MONETARY POLICY DURING TRANSFORMATION

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ABSTRACT

The present paper analyses the monetary policy of the Czech Republic (Czechoslovakia) during the transformation. Dynamic behaviour of monetary aggregates, GDP and CPI along with Granger-causality is studied.

The Granger-causality between GDP and monetary variables, taken from advanced market economies, has not been confirmed for the Czech Republic. Having analyzed monthly data we discovered independence between GDP and monetary variables (except GDP Granger-cause M2), feedback (bilateral causality) between price level and M2. This reflects the evolving nature of a transmission mechanism between monetary and real variables on the one hand and the accommodative character of monetary policy on the other.

The institutional changes in the monetary sphere in first years of transformation from a command to a market type economy indicate that a two-tier banking system has been created and that the Central Bank has at its disposal the whole tool kid of advanced market economies.

Having utilised the information contained in both the monetary base and balance sheet of the CNB we calculated ex post multipliers for both narrow and broad money. Money multipliers for 12 months do not exhibit a stable pattern because of different factors reflected in the development of currency-deposit ratio, reserve-deposit ratio and the amount of high-powered money. Both the autonomous factors and monetary policy factors have been mirrored in these figures.

The analysis documents the rapidly evolving nature of the monetary sphere in the Czech Republic and the increasing monetization of the Czech economy.

ABSTRAKT

Studie analyzuje monetární politiku v České republice (Československu) v prvních letech transformace. Na základě porovnání vývoje peněžních agregátů (úzce vymezené peníze, šířeji vymezené peníze) s HDP došli autoři k názoru, že monetární politika v období 2.čtvrtletí 1990-3.čtvrtletí 1993 byla takřka neutrální s podstatnými rozdíly v jednotlivých čtvrtletích.
Na základě měsíčních dat byly zkoumány Granger-Simsovy příčinné souvislosti mezi monetárními proměnnými a GDP, respektive cenovou hladinou. Výsledky testů plně nepotvrdily příčinné vztahy, známé pro vyspělé tržní ekonomiky.

Na základě využití informací obsažených v monetární bázi a bilanční rozvaze ČNB jsme vypočítali peněžní multiplikátory ex post pro úzce i šířeji definované peníze. Peněžní multiplikátory za 12 měsíců nevykazují stabilitu, což je odrazem vývoje poměru oběživa k depositům, reserv k depositům a množství peněz v monetární bázi. Zatímco na úvěrovém trhu převažuje stále necenová alokace, na peněžním trhu plní úrokové míry svoji rovnovážnou úlohu.

Studie dokumentuje prudký vývoj monetární sféry v České republice a vzrůstající monetarizaci české ekonomiky.

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Contents :

Introduction

Chapter 1 Targets and tools of monetary policy

1.1 Quantity equation and intermediate targets
1.2 Monetary aggregates and gross domestic product
1.3 Monetary tools

Chapter 2 Development of monetary aggregates

2.1 Flow of funds equation
2.2 Development of assets and liabilities

Chapter 3 Balance sheet of the CNB and monetary base

3.1 Balance sheet of the CNB
3.2 Two concepts of monetary base
3.3 Monetary approach to the balance of payments
3.4 Money multipliers

Chapter 4 Interest rates

4.1 Credit market
4.2 Money market

Conclusions

Literature

Appendix

A.1 Monetary survey
A.1.1 Table Monetary Survey
A.1.2 Chart Assets
A.1.3 Chart Money & Quasi money

A.2 Balance sheet of the CNB
A.2.1 Table Monthly balance of CNB

A.3 Monetary base
A.3.1 Table Monetary Base
A.3.2 Chart Monetary Base and Money Supply

A.4 Interest rates
A.4.1 Chart Average Credit & Debit rates

A.5 Calendar of monetary policy

Introduction

The goal of this paper is to analyze quantitatively the monetary policy of the former Czechoslovakia, or lately the Czech Republic, with the help of analytical tools taken from advanced market economies.

More concretely, we have in mind the following constructs: the quantity equation and its relation to the quantity theory of money, the relation between monetary and real variables, the impossibility to control both intermediate targets like money or credit growth and interest rate, the well known Granger-Sims causality between GDP and money stock or between money stock and price levels, the role of direct and indirect monetary tools, the flow-of-funds analysis as a special method of combining both assets and liabilities, the use of balance sheets by the Czech National Bank (CNB) as a mirror reflecting the evolution of monetary policy, two concepts of monetary base in the spirit of the Federal Reserve Bank of St.Louis seminal paper , the monetary approach to the balance of payments popularized by the International Monetary Fund, the proximate determinants of the quantity of money and resulting money multipliers and their use in the prediction by the CNB.

In a command economy money did not matter because planning "in natura" was the prevailing approach. Credits were allocated directly following planned figures for branches and enterprises. But even in those times Czechoslovakia was a country with an insignificant monetary overhang, which was a relatively good starting position for accomplishing a prudent macroeconomic policy. One must underline that other post-socialist countries were in a worse starting position. This tradition of prudence in both monetary and fiscal policies was reflected in the new institutional framework after the Velvet Revolution in November 1989.

One must realise that after 4 years we are still beginning to establish all the necessary institutions in the monetary sphere. Ongoing privatization and changing property rights will especially influence the microeconomic behaviour of economic agents which is reflected in macroeconomic aggregates.

1. Targets and tools of monetary policy

1.1. Quantity equation and intermediate targets

The blocking of an inflationary process was declared as the priority of macroeconomic policy during the transition from a command to market economy. Other goals of macro-economic growth, employment and a balanced balance of payments were regarded as subordinate.[1]

The target of both monetary and fiscal policies, designed as restrictive ones, emanated from this priority. A restrictive approach to the monetary sphere became one of the key parts of the macroeconomic stabilization policy.

But what does this restrictive approach concretely mean? How have the targets been planned? Which aggregates play the role of targets? Quotations from our official sources can help to make this problem clear.

The intermediate targets since 1990 have been set in the form of planned changes of credits or money.

For 1990 the target was: "...to keep the development of credits in total within the scope of - 2% to +1% related to the level at the end of 1989".[2]

In 1991 no target was set, only the comparison of a rate of growth of money stock and credit with a rate of growth of nominal Gross Domestic Product (GDP) was used.

For 1992 the monetary program was based on 12 % of inflation rate and zero increase of real GDP.[3]

The target for 1993 was: "...to keep the growth of money stock about 17% and increase credits to enterprises and households by about 11% (this corresponds to the considered growth of national product in 1993)".[4] Further, the balanced state budget and stable nominal exchange rate were relied on.

The starting point of the monetary program of the Czech National Bank (CNB) for 1994 has been the expected growth of GDP (2-3% in real terms) and an inflation rate which should not surpass 10%.[5]

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[1] The scenario /1990/

[2] Government Act /1990/

[3] Czechoslovak banks /1992/.

[4] Banking /1993/, p. 5

[5] Hospodarske noviny /1993/, 21.12.

This approach seems to copy the procedures in advanced market economies. For instance, the German Bundesbank, having announced the principles of monetary policy for 1994, counts on the growth of money supply (4-6%) which takes into account the expected drop of production by about 2,5%, the lowering of inflation rate (2%) and slowing down of the velocity of currency circulation by about 1%.

In Great Britain the aim of monetary policy in the 1980s was: " ...to keep the rate of growth of the effective monetary aggregate broadly in line with inflation".[6]

What was never stated explicitly is the philosophy "behind" the chosen targets. Without a deep reflection upon this theme one can declare that it was the famous equation of exchange. Total monetary expenditures have had to increase proportionally to nominally expressed gross domestic product. Nothing more and nothing less has been required from monetary policy. Monetary policy should serve one goal - preventing high inflation.

As a rule of thumb this reasoning is both understandable and acceptable. But a more profound discussion must draw our attention to several points:

1) There are several versions of the equation of exchange. It can be perceived (in the spirit of J. Fisher) as a simple accounting identity between the total quantity of money in the economy, on the one hand, and the total physical volume of transactions, on the other. If we limit ourselves to income instead of transactions we get the income version of A. Pigou. The difference between the total volume of transactions and transactions counted in national income accounting is important for the economies in transition. A part of the transactions accounts is used for intermediate-good or inter-business expenditures and is not counted in GDP accounts. And it is well known that, especially in deliveries among enterprises, money is sometimes absent and serves not as a medium of exchange but as a unit of account only. Taking into account only nominal GDP is a part of the story, but not the whole story. Some transactions are not registered at all (underground economy, some imports).

[6] A. Griffiths, S. Wall /1991/, p.337.

2) The Cambridge cash balance approach realises that money primarily serves as a medium of exchange (in Czech terminology M1 - currency and demand deposits) and secondary as a temporary abode of purchasing power (in Czech terminology M2 - time and saving deposits and deposits in foreign currency).In this version the nominal quantity of money demanded is proportional to nominal income, and money supply is determined by the banking system. Nominal income is decomposed into a change in real output and a change in the price level. The focus is on the demand for money and volition rather than emphasizing mechanical aspects of the circular flow of money.

3) The traditional unidirectional link from money to income is blurred in advanced market economies by the existence of many forms of financial assets with different degrees of liquidity.In transforming economies the scope for reserve assets (treasury bills) and investment assets (bonds, shares) widens step by step and also weakens the links between money stock and expenditure flows. What is , at least in the Czech Republic, even more important is the financing of running assets through quasi commercial credits (interenterprise indebtedness)[7], which blurs the relation between money and goods in the enterprise sphere. There is a scope, created by enterprises themselves, for offsetting any potential effects of monetary stringency on spending plans. An expanded version of the equation of exchange should therefore take into account not only money in narrow and broader senses, but also different kinds of quasi credits in transforming economies.

4) It is not by chance that the concept of velocity has not been mentioned in the quotations of the representatives of the CNB. It is the constancy, or at least the predictability, of velocity (income, transactions) that changes the equation of exchange into the quantity theory of money. In transforming economies velocity is neither constant nor predictable.

5) Last but not least , one must point out that even in the quantity theory applied in advanced market economies, there is a certain "black box" connecting the quantity of money, on the one hand, and its effect on prices and quantities, on the other. Between a change in monetary aggregates and offsetting changes in other variables, there is a transmission mechanism with its specific features made by the institutional framework in which it operates. To specify this transmission mechanism and to open the "black box" means both to

[7] The enterprise indebtedness has been estimated to be 150bn CK at the beginning of 1994.

describe and to analyze the ways in which money is created and how it influences real variables. These ways change through the evolution of new institutions in transforming economies.

Besides the monetary and credit targets[8] there was a further claim in the Scenario:"Besides its restrictive stance, the monetary policy will earnestly care about a positive real interest rate which is one of the basic preconditions for stabilizing the propensity to save".[9]

Concern for interest rates was proclaimed several times, as the quotations from our press witness. At the beginning of 1994 the Governor of CNB, J. Tošovský said: "We try to influence interest rates indirectly through the regulation of money supply. We observe practically daily the development of liquidity in the banking sphere, the development of interest rates on the inter-bank market (where surprisingly the decrease is more profound than the decrease of interest rates on credits granted to clients), and we can to a certain degree influence the interest rates by adding to or withdrawing from the money supply of the economy".[10]

The CNB can control both money supply and interest rates to a limited degree only. The control of interest rates presupposes the discount policy taking in the proper role. The CNB can directly control short-term interest rates if it is ready to lend unlimited quanties of reserves at any given discount rate. That is, if it wishes to lower short-term interest rates, it must agree to lend unlimited reserves to commercial banks at a discount rate below market rates. This mechanism further presupposes that competition among commercial banks will cause all rates to fall.

The CNB can thus make borrowing from it a profitable source of funds. But, sensu stricto, a discount rate that is set with no restriction on the quality of CNB lending would require the CNB to relinquish its control over the money stock.

J. Tošovský does not go so far, but stresses that the CNB can influence interest rates only to a certain degree. Putting aside the fact that at the

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[8] Sensu stricto, money supply and credit represent two different possible intermediate targets. The first is connected with Milton Friedman, the second with another Friedman, Benjamin. Both approaches have been based on different schools of thinking.

[9] The Scenario /1990/.

[10] EKONOM, 6/1994, p. 14

beginning of the transition in post-socialist economies the net of commercial banks was only being created and that financial markets were in an embryonic phase, the point is that the CNB can not simultaneously[11] set short-term interest rates and the rates of the growth of money supply targets (neglecting at this moment that achieving the interest rate target in nominal terms does not mean achieving a positive real interest rate).

This remark tacitly assumes the use of the IS-LM apparatus for the analysis of transforming economies, which is not so self-evident.

One must stress that the IS-LM apparatus[12] was constructed by Hicks and Hansen for a closed, private economy. In deriving the IS curve one relies on the relationship between interest rate and net investment because the real interest rate is the link between the real and monetary worlds.

Keynesian analysis presupposes the existence of financial assets in many forms. Besides money one can invest in bonds, common stocks, certificates of deposits and so on. In the Czech Republic until now there has been only limited choice in creating portfolio of financial assets but the scope for speculative money demand widens every month.

Traded bonds (and thus influencing the level of real national income) are essential in deriving the LM curve. We must realize that by using the LM curve we postulate an equilibrium between the real demand and the real supply of money in a world where "money does matter" in a limited degree only (e.g. the law on bankruptcy - the necessary tool of any market economy - is still mainly only on paper).

To assume fixed prices (the fixed price level version of the IS-LM model is

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[11] Standard textbook analysis /e.g. E. Dornbusch, S. Fisher/ shows that a money stock target would be more stabilizing than an interest rate target in a world of stable LM and unstable IS curves. On the contrary an interest rate target would be more stabilising than a money stock target in a world of stable IS and unstable LM curves.

In the case of unstable IS curves it is evident that the difference between hitting the desired output level through the money stock target and through an interest rates target depend, ceteris paribus, on the steepness of the IS curves. The steeper IS curves the smaller the difference in achieving the desired output level through both targets.

This configuration could be more relevant for transforming economies during privatization process. The interest elasticity of investment demand /if we can use such a gentle tool of economic analysis in a situation of enormous credit sucking/ seems to be low, therefore IS curves must be steep.

[12] The use of the IS-LM model is an object of a controversy in american literature, but "...despite criticism model survives in use past its fiftieth year", O. Blanchard, S. Fisher /1990/, p. 529.

a standard one) seems to be inappropriate especially at the beginning of the transformation process with once and for all price jumps (the abolition of negative turnover taxes, different kinds of subsidies and tax reform).

At the end of this line of reasoning we add that the mentioned problem of hitting both targets can be demonstrated without utilizing the IS-LM approach at all. We need the assumption of a negatively slopped demand curve (vis a vis the interest rate) and a given money supply curve as a vertical line.

But even these simple assumptions are not without a drop of poison. In the Czech system of a fixed nominal exchange rate the money supply is not entirely endogenous.

Textbook analysis demonstrates that a nation under a fixed nominal exchange rate system can not pursue a monetary policy that is independent from the monetary policies of its main trading partners. For the CNB this means the loss of one degree of liberty in influencing the quantity of high powered money circulation.

The over-determination of intermediate targets in the field of macroeconomic stabilization policy - the intended increase of money stock or of credits, a stable, nominal fixed exchange rate, a balanced state budget, the increase of nominal wages linked to the increase of general price levels, not to mention the problem of positive real interest rates, seems to represent another problem. But only dynamic analysis, describing the main features of our institutional setting, can confirm or refute this suspicion.[13]

[13] This dynamic analysis can, to a certain degree, utilize a methodological approach having been used for macroeconomic stabilization policy in developing countries. For example, S. Edwards presented a simple dynamic model describing the mechanics of indexation, inflationary inertia and nominal exchange rate anchor.

The equations of this model are also suited for describing the Czech institutional and economic setting. The real appreciation of domestic currency due to higher inflation rates in the Czech Republic than in its of the main trading partners open the question of further devaluation in the future. The wage adjustment rule can be deduced from a Tripartite agreement with a stipulated degree of inflationary "memory" of the economy.

S. Edwards /1993/ solved the model for the dynamics of inflation. The first-order difference equation showed the role of certain economic variables /demand and supply elasticities, parameters that measure the degree of indexation , rate of devaluation/ which play the almost same role in the Czech economy.

1.2. Monetary aggregates and gross domestic product

The quantity theory can be viewed as encompassing both a theory of money demand and money supply. The nominal money supply is determined by the behaviour of a banking system while the nominal quantity of money demanded is proportional to nominal income.

According to monetarists the decomposition of a given change in nominal income into a change in the price level and in real output is determined in the short run by inflation forecast errors and in the long run by the natural rate of output.

As the short run may be as long as several years we can limit ourselves to short run considerations and need not worry about the definition of the "natural rate of unemployment or output" in transforming economies.

At the beginning of transformation, the reason for holding money is to facilitate transactions. A positive relationship between economic activity, expressed first of all by a development of GDP and money stock, should therefore be expected (modified by the elasticity of demand).

From what has been said above in this chapter it is evident that the hotly debated problem of the restrictiveness of a monetary policy can be approached by comparing the development of both the monetary variable and GDP.[14]

Three situations can ensue:

a) The monetary variable can in time grow more quickly than GDP, then we speak about expansionary monetary policy.

b) The monetary variable can in time grow pari passu with GDP, then we speak about neutral monetary policy.

c) The monetary variable can in time grow more slowly than GDP, then we speak about restrictive monetary policy.

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[14] A. Bulir, having described the evolution of Czechoslovak monetary policy after 1989, came to the conclusion:"The graphs of M_1 respectively M_2 exhibit long-termed restrictive character of czechoslovak monetary policy. Both monetary aggregates in real terms were in the last quarter of 1992 lower than in December 1989", A. Bulir /1993/, p. 189-190.

The concentration on monetary variables only is of course questionable in spite of their deflation by a chosen deflator.

With the help of this rather crude benchmark one can, having analyzed our development in the period II. quarter 1990 - III. quarter 1993 (see Table 1-1 and graphs on the following page), assert the following:

Table 1-1 GDP and monetary variables[15] (II.quarter 1990 = 100)

	GDP	M2	M1	ΔGDP	ΔM2	ΔM1
II.Q 1990	100,0	100,0	100,0			
III.Q 1990	100,0	98,6	97,1	0	-1,4	-2,9
IV.Q 1990	117,1	100,7	96,0	17,1	2,1	-1,1
I.Q 1991	133,0	99,8	92,3	15,9	-0,9	-3,7
II.Q 1991	127,8	106,8	97,0	-4,2	7,0	4,7
III.Q 1991	128,4	114,5	107,1	0,6	7,7	10,1
IV.Q 1991	131,2	123,3	114,4	2,8	8,8	7,3
I.Q 1992	131,5	128,4	117,0	0,3	5,1	2,6
II.Q 1992	132,4	132,3	118,5	0,9	3,9	1,5
III.Q 1992	145,5	142,1	126,7	13,1	9,8	8,2
IV.Q 1992	150,8	151,6	137,2	5,3	9,5	10,5
I.Q 1993	154,7	147,7	118,7	3,9	-3,9	-18,5
II.Q 1993	162,0	157,3	130,5	7,3	9,6	11,8
III.Q 1993	165,9	165,6	141,5	3,9	8,3	11,0

Source: Calculated from the data of the Czech statistical office and Czech national bank.

[15] GDP calculated on yearly base, M_1 /currency and demand deposits/ M_2 /M_1 plus time and saving deposits plus deposits in foreign currencies/. Absolute data see Appendix, where also real magnitudes /deflator GDP/ are shown.

According to the development of both nominal GDP and M2- the main monetary variable (broad money, liquid liabilities), the monetary policy in the whole period can be labelled as neutral. The increases of GDP in nominal terms and M2 have been practically the same.

According to M1 (narrow money), the monetary policy can be labelled as restrictive, mainly due to currency contraction in some quarters (for further analysis, see Chapters 2 and 3).

These main conclusions are, of course, not valid for the whole period - as the quarterly differences show. The restrictive stance is evident till the end of the 1st quarter of 1991, at the very beginning of transformation process and then again after the creation of the independent Czech Republic in the 1st quarter of 1993.

In some quarters the monetary policy was expansionary, especially for the end of the 1st quarter of 1991 to the end of the second quarter of 1992 and in the second quarter of 1993.

This kind of reasoning presupposes that there is a causality between GDP and monetary variables. Further, this judgement does not take into account the existence of time lags.[16]

Besides the above mentioned results based on quarterly data we carried out an econometric analysis based on monthly data of GDP, M1 and M2 (1990:6 to 1993:6, i.e. 37 observations). The first question to answer was the degree of association between nominal GDP and M1, respectively M2.

[16] M. Friedman, having summarised with his collaborates the results of empirical findings, wrote: "Over short periods, the relation between growth in money and in nominal income is often concealed from the naked eye partly because the relation is less close for short than long periods but mostly because it takes time for changes in monetary growth to affect income, and how long it takes is itself variable. Today's income growth is not closely related to today's monetary growth; it depends on what has been happening to money in the past. What happens to money today affects what is going to happen to income in the future.

For most major Western countries, a change in the rate of monetary growth produces a change in the rate of growth of nominal income about six to nine months later. This is an average that does not hold in every individual case. Sometimes the delay is longer, sometimes shorter. In particular, it tends to be shorter under conditions of higher and highly variable rates of monetary growth and of inflation", M. Friedman /1989/, p.31.

Table 1-2 Correlation coefficients of the given indicators

	M1	M2	time
GDP	0.570	0.683	0.754

The correlation matrix has demonstrated a higher correlation between the trend variable (time) and nominal GDP than between nominal GDP and M1, respectively M2. Thus, we can hardly claim that there is evident relationship among them. The described situation leads to well-known problem of "spurious trends" (see Granger, Newbold (1974)) reported for macroeconomic data. The conventional tests would tend to reject the hypothesis of no relationship when, in fact, there might be none. To analyse the association between nominal GDP and money aggregates, we use a correlation analysis of differences and growths.

Table 1-3 Correlation coefficients of differences

	ΔM1	ΔM2
ΔGDP	0.002	-0.059

Table 1-4 Correlation coefficients of changes of growth

	Δlog(M1)	Δlog(M2)
Δlog(GDP)	-0.016	-0.138

We do not reject the hypothesis of no relationship among differences and growths, respectively.

The so-called Granger causality [18] assumes that the information relevant to the prediction of the respective variables, GDP and M, is contained solely in the time series data on these variables.

We run the Granger causality test based on the model:

$$M(t) = const. + \sum_{j=1}^{L} \alpha_j . M(t-j) + \sum_{j=1}^{L} \beta_j . GDP(t-j) \qquad (1.1)$$

$$GDP(t) = const. + \sum_{j=1}^{L} \alpha_j . GDP(t-j) + \sum_{j=1}^{L} \beta_j . M(t-j) \qquad (1.2)$$

where M denotes M1 and M2, respectively.

We say that Granger-causality runs from GDP to M, if (at least) one of β's in the model (1.1) is different from zero and analogously for the reverse direction.

Theoretically, four cases can be distinguished:

1) Unidirectional causality from M to GDP is indicated if the estimated coefficients on the lagged M are statistically different from zero as a group and the set of estimated coefficients on the lagged GDP is not statistically different from zero.
2) Unidirectional causality from GDP to M exists if the set of lagged M coefficients is not statistically different from zero and the set of the lagged GDP coefficients is statistically different from zero.
3) Feedback, or bilateral causality, is suggested when the sets of M and GDP coefficients are statistically significantly different from zero in both regressions.
4) Independence is suggested when the sets of M and GDP coefficients are not statistically significant in both regressions.

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[18] "Econometric models of the money supply can allow for feedback through the banking system. Under modern systems of inconvertible money, however, the feedback is dominated by monetary policies of the central banks, and attempts to model central bank behaviour have been less than satisfactory. Statistical tests of the erogeneity of the money supply using the Granger-Sims methodology have given mixed results", P. Cagan /1989/, p. 201.

For some up to date empirical results for the U.S. economy see Ch. Huh /1993/. E.g. "Repeated applications of the Granger causality test to simulated data lead to the finding that money causes output more often than expected", p. 147.

We have applied Granger-Sims causality on the above mentioned monthly data of real GDP and real money stock (GDP deflator) with time lags of up to three months.

We have asked following questions:

a) Did the change in M1 (M2) affect GDP? (see Table 1-6)

b) Did the change in GDP affect M1 (M2)? (see Table 1-7)

We have estimated via AR1 (autocorrelated disturbances, Cochrane-Orcutt iterative method) (1.1) and (1.2) and consequently we tested the hypothesis:

H_0: $\beta_1 = ... = \beta_L = 0$.

That is to say we propose that the change in M1 (M2) does not lead to the Granger-type causality with respect to GDP. For testing hypotheses we use the likelihood ratio test. The results are organized in the following Table 1-6 and Table 1-7 .

Table 1-6 Test H_0: $\beta_1 = ... = \beta_L = 0$ for a given number of lags, (1.1).

(change in GDP does not Granger cause a change in M1)

No. of lags (L)	Log of likelihood function	Likelihood ratio	P-value	Durbin's h alternative
1	-112.00	5.56	0.02	1.71
2	-110.10	3.50	0.17	-0.16
3	-110.03	3.17	0.36	-0.27

(change in GDP does not Granger cause a change in M2)

No. of lags (L)	Log of likelihood function	Likelihood ratio	P-value	Durbin's h alternative
1	-127.70	6.89	0.01	0.79
2	-126.90	5.05	0.08	-0.16
3	-126.71	4.03	0.26	0.94

Note that (1.1) applied on M1 produces a very high Durbin's h (test statistic for autocorrelation, having standard normal distribution). Thus the model with one lag is inappropriate. Analysing the column of corresponding P-values we conclude that:

1) We do not reject hypothesis that change of GDP itself does not Granger-cause change of M1 (on 5% significance level).It means we have to accept hypothesis that change of GDP itself does not cause change of M1.

But

2) we reject hypothesis that GDP does not Granger-cause M2 (on 1% significance level).

It is worth running the analogous analysis in the oposite direction to investigate whether GDP follows the path of M1 (M2).

Table 1-7 Test H_0: $\beta_1 = ... = \beta_L = 0$ for a given number of lags, (1.2).

(change in M1 does not Granger cause a change in GDP)

No. of lags (L)	Log of likelihood function	Likelihood ratio	P-value	Durbin's h alternative
1	-116.83	1.63	0.20	-1.82
2	-115.57	2.43	0.30	-4.74
3	-103.28	4.90	0.52	-0.18

(change in M2 does not Granger cause a change in GDP)

No. of lags (L)	Log of likelihood function	Likelihood ratio	P-value	Durbin's h alternative
1	-116.43	2.43	0.12	-1.87
2	-115.18	3.19	0.20	-4.71
3	-102.94	5.59	0.13	0.58

Due to very high Durbin's h for models with one or two lags, we may use models with three lags only. Since their P-values are 0.52 and 0.13, respectively, we have to accept hypothesis that the change of neither M1 nor M2 affects the change of GDP.

Notice that these results (Table 1-6 and Table 1-7) can be caused either by statistical data or the insufficient degree of "monetization" of the Czech economy until now. The time series are not long enough (max. 37 observations), so we have had to limit the time lags utilized for calculations. Monthly data on GDP are estimates of the Czech statistical office and monthly data on monetary aggregates M1, M2 before December 1991 are unofficial estimates.

The transmission mechanism between monetary and real variables has still been evolving and changes practically every month. New tools and instruments of monetary policy have been applied and new institutions have been created during privatization. In this environment one can hardly count on the stable relationship expected form advanced market economies.

Furthermore, we studied the relationship between monetary variables and price level (consumer price index) using monthly data. We tested Granger causality again with a time lag of up to three months.

Analogously, the models for testing Granger causality have been as follow

$$M(t) = const. + \sum_{j=1}^{L} \alpha_j . M(t-j) + \sum_{j=1}^{L} \beta_j . CPI(t-j) \qquad (1.3)$$

$$CPI(t) = const. + \sum_{j=1}^{L} \alpha_j . CPI(t-j) + \sum_{j=1}^{L} \beta_j . M(t-j) \qquad (1.4)$$

where M denotes M1 and M2, respectively.

Results of Granger causality analysis are summarized in Table 1-8 and Table 1-9.

Table 1-8 Test H_0: $\beta_1 = ... = \beta_L = 0$ for a given number of lags, (1.3).

(Impact of CPI on M1 does not exibit Granger causality)

No. of lags (L)	Log of likelihood function	Likelihood ratio	P-value	Durbin's h alternative
1	-130.82	3.96	0.05	0.47
2	-129.78	5.80	0.06	-0.29
3	-127.72	9.05	0.03	-0.07

(Impact of CPI on M2 does not exibit Granger causality)

No. of lags (L)	Log of likelihood function	Likelihood ratio	P-value	Durbin's h alternative
1	-131.24	3.67	0.06	0.01
2	-129.55	7.05	0.03	-0.92
3	-128.06	10.02	0.02	0.75

Based on p-values we reject hypothesis (5% significance level) that a change of CPI does not affect (Granger-causality sense) M1 and M2, respectively.

Analysis of the opposite-causality direction is the following:

Table 1-9 Test H_0: $\beta_1 = ... = \beta_L = 0$ for a given number of lags, (1.4).

(Change in M1 does not Granger cause a change in CPI)

No. of lags (L)	Log of likelihood function	Likelihood ratio	P-value	Durbin's h alternative
1	-108.90	3.19	0.07	-0.43
2	-108.32	4.22	0.12	-0.16
3	-108.25	4.37	0.22	-0.62

(Change in M2 does not Granger cause a change in CPI)

No. of lags (L)	Log of likelihood function	Likelihood ratio	P-value	Durbin's h alternative
1	-107.44	6.11	0.01	-0.30
2	-106.66	7.55	0.02	-0.35
3	-106.43	8.01	0.05	-0.89

Looking at P-values we conclude that:

1) Change in M1 does not lead to Grange-type of causality with respect to the CPI. (hypothesis is accepted on 5% significance level).

But

2) we reject hypothesis that M2 do not Granger-cause CPI (on 1% significance level).

To sum up, we find bilateral causality between M2 and CPI. These empirical results confirm the accommodating character of Czech monetary policy.

1.3. Monetary tools

In a command economy, monetary policy reflected the state plans expressed mainly in physical targets. Planned direct credit allocation was linked to the planned growth of national income. The Central Bank and its subsidiaries sought to control inflation in the sphere of consumer goods by balancing the money incomes of the population with the planned volume of consumer goods.

Credits to enterprises were directly allocated, with little attention paid to the creditworthiness of the borrowing enterprise. Risk was "socialised" due to the existence of a unitary banking system.

The introduction of a new Central Bank Act and a new banking law in late 1989 marked the beginning of the development of a market - oriented banking system. The Act laid the basis for establishing a "two tier" banking system through a separation of the Central Bank and commercial banking functions and provided the Central Bank with the means to conduct monetary policy and with regulatory authority over the banks. The latter established the legal basis for a universal banking system. The separation of Central Banking from commercial banking was put into effect on January 1, 1990.

The division of Czechoslovak Federation into two independent republics on January 1, 1993 meant the creation of the Czech National Bank. According to the Act [19] the CNB is independent of any instructions given by the government.

[19] Act of the Czech National Council, N6/1993

According to the Act:

a) The CNB may set the minimum rates of interest on the deposits accepted by commercial banks.

b) The CNB may set the maximum rates of interest on the credits provided by commercial banks.

c) The CNB may stipulate the maximum volume of credits to be provided by commercial banks.

d) The CNB may demand that banks deposit in an account kept by the CNB (a predetermined part of their funds minimum reserve requirement) which will normally bear no interest. The minimum reserve requirement may account for a maximum of 30% of banks's total liabilities.

e) In order to place constraints on excessive liquidity and overcome inflationary pressures, the CNB shall have the right to demand that the minimum reserve requirement be greater than as defined above. In such a case the amount that is in excess of the level defined above shall bear interest at the effective discount rate.

f) In the event of a bank failing, to maintain the specified minimum reserve requirement the CNB shall be entitled to charge interest on the sum for which the minimum reserve requirement is in default at a rate of up to three times the effective discount rate.

g) When increasing the level of the minimum reserve requirement the CNB shall set the deadline by which a bank shall have to achieve this level.

The described tools of monetary regulation seem to be very prudent but one must keep in mind that the capital base of commercial banks is still insufficient and that a certain policy against potential risk must exist.

The intended transactions of CNB demonstrate the endeavour to create functioning monetary and capital markets:

a) The CNB may purchase from banks and possibly sell to them:

   aa) Bills of exchange maturing within six months of the day of their purchase by the CNB.

   ab) Government bonds or other securities underwritten by the government which the CNB may buy and hold for up to a one year maximum.

b) For a maximum of three months the CNB may grant to banks credit guaranteed by securities specified above, and or government bonds or other securities underwritten by the government or by stock lists of bulk goods fully insured against lost and damage or by other collateral.

c) In order to preserve a bank's liquidity the CNB may, as an exception, provide short-term credit for a period of up to three months.

d) On the basis of a decision taken by the Bank Board, the CNB shall grant to the Czech Republic short-term credit by way of purchasing state treasury bills maturing within three months from the day of their purchase. The total amount of such credits may not exceed 5 % of the revenues of the state budget of the previous year.

e) The CNB offers for sale state bonds and in agreement with the Ministry of Finance may perform on its behalf and for the agreed remuneration activities related to the management, repayment and transfer of state bonds and payment of interest on these bonds.

f) In order to regulate the money market the CNB may buy and sell negotiable securities.

g) The CNB may issue short-term securities maturing within 6 months and trade in them.

The CNB has therefore at its disposal the whole kit of tools known to advanced market economies.

At the beginning of the transformation process the main tools of monetary policy were direct ones, such as credit limits for individual commercial banks and ceilings for interest rates expressed as maximal deviations from the discount rate.

Indirect tools replaced the direct ones step by step. Credit limits were abandoned in September 1992 (small banks) and October 1992 (big banks). Binding constraints for credit activities represented minimum reserve requirements and rules for credit activities.

In the third quarter of 1992 bills of the CNB were emitted to decrease free reserves of commercial banks. Required reserves and discount rate policy became the main tools.

In 1993 the development of the money supply was entirely through indirect tools. The liquidity of commercial banks was controlled daily. CNB bills and state securities were traded in the free market.

Further refinement has been planned for 1994. The minimum reserve requirement should be changed only in cases of a big decrease or increase in the liquidity of the banking system.

Discount and lombard interest rates will mainly play signal roles due to the limited volume of trades realised at these interest rates.

Open market operations (emission of bills of the CNB, Treasury bills, bills of Fund of National Property, government bonds) will serve as the basic tools for managing liquidity in the banking system and influencing the development of interest rates on the inter-bank money market. Commercial banks should have enough securities in their assets to be able to trade with the CNB.

2.Development of monetary aggregates

2.1. Flow - of - funds equation

It is well known that the interdependence of policy instruments is essential to understanding macroeconomic stabilization policy. Therefore it is necessary to have some sort of conceptual framework both to elucidate the interrelationship between monetary and fiscal variables and to analyze their impact.

Such a framework represents the flow-of-funds analysis[20] using the orthodox definition of the money supply (currency plus deposits) and making various substitutions between assets and liabilities of the banking sector.

Having utilized monetary survey [21] of the Czech Republic, we can in the spirit of the flow-of-funds analysis deduce the following relationships:

$$M2 = NDA + NFA \qquad (2\text{-}1)$$

Liquid liabilities (M2) equal the sum of net domestic assets (NDA) plus net

[20] The derivation of the flow-of-funds equation rests on two substitutions. Firstly, loans /assets/ are substituted for deposits /liabilities/. Secondly, the government finance equation reflects a special definition of the budget deficit - public sector borrowing requirement. See D. Gowland /1990/, p. 18-40.

[21] Published regularly by the Monetary Department of the CNB. See the Appendix.

foreign assets (NFA).[22] This identification between the leading monetary aggregate and the sum of net assets is the starting point of further analysis.

Net domestic assets can be expressed as the difference between domestic credit (DC) and other items net (OIN), which is a balancing item not more profoundly explained in monetary survey.

$$NDA = DC + OIN \tag{2-2}$$

Domestic credit is composed of total credit (TC) plus net credit to the government (NCG) plus net credit to the National Property Fund (NCPF):

$$DC = TC + NCG + NCPF \tag{2-3}$$

Total credit is composed of credit to enterprises in Czech Crowns (CE), credit to households in Czech Crowns (CH) and credit in foreign currency (CFC)

$$TC = CE + CH + CFC \tag{2-4}$$

If we add NCG and NCPF we obtain public sector borrowing requirements (PSBR). The items OIN and CFC are grouped together as residual(R).

Having made these substitutions we can express the most important monetary aggregate M2 through the assets items. The sources of money supply represent enterprises, households, public sector, foreign sector and a residual:

$$M2 = CE + CH + PSBR + NFA + R \tag{2-5}$$

For example, in % for June 1993 this means :

$$100 = 93{,}8 + 7{,}2 - 0{,}7 + 15{,}5 + (-15{,}8)$$

[22] We have added NFA vis a vis the Slovak republic with other NFA.

2.2 Development of assets and liabilities

This sector disaggregation of money supply sources allows us in the analyzed period (Dec. 1991 - Nov. 1993) to deduce the following trends:

l) Credits to enterprises represent by far the most important source of money supply. Their average monthly coefficient of growth is 1,29 %, which is lower than the relevant coefficient for M2 (1,43%),. With some exceptions (Dec. 1992,Jan. 1993) credits grew steadily in absolute amounts.

2) Credits to households exhibit not only relatively declining trend (coef. of growth is 0,87 %), but also an absolute decline since Dec. 1992 (the maximum 46,5 bn CK). The credits in Nov. 1993 were nominally the same as in Dec.1992 (44,2 bn CK) in spite of continuing inflation.

3) The public sector plays probably a unique role in transforming economies. The influence of PSBR is not inflationary but, on the contrary, deflationary since May 1993 thanks to the existence of the National Property Fund. It is obvious that asset sales during the privatization process reduce the PSBR. Thus it is possible to understand the rationale of the government policy to use funds from the National Property Fund to finance the interest payments of state debt[23]. Nobody of course denies that this manoeuvre can not continue forever but it can help in overcoming the difficulties on the receipt side of the state budget in times of a radical changes in property rights.

4) Net foreign assets represent by far the most dynamic source of money supply with a coefficient of growth 6,89%. This ratio on M2 increased from 5,4% in December 1991 to 18,2% in November 1993. This rapid increase of net foreign assets has well known consequences on the autonomy of the monetary policy of the CNB.

From the flow of funds analysis some of the rival candidates for the role of intermediate targets can be identified and their interrelationship with

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[23] The interest payments on state debt in 1994 should be , according to Ministry of Finance, 14 bn CK. Total debt service /plus 16bn CK for repaying principal/ should therefore be 30bn CK, which is about 7,9% of the planned state budget for 1994 /381,8 bn CK/.

The total amount of debt will remain nominally at the end of 1994 the same as one year before /163 bn CK/. At the end of 1994 the state debt represented less than 20% of GDP. The state debt was interited mainly from the past /the credits to developing countries and countries of Comecon including Soviet Union - 61 bn CK, costs of devaluations - 26 bn, the loss from devaluations - 17 bn, take-over of some old debts of Czechoslovak Trade Bank - 58 bn.

elucidated-liquid liabilities,money (M1 - currency plus demand deposits), net domestic assets, domestic credit and public sector borrowing requirements.

The case for intermediate targets has been clear - to constrain or discipline government, on the one hand, and to give information about the government stabilisation policy to economic agents, on the other. To fulfill this role the targets must exhibit certain properties. One of them is the relative stability over time, to enable predictions of future development.

In the relevant time period the coefficient of variation was lowest for total credit (74,1%) and total credit to enterprises (84,8%). Higher coefficients were observed for domestic credit (105%) and M2 (107,0%). The broader monetary aggregate, M2, has of course been more stable than the narrower one, M1 (259,2%). Net domestic assets, an intermediate target elaborated in cooperation with the International Monetary Fund (IMF), had the coefficient of 257,2% , even higher than net foreign assets (216,9%). The public sector borrowing requirement, due to a composite structure and the beginning of privatization, proved to be the most unstable target (723,7%).

On the liabilities side the following tendencies have emerged:

1) The changing proportions of money (M1) and quasi money in the total liabilities (M2) are significant. The ratio slightly decreased from 52,5% in December 1991 to 49,9% in November 1993. This means that the trade off between liquidity and profitability has been changing in favour of profitability.

2) For the currency item the big drop after the dissolution of the Czechoslovak Federation is significant. The ratio on M2 decreased from 11,3 % in December 1991 to 5,5% in January 1993 with an increase over the following months. The ratio in November 1993 was still lower (8,7%) than at the beginning of the investigated period.

   It is interesting to note that in the United States the currency ratio has increased. As a percentage of M1 it has risen from 20,5% at the end of 1960 to more than 26% at the end of 1988 (in the Czech Republic the ratio of currency on M1 in November 1993 was 17,4%): "Why has there been such a large expansion of the use in currency in the 1970s and 1980s? We are not sure, but one major reason is the increased size of the so-called underground economy" [24]. This comparison does not mean that the size of the underground economy in the Czech Republic is lower. One must be careful making judgements because of the

[24] R. Miller, R. Pulsinelli /1989/, p. 39.

rapidly evolving institutional structure of the financial system in the Czech Republic.

3) The second part of M1, demand deposits exhibit different development patterns in households and enterprises. The coefficient of growth is higher for the demand deposits of enterprises (1,63%) than for households (1,03%). Also the demand deposits of enterprises are quantitatively more important (68,6% of all demand deposits in November 1993).

   According to the definition of M1,there is in the Czech Republic a measure of the transactions demand for money because the financial innovations that could blur the distinction between M1 and other assets is still insignificant. The growing proportion of demand deposits of enterprises can have the same impact as in the United States. The American authors of a discussion entitled "Is M1 still a measure of the transactions concept of money?" assert:"...you should be aware that most of the demand deposits included in M1 are owned by businesses, not households. This means that these transactions accounts will be used for intermediate goods (not final-goods) or inter-business expenditures and on purely financial transactions. Expenditures on intermediate goods and on financial transactions are not counted in GNP accounts. This means that the relationship between M1 and GNP (whose growth is a national economic goal) is weakening"[25]

   In the Czech Republic the existence of inter-enterprise indebtedness contributes to the widening gap between real transactions and those captured by monetary aggregates.

4) In time and savings deposits the ratio between the deposits of households and those of enterprises was, and has remained just the opposite. Even in November 1993 the ratio of deposits of enterprises was only 21,1% of total time and savings deposits. But the dynamics of growth have been remarkable (coef. of growth 8,64, whereas that of time and savings deposits of households 1,10) which reflects better cash management and a longer time horizon in the decision making processes in enterprises.

The time and savings deposits of enterprises (TSDE) reached the greatest average monthly coefficient of growth in the period Dec. 1991 - Nov. 1993

[25] R. Miller, R. Pulsinelli /1989/p. 46-7.

for all asset and liability items:

Table 2-1

Average monthly coefficients of growth

(selected items of assets and liabilities of monetary survey)

TSDE	NFA	DDE	M1	M2	CE
8,84	6,86	1,63	1,20	1,43	1,29

TSDH	DC	DDH	CH	CU
1,10	1,13	1,03	0,87	0,25

The data derived from the monetary survey confirm the growing importance of the enterprise sector on both sides of the balance in comparison with the households sector, as well as the increasing influence of foreign sources of money supply.

3. Balance sheet of the CNB and monetary base

3.1. Balance sheet of the CNB

The balance sheet of the Central Bank in advanced market economies represents a very useful "mirror" reflecting the situation in the monetary sphere[26]. The system based on accounting principles gives information about the specific activities of the Central Bank vis-a-vis commercial banks and government. Some items of both assets and liabilities monitor the impact of different monetary measures of the Central Bank.

In the Czech Republic the balance sheet of the CNB is published every decade in the daily Hospodarske noviny (Economic newspaper) and is accessible therefore to the whole public. An arithmetic statement presents the relationship between the assets on the one side and liabilities plus net worth on the other side.

The structure of both assets and liabilities of the CNB and their development in 1993 has, in comparison with that of the Federal Reserve System in the United States for example, some specific features[27]:

a) The most remarkable feature is the increasing amount of foreign assets (assets in foreign currencies abroad at foreign banks, participation in international monetary institutions and credits extended abroad). This important item on the asset side reflects favourable development in our balance of payments accounts. The proportion of total volume of assets increased from 42% on January 1, 1993 to 58,5% at the end of October (the biggest percentage) with a smaller percentage decline in the following months (55,6% at the end of January 1994). The surplus of the current balance of payments account, an inflow of direct foreign investment, the issuance of CNB securities in the international capital

[26] One of the classics, P. Cagan, identifies the liabilities of the Central bank with monetary base which simplifies the problem: "Uncertainties over the proper definition of money and instability in the velocity of money as variously defined led to monetarist proposals to target the monetary liabilities of the central bank, that is, the "monetary base" consisting of currency outstanding and bank reserves. The monetary base has the advantage of not being directly affected by market innovations and so of not needing redefinitions when innovations occur. Monetarists have proposed maintaining a constant growth rate of the base also because it would simplify - indirectly virtually eliminate - the monetary policy function of central banks and governments.Some of the European central banks have found targeting the monetary base preferable to targeting the money supply, though not without important discretionary departures from the target", /1989/, p. 202.

[27] Absolute numbers and percentages see Appendix.

market and the direct drawing on enterprise credits from foreign countries created a source of growth in foreign exchange reserves.

The relative increase of foreign assets in the structure of the balance sheet and an absolute increase during 1993 makes sense - it supports the holding of the nominal exchange rate (an anchor of the price level) stable.

b) In contrast, the level of both loans to domestic banks (different kinds of credits - auctionary refinancing credits, lombard, rediscount) and claims on government (credits extended in the past and credits covering the transitory[28] discrepancies between expenditures and receipts during fiscal year) decreased. Loans to domestic banks are the category through which the CNB can influence the quantity of bank reserves . It can be alternatively thought of as bank borrowing[29] and is another policy tool of the CNB. The amount of claims of commercial banks, due to the emission function of the CNB, decreased from 32,2% to 20,4% in the analyzed period. But this does not mean a steady decline. For instance, in April,1993, the claims on banks increased from 80,5 to 91,5 bn.CK, reflecting the increase of liquidity of commercial banks (the increase of volumes of auctionary refinancing credits), and therefore a temporary relaxation of monetary policy. Claims on government play a relatively modest role with a decreasing trend (23,3% at the beginning of 1993 and only 11,6% at the end of January 1994). For comparison, in the United States claims on government represent by far the most important item on the asset side.

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[28] The different timing of receipts and expenditures during the fiscal year has been the cause of the short-term borrowing from the CNB. E.g. in 1991 this timing in federal budget exhibited the following pattern:

	IQ	IIQ	IIIQ	IVQ	Dec.
Receipts in % of the whole year	24,6	26,9	23,5	24,9	9,4
Expenditures in % of the whole year	20,6	25,4	23,9	30,1	12,4

[29] More profoundly V.Izák (1993),p. 42.

The Czech situation signifies that the space for open market operations (the purchase and sale of securities) is still limited. Ironically, the relatively small state debt has not yet forced the government (also thanks to the existence of the Fund of National Property) to issue bonds on a mass scale.

The tendencies concerning liabilities have been following:

a) The most important item is again the relation with the foreign sector. In a small, relatively open economy it is no wonder (36% at the beginning of January, 1993, the peak at the end of May 1993 - 40,3% and then a relative decline -32,2% at the end of January, 1994). In absolute amounts growth is steady, with the exception of a drop in September 1993.

b) Currency represents a rather modest part of total liabilities (in the United States it is by far the most important item on the liabilities side). The strong decrease, even in absolute amount, at the beginning of 1993, was caused by an unrepeatable event - the dissolution of the monetary union with the Slovak Republic. The amount related to total liabilities is still lower at the end of period (18,6%) than at the beginning (24,7%).

c) Domestic liabilities to banks reflect again the intentions and aims of monetary policy. Banks held at accounts of the CNB not only required reserves, but also excess and non distributed reserves. After the dissolution of the monetary union, the CNB focused on the neutralisation of large free reserves in the banking system (the decrease in absolute amount of 8 bn CK in the first quarter of 1993).

d) Securities of the CNB become, step by step, an important item and their issues enable the space for open market operations to widen (the level increased from 0 to 14,9% in the relevant period). They contribute to the neutralization of the free resources of the banking system (20 bn CK represented in January 1994 the biggest monthly increase).

e) The difference between the foreign assets and the foreign liabilities of the CNB can be labelled net foreign assets. The average monthly coefficient of growth of this variable (15,5%) highly surpasses the coefficient of growth of total assets and liabilities (3,1%) and reflects the favourable financial situation of the CNB vis a vis the foreign sector. Under a regime of a fixed nominal exchange rate, the CNB must count on the impact of an increase of net foreign assets on the domestic money supply. Monthly changes of important items of both assets and liabilities of the balance sheet of the CNB thus witness for

the application of tools[30] of monetary policy.

3.2. Two concepts of monetary base

The monetary base has been regarded as a prominent and proper measure of monetary influence [31] on the economy, because the total money supply is manufactured out of the monetary base - from currency outside banks plus the reserves held by the commercial banks upon which the deposit component of the money supply is based.

The so-called "source base" is derived from a balance sheet of the Central Bank[32]. This "source " base is composed of two main parts[33]: "autonomous factors" and "monetary political factors". The former can hardly be influenced in the CNB, whereas the latter represent the main tool of the CNB by managing the monetary base and is therefore the main instrument for managing the money supply.

The autonomous factors are:

1) External sector - the position of the CNB vis-a-vis abroad.
2) Assets and liabilities of the CNB in hard currencies vis-a-vis domestic banks.
3) Government sector - net position of the government sector at the CNB (the difference between claims and obligations of the CNB vis-a-vis the state budget).
4) CNB credits - claims vis-a-vis non-bank clients (mainly the post).
5) Other net assets.

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[30] The timing of the application of different tools of monetary policy is given in Appendix.

[31] Another classic, K. Brunner noticed: "The monetary base appears thus as the sum of all 'assets' listed on the left side of the consolidated statement minus the sum of all non-monetary liabilities ", /1989/, p.176. And further: "Changes in the monetary base are a necessary constitution for persistently large or substantially accelerated monetary growth in most countries for most of the time "/1989/ p. 177.

[32] The concepts "source base" and "use of the base" are explained in an article written by staff members of the St. Louis Federal Reserve Bank, see /1973/ p. 111-114.

[33] I. Matalík , M. Jančar /1993/, p. 177.

Monetary policy factors are:

1) Refinancing credits (1-7 days, auctionary, emergency).
2) Rediscount of bills.
3) Lombard credit.
4) Treasury bills.
5) Government bonds.

The "use of the base" representing demand for the monetary base is composed of currency (the demand of the non-bank public),reserves of commercial banks (their demand for required, excess and undistributed reserves), bills of the CNB and other non-government deposits.

A look at the structure of "source base" uncovers[34] the following:

a) The amount of autonomous factors highly surpasses that of monetary policy factors. With some exceptions (Dec. 1992, April 1993) this ratio is approximately 9:1. In the period August 1993 - December 1993 it was even higher. This means, sensu stricto, that the modus operandi of CNB is narrower than expected.[35]

b) The influence of the external sector has also been growing from this point of view. In January 1994 the external sector comprised more than 38% of the total sources of the monetary base and represented the most important item.

c) Sound fiscal policy is reflected in a relatively small amount of net credit to the government, especially in the second half of 1993.

d) A special item is the relation of the CNB to the Slovak Central Bank. The constant figure (24,6 bn CK) witnesses the unsettled problem of compensation of the debt of the Slovak Central Bank.

e) The composition of the monetary policy factors reflects of course the use of monetary tools during 1993, e.g. the decrease of auctionary refinancing credits in January 1993 by one half in order to neutralise free reserves in the banking system. This decrease, accompanied by an

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[34] See Appendix.

[35] In Federal Reserve Bank of St. Louis' article one ascertains: "The supply of the monetary base is substantially under the complete control of the Federal Reserve System", /1973/, p.112.

increase of interest rates from these credits, evoked the interest of commercial banks in drawing rediscount credits.

f) The amount of rediscount credits [36], granted at a discount rate, increased in absolute amount, but remained at approximately the level of 3% of sources of the base. Prudence in supplying refinancing credits, observed in 1992 and in 1993, is given by the necessity of stabilizing this inflow in order not to allow so much money in circulation.

g) The role of securities - Treasury bills and bills of the Fund of National Property are still negligible, but as the evidence from January, 1994 shows, the situation can change in the near future.

A similar look at the structure of "use of the base" shows:

a) Currency outside banks remains the most important item (above 40% of the use) with the above mentioned decrease in the absolute amount in January 1993. Only in November 1993 did the amount of currency outside banks surpass the level in December 1992.

b) The development of reserves of commercial banks at the CNB monitors the impact of one of the tools of monetary policy at the disposal of the CNB. The decrease or increase of the minimum reserve requirement influences the amount of liquidity in the banking system and thus contributes to the dynamics of the money supply.

   The run from currency to deposits at the beginning of 1993 led to the increase of free reserves in the banking system which had to be neutralized by an increase of required minimal reserves for 4 big banks.

c) The bills of the CNB began to be utilised as a tool of intervention on money market since January 1993. The enormous increase of this kind

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[36] In Czechoslovakia one distinguished two kinds of credits extended to commercial banks:
a/ redistributive credits
b/ refinancing credits.
Redistributive credits were extended to 3 commercial banks /to banks created on January, 1, 1990 due to dissolvement of unitary State bank/. Some of these redistributive credits were granted at a discount rate. So called preferential redistributive credits were granted at a lower interest rate.

Refinancing credits were granted to all commercial banks. The development has been captured in Appendix.

of intervention can be dated since July 1993. In October and November 1993 their level of total use in monetary base climbed up to 20%.

The CNB has monitored the development of the monetary base every day since June 1992. The data are published regularly since December 1992. Up to date information on the major factors affecting movements in the monetary base makes it possible for the CNB to offset, if necessary, movements in the factors to achieve a change in the monetary base appropriate for economic stabilisation. Due to an enormous high percentage of factors having been classified as autonomous, this task is not an easy one.

3.3. Monetary approach to the balance of payments

The information contained in both the monetary base and the balance sheet of the CNB enables us to analyze the so called monetary approach to the balance of payments used by the International Monetary Fund (IMF).

The monetary approach to the balance of payments argues that the balance of payments problems are a result of too rapid money growth. For the Czech Republic the situation, when nominal exchange rates are fixed but prices are flexible, is relevant.

The point is the existence of a link between the Central Bank's holdings of foreign exchange and domestic money supply. Following the logic of this approach a monetary contraction generates a contraction in economic activity and therefore a decline in imports which weakens the pressures on the balance of payment. The automatic adjustment mechanism can be suspended through open market purchases of bonds that restore the money supply.

The monetary approach was invented by experts of the IMF for countries in balance of payment trouble. The starting point is the balance sheet of the Central Bank, which in a simplified form [37] is composed from net foreign asset and domestic credits on the asset side and high powered money (monetary base) on the liability side.

For the changes one can write:

[37] R. Dornbusch, S. Fisher /1990/, p. 765.

$$\Delta NFA + \Delta DC = \Delta H \qquad (3\text{-}1)$$

In the Czech Republic the monetary base does not represent all the liabilities of the balance sheet of the CNB. To keep the accounting identity between assets and liabilities of the CNB we must group the remaining items into other liabilities (OL) and other assets (OA). Then:

$$\Delta NFA + \Delta DC + \Delta OA = \Delta H + \Delta OL \qquad (3\text{-}2)$$

In the logic of the monetary approach, the first step is to decide on a balance of payment target, therefore ΔNFA* is given. Further ΔH* depends on expected money demand and ΔDC is a dependent variable [38]. So

$$\Delta DC = \Delta H^{*} - \Delta NFA^{*} + (\Delta OL - \Delta OA) \qquad (3\text{-}3)$$

Table 3-1 shows the relevant figures in bn of Czech crowns:

Table 3-1 Selected items (bn CK)

	12/92	3/93	6/93	9/93	12/93	1/94
NFA	16,1	18,3	34,1	54,3	80,3	90,9
DC	148,8	135,2	137,7	127,7	123,5	124,3
H	123,1	92,0	119,8	133,8	166,6	177,5
OA	6,7	8,6	20,9	10,2	25,1	48,3
OL	48,5	70,0	72,9	58,4	62,3	85,9

Source: Balance sheet of the CNB and monetary base

[38] "Typically, a stabilization plan drawn up by the IMF will include a suggested limit on the expansion of domestic credit. The limit provides a ceiling on domestic credit expansion. The adoption of such a ceiling helps the central bank avoid the temptation of expanding its loans to the government or private sector in the face of rising interest rates or government budget deficits", R. Dornbusch, S. Fisher /1990/, p. 765.

"Sterilisation policies may be defined as actions designed to chance domestic credit in order to offset the monetary consequences of the balance of payments", A. Stevenson, V. Muscatelli and M. Gregory /1988/, p. 222.

The changes for the single quarters of 1993 and for the first month of 1994 are the following:

1.Q	-13,6	=	-31,1 - 2,6 + 19,6
2.Q	2,5	=	27,8 - 15,8 - 9,4
3.Q.	-10,0	=	14,0 - 20,2 - 3,8
4.Q.	-4,2	=	32,8 - 26,O - 11,O
January,94	0,8	=	10,9 - 10,6 + 0,4

The development in the Czech Republic in 1993 and in January 1994 exhibits a clear picture. In all sub-periods the increase in net foreign assets[39] had to be dampened either by a decrease or only a small increase of domestic credits to commercial banks and government.

The problem of the Czech Republic in the months is not the balance of payments, so the starting point of the monetary approach need not be a balance of payment target.The problem is to keep the increase of money stock in reliable limits and not to curb the credits for domestic agents too much.

CNB Governor J. Tošovský[40] has stressed that the CNB will strive during 1994 to keep the growth of M2 between 12-15 %. It will be caused mainly by the inflow of foreign capital so that credit expansion will remain maximally at 5 % (in 1993 16-17 %). The main tool of monetary policy will again be open market operations, mainly the contraction of liquidity coming from abroad, through the bills of the CNB.

[39] Net foreign assets deduced from the balance sheet of the CNB do not represent totally the situation in the balance of payments. The illustration of the monetary approach should be perceived with this caveat.

[40] Hospodarske noviny, 21.12.1993.

3.4. Money multipliers

Having summarized a vast amount of empirical findings, M. Friedman[41] came to the conclusion that the factors determining the nominal money supply depend critically on the monetary system.

These factors can be analyzed under three main headings termed the proximate determinants of the quantity of money:

1) The amount of high-powered money directly controlled by the Central Bank.
2) The reserve-deposits ratio determined by the laws regulating reserves and the policies of the commercial banks.
3) The currency-deposit ratio expressing the preferences of the non-bank public us to how much money to hold in the form of currency and how much to hold in the form of demand deposits.

This can be expressed as an equation known from many textbooks of macroeconomics theory or monetary economics:

$$\frac{M}{H} = \frac{CU + D}{CU + RE} \qquad (3\text{-}4)$$

where M..... monetary aggregate

H..... high powered money (monetary base)

CU..... currency (outside banks)

D..... deposits

RE..... bank reserves

The ratio M/H, which can be expressed through the fraction on the right hand side of equation (3-4), is known as the money multiplier. When we divide both the nominator and the denominator on the right side by D, we obtain:

$$\frac{M}{H} = \frac{cu + 1}{cu + re}, \qquad (3\text{-}4')$$

where

[41] M. Friedman /1989/, p. 9-10.

$$cu = \frac{CU}{D}$$

and

$$re = \frac{RE}{D}$$

It is evident that the money multiplier in this textbook version is a convenient summary of the effect of the two mentioned deposit ratios.

In our monetary survey M1 is defined as currency plus demand deposits, whereas M2 is defined as M1 plus time and saving deposits plus foreign currency deposits.

Thus:

$$M1 = CU_m + DD \tag{3-5}$$

$$M2 = CU_m + D \tag{3-6}$$

where: CU_m ..... currency (outside banks)[42]

DD ..... demand deposits

D ..... total deposits

The monetary base (the "use of the base" concept) is, as mentioned previously, composed of four items: currency outside banks (CU_h), deposits of commercial banks at the CNB (RE), bills of the CNB (B) and other non-government deposits (OD). Therefore:

$$H = CU_h + RE + B + OD \tag{3-7}$$

and

$$H = (cu_h + re + b + od).D \tag{3-7'}$$

where small letters on the right-hand side indicate the relevant fractions of

[42] Currency outside banks displayed in Monetary survey /CU_m/ is not identical with currency outside banks displayed in Balance sheet of the CNB and Monetary base /CU_h/.To keep the accounting identities we are forced to distinguish these two concepts.

four items of monetary base and deposits.

The difference between money multipliers mm_2 and mm_1 is given by dividing the relevant variables by total deposits (for mm_2) or demand deposits only (for mm_1).

$$mm2 = \frac{M_2}{H} = \frac{cu_m + 1}{cu_h + re + b + od} \qquad (3\text{-}8)$$

For the analyzed periods (Dec. 1992 - Nov. 1993) we have obtained the following figures (analogically for mm_1):

	12	1	2	3	4	5	6	7	8	9	10	11
mm_2	4,89	6,25	5,97	6,38	5,18	5,39	5,18	5,12	5,02	4,92	4,79	4,47
mm_1	2,49	2,97	2,75	2,89	2,40	2,51	2,44	2,42	2,40	2,37	2,34	2,22

Our empirical multipliers[43] are not very stable, especially in the first months of 1993, which reflects the dissolution of the monetary union in this time period.

A closer look at the item "banking deposits with CNB" reveals that in the second half of 1993 (after the unifying required reserves for all banks since July 1st), the ratio rr was remarkably stable. Also the ratio cu_m exhibited a stable pattern in the last months of 1993. If this tendency also continues in the following months both multiplies could be more stable and a solid base for predicting money supply could be created with the caveat that the Czech Republic is a small open economy.

[43] Multipliers published by the CNB has been calculated by using the average height of monetary base in relevant months. For our approach we have used the height of monetary base at the end of relevant months so our multipliers are "end month' multipliers". Further refinement of the CNB is the use of moving average of monetary base /3 last months/. See J. Matalík, M. Jančar /1993/, p. 179.

4. Interest rates

4.1 Credit market

In discussing the role of interest rates in the first years of transformation one must distinguish the single markets and their segments. The assertion that interest rates still do not fulfill a market clearing function is valid only partially, first of all in credit markets.

Under the heading credit market, we understand the market with commercial banks on the one hand and enterprises on the other. During the first years of transformation commercial banks have been confronted with several challenging tasks. They have had to improve their capital adequacy to a level which is internationally comparable. Further they have had to support the emerging private sector and they could not allow a massive credit crunch to help solve soaring payment arrears.

Due to rocketing profits the banks have been able to increase their capital/assets ratio from 1,5-2% at the beginning of transformation to nearly 6% today. The high spread between interest rates on deposits and those charged for banks loans (6-7%) ranks among to the highest in Europe (the standard in Western Europe is 2-3%) and has been subject of a criticism even from government circles.

But before criticising banks for this high spread one can not avoid mentioning the situation of both commercial banks and enterprises in the phase of continuing privatization and beginning restructuralisation.

Commercial banks are confronted not only with bad loans inherited from the command economy, but, maybe surprisingly, also with new bad loans. The share of risky credits to all credits amounted in September 1993 to 22,8% and risky credits concern not only the state, as of yet non-privatized enterprises but also of private sector as well. The purposeful creation of higher reserves in past years, to cover these risky credits, is therefore understandable.

The behavior of many state owned enterprises slated for participation in the voucher privatization is characterized as pre-privatization agony in the literature. This label indicates the wasteful behavior of some (maybe many) enterprises demanding loans in spite of their price to avoid or postpone bankruptcy.

The sanction of bankruptcy has still remained mainly on paper due to reasons which are not only of an economic nature. The past bargaining about

state subsidies and planned targets, well known from a command type economy, has been changed into tenacious bargain about credits that have to bridge over the liquidity problem. The soft budget constraint of J. Kornai has not been totally abolished, but has appeared in another guise. This assertion is valid first of all for big enterprises with many thousands of employees.

The reluctance of the banks to initiate court proceedings against their big corporate clients has some logic. A specific feature of our voucher privatisation is the emergence of commercial banks both as creditors and holders (through investment privatisation funds created by big banks) of considerable shares of equity of enterprises being privatised. Further, in the past special links between banking officials from the previous State Bank and its subsidiaries, on the one hand, and managers of state enterprises on the other, were established. New customers are often terra incognita for banks.

Often the loans have been allocated according to other characteristics than the willingness to pay the required interest rate. The system of "non-price allocation" has been created. Some typical examples can be quoted :

a)Komercni banka (the biggest of commercial banks) set the ceiling of 1OO mil. CSK for state-owned enterprises and 5 mil. CSK for private enterprises in the jurisdiction of its branch offices. Loans surpassing the ceiling had to be discussed at headquarters.

b)The other kind of restriction represents the requirement of collateral. The loan must be covered by saleable assets of the debtor. The bank secures against possible failures of some projects. This procedure markedly restricts the possibility of being given loans to small enterprises with insufficient assets.

c)Special monitoring procedures also exist, e.g. the second loan is granted only after the first has been repaid. The regularity of monetary flows on customer accounts has been watched. Banks can decide to grant short and middle-term loans only and not fall into a prolongation of loans. The procedure is again disadvantageous for new private entrepreneurs.

d)Although very important (we hope), the existing mechanism represent bribes, demanded by banking officials for granting loans. Several tens of thousands of crowns have been demanded for the approval of a loan for private entrepreneurs.

High nominal interest rates on loans partially reflect ongoing inflation. The core inflation, being estimated under 1O%, promises (after the one-time price

jumps due to price liberalisation and the introduction of the VAT system) the lowering of interest rates on loans in 1994.

The existing interest rates call for the offer of investment projects with extremely high expected returns which are of course scarce goods.

The partial conclusion which can be drawn from what has been said above is that such concepts as interest elasticity of investment demand are still too subtle to be used as tools of economic analysis in our reasoning and that the function of market clearing on interest rates on the credit market is limited.

4.2 Money market

In the money market the situation is different and here interest rates play a significant market clearing role.

In the relations between the CNB and commercial banks the discount rate has an unsubstitutable place. Increase or decrease of the discount rate serve, first of all, as a signal indicating the intentions of the CNB as concerns the degree of tightness of monetary policy (see the Reports of the CNB).

At the beginning of 199O the discount rate was set too low. The intention was to give a signal that inflation (after the initial run up) would return to a moderate level. The discount rate, strongly negative in real terms, had to preserve an interest rate structure that would be sensible once the price adjustment had been completed.

Later in 199O the discount rate had to be increased several times. The allowed difference between the interest rates on loans and the discount rate represented a useful device of monetary policy in the initial phase of transformation. The role of the discount rate depends on the need to refinance credits from commercial banks. In particular, the big banks with their own internal sources (deposits from clients) have been dependent on refinancing credits to a certain degree only.

The movement of the discount rate and later that of the accompanying Lombard rate has been influencing the movement of interest rates on the inter-bank money market (1O participants) where a surplus of uncommitted resources of the major banks has been traded.

One can begin to speak in 1992 and especially in 1993 about the market clearing role of interest rates. In January 1993 the restriction of refinancing credit volume was accompanied by an alteration of the conditions for their drawing. The CNB had to reduce the liquidity of banks through open market

operations. Shorter interest rates progressively rose, but the limited number of disposable securities and the relatively small use of bills was in practice a limiting factor.

It has been the small banks, with limited access to cheap sources in the form of deposits from clients, which have not been dependent on the resources of the money market. The increase in interest rates on auctionary refinancing credits has resulted since 1992 in a greater demand for less used forms of refinancing credits - Lombard and rediscounting credits. An inadequate volume of tradable securities has represented a limit of the volume of refinancing credits obtained in this way.

The best indicator of interest rates on the inter-bank money market is PRIBOR (for 7 days, 3 months) reflecting flexibly the supply and demand for money.

The development of the situation on the money market, following its rather unusual beginning in 1993 (the dissolution of the Federation - see the previous parts of this paper), was a result not only of the changes in the discount rate, but of a large number of measures directed towards further improving the management of liquidity in the banking system as well (e.g. by enlarging the number of interest rates quoted on the money market and altering their method of calculations).

The fixing method was adopted on the inter-bank foreign exchange market since September 1992 for setting of the CSK exchange rate. This method, making it possible for the exchange rate to fluctuate in the range +O,5%-O,5% around the exchange rate derived from fluctuations of the currencies included in the currency basket, facilitates a more flexible response to developments on the inter-bank foreign exchange market. It takes into account not only fluctuations in the exchange rates for freely convertible currencies, but also several other factors such as domestic demand for foreign exchange, monetary policy etc.

This new method of exchange rate setting has definitively created the preconditions for more flexible management of the commercial bank portfolios including the use of the CNB reserves.

Conclusions

Having been inspired by the equation of exchange, the monetary authorities start by preparing a monetary program for the current year that takes into account expected changes of both GDP and price level.

After having compared the evolution of monetary aggregates M1, M2 with GDP in the period 2nd quarter 1990 - 3rd quarter 1993, we came to the conclusion that the monetary policy was almost neutral with significant differences in single quarters.

The Granger-Sims causality between GDP and monetary variables, taken from advanced market economies, has not been confirmed for the Czech Republic. Having analyzed monthly data we discovered independence between GDP and monetary variables (with exception: GDP Granger-cause M2), feedback (bilateral causality) between price level and monetary variables. This reflects the evolving nature of a transmission mechanism between monetary and real variables, on the one hand, and the accommodative character of monetary policy, on the other.

The institutional changes in the monetary sphere in first years of transformation from a command to a market type economy indicate that a two-tier banking system has been created and that the Central Bank has at its disposal the whole tool kid of advanced market economies.

The development of monetary aggregates has been analyzed from different angles. The application of flow-of-funds analysis enables one to identify the main sources of money supply. We show net foreign assets as the most dynamic source of money supply with well known consequences on the autonomy of the monetary policy of the CNB.

Nevertheless, credits to enterprises represent by far the most important source of money supply. What is worth further notice is the deflationary influence of public sector borrowing requirements which are unique in post-socialist countries.

The changing proportion between narrow money and broad money in the favour of the latter is significant. It means that the trade off between liquidity and profitability has been changing in favour of profitability.

The favourable development in the Czech balance of payments is reflected in the increasing percentage of foreign assets in the balance sheet of the CNB. The analysis of assets shows the continued limited space for open market operations. Ironically, the relatively small state debt has not yet forced the government to issue bonds on a mass scale. Securities of the CNB become an important item on the part of liabilities.

The desegregation of use of the monetary base and the split of source has allowed us to analyze the monetary policy in its dynamics and to point out its specific features in different time periods.

The monetary approach to the balance of payments uncovers the relation between the increase in net foreign assets and the necessity of dampening the increase of domestic credits to commercial banks and the government. Contrary to the logic of this approach, the problem of the Czech Republic is not the balance of payments, so the starting point of the monetary approach need not be a balance of payment target.

Having utilised the information contained in both the monetary base and balance sheet of the CNB we calculated ex post multipliers for both narrow

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