

Institut für Höhere Studien (IHS), Wien
Institute for Advanced Studies, Vienna

Reihe Osteuropa / East European Series

No. 21

**FISCAL DEFICITS, MONETARY REFORM AND
INFLATION IN TRANSITION ECONOMIES:
THE CASE OF BULGARIA**

Nina Budina and Sweder van Wijnbergen

**Bestellen Sie jetzt: Codex. Die neue
Publikationsreihe über die Rechtslage
in den Reformstaaten Ungarn,
Polen, Slowenien, Tschechien
und Slowakei.**

Ja, senden Sie mir ein Codex-Jahresabonnement:
☐ Zwei Länderanalysen: öS 7.480,- (inkl. MWSt) ☐ Eine Länderanalyse: öS 4.290,- (inkl. MWSt)
☐ Alle vier Länderanalysen (Ungarn, Polen, Slowenien, Tschechien und Slowakei): öS 11.000,- (inkl. MWSt) ☐ Drei Länderanalysen: öS 8.800,-
☐ Ungarn ☐ Polen ☐ Slowenien ☐ Tschechien und Slowakei

Name: _____
Adresse: _____

Kupon einsenden an: Bank Austria
Auslandgeschäftsstelle 2 (8529)
Postfach 35
A-1011 Wien

Bank Austria

Fiscal Deficits, Monetary Reform and Inflation in Transition Economies: The Case of Bulgaria

Nina Budina and Sweder van Wijnbergen

Reihe Osteuropa/ East European Series No. 21

March 1995

Nina Budina
CERGE and University of Amsterdam
Tinbergen Institute Amsterdam
Netherlands Research Institute
and Graduate School for Economics
Keizersgracht 482
NL-1017 EG Amsterdam
Phone: +31-20-551-3500
Fax: +31-20-551-3555
e-mail: budina@ihssv.wsr.ac.at

Sweder van Wijnberger
University of Amsterdam
Roeterstraat 11
NL-1018 WB Amsterdam

**Institut für Höhere Studien (IHS), Wien
Institute for Advanced Studies, Vienna**

Comments

The authors thank the European Commission for financial support through the ACE program.

Abstract

We develop a simple integrated framework to assess consistency between fiscal policy, monetary reform and inflation. The framework is designed to be applicable in transition economies, where reliable data are at a premium and the financial sector in a state of flux. The model is applied to Bulgaria and is used to assess the impact of financial reform, debt management and external debt relief on the relation between fiscal deficits and sustainable inflation. We also discuss the impact of a transition to market rate of interest on foreign and domestic debt, of a recovery of real output growth and delays in fiscal adjustment.

1. Introduction

Problems with bringing inflation under control have been a hallmark of the adjustment experience of almost all countries in transition. Some have had success (the Czech republic, Slovenia, Albania, to a lesser extent Poland), some have failed spectacularly (the Ukraine, Russia) and many muddle through precariously (most Balkan countries). In the absence of debt markets in most countries, fiscal deficits broadly defined have been a direct input into the money creation that has fuelled inflation. Thus, assessing the consistency between fiscal and monetary policies is crucial in understanding what is necessary to stabilize inflation in the long run.

But developing a quantitative approach to what consistency amounts to is obviously difficult because of the problematic quality of the available data and the rapidly shifting economic structure. In this paper we develop a very simple framework designed to minimize the problems just mentioned. Data requirements are kept to a minimum by focusing on medium term consistency relations at the expense of short term predictive power. Moreover, since most of the empirical work required is in the financial area where markets operate much faster than in commodities markets, the relatively short period of time that has passed since price liberalization is less of a problem.

We demonstrate the framework by assessing the fiscal policy stance in Bulgaria, a country that fits in the precariously muddling through category, but may well slip into high inflation. Many issues that are familiar from other countries show up here, making the case of wider interest than just as a specific case. The huge external debt burden is one of the major sources generating fiscal and inflationary pressures in the Bulgarian economy and, therefore, debt-management policies must have an important place in devising macroeconomic policy. Financial sector reform has taken place, changing the relation between asset demands and base money, and thus the link between fiscal deficits and inflation. Debt issue has been promoted using costly fiscal incentives, thus raising the cost of public debt substantially above recorded interest rates. Low growth undermines seigniorage, pushing up inflationary pressure for any given deficit, which in turn might jeopardise growth further; and so on.

In what follows we first outline the theoretical framework employed. We then describe the empirical preliminaries, in particular the results of estimating asset demand equations (Section 2). In section 3, the model is put together and applied to a series of

issues most of which have mentioned in the preceding paragraphs. Section 4 concludes.

2. A Theoretical framework.

This paper presents a simple framework which links debt, deficit and inflation with an application to the Bulgarian economy. The objective is not to develop a forecasting model assessing short term inflation outlook; the focus is much more on the medium run consistency between fiscal policy, inflation, financial structure and reforms, and debt management. A key design feature is parsimonious data requirements, for obvious reasons. A second necessary feature should be the ability to capture the type of monetary reform transition economies are going through; otherwise much of the analysis would suffer from structural instability.

In the model the primary deficit is taken to be a policy parameter. Debt management is summarized by targets for the debt to GDP ratio for foreign and for domestic debt. Implicit in this approach is the view that lenders will impose such a constraint because potential tax revenue, the ultimate source from which debt will need to be serviced, is obviously limited as a share of GDP (Kharas (198*)). Base money growth, for any given inflation target, is endogenously determined by the path of the primary deficit, debt policy, the real rate of interest, the financial structure and the growth rate of GDP. The model is designed to indicate whether any given inflation target is consistent with the other policy parameters and structural characteristics of the economy; alternatively, consistency can be imposed which yields the inflation rate consistent with structural stability, other policy variables and the financial structure of the economy.

The model A starting point for the analysis is the government budget constraint:

$$D + iB + i^*B^*E = \dot{B} + \dot{B}^*E + D\dot{C}_g \quad (1)$$

A "." above a variable indicates absolute changes in that variable. On the left are the funding requirements: the public sector primary deficit plus the interest payments on the domestic and foreign debt; on the right the different sources of financing: domestic debt issue, foreign borrowing and domestic credit to the government. To make the link between credit growth and base money creation, it is necessary to integrate the Central Bank with the fiscal authorities (cf Anand and van Wijnbergen (1989)). After subtraction and addition of the net foreign assets of the Central bank from the RHS, and taking into account that:

$$\dot{D}\dot{C}_g + N\dot{F}A.E = \dot{M} \quad (2)$$

the budget constraint can be rewritten in the following way:

$$D + iB + i^*(B^* - NFA^*)E = \dot{B} + (\dot{B}^* - N\dot{F}A)E + \dot{M} \quad (3)$$

Note that integration of the Central Bank requires a switch to a net concept of foreign debt, foreign debt minus net foreign assets of the Central Bank.

With debt policy defined in terms of target debt output ratios, real increases in debt are tied to the growth rate of real GDP, n :

$$\begin{aligned} \Delta(B/P) &= n(B/P) \\ \Delta\left(\frac{(B^* - NFA)E}{P}\right) &= n\left(\frac{(B^* - NFA)E}{P}\right) \end{aligned} \quad (4)$$

Δ indicates the absolute change in the expression that follows (like a dot above a single variable). Y is real GDP.

Substituting eq. 4 into (3), using some standard identities linking nominal changes to real changes and inflation, dividing by Y , and collecting terms allows us to derive a measure of the difference between funding requirements and funding sources given the target debt-output ratios. We label this difference, expressed as a percentage of GDP, rdr for Required Deficit Reduction:

$$rdr = [d + rb + (r^* + \hat{e})(b^* - nfa^*)e] - [nb + n(b^* - nfa^*)e + nm + \pi m] \quad (5)$$

r and r^* stand for domestic and foreign real interest rates respectively, and e is the real exchange rate $P/(EP^*)$. Lower case variants of variables already defined as upper case indicate the corresponding ratios to GDP. For example b is the ratio of domestic debt to GDP, $B/(PY)$. The first term between square brackets stands for the actual public sector deficit, inclusive of real interest payments on domestic and (net) foreign debt. The second term stands for the financeable deficit using the two constraints for the growth rate of the domestic and foreign debt (it should not grow faster than the growth of the real resources available for its servicing) plus the resources collected through the increase in the monetary base (seigniorage). n is the real growth rate of the economy and π the target

inflation rate. $(n+\pi)m$ equals the real value of the nominal increase in base money, dM/P .

Seigniorage revenues $(n + \pi)m$ in turn are a function of the inflation rate, reserve requirements, liquidity requirements and asset demands.¹ The monetary base m equals all interest free net public sector liabilities - i.e. currency in circulation and commercial bank reserves held in the central bank minus any claim the Central Bank has on the non-government sector.

Under a fractional reserve system, demand for monetary base equals:

$$\frac{M_0}{PY} = \frac{Cu}{PY} + \sum_{i=1}^n RR_{D_i} \frac{D_i}{PY} \quad (6)$$

M_0 is the monetary base, P is the price level and Y is real income (GDP). D_i are commercial bank deposits against which reserves have to be held at the Central Bank (in Bulgaria's case $n=4$: demand, time, savings and foreign currency deposits). RR_{D_i} are the respective reserve requirements against these deposits. CU is currency in circulation.

To evaluate the monetary base as a function of the variables mentioned we need expressions for the various asset demands. In standard portfolio theory fashion, these are a function of interest rates on the various deposits and inflation.

Empirical preliminaries for Bulgaria The more technical aspects of the data used are outlined in Annex 1; one point bears mentioning, however, on measuring the cost of domestic debt. Treasury bills have an unusual tax treatment, in that not just interest income, but also moneys spent on purchasing the principal can be deducted from taxable income. This implies that a substantial part of the return is paid out in the form of tax concessions. Thus, the corrected real interest is:

$$\begin{aligned} (1+rr^1) &= \frac{(1 + \hat{i})(1 + \tau)}{(1 + \hat{P})} = \frac{(1 + rr)(1 + \hat{P})(1 + \tau)}{(1 + \hat{P})} \\ &= (1 + rr) * (1 + \tau) \end{aligned} \quad (7)$$

Since this tax measure was only initiated in 1993, the impact is not yet felt in the cash deficit of that year; we adjusted the deficit accordingly.

Estimation of Base Money Demand Through the fractional reserve system, base money

¹ See Ritu Anand and Sweder van Wijnbergen, "Inflation and the Financing of Government Expenditure: an Introductory Analysis with an Application to Turkey", World Bank Economic Review, vol. 3, #1, pp.17-38.

depends on demand for the various assets offered by the banking system and on demand for cash balances. We therefore start with econometric estimation of the demand functions for Currency in circulation, Demand Deposits, Time Deposits, Savings Deposits and Foreign Currency Deposits. The results are given in table 3.1.

Table 3.1. The Estimates of the financial sector portfolio model for the Bulgarian economy, with the assumption of unitary income elasticity.

DEPENDENT VARIABLE	Const	Dummy	$\ln(CPI/CPI(-1))$	$\ln(1+r_{TD})$	$\ln(1+r_{FD})$	$\ln(1+i_{FD})$	Trend
$\ln(Cu/PeY)$ $R^2=.97$ DW=2.53 1990.1-1993.4	0.0204 (0.15)	-0.6189 (-1.28)	-1.2537 (-3.11)	-1.3567 (-9.29)			-.0328 (-5.50)
$\ln(DD/PeY)$ $R^2=.98$ DW=2.23 1990.1-1993.4	1.4948 (8.62)	-1.1047 (-1.75)	-1.2518 (-2.39)	-1.8013 (-9.49)			-.0812 (-10.47)
$\ln(SD/PeY)$ $R^2=.985$ DW=1.986 1990.1-1993.4	1.9644 (10.72)	-0.7592 (-1.14)	-1.8676 (-3.38)	-2.2679 (-11.3)			-.0851 (-10.39)
$\ln(TD/PeY)$ $R^2=.96$ DW=1.9 1990.2-1993.4	-2.1075 (-6.07)	4.0339 (2.38)	-2.5123 (-2.06)	0.7019 (2.67)	-2.219 (-3.48)		.0688 (6.00)
$\ln(FD/PeY)$ $R^2=.924$ DW=3 1990.2-1994.1	-0.0516 (-0.41)		-1.1228 (-2.60)			0.61328 (2.06)	-.3141 (-3.81)

* The numbers in brackets are the t values of the regression.

The sample period includes quarterly data for the period 1990.1 - 1993.4, except for the time and foreign currency deposits equations; these were estimated for the period of 1990.2 - 1993.4 because of data availability problems. The table shows that, except for time deposits, all the asset equations have a significant negative time trend, reflecting the gradual shift out of cash into interest-bearing assets. The signs of the various interest variables accord with common sense: a negative impact of time deposit rates on savings deposits, demand deposits, and currency, and a positive impact on time deposits; a negative impact of the real interest rate on foreign currency on time deposits, but a positive impact on foreign currency. The "liberalization dummy" captures the effect of a series of measures initiated in the first quarter of 1991, the most important of which are price liberalization and an end to restrictions on holdings of foreign currency deposits. That date also marks the transition to high interest rates.

3 Deficits, Inflation and Financial Sector Reform in Bulgaria

The model developed in section 2 is applied to an analysis of inflation, public sector deficits and financial sector reform in Bulgaria. In the first part (section 3.1), we look at the basic inconsistencies prevailing at the end of 1993. We then analyse the fiscal impact of the recently concluded external debt restructuring deal and finally analyse the financial reforms introduced in 1994.

3.1. Inflation and the Consistency of Fiscal policy.

Table 1 summarises the results of using the model to assess potential revenues from seigniorage and the inflation tax for various inflation rates. This table presents the demand for currency, demand deposits, time deposits, savings deposits, and foreign currency deposits for various inflation rates. These asset demands are derived by using the estimated functions, reported in section 2, as well as base year data for the inflation rate and different assets to GDP ratios. We then compute the demand for base money as a function of the reserve requirements for the correspondent assets. The next column presents the inflation tax revenue, while the final lists total revenue from seigniorage.

The results indicate a very high sensitivity of the monetary base to inflation; demand falls increasingly rapidly with rising inflation. Of course the increasing elasticity is a feature of the semi-logarithmic functional form used in the estimation. But the increase is unusually rapid. As a consequence, the inflation tax is of course increasing with the rise of inflation initially, but at a declining marginal rate, until the maximum is reached at 5.22% of GDP for a very low revenue maximizing rate of 120% per annum. This is indeed relatively low; studies in Latin America tend to come up with a revenue maximizing rate of 300% or higher. This result indicates the limited fiscal leeway the authorities in Sophia have and explains at least partially why inflation has been so difficult to bring down.

Table 1: Inflation Tax and Seigniorage at Various Inflation rates (percent of GDP)

Inflation rate	DEMAND FOR					Base money	Inflation tax	Seigniorage
	Currency	Deposits						
		Demand	Time	Savings	Foreign			
0	12.34	11.27	100.01	18.62	17.47	22.65	0.00	-0.95
10	10.95	10.00	78.81	15.58	16.66	19.42	1.85	1.00
20	9.82	8.97	63.40	13.25	15.94	16.92	3.09	2.31
30	8.88	8.11	51.90	11.41	15.31	14.95	3.93	3.22
40	8.09	7.39	43.12	9.93	14.75	13.36	4.51	3.85
50	7.42	6.78	36.29	8.73	14.25	12.04	4.92	4.30
63.9	6.64	6.07	29.08	7.40	13.63	10.57	5.28	4.71
70	6.34	5.80	26.54	6.91	13.38	10.03	5.38	4.83
80	5.90	5.40	23.01	6.21	13.00	9.24	5.51	4.99
90	5.52	5.04	20.10	5.62	12.65	8.56	5.59	5.09
100	5.17	4.73	17.68	5.10	12.33	7.96	5.63	5.16
110	4.87	4.45	15.65	4.66	12.03	7.44	5.65	5.20
120	4.59	4.20	13.93	4.27	11.75	6.98	5.65	5.21
130	4.34	3.97	12.47	3.93	11.49	6.57	5.63	5.22

Next we look at the implications for the current fiscal stance, using the actual data for 1993, but accounting for the impact of the tax concessions on the real interest rate on the domestic debt. For reasons explained earlier, we impose a ceiling equal to the current (i.e. end of 1993) values on the domestic and foreign debt-to-output ratios.

Table 2 is constructed for the actual ex post real interest rate on domestic debt (0.8%, the weighted average of the interest rates on long term bonds and short term Treasury Bills) and the approximated real interest rate on foreign debt in the base year 1993. We also assume continuation of the actual real exchange rate depreciation in the base year, 2 percent. Finally we do incorporate in our deficit definition the consequences of the tax concessions granted to buyers of Treasury paper that we discussed earlier. The table presents the financeable deficit, the actual real 1993 deficit, and the Required Deficit Reduction (rdr) for various inflation rates. A minus sign for financeable and actual real deficits indicate a surplus, whereas a positive sign indicates a deficit respectively. Figure 1 shows the change of the required deficit reduction as a function of target inflation.

Table 2 The financeable deficit, actual deficit and rdr for various inflation rates (percent of GDP).

Inflation rate	Financeable deficit	Actual deficit	Required Deficit Reduction
0	-4.93	-4.66	0.27
10	-2.98	-4.66	-1.68
20	-1.66	-4.66	-3.00
30	-0.76	-4.66	-3.90
40	-0.12	-4.66	-4.54
50	0.32	-4.66	-4.98
63.9	0.73	-4.66	-5.39
70	0.86	-4.66	-5.52
80	1.01	-4.66	-5.67
90	1.12	-4.66	-5.78
100	1.18	-4.66	-5.84
110	1.22	-4.66	-5.88
120	1.24	-4.66	-5.90
130	1.24	-4.66	-5.90

On the face of it, all this looks rather good; if this was indeed Bulgaria's fiscal position, all but a zero inflation rate would have been consistent (with some to spare) with the current fiscal stance. Of course if this indeed were the case, one would reasonably wonder why Bulgaria's actual inflation has been stubbornly refusing to come down. However, the actual situation is in fact much worse. At

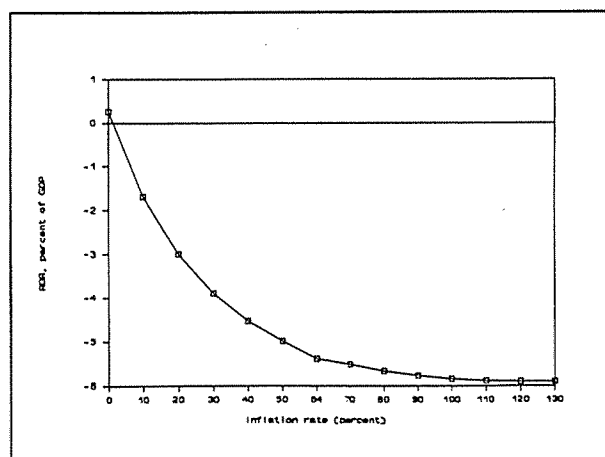


Figure 1

issue here is the fact that both the domestic and the foreign debt currently carry interest rates far below market rates. The assumption implicit in the analysis so far, that all debt coming due can be refinanced at that same below market rate, is patently unrealistic. In

fact at least on domestic debt the government may already be paing more than the records show: the low interest component consists of long term bonds issued to the banking system at below market rates. But since the losses of those banks in the end come back to the government either via subsidies or renewed recapitalization expenses, what is saved on low interest rates is lost on higher subsidies needed. For medium term sustainability, an analysis assuming full market rates on all debt is thus obviously called for.

The effects of a transition to market interest rate on foreign and domestic debt are presented step-by-step in table 3. The first column of the table presents the current situation. The second column calculates the effects of switching to market rates on all domestic debt, where we take the current cost of Treasury Bill financing as the indication of market rates. The final column presents the required deficit reduction under assumptions of a 45 percent market real interest rate on domestic debt and a 5 percent real interest rate on foreign debt. A comparison between the rdr's points at the hidden inconsistencies in the economy. At the 19993 inflation rate of 64%, the necessary adjustment rises from -5.39 to 2.31 percent, and it reaches 8.45 percent of GDP under market interests on domestic and foreign debt. This comparison exhibits a very large medium term inconsistency between the current fiscal stance and even the current inflation rate, not to mention any plans of shooting for lower rates of inflation. The table indicates the severe resource constraints facing the economy once this transition takes place. In the long run, the resulting monetization of the deficit could well result in run-away inflation: the table indicates that there is no inflation for which the accounts will balance without any additional measures.

Table 3: Switching to market interest rates on public sector debt

Inflation rate	Required Deficit Reduction		
	$r=.8\%$ $r^*=.8\%$	$r=45\%$ $r^*=.8\%$	$r=45\%$ $r^*=5\%$
0	0.27	7.97	14.11
10	-1.68	6.02	12.16
20	-3.00	4.71	10.85
30	-3.90	3.80	9.94

40	-4.54	3.17	9.31
50	-4.98	2.72	8.86
63.9	-5.39	2.31	8.45
70	-5.52	2.19	8.33
80	-5.67	2.03	8.17
90	-5.78	1.93	8.07
100	-5.84	1.86	8.00
110	-5.88	1.82	7.96
120	-5.90	1.81	7.95
130	-5.90	1.81	7.94

ii. The impact of substituting foreign borrowing by domestic debt issue.

The next experiment consists of assessing the impact of substituting 10 percent of the foreign debt by a 10 percent increase in the domestic debt issue. The underlying assumptions here are a 5 percent real interest rate on foreign debt and a 45 percent real interest rate on domestic debt. Such an experiment could come about if foreign debt is retired at face value, financed by issue of domestic debt (some proposals for Debt-Equity swaps have this implication). The results of this simulation are presented in Table 4 below.

Table 4: Assessing the impact of foreign-to-domestic debt substitution

Inflation rate	Required Deficit Reduction $r=45\%$ $r^*=5\%$	
	No foreign debt substitution	10% foreign debt substitution
0	14.1	18.5
10	12.2	16.6
64	8.5	12.9
120	8.0	12.4

The first column represents the current situation under 5 percent real interest rate on foreign and 45 percent on domestic debt, whereas the second column presents the impact of 10 percent foreign debt retiring on the Required deficit reduction. For 63.9 percent inflation rate in 1993, this policy raises the amount of deficit reduction from 8.45 to 12.88 percent of GDP. The smallest required deficit reduction is of course still achieved at a 120-130 percent inflation rate: 12.4 percent against a base case value of 8.5%. Across the whole schedule, however, deficit reductions go up substantially. Debt restructurings that have, explicitly or implicitly, the same impact as this substitution experiment will have very serious macroeconomic consequences.

iii. The impact of real exchange rate depreciation.

The cost of servicing the foreign debt depends of course on real exchange rate developments. In this section we examine therefore the impact of varying the rate of real exchange rate depreciation on foreign debt servicing costs and thus on the financeable deficit and Required deficit reduction. We assume as base case the run with full market rates on all domestic and foreign debt. Table 5 shows the impact of varying the rate of real depreciation from 0% to 2% (the assumption in the base case) to 4%. It is obvious from the table that a policy rule of pegging the real exchange rate will decrease significantly the required surplus and consequently the required fiscal adjustment for all inflation rate. The rdr at 0 inflation would decrease from 17.9% at a 4% p.a. real depreciation to 14.1% at a depreciation rate of 2% and to 11.6 percent of GDP with a pegged real exchange rate. At 64 percent inflation, the rdr falls to 5.9%.

Table 5. The impact of real exchange rate depreciation

Inflation rate	Required Deficit Reduction		
	0% real exch. rate depreciation	2% real exch. rate depreciation	5% real exch. rate depreciation
0	11.6	14.1	17.9
10	9.6	12.2	16.0
64	5.9	8.5	12.3
120	5.4	8.0	11.8

iv. The effects of foreign debt relief.

This simulation is done under the assumption that the foreign debt is reduced by 50 percent, i.e., the foreign debt to GDP ratio drops from 144.65 to 72.3 percent. This is the reduction achieved under the recent Brady deal. The deal has reduced the amount of debt outstanding but also implies a switch to market rates for what remains on the books.² The results of this experiment are presented in table 6. The table assesses the impact of debt relief plus a switch to actual market rates in a two-step fashion. Will this foreign debt relief be sufficient to restore consistency?

Table 6: Assessing the impact of 50 percent foreign debt relief

inflation p	Required Deficit Reduction		
	No Foreign Debt Relief	50% Foreign Debt Relief	
	r=45% r*=.8%	r=45% r*=.8%	r=45% r*=5%
0	7.97	5.4	8.5
10	6.0	3.5	6.7
64	2.3	-0.2	2.9
120	1.8	-0.7	2.3

Comparing the second and the third column shows the net gain from such a package. At the actual 1993 inflation rate of 64%, cutting the debt by 50% will achieve some reduction of adjustment measures needed but not much because the real rate on foreign debt that is actually paid is so low (rdr falls from 2.3 to -0.22% of GDP). However, once we account for the fact that the remaining debt will need to be financed at market rates, the picture changes radically: the gain from the foreign debt relief dissipates once market rates need to be paid over what remains. The net impact is in fact a small *increase* in required deficit reduction!

² Most of the rescheduled debt actually carried market rates already but simply was n't serviced.

Of course there may also be side benefits to such a deal that may affect this result. In particular, renewed capital market access may lead to renewed growth, which is after all the whole point of such exercises. Therefore, the next experiment analyzes the implications of the restoration of the real output growth. Table 7 presents the impact of different growth rates on the required deficit reductions for various inflation rates.

A positive real output growth rate will first of all increase seigniorage revenue. With an inflation rate of 64 percent and 2 percent real output growth, seigniorage revenue will increase from 4.7 to 5.6 percent of GDP. Second, higher growth rates will allow more debt issue for given debt-output targets. Otherwise the table maintains our base case assumptions of a 5 percent real interest rate on foreign debt, a 45 percent real interest rate on domestic debt and a 2 percent rate of real exchange rate depreciation. We also assume 50 percent foreign debt relief since by assumption the growth rates would pick up in response to such a debt relief package.

Table 7: The impact of higher output growth

Inflation rate	Required Deficit Reduction		
	n=-4.2%	n=2%	n=4%
0	8.5	6.4	5.5
10	6.6	4.6	3.8
64	2.9	1.3	0.6
120	2.3	1.0	0.4

If the debt deal will restore economic growth, to say 2 percent, the model suggests that at 64 percent inflation rate the amount of required deficit reduction will decrease from 2.9 to 1.3 percent of GDP. This is lower than the pre-debt-deal base case, so on balance the deal will improve the fiscal situation, if at least the restoration of growth materializes. This gain will increase as the growth rate goes up further: at 4% per annum, the rdr will decrease further to 0.63 percent of GDP.

3.2. The Impact of Financial Sector Reform on the Fiscal Policy.

Financial sector reforms affect the fiscal deficit that is consistent with a given inflation target, or alternatively, the inflation rate that will prevail eventually if no fiscal adjustment takes place, because of their impact on demand for base money. We examined the following policies: changes in the reserve requirements on various deposits; partial inflation correction of the rate of interest paid on time deposits, which currently are not indexed; and paying interest on reserves held at the Central Bank. The first two policies correspond to measures actually taken in 1994; the model illustrates their implications for the consistency of the fiscal and monetary policy.

As before, we assume market rates paid on domestic and foreign debt and 50% foreign debt relief. However, we assume continuation of the negative growth rate, as no restoration of growth has yet materialized at the time of writing. The first experiment consists of an increase of the reserve requirements for all deposits. The actual value of the central bank reserve requirements was 7 percent for all types of deposits until the reforms of 1994, at which time they were raised to 10%. This measure obviously increases the monetary base and thus seigniorage revenue; comparing the current state (the first column) and the results from this experiment show that at a 64 percent inflation seigniorage increases from 4.7 to 5.5 percent, with corresponding effect on the required deficit reduction.

The second experiment consists of reducing reserve requirements against foreign currency deposits to zero, one of the January 1994 measures. The measures are introduced cumulatively (i.e. the increase in the reserve ratio from 7 to 10% remains in place). Now the net effect of such a policy is seen by comparison between the first and the third column of table 4.2.1. As we see, although the reserve requirements for the rest of the deposits have been increased by three percentage point, the net effect depends on the relative share of these deposits. Although the share of the foreign currency deposits in GDP is substantial, at 63.9 percent inflation rate the seigniorage revenue rises from 4.71 to 4.85 percent of GDP. The maximum potential revenue from seigniorage, however, falls from 5.22 to 5.13 percent of GDP, which shows the high sensitivity of the monetary base to the inflation rate. The inflation rate, at which this maximum is reached falls from 130 to 100-110 percent.

Table 8: The impact of financial sector reforms

Inflation rate	Required Deficit Reduction				
	Base case $RR_{Di}=7\%$ $iRR=0$	Financial Sector Reforms			
		$RR_{Di}=10\%$	$RR_{FD}=0$ $RR_{Di}=10\%$	$RR_{Di}=10\%$ $iRR=12\%$	$RR_{Di}=10\%$ $iRR=12\%$ $iTDcorr=50\%$
0	8.5	8.3	8.6	10.5	10.7
10	6.6	6.4	6.5	7.8	7.7
64	2.9	2.1	2.7	2.8	2.8
120	2.3	1.6	2.5	2.0	2.7

The next policy examines the impact of introducing a 12 percent interest rate on the reserves. This measure will not affect the revenue from seigniorage, but it will decrease the financeable deficit, since the central bank has to pay interest on the reserves, and therefore, it would increase the required deficit reduction. The effect of this policy may be seen by comparing the second and the fourth columns of table 8. Particularly at low inflation rates, the impact is serious: almost 2 percentage points of GDP.

The last policy considered is inflation correction of the nominal interest rate on time deposits. Thus, we carried out an experiment, assuming that the central bank corrects the time deposits nominal interest rate by 50 percent of the inflation rate. This experiment, Table 8 indicates, has a negligible impact.

3.3. Debt, Money Creation and the Trade-off between Current and Future Inflation.

In this section we use the model to predict what would be the outcome if the government decides to close the gap between financeable and actual real deficits through debt accumulation rather than fiscal adjustment. We show the effects both for the current negative real growth rate and for a more optimistic assumption of 2% real GDP growth.

Table 9: The implication of delayed adjustment

Inflation rate	r=45% r*=5% n=-4.2% 50% foreign debt relief		r=45% r*=5% n=2% 50% foreign debt relief		r=45% r*=5% n=4% 50% foreign debt relief	
	rdr now	rdr after 6 years	rdr now	rdr after 6 years	rdr now	rdr after 6 years
63.9	2.9	31.4	1.3	10.8	0.6	5.0

The debt accumulation process crucially depend on the difference between the real interest rate and the real output growth rate. Whenever the real interest exceeds the growth rate, as it does in a big way in the base year under consideration, delaying the necessary deficit reduction means a bigger adjustment problem later, as the table indicates. By the same token, the higher the growth rate, the slower the escalation of the debt burden measured as a percentage of GDP; compare the increase in rdr in the $n=-4.2\%$ columns with the increase in the $n=4\%$ columns in Table 9.

4 Conclusions.

Fiscal problems are widely recognized as the key factor behind persistent inflation in Eastern Europe post-1989. But little has been said beyond these generalities. Deficits need to be cut back, but how far for any given inflation target? What is the implication of shifting financial structures, external debt management or exchange rate policy for this link between deficits and inflation? Establishing a framework for answering these questions faces special problems in Eastern Europe because post-reform data series are short and pre-reform series difficult to use given the radical changes in economic structure taking place since reforms were initiated. In this paper we propose a simple framework designed with these problems in mind. The only econometrics required is estimation of some components of money demand, which is becoming possible in most countries. For obvious reasons, no attempt is made at tracking short run dynamics; the focus is squarely on medium run consistency given a variety of macroeconomic policy objectives.

We apply this framework to the case of Bulgaria; this is an interesting example in its own right, because of the seemingly puzzling persistence of inflation in the face of

what at least in our base year (1993) looked like a moderate fiscal deficit. The analysis shows that much of this puzzle disappears once the various tax concessions given to buyers of domestic debt instruments are taken into account; introduced in 1993, they do not show up yet in that year's budget numbers but they hide the fact that the cost of domestic debt issue is extremely high. Further doubts about fiscal sustainability are raised by the recognition that most old debt was issued at rates far below current market rates. Analyzing the consequences of refinancing all that at new market rates brought further inconsistencies to light.

We also used the framework to assess the fiscal impact of the recently concluded Brady deal for Bulgaria. The direct effects turned out to be modest; while the total amount of external debt was halved, what remains will now need to be serviced at market terms; switching to market rates, even for only 50% of the old face value, turns out to raise the fiscal burden of external debt more than cutting the face value by 50% lowers it. A netto positive effect will come out, however, if the debt deal would lead to a recovery of growth from its dismal 1993 value of minus 4.2%. The resulting increase in seigniorage is just enough to restore a positive net fiscal impact of the package.

We finally use the same framework to assess the impact of a series of financial sector reforms introduced in 1994 which have a potential impact on the demand for base money and in one case (paying interest on reserves) affect seigniorage for given base money demand. We show that in particular paying interest on reserves is a very costly measure: the required fiscal deficit correction goes up by about two percentage points of GDP. While there are clear efficiency costs to taxing financial intermediation, giving up seigniorage revenues in this manner may be premature given the large fiscal corrections needed and the unfinished state of the process of tax reform in Bulgaria.

REFERENCES

Anand, Ritu and Sweder van Wijnbergen (1988), "Inflation, External Debt and Financial Sector Reform: A Quantitative Approach to Consistent Fiscal Policy with an Application to Turkey", *NBER Working Paper* No.2731.

Anand, Ritu and Sweder van Wijnbergen (1989), "Inflation and the Financing of Government

Expenditure: an Introductory Analysis with an Application to Turkey", *The World Bank Economic Review*, vol.3, No1:17-38.

Algoskoufis, George S. and Nicos M. Christodoulakis (Sep.1990), "Fiscal Deficits, Seigniorage and External Debt: The Case of Greece", *CEPR Discussion Paper* No.468.

Angelov I., S.Dulev, V. Iotzov, T. Houbenova-Delisivkova, V. Konsulov, The Economy of Bulgaria till 1996, Bulgarian Academy of Science, Economic Institute, December 1993.

Buiter, Willem H. (1985), "A guide to public sector debt and deficits.", *Economic Policy*, November 1985, No.1.

Buiter, Willem H. (1990), International Macroeconomics.

Buiter, Willem H.(June 1993), Public Debt in the USA: How much, How bad and Who pays?, *CEPR Discussion Paper* No. 791.

Bulgarian National Bank (1990, 1991, 1992, 1993) *Annual reports*, Sofia.

Miller, J., The Bulgarian Banking System, Bulgarian National Bank, 1992.

Wijnbergen, Sweder van (1990), "External Debt, Inflation, and the Public Sector: Towards Fiscal Policy for Sustainable Growth", *The World Bank Economic Review*, vol.3, No.3:297- 320.

Annex I Data Description

The analysis is based on officially published data from the Annual report of Bulgarian National Bank, Ministry of Finance, the Agency of Economic Coordination and Development, and International Financial Statistics. Since there were no data available for the domestic interest rate on foreign currency for the whole period, we use as an approximation the official London dollar time deposits interest rate, corrected for domestic inflation and exchange rate depreciation. We have also used quarterly data on nominal interest rate on time deposits, CPI index, GDP, exchange rate and disaggregated quasi-money. To apply the econometric analysis we have done the following calculations:

i.Regarding the asset demands to GDP ratio, first we corrected these ratios for the end of the period inflation rate. If we denote by x any asset, then the corresponding ratio is expressed as

$$\frac{X}{P_e Y} = \frac{X}{\bar{P} Y} \frac{1}{(1 + \hat{P})^{\frac{1}{2}}} \quad (1)$$

In our econometric model we use the logarithmic money demand function, and hence for the dependent variable we use

$$\ln \frac{X}{P_e Y} = \ln \frac{X}{\bar{P} Y} - \frac{1}{2} \hat{P} \quad (2)$$

where P is the CPI inflation:

$$\hat{P} = \ln \frac{CPI}{(CPI(-1))} \quad (3)$$

ii.For the interest rates variables, we made the following adjustment:

$$\ln(1 + r_{TD}) = \ln(1 + i_{TD}) - \hat{P} \quad (4)$$

$$\ln(1 + r_{FD}) = \ln(1 + i_s) + \hat{E} - \hat{P} \quad (5)$$

where $E = \ln(\text{EXR}/\text{EXR}(-1))$.

The dummy variable captures the effect of a series of measures initiated in the first quarter of 1991: price liberalization, transition to high interest rates and an end to restrictions on holdings of foreign currency deposits.

Table A.1.: Actual data inputs for base year 1993.

Total domestic debt, B	111161.6
BNB credit to the government	33447
Interest payments of the BNB credit to the government	13929.4
Net Domestic debt, NB	63785.2
Issued Treasury Bills, TB	5150.2
Issued Long term bonds, LB	58635
Nominal Interest on TB, $i_{TB} = (1 + 0.5844)(1 + t) - 1$	1.377
Real interest on the issued Treasury Bills (interest at the margin), $r_{TB} = (1 + i_{TB}) / (1 + p) - 1$	0.45
Nominal Interest of the Long term bonds, i_{LB}	0.5875
Real interest on the long term bonds, $r_{LB} = (1 + i_{LB}) / (1 + p) - 1$	-0.03142
Average interest rate on the domestic debt $rr = LB/GDP * r_{LB} + TB/GDP * r_{TB}$	0.00745
Marginal income tax rate	0.50

Inflation rate for Dec 92- Dec 93	0.639
Gross Domestic product, GDP	286134
Primary Deficit, PD	5217.5
Primary Deficit to GDP ratio, PD/GDP	0.018234
Nominal deficit, ND	32536.9
Nom. deficit to GDP ratio, ND/gdp	0.114
Real debt to GDP ratio, b/y	0.174125
Inflationary component of the debt, pb/y	0.111266
OD/GDP	0.002734
$OD/gdp1=PD/GDP+rLB*LB/GDP+rTB*TB/GDP+rB^*/GDP(\$)$	0.03045
Real output growth rate, n	-0.042
AV.EXR.93	27.594
$i*EB^*$	3126.3
$i*B^*$	113.298
B^*	15000
$i*B^*/GDP$	0.010926
rr*	0.007553
GDP\$	10369.59
B^*/Y	1.447

First, we start by deriving of the actual real public sector deficit to GDP ratio in 1993, accounting only for the real interest payments on foreign and domestic debt in the

base year. The actual real deficit is measured by the operational deficit, counting only the real resource transfer to the public sector. Thus the operational deficit to GDP ratio is equal to the nominal deficit to GDP ratio minus the inflationary component of domestic debt to GDP ratio, where nominal GDP is adjusted for the end of the year price level:

$$\frac{ND}{\bar{P}Y} = \frac{D}{\bar{P}Y} + \frac{iB}{P_e Y} + \frac{i^*EB^*}{P_e Y} \quad (6)$$

$$\frac{OD}{\bar{P}Y} = \frac{ND}{\bar{P}Y} - \hat{P} \frac{B}{P_e Y} \quad (7)$$

$$\hat{P} \frac{B}{P_e Y} = \hat{P} \frac{B}{\bar{P}Y} \frac{1}{(1 + \hat{P})}^{\frac{1}{2}} = \hat{P} \frac{B}{GDP} \frac{1}{(1 + \hat{P})}^{\frac{1}{2}} \quad (8)$$

Or finally, the operational deficit is equal to:

$$\frac{OD}{\bar{P}Y} = \frac{D}{\bar{P}Y} + rr \frac{b}{y} + rr^* \frac{b^*}{y} \quad (9)$$

where D is primary fiscal deficit, ND is the nominal deficit including nominal interest payments on public sector debt, OD is the operational deficit, including only real interest payments. We have got the data on nominal GDP, which is equal to the average price level times real GDP, but to compute the real domestic debt to real GDP ratio we need to correct real GDP for the end of the year price level. Therefore we have to correct the nominal ratio of domestic debt to GDP for the end of the year price level:

$$b/y = \frac{B}{P_e Y} = \frac{B}{\bar{P}Y} \frac{1}{(1 + \hat{P})}^{1/2} = \frac{B}{GDP} \frac{1}{(1 + \hat{P})}^{1/2} \quad (10)$$

This is an expression for the real debt to real GDP ratio and it is denoted with small case letters.

The next point explains the derivation of the real interest rate on domestic debt. Since the information we have is on the amount of nominal interest payments on domestic debt, net of Central bank credit to the government, as well as the interest payments on the Central Bank credit to the Government. Here it is important to distinguish between the long term bonds, issued to cover the bad loans of the enterprises, traded only by the

commercial banks, and the issued Treasury Bills, traded on the secondary market and used for deficit financing. Whereas the long term government bonds yield 58.75 percent nominal interest rate, Treasury Bills yield 58.44 percent, but in addition they have a preferential tax treatment, in the sense that their principle, as well as interest are tax deductible. This has a strong implications for the real interest on the short term domestic debt, because a substantial part is paid out in the form of tax concessions. Thus, the corrected real interest is expressed as

$$(1+rr^1) = \frac{(1+i)(1+\tau)}{(1+\hat{P})} = \frac{(1+rr)(1+\hat{P})(1+\tau)}{(1+\hat{P})} \quad (11)$$

and finally rr^1 is equal to

$$rr^1 = (1+rr)(1+\tau) - 1 \quad (12)$$

The next implication of this policy is that it will also affect the measure of operational deficit. Considering the operational deficit on continuous (year-to-year) basis, we note that the domestic debt, issued throughout the current year will increase the operational deficit in the next year because of the tax concessions, i.e., the real interest payments in the next year will be equal to the product of the adjusted real interest (rr^1) and the real short term domestic debt to real GDP ratio. Thus the operational measure of the deficit has to be corrected for the tax concessions on the issued Treasury Bills:

$$\frac{OD}{PY} = \frac{D}{PY} + rr_{TB}^1 \frac{TB}{y} + rr_{LB} \frac{LB}{y} + rr^* \frac{b^*}{y} \quad (13)$$

This correction for the preferential tax treatment of the TBills has increased the operational deficit to GDP ratio, since it has risen marginal cost of issuing domestic debt. Although the real interest on the long term government bonds is much lower, we have used the tax adjusted real interest on the issued Treasury bills as a base year interest rate.

The next issue to deal with is derivation of the foreign debt to GDP ratio and real interest payments to the real GDP ratio. Eq.6 indicated that foreign debt has to be netted out with the CB net foreign assets; then real interest payments on foreign debt using the home good as numeraire become:

where

$$(rr^* + \hat{e}) \frac{(B^* - nfa^*)E}{P_e Y} \quad (14)$$

$$(1 + \hat{e}) = \frac{(1 + \hat{E})(1 + \hat{P}^*)}{(1 + \hat{P})} \quad (15)$$

E-hat is the rate of nominal depreciation.

Due to the absence of data on currency composition of debt, we approximate the real interest rate in terms of foreign goods by the ratio of interest payments on foreign debt converted into dollars to GDP in dollar terms using the average nominal exchange rate for 1993.

Finally, these base year parameters are used to obtain the financeable deficit for the base year, adding the maximum issue of foreign and domestic debt compatible with stable debt-output ratios to the estimated seigniorage revenues from the first block.

The actual data for 1993 are presented in table 4.1. In order to analyze the whole public sector debt and deficit, we consolidate the BNB (the Bulgarian Central Bank) with the fiscal authorities. We therefore excluded from the domestic debt the BNB credit to the government, as well as the interest payments on this credit. Thus the public sector debt consists of government securities held outside the Central Bank. We also account for the fact that amounts spent on purchasing short term Treasury Bills, which are the only type of government paper traded on the secondary markets, are tax deductible. This implies that official interest rates underestimate the cost of public debt; one needs to add the reduction in the tax burden to the cost of debt service for a proper accounting. We do this by assuming tax revenues are not affected when more debt is issued, but by adjusting (grossing up) real interest paid. The main difference between the two numbers for the operational deficit to GDP ratios is that the first one does not account for a part of the 1993 deficit which is shifted through Treasury Bill tax concessions into the next year deficit. Therefore, when we adjust the operational deficit with the tax corrected real interest on the Treasury Bills, the deficit increases from .2% to 2.13% of GDP.

Institut für Höhere Studien
Institute for Advanced Studies
Department of Economics
Stumpergasse 56
A-1060 Vienna
Austria

Tel.: +43-1-599 91-149
Fax.: +43-1-599 91-163
e-mail: woergoet@ihssv.wsr.ac.at