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MEASUREMENT OF GOVERNMENT BUDGET DEFICIT, LOSSES OF CENTRAL BANKS AND THE IMPACT OF AGGREGATE DEFICIT OF THE PUBLIC SECTOR ON INFLATION

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INTRODUCTION

Experts of the International Monetary Fund have recently issued a publication entitled »Measurement of Fiscal Impact, Methodological Issues« (ed. by Mario I. Blejer and Ke-Young Chu, Occasional Paper. No. 59, June 1988) in which they analyze three interrelated methodological problems. The first one is how to measure the deficit of the government budget under inflationary conditions. The second one concerns the problem of central bank losses and their impact on the aggregate deficit of the public sector (non-financial and financial). The third problem concerns the impact of this aggregate deficit on macro-economic variables and the necessary fiscal adjustment for anti-inflationary policy.

Some of the papers in this publication are devoted to the problem of definition and accurate measurement of government budget deficit in economies with a high rate of inflation. Vito Tanzi, Mario Blejer and Mario Teijeiro (1988) thus analyze problems concerning deficit measurement in situations in which a considerable portion of budget expenditure accounts for nominally high interest pauments on domestic government debt. Since in such a situation a considerable part of nominally high interest payments represent a compensation for, or the refund of, the real value of the debt's principal, the inclusion of the entire amount of interest payments in budget expenditure leads, according to the authors, to an overestimation of the deficit's real magnitude. If, instead of the same amount of the domestic debt on which it pays nominally high interest rates, the government had a foreign currency debt, or a debt in the domestic currency with the indexation of the principal, then according to the conventional methodology, the deficit would appear to be smaller. It is evident, however, that in both cases the deficit would be the same. This situation makes it difficult to measure the real budget deficit under infla-

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tionary conditions. It is also difficult to measure the movement of the real budget revenue and expenditure of a country over time, as well as to compare deficits among several countries. The authors therefore considered the possibility of defining the so-called operational deficit, from which the part of interest payments on the government debt making up compensation for inflation should be excluded. The operational deficit could be alternatively defined as so-called primary deficit (government revenue and expenditure without interest expenses) which is increased by real interest payments on government debt. Further, the authors analyze whether this operational deficit provides a better basis for assessing the impact of the public sector on macro-economic variables, primarily on inflation, than the conventional definition of deficit. According to them, this depends to a great extent on the kind of reaction of households and other economic agents to nominally high interest rates. If they do not consider these interest payments as income and are ready to reinvest them, then in the opinion of the authors, the operational deficit would provide more precise information on the inflationary impact of the public sector.

The so-called operational deficit is linked with the problem of estimating a fiscal adjustment required to curb inflation. More specifically, reducing deficit is one of the instruments of anti-inflationary policy. Therefore the question to be asked is how much budget expenditure should be adjusted to become compatible with a low or zero rate of inflation. The authors consider that real fiscal adjustment is smaller than conventionally measured budget deficit. A smaller decrease in primary deficit should in principle result in a drop in inflation, which would through lowered nominal interest rates lead to a further decrease in conventionally measured deficit. The authors do not maintain that fiscal adjustment is equal to operational deficit (instead of being equal to conventional deficit). They think that required fiscal adjustment lies somewhere between conventional and operational deficit, depending on price trends, foreign exchange current account, available sources for financing deficit (especially on saving behaviour of households) and the assessment of the main cause of inflation.

Correction of the deficit for the amount of interest payments as compensation for inflation should, therefore, always be used at least as additional information in estimating the budget's impact on inflation.

Tanzi et al. do not, however, consider the problem of how to technically correct interest payments on government debt for the impact of inflation. They speak of the problems of choosing different inflation rates, and of even greater problems concerning the basis on which the rates should be applied. Special problems are encountered when interest rates are negative in real terms. In such a case it would then follow that the correction should be greater than the aggregate amount of interest payments, or that the operational deficit would not only be smaller than the conventional one, but smaller then the primary deficit as well. This problem is only mentioned by the authors but not considered in great detail. The authors also say that some other authors have proposed correcting the budget deficit using the government's overall debt profit on all of its financial liabilities, including high-powered money (in other words, that inflationary profit made on the basis of all liabilities of the government should be treated as fiscal revenue). Tanzi et al. (1988) consider, however,

that this would mean that inflation is excluded as a variable that should be explained by fiscal deficit.

In the same publication (Blejer et al. 1988) Michael Wattleworth presents a methodology for assessing the elements of subsidies in credits given by the government. The author's idea is that such subsidies should be included in budget expenditure. This proposal differs from the IMF methodology, followed by Tanzi *et al.* This methodology includes the entire amount of newly needed funds for credits granted by the government in budget expenditure, not only the subsidy element contained in these credits.* The author defines the amount of explicit subsidies as the difference between the expected present value of interest payments that the government will collect on credits it has given and the interest it will pay on its debt.

The paper of David J. Robinson and Peter Stella *Amalgamating Central Bank and Fiscal Deficits* deals with those aspects of central bank operations which must be taken into account in measuring the deficit of the public sector as a whole (non-financial and financial part). The authors proceed from the fact that the profit of the central bank is usually transferred to the budget. Thus, this aspect of central bank operations is already included in the conventionally measured government budget and its deficit. Losses of the central bank however are, as a rule, not shown as budget expenditure. They consider that this asymmetric approach is not justified and that, therefore, in assessing the real budget deficit, these losses should be taken into account. From the viewpoint of correct accounting, governments themselves should, in Robinson's and Stella's opinion, increase budget expenditure by this amount, even if they have to finance this adjustment by additional credits from the central bank.

Robinson and Stella also consider the problem of interest paid by the government on its debt with the central bank. If this interest is low, or zero, than the deficit-financing costs are underestimated. However, according to the authors this will not have any impact on the deficit itself because the transfer of the central bank's profit to the budget will decrease by the same amount. If, however, the central bank as a result of such practices has losses, then the budget deficit will nevertheless be underestimated.

The influence of the central bank on the real volume of budget deficit is not solely confined to the effects contained in the profit and loss account of the central bank. The authors consider that all quasi-fiscal activities of the central bank, as for example, giving favourable credits to specific economic sectors, should be transferred to budget expenditure. In this way selective credits given by the central bank should be treated quite differently from the

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* A rise in credits approved by governmental agencies according to the IMF methodology (See: International Monetary Fund, *Manual on Government Finance Statistics*, Washington, 1986) is considered government expenditure, consequently a kind of final consumption, and not as an operation which increases its financial claims. Only financial investments by local governments whose purpose is not to achieve specific political objectives, but which are guided by liquidity interests, are treated as financial investments. In this respect the IMF methodology differs from the methodology of the system of national accounts.

central bank's open-market operations which are conducted exclusively for the purpose of monetary objectives. At the same time, there is no reason to treat favourable credits given by the government and those given by the central bank differently.

The authors believe that in assessing real deficit these central bank activities should be added to the budget. This should be done so that the rise in credits for these purposes should be stated as budgetary expenditure, and that at the same time, revenue from such operations should be included in budgetary revenue. The central bank should at the same time record a rise in credits to the budget.

Robinson and Stella then discuss the impact of specific activities of the central bank which are not seen in the overall balance sheet, nor in the profit and loss account of the central bank. These primarily relate to exchange rate guarantees which were often given by the central banks in some South American countries. Since these are conditional guarantees, their effects are difficult to assess before their realization. As a possibility, the authors mention separately presenting the liabilities which the central bank would incur if the guarantees were realized at the exchange rate existing at the moment of drawing up the balance sheet.

Let us, however, return to the profit and loss account of the central bank. We have seen that the authors consider that losses of the central bank should be included in the valuation of the overall deficit of the public sector. They, however, consider that central bank losses rarely occur, and if so, only in developing countries. Referring to some South American authors, they cite examples from four countries in this region whose central banks incurred losses for several years, but they do not analyze the causes of such losses. In the paper of these authors one cannot even see the possible sources of major losses. When they consider the expenditure of the central banks which may have caused the losses, they only mention the costs of rescuing ailing banks and industries. Since in such cases this is most frequently a matter of the overvalued assets of the central bank, the authors see the solution of the problem in the formation of appropriate reserves. Such a formation should be compulsory for central banks, as it is for other banks, which should be monitored by auditors. Other possible causes of losses are not considered or mentioned.

On the side of potential revenue, the authors mention the impact of rate of exchange on the value of the foreign assets of the central bank. In this connection they only note that this impact of revaluation is, as a rule, excluded from the income statements and is included in »other items« in the liabilities. According to the authors, this procedure is no longer valid once these profits are realized. More specifically, even if these items in the liabilities were not formally transformed into reserves, the need for forming central bank reserves would objectively decrease, resulting in an increase in the bank's profit. The authors, therefore, conclude in passing that an *ad hoc* solution of this problem could lie in the gradual inclusion of such revaluation profits in the income

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The authors presume that foreign exchange reserves are managed by the central bank and that interest payments collected on these reserves are included in its revenue.

statement over a period of several years. Losses are also mentioned, but in their framework it cannot be seen how they would occur.

ARE CENTRAL BANK LOSSES A RARE PHENOMENON

Possible Causes of Central Bank Losses

The papers of Tanzi *et al.* (1988) and Robinson and Stella (1988) consider two interconnected themes. In my view, however, in both cases the authors do not take note of some important aspects of the functioning of central banks and their impact on the real volume of deficit of the aggregate public sector.

First of all, in their paper, Robinson and Stella do not perceive the main possible cause of central bank losses, which are exchange rate losses on liabilities. Central banks can incur exchange rate losses in two cases. The first one occurs with central banks which have considerable foreign exchange reserves whose value declines in relation to their domestic currencies. This occurs in countries whose currencies have shown a long-term appreciation trend relative to the American dollar, the currency in which the largest amount of foreign exchange reserves is held. These are countries like the Federal Republic of Germany, Switzerland, Austria, Japan, etc. Since these countries have very low rates of inflation (resulting in the appreciation of their currencies), they are not interesting examples for analyzing the problem of the impact of the public sector's deficit on inflation.

The second case of exchange rate losses occurs with central banks which have net foreign exchange liabilities, and their respective currencies depreciate in relation to world currencies. Since the depreciation of their currencies is, as a rule, caused by a higher rate of domestic inflation, this case is much more interesting with respect to the impact of fiscal deficit on inflation.

We shall also easily see that this is even the most important cause of central banks losses; central banks do not have any other major expenditures that could cause losses. Possible bankruptcy of an enterprise whose securities are held by the central bank is not probable, especially in any major measure. In addition, in countries with a higher rate of inflation, interest payments can become much more important than the amortization of the principal. By waiving interest payments, the central bank can keep such an enterprises afloat without writing off the principal. Uncollected interest payments will not result in losses, in contrast to the writing off of the principal.

Consequently, if one wants to analyze the impact of central bank losses on the overall deficit of the public sector in countries with higher rates of inflation, attention must be devoted precisely to exchange rate losses on foreign exchange liabilities of the central banks. However, until now this problem has not attracted any major attention in world literature. This is most likely due to textbook perceptions, which portray central banks as always having only foreign exchange reserves, but no foreign exchange liabilities. It seems that this is the picture which Robinson and Stella had in mind.

Central Bank Exchange Rate Losses as Reported in the Literature

The problem of central bank exchange rate losses is not unknown in the literature, but authors mainly consider cases of losses incurred on account of foreign exchange reserves whose currencies depreciate in relation to domestic currency. This hold especially true for the Federal Republic of Germany and Switzerland. In economic writings from these countries this problem is always discussed in connection with concrete decisions of their central banks regarding the distribution of profits, but also in connection with the covering of losses in the periods of a major depreciation of their currencies. In discussions, different views were heard, from the point of view that the central bank need not distribute profits at all, to the idea that it may give subsidies to the budget regardless of traditionally computed profits. As concerns exchange rate losses, opinions were heard that they should not be covered and others that they should be fully covered in the current year budget. Opinions were also expressed that neither the income statement nor the overall balance sheet of the central bank has any economic sense.*

However, the central banks of these countries in practice followed rather conservative principles. Thus, the losses on account of foreign exchange reserves were always covered at the expense of current revenue and reserves, and only exceptionally carried over to subsequent year. The rate-of-exchange profits of the German Bundesbank were in years when they appeared in the same way included in profits for distribution. In addition, these central banks always formed fairly large reserves as an insurance against rate of exchange risks, which, for example, in the case of Switzerland amounted for some time to as much as 30 per cent of the country's overall foreign exchange reserves. These accumulated reserves made it possible to cover exchange rate losses even under conditions of a great appreciation of the domestic currency.

The problem of the rate of exchange losses of central banks on account of foreign exchange reserves is also only touched by English authors, as for example Praet (1982), who analyzed the profitability of keeping various forms of foreign exchange reserves (gold, American dollars, English pounds etc.). In this regard, he reports on the losses incurred in 1967, when the British pound was devalued, by the central banks which kept reserves in this currency.

In the literature, however, virtually nothing can be found about central bank exchange rate losses resulting from foreign exchange liabilities in the case of depreciation of domestic currencies. A little more can be found in the literature about a similar problem, viz. rate of exchange guarantees given by the central banks of some countries. The impacts of central bank rate of exchange guarantees in Israel for example, are discussed by Fisher (1984) and Frenkel (1984), in Argentina by Fischer and Trapp (1985), and by Martone (1987) in Brazil.

James Hanson and Barletta *et al.* (1983) mention in connection with foreign exchange guarantees that if these are free of charge, great demand may arise which might lead to the creation of negative international reserves of central banks. In their paper presented at this symposium about economic liberalization and stabilization policies in South American countries, the role

* Extensive references to German and Swiss papers are given at the end in the Bibliography.

played by such central banks guarantees in curbing domestic interest rates was considered.

Robinson and Stella (1988) refer to the papers of some South American economists in Spanish and Portuguese, but these papers are not easily accessible. Much has been written by Yugoslav economists about this issue, which is very topical in Yugoslavia, but their papers, too, are not known in the world.

It is interesting to note that in the last fifteen years much has been written in English about the problem of money issue profits seigniorage, inflation tax, etc. However, in these papers, money issue profit is always defined as a rise in the volume of high-powered money, and not as a profit of the central bank involved. This view is close to that held by German and Swiss authors who negate the value of the overall balance sheet for the central bank, and according to whom high-powered money does not constitute an obligation of the central bank.

The present IMF methodology regarding government finance statistics (*Manual on Government Finance Statistics, IMF*, 1986) monitors all transactions primarily on the basis of cash flows and strictly excludes central bank operations from budgetary fiscal statistics. According to this methodology, central bank profits are included in so-called non-tax budget revenue. However, methodology demands that possible profits on account of foreign exchange reserves are treated differently. Transfers of assets on this basis, in favour of the budget, should not be treated as revenue but rather as credits given by the central bank. The *Manual* also mentions transfers to financial institutions for covering losses incurred through purchases and sales of foreign currencies, and incorporates such transfers in budgetary expenditure, but only if payments from the budget are really effected. It is interesting to note that the *Manual* does not make any distinction between transfers to the central bank and those to other financial institutions. In another place the *Manual* says that »any unrealized revaluation losses charged to government would be a negative entry in financing from the central bank« but this view itself is not clear. What is still more important is that the *Manual* does not include debts of the central bank in the aggregate government debt. It is quite certain that this approach in the IMF Manual could not have contributed to directing attention to the problem of central bank rate-of-exchange losses.

Central Bank Rate-of-Exchange Losses in Practice

The absence of empirical and theoretical papers on central bank rate-of-exchange losses deriving from their net foreign exchange liabilities could also be explained by the fact that this phenomenon is very rare. But is this really so? This question has prompted us to do some research into the incidence of central bank losses on account of net foreign exchange liabilities.

Central banks do not, as a rule, publish their income statements, and if they do so, the accounting methods are not explained. We could, therefore, only rely on central bank balance sheets published in *International Financial Statistics, 1988.*

We first of all wanted to find out how many central banks have net foreign exchange liabilities at all. We computed net foreign exchange liabilities as a difference between central bank foreign assets and their foreign liabilities. We assumed that all foreign assets and liabilities are always denominated in foreign currencies. For exchange rate losses it is not important who has a title to liabilities, but in what currencies they are denominated. This is why we added to foreign liabilities foreign exchange deposits of residents which some central banks have in their balance sheets.* In this way we were able to establish for all central banks whether they have net foreign exchange claims or liabilities.

The second question that interested us was whether these banks had exchange rate losses. As already stated, central banks do not, as a rule, publish their income statements. Therefore, in seeking an answer to this question, we could not rely on these income statements. Likewise, in central bank balance sheets in *International Financial Statistics* there is no such item as losses. However, already at the first glance, it is possible to notice that with a number of central banks a negative position is found in their liabilities under the title »other items«. Four of them have separate sub-positions containing the item »revaluation adjustment«. Two banks have a negative amount in the capital account. Finally, in two cases there is also a difference between central bank assets and liabilities stated.

For all central banks we computed their aggregate net worth as the sum of the capital account, »other items« in liabilities and differences between assets and liabilities. We interpreted all negative items in liabilities as accumulated losses. Finally, we compared the losses thus estimated with data on the net foreign exchange positions of the central banks and with changes in the exchange rates of their currencies over the last five years.

Data for the central banks having net foreign exchange liabilities are presented in Table 1. Out of a total of 140 central banks for which data were available in *International Financial Statistics*, as many as 50 (or 36 per cent) had net foreign exchange liabilities.

However, a negative foreign exchange position is not by itself sufficient to cause exchange rate losses to central banks on account of their liabilities. A necessary condition for it is also the devaluation of their currencies. We therefore divided countries whose central banks had net foreign exchange liabilities into those whose currencies had in the last five years depreciated relative to the American dollar (in the first part of the Table) and those whose currencies did not change their rate of exchange, or which in this period appreciated relative to the American dollar (the second part of the Table).

Out of the 50 countries whose central banks had net foreign exchange liabilities, the currencies of 36 of them depreciated in the last five years relative to the American dollar. In 30 of them, the central banks had according to the

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* Four central banks (Chile, Israel, Rumania, Yugoslavia) state separately liabilities stemming from foreign deposits, so we included this item in their foreign exchange liabilities. Nine central banks (Afganistan, Brazil, Columbia, Costarica, Ecuador, Indonesia, Mexico, Panama and Zaire) have the item »Time, savings and foreign currency deposits«. Since in these cases we could not establish which part related to foreign exchange deposits, we did not take this item into account. We could have, however, done the opposite, proceeding from the assumption that these central bank liabilities most likely involve expensive liabilities, regardless of whether or not they were denominated in foreign currencies.

above definition a negative net worth. The exceptions were Israel, Chile, Sri Lanka, Kenya, Bangladesh and Rumania. In Israel, the net foreign exchange liabilities of the central bank derived exclusively from foreign exchange deposits. In this case it can be noticed, however, that claims on the government grew together with liabilities deriving from foreign exchange deposits and that at the same time the central bank's claims on the government considerably exceeded the total amount of high-powered money. This indicates that most likely there existed an arrangement under which the government took over liabilities arising from these foreign exchange deposits with the central bank. These government liabilities towards the central bank were not the consequence of credits received by the government from the central bank in domestic currency, since in such a case the amount of cash would be much bigger. As regards Chile, the last published data on the central bank balance sheets date back to 1984.* In Kenya the depreciation of the domestic currency was relatively mild. In its central bank the position »Other items« in liabilities was negative, but this central bank had a considerable amount in the capital position, so that the net worth, as defined above, was nevertheless positive. In Rumania, devaluation amounted in the last five years to only 1.9 per cent. In the same period Sri Lanka had a devaluation of 44 per cent relative to the American dollar, and it can be seen from relevant data that the positive amount in the position »Other items« in liabilities had a downward trend.

A negative worth was also recorded by another 5 central banks (Panama, Liberia, Syria, Honduras, Gabon) which had net foreign exchange liabilities but whose currencies had appreciated in the five-year period considered relative to the American dollar, but on a relatively small scale.

Finally, a negative net worth was also recorded by 11 central banks which had net foreign exchange claims (See Table 2).**

From the above data it can be seen that there are a large number of central banks which have net foreign exchange liabilities. In the countries in which this is accompanied by a depreciation of the domestic currency, 83 per cent of the cases showed a negative net worth (according to the above definition) in their central banks. With all other central banks, a negative net worth, as defined above, appeared in only 16 per cent of cases. Although these data are not a conclusive proof, it is nevertheless a strong indication of rate of exchange losses on account of foreign obligations of a significant number of central banks. The data further show that these losses were not covered from the current central banks revenue, because if this were so, they would not accumulate in the balance sheet.

The amount itself of accumulated rate-of-exchange losses arising from foreign exchange liabilities is not negligible. The greatest accumulated losses were recorded in two socialist countries, notably by the Yugoslav central bank

* It is interesting that in Chile the negative position »Other items« in the liabilities was recorded by deposit banks.

** In this group of countries the biggest losses were recorded in the balance sheet of the Japanese central bank. This was most likely the result of rate-of-exchange losses on account of foreign exchange reseves caused by the appreciation of the yen which were not covered in profit and loss account. The practice of the Japan's central bank with regard to the covering of these losses, judging by all appearances, was different from that of the central banks in the Federal Republic of Germany and Switzerland.

– totalling 15.3 billion US dollars, and by the Hungarian central bank – 6.3 billion US dollars. Losses exceeding one billion US dollars were recorded by the central banks of Argentina, Brazil, Ecuador. Costarica, the Dominican Republic, Hungary, the Philippines, the Sudan and Zambia. If we compare the amount of accumulated losses with GNP (GNP data were taken from the World Bank Atlas, considering that it is more reliable than those in IFS), then first place was held by Jamaica (62 per cent), followed by Gambia (58 per cent), Zambia (40 per cent), Guiana (38 per cent), Madagascar (33 per cent), the Dominican Republic (32 per cent), Costarica (28 per cent), Hungary (27 per cent) and Yugoslavia (26 per cent).

In this way we obtain the following picture: a significant number of central banks had over a period of time come into a negative net foreign exchange position. This was because central banks borrowed abroad and used foreign exchange to finance the balance-of-payments deficit.* In the countries which already had a significant rate of inflation, this resulted in current rate-of-exchange losses. These were, however, for the most part not covered by the current revenues of the central banks, but resulted in negative values of the worth of these banks. Consequently, we see that losses incurred by central banks are not a rare phenomenon.

Let us consider links between such losses and the aggregate debt of the public secotr.

Central Bank Losses and Deficit of the Whole Public Sector

Robinson and Stella (1988) arrived at the conclusion that a conventionally presented deficit should be corrected by central bank losses. However, in their paper they failed to notice the main cause that may lead to central bank losses, viz. rate-of-exchange losses on account of net foreign exchange liabilities. Let us now consider how to incorporate the impact of these losses in the valuation of the deficit of the aggregate public sector. Let us consider it with the following example.

Let us imagine a central bank in a country in which inflation runs at an annual rate of 30 per cent. At the beginning of the year the central bank borrows abroad 100 million US dollars (at 5 per cent interest rate), and it sells the foreign exchange to importers for 200 million dinars for example (the rate of exchange of the US dollars is 2 dinars). Let us ignore the effects thereof on the foreign trade balance, i. e. let us suppose, for example, that domestic agents have borrowed that much less abroad. By selling foreign exchange the bank has withdrawn from circulation the correspanding amount of domestic high-powered money. Let us assume that the bank has at the same time neutralized these effects on high-powered money by increasing domestic credits. In this way it has transformed its foreign exchange liabilities into domestic loans.

Let us further assume that the bank has collected on domestic loans interest payments at a nominal rate of 36.5 per cent (30 per cent as compen-

* Sometimes central banks have taken over foreign debts of domestic firms and banks. The original debtors repaid those debts to the central bank in domestic currency. Sometimes even special loans were given by the central bank to enable the debtors to repay their foreign debts to the central bank.

sation for inflation and 5 per cent in real terms). Finally, let us assume that by the end of the year, the exchange rate has changed precisely for the rate of inflation and that it amounts to 1 US dollar – 2.60 dinars. Let us now compare this situation with a situation where the central bank has not incurred a debt and where foreign exchange credits have been taken over by the private sector. Let these two situations be identical with respect to all other parameters.

At the end of the year the revenue of the central bank on account of domestic credits amounts to 73 million dinars. Interest payments on account of the foreign exchange debt amounts to 13 million dinars. The balance of interest revenue and expenditure amounts, consequently, to 60 million dinars. This is exactly what the exchange rate losses of the central bank amount to. These rate-of-exchange losses are, however, not covered from interest revenue, but are included in the balance sheet as »revaluation adjustment«. The surplus of interest revenue, which is not used to cover these rate-of-exchange losses, increases the profit of the central bank, which is, as a rule, transferred to the budget. As a result, the budgetary revenue is in this way greater than in a comparable situation where the central bank has not incurred a debt. From this it follows that the conventional deficit must be corrected by the increase in rate-of-exchange losses of the central bank, i. e. by 60 million dinars. The interest revenue, which through the profit of the central bank is included in budgetary revenue, is evidently fictitious income.

In the first year we see that the surplus of interest revenue equals current rate-of-exchange losses. The cumulative rate-of-exchange losses equal, of course, the current losses. The situation is, however, more complicated in the subsequent years. In Table 3 we have presented the impacts of such transactions on the balance sheet and income statement of the central bank in 20 subsequent years. Already in the second year the surplus of interest revenue of the central bank differs from current rate-of-exchange losses. More specifically, the amount of the surplus of the interest revenue of the central bank in domestic currency decreases. This is due to its revenue deriving from domestic loans remains unchanged, and its interest payments on foreign debt, expressed in domestic currency, increase. In our example, after seven years, high nominal interest rates on domestic loans are no longer sufficient to cover low nominal interest payments on foreign exchange debt, because the base on which they are computed has in the meantime become incomparably smaller than the volume of foreign debt. From this moment onwards the central bank must begin to cover these costs of interest payments on foreign debt from other sources. As a result of such transformation of foreign exchange liabilities into domestic loans, the central bank will no longer realize fictitious profit to be transferred to the budget. However, this will not change anything in the fact that the conventional deficit will undervalue the real budgetary deficit. More specifically, although the surplus of interest revenue will not be the same as before, in such a situation interest payments on total fiscal debt will be undervalued.

In the second year, there will also be a difference between current rate-of-exchange loss CERL defined as the foreign debt FL$ multiplied by the difference of the exchange rate (i. e. change in the domestic value of the foreign debt).

$CERL = FL\$ * (ER_t - ER_{t-1})$, which at the same time represents the increase in cumulative rate-of-exchange loss in domestic currency, and the rise in the dollar value of cumulative loss.

$dERL\$ = (L_t/ER_t - L_{t-1}/ER_{t-1})$. This is so because the current rate-of-exchange loss, expressed in domestic currency, contains, on the one hand, the revaluation of losses accumulated in earlier years, and, on the other, the new increase in rate-of-exchange losses in that year. This can be seen in Appendix 1. More specifically, after the first year there is no longer any claim vis-à-vis the part of foreign exchange debt amounting to 23.08 million US dollars (domestic value 60 million dinars). In the course of the second year part of the foreign exchange debt will increase its value in domestic currency, i. e. it will be revalued by 18 million dinars, but it will preserve its value in dollar terms. In addition, rate-of-exchange losses will again occur to an amount of 60 million dinars for the part of the foreign exchange debt which has as a contraposition claim arising from domestic loans. In this way total current rate-of-exchange losses will contain the revaluation of the old loss with the change in the exchange rate, plus the increase in new rate-of-exchange losses on account of that part of the foreign debt which still has a contraposition in domestic claims. Since this part of the foreign debt steadily decreases the dollar amount, the dollar or real value of the increase will also be lower.

The question, therefore arises, for what amount of the central bank's loss due to rate-of-exchange should the budgetary deficit be corrected. If we remain within the framework of the conventional deficit measurement, two solutions are then possible. Let us assume that the budget is not financed from the actually fictitious profit of the central bank, but from a new domestic debt at high nominal interest rates. In such a case, the deficit would in subsequent years, with other conditions remaining unchanged, be larger by the total amount of nominally high interest payments on the debt. Correspondingly, the current deficit should be increased by the overall current rate-of-exchange loss of the central bank in a given year.

If we, however, assumed that an alternative was to finance the deficit from the foreign debt, or from the domestic indexed debt, or that the so-called operational deficit should be applied, then the correction of the current government deficit should be made only for the real increase in central bank losses (i. e. by the increase in the real or dollar amount of the cumulated debt). The problem of whether to correct the government deficit by the total rise in the accumulated loss of the central bank measured in domestic currency, or only for the real increase in this loss is thus similar to the alternative between conventional and operational deficit. This problem, however, will be discussed again in the next chapter.

Until now, we have assumed that the central bank has corrected the decrease in the volume of high-powered money by domestic investments which have had the same real returns as the foreign exchange credits. This would correspond to a situation in which the central bank has increased its assets through open-market operations.

However, it is frequently the case that a central bank gives favourable credits to individual users or for specific purposes. In such cases, the rate-of-

exchange losses of the central bank will not represent a contraposition to the fictitious surplus of the interest revenue of the central bank transferred to the budget but a contraposition of the costs of the quasi-fiscal activities of the central bank, or the costs of the favourable crediting of privileged users. Regardless of whether the rise in the net foreign exchange debt of the central bank is used for its open-market operations or for an increase in selective credits, in both cases the fiscal deficit must be corrected for the rate-of-exchange losses of the central bank.

Needless to say, the above example represents a situation in its simplest form. In this concrete case we assumed that the foreign exchange debt of the central bank had no impact on the current foreign exchange account, but that the private debt abroad was replaced by the debt of the central bank. We further assumed that the change in the nominal exchange rate equalled exactly the rate of domestic inflation, that the real exchange rate was unchanged (the inflation of the American dollar is disregarded), and that the domestic real interest rate paid on loans given by the central bank equalled the real interest rate paid on the foreign debt. All this was assumed for the purpose of simplifying the analysis. However, departures from these assumptions, especially under conditions of high inflation, would not have any major impact on the results obtained.

If, however, the central bank took credits to sustain a high exchange rate of the domestic currency, then it would sooner or later be confronted with real (and not only nominal) rate-of-exchange losses on account of its foreign exchange liabilities, which will occur when the change in the exchange rate is higher than the rate of domestic inflation.

The impact of central bank losses can also be considered from another angle. On the basis of its monopoly of creating high-powered money under normal conditions (without foreign exchange liabilities, without cumulated rate-of-exchange losses) the central bank realizes profits on account of money issue. More specifically, the central bank does not, as a rule, pay any interest on its monetary liabilities, but it does collect interest payments on its domestic assets, even on part of foreign exchange reserves. In the event of inflation, interest revenues increase while at the same time rate-of-exchange profits are realized on account of foreign exchange reserves. A central bank, however, which has net foreign exchange liabilities and a loss in its assets, has, on the one hand, diminished its revenue, and, on the other, increased its costs. Such a central bank has in this way spent in advance its future money issue revenue for servicing the foreign debt.

On Operational Deficit and the Necessary Fiscal Adjustment

Tanzi, Blejer and Teijeiro presented in their paper (1988) arguments in favour of the correction of conventionally measured deficit for the amount of interest payments necessary to maintain the real value of the fiscal debt. Such correction, which was to translate »conventional deficit« into »operational deficit«, had a dual purpose. Operational deficit was understood to mean a kind of »real deficit«, i. e. a deficit which does not incorporate the return of the

debt's real value through nominally high interest rates. The second purpose was to compute the fiscal correction necessary to curb inflation, it being implicitly presumed that a low rate of inflation is feasible only if the »real« deficit is reduced to zero. The so-called operational deficit should, therefore, automatically give the amount of the correction of existing expenditure which would at the given level of revenue be sufficient to bring the budget to a level which would be compatible with the zero rate of inflation. Such a correction of expenditure, which is considerably smaller than the conventional deficit, should in principle be sufficient to bring about a decrease in inflation. This in turn would lower the expenditure on nominally high interest rates, so that as a result, the conventional deficit would fall to zero. True, Tanzi *et. al.* (1988) warn that a really necessary fiscal adjustment could be somewhere between the conventional and operational deficit, which they link to the behaviour of consumers or savers. More specifically, if consumers treated the nominally high interest payments on the fiscal debt as real income, and they spent it, this would diminish their savings and thereby also possibilities for the further financing of the fiscal debt. The authors, therefore, consider that in practice the impact of the fiscal factor on inflation could be greater than the total operational deficit.

In my opinion two problems are mixed up here. Let us consider the case of an economy which, for example, under the impact of an external shock, recorded a rise in inflation while sustaining at zero its operational deficit. Conventionally measured, such an economy would show a fiscal deficit. If households interpreted increased interest revenue as income available for expenditure, leading to a fall in savings, then there would really appear the problem of financing the conventional deficit. But this would happen because households would begin to spend financial capital (dissaving), by which the old fiscal debt was financed, and not because of the government's need for new real funds. Needless to say, a way out of this situation could also lie in government saving, which would be reflected in a decrease in its real debt. However, in such situations it would probably not be accurate to say that zero operational deficit stimulates inflation. It seems useful to make a distinction between an incentive for inflation coming from the fiscal deficit and possible problems of financing the existing real level of the fiscal debt because of low savings (probably even dissaving) in the economy.

In my opinion, however, there are other reasons why it is not likely that a fiscal correction amounting to the above-defined »operational deficit« would be sufficient to eliminate the influence of the budget on inflation. These reasons are due to a certain ambiguity of the definition of the so-called operational deficit. The operational deficit is understood to mean, on the one hand, a kind of »real« deficit, and, on the other, the correction of expenditure required to bring them, together with the eventual effects of the curbing of inflation, to the level of actual tax revenue.

In this connection two questions arise. The first is whether the proposed correction is methodologically consistent. Does it really represent a correct evaluation of »real deficit«, as the part of deficit which does not incorporate interest payments which by their economic essence are not in fact income but mean the amortization of the real principal of the old debt?

The second question is whether a level of expenditure, which at the given tax revenue and a specific rate of inflation ensures a »zero real deficit«, is also the level of expenditure which would guarantee a balanced budget at a zero (or low) rate of inflation.

How to Compute »Real Deficit« or Revenue and Expenditure Incorporating Real Interest Payments Only

First of all, the proposed method of correcting conventional fiscal deficit for interest paid on the debt up to the level of inflation takes only the expenditure side into account. However, a high rate of inflation increases budgetary revenue also, both in nominal and real terms. There is a nominal increase in revenue from interest payments on credits given by the government. Although interest payments on such credits are, as a rule, below the rate of inflation, they nevertheless increase with the rising inflation. If we are interested in »real deficit«, then such interest payments should be excluded on the revenue side. However, according to the conventional methodology, budget expenditure incorporates aggregate increase in such credits (and not only the difference between the interest payments mada by the government and those collected by it). Therefore, it could be said that under inflationary conditions a nominal rise in such credits, which under conditions of inflation in the greatest part reflects the real value of the given stock of credits, represents a contraposition on the expenditure side for the interest revenue from such credits. The asymmetric treatment of debts and credits in the budget creates certain problems in this sphere too. It is consequently possible that in computing »real deficit« we renounce the correction of revenue for interest payments on investments up to the level of inflation.

The question is, however, whether it would be more correct to apply a different treatment of government credit claims in computing »real deficit«. In such a case, it would not be necessary to incorporate in the budget the rise of this credit in the course of the year, but the costs of such creditis would be entered in the budget through the difference between interest payments made by the government on its debt and those it collects on its credits. If we then wished to compute the »real deficit«, interest payments on credits and the debt should be corrected for the inflationary profit or loss on the principal. If we made such a correction, we would see that the real costs (or real interest payments) of the government debt was smaller (possibly even negative), but that the government would at the same time have high inflationary losses or costs (a negative real interest rate) on the credits given by it.

This would enable us to perceive another important impact of inflation on government finance. More specifically, it was found relatively early that by lowering the real value of taxes collected by the government because of delayed collection, inflation contributes to the rise in the fiscal deficit. This is referred to as the self-strengthening impact of inflation. However, there is also a very similar impact of credits given by the government. Such credits are very often given at fixed interest rates, at a level below that prevailing on the market and

below the rate of inflation. Such lower interest rates mean explicit subsidies to credit users. However, the real amount of such subsidies essentially depends on what the future rate of inflation will be. The higher the future rate, the higher the subsidies realized and thereby also the government costs. The specific feature of this form of subsidy lies precisely in the fact that its real amount is not known in advance, and that it essentially depends on the rate of inflation actually recorded. We see, therefore, that the rate of inflation not only diminishes the real value of fiscal tax revenues, but it also increases government losses or costs due to beneficial credits granted by it.

If we computed real government revenue and expenditure in the above-proposed manner, we could more precisely assess the impacts of inflation on the government's financial position.

This could be especially useful in relatively frequent cases, such as the following. Let us assume that a country is compelled to carry out real depreciation of its currency. However, owing to the fact that at the same time this country does not take any anti-inflationary measures, this real depreciation can be effected only through a great nominal depreciation. The inflation occurring in this process destabilizes the government's finance through great losses on account of credits granted by it, on the one hand, and through great rate-of-exchange losses on account of its foreign liabilities and foreign liabilities of its central bank. All of this contributes to the further destabilization of public finance and increases inflation. The self-reinforcing mechanism of inflation reappears again. I am convinced that there is a fairly large number of such countries.

There is another interesting problem in this connection. In the Anglo-Saxon literature considerable attention is paid to so-called seigniorage and the inflationary tax realized by the government on account of its money issue monopoly. A large number of papers have been published regarding the constant rate of inflation at which the government realizes the highest revenue. In other papers it was analyzed whether the government will not achieve an even higher revenue if it constantly changes the rate of inflation, etc. Seigniorage in this connection is defined as a rise in the real volume of high-powered money, and inflationary tax as the rise in high-powered money up to the rate of inflation. In some instances the overall rise in the amount of high-powered money is referred to as seigniorage.

This approach has, however, never taken into account the fact that in modern economies high-powered money is created through open-market operations and not through financing government expenditure. If it were created through the financing of government expenditure, then the government expenditure would actually equal the increased volume of high-powered money. However, when this money is created through credits, it seems to me that it is more accurate to treat the surplus of central bank revenue as government revenue on account of money issue. This surplus derives from the fact that the central bank collects interest on its loans and that it does not pay any interest on cash, not even on its other monetary liabilities. Any possible failure to realize this interest for any reason, and even a possibility of incurring losses on its loans, would evidently lower the government's revenue.

However, in writings on the impact of inflation on the government's revenue from seigniorage, no account is anywhere taken of the fact that a consolidated public sector can fail to realize interest revenue on its financial claims. In this sense, it is, in my opinion, erronecus to treat the total increase in the volume of high-powered money as seigniorage. (In some models it can be shown that these two magnitudes can be equal, but can also differ due to the difference between the real rate of interest and the rate of economic growth).

The second problem in connection with this approach to seigniorage and inflationary tax lies in the fact that it does not take into account that the government also has numerous financial claims through which it incurs inflationary losses. A rise in inflation can, therefore, frequently lead to a greater increase in inflationary losses than to a rise in seigniorage. Thus, for example, S. Fischer (1984) found that the overall impact of the inflationary tax in Israel was for several years negative, because the government's inflationary loss on account of financing claims was greater than its profit on account of the debt. This phenomenon was tried to be accounted for by the difference between the marginal and average revenue from the rise in the volume of high-powered money, but this explanation is not persuasive.

What actually happened can be understood if we look at this problem from the following angle. If the financing of the fiscal deficit from money issue (or simply the absence of anti-inflationary measures) had led to a rise in inflation, and the latter resulted in greater inflationary losses of the government on the side of claims than the profits on the side of liabilities, then the real value of government debt would have increased in relation to the real value of government financial claims. This means that the real value of *net* government debt went up. Therefore, in such a case it cannot be said that the increased government expenditure was financed through greater seigniorage profit. Rather it is more precise to say that it was financed from the larger net government debt.

These arguments speak in favour of the view that it is useful, at least for some purposes, in the statistics of government finance to exclude from expenditure the rise in the credits given, and then to compute »real revenue and expenditure«, which should show how great the real revenue from loans granted by the government are. This would in many situations make it possible to perceive the nature and effects of the inflationary process more precisely, especially in cases when the government makes inflationary profits on its debt and incurs losses on loans given by it.

Required Fiscal Adjustment

The above-deseribed impacts of inflation government interest revenue and expenditure could be denoted as »nominal« because a nominal increase in interest payments need not mean a change in real magnitudes. However, inflation substantially increases one kind of government revenue, and does so in

real terms. This revenue is the accrued profit of the central bank. If we wanted to establish the required fiscal adjustment of the budget, meaning correcting the expenditure in order to bring it to a level which could under non-inflationary conditions be financed from existing fiscal revenue, than we should also include in the correction the substantially lower revenue from the profits of the central bank.

If we now link the effects arising from the amount of interest revenue of the central bank under inflationary conditions, the effects from the foreign exchange debts of the central bank and the problem of eliminating interest payments up to the level of inflation from the expenditure side of the budget, then we could assess the required fiscal adjustment in the following way.

Conventional deficit can be defined as:

$$D = E - T - Pcb + Inom + Ireal,$$

where

D = conventional deficit,
E = primary budgetary expenditure (i. e. without interest),
T = budgetary tax revenue,
Pcb = central bank profit transferred to the budget,
Inom = interest payments up to the rate of inflation,
Ireal = real part of interest payments on budgetary debt.

In a situation, which is not infrequent, where the government pays interest on its debt at a rate below the rate of inflation, the magnitude of *Ireal* will, of course, be negative.

If we assume that fiscal budgetary revenue under conditions without inflation will not change, for a balanced budget at a zero (or low) rate of inflation, the following formula must apply:

$$T - E_o - Ireal_o + Pcb_o - Iforcb = 0$$

where

E_o = primary budgetary expenditure at zero rate of inflation which is in accord with a balanced budget,
$Ireal_o$ = estimated real interest payments on the government debt at the zero rate of inflation,
Pcb_o = estimated profit, without the cost of foreign exchange debt, of the central bank which could be transferred to the budget under non-inflationary conditions,
Iforcb = interest payments on the foreign exchange debt of the central bank.

From this it follows that the required fiscal adjustment is:

$$E - E_o = D + (Pcb - Pcb_o) + Iforcb + (Ireal_o - Ireal) - Inom$$

The fiscal adjustment of expenditure, required to bring it to the level of revenue at the zero rate of inflation, is consequently equal to the conventional deficit, which should be corrected for the following items. Conventional deficit should be increased by the difference between the profit of the central bank

transferred to the budget and the estimated profit which would be realizable at low rates of inflation. This profit would be smaller because interest payments on the domestic loans of the central bank would be considerably lower. As a separate item which would increase the required correction of expenditure we mentioned interest payments on the foreign debt of the central bank.

The question can be asked here why we separately presented the estimated profit of the central bank transferred to the budget and interest payments on the central bank's foreign debt. We did so because in substantial number of cases it will be shown that under conditions of a low rate of inflation the revenue of the central bank would not be sufficient to cover its interest payments. This actually means that instead of the central bank's profit being transferred to the budget, the budget will have to assume the obligation to pay interest on the debt of the central bank (See Appendix 3).

Furthermore, conventional deficit should be increased by the estimated difference between real interest paid by the government on its debt and the interest it would pay under non-inflationary conditions. Very often in inflationary economies the real part of interest paid on government debt is negative. Even when this magnitude is in average terms positive, there may be a part of the debt with respect to which it is negative. A government which strives to curb inflation cannot reckon that it will retain this inflationary profit under conditions of zero or a very low rate of inflation. Precisely because of this, it is likely that expanditure arising from *real* interest payments will be greater than it was in the initial situation. Only after that is it necessary to deduct the part of interest payments on the debt which corresponds to the rate of inflation from the sum of previous items.

The foregoing shows that we cannot arrive at required fiscal adjustment solely by computing the so-called operational deficit.

Conclusion

In this paper we have shown that in order to appraise the impact of the aggregate deficit of the public sector on inflation it is necessary to proceed as follows:

The current deficit of the public sector cannot be correctly measured if it does not incorporate losses of the central bank. These losses are by no means a rare phenomenon. They appear primarily with central banks which have net foreign exchange liabilities and whose domestic currencies are depreciating due to inflation. Exchange rate losses that appear in such cases are frequently not covered by central banks from their revenue, so that a distorted picture is obtained of the deficit of the public sector. This problem has until now not attracted sufficient attention in the professional literature, nor in papers of IMF experts.

For countries with high rates of inflation, it is useful to correct the cost of interest paid on government debt for the effects of inflation. However, it is equally necessary to compute inflationary losses on credits granted by the government, its agencies, and the central bank. In this way an insight can be gained into the impact of inflation on the overall financial position of the government. By comparing the real debt cost (or inflationary profit), inflation-

ary losses on credits, the stated profit of the central bank and its rate-of-exchange losses which are not included in the income statement, it is possible to gain an insight into important characteristics of inflationary processes in individual countries.

The required fiscal adjustment aimed at stabilization, i. e. at reducing expenditure at the given level of tax revenue, which would bring expenditure to a level that would be compatible with a balanced budget at low rates of inflation, cannot be computed by simply deducting interest payments on the government debt at the level of inflation from the conventional deficit. The required correction of expenditure should also be increased by the decrease in the profit of the central bank which will occur under conditions of lower inflation. To this the interest payments on the foreign debt of the central bank should also be added. In a number of countries interest payments on the foreign debt of the central bank will be greater than the profit of the central bank from its domestic operations. Finally, it is also necessary to take into account the difference between real interest now paid by the government on the public debt and the interest it would pay under non-inflationary conditions. In a considerable number of cases, interest payments on domestic debt are below the rate of inflation, but under conditions of stabilization the government will no longer be able to reckon with this inflationary profit.

The adjustment of expenditure assessed in this way will be perhaps overvalued with respect to three elements. First, the reduction of interest payments on domestic loans of the central bank will be partially compensated for by the remonetization of the economy, i. e., by an increase in the real volume of high-powered money, which will make it possible to increase the volume of lending. Second, in the above estimate we did not take into account the fact that the reduction of inflation would result in a decrease in government losses on credits given, or that the need for their nominal growth would decrease. Third, we did not take into account the decrease in government losses due to delayed tax collection.

We could try to correct the above estimate also with respect to these effects. However, we could also consider that all these are profits yet to be realized and that, therefore, the initial fiscal adjustment should be estimated without taking them into account.

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Appendix 1

Survey of impacts on the balance sheet of a central bank which has converted 100 US dollars of foreign exchange debt into domestic loans and which does not cover rate-of-exchange losses.

In this Appendix we shall present the impact of the conversion of foreign exchange liabilities into domestic loans on the central bank's balance sheet, as described in Table 3.

Initial balance sheet

DA=200	FL=200 (100$)

At the end of the first year

DA=200	FL=260 (100$)
L=CERL$_1$=60	

Part of the foreign debt which has as a contraposition a loss = 60 dinars (23. 08 U$)

At the end of the second year

DA=200	FL=338 (100 $)
CERL$_3$=60	
L=60	
CERL$_2$=18	

– New loss on account of foreign debt which at the beginning of the period still had domestic claim as a contraposition

– part of the debt which at the beginning of the period had as a contraposition a loss, at exchange rate at the end of the period

Legend:

DA = domestic credits

FL = foreign debt in domestic currency at current exchange rate

L= loss at the end of the first period

CERL$_1$ – current of rate-of-exchange loss in the first period

CERL$_2$ – revaluation of rate-of exchange losses on account of the part of foreign debt which at the beginning of the period did not have a contraposition in domestic claims

CERL$_3$ – current rate-of-exchange loss on account of that part of foreign debt which at the beginning of the period did not have a contraposition in domestic claims.

In the above scheme we present the mechanism that leads to rate-of-exchange losses of a central bank which sold foreign currency and increased domestic loans. In the first year the current loss in domestic currency (which is, of course, equal to the cumulated loss), is equal to the state of the debt at the beginning of the period

in the foreign currency, multiplied by the change in the exchange rate in the current period.

At the beginning of the second period a part of the foreign debt (now that part of foreign debt which at the beginning had a loss as a contraposition, will be revalued proportionally to the change in the exhange rate, and so will be the corresponding loss. Measured in foreign currencies, the revalued losses accumulated in the preceding period will, naturally, remain the same.

The part of the foreign debt which at the beginning of the period still had a contraposition in domestic claims will become a source of increment of the overall rate of exchange loss measured in foreign currency. This increment will, however, steadily decrease so that accumulated loss measured in the dollar amount will converge to the total foreign debt.

Appendix 2

What happens to the central bank with accumulated losses if it is decreasing its net foreign debt?

Until now we have considered situations in which the foreign debt has not decreased. Let us assume that a central bank buys a certain amount of foreign media of exchange and through this pays a part of the foreign debt. In this case, a contra-position to the loss would no longer be the foreign liability of the central bank, but rather its monetary liabilities. Now the balance sheet situation will be as follows:

DA	FL
L_1	
L_2	M

The fact that part of the losses will no longer have the foreign debt as a contraposition will have the following consequences:

– part of loss L_2 vis-à-vis monetary liabilities of the central bank measured in domestic currency will remain nominally the same, and will fall in terms of foreign currency,

– part of loss L_1 vis-à-vis the foreign debt will maintain its dollar value, and will increase its value in domestic currency,

– the remaining part of the foreign exchange imbalance, i.e. the part of the debt which has domestic claims as a contraposition, will generate further current rate-of-excange losses, which will contribute to a rise in their dollar amount.

The overall effect of these three elements on the real value of accumulated losses (measured, e.g. in US dollars) may be different. A possible decrease in

the real value of accumulated losses will depend on the ratio of the first to the third element.

It should, however, be kept in mind that such a decrease in net foreign exchange liabilities of the central bank, which can then lead to a decrease in the real value of accumulated rate-of-exchange loss, has other effects as well. Purchases of the central bank have, *ceteris paribus*, as a consequence an increase in the volume of high-powered money. If the central bank wishes to neutralize these effects, it must diminish its domestic loans. This will, however, result in a decrease in its interest revenue. Since in the above examples we assumed that the real return on foreign debt and that on domestic loans given by the central bank are equal, the decrease in interest revenue will exactly equal the decrease in current rate-of-excange losses. If, consequently, the central bank offsets the monetary effects of the increase in foreign exchange reserves by decreasing domestic credits, nothing will change in respect to its revenue and costs. However, in view of the fact that the central bank allocates to the budget a position. This would happen not because of an increase in its revenue, or because of a decrease in its expenditure, but due to a decrease in the distribution of the fictitious profit.

Needless to say, it is possible that the central bank will not offset the rise in the volume of high-powered money by a decrease in domestic loans. In such a case, a possible improvement in its net worth would derive from a greater money issue profit. (Effects of the revaluation of increased foreign exchange reserves can also be regarded as an increase in money issue revenue). This would, however, evidently have consequences for the monetary objectives of the central bank.

We should mention here that there is also a possibility that a central bank would increase its money issue revenue at the expense of commercial banks, e.g. by compelling them to hold larger compulsory reserves, on which the central bank does not pay any interest. This would in fact mean that the central bank would begin to cover its losses by taking over the money issue profit of the commercial banks. We shall, however, not analyze this possibility any further here.

Appendix 3

Is it possible that a central bank is no longer able to cover interest payments of foreign debt out of its revenues? What are the monetary consequences?

In connection with the foregoing, the question arises as to whether a central bank can find itself in a situation where it is no longer able to cover interest expenditure by its interest revenue. We have seen in Table 1 that it is relatively frequent that central banks have considerable losses in their assets. For two reasons this need not, however, cause a negative balance of interest

revenue in relation to interest expenditure. The first is that central banks do not pay any interest on cash, nor do they pay it on banks' accounts.

The other reason is that the rates of interest paid on foreign exchange liabilities, and this is, as a rule, the main interest expense of central banks, are nominally low. The rates of intrerest paid on domestic loans can, however, under inflationary conditions be nominally very high. Thus, the central bank can on a smaller part of its assets realize through high interest rates enough revenue to cover interest on the major part of its liabilities, but at lower rates. Another way of intrerpreting this phenomenom is that in such a situation, central banks use part of their money issue profit (i.e. interest payments on domestic loans) to service foreign debt. A central bank which has accumulated rate-of-exchange losses could be considered to have spent its money issue profit in advance.

Let us suppose, however, that the aim is to stabilize the economy and significantly to curb inflation. After the inflation has been curbed, nominal rates of interest paid on domestic loans will have to drop considerably. This will diminish the interest revenue of the central bank, while its interest cost on account of foreign debt will not decrease at the same time. Such a bank could easily come into a situation where it will no longer be able to cover its interest costs. The following is an example of such a situation.

Let us assume that in an imagined country inflation fell to the level of inflation of the currencies in which it has its foreign debt. Let us also assume that the nominal rates of interest paid on foreign debts and domestic investments are equalized. In such a situation the central bank will be able to cover its interest expenditure only if its domestic loans are at least equal to the part of liabilities on which interest is paid (i.e. foreign debt). Then, however, on which no interest is paid. Monetary liabilities of the central bank have in this sense the same character as the bank's capital.

In order to see whether there are central banks whose accumulated losses are greater than their net worth and monetary liabilities taken together, we compared in Table 1 cumulated losses with thus defined »expanded capital« of central banks. Owing to available data, we included only cash in the monetary liabilities of central banks.

As we can see in this Table, among central banks with net foreign exchange liabilities and a devalution of domestic currency, there were as many as 21 banks which had a negative net worth, even when cash in circulation was included in their »expanded capital« (NW2). Among other central banks there has only been one which had a net worth thus defined.

Consequently, in these countries it would most likely happen that after economic stabilization the central bank would have a loss in the income statement, even with

ut further domestic inflation and depreciation of its currency. It should, however, be said that in the above comparison we did not take into account the fact that after stabilization there would be an increase in demand for high-powered money in circulation, so that as a result there could be a rise in

domestic investments and in central bank revenue. However, judging by the high proportion of net losses of the central bank in the gross domestic product (GDP) of some countries, re-monetization would not eliminate the problem.

The question, however, arises as to whether the current losses of central banks on account of interest revenue and expenditure would have any significance, and especially whether they could come into conflict with their monetary functions. In order to understand this problem, we shall assume that the foreign net debt will not change after economic stabilization. However, the central banks will have to buy foreign exchange to pay interest on the foreign exchange debt, and this will lead to the creation of high-powered money. The amount of interest payment will total:

$$I = i\,D = i\,d\,GDP,$$

where *i* is the interest rate on the debt side, and *d* the proportion of foreign debt of the central bank to the gross domestic product. Let us assume that the central bank oreates in this amount high-powered money. In this case the following formula applies:

$$I = \Delta M = i\,d\,GDP$$

$$\frac{\Delta M}{M} = \frac{id}{m}$$

where *m* is the ratio of high-powered money to gross domestic product. Let us assume that the probable value of the interest rate is $i = 0.05$, the value for ratio of the monetary base to GDP in non-inflationary conditions is $m = 0.20$, and the ratio of foreign debt of the central bank to GDP is 40%. Then, only on account of interest payments, there would be an increase in the volume of high-powered money of 10 per cent. At a rate of interest of 8 per cent and with an of *m* of 10 per cent, including the proportion of the central bank's debt of 40 per cent, the expansion of the monetary base will amount to as much as 32 per cent. These examples should only serve as an illustration of the problem. We see, however, that in such cases the government should assume responsibility for covering part of interest payments on the foreign excange debt of the central bank, if it wanted to prevent an excessive rise in the volume of high-powered money.

The situation is somewat different if we also take into account the central bank's revenue from domestic loans. Let us assume that the real volume of high-powered money before economic stabilization is negligibly small, and that the central bank has carried out monetary reform after which it no longer recognizes old banknotes.)

On the assumption that after the stabilization the rate of interest paid on domestic investments will equale the rate of interest paid on foreign debt, it follows that the interest revenue of the central bank will be

$$IR = i\,m\,GDP$$

If the difference between the central bank's interest revenue and expenditure were covered by the creation of high-powered money, then the rise in this money would be:

$$\frac{\Delta M}{M} = \frac{i(d.m)}{m}$$

For values d = 0.40, i = 0.8, m = 0.15 the rise in the volume of high-powered money after stabilization would amount to 12.5 per cent.

The above-given figures only serve as a rough illustration of the problem. It is likely that greater problems would appear in the transitional period of stabilization.

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Table 1 / CENTRAL BANKS WITH NET FOREIGN LIABILITIES

(in millions USD)

	Country	Year	% exchange in exchange rate in last 5 years	Foreign assets	Foreign liab.	Foreign currency deposits	NFA	Other items	Valuat. adjustment	Cap. acc.	difference between	NET WORTH 1
				1	2	3	4 (1-(2 + 3))	5	6	7	8	9 (5+7+8)
1	BOLIVIA	86	9614900.0	500.78	554.86		-54.08	-344.25		0.00		-344.25
2	ARGENTINA	86	174483.3	7062.05	9246.62		-2184.57	6723.95		1987.27	-11089.10	-2377.88
3	BRAZIL	85	14885.7	16282.17	23698.76		-7416.59	-3203.05		0.00		-3203.05
4	ISRAEL	87	4426.5	6092.92	29.24	6445.09	-381.42	629.63		0.00		629.63
5	GHANA	86	3175.7	1018.76	1616.16		-597.40	-250.19		0.00		-250.19
6	S. LEONE	86	2930.6	6.52	248.40		-241.88	-226.51	-198.47	0.00		-226.51
7	ZAIRE	87	2188.5	399.85	1129.22		-729,38	796.76		-874.47		-77.71
8	YUGOSLAVIA	87	1890.8	2575.56	6364.79	11766.16	-15555.39	-15307.40		0.00		-15307.40
9	UGANDA	86	1547.1	29.21	256.49		-227.28	-398.34	511.08	0.00		-398.34
10	URUGUAY	86	1461.2	1.16	2.16		-1.00	-0.62		0.00		-0.62
11	SOMALIA	86	1337.6	19.81	272.42		-252.61	-220.62		17.87		-202.75
12	ZAMBIA	86	1266.7	71.30	1233.07		-1161.77	-759.93		0.00		-759.93
13	TANZANIA	87	775.1	31.75	468.59		-436.84	-112.45		0.00		-112.45
14	ECUADOR	87	568.2	282.56	2124.68		-1842.12	-1716.21		43.90		-1672.32
15	TURKEY	87	446.7	5382.51	16177.88		-10795.38	-328.14		240.96		-87.18
16	DOMINIC. REP.	87	396.0	183.87	1695.50		-1511.63	-1564.25		-18.19		-1582,44
17	SUDAN	87	246.5	14.92	1873.28		-1858.36	-102.50	-1315.39	28.46		-1389.43
18	GUYANA	87	233.3	8.43	547.33		-538.90	-184.03		65.64		-118.39
19	CHILE	84	228.8	3141.77	4211.63	123.21	-1193.08	5850.90		1354.49		6705.40
20	JAMAICA	87	208.7	169.05	1172.36		-1003.31	-1455.84		58.35		-1397.49

Table 1 / CENTRAL BANKS WITH NET FOREIGN LIABILITIES

21	MADAGASCAR	86	167.9	114.05	1339.32		-1225.26	-801.72		11.99		-789.73
22	GAMBIA	87	159.9	20.91	88.54		-67.63	-112.32	-82.09	8.82		-103.50
23	GUATEMALA	87	150.0	156.44	495.76		-339.32	-664.16		53.68		-610.48
24	PHILIPPINES	87	126.8	2013.46	2720.67		-707.21	-2180.77		0.00		-2180.77
25	EL SALVADOR	87	100.0	279.60	400.60		-121.00	-237.00		105.60		-131,40
26	MALAWI	87	87.2	51.85	152.43		-100.58	-81.83		0.00		-81.83
27	COSTA RICA	87	72.0	512.40	2248.43		-1736.03	-2333.04	-2333.04	74.74	1053.08	-1205.21
28	MAURITANIA	86	51.4	50.12	28.601		-78.48	-78.17		51.47		-26.70
29	SRI LANKA	87	44.3	312.71	343.63		-30.91	2.18		433.44		435.62
30	NICARAGUA	83	43.0	158.41	1716.05		-1557.64	-403.25		26.75		-376.51
31	KENYA	87	29.8	287.80	407.27		-119.47	830.94		54.38		23.43
32	BANGLADESH	87	29.6	934.39	959.94		-25.54	-13.78		128.43		114.65
33	MOROCCO	87	24.5	429.60	1190.21		-760.61	-203.33		0.00		-203.33
34	HUNGARY	87	17.1	3530.08	15937.01		-12406.92	-6715.24		405.93		-6309.31
35	EQUAT. GUINEA	87	6.3	0.56	22.51		-21.95	-18.80		0.00		-18.80
36	RUMANIA	86	1.9	693.06	971.86	5.89	-284.69	54.32		0.00		54,32
37	PANAMA	85	0.0	98.00	669.60		-571.60	-197.10		108.60		-88.50
38	LIBERIA	87	0.00	0.51	327.03		-326.52	-52.63		20.05		-32.58
39	EGYPT	87	0.0	3780.08	9398.76		-5618.68	681.44		0.00		681.44
40	SYRIAN AR. R	86	0.0	599.24	2858.09		-2258.85	-61.66		47.13		-14.52
41	HAITI	84	0.0	29.16	241.44		-212.28	-34.34		57.30		22.96
42	HONDURAS	87	0.00	130.95	599.45		-468.50	-190.70		165.60		-25.10
43	BURMA	86	-4.8	56.82	167.77		110.95	804.74		0.00		804.74
44	SENEGAL	87	-20.6	9.21	661.09		-651.87	39.51		0.00		39.51

Table 1 / CENTRAL BANKS WITH NET FOREIGN LIABILITIES

45	MALI	87	-20.6	15.84	137.68		-121.84	42.62		0.00		42.62
46	CÔTE d'IVOIRE	87	-20.6	8.99	1206.37		-1197.38	128.09		0.00		128.09
47	CAMEROON	87	-20.6	78.31	549.18		-470.86	91.12		0.00		91.12
48	CONGO	87	-20.6	8.80	120.75		-111.95	18.01		0.00		18.01
49	BENIN	87	-20.6	1.60	136.37		-132.77	12.77		0.00		12.77
50	GABON	87	-20.6	18.24	124.83		-106.59	-18.13		0.00		-18.13

Table 2 / CENTRAL BANKS WITH NET FOREIGN ASSETS AND NEGATIVE NET WORTH

millions of US Dollars

	Country	Year	Capital accounts	Other items	Currency	NW1	NW2	NW1/GNP	NW2/GNP	NW3/GNP
			1	2	3	4 (1 + 2)	5 (4 + 3)	6	7	8
1	ANTIGUA AND BARBUDA	86	0.00	-0.71	12.02	-0.71	11.31	-0.00	0.06	-0.01
2	BARBADOS	86	15.37	-49.58	68.29	-34.22	34.08	-0.03	0.03	0.03
3	BELIZE	86	0.00	13.29	12.95	13.29	26.24	0.07	0.13	-0.02
4	DOMINICA	87	0.00	0.70	7.69	0.70	8.39	0.01	0.07	-0.10
5	GREECE	87	0.00	1712.13	5093.51	1712.13	6805.64	0.04	0.16	-0.00
6	INDIA	86	3565.01	6947.87	20423.72	10512.88	30936.60	0.05	0.14	0.02
7	IRAN	83	2476.15	1463.23	19928.31	3939.38	23867.70	0.03	0.15	0.05
8	ITALY	87	0.00	55985.63	46001.03	55985.63	101986.66	0.09	0.17	0.02
9	JAPAN	86	0.00	-30923.38	164663.73	-30823.38	133840.35	-0.02	0.09	0.05
10	JORDAN	86	0.00	-376.69	1696.78	-376.69	1320.10	-0.09	0.32	0.17
11	KOREA	87	0.00	-5598.89	5607.72	-5598.89	8.84	-0.05	0.00	0.01
12	LIBYA	86	0.00	-2511.21	3261.51	-2511.21	750.30	-0.12	0.03	0.04
13	MALDIVES	85	0.94	-4.33	9.61	-3.39	6.22	-0.07	0.12	-0.32
14	MEXICO	86	0.00	4916.08	3321.06	4916.08	8237.14	0.03	0.05	-0.02
15	SOUTH AFRICA	87	0.00	-921.36	2603.96	-921.36	1682.60	-0.01	0.03	0.04
16	SPAIN	86	2885.20	-5234.14	18172.21	-2348.94	15823.26	-0.01	0.08	-0.02
17	SURINAM	86	27.77	95.50	252.82	123.27	376.10	0.13	0.38	-0.46
18	SWEDEN	87	0.00	8975.72	0.00	8975.72	8975.72	0.07	0.07	-0.06
19	USA	87	0.00	-2500.00	199400.00	-2500.00	196900.00	-0.00	0.04	-0.01
20	YEMEN (ARAB REP.)	85	20.62	269.51	1930.00	290.12	2220.12	0.07	0.54	-0.07
21	YEMEN, PDR	87	0.00	61.18	867.55	61.18	928.72	0.06	0.97	-0.87
22	ZIMBABWE	86	0.00	-177.52	226.26	-177.52	48.74	-0.03	0.01	-0.00

Source: International Financial Statistics, yearbook 1988, with exception for

GNP: The World Bank Atlas 1987, 1988

GDP instead GNP: Iran, IFS 1988

Table 3 / BRANCH STRUTURE OF EQUIPMENT INVESTMENT IN THE CROATIAN INDUSTRY FROM 1978 TO 1987

Effects of foreign debt, when foreign currency is sold, and monetary effects compensated for by an increase in domestic loans, on the balance sheet and income statement of the central bank that is distributing interest revenus surpluses and not covering exchange rate losses.

		Baiance sheet				Income statement							
t	ER	DA	FL$	FL	L	R	C	NII	NII/ER	CERL	CERL/ER	ERL\	CUERL$
0	2.00	200	100	200.00	0.00	-	-	-	-	-	-	-	-
1	2.60	200	100	260.00	60.00	73	13.00	60.00	23.08	60.00	23.08	23.08	23.08
2	3.38	200	100	338.00	138.00	73	16.90	56.10	16.60	78.00	23.08	17.75	40.83
3	4.39	200	100	439.40	239.40	73	21.97	51.03	11.61	101.40	23.08	13.65	54.48
4	5.71	200	100	571.22	371.22	73	28.56	44.44	7.78	131.82	23.08	10.50	64.99
5	7.43	200	100	742.59	542.59	73	37.13	35.87	4.83	171.37	23.08	8.08	73.07
6	9.65	200	100	965.36	765.36	73	48.27	24.73	2.56	222.78	23.08	6.22	79.28
7	12.55	200	100	1254.97	1054.97	73	62.75	10.25	0.82	289.61	23.08	4.78	84.06
8	16.31	200	100	1631.46	1431.46	73	81.57	-8.57	-0.53	376.49	23.08	3.68	87.74
9	21.21	200	100	2120.90	1920.90	73	106.04	-33.04	-1.56	489.44	23.08	2.83	90.57
10	27.57	200	100	2757.17	2557.17	73	137.86	-64.86	-2.35	636.27	23.08	2.18	92.75
11	35.84	200	100	3584.32	3384.32	73	179.22	-106.22	-2.96	827.15	23.08	1.67	94.42
12	46.60	200	100	4659.62	4459.62	73	232.98	-159.98	-3.43	1075.30	23.08	1.29	95.71
13	60.58	200	100	6057.50	5857.50	73	302.88	-229.88	-3.79	1897.89	23.08	0.99	96.70
14	78.75	200	100	7874.75	7674.75	73	393.74	-320.74	-4.07	1817.25	23.08	0.76	97.46
15	102.37	200	100	10237.18	10037.18	73	511.86	-438.86	-4.29	2362.43	23.08	0.59	98.05
16	133.08	200	100	13308.33	13108.33	73	665.42	-592.42	-4.45	3071.15	23.08	0.45	98.50
17	173.01	200	100	17300.83	17100.83	73	865.04	-792.04	-4.58	3992.50	23.08	0.35	98.84

Table 3 / BRANCH STRUTURE OF EQUIPMENT INVESTMENT IN THE CROATIAN INDUSTRY FROM 1978 TO 1987

18	224.91	200	100	22491.08	22291.08	73	1124.55	-1051.55	-4.68	5190.25	23.08	0.27	99.11
19	292.38	200	100	29238.41	29038.41	73	1461.92	-1388.92	-4.75	6747.32	23.08	0.21	99.32
20	380.10	200	100	38009.93	37809.93	73	1900.50	-1827.50	-4.81	8771.52	23.08	0.16	99.47

Explanation of the symbols:

t – end of year:

ER – exchange rate:

DA – domestic assets;

FL$ – foreign liabilities in USD;

FL – foreign liabilities, value in domestic currency;

L = (FL$*ER-DA) cumulated exchange rate loss (»revaluation adjustment«), value in domestic currency;

R – interest revenue on domestic assets;

C – interest cost on foreign debt;

NII – net interest income, value in domestic currency;

NII$ = NII/ER – net interest income, value in USD;

CERL = $FL\$(ER_t-ER_{t-1})$ current exchange rate loss;

CERL/ER – current exchange rate loss, value in USD;

CERL$ = $(L_t/ER_t) - (L_{t-1}/ER_{t-1})$ increase in dollar value of cumulated exchange rate loss;

CUERL$ = L/ER cumulated exchange rate loss in USD

Assumptions:

– yearly rate of inflation 30%,

depreciation 30%, interest on foreign

debt 5%, interest rate on

domestic assets $(1.3*1.05 - 1) = 36.5\%$

Table 4.

Same effects at the central bank that is using interest revenue surplus to cover exchange rate loss

	ER	DAt	Lt	FL$	FLt	Rt	Ct	NII	CERL	NI
0	2.00	200.00	0.00	100	200.00	-	0.00	0.00	-	-
1	2.60	260.00	0.00	100	260.00	73.00	13.00	60.00	60.00	0
2	3.38	338.00	0.00	100	338.00	94.90	16.90	78.00	78.00	0
3	4.39	439.40	-0.00	100	439.40	123.37	21.97	101.40	101.40	0
4	5.71	571.22	-0.00	100	571.22	160.38	28.56	131.82		0
5	7.43	742.59	-0.00	100	742.59	208.50	37.13	171.37	171.37	0
6	9.65	965.36	-0.00	100	965.36	271.04	48.27	222.78	222.78	0
7	12.55	1254.97	-0.00	100	1254.97	352.36	62.75	289.61	289.61	0
8	16.31	1631.46	-0.00	100	1631.46	458.06	81.57	376.49	376.49	0
9	21.21	2120.90	-0.00	100	2120.90	595.48	106.04	489.44	489.44	0
10	27.57	2757.17	-0.00	100	2757.17	774.13	137.86	636.27	636.27	0
11	35.84	3584.32	-0.00	100	3584.32	1006.37	179.22	827.15	827.15	0
12	46.60	4659.62	-0.00	100	4659.62	1308.28	232.98	1075.30	1075.30	0
13	60.58	6057.50	-0.00	100	6057.50	1700.76	302.88	1397.89	1397.89	0
14	78.75	7874.75	-0.00	100	7874.75	2210.99	393.74	1817.25	1817.25	0
15	102.37	10237.18	-0.00	100	10237.18	2874.28	511.86	2362.43	2362.43	0
16	133.08	13308.33	-0.00	100	13308.33	3736.57	665.42	3071.15	3071.15	0
17	173.01	17300.83	-0.00	100	17300.83	4857.54	865.04	3992.50	3992.50	0
18	224.91	22491.08	-0.00	100	22491.08	6314.80	1124.55	5190.25	5190.25	0
19	292.38	29238.41	-0.00	100	29238.41	8207.24	1461.92	6747.32	6747.32	0
20	380.10	38009.93	-0.00	100	38009.93	10672.02	1900.50	8771.52	8771.52	0

Legend: NI – Net income; The rest as in Table 3.

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