the basis of market share, probability of external support, the assessment of the parent company or a characteristic of its economic environment.

Upon completing the questionnaires, most banks indicated maturity as an effective limiting factor in the case of interbank and securities transactions. In the case of a longer-term transaction – in addition to the fact that it burdens the limits for a longer time – the exposure that the bank can undertake may as well decline, even to zero in an extreme case. Several banks reported that as a result of the general distrust that evolved in the unsecured interbank forint market, they have serious difficulties in receiving limits for maturities longer than one week; their limits have practically been reduced to zero on maturities longer than one week.

Based on responding banks' statements, since the outbreak of the crisis the effect of the CSA[9] and other risk-reducing agreements has appreciated during the setting of limit levels. Almost all credit institutions participating in the survey marked risk-reducing agreements as factors influencing limit levels in the FX forward, FX swap and CIRS[10] markets. During personal conversations, several people said that their counterparties often cannot enter into transactions with them without a CSA agreement. Some banks also named CLS[11] membership as a factor influencing limit levels.

In the case of the majority of responding banks, Value at Risk (VaR) and duration do not have an effect on the size of the limits set and do not influence the utilisation of limits. In the case of credit institutions where the VaR is applied in the limit system, it is an influencing factor mainly in the case of FX market transactions, whereas duration is an influencing factor only in bond market transactions.

In the questionnaires, we asked the responding banks what factors they perceived in the case of individual types of transactions as determinants of the setting of limits by their counterparts. It can be stated that the majority of banks have relatively little information about their counterparties' limit setting practices. At best, they have precise information about the level of individual limits applied to them, and even this information usually arises when they encounter limit constraints upon making transactions. Presumably, however, the conduct of non-resident counterparties and domestic institutions is determined by similar factors.

LIMITS VIS-À-VIS THE MNB

The subjects of our survey also included the limits applied to the MNB; the necessity of this was corroborated by the market events of the recent period as well. It was experienced for the first time in the domestic interbank markets on 17 and 18 January 2012 that the average O/N unsecured interbank interest rate (HUFONIA) left the interest rate corridor, which means an effective limit in the case of efficiently functioning interbank markets. Answering our questions, some banks said that at end-2011 and in early 2012, primarily as a result of the downgrades affecting the Hungarian sovereign, their respective parent banks reduced the size of their limits vis-à-vis the MNB, and thus they were compelled to place some of their forint liquidity at interbank forint markets even outside the interest rate corridor. Some banks encountering limit constraints reduced their surplus forint liquidity in the currency swap market, contributing to the deepening of FX swap market tensions in early 2012, which was most spectacularly reflected in an increase in market spreads and a surge in recourse to central bank swap facilities (MNB, 2012).

The great majority of banks participating in the survey apply specified limit levels vis-à-vis the MNB, while some of the banks do not set limits for the MNB or their limits vis-à-vis the MNB are unrestricted or can be expanded within local competence practically without restriction. At the great majority of banks that apply limits to the MNB, minimum reserves are included in the limits vis-à-vis the MNB, in spite of the fact that maintaining minimum reserves is a regulatory requirement. In nearly half of the cases, the limits vis-à-vis the MNB are treated together with the sovereign, while separate limits are set vis-à-vis the Hungarian State and the Magyar Nemzeti Bank in the other half of the cases.

CHANGES EXPERIENCED DURING THE CRISIS

The breaking points identified on the basis of banks' responses were in line with our intuition

Individual banks' responses to the questionnaire confirmed that in terms of the management of counterparty limits the outbreak of the crisis in October 2008, the development of the Greek crisis since early 2010 and the downgrade of Hungarian government debt at end-2011 and in early 2012

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[9] Credit Support Annex.
[10] Cross-currency Interest Rate Swap.
[11] Continuous Linked Settlement (for more details, see: MNB, 2001 and Tanai, 2007).

were the most important breaking points. Some institutions added that the start of the subprime mortgage market crisis in the summer of 2007 also had a perceptible impact on the management of counterparty limits. Several credit institutions emphasised that the autumn 2011 announcement of the possibility of early repayments of foreign currency loans at a fixed, preferential exchange rate also narrowed counterparty limits. In addition to the above, the money market turbulence in early 2012 was also reflected in counterparty limit management.

Of the events mentioned above, clearly the October 2008 crisis was considered the most important breaking point, when counterparty limits fell drastically and extremely rapidly (practically immediately in measures considered necessary individually). The most important changes in counterparty limit management were faster reaction than earlier, an increase in the importance of immediate interventions considered necessary on the basis of monitoring activity, the introduction of warning/alert lists and an increase in the role of CSA agreements, which reduce counterparty risk. In addition, the trend towards the clearing of OTC derivative transactions through central counterparties (CCP) – which is partly reflected in regulatory proposals and partly in counterparties' expectations – is also a significant limiting factor in terms of counterparty limit management.

In addition to the written responses to the surveys sent to banks, the impact of the crisis on counterparty limit management was examined on the basis of market data as well (stocks, turnover, number of active participants, number of counterparties, duration) in the unsecured forint interbank market and in the currency swap market. These data typically did not completely reflect the breaking points. This was attributable to factors that in technical terms cannot even appear in the developments in these breaking points (e.g. the cutting of unutilised limits cannot be seen in the actual transactions). The following subchapters contain a more detailed analysis in a breakdown by market.

Unsecured forint interbank market

Following the Lehman bankruptcy, starting from November 2008, the earlier average daily volume of HUF 100-150 billion of extra-banking group transactions fell to one half in the unsecured forint interbank market (hereinafter: depo market) in a few weeks (Chart 5). In parallel with that, the number of banks active in the depo market declined by around one third, while the average monthly number of their counterparties fell to one half (Chart 6). However, the decline in turnover at end-2008 is not exclusively attributable

Chart 5
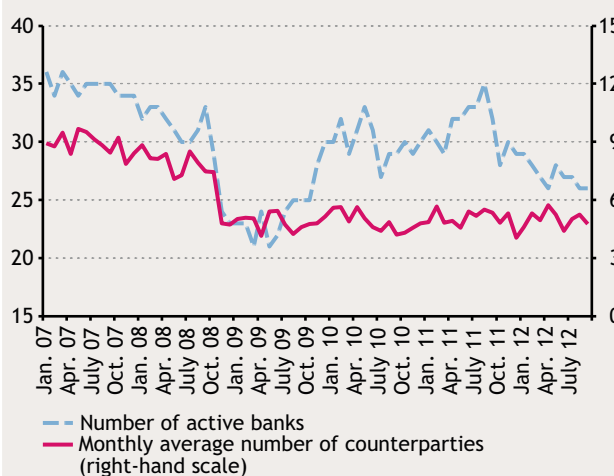**Daily turnover and amount outstanding in the depo market**
(extra-group transactions, 4-week moving average)
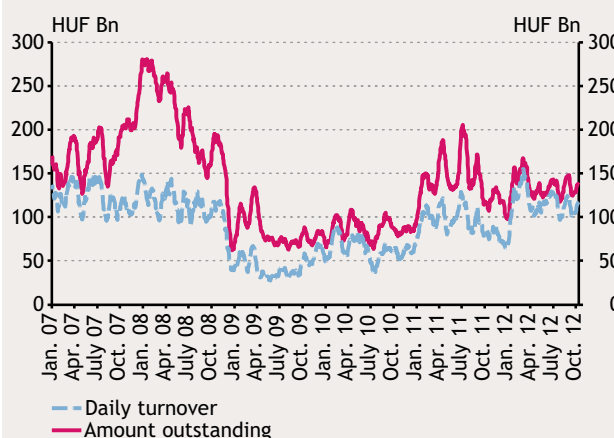
Source: MNB.

Chart 6
Number of active banks and monthly average number of counterparts in the depo market
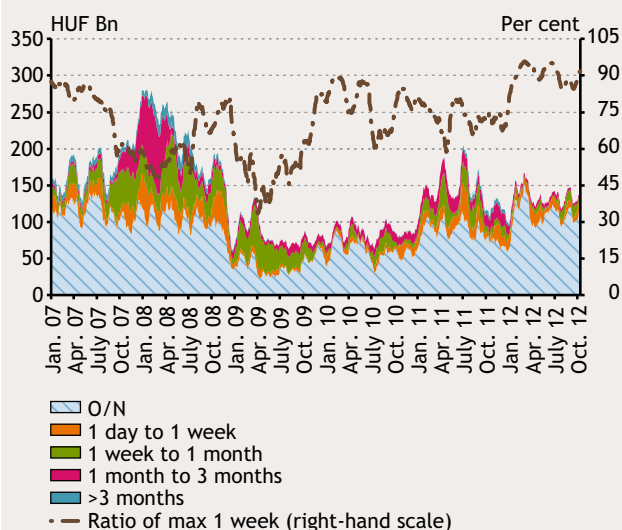*(placing side, extra-group transactions)*

Source: MNB.

to the tightening of limit systems. In addition to the more conservative limit management, the decline in depo market activity is also attributable to the increasing mistrust, which incited banks to manage liquidity in a more cautious manner and to increase their central bank O/N deposits (Molnár, 2010). Meanwhile, instant liquidity buffers, which were swelling as a result, led to a decline in demand in the depo market.

The general mistrust emerging after the Lehman bankruptcy declined only slowly in the markets; until early 2012, turnover in the depo market remained below the level observed prior to November 2008. The next breaking point

Chart 7

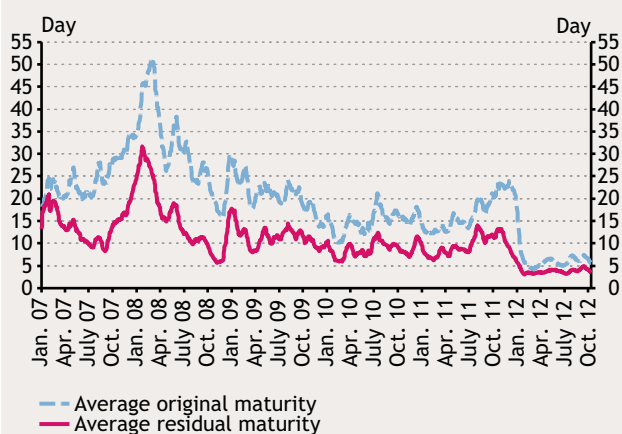**Outstanding extra-group depo stock by original maturity**

(4-week moving average)

O/N
1 day to 1 week
1 week to 1 month
1 month to 3 months
>3 months
Ratio of max 1 week (right-hand scale)

Source: MNB.

Chart 8

Outstanding extra-group depo stock by average original and residual maturities

(4-week moving average)

Average original maturity
Average residual maturity

Source: MNB.

occurred in the depo market at the beginning of 2012. Following the exclusion of the Hungarian sovereign debt from the investment category, against the background of an unchanged depo stock, the daily turnover of the market surged in early 2012, while the maturity of transactions fell considerably. In a few weeks, the average original maturity of the outstanding stock fell to one fifth of its previous level, while its residual maturity fell by two thirds. In parallel with that, within the stock, the ratio of transactions with a maturity of up to one week increased from the earlier level of around 70 per cent to above 90 per cent

(Charts 7 and 8). As banks stated, the reason for the significant shortening of maturity was that at several credit institutions active in interbank markets the maximum maturity of transactions that can be concluded in the depo market was reduced to one week due to risk management considerations.

Examination of the unsecured forint interbank market confirmed the emergence of the major breaking points taking shape on the basis of our intuition and banks' responses. The change in the conduct of banks active in the depo market can clearly be identified in the November 2008 period following the Lehman bankruptcy and in the early 2012 period following the exclusion of Hungarian sovereign debt from the investment category, whereas examining the transactions of depo market participants, direct effects of the unfolding of the Greek crisis since early 2010 cannot be clearly identified.

Looking at individual bank levels, the depo market behaviour of individual banks does not show a uniform picture. Most participants reduced their activities after November 2008. As a result of the tightening of limits, some banks that used to be active in the depo market left it completely, and started to build positions again only years later, with the easing of the effects of the crisis, although the magnitude of these positions is mostly still below the pre-crisis level. There were credit institutions whose deposit volume also declined in November 2008, but their depo market activity returned to earlier levels already at the beginning of 2009.

Currency swap market

In the currency swap market, changes in average residual maturity only partly reflected the tightening of (maturity) limits. The average residual maturity projected for the total currency swap exposure (providing foreign currency liquidity) increased considerably following the outbreak of the crisis. This may be explained by several factors. First, compared to interbank transactions, currency swap transactions can be considered secured instruments: a claim in one currency serves as collateral for a liability in the other currency (Mák and Páles, 2009). Accordingly, it involves a lower counterparty risk than an unsecured interbank loan. Second, the application of CSA agreements became widespread following the crisis: transactions with CSA agreements are lower burdens for counterparty limits. Third, right after the outbreak of the crisis, as a result of strong parent bank commitment, the ratio of intra-group transactions increased in the case of several affiliate banks, and following the outbreak of the October 2008 crisis, parent banks concluded transactions with much longer maturities with domestic subsidiaries and branches than

Chart 9

Average residual maturities by types of counterparties
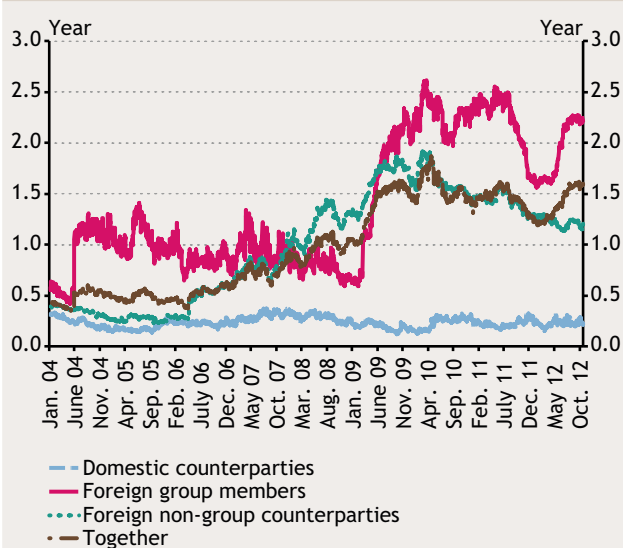
Source: MNB.

Chart 10

Number of extra-group counterparties in transactions providing foreign currency liquidity
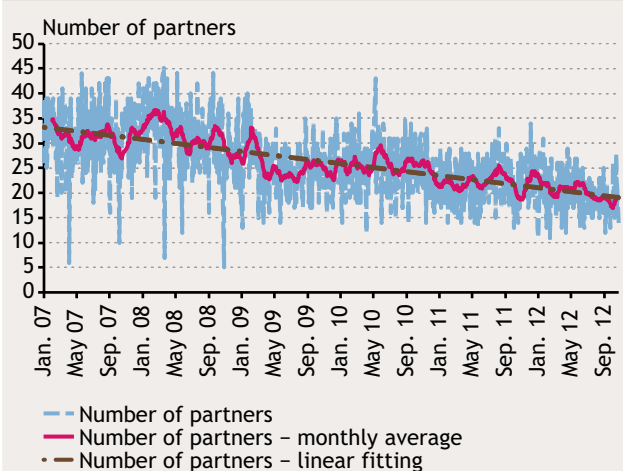
Source: MNB.

earlier (Chart 9). It follows from the above that the maturity of swaps outstanding, which had been very short prior to the crisis, started to become longer. It can be observed, however, that starting from early 2010 the average residual maturity of extra-group transactions followed a declining trend at the system level (from 1.9 years to 1.2 years): this was mainly typical of transactions concluded by domestic banks without foreign strategic ownership, while the maturity of extra-group transactions concluded by subsidiaries and branches remained practically unchanged between 2009 and 2012. This means that the swap transactions providing foreign currency liquidity were

concluded (by domestic banks) in the market at shorter and shorter maturities; maturity extension as of 2010 was basically attributable to transactions concluded with parent banks. The extension of maturity was encouraged by the introduction of the foreign exchange funding adequacy ratio (FFAR) as of July 2012: following the decline in the maturity of parent bank transactions in 2011 H2, the maturity started to become longer as of the spring of 2012 (from 1.5 years to above 2.2 years). Within the group of subsidiaries and branches, the maturity of extra-group transactions also rose (from 0.7 year to 1 year).

In the currency swap market providing foreign currency liquidity, the number of extra-group counterparties moved on a declining trend after the crisis: partly, this may have reflected the tightening of counterparty limits. However, at the system level the decline in the number of counterparties may also have been attributable to the fact that following the crisis, maturities became much longer as a result of transactions concluded with parent banks: therefore, fewer transactions had to be concluded and less often (Chart 10).

SUMMARY

Our survey of the limit setting practices of domestic banks confirmed that during the current financial and economic crisis, non-price factors, mainly limits and margin requirements, came to the fore in financial markets as well. In the past period, in terms of limit setting, centralisation was typical within foreign banking groups, which is basically reflected in the methodology of limit setting. The surveyed banks typically apply the same limit categories, of which they felt counterparty limits to be the most restrictive at the time of the survey. The external credit rating of the counterparty (and its country), its financial indicators and CDS spread were the most important determinants of the internal ratings serving as the basis for limit amounts. In the recent period, however, maturity limits have also appeared increasingly, in addition to limit amounts. Limits are usually revised on an annual basis, but during the crisis, procedures were developed that allow prompt reaction to certain market events. Domestic banks do not have precise information on the limits set vis-à-vis them by their external market counterparties, but according to their perception, typically similar aspects may determine the specific limit levels in the banking sector.

Responding institutions confirmed the presence of breaking points presumed by us and important in terms of limit setting: the outbreak of the crisis in October 2008, the unfolding of the Greek crisis since early 2010 and the downgrade of Hungarian government debt at end-2011 and early 2012. At the same time, it was also found that some

institutions experienced similar effects already in the summer of 2007. Moreover, the announcement of the early repayment scheme and the market turbulence in early 2012 influenced the risk assessment of the exposure to domestic players.

In our analysis, we examined the unsecured forint interbank deposit and forint currency swap markets, which play a key role in terms of monetary transmission. Data originating from transactions confirm that significant limit tightening may have taken place in the past few years. However, market data only partly reflect the perceived breaking points; the reduction of unobserved, unutilised limits may play an important role in the difference. In the interbank deposit market, this was reflected in the decline in daily turnover and the shortening of maturity, while maturity shortening in the currency swap market took place only in more turbulent periods, as a result of the spreading of margin requirements and the introduction of the foreign exchange funding adequacy ratio (FFAR).

The tightening of counterparty limits in the forint interbank money market and the currency swap market may result in damage to the interest rate transmission mechanism as well as in greater reliance on the central bank of Hungary. At the same time, the tightening and entry into effect of the limits set vis-à-vis the MNB may reduce the efficiency of central bank instruments. We faced all this at end-2011 and in early 2012, following the downgrade of Hungarian sovereign debt to the non-investment category, when – according to our survey as well as available data – in certain markets the limits among participants and their limits set to the MNB became restrictive. As a result, the average interest rate on overnight unsecured interbank forint money market transactions (HUFONIA) left the interest rate corridor for a short time, and FX swap spreads and recourse to central bank swap facilities surged, in parallel with rising demand for foreign currency.

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ANNEX 1: DETERMINANTS OF LIMIT AMOUNTS AND OTHER TYPES OF LIMITS BY TRANSACTION TYPE (RATIO OF MENTIONS)

Market	Deal/ Asset type	Duration	Tenor	CDS of the counterparty/ issuer	CDS of the counterparty/ issuer's country	Value at risk	Counterparty/ issuer's credit rating	Credit rating of the counterparty/ issuer's country	CSA or the other risk-mitigating agreement	CLS membership	Financial indicators (e.g. leverage ratio)	Other market indicators
Money market	HUF depo	0	8	5	6	1	9	6	3	0	7	3
	HUF repo, Sell & Buy	0	7	4	5	1	8	5	3	0	6	3
	FX depo	0	8	5	6	1	9	6	3	0	7	3
	FX repo, Sell & Buy	0	6	4	5	1	8	5	3	0	6	3
FX market	Spot	0	5	5	6	3	9	6	4	2	7	4
	Forward	0	7	4	5	4	8	5	8	1	7	5
	FX swap	0	7	4	5	4	8	5	8	1	7	5
	CIRS	0	6	5	5	4	8	5	7	1	6	5
Bond market	Bank	3	6	4	5	1	7	5	4	0	5	4
	Corporate	3	4	4	4	1	6	4	4	0	4	4
	Hungarian sovereign	4	7	5	6	2	9	7	4	0	6	4
	Other sovereign	3	6	4	5	2	8	6	4	0	5	4
	Covered	3	4	4	4	1	6	4	4	0	4	4
Total		16	81	57	67	26	103	69	59	5	77	51

Publications of the Magyar Nemzeti Bank

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Papers

MNB Bulletin / MNB-szemle
http://english.mnb.hu/Root/ENMNB/Kiadvanyok/mnben_mnbszemle
http://english.mnb.hu/Kiadvanyok/mnben_mnbszemle/mnben_szemle_cikkei
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Report on payment systems / Jelentés a fizetési rendszerről
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Féléves jelentés: Beszámoló az MNB adott félévi tevékenységéről (Semi-annual report: Report on the MNB's operations in a given half-year)
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