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BRASIL:

GROWTH EXERCISES FOR THE NINETIES

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SUMÁRIO

Simulações com base em um modelo de três hiatos são utilizadas para avaliar as restrições que podem condicionar o processo de crescimento da economia brasileira nos anos noventa. São analisados os desdobramentos de diferentes cenários, envolvendo distintos conjuntos de hipóteses acerca ue variáveis externas e internas.

ABSTRACT

A three-gap simulation model is used to evaluate the constraints which may bind the growth process of the Brazilian economy in the nineties. Different scenarios for the external and domestic variables and their consequences in terms of the feasible growth performance are considered.

1. Introduction[1]

The analysis of alternative growth strategies for the Brazilian economy for the next decade requires a good deal of abstraction in view of the present chaotic situation of the country. After five years and five attempts, it has been impossible for the Sarney government to fight high inflation. To overcome lack of confidence in the basic structure of the economy, as well as in its governability, a thorough and convincing stabilization programme seems to be required so that resumption of economic growth may be announced without provoking doubtful frowns. The experience of the eighties is a good example of how badly a country can perform -- after a reasonably competent growth strategy, has been adopted for quite a long time -- when its policy makers are either too busy or too pessimist to consider the long run effects of stopgap policies.

From the viewpoint of long-run growth policy, Brazil has been in the past ten years in a situation similar to that of the early sixties. Then, any attempt to curb endemic recession by stimulating investment faced the twin constraints of government

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finance and balance of payments. Without a convincing recovery of public savings, private investment has shown no willingness to replace public investment. It suggests that if the government is not able to find non-inflationary finance for complementary public investment, there will be no eager private entrepreneurs to fill in the empty spaces, as hoped by the Nova República Development Plan of 1985.

The public sector, at all levels -- specially the federal public enterprises, which are crucially important for any serious effort at increasing public investment -- is overburdened by debt and unable to generate the required savings to finance either traditional or non-traditional public investment. Much less yet is available to supplement private savings through long term finance provided by the development banks' network. This was a consequence of the massive transfers of real resources to the private sector accomplished by means of negative spreads of public financial intermediation, tax expenditures, as well as low prices for the intermediate goods and services sold by public enterprises.[2]

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[2] See Werneck [1986] and Werneck [1987] for the analysis of the reasons behind the fall in public savings. Carneiro [1987] and Carneiro and Werneck [1986] examine the investment strategy and the subsequent decline in the investment ratio.

This paper adapts to the Brazilian economy a three-gap growth model proposed by Taylor [1988] and draws from a recent research effort on the difficulties of growth resumption in Brazil.[3] It analyses some simulation exercises with arbitrary, but hopefully plausible, values for the structural parameters, in order to evaluate the constraints binding the growth process of the Brazilian economy in the nineties. Section 2 focuses on the role of public investment and its constraints, which are behind the hypothesis of investment complementarity. Section 3 describes the model and uses it to interpret the starting situation of the late eighties. Section 4 discusses plausible values for the parameters. Section 5 examines alternative scenarios for the external and domestic variables and uses the model to analyse the consequences in terms of the feasible growth performance during the nineties. Section 6 examines the sensitivity of the results to the assumptions adopted in the simulations. Final comments on the nature of long-run policy problems faced by the Brazilian economy are presented in section 7.

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[3] See Carneiro and Werneck [1988] and Werneck [1987].

2. Past Growth Experience and Public Investment

Up to the late sixties the Brazilian growth experience was by any measure rather inward looking. Export prices of a few commodities essentially defined the external constraint and domestic policies chose the ways to overcome them, with varying degree of success. An effort to remove the anti-export bias by means of indexing the exchange rate and overtly promoting export diversification blossomed in the early seventies, when the world economy provided sufficient stimulus to yield a 10%-plus a year real output growth. In both experiences -- more and less introverted -- public investment played an important part in the growth project: in the fifties, it provided infrastructure like roads and electricity which allowed private industries to sell their cars and home appliances, but also cheap steel plates and petrochemicals which were used to make the latter. In the sixties and early seventies, public companies advanced to produce intermediate goods and services like iron ore, petrochemicals, cheap electricity and export-oriented transportation and port facilities.

After the first oil price rise, the so-called positive policy response, which took the shape of an ambitious investment programme coupled with the decision to rule out potentially recessive stabilization measures, led to a highly favourable

growth record for the Brazilian economy, either in absolute or in relative terms. The world crisis notwithstanding, Brazil had grown at 7.1% per annum in the five years after the shock, which happens to be its long-run average rate of growth since the early forties. During this period, the role of the public sector was important either as a direct investor in crucial sectors such as the production of oil, electricity and non-ferrous metals or as a provider of long run credit or cheap inputs. An increase in public expenditures was not accompanied though by a matching increase in the ability to collect revenues. But the hardest costs had not to be faced until the rise in international lending rates in the early eighties.

The cumulative effects of the second oil shock and the record-high interest rates had a devastating impact on Brazil's balance of payments, raising the current account deficit from US$ 7 to 16.3 billion between 1978 and 1981 as interest rates doubled and oil prices trebled. In order to be able to complete the investment projects of the 1975/79 II Development Plan, the Brazilian government had to increase its debt both by replacing the private sector as external debtor and by offering increasing real rates of interest on its domestic debt in order to prevent private capital from fleeing the country. Continuous resort to inflationary financing and inability to revise fiscal incentives complete the picture of an overburdened and ineffective fiscal budget. The consequent decline in government savings led to both

a decline in public investment and an deterioration of the capacity of the government to finance part of the private investment effort.

On the other hand, following the debt crisis of 1982/83, the flow of external finance was reverted. Net financial transfers amounted to around 25% of total export revenues and something like twice the expenditure with imports of capital goods in the 1982/86 period. In terms of real resources, that is net exports of goods and services, the burden of the transfer has reached an average of 3.6% of its GDP in the period.

From 1980 to 1987 the average annual GDP growth rate was 2.9%. An analysis of the evolution of the sectoral components of GDP (industry, agriculture and services) helps to understand the slow down pattern. Although both industry and services show a time profile similar to that of aggregate GDP in the eighties, industrial growth is higher in absolute value than that of aggregate GDP both in decline and in recovery. For industry as a whole, the average rate of growth has been up to 1987 of a mere 1.55% per year whereas for manufacturing industry, the most traditional locomotive of Brazilian growth, the rate is of 0.8% per year. Mining and public utility, the sectors which have exhibited the strongest post-1983 growth were those which reflected the investment priorities of the second half of the seventies, whereas construction and manufacturing have shown practically no growth in the present decade.

Such sectoral behaviour is likely to have some consequences to the future growth prospects of the economy. Mining and public utilities, the recent stars, have traditionally been dependent on government savings and the concrete growth prospects for these sectors are likely to be essential to private investors' willingness to follow through. On the other hand, manufacturing industry and construction have been constrained by a combination of unstable demand policies which have accompanied the inflationary explosion of the eighties, with the disruption of the financing mechanism which has been brought about by high inflation itself: the bankruptcy of the housing financial system and its absorption by the banks as well as the virtual disappearance of consumer credit and the financial fragility of the household sector. Their reconstruction, even after inflation has been controlled down to manageable levels is by no means a trivial task. Without the recovery of residential construction, it is hard to imagine what will happen to the urbanization process.

The interruption of the process of modernization of the urban household due to the financial squeeze of the urban middle-class means not only less comfort to the latter, but less demand to manufacturing industry. At the same time, as bankrupt local governments ceased to invest in urban infrastructure and mass transportation, urban chaos contributes to further disrupt the process of urbanization.

The decline in the rate of investment in the eighties has been dramatic. In the beginning of the decade, the fixed investment/GDP ratio was roughly at the level which had prevailed in the previous five years, around 22%. From the last quarter of 1980, when Delfim Netto's reversal of macropolicy began, with higher interest rates, budget cuts affecting primarily the investment plans of the federal public enterprises and control over the public sector imports, the rate of aggregate investment falls almost continuously by 7 percentage points until the third quarter of 1983. It remained around the 15 to 16% level until mid 1985. The recovery which took place from the bottom value of 15.25 in the second quarter of 1984 seems to have been prematurely aborted after the last quarter of 1986, in the wake of the frustrations around the Cruzado experiment. From the end of 1986 to the end of 1987, the fall in the investment ratio accompanied the increasing uncertainty stemming from the inflationary explosion of 1987.

Conditions for the recovery of the rate of investment is certainly an essential element of a strategy to resume economic growth. Among the causes of the decline in the rate of investment is the fall in public investment, and that relates naturally to the disappearance of public savings.

Age-old arguments concerning the engines of growth, the strategic role of infrastructure investment, or the role of the public investment in providing positive externalities to private investors do not seem to have been made obsolete by the wave of the hand pessimism concerning the reform of the public sector. There is hardly any convincing evidence that public investment has become less necessary than before in order to attract private capital and bind private interests to feasible national projects, as writers of the Nova Republica 1985 Plan seemed to assume. There seems to be no reason to forsake public investment simply because the public budget is overburdened with the unpaid costs of the past growth experience.

The model presented in the next section is a convenient analytical tool to assess the importance of public investment and allows to evaluate the importance of the hard-to-estimate parameters describing investment complementarity and the sensitivity of private investment to capacity utilization. The issue of a sustainable level of capacity utilization is likely to rank high in the next years after the failures of the three heterodox attempts at stopping inflation in Brazil.

3. The Three-Gap Model

The three-gap model used here follows with small adaptations, the one proposed by Taylor [1988], to serve as a common analytical framework for the WIDER country studies on medium term development. The model's formulation is presented on table 1. All level variables are defined as a proportion of potential GDP. The average annual growth rate (g) is determined in the first equation as a function of aggregate investment. The parameter (k) is the output-capital ratio and (go), which would usually be negative, may be associated to a depreciation allowance. In equation [2] it is assumed that private investment (ip) depends upon public investment (ie) and the capacity utilization rate (u) and has an autonomous component (io). The parameter (alfa) is in principle assumed to be positive, meaning that private investment is crowded-in by public investment for each level of capacity utilization.[4] Total investment, which results from adding up private and public investment, is given by equation [3].

Equation [4] introduces the notion of fiscal effort embodied in the variable z, which is defined as the tax revenue,

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[4] Note that this does not assume away the possibility of private investment being crowded out by public investment in the short run.

TABLE 1

THE MODEL'S FORMULATION

Average Annual Growth Rate

$$g = go + k.i \quad [1]$$

Private Investment

$$ip = io + \alpha.ie + \beta.u \quad [2]$$

Total Investment

$$i = ip + ie = io + (1 + \alpha).ie + \beta.u \quad [3]$$

Public Sector's Savings

$$sg = z - js \quad [4]$$

Fiscal Effort

$$z = zo + z1.u \quad [5]$$

Public Sector's Deficit

$$d.u = ie - sg \quad [6]$$

Private Savings

$$sp = \sigma o + \sigma 1.u \quad [7]$$

Foreign Savings

$$\Phi = m + (ao + a1.u) + (\Gamma o + \Gamma 1.i) + jt - (\xi o + \xi 1.u) \quad [8]$$

net of subsidies and transfers, plus public enterprises' operational surplus, less government consumption expenditures and interest payments on the public sector's domestic debt. In equation [4] public sector savings are determined as the difference between the fiscal effort variable (z) and (js), interest payments on the public sector's foreign debt. Another way to interpret equation [4] is to notice that resources (z) generated by the fiscal effort may be channelled to either savings (sg) or to interest payments (js) on the public sector's foreign debt. In equation [5] it is assumed that z is determined by the capacity utilization rate (u) and a coeficient (zo) which may be changed by fiscal policy instruments. Public sector's deficit is defined in equation [6] as the difference between public sector's investment (ig) and savings (sg). In that equation d is the overall public sector borrowing requirement (PSBR) measured as a proportion of GDP. The product d.u is equal to the PSBR in proportion of potential GDP.

In equation [7] it is assumed that private savings (sp) is determined by the capacity utilization rate (u). Foreign savings are defined in equation [8] as the balance of payments' current account deficit (phi). Intermediate imports are represented by the term (ao + a1.u), capital goods imports by the term [(gamma)o + (gamma)1.i] and interest payments on the foreign debt by (jt). Total exports are represented by the term [(epsilon)o + (epsilon)1.u], where one would expect (epsilon)1

to be negative. The algebraic sum of other current account items -- including other imports -- is denoted by m. Again, as already made clear, all level variables are defined as proportions of potential GDP. As may be noticed, intermediate imports and total exports are determined by the capacity utilization rate (u) and capital goods imports by aggregate investment (i).

Table 2 presents semi-reduced form equations, which establish the maximum feasible public investment for each level of capacity utilization, relating two variables which are thought to be extremely relevant for the assessment of growth possibilities for the Brazilian economy in the nineties. This may be done by computing the maximum investment ratio for the decade, for given assumptions concerning the structural parameters and policy variables. The maximum sustainable investment ratio may be bound, for each level of capacity utilization, by different constraints: the feasible level of public sector borrowing requirements, the domestic rate of savings and the feasible level of the balance of payments current account deficit.

Equation [9] determines the maximum value of public investment (ig) allowed by the fiscal constraint. Substituting the value of z in equation [5] into [4] and using the resulting expression for (sg) in [6], one gets equation [9], after rearranging terms. For each value attributed to (d), the

TABLE 2

SEMI-REDUCED FORM EQUATIONS

Maximum Public Investment Allowed by the Fiscal Constraint

$$ig = (d + z1).u + zo - js \qquad [9]$$

Maximum Public Investment Allowed by the Saving Constraint

$$is = (\sigma 1 + z1 - \beta)\frac{u}{1 + \alpha} + \frac{zo - js + \sigma o + \phi - io}{1 + \alpha} \qquad [10]$$

Maximum Public Investment Allowed by the Foreign Exchange Constraint

$$if = \frac{-(a1 + \Gamma 1.\beta - \xi 1).u + \phi - m - jt - io.\Gamma 1 - ao + \xi o - \Gamma o}{\Gamma 1.(1 + \alpha)} \qquad [11]$$

Maximum GDP Growth Rate Allowed by the the Fiscal Constraint

$$gg = go + k.[io + (1 + \alpha).ig + \beta.u] \qquad [12]$$

Maximum GDP Growth Rate Allowed by the Saving Constraint

$$gs = go + k.[io + (1 + \alpha).is + \beta.u] \qquad [13]$$

Maximum GDP Growth Rate Allowed by the Foreign Exchange Constraint

$$gf = go + k.[io + (1 + \alpha).if + \beta.u] \qquad [14]$$

equation establishes the maximum feasible public investment (ig) consistent with each capacity utilization rate (u).

The saving constraint imposes limits of a different nature on public investment. Making the expression for aggregate investment (i) in equation [3] equal to aggregate saving, defined as the sum of the the lefthand side of equation [8] and the righthand sides of equations [7] and [4], after substituting in the latter the value of (z) given by [5], one gets equation [10], after rearranging terms. Public investment is designed by (is) in [10] in order to make it clear that the equation establishes the maximum feasible public investment values from the viewpoint of the saving constraint. For a given assumption about the value of foreign savings available (phi), that equation sets the value of (is) consistent with each value of the capacity utilization rate (u).

Equation [11] determines the limits on public investment that stem from the foreign exchange constraint. It is obtained by simply substituting the expression for aggregate investment (i), given by equation [3], into equation [8], and rearranging terms. In equation [11], the public investment variable is denoted by (if), since what is being taken into account is the foreign exchange contraint. For a given assumption about the feasible current account deficit (phi), it determines the maximum value of public investment consistent with each value of the capacity utilization rate (u).

Equations [12], [13] and [14] establish the maximum average annual growth rates which would be allowed by each of the three constraints. To get them, one has simply to substitute the value of aggregate investment (i), given by equation [3], into [1], and to consider in the resulting expression, one at a time, the three public investment values established by equations [9], [10] and [11]. In the frontiers which are obtained, the maximum GDP growth rates consistent with different values of u are designed (gg), (gs) and (gf), depending on which constraint is being considered in each case.

4. Plausible Values

In order to use the model for simulations, plausible values were attributed to the parameters and exogenous variables. Typically, the values of the parameters in the one-variable linear equations were obtained on the basis of known passage points and plausible elasticity values. The elasticities of total exports and intermediate imports with respect to capacity utilization were assumed to be equal to 2.0 and .5, respectively. The elasticity of capital goods imports with respect to total investment was assumed to be equal to 2.0. A value of 4.0 was initially assumed for the elasticity of public sector savings with respect to capacity utilization. In the case

of private sector savings the corresponding elasticity was assumed to be equal 2.0.

Given the difficulty of making a definitively convincing assumption about the parameters of the private investment behaviour equation [2], one had to resort to an extensive analysis of the sensitivity of the results to different hypotheses about the parameters (alfa) and (beta). Again, a known passage point was used to (endogenously) define values consistent with these hypotheses to the linear coeficient (io). Initially, the value of (alfa) was set at 1.0 and the value of (beta) at .2. On the other hand, the value attributed to (k) was consistent with the assumption of an incremental capital-output ratio equal to 3.5, and the value of (go) with the assumption of depreciation being equivalent to 5% of the potential GDP.

5. Growth Scenarios

Given the present difficulties concerning the politically feasible stabilization policies after a the decade of high inflation and rising uncertainty, the feasible level of capacity utilization in the nineties is likely to depend crucially on the pattern of short run stabilization policies which will prevail.

In the analysis of the results of the simulation exercises based on the model, attention will be focused on equations [12], [13] and [14]. Those equations establish, for each value of the capacity utilization rate (u), the maximum feasible average annual growth rate consistent with the fiscal, saving and foreign exchange constraints, respectively.

In the basic scenario, (d), the public sector borrowing requirement and (phi), the current account deficit in the balance of payments, were both made equal to zero. Again, uncertainty about the feasible values for both deficits is the easier defense of the chosen values. Zero (d) represents no further need for increase in the domestic public debt after years of uncertainty on the willingness of the private sector to hold more public debt. A (phi) equal to zero represents independence from external sources of savings in the aftermath of the external debt crisis. Historical values for the main variables of the model are presented on table 3.

The basic scenario's growth constraints are presented in the figure in panel 5.1. It may be seen that the saving and foreign exchange constraints jointly determine the maximum feasible growth rate -- approximately 3.3%, well below the historical 7% average annual rate observed in the period 1940-80.[5] The values for the maximum growth rates, (gs), (gg) and

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[5] It should be noticed that the saving constraint is represented in the figure by a simple line, the foreign constraint by rectangles connected with lines, and the fiscal constraint by X's connected with lines.

Historical Values of Selected Variables (1)

(as % of potential GDP)

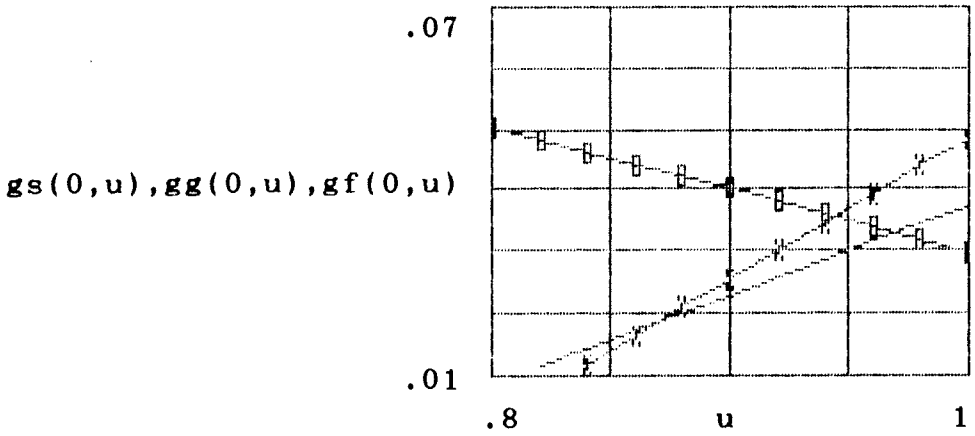
	Capacity Utilization (u)	Investment Ratio (i)	Private Investment (ip)	Total Public Investment (ie)	Private Savings (2) (sp)	Public Sector's Savings (2) (sg)	Interest on Public External Debt (js)	Fiscal Effort Variable (z)	Current Account Deficit (phi)	Fiscal Deficit(3) (d.u)
1975	1.00	0.244	0.156	0.088	0.126	0.076	0.006	0.081	0.056	0.012
80	0.98	0.220	0.153	0.067	0.129	0.043	0.027	0.069	0.052	0.024
81	0.90	0.189	0.119	0.070	0.112	0.038	0.025	0.063	0.040	0.032
82	0.86	0.175	0.111	0.064	0.092	0.029	0.029	0.058	0.052	0.035
83	0.79	0.127	0.084	0.043	0.070	0.020	0.031	0.051	0.026	0.023
84	0.79	0.122	0.081	0.041	0.101	0.021	0.031	0.052	-0.019	0.020
85	0.81	0.135	0.092	0.043	0.127	0.007	0.030	0.038	-0.001	0.035

Notes: (1)See text for definitions; (2) Breakdown of savings between public and private follows Herneck (1987b), for 1975 and Moraes (1989) for 1980-85; (3) Flow of funds concept;

Sources: FIBGE, Moraes (1989), Herneck (1987b) and Carneiro and Herneck (1989).

Panel 5.1

The three growth constraints for zero deficits



u	gs(0,u)	gg(0,u)	gf(0,u)
0.8	0.009	0.003	0.051
0.82	0.012	0.007	0.048
0.84	0.014	0.012	0.046
0.86	0.017	0.016	0.044
0.88	0.02	0.021	0.042
0.9	0.023	0.025	0.04
0.92	0.026	0.03	0.038
0.94	0.029	0.035	0.036
0.96	0.032	0.039	0.034
0.98	0.034	0.044	0.032
1	0.037	0.048	0.03

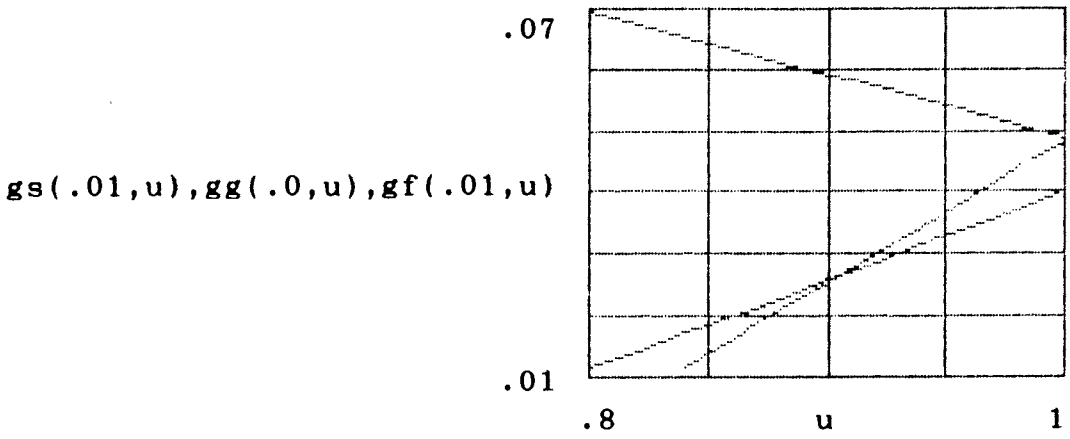
(gf), for (u) values ranging from .8 to 1.0 are also presented in the same panel. Levels of capacity utilization were estimated defining peaks of full capacity since 1947. In the late seventies the peak years were 1975 and 1977. The average value for (u) in the 1975-80 period was .99. In 1987, the observed value was .8.

In such a scenario the possibility of keeping a higher current deficit in the balance of payments would alter to a limited extent the growth possibilities. As shown in the figure in panel 5.2, with (phi) = 1% of GDP the foreign exchange constraint would become non-binding and the slight upward shift in the saving constraint could allow a maximum growth rate of 4%, but only at the cost of keeping the capacity utilization rate very close to 100% -- what could mean, in practice, a more overheated economy than might be advisable from the viewpoint of inflation control.

Growth rates higher than 4% would only become feasible through policies that could lead to less severe fiscal and saving constraints. In fact, with (phi) = 1% the saving constraint would become the only binding one for (u) values above approximately 90%. This means that, under these conditions, an upward shift in the fiscal constraint stemming from the possibility of maintaining a PSBR higher than zero would not affect the relevant part of the feasible set. Much

Panel 5.2

The three growth constraints for a current account deficit (ϕ) of 1% of GDP



u	gs(.01,u)	gg(0,u)	gf(.01,u)
0.8	0.012	0.003	0.07
0.82	0.014	0.007	0.067
0.84	0.017	0.012	0.065
0.86	0.02	0.016	0.063
0.88	0.023	0.021	0.061
0.9	0.026	0.025	0.059
0.92	0.029	0.03	0.057
0.94	0.032	0.035	0.055
0.96	0.034	0.039	0.053
0.98	0.037	0.044	0.051
1	0.04	0.048	0.049

will therefore depend on the possibility of acting jointly upon the saving and fiscal constraints. A strong fiscal adjustment may be an important instrument to shift upward in a significant way these two constraints.

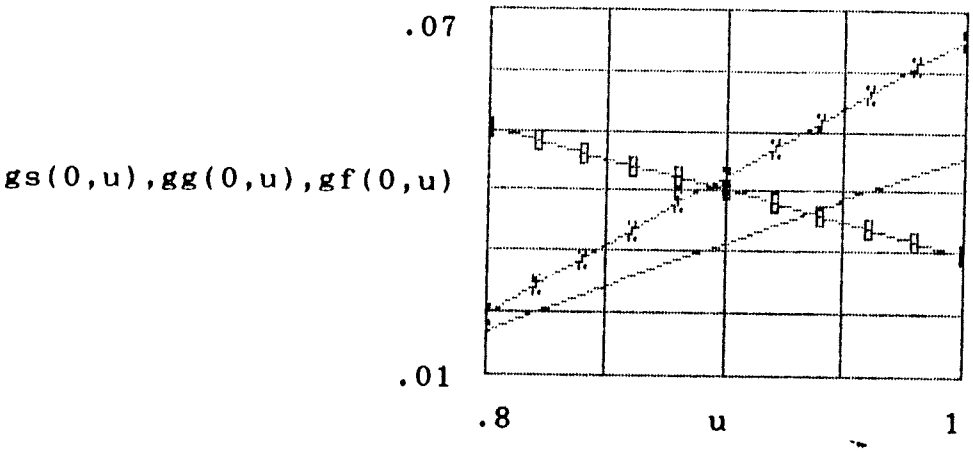
The pattern of fiscal adjustment, however, has to be carefully considered, since the adjustment is needed, not so much as a way to shift the fiscal constraint upward, but as a way to turn the saving constraint less severe. This may be easily illustrated by two additional experiments. Going back to the basic scenario -- making again (phi) = 0 --, and increasing the value of the (zo - js) to incorporate the assumption of a fiscal adjustment corresponding to 3% of the GDP, one gets the feasible set presented in the figure of panel 5.3. Now, the maximum feasible growth rate is not significantly different than the one observed in the basic scenario. The main difference is that it is consistent with a lower (u). But the saving constraint remains binding, whereas a substantial slack is introduced in the fiscal constraint. This means that there is an overkill in the assumed fiscal adjustment.

There is no point in increasing the investment financing capacity of the public sector if the overall investment financing capacity of the economy remains binding. The overkill may be eliminated if the fiscal adjustment corresponding to 3% of the GDP is combined with the assumption of an offsetting

Panel 5.3

A fiscal adjustment overkill
with an increase of 3% of GDP in z with d=0

zo = -0.182



u	gs(0,u)	gg(0,u)	gf(0,u)
0.8	0.017	0.02	0.051
0.82	0.02	0.024	0.048
0.84	0.023	0.029	0.046
0.86	0.026	0.033	0.044
0.88	0.029	0.038	0.042
0.9	0.031	0.042	0.04
0.92	0.034	0.047	0.038
0.94	0.037	0.052	0.036
0.96	0.04	0.056	0.034
0.98	0.043	0.061	0.032
1	0.046	0.065	0.03

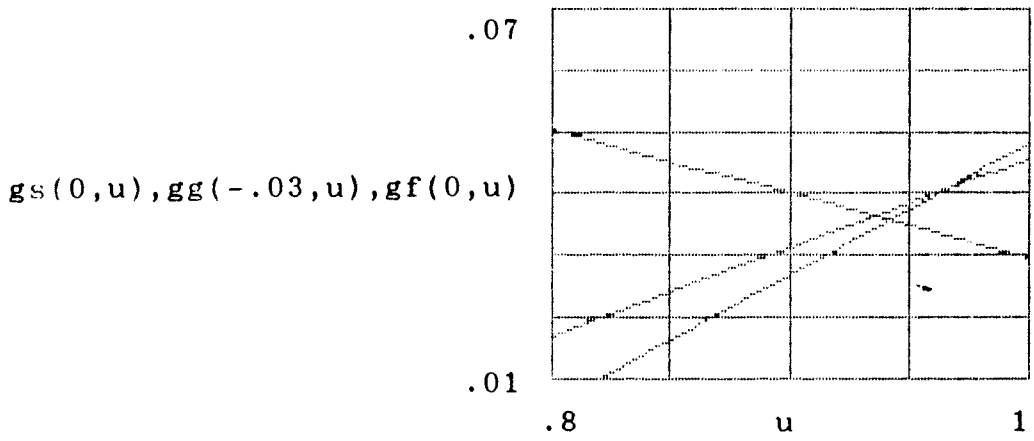
negative PSBR (d = -3%). This could be achieved, for example, by an increase in the net tax rate not matched by a simultaneous equivalent rise in public expenditure, as was implicit in the previous exercise (panel 5.3), which assumed an unchanged PSBR, that is, a constant (d). In the new exercise, shown in the figure of panel 5.4, the adjustment acts basically upon the saving constraint, avoiding an impact on the fiscal one that would be unavailing from the viewpoint of faster growth.

The maximum feasible growth rate in that figure is still around 3.5%, but now one may note that the same shift upward in the foreign constraint considered before, as a result of making again (phi) = 1%, would allow an increase in the growth rate to approximately 4.5%, for very high (u) values. To make still higher growth rates possible, or to avoid the need of maintaining high, potentially unstable, (u) values, a yet more vigorous fiscal adjustment would be necessary. In the figure of panel 5.5, one may see the feasible set when one introduces an increase in (zo - js) which assumes a fiscal ajustment of 6% of GDP. It is assumed as well that the fiscal surplus is raised to (d =-4%) and that the current account deficit in the balance of payments (phi) may be kept at 1.5% of GDP. In this scenario a growth rate of approximately 6% could be attainable.

Notice that the feasible set would be significantly more favourable if a higher value were attributed to (z1), the

Panel 5.4

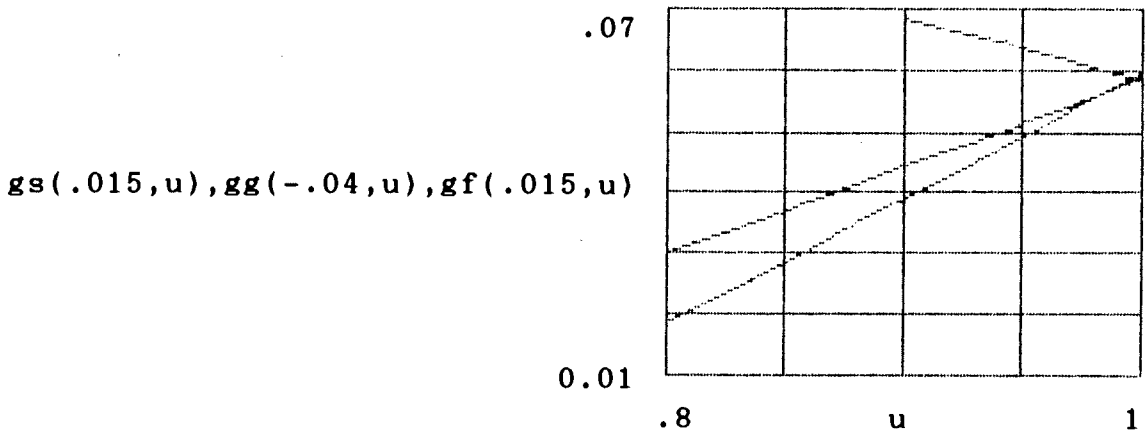
Eliminating the overkill
with a fiscal surplus of 3% of GDP



u	gs(0,u)	gg(-.03,u)	gf(0,u)
0.8	0.017	0.006	0.051
0.82	0.02	0.01	0.048
0.84	0.023	0.014	0.046
0.86	0.026	0.019	0.044
0.88	0.029	0.023	0.042
0.9	0.031	0.027	0.04
0.92	0.034	0.031	0.038
0.94	0.037	0.036	0.036
0.96	0.04	0.04	0.034
0.98	0.043	0.044	0.032
1	0.046	0.048	0.03

Panel 5.5

Consequences of a fiscal surplus of 4% of GDP
combined with a 6% increase in the fiscal effort z



u	gs(.015,u)	gg(-.04,u)	gf(.015,u)
0.8	0.03	0.018	0.079
0.82	0.033	0.023	0.077
0.84	0.036	0.027	0.075
0.86	0.039	0.031	0.073
0.88	0.041	0.035	0.071
0.9	0.044	0.039	0.069
0.92	0.047	0.043	0.067
0.94	0.05	0.047	0.064
0.96	0.053	0.051	0.062
0.98	0.056	0.056	0.06
1	0.059	0.06	0.058

parameter measuring the sensitivity of the fiscal effort (z) to the capacity utilization rate (u). If one assumes a 10% increase in (z1), the fiscal adjustment required to reach a 6% growth rate for the nineties could be equivalent to only 4% of GDP, instead of 6%, as found above. In fact,one could increase (z1) as a result of policies that enhance the response of the tax burden to (u).

6. Sensitivity Analysis

Several types of sensitivity analyses could be done with the model, the most interesting ones being of course those related to the importance of the main behavioural parameters (alpha), (beta), (sigma1) and (gamma1) upon the results described above. In the present section, the robustness of the policy conclusions suggested in the scenarios of the last section is checked through experiments with different values for these four parameters.

In panels 6.1 to 6.3 one may analyse the sensitivity of the maximum feasible growth rate values to different values assumed for the effect of capacity utilization on private savings (sigma1), to the response of private investment to public investment (alpha) and to the sensibility of private investment to capacity utilization (beta).

Panel 6.1 presents the sensitivity of the saving-constrained growth rate to (sigma1), which was assumed to be equal to 0.2 in the experiments of section 5. Growth rates for (sigma1) values equal to 0.18 and 0.22, for each level of the capacity utilization rate, are shown in the panel. For a 90% rate of capacity utilization, for example, a full percent point gain in the saving-constrained growth rate is obtained if (sigma 1) is taken to be 0.22 and not 0.18.

Panel 6.2 examines the sensitivity of the fiscal-constrained growth rate to the value of (alpha), for each value of the rate of capacity utilization, from 0.8 to 1.0. The value assumed for (alpha) in the simulations was 1.0. In panel 6.2 one may observe the effect of assuming it to be equal to 0.8 and 1.2. As expected, the more complementary is private to public investment the higher is the fiscal-constrained economic growth rate for each level of (u). At (u=0.9), an increase in (alpha) from 1.0 to 1.2 raises the maximum rate of growth permitted by the fiscal constraint by almost a third of a percent point.

The sensitivity of the fiscal-constrained rate of growth to the parameter (beta) is reported in Panel 6.3. In the upper part of the panel it is noted that the sensitivity of (gg) to (beta) depends significantly on the level of (beta). Gains in the fiscal-restricted growth rate, which follows a 10% increase

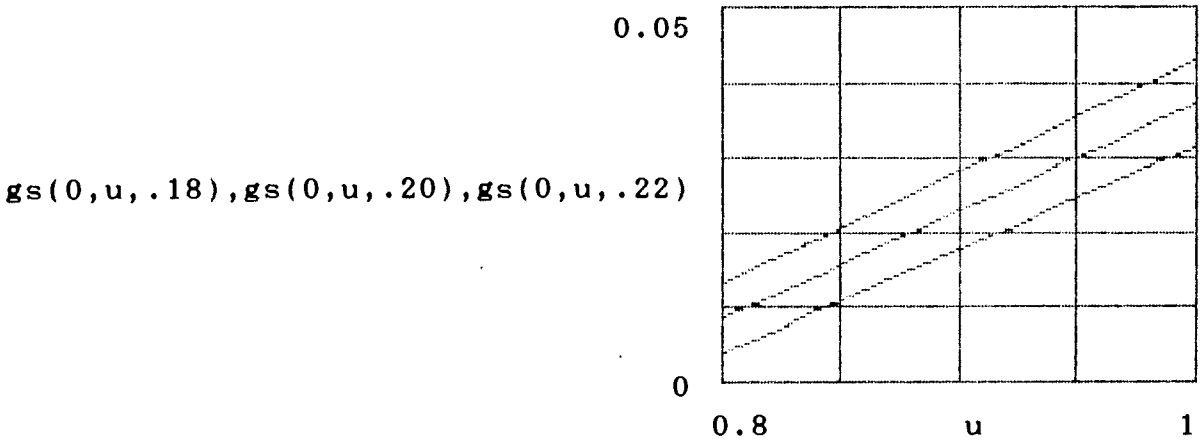
Panel 6.1

Sensitivity of the savings constraint to σ1 (=.2)

Higher private savings will lead to a higher maximum feasible public investment allowed by the savings constraint. Considering impacts on gs of a 10% change in σ1 around the assumed value of .2 one gets, for

u := .8,.82 ..1

u	gs(0,u,.18)	gs(0,u,.2)	gs(0,u,.22)
0.8	0.004	0.009	0.013
0.82	0.007	0.012	0.016
0.84	0.01	0.014	0.019
0.86	0.012	0.017	0.022
0.88	0.015	0.02	0.025
0.9	0.018	0.023	0.028
0.92	0.021	0.026	0.031
0.94	0.023	0.029	0.034
0.96	0.026	0.032	0.037
0.98	0.029	0.034	0.04
1	0.032	0.037	0.043



Panel 6.2

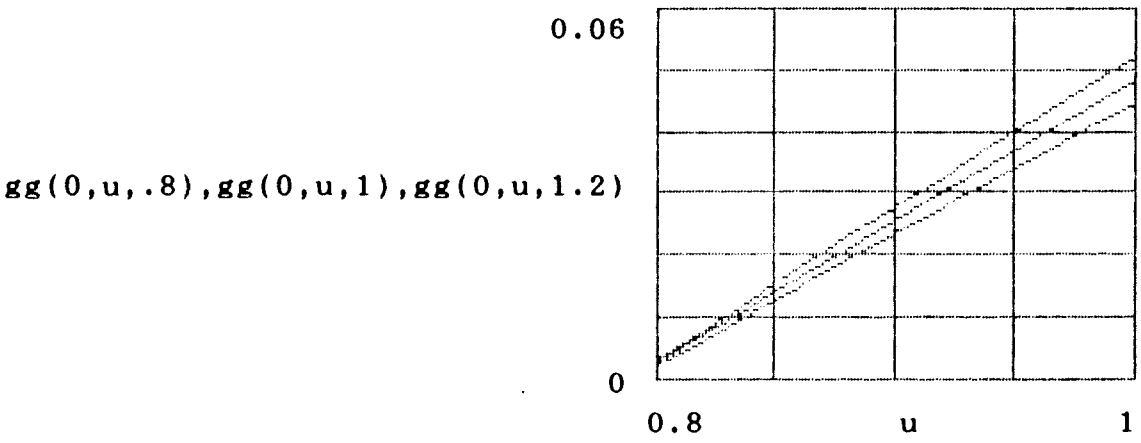
Sensitivity to α

It turns out that α does not affect either gs or gf, although it influences the respective is and if.

The sensitivity of the fiscal-constrained growth rate gg to α may be computed as follows, where α is made equal to 0.8, 1.0 and 1.2:

u := .8,.82 ..1

u	gg(.0,u,.8)	gg(.0,u,1)	gg(.0,u,1.2)
0.8	0.002	0.003	0.003
0.82	0.006	0.007	0.008
0.84	0.011	0.012	0.013
0.86	0.015	0.016	0.018
0.88	0.019	0.021	0.023
0.9	0.023	0.025	0.028
0.92	0.028	0.03	0.033
0.94	0.032	0.035	0.038
0.96	0.036	0.039	0.042
0.98	0.04	0.044	0.047
1	0.044	0.048	0.052



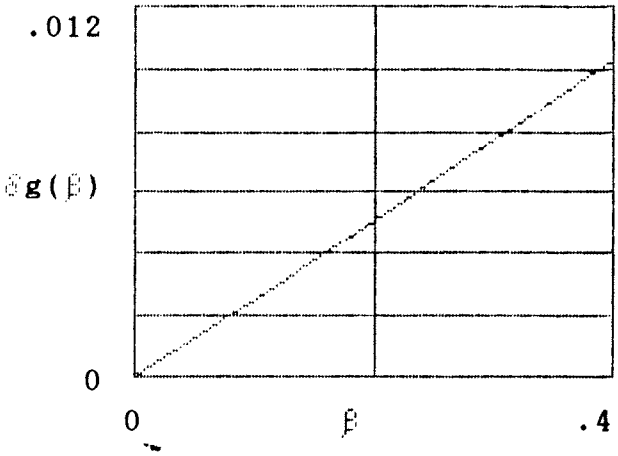
Panel 6.3

Sensitivity of the fiscal constraint to β (=.2):

The impact on **gg** of a 10% change in β is defined as:

$$\Delta g(\beta) := (.1\cdot\beta)\cdot\left[\frac{d}{d\beta} gg(0,.9,\beta)\right]$$

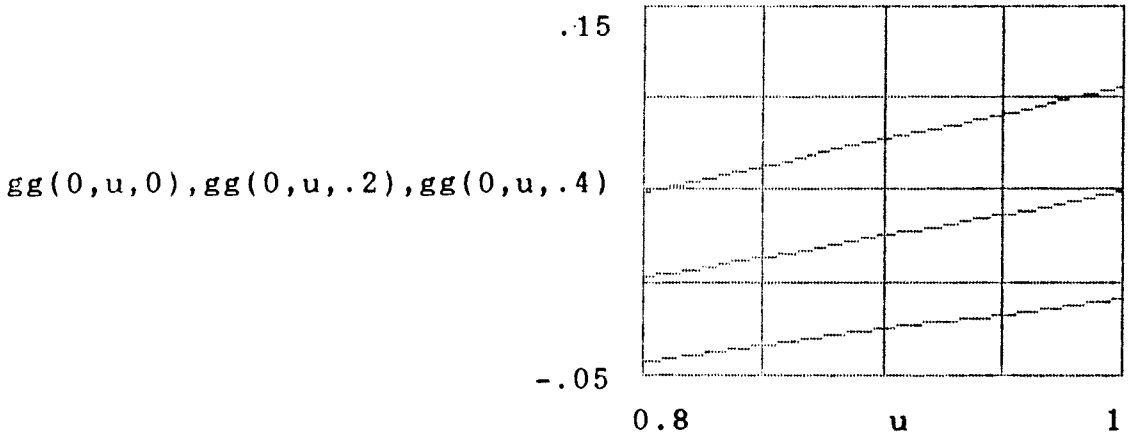
β	Δg(β)
0	0
0.1	0.003
0.2	0.005
0.3	0.008
0.4	0.01



Sensitivity of **gg** to the values of β=.1,.2 and .3

u := .8,.82 ..1

u	gg(0,u,0)	gg(0,u,.2)	gg(0,u,.4)
0.8	-0.043	0.003	0.048
0.82	-0.04	0.007	0.054
0.84	-0.036	0.012	0.06
0.86	-0.033	0.016	0.066
0.88	-0.029	0.021	0.071
0.9	-0.026	0.025	0.077
0.92	-0.023	0.03	0.083
0.94	-0.019	0.035	0.088
0.96	-0.016	0.039	0.094
0.98	-0.012	0.044	0.1
1	-0.009	0.048	0.106



in the value of (beta), for a capacity utilization rate (u) equal to 90%, are presented. Examples of the way the fiscal-constrained growth rate varies with (beta) for each level of capacity utilization are reported in the lower portion of the panel, for values of (beta) equal to zero and 0.4.The value assumed for (beta) in the simulations was 0.2.

The impact of additional investment on the demand for imported capital goods is also likely to be an important parameter to be considered in the evaluation of the external constraint to the economic growth of the Brazilian economy in the nineties. In the version of the model described in section 3, the share of imported capital goods in total investment was made to depend on the investment ratio. The higher the investment ratio the higher the importance of capital goods imports in total investment. The parameter (gamma1) measures the response of the share of imported capital goods to total investment (i).

The value of (gamma 1) will depend on the investment pattern that will prevail in the nineties and may reflect the effect of import-substitution policies in the capital-goods industry. The degree of success of the last round of such policies implemented in the second half of the seventies are hard to evaluate, due to the fall in the rate of investment following the stabilization crisis in 1982/83. In the first half

of the seventies, typical figures for the share of imports in total machinery and equipment outlays were above 20%, and this figure declines to 13,2% in 1980 and to only 9% in 1982. As a fraction of total fixed investment, imported capital goods declined from 10% in 1973 to 5.4% in 1980 and to 3.4% in 1982. In the model used above, (gamma1) was taken as 0.15 in the simulations of section 5 meaning that an increase of 1% of GDP in the rate of investment leads to an increase in the imports of capital goods of 0.15% of GDP. Between 1973 and 1975, the observed value for (gamma1) was 0.125 and between 1980 and 1982 the figure was 0.14.

It is likely that the effectiveness of the external constraint to economic growth will change substantially with the expected role to be played by imported capital goods in total investment. But, as already mentioned, this role depends on both the investment pattern and the industrial policy decisions concerning the degree of import-substitution which is expected to take place in the capital goods industry. On the other hand, further import substitution in the capital goods industry may lead to an increase in the value of (k) -- the incremental capital-output parameter -- and that would be detrimental to growth. Unfortunately, the latter effect is not considered in the model developed here.

The sensitivity of the results reported in section 5 to the parameter (gamma1) is examined in Panel 6.4 in three different ways. First, it is found out that the response of the foreign- exchange-constrained public investment to the level of feasible current account deficit (phi) largely depends on (gamma1). The fall in this multiplier as (gamma1) increases is shown in the upper part of the panel. The derivative was calculated for (phi) equal zero and (u) equal to 90%. It may be seen that assuming (gamma1) to be 0.2, instead of 0.15, more than doubles the multiplier. Secondly, the effect of changes in (gamma1) on the response of the foreign-exchange-constrained growth rate to the level of feasible current account deficit (phi) is computed in the middle part of the panel 6.4. If (gamma1) is supposed to be equal to 0.1, an increase in (phi) equivalent to 1% of the GDP may raise the maximum feasible growth rate from the viewpoint of the foreign exchange contraint by 2.86 percent point. This effect is halved if (gamma1) is assumed to be equal to 0.2.

The importance of the value of (gamma1) in the determination of the maximum rate of growth permitted by the foreign exchange constraint may be evaluated in a different way in the bottom part of the panel, for an average level of capacity utilization of 90% in the decade. A decline in the value of (gamma1), from 0.15 to 0.1, would increase the externally-constrained rate of economic growth from an annual average of 4% to 6.7% in the nineties.

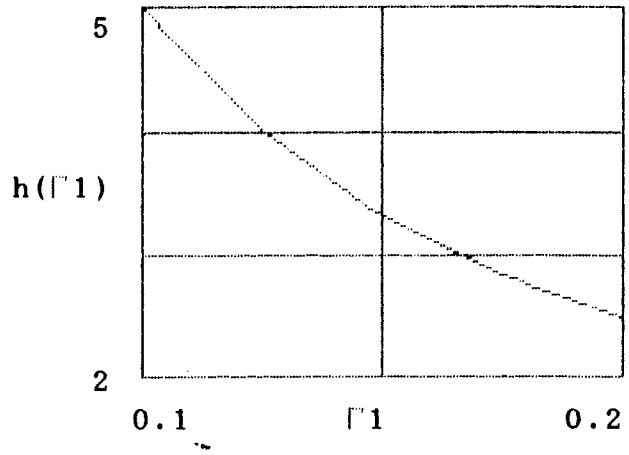
Panel 6.4

Sensitivity of the foreign exchange constraint to Γ1

Sensitivity to Γ1 of the impact of the availability of more foreign finance on the maximum public investment level allowed by the foreign exchange constraint, for ϕ = 0 and u =0.9.

$$h(\Gamma 1) := \frac{d}{d\phi} if(\phi, \Gamma 1, u)$$

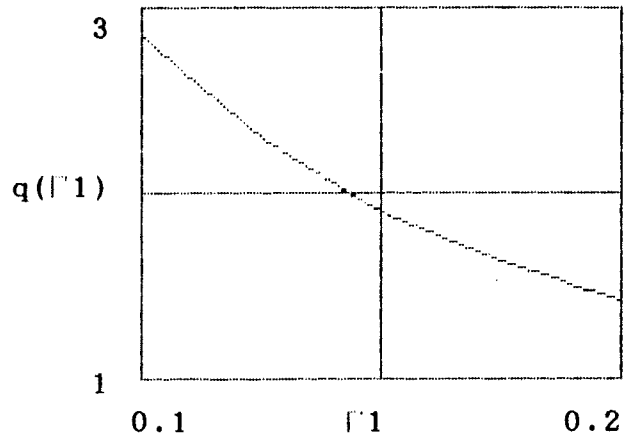
Γ1	h(Γ1)
0.1	5
0.125	4
0.15	3.333
0.175	2.857
0.2	2.5



Sensitivity to Γ1 of the impact of the availability of more foreign finance on the maximum GDP growth rate allowed by the foreign exchange constraint, for ϕ = 0 and u =0.9.

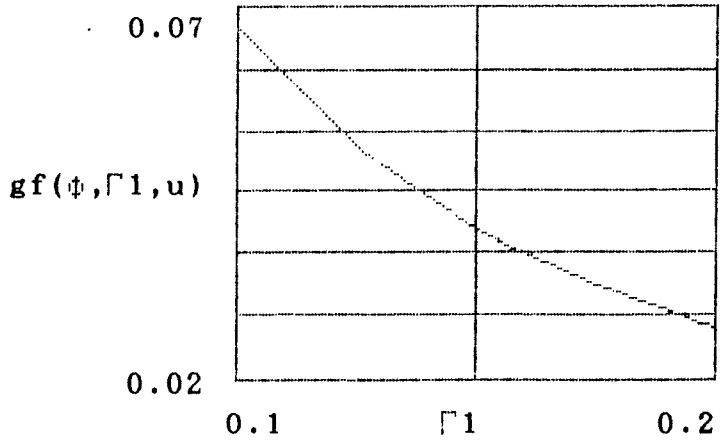
$$q(\Gamma 1) := \frac{d}{d\phi} gf(\phi, \Gamma 1, u)$$

Γ1	q(Γ1)
0.1	2.86
0.125	2.288
0.15	1.907
0.175	1.634
0.2	1.43



Sensitivity of the maximum GDP growth rate allowed by the foreign exchange constraint to Γ1, for ϕ = 0 and u =0.9

Γ1	gf(ϕ,Γ1,u)
0.1	0.067
0.125	0.051
0.15	0.04
0.175	0.032
0.2	0.026



7. Concluding Remarks

The growth excercises presented above illustrate some of the key policy issues the Brazilian economy will have to face in the 1990's. In the basic scenario a hypothetical situation of zero deficits was analysed: without a major improvement in public sector savings and if both the fiscal budget and the current account are kept strictly balanced, average annual growth rates slightly above 3% are all that may be ahead for the nineties, which is less than half the observed average rate of economic growth since 1940.

It has to be added to the picture another result of the same scenario that even such a modest rate would require the maintenance of a rather high rate of capacity utilization compared with historical levels. One is entitled to doubt whether a reasonably stable economy can be sustained at average rates of capacity utilization above 95%, with low rates of inflation following the present high inflation starting situation. The effects of the removal of the external constraint in the basic scenario reinforces the above conclusion. A higher rate of economic growth -- around 4% -- could be obtained if the economy could sustain full capacity for the whole decade. That, however, stands against the more likely prospects of conservative short-run policies in the aftermath of the the current inflationary outburst.

After a decade of virtual stagnation of per capita income, the minimum requirements for resumption of sustained economic growth involve a frontal attack on the country's savings and fiscal constraints. The exercises described in panels 5.3 to 5.5 illustrate the complementarity of policies directed towards shifting the fiscal and savings contraints upwards. One simple lesson is the poverty of single-minded policies directed for "austerity at any price" in the public sector if significant improvement in total savings is not obtained at the same time. Another lesson is that an incresse in the fiscal effort may be justified, even if the fiscal constraint is not binding, simply as an effective way to turn the saving constraint less binding.

The importance of harnessing private savings to the growth-related activities cannot be exaggerated in view of the current trend of financial capital first to remain as liquid as possible, then fly abroad at the first sign of instability. With the present level of uncertainty prevailing in the Brazilian economy, it is understandable that private investors are so reluctant to part with liquidity and thus the rate of investment remains very low. In the meantime, short run indexed liquidity provided by government's indexed bonds is the basic asset in the private sector's portfolio. A credible programme of public investment, based on solid prospects on the availability of

public savings, is crucial for the recovery of investors' willingness to engage in long run projects. The results of section 5 are useful to evaluate the size of the savings and fiscal effort needed to put the economy back in a feasible growth track.

From the sensitivity experiments presented in section 6 two types of results may be derived: one is the sensitivity of the simulation results to values attributed to parameters described in section 4, in view of the precariousness of some of the estimates. Another one is the evaluation of the potency of some types of policies aimed at changing some of the structural parameters like the response of private savings to the rate of capacity utilization and the coeficients of the export and import functions, which were used in the basic simulation.

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