Volume Title: Financial Policies and the World Capital Market: The Problem of Latin American Countries

Volume Author/Editor: Pedro Aspe Armella, Rudiger Dornbusch, and Maurice Obstfeld, eds.

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-02996-4

Volume URL: http://www.nber.org/books/arme83-1

Publication Date: 1983

Chapter Title: Debt and the Current Account Deficit in Brazil

Chapter Author: Olivier Jean Blanchard

Chapter URL: http://www.nber.org/chapters/c11192

Chapter pages in book: (p. 187 - 198)

8 Debt and the Current Account Deficit in Brazil

Olivier Jean Blanchard

One of the premises underlying the debate about economic policy in Brazil is that the country is accumulating too much external debt. Therefore, most of the proposed policies attempt, through either depreciation or a reduction in economic activity, to reduce the current account deficit. The purpose of this short paper is to question the validity of that premise and thus the necessity of such painful remedies.

Brazil indeed has a level of debt which is both high by international standards and increasing fast. The ratio of external guaranteed debt to GDP is approximately 25 percent, slightly lower than the Latin American average. The ratio of total external debt to GDP is probably around 35 percent. The current account deficit has increased rapidly since 1973, reaching 5 percent of GDP. This increase was initially the result of a larger trade balance deficit, and more recently the result of the higher nominal interest payments on existing debt.

Does this represent too high a level of debt and too high a current account deficit? As the current account is the difference between income and spending, the question can be rephrased as follows: Given the current levels of debt and capital, is consumption or investment spending too high? The underlying rate of growth is still high and expected to remain high. This suggests the feasibility of maintaining high levels of consumption together with the ability to repay debt in the future. The

Olivier Jean Blanchard is an associate professor in the Department of Economics, Harvard University, and a faculty research fellow of the National Bureau of Economic Research.

This paper was written while the author was on leave at the Hoover Institution. Financial assistance from the Hoover Institution and from the John Stauffer Charitable Trust is gratefully acknowledged.

The author wishes to thank Andrew Abel, Eliana Cardoso, Rudiger Dornbusch, and especially Jeff Sachs for suggestions and discussions.

rate of return on investment still largely exceeds the world real interest rate charged for similar projects; this suggests the desirability of further investment.

In order to answer the question, I proceed in three steps. In section 8.1, I specify what is probably the simplest model needed to address the question and show the qualitative features of the answer. In section 8.2, I refine the model just enough so that it can be used for simulations and give quantitative answers which have a semblance of relevance for Brazil. The results suggest that a country like Brazil can safely run a current account deficit at its present level. In section 8.3, I extend the question slightly by considering the possibility that Brazil may want, nevertheless, to reduce its current account deficit. The problem then becomes the allocation of the reduction in spending between consumption and investment. This section suggests that most of the decrease in spending should come from consumption rather than from investment.

8.1

To ask whether the current account deficit is too high is to ask whether investment or consumption spending is too high. Investment spending may be too high, even if the rate of return on capital exceeds the borrowing rate, if it is proceeding too fast and too inefficiently, wasting too many resources in return for future output. Consumption spending may be too high if the implied accumulation of debt leads to drastic reductions in future consumption.

To answer these two questions, a model must have at least two components. It must have a description of technology such that high rates of investment are associated with waste or high installation costs. It must have an objective function which allows the ordering of different paths of consumption. The following model is probably the simplest one:[1]

$$\max_{\{C,I\}} \int_0^\infty e^{-\Theta t} U(C_t)dt, \text{ subject to}$$

$$\dot{B}_t = C_t + I_t[1 + \psi(I_t)] + \Theta B_t - F(K_t, \bar{L}),$$

$$\dot{K}_t = I_t,$$

$$K_0,\ B_0, \text{ given; } \psi' > 0,\ F_K > 0,\ F_{KK} < 0.$$

Spending is the sum of consumption, C_t, and investment spending. Investment spending itself is the sum of investment, I_t, and "installation

1. This model is implicit in much of the literature on debt and the current account. This includes in particular work by Bardhan and Bruno in the 1960s, and more recently by Helpman, Obstfeld, Razin, Sachs, and Svensson, among others. An exhaustive bibliography is given in Svensson (1983).

costs" $I_t\psi(I_t)$; $\psi(\cdot)$ is an increasing function of I_t, implying higher installation cost per unit of investment for higher levels of investment.

The country can borrow or lend at the world interest rate, Θ. The excess of spending plus interest on debt, ΘB_t, over output, $F(K_t, \bar{L})$, is equal to the current account deficit, itself equal to the change in debt, $\dot{B}$. There are, in this simple model, no population growth ($L = \bar{L}$), no productivity growth, and no depreciation of capital; furthermore, the subjective discount rate is equal to the world interest rate; all these assumptions will be relaxed later.

The solution to the above problem as stated is probably difficult to advocate. It is to go deeper and deeper in debt forever, issuing new debt to meet interest payments. To avoid such Ponzi games, an additional condition is needed. The following will do:

$$\lim_{t \to \infty} e^{-\Theta t} B_t = 0 .$$

Solving the first order conditions and rearranging gives the following characterization of the solution:

$$(1) \qquad 1 + \psi(\dot{K}_t) + \dot{K}_t \psi'(\dot{K}_t) = q_t ,$$

$$(2) \qquad \dot{q}_t = \Theta q_t - F_K(K_t, \bar{L}); \ \lim_{t \to \infty} e^{-\Theta t} q_t = 0 ,$$

$$(2') \qquad q_t = \int_t^\infty e^{-\Theta(s-t)} F_K(K_s, \bar{L}) ds ,$$

and

$$(3) \qquad C_t = \bar{C} ,$$

$$(4) \qquad \dot{B}_t = \Theta B_t + C_t + \dot{K}_t [1 + \psi(\dot{K}_t)] - F(K_t, \bar{L}) .$$

Equations (1), (2), and (2′) characterize investment spending. Equation (1) says that investment should take place until the marginal cost of investing equals q_t. Equation (2) implies (2′), which gives q_t as the present value of future marginal products. The important characteristic of the solution is that investment spending depends only on the technology and the world rate of interest and does not depend on the objective function or the initial level of debt.

Once the investment problem has been solved to give the path of investment and the capital stock, the consumption problem can be solved using (3), (4), and the transversality condition we have imposed on debt. If, as we have assumed, the subjective discount rate is equal to the world interest rate, the preferred path of consumption is constant. The problem is then to find the highest sustainable level of consumption. Solving (4), using the transversality condition, gives consumption as function of net wealth:

$$C_t = \Theta[\int_t^\infty e^{-\Theta(s-t)}\{F(K_s,\bar{L}) - \dot{K}_s[1 + \psi(\dot{K}_s)]\}ds - B_t].$$

Consumption depends positively on the sequence of net output, negatively on existing debt.

Returning to the current account, this model suggests an essential asymmetry between investment and consumption. Whatever the initial level of debt, investment should proceed if the current marginal product exceeds the interest rate. Whether consumption should be high or not and, thus, whether the current account should be balanced or not depends very much on the initial level of debt and cannot be determined a priori. To get some idea of what the answer might be for Brazil, this initial model needs to be refined a little.

8.2

The purpose of this section is to derive, under different assumptions about growth, feasible paths of consumption for a country like Brazil. To do this, I must allow for population growth, n, time varying Harrod neutral technological progress β_t, a positive rate of capital depreciation δ, and let the subjective rate of discount Θ_t possibly vary over time. The model thus becomes:

$$\max_{\{C,I\}} \int_0^\infty L_t U\left(\frac{C_t}{L_t}\right) e^{-\int_0^t \Theta_s ds} dt,$$

subject to:

$$\dot{B}_t = C_t + I_t\left[1 + \psi\left(\frac{I_t}{K_t}\right)\right] + rB_t - F(K_t, L_t e^{\int_0^t \beta_s ds}),$$

$$\dot{K}_t = I_t - \delta K_t,$$

$$K_0,\ B_0,\ \text{given}.$$

The world interest rate is still assumed constant and is now denoted by r. The only additional modification is in the functional form of the installation cost of investment. The installation cost is now assumed to be a function of the ratio of investment to capital rather than of the level of investment. This assumption is more appropriate in a growing economy.

As usual, it is convenient to work with all variables divided by labor in efficiency units. They will be denoted by lower case letters. Solving the first order conditions gives a characterization very similar to the previous one. Investment and capital accumulation are characterized by:

(5) $$\frac{i_t}{k_t}\psi'\left(\frac{i_t}{k_t}\right)+\psi\left(\frac{i_t}{k_t}\right)=q_t-1;$$

$$\dot{k}_t=i_t-(\delta+\beta_t+n)k_t,$$

(6) $$\dot{q}_t=(\delta+r)q_t-\left[\left(\frac{i_t}{k_t}\right)^2\psi'\left(\frac{i_t}{k_t}\right)+f'(k_t)\right].$$

Again, the rate of investment takes place until the marginal cost of investing is equal to the present value of marginal products, q_t. The slightly different specification of installation costs is responsible for the difference between equations (5) and (6) and the previous equations (1) and (2). Again, investment does not depend on tastes or the level of debt.

Consumption is now characterized by:

(7) $$\epsilon\left(\frac{\dot{c}_t}{c_t}+\beta_t\right)=\Theta_t-r;\ \epsilon\equiv\frac{C_te^{\int_0^t\beta_sds}U'}{U''},$$

(8) $$\dot{b}_t=(r-\beta_t-n)b_t+i_t\left[1+\psi\left(\frac{i_t}{k_t}\right)\right]-f(k_t).$$

Equation (7) characterizes the path of consumption. If $\Theta_t=\Theta=r$, consumption in efficiency units decreases at rate β so that consumption per capita is constant as in the first model. If $\Theta_t=r+\epsilon\beta_t$, consumption in efficiency units is constant so that, along the optimal path, consumption per capita grows at the rate of technological progress. Equation (8) together with a nonexplosion condition for debt determines the highest feasible path of consumption.

To get quantitative answers, functional forms, initial conditions and values of the parameters must now be specified. I shall concentrate on the effects of varying two parameters. The first one, related to technology, is the rate of growth of technological progress. The second, related to the objective function, is the discount rate; varying it will allow consideration of different feasible consumption paths, given the technology. The rest of the model is specified as follows:

On the technology side, $f(\cdot)$ is Cobb-Douglas, with a share of capital of 25 percent. Depreciation is equal to 10 percent, population growth 1 percent. $\psi(\cdot)$ is linear: $\psi(i/k)=2(i/k)$. This implies that a ratio of gross investment to capital of 10 percent per year leads to an installation cost of 20 percent of investment. The world real interest rate is 5 percent. This implies from equations (5) and (6) a steady state gross marginal product of 19 percent. The initial condition for capital is chosen so that the initial marginal product is 25 percent.

The utility function is logarithmic, so that $\epsilon=-1$. The initial ratio of debt to GNP is chosen to be approximately 50 percent, higher than the current Brazilian ratio.

The first set of simulations, reported in table 8.1, gives the highest sustainable *constant level of per capita consumption*. Variable Θ_t is set equal to r in all three simulations which represent three different hypotheses about the rate of technological progress. In all three cases, it is assumed to have a 1980 value of 6 percent. In the first case, this rate is assumed to decline by 5 percent per year, in the second by 10 percent, and in the third by 20 percent.

In view of the constant consumption per capita (which corresponds in the table to a decreasing consumption per efficiency unit) in a growing economy, the dramatic results in table 8.1 are easily understood. Optimal investment is approximately equal to 22 percent of GNP and relatively insensitive to the anticipated rate of growth. Consumption is, however, very sensitive; even in the "pessimistic" case, consumption is initially larger than production, and debt increases to 3 times GNP. The required trade balance surplus in steady state represents 10 percent of GNP.

What these three simulations show is the high level of sustainable consumption in a rapidly growing economy and the associated large

Table 8.1 Constant Consumption per Capita

Year	β	$f(k)$	c	i	cad	tbd	b
			Optimistic				
1980	.060	.70	1.27	.16	.83	.81	.40
1981	.057	.71	1.19	.16	.77	.71	1.20
1985	.047	.73	.95	.15	.59	.42	3.45
1990	.037	.75	.76	.14	.45	.20	5.01
2000	.023	.76	.57	.13	.30	−.01	6.49
2020	.014	.76	.40	.11	.16	−.21	7.57
			Intermediate				
1980	.060	.70	.96	.15	.50	.48	.40
1981	.055	.71	.90	.15	.45	.40	.87
1985	.037	.73	.73	.14	.29	.19	2.09
1990	.023	.74	.62	.12	.18	.04	2.83
2000	.009	.76	.53	.11	.10	−.07	3.39
2020	.001	.77	.49	.11	.04	−.14	3.61
			Pessimistic				
1980	.060	.70	.80	.14	.33	.31	.40
1981	.050	.71	.75	.14	.28	.24	.70
1985	.024	.73	.63	.13	.14	.07	1.40
1990	.010	.75	.58	.12	.07	−.01	1.76
2000	.002	.76	.55	.11	.02	−.07	1.97
2020	.000	.77	.55	.11	.02	−.08	2.01

Note: All variables in efficiency units. cad = current account deficit. tbd = trade balance deficit.

initial trade balance deficits. Constant consumption per capita in a growing economy is, however, neither politically feasible nor desirable. A more relevant path of consumption may be a path where consumption per capita grows at the rate of technological progress, or where, equivalently, consumption per efficiency unit is constant. Returning to equation (7), we can find the best feasible paths satisfying this condition by putting $\Theta_t = r + \epsilon\beta_t$. As ϵ is negative, this implies a discount rate smaller than the world interest rate. This assumption is made in the three simulations reported in table 8.2. In all three cases, the 1980 value of β_t is 6 percent. In the first simulation, this rate declines by 5 percent per year, in the second by 10 percent, and in the third by 20 percent.

As the assumptions about technology are the same as before, investment and output are the same as in table 8.1. The level of consumption is different, however. Because of the assumption linking the discount rate to the rate of technological progress, the initial level of consumption is approximately insensitive to the rate of technological progress. What allows consumption to be relatively high initially compared to income is

Table 8.2 Constant Consumption per Efficiency Unit

Year	β	$f(k)$	c	i	cad	tbd	b
			Optimistic				
1980	.060	.70	.58	.16	.14	.12	.40
1981	.057	.71	.58	.16	.13	.10	.51
1985	.047	.73	.58	.15	.09	.05	.79
1990	.037	.75	.58	.14	.06	.02	.96
2000	.023	.76	.58	.13	.04	−.01	1.10
2020	.014	.76	.58	.11	.03	−.03	1.25
			Intermediate				
1980	.060	.70	.59	.15	.14	.12	.40
1981	.055	.71	.59	.15	.13	.10	.51
1985	.037	.73	.59	.14	.07	.04	.77
1990	.023	.74	.59	.12	.05	.01	.92
2000	.009	.76	.59	.11	.03	−.02	1.05
2020	.001	.77	.59	.11	.01	−.04	1.11
			Pessimistic				
1980	.060	.70	.59	.14	.13	.11	.40
1981	.050	.71	.59	.14	.11	.09	.49
1985	.024	.73	.59	.13	.07	.03	.75
1990	.010	.75	.59	.12	.05	−.00	.91
2000	.002	.76	.59	.11	.02	−.03	1.03
2020	.000	.77	.59	.11	.01	−.04	1.04

Note: All variables in efficiency units. cad = current account deficit. tbd = trade balance deficit.

the anticipated capital accumulation and capital deepening. The highest feasible path of consumption implies an initial trade balance deficit of 16 percent, and the trade balance remains in deficit for approximately ten years. In steady state, the country must run a trade balance surplus equal to 4 percent of GNP to meet interest payments on debt. All three simulations suggest that the present levels of trade balance and current account deficits in Brazil can be run quite safely.

The steady state level of debt, as opposed to the steady state capital stock, depends on both the initial conditions and the path of the economy. In all three simulations, the optimal path of consumption is associated with a high level of steady state debt, equal to approximately 1.5 times GNP. Such a level of debt may be considered unacceptable, not, as we have seen, because of issues of solvency, but for reasons of political risk. This may be particularly true if most of the capital inflow is in the form of direct investment. In section 8.3, I include this potential cost of high levels of debt and consider its implications.

8.3

The simplest way of taking account of the nonmonetary costs of foreign debt is to extend the objective function to include a "disutility of debt" function, so that the maximization problem now has as an objective function:

$$\max_{\{c,i\}} \int_0^\infty [U(c_t e^{\int_0^t \beta_s ds}) - G(b_t)] e^{nt - \int_0^t \theta_s ds} dt.$$

The function is directly stated in terms of efficiency units. The "disutility of debt," $G(b_t)$, is a function of the level of debt per efficiency unit. Not much would be changed if it was made a function of debt per capita or of the ratio of debt to income. $G(\cdot)$ is such that $G' > 0$; $G'' \geq 0$.

The first order conditions are similar to the conditions of section 8.2, except for the equations characterizing the movement of q and c over time. Those are now:

$$(6') \qquad \dot{q}_t = (\delta + r + \lambda_t) q_t - \left[\left(\frac{i_t}{k_t}\right)^2 \psi'\left(\frac{i_t}{k_t}\right) + f'(k_t) \right],$$

$$(7') \qquad \epsilon\left(\frac{\dot{c}_t}{c_t} + \beta\right) = \theta_t - r - \lambda_t,$$

where

$$\lambda_t \equiv G'(b_t) / e^{\int_0^t \beta_s ds} U'(c_t e^{\int_0^t \beta_s ds}).$$

The interpretation of these conditions is straightforward. The presence of a disutility of debt function implies that the relevant interest rate for both consumption and investment decisions is not r, but $r + \lambda_t$, where λ_t is simply equal to the ratio of the marginal disutility of debt to marginal utility of consumption. A high marginal disutility of debt implies a high shadow interest rate, a substitution of consumption in favor of consumption in the future and a decrease in investment.

I shall use as a benchmark the first simulation of table 8.2, so that I derive the highest feasible path of consumption under the assumptions that $\Theta_t = r + \epsilon\beta_t$ and that the rate of technological progress decreases by 5 percent per year. The assumption that $\Theta_t = r + \epsilon\beta_t$, together with the assumption that $U(\cdot)$ is logarithmic, implies that

$$\frac{\dot{c}_t}{c_t} = \lambda_t .$$

In steady state, if it is ever reached, λ_t must therefore be equal to zero. This in turn implies $G'(b) = 0$, so that this equation determines the steady state level of debt. In the light of this, I specify $G(b)$ to be:

$$G(b_t) = g(b_t - .4)^2, \; g \geq 0 .$$

This implies that the level of debt must return eventually to its initial value of .4. Different values of g will imply different paths of debt over time but leave the steady state level unchanged. Table 8.3 gives the results for three values of g: 0, .005, .075.

Table 8.3 indicates that, if a reduction in the growth of debt has to be achieved, it must be done by reducing consumption rather than investment. The investment path remains approximately unchanged as the marginal cost of debt is increased, as g increases from 0 to .075. A decrease in investment, although it decreases the current trade deficit, would lead to a decrease in potential output, either increasing future trade deficits given consumption or requiring a decrease in future consumption. The implication of this result is that even if the cost of debt is high (g = .075) so that debt never reaches more than 75 percent of GNP, it is better to run a trade balance deficit initially, when investment spending is high.

The main conclusion of this last set of simulations is that, if a reduction in the growth of debt must be achieved, investment spending and consumption spending should not be treated identically. Measures such as an exchange rate depreciation or a recession are likely to affect both investment and consumption, or even to alter investment more than consumption, and are therefore not attractive in this respect.

8.4 Conclusion

The above analysis suggests that from the point of view of solvency, Brazil's current account deficit is not a major problem. It also suggests

Table 8.3 **Debt-Constrained Paths**

Year	$f(k)$	c	i	cad	tbd	b
			(g = 0)			
1980	.70	.58	.16	.14	.12	.40
1981	.71	.58	.16	.13	.10	.51
1985	.73	.58	.15	.09	.05	.79
1990	.75	.58	.14	.06	.02	.96
2000	.76	.58	.13	.04	−.01	1.10
2020	.76	.58	.11	.03	−.03	1.25
			(g = 0.005)			
1980	.70	.56	.16	.11	.09	.40
1981	.71	.56	.15	.09	.07	.48
1985	.73	.56	.14	.06	.02	.66
1990	.74	.56	.13	.03	.00	.72
2000	.75	.57	.12	.02	−.01	.71
2020	.76	.59	.11	.01	−.02	.64
			(g = 0.075)			
1980	.70	.53	.15	.07	.05	.40
1981	.71	.53	.15	.05	.03	.44
1985	.73	.54	.14	.03	.00	.48
1990	.74	.56	.13	.02	−.00	.46
2000	.75	.57	.12	.00	−.01	.45
2020	.76	.60	.11	.00	−.01	.41

Note: cad = current account deficit; tbd = trade balance deficit.

that, if Brazil does not want to accumulate high levels of debt, the reduction in the deficit should come mostly from consumption rather than from investment.

The model used to reach these conclusions is quite simplistic, and it is useful to point to some of the ways in which these conclusions could potentially be overturned:

The implicit assumption of the model is the "one good" assumption, or equivalently, that the terms of trade are constant. If there is an anticipated adverse shift in the terms of trade, this would lead to lower levels of feasible consumption and trade balance deficit.

The explicit assumptions of the model about technology may be challenged. Government guarantees on private loans make these loans less risky than they truly are, and the difference between the rate of return and the true interest rate may be smaller than assumed above.

Finally, even the consumption sequences of tables 8.2 and 8.3 may be politically infeasible. Any trade balance deficit must be followed at some time by a trade balance surplus. If, for example, we required consumption to be growing at the same rate as income—rather than at the rate of technological progress, as in table 8.2—the initial level of consumption would be reduced and so would the trade deficit. This raises issues about the ability of fiscal policy to affect consumption and domestic savings, which have not been considered here.

Reference

Svensson, Lars E. O. 1983. Oil prices, welfare, and the trade balance. *Quarterly Journal of Economics*, forthcoming.