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The monetary programme

(A methodological description)

NBH OCCASIONAL PAPERS 8

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1 Major concepts of the monetary programme[1]

The forecast horizon is 8–17 months

A monetary programme is constructed every three months by the Monetary Policy Department staff of the National Bank of Hungary. Based on the Economics Department's projections of several key macroeconomic variables, the programme is constructed after several rounds of discussion between the two departments. The time horizon of the projections varies between 8 months and 17 months. By way of example, when constructing the April monetary programme, the focus of the forecast is usually on the current year. The July monetary programme, however, takes a broader perspective, as it includes projections for the following year as well.

1.1 Net financing capacity

Net financing capacity = income – consumption – accumulation

The Monetary Programme provides a method of forecasting the net financing capacities of the individual institutional sectors, the key monetary aggregates, the balance sheet of the central bank and the consolidated balance sheet of the banking sector. A sector's net financial savings, i.e. the portion of its income that it does not spend on consumption or accumulation, is generally referred to as *net financing capacity*.[2] Net financial savings of one sector thus provide a source of spending by some other economic unit over and above its income. *Therefore, the sum of net financing capacities of all resident and non-resident units is equal to zero* – if one sector utilises its resources on consumption and accumulation in excess of its income, it can either finance the resulting gap by disposing of its assets or by borrowing from other sectors. This then will cause its net financing capacity to become negative, which will be counterbalanced by the positive overall net financing capacity of other sectors.

[1] The authors would like to thank *István Ábel, Emma Boros, Tamás Czeti* and *Péter Koroknai* for their assistance in writing this Paper. Our thanks also go to the participants in the discussion of the first draft held at the Bank for their valuable comments. Naturally, it is the authors who should be held responsible for any occurrence of error. This analysis reflects the authors' views, which do not necessarily correspond to the official viewpoint of the Bank.

[2] If an economic agent spends more than its income, its net financing capacity is negative. This is referred to as a borrowing requirement. Positive net lending capacity is also referred to as financing capacity.

Table A

Net financing capacity of the individual sectors; as a percentage of GDP

	1999			2000
	H1	H2	H1+H2	H1
Net foreign borrowing requirement (I + II)				
Nominal	–5.9	–2.7	–4.3	–3.3
Of which: Current account balance	**–5.3**	**–3.4**	**–4.3**	**–3.6**
Operational	–5.4	–2.1	–3.7	–2.6
I. Consolidated general government				
Nominal	–7.3	–4.0	–5.6	–4.4
Operational	–4.6	–0.9	–2.7	–1.1
II. Private sector (1 + 2)				
Nominal	1.4	1.3	1.4	1.1
Operational	–0.8	–1.3	–1.0	–1.5
1. Households				
Nominal	5.5	5.6	5.5	4.5
Operational	3.0	2.9	2.9	2.0
2. Corporate sector (a + b)				
Nominal	–4.1	–4.3	–4.1	–3.4
Operational	–3.8	–4.2	–4.0	–3.4
a) Non-financial corporations				
Nominal	–4.6	–5.8	–5.3	–5.3
Operational	–4.0	–5.1	–4.7	–4.4
b) Financial corporations				
Nominal	5.2	1.5	1.1	1.8
Operational	0.2	1.0	0.7	1.0

The monetary programme provides a description of the major financial and income trends of the four institutional sectors, i.e. the corporate, household, general government and non-resident sectors. Net financing capacities are calculated for these four sectors. However, because they develop rather differently, the positions of the financial and non-financial corporations sub-sectors within the corporate sector are shown individually *(see Table A)*.

Net financing capacity can be derived from both the financing and income sides

Net financing capacity can be derived from both *the financing and income sides*. In the first case, net financing capacity can be measured by analysing changes in financial assets and liabilities, i.e. financial wealth of the individual sectors. In the second case, the indicator is calculated by describing the path of the individual sectors' incomes, the application of their incomes and subtracting consumption and accumulation expenditures of sectors from their respective incomes. Despite the differences in these approaches, the methods of deriving net financing capacity should produce the same result, providing a framework for cross-checking the forecasts.

1.2 Nominal and operational flows

Change in stock – other volume change – exchange rate effect = nominal flow

Forecasts of changes in financial assets and liabilities take flows, that is 'net' changes in stocks due to transactions, as their point of origin. The reason for choosing this approach is that changes in stocks also include the effects of factors which tend to increase the difficulty and uncertainty in exploring the underlying developments which need to be grasped in order to produce the projection. Therefore, in constructing the monetary programme, so-called *nominal flows*[3] are determined from the changes in stock data by eliminating the effects of both exchange rate movements and other changes in the volume of assets and liabilities (only the effect of other volume changes in respect of forint-denominated financial assets).[4]

Nominal flow – compensation for inflation = operational flow

A nominal flow for a given stock of assets includes (nominal) interest payments on financial assets as well as changes due to transactions other than interest payments.[5] The real return on a financial asset is derived by eliminating the impact of inflation on the nominal return. The sum of real return and changes in the volume of financial assets due to transactions other than interest payments is called *operational flow (see Table B)*, which, unlike the nominal flow, does not reflect the distorting impact of inflation. In this manner we obtain an indicator which can help us to explore the underlying developments in the individual sectors' net financing capacities, even in an environment characterised by high and variable inflation.

Operational flow does not include the distorting effects of inflation

In calculating operational flow, the lower of nominal interest and the inflation rate,[6] is used to derive compensation for inflation. This means that, when calculating operational flows, the real interest component, added to the value of transactions other than interest payments, is positive if the interest rate on the asset is higher than the rate of inflation and, conversely, is zero if the interest rate is lower than inflation.

Table B

Relationship between nominal and operational flows

<table>
<tr><td colspan="3">Nominal flow</td></tr>
<tr><td colspan="2">Interest income</td><td>Transactions other than interest payments</td></tr>
<tr><td>Compensation for inflation</td><td>Real interest rate</td><td>Transactions other than interest payments</td></tr>
<tr><td>Compensation for inflation</td><td colspan="2">Operational flow</td></tr>
</table>

[3] Our use of the various concepts differs from that of the SNA, where flows include the effect of exchange rate changes, in addition to that of transactions.

[4] Other volume effect, e.g. the write-off of a loan, when the amount of outstanding debt changes without a transaction taking place.

[5] Transactions other than interest payments mean net purchases and deposits in the case of assets, and net borrowing in the case of loans.

[6] When calculating operational flows, compensation for inflation is subtracted from interest or interest type income earned on financial assets. This means that, in addition to bank deposits and lending, compensation for inflation is also computed in the case of investment funds investing in government debt securities. However, the value of compensation for inflation is zero the case of non-interest-bearing cash investments and acquisitions of shares not guaranteeing secure returns.

When inflation exceeds the nominal return on an asset, the investor earns negative real interest by holding various financial assets. Negative transfers of income between issuers of a financial asset and holders, which arises in economic terms, is not taken into account in determining operational flows. The reason for this is that the international statistical system (SNA) also uses this indicator, thus enabling us to obtain internationally comparable data.

Another argument for calculating the operational flow with the above approach is that taking account of negative interest income would cause complications when recording the income of the individual sectors. The operational net financing capacities of the various sectors include an amount of disposable income which, when the sector's consumption and accumulation expenditure is subtracted, provides us with the sector's net financing capacity. If negative real interest were taken into account when calculating operational flows and financing capacity, a transfer of income which is both difficult to statistically interpret and which does not involve genuine financial flows would have to be recorded on the income side.

Different categories of income are associated with nominal and operational flows

There is also a disposable income component of operational financing capacity which is associated with zero or positive real interest. This is obtained by subtracting the compensation-for-inflation component of interest and interest type incomes from the disposable income component of nominal net financing capacity. This allows the process of adjusting for inflation to be interpreted in the income-side approach as well, and thus operational financing capacity can be calculated from both the perspective of income and financing.

Nominal income, which is consistent with nominal flows, can primarily be disaggregated into labour and property income constituents. The latter constituent also includes interest type income. This implies that interest income, calculated on the basis of the nominal interest rate, not only includes the real income of a given sector, but compensation for the diminution in the value of a financial asset caused by inflation as well. In estimating the incomes pertaining to the operational borrowing requirement of specific sectors, this com-

Table C

Relationship between nominal and operational income

<table>
<tr><td colspan="4">Nominal income</td></tr>
<tr><td colspan="3">Property income</td><td>Labour income</td></tr>
<tr><td colspan="2">Interest income</td><td>Allowances</td><td>Labour income</td></tr>
<tr><td>Compensation for inflation</td><td>Real interest rate</td><td>Allowances</td><td>Labour income</td></tr>
<tr><td>Compensation for inflation</td><td colspan="3">Operational income</td></tr>
</table>

pensation component must be eliminated. Consequently, in the operational approach, income is derived by subtracting the inflation compensation component of nominal interest from property income *(see Table C)*.

The first step is to produce the forecast of operational financing capacities

When constructing the monetary programme, the first step is to produce forecasts of the individual sectors' operational financing capacities and to project the operational flows of the various assets and liabilities. These indicators are then modified by the inflation-compensation component on the basis of forecast inflation. This provides us with forecasts of both nominal financing capacities and changes in stocks. However, both calculations, i.e. the programme based on nominal flows and that based on operational flows, must concur with developments on the income side. At the same time, by ensuring this consistency both approaches can be cross-checked.

2 | Calculating net financing capacity

Forecasting financing capacities is not aggregating financial assets

This Section describes the method of estimating the individual sectors' net financing capacities by deriving from the financing side. The equations referred to present a detailed explanation of how net financing capacity can be calculated for each sector, based on financial assets and liabilities and on the various items in the balance of payments. Later on, we will present in detail the steps of constructing the monetary programme itself. We should like to emphasise, however, at this early stage that, *in generating the prognosis, the monetary programme is not constructed as an aggregation of the individual forecasts of various financial assets. On the contrary – the decisions taken by the individual sectors in respect of their portfolios, that is, the expected measure of changes in the individual items of wealth, is determined using net financing capacity as a basis.*

2.1 The current account and components of its financing

The monetary programme states the individual sectors' net financing capacities on a cash basis instead of an accrual basis. The net external borrowing requirement is therefore equal to the sum of the current and capital account deficits.

The following items constitute the major components of the balance of payments:[7]

- Current account balance (CA);
- Capital account balance (KA);
- Foreign direct investment (excluding privatisation revenue, FDI);
- Foreign borrowing: credit flows of consolidated general government, i.e. the NBH and the central government ($\Delta L_{FG}= \Delta L_{FJ} + \Delta L_{FK}$),[8] foreign borrowing by the non-financial corporations sector (ΔL_{FV}) and foreign borrowing by credit institutions (ΔL_{FB});

[7] The variables used in the description are included in the Appendix at the end of the document.

[8] Here and in the following, Δ is meant to indicate the change in the volume of a given instrument after eliminating the effects of exchange rate movements and other volume changes, i.e. nominal flows. The relationships are valid using operational numbers as well. In this case, changes in stocks must be reduced by the value of compensation for inflation.

Table D

Current account formula (1998, 1999 and 2000 H1)

millions

	Variables	1998	1999	2000 H1
1. Current account balance	*CA*	**–2,020**	**–1,970**	**–860**
2. Financing		**2,780**	**4,212**	**983**
2.1 *Foreign direct investment (net of privatisation revenue)*	*FDI*	***1,387***	***1,612***	*906*
2.2 *Credit balance of consolidated general government*	ΔL_{FG}	***276***	***1,219***	*–2*
Credit balance of NBH	ΔL_{FJ}	**–400**	**–1,657**	–807
Credit balance of central government (excluding government securities)	ΔL_{FK}	**–119**	**2,274**	223
Acquisitions of government securities by non-residents	ΔB_F	***795***	***601***	*583*
2.3 *Privatisation revenue*	Pv_F	***158***	***351***	*8*
2.4 *Net borrowing of the private sector*		***761***	***1,236***	*41*
Borrowing of credit institutions	ΔL_{FB}	**311**	**299**	715
Portfolio investments (net of privatisation revenue)	ΔE_F	**302**	**608**	–289
Corporate foreign borrowing	ΔL_{FV}	**148**	**329**	–385
2.5 *Capital account balance*	*KA*	***170***	***31***	*84*
2.6 *Balance of errors and omissions*		***28***	***–237***	*–54*
3. Change in international reserves	ΔRes	**760**	**2,241**	**123**

– Acquisitions of government securities (ΔB_F) and shares (ΔE_F, *including foreign currency* revenue from privatisation) by non-residents; and
– Changes in international reserves (Res).

Using these items, the current account equation can be expressed as follows:

$$CA+KA+FDI+\Delta L_{FG}+\Delta L_{FV}+\Delta L_{FB}+\Delta B_F+Pv_F+\Delta E_F=\Delta Res \qquad (1)$$

Rearranging equation (1), we obtain the items financing the current account deficit *(see Table D)*.[9]

2.2 Net financing capacity of general government

General government consolidated with NBH

In order to estimate the general government net borrowing requirement, the change in the debt of *consolidated general government*, including the central bank, is determined as a first step. In this con-

[9] In each case, the quantification of the various equations has made it necessary to include an item, so as to be able to handle data errors and other discrepancies. This error component, however, is not shown separately in the equations.

Table E

(Simplified) balance sheet of consolidated general government

Asset			Liability
L_{JB}	Refinancing loans	Monetary base (banknotes and coin plus required reserves)	$KP+RR$
Res	International reserves	Outstanding sterilisation instruments	CD^{Ft}
E_G	Equity ownership	Foreign currency deposits of commercial banks	$CD^{\$}$
		Foreign borrowings of general government	L_{FG}
		Outstanding government paper	B

solidation, the mutual assets and liabilities of general government and the central bank are eliminated, but at the same time assets and liabilities of the central bank vis-à-vis non-residents and the domestic private sector are included. The required reserves of commercial banks appear as a constituent of the monetary base, and their two-week deposits with the NBH are treated as part of sterilisation instruments, similar to the treatment of NBH bills *(see Table E)*.

Privatisation revenues treated as a correction item

When we express the sector's net borrowing requirement based on the consolidated general government balance sheet presented in Table E, state property must also be shown on the asset side of the consolidated general government balance sheet. The reason for taking this approach is that proceeds from privatisation result in a decrease in state ownership, which is presented on the assets side of the general government balance sheet. When state assets are sold, government ownership declines ($Pv = -\Delta E_G$), but general government's net financial assets increase, and the transaction leaves the sector's net financing capacity unaffected. Net financing capacity, calculated on the basis of net financial assets, but taking no account of revenues from privatisation, would show the position more favourably than it actually is. Therefore, when calculating net financing capacity, privatisation revenues are taken into account with a negative value, as an item increasing the borrowing requirement.

$$NFK_G = -\Delta KP - \Delta RR - \Delta B - \Delta L_{FG} - \Delta CD^{Ft} - \Delta CD^{\$} - Pv + \Delta Res + \Delta L_{JB} \quad (2)$$

In order to forecast the central bank balance sheet, one of the pillars of the monetary programme, it is necessary to produce the asset and liability statements of the central bank and general government (the two sub-sectors of the consolidated general government sector) separately. Therefore, given that the simplified flow-of-funds matrix in *Appendix 1* to this Paper includes the various items in a breakdown by sub-sector, the mutual assets and liabilities

of the two sub-sectors are also indicated. Among these items, the most important ones are the government's account held with the central bank (the Treasury Account) and net foreign currency lending by the central bank to the government ($\Delta L^{\$}_{JK}$). (The latter includes the government's special foreign currency deposits with the central bank, with a negative sign.)

2.3 Net financing capacity of the household sector

The calculation of household sector net financing capacity takes into account the following financial assets:

- cash holdings (ΔKP_H);
- forint deposits (ΔD^{Ft}_H); these include outstanding bank securities and the sector's assets in home-savings institutions as well;
- foreign currency deposits ($\Delta D^{\$}_H$);
- government securities holdings (ΔB_H); and
- holdings of securities issued by enterprises, whereby claims on company equity (shares, ΔE_H)[10] are distinguished from claims on financial corporations other than credit institutions (investment fund certificates, life insurance reserves, the sector's equity in pension funds, ΔMF).

The vast majority of household sector financial liabilities are accounted for by commercial bank lending (L_{BH}). Taking into view all these, net financing capacity, i.e. the increase in net financial assets, can be expressed by the following formula:

$$NFK_H = \Delta KP_H + \Delta D^{Ft}_H + \Delta D^{\$}_H + \Delta B_H + \Delta E_H + \Delta MF - \Delta L_{BH} \qquad (3)$$

2.4 Net financing capacity of the corporate sector

Financial and non-financial corporations should be treated separately

When analysing the corporate sector, companies are categorised into those pursuing financial and non-financial activities. In addition, credit institutions are also treated separately within financial corporations, by virtue of the role they play in the economy.

[10] Currently, this primarily indicates holdings of exchange-traded shares. However, as there is no available statistical information regarding shares outside the Stock Exchange, we are unable to give an accurate forecast of the sector's holdings of shares.

2.4.1 Non-financial corporations

The definition of non-financial corporations' net financing capacity is similar to that of the household sector. The following asset categories comprise the sector's financial assets:

- cash holdings (ΔKP_V);
- forint deposits (ΔD_V^{Ft});
- foreign currency deposits ($\Delta D_V^{\$}$);
- government securities holdings (ΔB_V);
- holdings of NBH bills (ΔCD_V^{Ft}) and
- equity ownership (ΔE_V).

Corporate sector financing can be categorised into the following components:

- issues of shares (I_V);
- increase in forint borrowings from domestic credit institutions (ΔL_{BV}^{Ft});
- increase in foreign currency borrowings from domestic credit institutions ($\Delta L_{BV}^{\$}$);
- increase in foreign currency borrowings from abroad (ΔL_{FV}); and
- foreign direct investment (FDI).

Based on these items, the net financing capacity of non-financial corporations can be expressed as follows:

$$NFK_V = \Delta KP_V + \Delta D_V^{Ft} + \Delta D_V^{\$} + \Delta B_V + \Delta CD_V^{Ft} + \Delta E_V - \\ - I_V - \Delta L_{BV}^{Ft} - \Delta L_{BV}^{\$} - \Delta L_{FV} - FDI \qquad (4)$$

2.4.2 Financial corporations

Credit institutions within the financial corporations sector are given a special role

The expression defined by formula (4), does not represent the entire corporate sector's financing capacity: the net financing capacity of financial corporations must also be added. Financial corporations can be disaggregated into two further sub-groups, namely (1) credit institutions and (2) financial corporations. This grouping is justified by the fact that key items in the balance sheets of credit institutions are afforded a special role in the monetary programme when forecasting the aggregate balance sheet of the banking sector.

In respect of the corporate sector, accumulation expenditure, i.e. fixed investment and increase in inventories, typically occurs outside of the financial sector. Therefore, in analysing the financial sector, a simplifying assumption has been made that the sector does not spend on accumulation, so its net financing capacity is de-

pendent on profits earned. Profits of the financial sector can be closely linked to its disposable income, which, if positive, increases the total available income of domestic sectors and reduces the country's external borrowing requirement. Basically, the financial sector links parties with financial savings to borrowers. Nevertheless, the sector is capable of lending in excess of the value of the financial savings it attracts, up to the extent of its disposable income.

In accordance with the method of calculation from the financing side, the change in net assets, after elimination of the effects of exchange rate movements and other volume effects, must show the net financing capacity (or, for the sake of simplicity, profits) of the financial sector, as is the case in respect of other sectors. Therefore, in order to derive net financing capacity we must take the balance sheet of the financial corporation sector as a basis, and calculate such capacity from changes in the sector's financial assets and liabilities.

2.4.2.1 Credit institutions

The net financing capacity of credit institutions is defined with due consideration of the following classes of financial assets and liabilities *(see Table F)*.

Table F

Aggregate balance sheet of credit institutions

Asset		Liability	
KP_B	Cash	Shareholders' quality	C_B
RR	Required reserves	Forint deposits	$D^{Ft} = D_V^{Ft} + D_H^{Ft} + D_R^{Ft}$
CD^{Ft}	Forint deposits with central bank	Foreign currency deposits	$D^{\$} = D_V^{\$} + D_H^{\$}$
$CD^{\$}$	Foreign currency deposits with central bank	Refinancing loans	L_{JB}
$L_B^{Ft} = L_{BH}^{Ft} + L_{BV}^{Ft} + L_{BR}^{Ft}$	Forint lending	Foreign borrowing of commercial banks	L_{FB}
$L_{BV}^{\$}$	Foreign currency lending		
CB_B	Corporate bonds		
B_B	Outstanding government paper		

Accordingly, the increase in the net assets of credit institutions can be expressed with the following formula:

$$NKF_B = \Delta KP_B + \Delta RR + \Delta CD^{Ft} + \Delta CD^{\$} + \Delta L_B^{Ft} + \Delta L_{BV}^{\$} + \Delta B_B - I_B - \Delta D^{Ft} - \Delta D^{\$} - \Delta L_{JB} - \Delta L_{FB} \quad (5)$$

where the change in shareholders' equity equals the value of shares issued by credit institutions: $\Delta C_B = I_B$.

2.4.2.2 Other financial corporations: investment funds, insurance companies, securities brokers

Other financial corporations are categorised into one sub-sector. In addition to investment funds, this sub-sector also includes insurance companies and pension funds. In determining this sub-sector's net financing capacity, the following financial assets and liabilities are taken into account:

- government securities holdings (ΔB_R);
- forint deposits (ΔD_R);
- holdings of NBH bills (ΔCD_R^{Ft})
- forint borrowings from domestic banks (ΔL_{BR});
- acquisitions of equity stakes in non-financial corporations (total holdings of corporate shares,(ΔE_R);and
- major liabilities of the sector: outstanding investment fund certificates, life insurance reserves, liabilities of pension funds to the household sector (ΔMF).

Using these items, the formula for determining their net financing capacity can be expressed as follows:

$$NKF_R = \Delta D_R + \Delta B_R + \Delta E_R + \Delta CD_R^{Ft} - \Delta MF - \Delta L_{BR} \quad (6)$$

Total corporate sector net financing capacity is the sum of the three sub-sectors' net financing capacities taken individually. Using formulae (4), (5) and (6), this can be expressed as follows:

$$NFK_{TV} = NFK_V + NFK_B + NFK_R \quad (7)$$

As well as providing a description of credit flows between the sub-sectors, the simplified flow-of-funds matrix is an important element in estimating the net financing capacities of the individual sub-sectors, and summarises the interrelationships presented so far.

2.5 The flow-of-funds matrix

Changes in assets and liabilities of the four sectors are presented by the flow-of-funds matrix

The flow-of-funds matrix we employ, which is constructed from mutual assets and liabilities of the individual sub-sectors, is presented in Appendix 1.[11] Changes in the financial assets and liabilities of the four sectors constitute a closed system – every financial asset is simultaneously a liability of another sector. Consequently, if for a given asset we aggregate the changes in stocks at the levels of the individual sectors by assigning positive value to an increase in assets and negative value to an increase in liabilities the result is zero. It follows that the sum totals of the items in the individual rows of the flow of funds matrix must be zero.

As the asset and liability portfolios are mapped out separately for each sector, when constructing the monetary programme, the flows must be analysed in a closed system in order to ensure consistency. The flow-of-funds matrix describes market participants' decisions on their asset and liability portfolios in such a way which ensures the equilibrium of money and capital markets, that is, the balance of supply and demand for financial assets.

Supply of and demand for the individual instruments are equal

The flow-of-funds matrix, therefore, complements the relationship presented earlier, *according to which the sum of net financing capacities of the individual sectors is zero*, with further equations relating to the individual instruments.

Sum of net financing capacities of the sectors is zero

The products of the money, foreign exchange and capital markets have been categorised into 11 groups, according to their interest-bearing nature and characteristic yield levels (financial assets shown in rows 1–11 of Appendix 1). The breakdown of product groups according to different liquidity characteristics and currency denomination is mainly justified by the fact that this presents a sufficiently detailed picture of market participants' portfolio-based asset allocation, while also providing an opportunity to calculate the major financial and credit aggregates.

The next four rows (12–15) detail all those major financial asset classes which are indispensable ingredients for forecasting the central bank balance sheet, and which are not included in the monetary aggregates. They include financial settlements between the central government and the central bank and those between the central bank and commercial banks. In the system provided by the flow-of-funds matrix, equilibrium is established between the balance sheets of the central bank, the banking sector and the major institutional sectors at the levels of both the sectors and the instruments.

Appendix 2 illustrates a version of the flow-of-funds matrix assembled on the basis of actual data for 1999.

[11] In the flow-of-funds table, changes in liabilities of a sector is shown with a negative value and those in assets with a positive value.

3 | Stages of constructing the monetary programme

Step 1: forecasting financing capacities

The flow chart for constructing the monetary programme and the synopsis of the individual steps to be taken are presented in *Appendix 3*. The following is a step-by-step description of the procedures followed, according to the matrix shown in the Appendix. The first step consists of determining the financing capacity of the various sectors. In order to do this, developments *in the short-base trend,* obtained by assembling past data for net financing capacity and analysing its series, forecasts of GDP, inflation and the interest rate path as well as of the state budget, are used as inputs. The final values for net financing capacity are determined taking into account economic events on the income side and by providing for consistency between the financing and income sides.

Step 2: forecasting financial assets

When the net financing capacities of the various sectors are known, the financial assets that underlie the changes in financial wealth of the individual sectors can be identified using portfolio analysis. During this phase of constructing the flow-of-funds matrix, disaggregation of foreign exchange market intervention into its constituents and analysis of the interrelationships between the current account, foreign exchange market intervention and the central bank balance sheet play an important role.

Step 3: assembling the consolidated balance sheet of the banking sector and the rolling liquidit

Given the changes in the various financial assets, we are now able to assemble the consolidated balance sheet of the banking sector and, finally, the rolling liquidity programme is also constructed. This Section provides a more detailed overview of the process of forecasting net financing capacity, the interrelationships between the balance of payments, foreign exchange market interventions and the central bank balance sheet as well as the construction of the flow-of-funds matrix. The balance sheets and rolling liquidity programme, representing the outputs of the monetary programme, will be presented in the next Section.

3.1 Forecasting net financing capacity

The structure of the forecast is built on the flow-of-funds matrix. The essence of this is that the net financing capacities of the three sectors comprising the economy, i.e. general government, enterprises

and households, and of non-resident sector can be encapsulated in a closed system. The objective of the monetary programme is to formulate the structure of assets and liabilities of the sectors so that the assets and liabilities with various liquidity and currency denomination characteristics each constitute a closed system as well.

Seasonally adjusted operational flows serve as basis for the forecast

Operational flows, which better reflect the underlying developments and are adjusted for inflation, serve as a basis for producing the forecast. Generally, economic transactions reflect significant seasonal influences, therefore, when possible, seasonally adjusted data are used, which are transformed into data on a constant price basis for the purpose of comparing such with past events. Taking these steps we obtain the time series for the sectors' assets and liabilities which can be interpreted from an economic perspective. Occasionally, these data, which are collected on a monthly basis, exhibit strong fluctuations: in such cases the values are smoothed using moving averages. This allows economically justifiable developments to become more evident.

A wide range of data, for example the inflation path and the first draft of the GDP forecast by the Bank's Economic and Research Department, is used as exogenous factors to produce the forecast. Similarly, the financing capacity of the general government sector can also be viewed as an exogenous factor.

Time series analysis and stability test

Given the lack of formalised relationships, items on the financing side are forecast using several methods. The first phase of producing the projection is time series analysis. Seasonally adjusted time series of operational flows, which eliminate the distorting effects of inflation, are calculated for both financing capacities and individual assets. Within the framework of the time series analysis, the autoregressive (in most cases ARIMA) model, as employed by the Demetra programme,[12] produces the future trend of a given variable which can be adjusted for seasonality. Based on this trend the future values, as estimated by the Demetra programme, can be derived by adding the seasonal factors. These projections represent an important starting-point for forecasting the financing items.

The reliability of the figures projected for the various time series by Demetra varies. Therefore, in each case we analyse the stability of the trend forecast by the programme, i.e. whether it changes significantly when new data is entered. One possible method of conducting this stability measurement exercise is to set, for a given point in time, the autoregressive model and its parameters found optimal by Demetra, and test whether the time series complemented with new data can be reconciled with the model expressed on the basis of earlier data. If the expanded time series cannot be explained by the fixed model on the basis of the significance tests, this suggests a cer-

[12] The Demetra programme, designed for Eurostat, runs the TRAMO & SEATS and X-12-ARIMA algorithms for seasonal adjustment to analyse the individual time series. Our analyses have been made using Version 1.4 of the programme, released in February 2000.

tain instability. In this case, forecasts produced by Demetra should be treated with reservation.

If the time series does not show the effect of any significant seasonal pattern (for example, foreign capital inflow), the time series forecast by Demetra is not available. In such cases, the original times series are analysed using other methods, for example moving averages, in order to reveal both short-term and future trends. The use of moving averages may be useful in the case of seasonally adjustable time series, if the seasonally adjusted time series is extremely volatile and the trend calculated by Demetra is unstable, that is, it reacts sensitively to new data.

Finding explanatory variables using correlation calculations and simple regressions

In addition to the time series analysis, identifying *explanatory variables* which could, in theory, affect the given flow and developments in the value of a given asset is an important step in the forecasting process. As regards the variables which may, in theory, be used for the analysis, it is analysed for which variables the *correlation calculations* and *simple regressions* indicate a statistically significant relationship, pointing in the same direction with that expected on the basis of theory.

Due to the structural disruptions caused by economic transition, the short time series and errors in the statistical data, we have not found yet an econometric model, the parameters of which could be safely relied upon in formulating projections. So far, the most reliable results have been achieved when explaining the behaviour of cash holdings. In respect of most items, the significant effect of one or more variables is demonstrable on the basis of the correlation calculations. Nevertheless, we have not yet been able to generate regressions which are able to satisfy serious stability tests. In these cases, either the theoretically expected coefficient is hypothesised (for example, 1 in the case of elasticity of the real quantity of money according to income) or an analysis is conducted to determine whether the projection using parameters suggested by the simple regressions passes the wide variety of consistency tests required by the relationships of the monetary programme.

Past data do not appear to confirm the theoretically expected relationships for certain instruments. In this case, if a given explanatory variable is expected to show considerable variation based on the forecasts of inflation and yields on the income side, this is taken into account when projecting operational flows. As the coefficient of the explanatory variable is unknown, this means that, within the boundaries defined by the consistency analyses, the forecast is modified to a greater or lesser extent in a certain direction which is theoretically justified by the future shifts in the explanatory variable.

Income-side variables and the inflation forecast are produced by the Economics and Research Department

The forecast of variables explaining the items on the financing side is founded on the projections of changes in the income side and inflation contributed by the Economics and Research Department. The most important explanatory variables derived from such are the

individual sectors' disposable income and the various components of GDP (consumption, fixed investment, net exports), as well as inflation. In addition, the monetary programme renders forecasts for the future path of three-month government securities yields using information derived from the yield curve, and the expected future trajectory of interest rates on loans and deposits as well. The transmission relationship between the three-month government securities yield and interest rates on loans and deposits allows us to forecast lending and deposit rates with relative accuracy. This forecast, in turn, will play a role as an explanatory variable when forecasting operational flows.

The values derived from forecasting the financing capacities of the four sectors, i.e. non-residents, general government, households and enterprises, are very closely interlinked, which allows us to cross-check and modify the plausibility of net positions which reflect developments characteristic of a given sector. During this cross-checking, the figures on the financing side are checked against the first draft of the forecast obtained from the income-side analysis, which uses the same figures for growth and balance of payments, and final projections ensuring the consistency of the two sides are then formulated. A detailed description of the process of establishing the consistency of the data on the income and financing sides is provided in the next Section.

3.2 Consistency of data on the income and financing sides

Financing capacity in the monetary programme derived using data on the financing side must correspond with the data obtained from calculations on the income side. Consequently, after the first draft of forecasts of data on the financing and income sides is prepared, the two values for financing capacity must be cross-checked against each other by sector. The two highly simplified calculations are illustrated *in Table G.*

Translating income-side figures into financial stocks may reveal inconsistencies

In the event of discrepancy between the financing capacities obtained by the two approaches, the two values are substituted in the other framework, in order to decide which value, better approximating the financing capacity, is acceptable for both approaches. First, we attempt to calculate the financing capacity obtained by the income-side analysis as the allocation of the various financing capacities. Taking into view past developments in the various financial assets and liabilities as well as future events suggested by the current state of the economy, the financial assets and liabilities of the various sectors are aggregated. This may give rise to significant discrep-

Table G

Net financing capacity derived from the income and financing sides

Corporate sector	General government	Households	Whole economy
Y_V Disposable income	Y_G Disposable income	Y_H Disposable income	Y Disposable income
	C_G Community consumption	C_H Consumption	C Consumption
I_V Corporate gross accumulation	I_G General government fixed investment	I_H Household sector fixed investment	I Fixed investment
NFK_V (Y_V–I_V = E_V–F_V)	NFK_G (Y_G–C_G–I_G = E_G–F_G)	NFK_H(Y_H–C_H–I_H = E_H–F_H)	Current account (Y–C–I=E–F)
E_V Asset	E_G Asset	E_H Asset	E Financial Assets
F_V Liability	F_G Liability	F_H Liability	F Borrowings
Income-side cross-checking items			
Reinvested earnings, change in income		Real consumption growth	Real GDP growth
		Real growth in total income	
Financing-side cross-checking items			
			Increase in monetary aggregates
			Increase in credit aggregates

ancies between the forecasts of the monetary aggregates, the credit aggregates and the financing capacities, which are not compatible with their past developments and, ultimately, may prompt us to modify the initial projection of financing capacities.

Financing-side figures can be refined on the basis of cross-checking on the income side

The next step is to enter the financing capacity, derived analogously with the previous method on the basis of financial assets and liabilities, in the income-side matrix. At this point, the forecasts of income-side projections may be modified, which is justified when feedback from the financing side is received. When establishing consistency, any interference between financing and income-side variables, which may have gone unnoticed the time the first projections are generated, is also taken into account. For example, an increase in households' liquid balances may function as an indicator of future rises in consumption, but shifts in the balance of corporates' assets and liabilities within their financing capacity may as well be a gauge of the sectors' future profitability trends.

Forecasts are fine-tuned using the iteration method

The iteration method is used to fine-tune the forecasts of financing-side variables when establishing consistency with the income-side numbers. The main idea of the iteration method is that if net financing capacities (calculated using the different approaches)

deviate, then the variables in the given relationship (financing capacity, disposable income, consumption, accumulation) are modified towards equilibrium. Imbalance clearly indicates the direction a given variable should take in order for consistency to develop. When applying the iteration method, forecasts for variables which (based on past data and economic processes) exhibit the greatest probability to deviate from the initial estimate towards equilibrium is modified.

Imbalance indicates the direction of necessary changes

In respect of the household sector, for example, given the deflators of consumption and income, it can be determined which combination of real increases in income, fixed investment and consumption is required for financing capacity to arise. Accordingly, fixing two of the variables yields the measure of the third on the principle of residuals, which then assists in determining the real rate of growth of the given variable. If the real growth of a variable, calculated this way, does not appear to be acceptable taking into view the short-base trends (time series analysis), past relationships (correlation calculation, simple regression) and economic events, consistency of the data on the financing and income sides is established by modifying the forecast of the given variable. It may also occur that the forecasts of several variables (including financing capacity) must be modified.

In such modifications, the mutual consistency of potential increases in consumption and income is examined, taking into account the impact of these modifications on other sectors as well. (For example, the disposable income-to-GDP ratio of an individual sector may only change to the detriment of the others.)

The financing capacities of the individual sectors develop as a result of the consistency analysis of the data on the income and financing sides. The next step in assembling the monetary programme is to determine a portfolio structure which is suitable for the financing capacity values which have been rendered consistent according to the above procedure. In other words, the structure of financing capacity in terms of financing items is examined.

3.3 Foreign exchange market intervention and its components

Forecasts of foreign exchange market intervention and its components complement the projection of financing capacities

With knowledge of the sectors' financing capacities, we can forecast foreign exchange market intervention and its components. In this phase, we focus on foreign currency-denominated financing items and develop a forecast of the foreign exchange items in the central bank's and commercial banks' aggregate balance sheet. Complementing these with the forecast of balance of payments items, the

measure of foreign exchange market intervention can also be determined.

The following is a description of relationships between the above factors. The three variables which can be viewed as being of key importance are: the (1) current account deficit, (2) changes in international reserves and (3) foreign exchange market intervention.

The equations below establish a relationship among these three key variables:

- the schematic balance sheet of commercial banks, which helps determine the relationship among the changes in commercial banks' on-balance sheet open positions and other balance sheet items as well as commercial banks' foreign borrowings;
- the structure of current account financing, which, given a balance of payments deficit, shows how international reserves change as a result of capital and credit flows; and
- the measure of oversupply (conversion) in the foreign exchange market, which must be equal to the change in net foreign exchange assets in the central bank balance sheet.

As a result of these three relationships, we obtain the components of foreign exchange market intervention. The individual equations are presented in the following.

3.3.1 Open position of commercial banks

Using the schematic balance sheet drawn up for commercial banks' foreign exchange assets and liabilities, we are able to express commercial banks' on-balance sheet open positions on the basis of their foreign borrowings, foreign currency deposits with the central bank and foreign currency lending by the central bank as well as foreign currency deposits placed with them.

Table H

Schematic balance sheet of commercial banks' foreign exchange assets and liabilities

Asset			Liability
$CD^{\$}$	Foreign currency deposits with central bank	Household and corporate sector foreign currency deposit	$D^{\$}$
$\Delta L^{\$}_{BV}$	Foreign currency lending to corporate sector	Net foreign borrowing of commercial banks	$L^{\$}_{FB}$
OP	On-balance sheet open position		

Changes in commercial banks' open positions play an important role in foreign exchange market intervention

Commercial banks' on-balance sheet open position shows the surplus of foreign exchange liabilities in the balance sheet over and above foreign exchange assets. Accordingly, if $OP>0$, that is, if the value of commercial banks' foreign exchange liabilities exceeds that of their foreign exchange assets, the balance sheet is characterised by a short position in foreign exchange, or, in other words, a long forint position. Conversely, if $OP<0$, then foreign exchange assets show a surplus over foreign exchange liabilities, indicating a short forint position.

The change in on-balance sheet open positions can be expressed from Table H using the following equation:

$$\Delta OP = \Delta D^{\$} + \Delta L^{\$}_{FB} - \Delta CD^{\$} - \Delta L^{\$}_{BV} \qquad (8)$$

If $\Delta OP>0$, resulting in a shift towards a long forint position, commercial banks enter the market with a demand for forint funds, while in the opposite case they appear as suppliers of forint funds, resulting in a shift towards a long foreign exchange position.

Table I shows changes in commercial banks' balance sheet items as expressed by equation (8). Taking into account the value of financial derivatives, commercial banks' total open position can be calculated as the sum of their on-balance sheet open position and net foreign currency claims from financial derivatives.

Table I

Changes in commercial banks' open positions (1998, 1999 and 2000 H1)

millions

	Variables	1998	1999	2000 H1
I Assets (1+2)		**740**	**–249**	**274**
1 Claims on NBH	$\Delta CD^{\$}$	404	–818	–427
2 Foreign currency lending to enterprises	$\Delta L^{\$}_{BV}$	336	568	701
II Liabilities (3+4+5)		**–152**	**–532**	**471**
3 Net foreign liabilities	ΔL_{FB}	311	299	715
4 Corporate and household sector foreign currency deposit	$\Delta D^{\$}$	18	–47	–9
5 Net other liabilities		–481	–784	–235
III On-balance sheet open position (long forint: II– I)	ΔOP	**–892**	**–283**	**197**
6 Net foreign currency claims from derivatives		781	231	–128
IV Total open position (long forint: III+6)		**–111**	**–52**	**69**

3.3.2 Changes in the central bank's foreign exchange position

Conversion is a broader category than intervention

The total amount of foreign currency converted by the central bank into forint is called conversion. This includes the net forint demand of both the private and the general government sectors. Here, the forint demand of the private sector is exactly equal to the value of foreign exchange market intervention. Forint demand of the general government sector is comprised of the items of the current and capital accounts and a few other items linked to general government (CA_G+KA_G), foreign currency revenues from privatisation (Pv_F) and net foreign currency borrowings of the general government sector. Later, privatisation revenue is divided into two categories, such that can be categorised into foreign direct investments and such that can be classified into foreign currency proceeds from privatisation ($Pv_F = Pv_{FFDI} + Pv_{FE}$).[13] Net foreign currency borrowings also include foreign currency borrowing transactions between general government and the NBH. In practice, this item is primarily the balance of foreign currency borrowings of the central government abroad (ΔL_{FK}) and repayments of foreign currency lending to the NBH (ΔL_{JK}). Thus, using the earlier variables, the items comprising conversion are the following:

$$conversion = Int + CA_G + KA_G + Pv_F + \Delta L_{FK} + \Delta L^{\$}_{JK}$$

However, conversion is also recorded in the central bank's balance sheet and is equal to the change in the central banks' net foreign exchange assets after elimination of the effects of movements in exchange rates. *Table J* contains the major foreign currency-denominated items of the central bank balance sheet.

On the basis of the central bank balance sheet, the major items of the change in net foreign exchange assets are the increase in in-

Table J

Schematic balance sheet of the central bank's foreign currency assets and liabilities

Asset		Liability	
Res	International reserves	Foreign currency deposits of commercial banks	$CD^{\$}$
$L^{\$}_{JK}$	Net foreign currency lending to central government[14]	Foreign borrowings of central bank	$L_{F,J}$

[13] The balance-of-payments categorisation depends on whether the given non-resident investor has acquired a stake of more than 10 per cent in the company in question. Acquisitions of more than 10 per cent in companies are recorded on the foreign direct investment row of the table.

[14] This item includes the special foreign currency deposit of the central government with the NBH.

ternational reserves, the increase in foreign currency lending to the central government, the decrease in commercial banks' foreign currency deposits, and the decrease in the central bank's foreign currency borrowings. Conversion can be broken down into the following items based on the central bank balance sheet:

$$conversion = \Delta Res - \Delta CD^{\$} - \Delta L_{FJ} + \Delta L^{\$}_{JK}$$

Table K

Relationship between foreign exchange market intervention and the central bank balance sheet

millions

	Variables	1998	1999	2000
I Net foreign assets of NBH (1–2)		**1,160**	**3,898**	**930**
1 International reserves	ΔRes	760	2,241	123
2 Foreign lending	ΔL_{FJ}	–400	–1,657	–807
II Foreign borrowing by central government	ΔL_{FK}	*–119*	*2,274*	*223*
III Foreign current and capital items of consolidated general government	CA_G+KA_G	*–531*	*–300*	*–164*
IV Foreign currency revenue from privatisation	Pv_F	*158*	*351*	*8*
V Foreign currency deposits of commercial banks with NBH	$\Delta CD^{\$}$	*404*	*–818*	*–427*
VI Other		*318*	*–534*	*–250*
VII Foreign exchange market intervention (I–II–III–IV–V–VI)	*Int*	**929**	**2,806**	**1,540**

The right sides of the latter two equations must be equal, as both determine the individual conversion items in the foreign exchange market. Taking this parity as a basis, we obtain the following relationship *(Table K)*:

$$\Delta Res - \Delta L_{FJ} - \Delta CD^{\$} = Int + CA_G + KA_G + Pv_F + \Delta L_{FK} \qquad (9)$$

3.3.3 Components of foreign exchange market intervention

From equations (1), (8) and (9) above, foreign exchange market intervention items can be determined. Introducing the variable $\Delta L_{FG} = \Delta L_{FJ} + \Delta L_{FK}$ we can aggregate the foreign borrowings of the central bank and general government into the expression, ΔL_{FG}, which represents consolidated general government foreign borrowings. Equation (9) can now be expressed in the following formula:

$$\Delta Res = Int + CA_G + KA_G + Pv_F + \Delta L_{FG} + \Delta CD^{\$}$$

Let us substitute the above expression for the change in international reserves in equation (1) of the balance of payments, which renders the following:

$$Int = CA_P + KA_P + (FDI - Pv_{FFDI}) + \Delta B_F + (\Delta E_F - Pv_{FE}) + \Delta L_{FV} + \Delta L_{FB} - \Delta CD^{\$} \qquad (10)$$

When substituting, foreign borrowings of the central government and foreign currency revenue from privatisation are eliminated. The variable $CA_P = CA - CA_G$ represents the balance of private sector current items, $KA_P = KA - KA_G$ showing the balance of private sector capital items.

Forint demand, arising in connection with the conversion of inward foreign currency flows, can be labelled as an 'exogenous factor' of foreign exchange market intervention. We can primarily identify this with the items of the balance of payments which have arisen as a result of private sector transactions. Independently of foreign economic relations, the change in commercial banks' foreign currency deposits with the central bank can be labelled as an 'endogenous factor'. The components, in accordance with equation (10), are shown in *Table L*.

Table L

Components of foreign exchange market intervention

1 Exogenous factor	(Variables)
Balance of payments components affecting intervention	
I Current account of the private sector	CA_P
II Capital account of the private sector	KA_P
III Financial account	
Foreign direct investment	$FDI - Pv_{FFDI}$
Portfolio investments	
a) Government paper	ΔB_F
b) Shares (net of privatisation revenue)	$\Delta E_F - Pv_{FE}$
Change in outstanding borrowing	
a) Foreign borrowings of the corporate sector	ΔL_{FV}
b) Foreign borrowings of commercial banks	ΔF_{FB}
2 Endogenous factor	
Change in commercial banks; foreign currency deposits with central bank	$-CD^{\$}$

This breakdown of foreign exchange market intervention can be further refined with the measure of foreign borrowing, which, in

turn, can be determined from commercial banks' balance sheet. This, using equation (8), can be stated as follows:

$$\Delta L_{FB} - \Delta CD^{\$} = \Delta L^{\$}_{BV} + \Delta OP - \Delta D^{\$} \qquad (11)$$

Now, substituting this in equation (10), we find that foreign exchange market intervention can be disaggregated into the following components:

$$Int = CA_P + KA_P + (FDI - Pv_{FFDI}) + \Delta B_F + (\Delta E_F - Pv_{FE}) + \Delta OP - \Delta D^{\$} + \\ + \Delta L_{FV} + \Delta L^{\$}_{BV} \qquad (12)$$

Forint demand arising in intervention can be broken down into the following components *(see Table M)*:

- current and capital items of the private sector (CA_P and KA_P);
- foreign direct investment (net of privatisation revenue) ($FDI\text{-}Pv_{FFDI}$);

Table M

Components of foreign exchange market intervention (1998, 1999, 2000 H1)

millions

	Variables	1998	1999	2000 H1
Foreign exchange market intervention (I+...+IX)	*Int.*	**929**	**2,806**	**1,540**
I Balance of private sector current items (1+2)	CA_P	*–1,444*	*–1,577*	*–677*
1 Current account balance	CA	–2,020	–1,970	–860
2 Current items of general	$-CA_G$	577	394	183
II Foreign direct investment	$FDI–Pv_{FFDI}$	*1,387*	*1,612*	*906*
III Banks' conversion effect[15]	ΔOP	*–111*	*–52*	*69*
IV Effect of derivatives		*–781*	*–231*	*128*
V Conversion effect of domestic foreign currency deposits	$-\Delta D^{\$}$	*–18*	*47*	*9*
VI Net portfolio investments (1+2)		*1,125*	*972*	*294*
1 Government paper	ΔB_F	795	601	583
2 Shares	$\Delta E_F - Pv_{FE}$	330	371	–289
VII Corporate sector foreign currency borrowings (1+2)		*484*	*897*	*316*
1 Domestic	$\Delta L^{\$}_{BV}$	336	568	701
2 Abroad	ΔL_{FV}	148	329	–385
VIII Capital account of private sector	KA_P	*124*	*–63*	*65*
IX Other		*163*	*1,199*	*431*

[15] The forint demand generated by commercial banks can be defined as the sum of two components; we, however, have aggregated these two items into changes in on-balance sheet positions, for the sake of simplicity. These two components are of commercial banks' conversion effect, which denotes the change in overall positions, and the change in outstanding derivative transactions.

– portfolio investments (government securities ΔB_F and shares $\Delta E_F - Pv_F$);
– the change in commercial banks' on-balance sheet open position (ΔOP); and
– forint demand arising from changes in foreign currency deposits and loans ($\Delta L^S - \Delta D^S$).

Isolation of interest-sensitive components of intervention

Whereas the short, interest-sensitive components of intervention are volatile, ...

Some intervention items are influenced by the annual cycles of economic activity and production, i.e. mainly by real economic factors. However, in respect of certain items we can assume that yield considerations underlie changes in stocks. These latter components of foreign exchange market intervention are known as interest-sensitive items. The following are categorised into this group:

– the change in non-resident holdings of government securities (with a positive sign);
– the change in commercial banks' on-balance sheet open position (with a positive sign);
– the change in corporate and household sector foreign currency deposits (with a negative sign); and
– the change in corporate sector foreign currency borrowings in Hungary and abroad (with a positive sign).

The interest-sensitive component can be further disaggregated according to maturity. On this basis, we can distinguish between short and long interest-sensitive components. The short interest-sensitive component includes

– the change in commercial banks' on-balance sheet open position;
– the change in non-resident holdings of short-term government securities; and
– the change due to transactions in short-term foreign currency loans and deposits.

Accordingly, the long-term interest-sensitive component includes

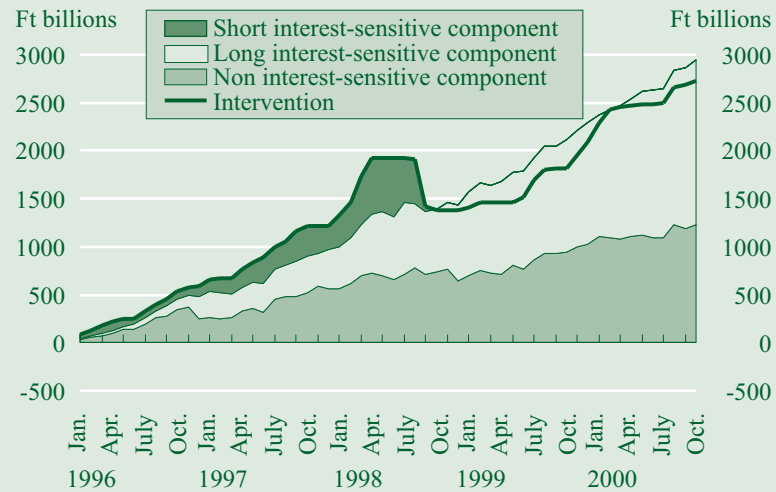
– the change in non-resident holdings of long-term government securities; and
– the change due to transactions in long-term foreign currency loans and deposits.

... the long or non-interest-sensitive components are more stable and are easy to forecast

Chart 1 plots the short and long items of the interest-sensitive component, complemented with the value of the non-interest-sensitive component for the period January 1996–July 2000. In addition to the stable upward trend in non-interest-sensitive items, it is clear that the long interest-sensitive component is also stable, with an upward trend. The variability of intervention, as plotted by Chart 1, is mainly attributable to the volatility of the short component –

Chart 1

Components of foreign exchange market intervention



Cumulative values: December 1995 = 0

large increases and decreases in intervention are accompanied by similar movements in the short component.

The major reason for choosing a breakdown by maturity is that the short and long components react rather differently to changes in the macroeconomic environment. As Chart 1 illustrates, during the Russian financial crisis it was mostly the constituents of the short component that fell, in contrast with the long component, which, following a brief pause, resumed its upward course. The varying degrees of past volatility clearly underline the need to separate the short interest-sensitive component from the long one. The major difference between the short and long components (in terms of behaviour), which justifies the inclusion of on-balance sheet positions as well, is their *predictability*. Movements in the short component are mainly influenced by short-term exchange rate and yield considerations, as well as by developments in the international capital markets. This item, therefore, is less predictable over the short run. The path of the long component, in contrast, is rather stable: it is influenced by the structural factors of economic transition and is less sensitive to short-term fluctuations in yields.

When predicting the items of foreign capital inflow, the characteristics of the short and long components, as presented above, are taken into account. Nevertheless, this does not mean that the forecast of the short components is produced by assuming the volatility experienced in the past. This is because it is difficult to predict exactly when the short interest-sensitive items of foreign currency in-

flow will be replaced by an outflow, and vice versa. Hence, when constructing the monetary programme, an average monthly inflow of short-term foreign currency is assumed, with due consideration of the outlook on international capital markets for the given period, which is complemented only with occasional seasonal effects. This method produces the smallest forecast error in the expected value.

3.4 Flow of funds: consistency at the level of instruments

Establishing equilibrium in the market of various assets

The next step in constructing the monetary programme is to forecast movements in forint assets. Consistency requirements derived from the assumption that the major financial and credit aggregates are balanced play a distinct role in this respect. In addition, the forecast of the increase in the aggregates must be brought into harmony with their past behaviour and the expected economic flows.

When forecasting the banking sector's balance sheet, a comparison of the deposit and credit balances, which may not show substantial differences, can provide further support. Any differences, however, must be reflected in foreign borrowings of the banking sector. The 'other' item in the banking sector's balance sheet is the difference between total assets and liabilities, and must also be consistent with economic events. Changes in this item may be linked with the profitability of banks. The sum of net financing capacities of non-residents, households, general government and non-financial corporations will determine net financing capacity of financial corporations. This is expected to change similarly to the 'other' item in the banking sector's balance sheet showing banks' profitability.

Thus, there are two important cross-checking points when constructing the aggregate balance sheet of the central bank and the banking sector – the first one is the flow-of-funds matrix, which is used to forecast changes in the financial and credit aggregates, and the second one is the relationship between the profitability of credit institutions, the financing capacity of the financial corporations sector and the other items of the aggregate balance sheet. This latter relationship is not as explicit as the flow of funds which ensures the balance of demand for and supply of the individual instruments. Taking into view all these considerations, based on the forecasts of the individual assets, we now can assemble the aggregate balance sheet of the central bank and the banking sector, which, in turn, will produce the projections of the major financial aggregates.

4| Forecasting monetary aggregates

Using the forecasts of the individual financial assets obtained earlier, both the central bank's and the banking sector's aggregate balance sheet can now be compiled. In the following sub-sections, we provide a description of the balance sheet formats (using the earlier variables to refer to the major items) which can be regarded as the key outputs of the monetary programme.

When forecasting the stocks, operational flows are complemented with seasonal factors and compensation for inflation

It is important to stress that, unlike earlier, the balance sheets which can be regarded as the outputs of the monetary programme contain stocks rather than figures adjusted for the effects of movements in exchange rates, volume changes and compensation for inflation. So, having rendered the operational flows consistent with the income-side data, the process described earlier which will ultimately lead to the operational figures must be applied in reverse, in order to produce the output of the monetary programme. In other words, the figures produced during the estimation are put on a current price basis, seasonal factors are applied and the whole is modified according to the inflation-compensation factor. As regards foreign currency-denominated items, their future values are forecast on the basis of the projected path of the forint exchange rate.

4.1 Consolidated balance sheet of the banking sector

Using the forecast of financial assets, the aggregate balance sheet of the banking sector can now be assembled *(see Table N)*.

Table N

Aggregate balance sheet of the banking sector (NBH and credit institutions)

Asset		Liability	
$L^{Ft}_{BH} + L^{Ft}_{BV}$	Forint lending	Cash	$KP_H + KP_V$
$L^{\$}_{BV}$	Foreign currency lending	Forint deposits	$D^{Ft}_V + D^{Ft}_H$
$L^{Ft}_{JK} + L^{\$}_{JK} + B_B - KESZ$	Net borrowings of central government	Foreign currency deposits	$D^{\$}_V + D^{\$}_H$
		Net foreign liabilities	$L_{FJ} + L_{FB} - Res$

The sum of the first three items on the banking sector's balance sheet gives the value of the monetary aggregate M3. Adding to this the banking sector's net foreign position, we can now produce the total values of outstanding lending by the banking sector *(see Table O)*.

Table O

Changes in the consolidated balance sheet of the banking sector

HUF billions

	Variables	1998	1999	2000 H1
1 Domestic lending (a+b+c+d)		**6,342**	**5,987**	**6,307**
a) Central government, total		*3,860*	*2,968*	*2,876*
Central government, net (forint)	$L^{Ft}_{JK} + B_B - KESZ$	1,742	1,431	1,439
Foreign currency lending	$L^{\$}_{JK}$	2,118	1,537	1,437
b) Corporate sector, total	$L^{Ft}_{BV} + L^{\$}_{BV}$	*2,021*	*2,410*	*2,738*
c) Household sector	L^{Ft}_{BH}	*361*	*475*	*553*
d) Other lending		*101*	*134*	*139*
2 Other assets, net		**–569**	**–541**	**–651**
Net domestic lending (1+2)		**5,773**	**5,447**	**5,656**
3 Net foreign liabilities	$L_{FJ} + L_{FB} - Res$	**1,002**	**85**	**35**
4 Broad money (M3) (a+b+c+d)		**4,620**	**5,362**	**5,423**
a) Currency held outside banks	$KP_H + KP_V$	*667*	*842*	*810*
b) Corporate deposits		*1,121*	*1,318*	*1,349*
Forint deposits	D^{Ft}_V	890	1,083	1,106
Foreign currency deposits	$D^{\$}_V$	231	235	243
c) Household deposits		*2,604*	*2,939*	*3,028*
Forint deposits	D^{Ft}_H	1,988	2,290	2,354
Foreign currency deposits	$D^{\$}_H$	616	648	673
d) Other deposits		*228*	*259*	*435*

4.2 Balance sheet of the central bank

Table P

Balance sheet of the central bank

Asset		Liability	
L_{JB}	Refinancing loans	Monetary base	$KP + RR$
Res	International reserves	Outstanding sterilisation instruments	CD^{Ft}
L^{Ft}_{JK}	Forint lending to central government	Foreign currency deposit of commercial banks	$CD^{\$}$
$L^{\$}_{JK}$	Net foreign currency lending to central government	Forint deposits of central government	$KESZ$
		Foreign borrowings of central bank	L_{FJ}
		Other liabilities (financial results)	Π

When estimating the central bank's balance sheet, we produce a forecast of the value of the monetary base by taking the required reserve ratio, the money stock M3 taken from the aggregate balance sheet and credit institutions' foreign liabilities *(see Table P)*. We have already produced a forecast of the foreign exchange items of the balance sheet, when the components of intervention were determined. The items of the central government (Treasury Account, foreign currency borrowing) are projected using the forecasts of the general government borrowing requirement and the issuing programme. Now, the only unknown item of the balance sheet remains the outstanding value of sterilisation instruments. This latter is part of ample supply of fresh liquidity flowing out during intervention which remains with the banking sector after banks have allocated their required reserves. This structural liquidity surplus will appear as part of the outstanding stock of sterilisation instruments on the central bank's balance sheet. Consequently, sterilisation instruments are an item of the central bank's balance sheet which is determined on the principle of residuals. *Table Q* presents the changes in the central bank's balance sheet.

Table Q

Changes in the central bank balance sheet (1998, 1999, 2000 H1)

HUF billions

	Variables	1998	1999	2000 H1
1 Net foreign currency assets	$Res + L^{\$}_{JK} - CD^{\$} - L_{FJ}$	*164*	*59*	*–169*
2 Net forint assets	$L_{JB} + L^{Ft}_{JK} - CD^{Ft} - KESZ$	*997*	*1,380*	*1,590*
Monetary base (1+2=A+B+C+D)	$KP + RR$	**1,161**	**1,439**	**1,421**
A Central government, net	$L^{Ft}_{JK} + L^{\$}_{JK} - KESZ$	*2,754*	*1,924*	*1,757*
B Banking sector, net	$L_{JB} - CD^{Ft} - CD^{\$}$	*–660*	*–1,038*	*–961*
C Non-residents, net	$Res - L_{FJ}$	*–507*	*504*	*737*
D Other assets, net		*–427*	*48*	*–112*

4.3 Rolling liquidity programme

Rolling liquidity programme: forecasting outstanding value of sterilisation instruments and the factors influencing them

The rolling liquidity programme is a survey of items that determine the changes in the value of sterilisation instruments on the central bank's balance sheet. Whereas the forecast of the central bank balance sheet refers to the outstanding stock on the last day of the individual quarters, the liquidity programme presents the monthly average stocks and the impact of the individual factors on the monthly average outstanding stock of sterilisation instruments.

The correlations of changes in the outstanding stocks of sterilisation instruments can be obtained mainly from the major items of the central bank balance sheet. Using the central bank balance sheet in Table P, we can now express the change in the value of outstanding sterilisation instruments. Accordingly, this change takes the following form:

$$\Delta CD^{Ft} = \Delta \mathrm{Re}s - \Delta L_{FJ} - \Delta CD^{\$} + \Delta L_{JB} - (\Delta KESZ - \Delta L_{JK}) - \Delta MB - \Delta \Pi$$

The first three elements on the left-hand side of the equation are equal to the measure of foreign exchange market intervention, so using equation (9) we can now express the change in the sterilisation instrument in the following form:

$$\begin{aligned} \Delta CD^{\$} &= Int - [\Delta KESZ - \Delta L_{JK} - CA_K - KA_K - Pv_F - \Delta L_{FK}] \\ &+ \Delta L_{JB} - \Delta MB - (\Delta \Pi - CA_J - KA_J) \end{aligned} \qquad (13)$$

Thus, the change in the sterilisation instrument can be expressed using not only the items of the central bank balance sheet, but also on the basis of certain flow variables, such as intervention and interest payments. According to the above expression, the outstanding stock of sterilisation instruments is increased by

- foreign exchange market intervention; and
- the increase in outstanding refinancing loans;

While the outstanding stock of sterilisation instruments is decreased by

- the increase in the monetary base;
- the increase in the balance on the Treasury Account, which, however, must be adjusted for items causing changes in the balance on the Treasury Account but leaving liquidity wholly unaffected (supply of foreign currency by general government and profit transfer by the NBH to the central government); and
- the financial results of the central bank earned on forint transactions, which essentially is equal to interest remunerated on net forint liabilities to commercial banks.

Quantifying the impact on the monthly average stock of sterilisation instruments

The importance of the rolling liquidity programme *(see Appendix 4)* lies in part in the fact that, within the methodological framework defined above, developments in the sterilisation instrument can be expressed using a few well-defined variables. What is more important, however, is that, as reserve requirements apply on average over a month, the measure of the monetary base can be forecast for the average of one month and not for the last day of a month. Therefore, it is useful to calculate the averages of the other factors of the rolling liquidity programme as well, and their effect on the

banking sector's average liquidity. When taking into account the averages, the exact timing of the various events becomes an important factor – those factors which normally arise at the end of the month and affect interbank liquidity, such as a maturing NBH bills, for example, tend to have a significantly lower impact on the *average* liquidity of the given period than *daily* liquidity. As a consequence of averaging, when using equation (13) it is the flow values arising from the monthly average stocks that must be taken into account, rather than those calculated from changes in stocks. Owing to these factors, the outputs of the rolling liquidity programme and the figures in the other tables of the monetary programme are not directly comparable.

The rolling liquidity programme is the only output table of the monetary programme which is regularly updated between two monetary programmes. The reasons for taking this approach are that developments in the banking sector's liquidity require constant monitoring and that, due to the uncertainty of the short-term forecast of foreign exchange market intervention, the value of outstanding sterilisation instruments may at times differ from the projected value. The rolling liquidity programme is updated weekly, based on the actual data on foreign exchange market intervention and the daily forecast of the Treasury Account balance.

Appendices

Appendix 1

Flow-of-funds matrix

Financial assets	House-holds	Corporate sector			General government		Non-residents
		Non-financial corporations	Credit institutions	Financial, other than credit institutions	Central government	Central bank	
1. Cash	ΔKP_H	ΔKP_V	ΔKP_B			$-\Delta KP$	
2. Required reserves			ΔRR			$-\Delta RR$	
Monetary base = 1+2							
3. Sight deposits	ΔDR_H^{Ft}	ΔDR_V^{Ft}	$-\Delta DR^{Ft}$	ΔDR_R^{Ft}			
M1 = 1+3							
4. Time deposits	ΔDH_H^{Ft}	ΔDH_V^{Ft}	$-\Delta DH^{Ft}$	ΔDH_R^{Ft}			
5. Foreign currency deposits	$\Delta D_H^{\$}$	$\Delta D_V^{\$}$	$\Delta D^{\$}$				
M3 = 1+3+4+5							
a) Non-monetary government paper	ΔB_H	ΔB_V		ΔB_R			
b) NBH bills		ΔCD_V^{Ft}		ΔCD_R^{Ft}			
M4 = 1+3+4+5+a+b							
c) Monetary government paper + government paper held by non-residents			ΔB_B				ΔB_F
6. *Total government securities issued = a+b+c*	ΔB_H	ΔB_V	ΔB_B	ΔB_R	$-\Delta B$		ΔB_F
7. Claims on financial corporations other credit institutions	ΔM_F			$-\Delta M_F$			
8. Shares and ownership interests	ΔE_H	$-I_V+\Delta E_V$	$-I_B$	ΔE_R	$-Pv=\Delta E_K$		ΔE_F
9. Forint loans	$-L_{BH}$	ΔL_{BV}^{Ft}	ΔL^{Ft}	$-\Delta L_{BR}$			
10. Foreign currency loans		$\Delta L_{BV}^{\$}$	$\Delta L^{\$}$				
11. Net foreign borrowing		$-\Delta L_{FV}-FDI$	$-\Delta L_{FB}$		$-\Delta L_{FK}$	$\Delta RES-\Delta L_{FJ}$	$FDI+\Delta L_F-\Delta RES$
12. Sterilisation instruments – refinancing loans			$\Delta CD_B^{Ft}-\Delta L_{JB}$			$\Delta L_{JB}-\Delta CD^{Ft}$	
13. Foreign currency deposits of commercial banks			$\Delta CD^{\$}$			$-\Delta CD^{\$}$	
14. Forint deposits – forint borrowing of central government					$\Delta KESZ$ $-\Delta L_{JK}^{Ft}$	$\Delta L_{JK}^{Ft}-$ $\Delta KESZ$	
15. Net foreign currency borrowings of central government					$-\Delta L_{JK}^{\$}$	$\Delta L_{JK}^{\$}$	
Financing capacity (I+...+15)	NFK_H		NFK_V			NFK_G	$-CA-KA$

Appendix 2

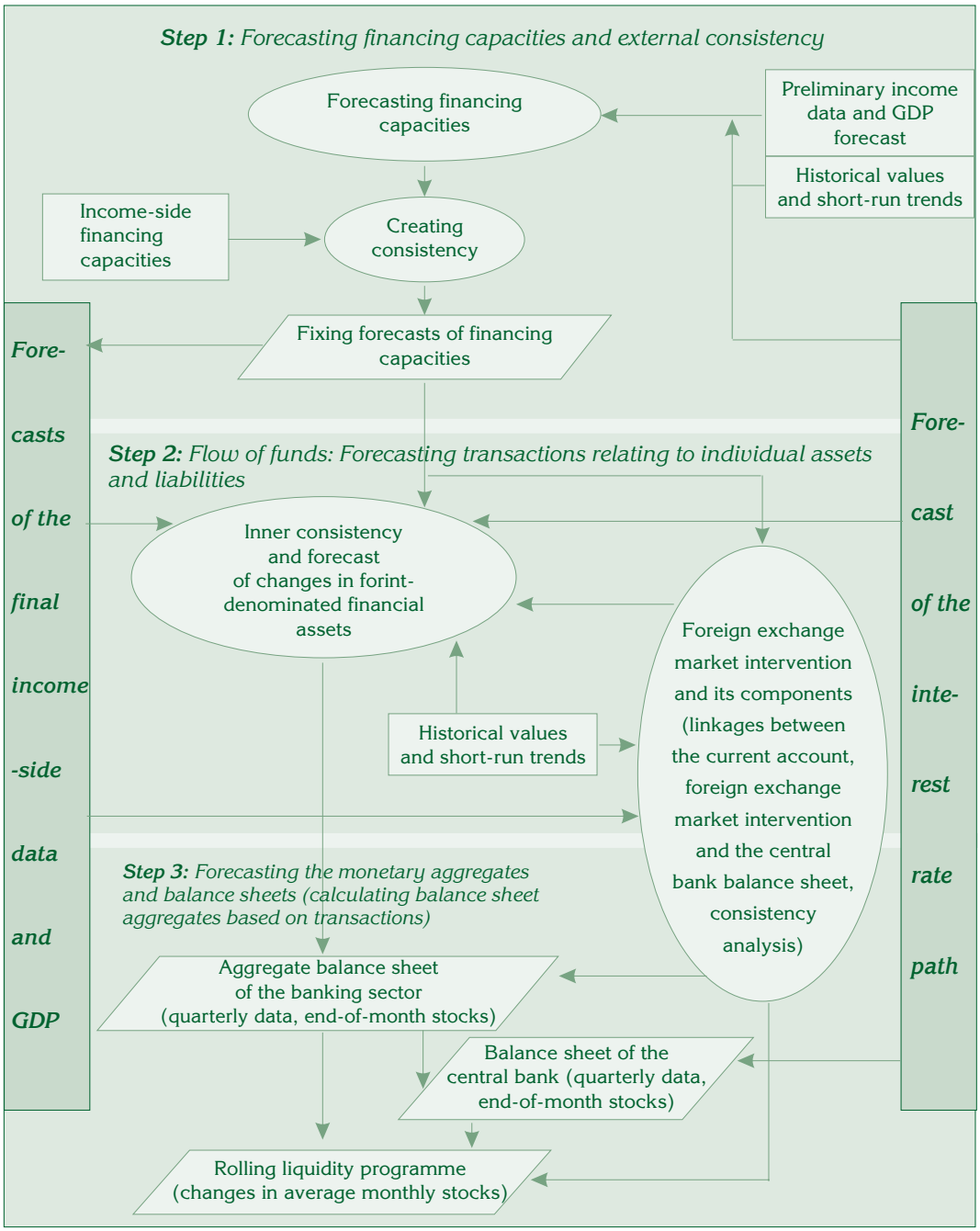
Flow-of-funds matrix based on 1999 values

HUF billions

	House-holds	Corporate sector			General government		Non-residents
		Non-financial corporations	Credit institutions	Financial, other than credit institutions	Central government	Central bank	
1 Cash	162	18	41			–220	
2 Required reserves			99			–99	
Monetary base = 1+2	***162***	***18***	***140***			***–319***	
3 Sight deposits	76	49	–133		8		
M1 = 1+3	***237***	***67***	***–92***		***8***	***–220***	
4 Time deposits	196	144	–340	7	–6		
5 Foreign currency deposits	–5	–5	9				
M3 = 1+3+4+5	***428***	***206***	***–423***	***7***	***3***	***–220***	
a) Government securities outside the banking sector	167	67		369	–603		
b) NBH bills	–9	–59	–121	–66	–15	269	
M4 = 1+3+4+5+a+b	***587***	***214***	***–544***	***310***	***–616***	***49***	
c) Government securities held by banks			–109		85	24	
d) Government securities held by non-residents					–152		152
6 Total government securities issued=a+c+d	***167***	***67***	***–109***	***369***	***–670***	***24***	***152***
7 Claims on financial corporations other than credit institutions	288			–288			
8 Shares and ownership interests	–124	–73	46	97	–185		240
9 Forint-denominated loans	–116	–227	370	–27			
10 Foreign currency loans		–145	145				
11 Net foreign borrowing		–378	–130		–573	983	98
12 Sterilisation instruments – refinancing loans			361			–361	
13 Foreign currency deposits of commercial banks			–212			212	
14 Forint deposits/borrowings of central government					200	–200	
15 Net foreign currency borrowings of central government					626	–626	
Financing capacity (1+...+15)	***635***	***–608***	***26***	***92***	***–615***	***–18***	***490***
Financing capacity (in % of GDP)	***5.5***	***–5.3***	***0.2***	***0.8***	***–5.4***	***–0.2***	***4.3***

Appendix 3

Stages of constructing the monetary programme*



* Oblongs indicate inputs, ellipses work flows and prallelograms outputs.

Appendix 4

Rolling liquidity programme

HUF billions

	1999											
	Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1 Changes in monetary base	–48.7	–8.8	20.0	14.8	29.8	20.5	27.7	13.0	7.0	25.2	7.9	98.3
2 Expected changes in the average balance of Treasury Account	3.7	10.8	–19.0	15.9	9.2	11.4	46.2	–10.3	50.3	23.0	8.9	–22.4
3 Effect of changes in the stock of NBH bills	27.2	42.9	85.9	33.4	44.4	21.0	49.0	15.3	16.3	0.0	0.0	0.0
4 Expected changes in the settlement account of ÁPV Rt	–15.9	2.2	–0.9	–5.3	0.5	49.5	8.9	–6.9	–5.5	8.1	1.0	–10.0
5 Net effect of changes in O/N deposits, repos and swaps	–47.6	37.3	0.3	–3.6	–4.5	–3.2	1.1	20.8	–21.9	–1.8	10.8	36.2
6 Net effect of changes in foreign currency from the central government	0.0	0.0	0.0	0.0	0.0	35.9	27.5	0.0	0.0	0.0	0.0	0.0
7 Effect of changes in refinancing loans	–6.4	0.0	–8.2	–14.0	0.0	0.0	–2.5	0.0	–0.1	–2.4	0.0	–0.1
8 Changes in Treasury Account balance due to transactions between central bank and government unaffecting interbank liquidity*	44.3	31.2	56.4	41.4	11.6	11.4	22.1	28.2	9.5	42.8	11.4	11.7
9 Net interest payments to commercial banks	5.7	7.1	7.6	8.8	6.7	6.9	7.2	8.1	9.7	9.5	8.6	9.6
10 Effect of intervention	–10.5	–61.9	–5.7	0.0	–4.0	–36.3	–126.3	–148.9	–50.7	–0.5	–59.7	–106.8
11 Others	12.0	13.9	–6.3	–2.1	–2.0	7.5	17.8	3.1	8.4	–10.3	–42.6	–11.5
Changes in the monthly average stock of sterilisation instruments (–1–2+3–4–5+6+7–8+9–10 +11)	**89.2**	**25.3**	**40.5**	**–33.0**	**10.7**	**2.9**	**83.7**	124.5	**28.7**	–79.4	**71.0**	**14.2**
Average stock of sterilisation instruments	**215.2**	**240.5**	**281.0**	**248.0**	**258.7**	**261.7**	**345.4**	**469.9**	**498.6**	**419.2**	**490.2**	**504.4**
Memos:												
Expected stock of the monetary base	*1,160.8*	*1,152.0*	*1,172.0*	*1,186.8*	*1,216.6*	*1,237.1*	*1,264.8*	*1,277.9*	*1,284.9*	*1,310.1*	*1,318.0*	*1,416.3*
Expected monthly average stock of cash outside the banking system	*657.8*	*653.9*	*663.8*	*673.2*	*695.4*	*714.2*	*727.6*	*739.5*	*739.5*	*746.9*	*761.0*	*845.0*
Expected stock of required reserves	*503.0*	*498.1*	*508.2*	*513.6*	*521.2*	*522.9*	*537.2*	*538.4*	*545.4*	*563.2*	*557.0*	*571.3*
Expected monthly average balance on Treasury Account	*53.3*	*64.1*	*45.0*	*60.9*	*70.1*	81.5	*127.7*	*117.3*	*167.7*	*190.7*	*199.6*	*177.1*
Expected monthly average balance on the settlement account of ÁPV Rt	*64.4*	*66.5*	*65.7*	*60.4*	*60.9*	*110.4*	*119.3*	*112.4*	*106.9*	*115.0*	*116.0*	*105.9*
Expected monthly average stock of NBH bills	*262.4*	*226.1*	*153.6*	*125.4*	*87.4*	*69.3*	*27.1*	*14.0*	*0.0*	*0.0*	*0.0*	*0.0*

* Profit transfers, repayments of debt, net interest payments by general government.

Appendix 5

Variables

When denoting the variables, we have attempted to maintain the abbreviations for the English expressions; however, in the case of a few exceptions the Hungarian abbreviations have remained. We have introduced a couple of rules in order to assist in reading the variables, because a description of all variables would be several pages long. The rules are the following:

Subscript text denotes individual sectors, while superscript text denotes whether the asset in question is denominated in forint or foreign currency. We indicate this latter separately only in cases when otherwise it would not be unambiguous. If there is no indication of such relating to a sector, then generally the whole stock is meant. For example, KP_H denotes the measure of cash held by households, and KP denotes the total value of banknotes and coin in circulation. In the case of flows, certain variables have been required to indicate two sectors. For example, ΔL_{FJ} denotes the change in central bank foreign borrowings, and ΔL_{BH} denotes the change in outstanding lending by credit institutions to households.

For sectors which are broken down by sub-sector, the total value characteristic of the given sector can be calculated by aggregating the sub-sectors. For example, NFK_{TV}, denoting total corporate sector financing capacity, is derived as the sum of the three sub-sectors' financing capacities, i.e. $NFK_{TV} = NFK_V+NFK_B+NFK_R$. This principle is valid in general, not only for this indicator.

Abbreviations denoting the individual sectors:

Index	Sector	Relationships valid in aggregations
H	Households	
V	Non-financial corporations	
B	Commercial banks	
R	Other-financial corporations	
TV	Entire corporate sector	*TV=V+B+R*
J	Central bank	
K	Central government	
G	General government (Central government + Central bank)	*G=K+J*
F	Non-residents	
P	Private sector	*P=H+TV*

Stock:

KP	Cash
RR	Commercial banks' reserves held at central bank
CD	Forint and foreign currency deposits with the central bank
DR	Sight deposits
DH	Time deposits
D=DR+DH	Forint and foreign currency deposits with commercial banks
L	Outstanding credit. Subscript denotes *which sector lends to which sector*. For example, denotation $L^{\$}_{JK}$ indicates lending by the central bank to the central government.
B	Holdings of government securities and Treasury bills
E	Shares and equity ownership
MF	Other financial corporations' holdings of investment fund certificates
Res	International reserves
C	Shareholders' equity
OP	Commercial banks' on-balance sheet open positions

Flows:

NFK	Net financing capacity (or borrowing requirement)
Int	Measure of intervention
CA	Current account balance
KA	Capital account balance
FDI	Foreign direct investment
Pv	Privatisation revenue
I	New issues of shares