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THE MACRODYNAMIC EFFECTS OF ALTERNATIVE RESOLUTION STRATEGIES FOR DEBTOR COUNTRIES*

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Abstract:

This paper examines the macrodynamic effects of alternative resolution strategies of indebted nations through simulation analysis. We examine the macrodynamic implications of continued debt servicing, debt forgiveness, and a debt/equity swap in a model which includes staggered contracts, rational expectations, a devaluation rule based on current account targets and endogenous government spending dependent upon the wage and exchange rate levels. Our analysis shows that debt/equity swaps induce greater instability in the subsequent macroeconomic adjustment process than simple debt forgiveness or continued debt servicing outcomes or resolutions to the debt problem.

The analysis is based on an open-economy, general equilibrium, rational expectations macroeconomic model with overlapping contracts or staggered wage setting. We introduce the spread of nominal wages as a relevant macroeconomic variable, and thus draw attention to a trade-off not accounted for in previous models. Higher wage dispersion may cause output losses (through more frequent contract negotiation and work stoppages), prolong business cycles, and increase its volatility. The paper shows that the long-term effects of debt/equity swaps, which increase wage dispersion more than other strategies, may be less desirable that what conventional models, which by and large have ignored these effects, may lead us to believe.

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I. Introduction

This paper examines the macrodynamic consequences of three alternative resolution strategies, continued debt servicing, debt abrogation or "forgiveness", and a debt/equity swap, of an indebted nation, facing a crisis of "negative transfers", when debt-servicing begins to exceed the inflow of funds from abroad.

We analyze the macrodynamic adjustment process for each of these outcomes with numerical simulation. The model is a rational expectations model with overlapping wage contracts, an exchange rate rule based on current account targets, a government expenditure rule related to the average wage and the exchange rate, and wage dispersion, measured by the coefficient of variation of nominal wages across sectors. Wage dispersion has negative feedback effects on the level of output supply through the increased labor market tensions which lead to work slowdowns or stoppages.

We draw attention to several ways in which external indebtedness and strategies of adjustment or renewed access can affect the dynamics of key macroeconomic variables. First, we allow capital inflows to affect output supply through exponentially declining productivity or infrastructure effects. Secondly, we allow a debt/equity swap to increase aggregate demand by an exponentially declining fraction of the total stock of foreign debt, since we assume that foreign creditors have been granted "seniority" on equity. Finally, we assume that the debtor country which writes off its debt faces a penalty in the form of higher world interest rates than countries which engage in debt/equity swaps.

Our results show that the debt/equity swap induces greater instability in output, the current account, real wages, the real exchange rate, and wage dispersion than debt abrogation or continued debt servicing. The reason is that the swap induces a rise in aggregate demand, and thus a current account deficit, which in turn leads to a devaluation. The devaluation induces output fluctuation through the rise in wage dispersion, which leads in turn to changes in demand and relative prices. While this is some variation after the debt forgiveness strategy, the fluctuations are not as pronounced.

The next section presents the model. We then discuss the design of our simulation experiments and the results.

II. The Macrodynamic Framework

To analyze the macroeconomic consequences of the alternative resolution strategies, we have merged a version of the multi-union model of Taylor (1983) with an expanded macro model adapted from Fischer (1988).

The model consists of six blocks: the goods market; the foreign trade equations and international exchange identities; the financial markets; the price-setting equations; the expectation formation assumptions; and the wage-setting mechanism.

The model has its origins in the works of Fischer (1977a, 1977b, 1984a, 1984b) with the extensions and modifications appropriate for economic environments with rapid inflation and a policy-determined exchange rate rule, rather than for flexible exchange rates and exogenous monetary policy. We have included in the present analysis an independent government sector, although this extension would have to be made more extensive when the model is applied to any specific country.

In our description of the variables of the model, lower case letter denote logarithmic values. A dotted variable is the first difference while a circumflex over a variable represents its rate of change. Variables without a subscript refer to the current-period values. When the subscript t immediately precedes a variable, and the subscript (t+1) immediately follows it, this notation represents the expected value of the variable at time t for time t+1.

The Goods Market

Equations (1) through (4) describe the goods market.

Output supply:

$$(1)\quad y^s = y_0 + \alpha_1 (q_{t-1} - w_{t-1}) + \alpha_2 (q_{t-1} - e_{t-1} - q^*_{t-1}) - \alpha_3 CV_{w,\,t-1} + \alpha_4 \sum_{i=1}^{n} \beta^i EXD_{t-i}$$

Aggregate demand:

$$(2)\quad d = \beta_0 - \beta_1 \log(1 - {}_t p_{t+1}) + \beta_2 (m^s - m^d)$$

Export function:

$$(3)\quad x = \delta_0 + \delta_1 (e + q^* - q) + \delta_2 (e_{t-1} + q^*_{t-1} - q_{t-1})$$

Domestic output:

$$(4)\quad Y^d = D + X + G - T + EXD_{t^*} (1-\lambda) \lambda^{t-t^*}$$

where $EXD_{t^*} = EXD_t$ at time of debt/equity swap 0 if no debt/equity swap

The first equation for output supply shows that output depends negatively on the real wage and the real exchange rate, as well as (negatively) on the coefficient of variation of wages, and positively on the inflows of foreign capital. The second equation states that domestic private demand depends negatively on the real interest rate and positively on the excess supply of money. Equation (3) states that exports depend on relative prices in the current and past period. The domestic output demand equation is the sum of domestic private demand, exports, the government budget deficit, and if the policy is undertaken, from the time of the debt/equity swap, the proportion of the debt swapped for claims on domestic output. For each dollar of external debt, α^* is paid, and the demand for domestic output is phased in at the exponentially declining rate $(1-\lambda)\,\lambda^t$ following t*, the time of the debt/equity swap.

The Foreign Sector

The next three equations are the foreign sector identities:

Imports:

$$(5)\quad IM = Y^d - Y^s$$

Balance of Trade:

$$(6)\quad B = (X - IM)\,(Q/E)$$

Reserve changes:

$$(7)\quad \dot{R} = B + E\dot{X}D - I^* EXD_{t-1}$$

Our expression for imports, equation (5), is an equilibrium equation which ensures that domestic overall demand will equal domestic supply. There is no behavior equation for imports. Elsewhere, we have assumed an independent import demand function, and allowed inventories to act as a buffer stock in order to equate overall supply and demand [Bigman and McNelis (1988)]. Equations (6) and (7) are the usual accounting identities.

The Financial Sector

Equations (8) through (10) are the money demand, money supply, and interest rate adjustment equations. Money demand depends on output demand as well as on the nominal interest rate. Money supply is governed by reserve changes, the exogenous component of the monetary base (GCB), as well as by fiscal deficits. Finally, the domestic interest rate is determined by the world interest rate, the expected rate of devaluation, and by a risk factor positively related to the external debt/gdp ratio.

Money demand:

$$(8)\quad m^d - p = \mu_0 + y^d - \mu_1 I$$

Money supply:

$$(9)\quad \dot{M}^s = \dot{R}\,E + GCB + G - T$$

Interest rate adjustment:

$$(10) I = I^* + {}_t\hat{e}_{t+1} + \Phi(EXD/Y)\ ;\ \Phi \geqslant 0$$

Price and Exchange Rate Adjustment

The next three equations describe the evolution of the consumer price index, the price of domestically produced goods, and the nominal exchange rate. We also assume that the expectations of the price level and the exchange rate are formed rationally. We have used the Fair-Taylor method for computing the expected price level in each period. We assume that the expected exchange rate is the expected price level, until a devaluation occurs. Then we assume that the policy rule is known, and that the devaluation will be fully expected until another reversal in exchange rate behavior occurs.

Price dynamics:

$$(11)\quad \hat{p} = \epsilon\hat{q} + (1-\epsilon)(\hat{e} + \hat{q}^*)$$

Price dynamics (domestically produced goods):

$$(12)\quad \hat{q} = -\eta_0/(y^s - y^f) + \eta_1\,\hat{w} + \eta_2\,(\hat{e} + \hat{q}^*) - \eta_4$$

Exchange rate rule:

$$(13)\quad \hat{e} = \hat{p} \text{ if } B > B^*$$

$$\epsilon^* \text{ if } B < B^*, \text{ with } \hat{e}^* > p$$

The mark-up model given in equation (12) has been analyzed by Bruno (1978), Corbo (1985) and Gordon (1975) in previous studies of open semi-industrialized countries.

The Wage Mechanism

The next four equations relate to the behavior of individual wages, the average wage, and the wage dispersion. There are (m+1) unions, so the wage contour is a vector of (m+1) nominal wages, assume to be staggered over (m+1) periods. We assume that the membership of the labor force is equally distributed over the (m+1) unions. The individual wage negotiated at the present, W(0, t) is fully indexed to the price level, and also reacts to differences between actual output supply and full-employment (or fully capacity) output, y^f. The average wage is simply the mean nominal wage, and the coefficient of variation is simply the standard deviation of the nominal wage divided by the average wage[1].

Wage contour:

$$(14)\quad [W(m, t), W(m-1, t), ..., W(1, t), W(0, t)]$$

Individual wage adjustment:

$$(15)\quad W(0, t) = p_{t-1} - \alpha_w/(y^s_{t-1} - y^f_{t-1}) - \alpha_0$$

Average wage:

$$(16)\quad \overline{W}_t = \sum_{i=0}^{m} W(i, t)/(m+1)$$

Coefficient of variation of wages:

$$(17)\quad CV_{w,t} = \left\{ \sum_{i=0}^{m} [W(i, t) - \overline{W}_t]^2 / W_t^2 \cdot (m+1) \right\}^{-1/2}$$

The Government Sector

The final two equations describe government spending and taxation.

Government spending:

$$(18)\quad G = \gamma_0 + \gamma_1\,\overline{W} + \gamma_2\,E$$

Taxation:

$$(19)\quad T = \tau_0 + \tau_1\,(P\,Y)$$

III. The Effects of Alternative Outcomes

We now turn to the dynamic paths generated by the model under alternative assumptions. We specified the model with numerical parameters and initial conditions based on likely values of a typical small open economy. The constant terms were chosen to insure initial full stock/flow equilibrium.

We set the stage for alternative outcomes or resolution strategies by creating a constant flow of credit from abroad to domestic residents. However, when the interest payments on accumulated debt began to exceed the new flow of external fund, there are three possible outcomes ot this "crisis": (1) to suspend further borrowing, but to continue to service the outstanding accumulated external debt; (2) to write off the outstanding debt, but to face a world interest rate which includes a penalty for the accumulated debt; and (3) to engage in a debt/equity swap. We call the first resolution or outcome, "continued debt servicing", the second "debt forgiveness" and the third "debt/equity swap".

At this stage, there are no further reactions from the world credit markets. In all likelihood, however, the resumption of external credit flows is contingent on performance of key macroeconomic variables, so that the behavior of inflation, output, the current account and the fiscal deficit following each of these options affect the credit worthiness of the country for future borrowing.

We first examine in detail the dynamic effects of the continued debt servicing. Then we consider the dynamic effects of debt forgiveness and debt/equity swaps. Before proceeding to this analysis, however, we summarize the effects of the three alternatives in terms of the mean and variance of key macroeconomic variables following the cut-off of new lending. The results appear in Table I.

TABLE I

MEAN AND VARIANCE OF KEY VARIABLES FOR ALTERNATIVE RESOLUTION STRATEGIES

	Servicing	Forgiveness	Swap
Output[1]			
Mean	1000	987	979
Variance	30.9	207.	308.8
Interest rate[2]			
Mean	6.5	6.9	7.7
Variance	1.07 E–06	.0004	.0007
Imports[3]			
Mean	296	310	320
Variance	7.53	317	1231.
Government Deficit[4]			
Mean	18.7	50.22	110.3
Variance	1.13	1307.	10242.

[1] Initial and steady-state level of output is 1000.
[2] Initial level of the interest rate is 3.00 (percent).
[3] Initial and steady-state level of output is 300.
[4] Initial level of the government deficit is 0.

Continued Debt Servicing

Figure I pictures the behavior of output, the trade account, and the fiscal deficit. We see that there is a drop in output supply at the time of the suspension of new borrowing, a temporary improvement in the trade account, and a levelling off of the fiscal deficit.

Output falls as a result of the decreased productivity or infrastructure effects from the cut-off of external lending. There is a recession for two to three years, and then output returns to its long run normal level. The trade balance improves as a result of the fall in demand, and then returns to a long run level slightly above zero.

Figures II and III present the behavior of the real exchange rate, the real wage, the interest rate and the price level. The real exchange rate goes through phases of appreciation and depreciation, while real wages first fall and then rise (at the time of the cut-off of new borrowing). Real depreciations are sometimes associated with a cut in the real wage and sometimes with a rise in the real wage. Figure IV pictures the coefficient of variation for wages, measuring wage dispersion, and the path of inflation. The influx of credit generates a rise in wage dispersion, and the suspension a fall in wage dispersion, while inflation falls sharply when credit is stopped.

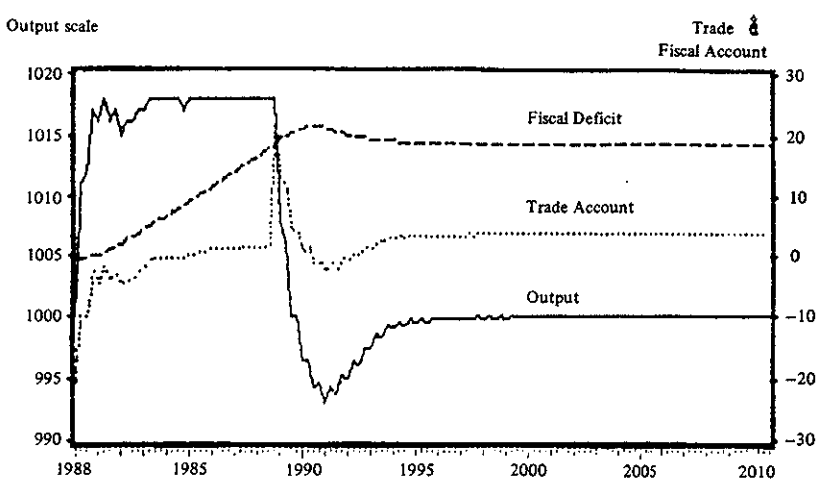
The results of Figures I through IV do not show much change after three or four years from the time of the suspension of new borrowing. Continued debt servicing brings the system back to equilibrium with very little fluctuation in output, but at a cost of a recession and a current account surplus at the time of the cutoff. The results are different for the two alternative resolution strategies.

Debt Forgiveness and Debt/Equity Swaps

Figure V pictures the price level for the three alternatives. Prices rise at the faster rate for the debt/equity swap than for the other outcomes.

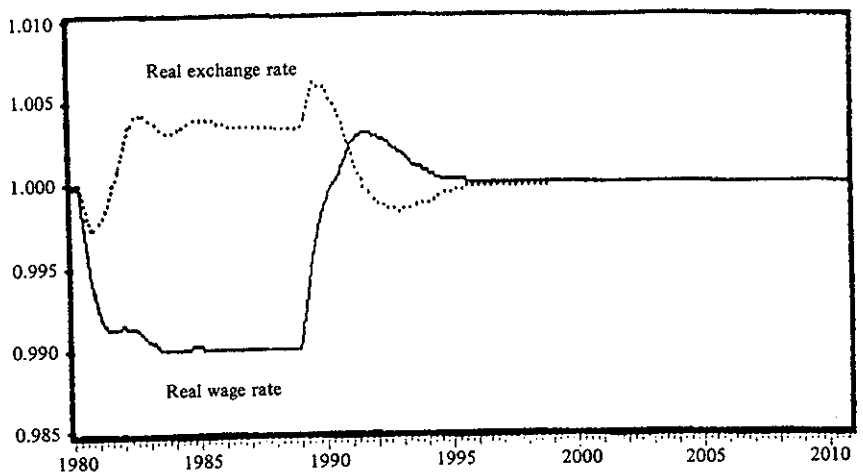
The behavior of the trade balance appears in Figure VI. The major difference between the debt/equity swap and the two alternatives is that the trade balance sharply falls after the implementation of this policy. This fall is due to the increase in demand,

FIGURE I



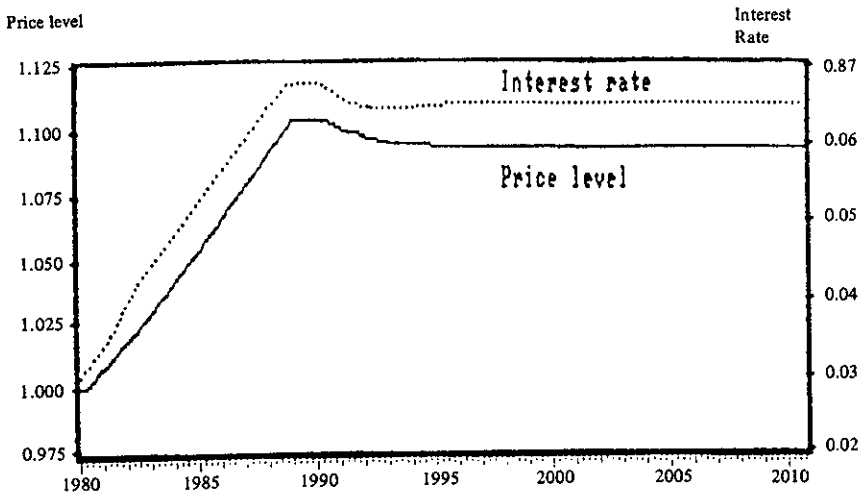
Output, Trade Account, and Fiscal Deficit Behavior with Continued Debt Servicing.

FIGURE II



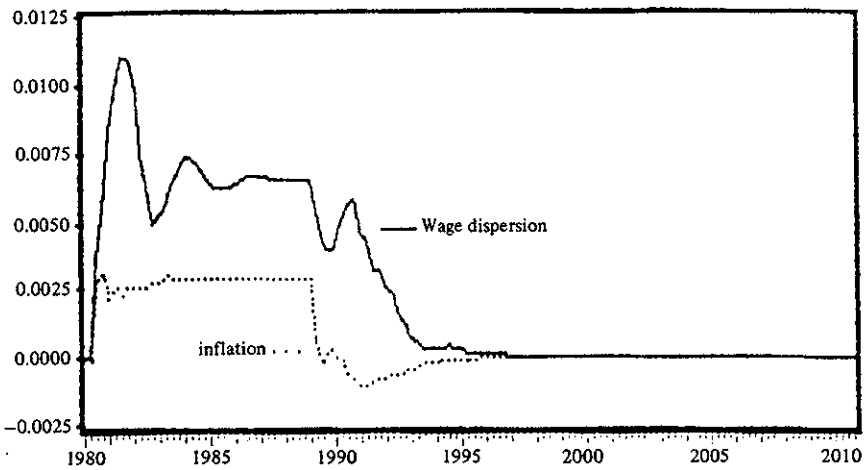
Real Exchange Rate and Real Hage Behavior with Continued Debt Servicing

FIGURE III



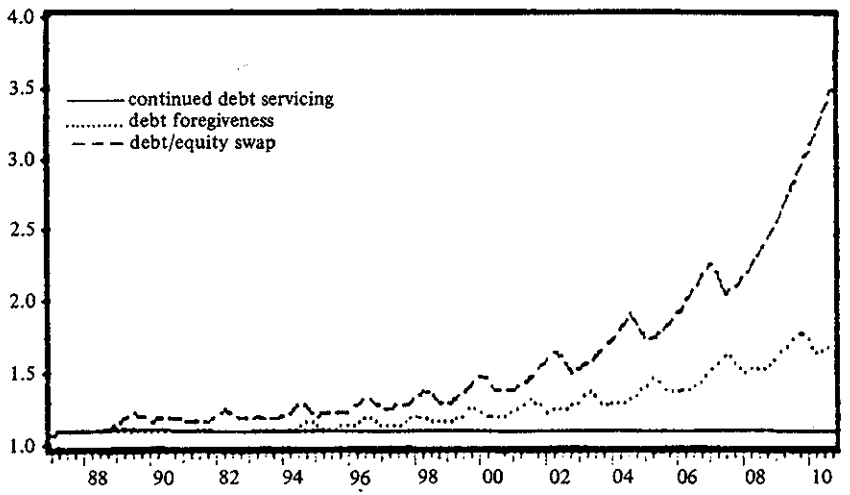
Price and Interest Rate Behavior with Continued Debt Servicing

FIGURE IV



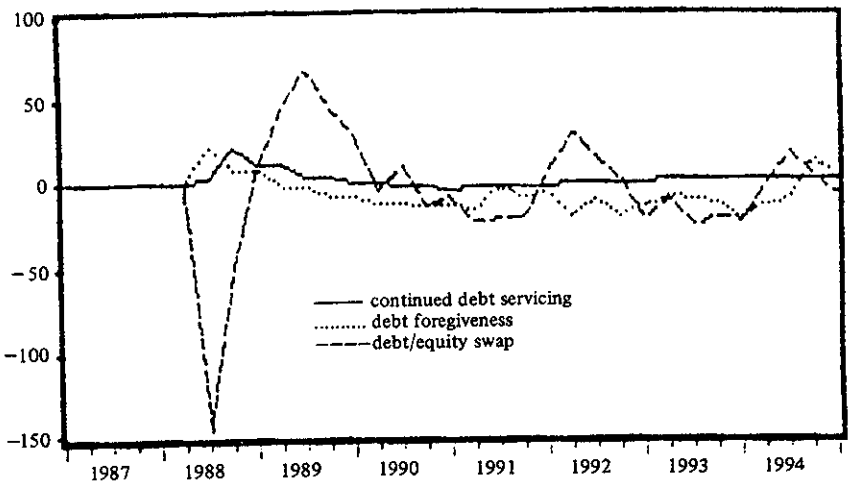
Inflation and Wage Dispersion with Continued Debt Servicing

FIGURE V



Price Adjusment Under Alternative Access Mechanisms

FIGURE VI



Trade Balance Adjustment Under Alternative Access Mechanisms

which results from the transfer of external debt to claims on domestic output by foreigners. Since imports absorb the difference between overall demand and supply, the trade balance reflects the effects of the increased claims on output. The trade balance continues to fluctuate in damped cycles following the debt/equity swap option.

Table I shows that the debt/equity swap brings a higher level of imports in the years following the swap, but at the cost of a lower average level of output, and greater instability in all of the macroeconomic variables. Figure VII illustrates this point: we see the cyclical variability of the real wage and the real exchange rate following the debt/equity swap, with a real depreciation occuring with a falling real wage, and a rising real wage with a real appreciation.

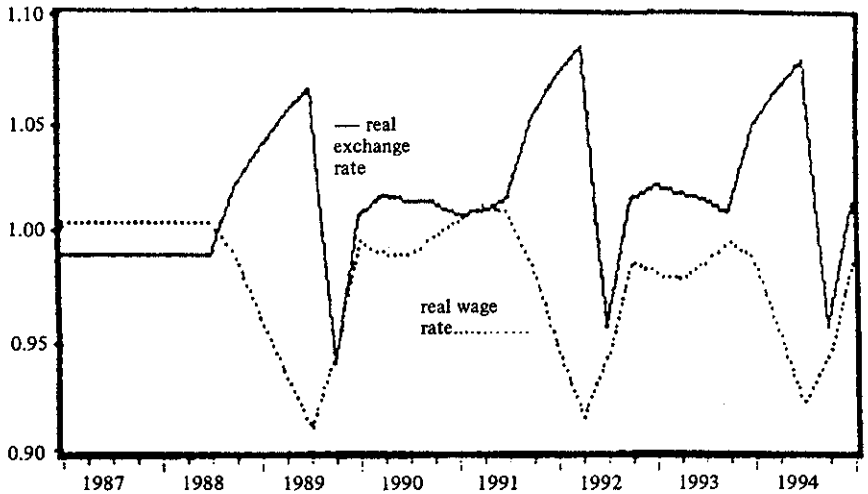
The last figure pictures the trade balance with the wage dispersion, following the debt/equity swap. These figure shows that improvements in the trade balance are associated with an increase in wage dispersion.

IV. Conclusion

The results of this study show that a debt/equity swap produces greater volatility in real and nominal variables than continued debt servicing or a debt forgiveness.

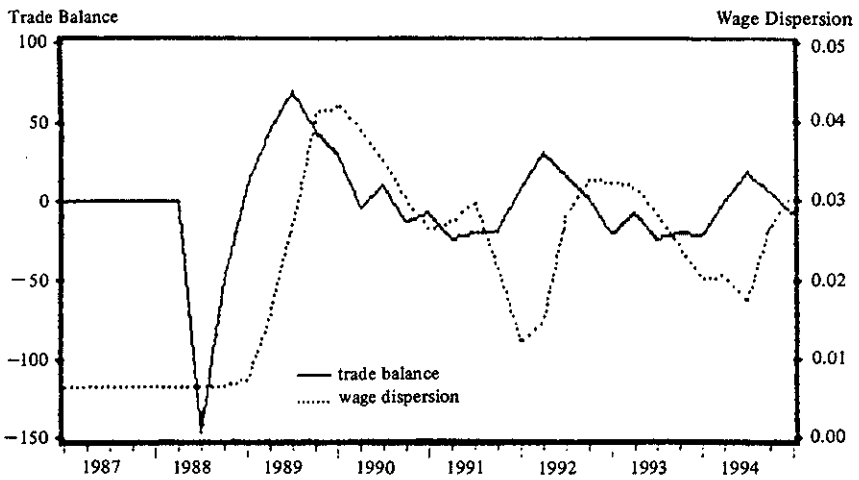
The results are no doubt quite model sensitive as well as dependent on the parameters and initial conditions. In particular, we plan to model explicit reaction functions for the resumption of new lending, which are based on the dynamic behavior of key macroeconomic variables. This extension will permit a ranking of the alternatives discussed in this paper based on criteria which permit more permanent access to international credit.

FIGURE VII



Real Wage and Real Exchange Rate Adjustment Following a Debt/Equity Swap

FIGURE VIII



Trade Balance and Wage Dispersion Following Debt/Equity Swap

Note

1 For more detailed empirical work on the effects of high inflation on wage dispersion, see Drazen and Hamermesh (1986).

Appendix

The initial conditions for the variables of this paper appear below. The values are not meant to represent the "stylized facts" of any particular economy. We have therefore selected arbitrary indices so that the effects of policy changes on these variables may be easily compared with the initial values in a stationary equilibrium.

Symbol:	Definition	Value
B	Current account balance	0
CV	Coefficient of wage variation	0
D	Domestic demand or absorption	1000
E	Exchange Rate	1.0
EXD	External Indebtedness	0
G	Government spending	250
GCB	Government borrowing from central bank	0
I	Domestic interest rate	0.03
I*	Foreign interest rate	0.02
IM	Imports	300
M^d	Money demand	12,000
M^s	Money supply	12,000
P	Consumer price index	1.0
Q	Domestic price deflator	1.0
Q*	Foreign price index	1.0
T	Tax revenue	250
W	Nominal wage rate	1.0
X	Exports	300
Yd	Total output demand	1300
Y0	Normal output	1000
Y^f	Full employment output	1060
Y^s	Aggregate supply	1000

The parameter values for the structural equations of the model were based on a priori expectations or ordinary values in other studies rather than on empirical estimation. These starting parameter values were used to generate benchmark simulations, and were systematically varied in a sensitivity analysis.

For equation (1) –the output supply equation– the elasticity of output with respect to the real wage, α_1, and the elasticity with respect to the price of domestic goods relative to foreign prices, α_2, were set at .7 and .1, respectively. We assume a higher elasticity with respect to current wages because we assume that the labor share of the input mix in production is significantly greater than imported inputs. We have set α_3, the coefficient

of wage dispersion, at –0.3 and α_4 = .1, with β, the exponentially declining weight set at .9 for the initial period t.

For equation (2), the absorption equation, we assume the elasticity with respect to the real interest rate to be relatively low. Hence β_1 = 0.05. In the simulation experiments of this paper, the focus of our analysis is on the feedback effects of wage dispersion on inflationary dynamics. For this reason we neglected the effects of government deficits on demand. We set the wealth effect on domestic absortion at a relatively large value in order to capture the feedback effect of monetary effects through reserve inflows on aggregate demand. Hence β_2 = 1.5.

In equation (3), the export equation, we assume that the elasticities of current and past period relative prices of domestic goods to foreign goods add-up to a value greater than one. This is equivalent to the Marshall-Lerner condition. Hence δ_1 = 1.5 and δ_2 = .5. For equation (4), the demand equation, we set λ = .5 and α^* = .5.

In the demand for money given by equation (8), we set the interest elasticity of money demand, μ_1. at 0.1. This assumption is consistent with empirical evidence in several industrialized and semi-industrialized countries. For the interest rate in equation (10) we set the coefficient Φ at .015. We thus assume that there is imperfect capital mobility, due to controls on foreign investment and capital flows.

For equation (10) which determines the evolution of the consumer price index, we set the coefficient with respect to domestic goods prices and foreign prices, ϵ at.5. Similarly, for the evolution of the price of domestic goods, given in equation (12), we set the coefficients for wage changes and foreign price changes, η_1 and η_2, at .7 and.3 respectively. The excess demand factor η_0 was set at 1.5, and the constant term η_4 was chosen at a value which ensured a steady-state price behavior when $y^s = y^n$.

Equation (13) specifies the rate of devaluation as a function of the policy rule of the government. We assumed in the simulation experiments that the government will follow a purchasing power parity rule and devalue at a rate equal to expected inflation (assuming that foreign inflation is zero). If the trade balance falls below a critical level of –250, we assume that devaluation will proceed at a higher rate, expected inflation plus five percent.

The semi-elasticity of wages with respect excess demand in the period preceding contract renewal, α_W, was initially set at unity. This parameter appears in equation (15). The constant term α_0 was chosen so as to ensure steady-state wage behavior when $y^s = y^n$. The threshold coefficient for the switching rule in the endogenous contract-length setting was et at 0.02. When the coefficient of variation passes this level, contract length starts to adjust to four-periods at the time of renewal of each contract. If wage dispersion is still greater than this value when the four-period contracts come due, then these contracts adjust to two-period ones at the time of renewal.

The parameters for the the government expenditure and tax functions in equations (18) and (19) $\alpha\rho\epsilon\ \sigma\epsilon\tau\ \alpha\tau\pi\eta\epsilon\ \sigma\lambda\lambda\sigma\omega\iota\nu\gamma\ \phi\alpha\lambda\upsilon\epsilon\sigma\neq$ γ_1 = .5, γ_2 = .5, and τ_1 = .1. The intercept terms are set at values so that the system is initially in a steady state.

The simulation method used in this analysis is based on the solution methods embedded in Version 12 of the TROLL system. The system was set in stationary equilibrium given the initial values by adjustment of the constant terms in the behavioral equations. Then the system was shocked at time t = t* by an exogenous change in the exchange rate. A full listing of the simulation model and solution algorithm for the rational expectations version is available from the authors on request.

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DEBT CONVERSION PROGRAM IN VENEZUELA

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Abstract:

This paper describes Venezuela's debt capitalization program and analyzes its general and sectoral impact. Especial emphasis is placed on the reasons as to why the program has been unsuccessful in reaching government's goals in therms of atracting new foreign capital.

I. Introduction

While debt capitalization programs already existed in most Latin countries, its wide use and evolution arised after the 1982 debt crisis. Since then, debt to equity schemes have been sought by most countries in the region as a way to ease debt burden and attract foreign investments. Within that general framework, the following paper examines the existing debt conversion program in Venezuela and its impact on the Country's overall debt reduction efforts.

This work will be structured as follows: First, we describe the Venezuelan capitalization and debt-to-equity schemes. Then, the impact that such programs have brought forth and a brief sector analysis is presented. Third, a critique to the scheme is presented based on the results shown to date; and finally, in section V a concluding comment regarding future viability of the conversion program for the short and medium term is discussed.

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