Venezuela
Oil and Exchange Rates
Historical Experience and Policy Options
February 12, 1993

Country Operations Division
Country Department I
Latin America and the Caribbean Region

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FISCAL YEAR

January 1 to December 31

CURRENCY EQUIVALENTS

Currency Unit = Bolivar (Bs)
Exchange Rate Effective December 31, 1992

US$1 = Bs. 79.7
Bs. 1 = US$0.012
Bs. 1,000 = US$12.55

ABBREVIATIONS

Bs = Bolivar (domestic currency)
IFS = International Financial Statistics
IMF = International Monetary Fund
OSF = Oil Stabilization Fund
PDVSA = Petroleos de Venezuela (Oil Company)
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Bibliography
This report is based on a self-standing paper by Professor Sebastian Edwards (UCLA), and reflects the findings of a mission to Venezuela by him and Mayra Zermeño (Task Manager), in October 1991. Some of the results reported here were prepared by Mr. Ricardo Hausmann (IESA). Mr. Abraham Vela (UCLA) provided statistical support and Ms. Cristina Pérez (Sr. Staff Assistant, LAICO) was responsible for the production of this report.

A draft of this report was discussed with the authorities at a seminar in Caracas in August 1992. This report incorporates the comments provided at this seminar.

A macroeconomic background for this report is in Part II (Macroeconomic Reforms) of "Venezuela Structural and Macroeconomic Reforms - The New Regime" (Report No. 10404-VE), dated April 29, 1992.
List of Variables

B = Trade Balance
BRER\(^0\) = Bilateral Real Exchange Rate Index
BRER\(^\Delta\) = Average Bilateral Rate
CPI = Consumer Price Index
DEV = Nominal Devaluation
DEVMU = Rate of Devaluation
DLM = Money Growth
dres = Change in Reserves
DUMINFi = Product of Dummy Variable and Logged Inflation
\(\&\) = Equilibrium Real Exchange Rate
\(\&\) = Official Nominal Exchange Rate
\&\& = Weighted Average Nominal Exchange Rate
\(\&\&\&\) = Oil Taxes in Local Currency
EXVOL = Export Volume
GDP = Gross Domestic Product
GCY = Government Consumption/GDP
GEXY = Total Government Expenditure/GDP
\(\&\) = Government Expenditure on Nontradable Goods
grocc = Rate of Growth of Domestic Credit
grocre = Change in Domestic Credit
gromo = Changes in Money
i = Domestic Interest Rate
i* = Foreign Interest Rate
INFLA = Inflation
\(\&\) = Nominal Money Supply
\(\&\) = Nominal Money Demand
NKF = Net Capital Flows
P = Domestic Prices
\(\&\) = Price of Nontradables
\(\&\) = Real Price of Oil
REER = Multiple (Effective) Real Exchange Rate
RER = Real Exchange Rate
TAXOIL-N = Oil Taxes/Non-Oil GDP
TAXOIL-Y = Oil Taxes/GDP
TAXRATIO = Ratio of Oil Taxes (Excluding Royalties) to Total Tax Revenue
TRARES = Index of Trade Restrictiveness
\(\) = Demand for Tradables
\(\) = Supply of Tradables
USINF = World Inflation
USNOWPI = Non-oil U.S. Wholesale Price Index
W = Wages
Z\(\) = Volume of Oil Production
### Variables in Simulations

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LGEXYFI</td>
<td>Log of Government Expenditure - Base Run</td>
</tr>
<tr>
<td>LGEXYSI</td>
<td>Log of Government Expenditure - Simulated</td>
</tr>
<tr>
<td>LMURERFI</td>
<td>Log of Government Expenditure - Base Run</td>
</tr>
<tr>
<td>LMURERSI</td>
<td>Log of Government Expenditure - Simulated</td>
</tr>
<tr>
<td>LMURERH</td>
<td>RER Path - Base Run</td>
</tr>
<tr>
<td>LMURERH1</td>
<td>RER Path - Simulation (1973 Fund)</td>
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<tr>
<td>LMURERH2</td>
<td>RER path - Simulation (1975 Fund)</td>
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<tr>
<td>LPROIL</td>
<td>Log of the real price of oil</td>
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<td>LPROILEX</td>
<td>Log of the assumed counterfactual price</td>
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</table>
EXECUTIVE SUMMARY

1. This report analyzes the relationship between the oil economy and the behavior of the real exchange rate (RER) in Venezuela as the basis for policy recommendations to improve macroeconomic management.

A. Issues

2. The importance of oil in the Venezuelan economy is easily illustrated: oil taxes, including royalties, account for about 80 percent of the central government’s revenue; oil constitutes about 80 percent of total merchandise exports; and oil GDP is about 20 percent of total GDP. There are several issues related to the management of this major export: 1) the ownership and exploitation of this exhaustible resource and its taxation; 2) the optimal extraction rate; 3) the allocation of revenue between current and future expenditures; and 4) the allocation of current expenditures between consumption and investment and between tradables and non-tradables.

3. This report assumes that: 1) oil ownership remains in the public sector; 2) the central government continues to tax the oil company, PDVSA; and 3) the present rate of extraction is maintained. The analysis focuses on the allocation of oil revenue and expenditures because this has significant implications for the economy through the RER. Regardless of who receives or spends the oil revenues, the larger the revenues and expenditures in the domestic economy, the lower (more appreciated) the RER. An appreciated RER reduces the competitiveness of non-oil tradables. Similarly, with a given level of expenditure, the larger the proportion spent on non-tradables, the lower (more appreciated) the RER.

4. A related issue is the variability of the RER. Venezuela’s oil income is highly dependent on the international price and the volume traded, both of which change frequently. The variability of oil receipts carries over to total expenditures and to the RER. Cross-country analysis has identified RER variability as a deterrent to efficient investment. In Venezuela, because the government depends heavily on oil trade, the variability of the oil market contributes to the vulnerability of public finances. This dependence makes macroeconomic management difficult.

B. Methodology

5. This report studies the impact of the oil economy on Venezuela’s RER level and variability. It starts by establishing empirically the average US-Venezuela rate in bolivars per $ as the RER. It uses regression analysis to establish: 1) the relationship between the oil market and the RER; 2) the other determinants of the RER; 3) the channels through which oil shocks affect the RER; and 4) the sources of inertia in the inflationary process.

6. Policy makers need to know not only whether the oil shocks affect the RER, but also whether this effect is sizable enough to require a policy response. In order to investigate this issue a simulation approach was followed. Several simulations provide answers: 1) Venezuela’s likely RER
path if in 1976 the international price of oil had experienced a temporary 30 percent increase; 2) Venezuela’s likely RER path if in 1976 the government had instituted a policy to invest part of the oil revenue in international capital markets; 3) the effect of an oil stabilization fund (OSF) of the Hausmann et al. (1991) type on RER level and variability. The simulations assume that the authorities had adopted this type of fund in 1973 and 1975, respectively.

C. Conclusions

7. The RER Determinants. The econometric analysis suggests an important relationship between developments in the oil sector and the RER. Specifically, increases in oil prices have been associated with RER appreciations, as expected from Dutch-disease mé The results indicate that government expenditures and trade protection also explain RER movements in Venezuela during the last 25 years.

8. Transmission Channels. The empirical analysis shows that oil price shocks are transmitted to the RER through three main channels: first, through disposable income; second, through government expenditures which, because of their extreme dependence on oil, are highly sensitive to changes in the oil market; and third, through the short-run effect of the monetization of part of PDVSA’s non-tax revenues. The empirical evidence suggests that oil price changes have an effect on money growth. But in the short run this effect tends to be smaller in Venezuela than in other commodity-dependent economies. The reason for this is that oil shocks have two offsetting effects on money creation: increasing it through the accumulation of international reserves, and decreasing it through a reduction in the public sector borrowing requirements.

9. Impact of Oil Shocks on the RER Level. A model is developed to investigate how increases in the oil price would affect RER behavior. For the case of a temporary increase in oil prices of 30 percent, the results suggest a real appreciation that goes from 7 percent to 10 percent at its peak. This appreciation then dies slowly until it fully disappears.

10. Changes in government expenditures affect the level of the equilibrium RER. Specifically, a simulation indicates that if the ratio of government expenditures to non-oil GDP had been 10 percent lower than observed since 1976, the equilibrium RER would have been significantly more depreciated. The magnitude and persistence of a higher RER would depend on whether the government spends the income obtained from the oil fund.

11. "Diversification" is an important topic of policy discussion in Venezuela. Those that favor "diversification" argue that by encouraging alternative exports the country can reap the benefits of positive externalities. The long-run equilibrium level of the RER is an endogenous variable determined by the "fundamentals": the fiscal and monetary policies, trade regime, income level, terms of trade, etc. Therefore, a "high" (depreciated) RER must be the result of a change in the fundamentals. A natural candidate is the degree of protection. Normally, a reduction in protection will depreciate the equilibrium RER, and thus improve the competitiveness of non-oil exports. However, in Venezuela government expenditures represent the most effective method of influencing the level of the RER.

12. Impact of Oil Shocks on RER Variability. Venezuela’s increased RER variability in the last few years is a serious threat to the expansion of the non-oil sectors. Recent cross-country
evidence suggests that the degree of variability of the RER is as important as its level for developing a diversified nontraditional exports sector. It is clear that a reduction in this variability would make a positive contribution to macroeconomic stability and the development of nontraditional exports. A counterfactual simulation indicates that if an OSF of the type proposed by Hausmann et al. had been adopted in 1973, RER variability would have been reduced significantly. Moreover, an OSF would increase the predictability of government expenditures and thus of the RER.

13. **Inflationary Inertia.** The empirical analysis shows that Venezuela had virtually no inflationary inertia until 1983. Since 1983 the inflationary process has been affected by devaluation and indexation. However, additional evidence is needed to establish if the degree of inertia declined after the exchange rate was unified and allowed to float in 1989.

**D. Recommendations**

14. Reducing the dependence of government revenues on oil should be a priority in reforms aimed at improving macroeconomic management. This could be accomplished by increasing the non-oil to oil taxation ratio.

15. This measure must be accompanied by better management of the rate of growth of government expenditures through the establishment of an OSF. Two comments are in order. First, it is important for the OSF to be governed by rules that are independent of the price of oil and that include a ceiling on the rate of growth of government expenditures. The fund proposed by Hausmann et al. has these characteristics. Second, to be credible, the OSF should be managed by an autonomous body like a truly independent central bank.

16. These corrective actions should not be considered "luxuries" but a matter of immediate concern. Postponing them will prolong a serious situation of fiscal vulnerability.

17. The adoption of a fixed or predetermined nominal exchange rate is not advisable now. The vulnerability of the fiscal situation would make this highly risky. However, once the fiscal situation has been corrected permanently, policy makers should assess the net benefits of adopting an exchange rate anchor as a complementary measure to reduce inflation fast. An independent central bank would contribute to the transition towards a more stable exchange rate system.
1. This chapter analyzes alternative RER indices in Venezuela and provides a historical analysis of the behavior of the RER during the period 1950-90.

A. Measuring Venezuela's RER

2. The three issues to be addressed are: 1) the relevant RER measurements for Venezuela; 2) the behavior of different RER indices through time; and 3) the most important statistical properties of these indices.

3. Three RER indices are defined: the bilateral index, the average bilateral index, and the multilateral index. The bilateral index with respect to the U.S. is based on the official nominal exchange rate and is computed as:

\[ BRER^0 = \frac{E^0(USNOWPI)}{CPI} \]  

where \( E^0 \) is the official nominal exchange rate in bolivars (Bs) per US$; USNOWPI is the non-oil U.S. wholesale price index (oil is excluded to capture the evolution of the relative price of non-oil tradables), a proxy for the world price of non-oil tradables; and CPI is Venezuela's consumer price index, a proxy for nontradable prices. An increase in \( BRER^0 \) represents a depreciation of the RER. Except for 1982-89, when the country had a multiple nominal exchange rate system, \( BRER^0 \) was an adequate measure of competitiveness from 1950-90.

4. The average bilateral RER index is based on the relevant average nominal exchange rate from 1982-89, which is weighted with the multiple nominal rates, calculated by the IMF. The average bilateral RER index is computed as:

\[ BRERA^A = \frac{E^A(USNOWPI)}{CPI} \]  

where \( E^A \) is the weighted average nominal rate with respect to the US$; and USNOWPI and CPI are the same as defined above. Until 1982, the evolution of \( BRER^0 \) and \( BRERA^A \) coincided (Figure A.1).

5. The multilateral, or effective, RER index accounts for the variability of cross-rates between the bolivar and other currencies (see Edwards, 1989). This index -- denoted as REER -- has been computed by the IMF only since 1976. In this presentation it is redefined to show that an increase represents a real depreciation. REER generally has moved along the same path as the two bilateral indices (Figure A.2).
6. The coefficients of correlation between the three RER indices for the period 1950-90 and selected subperiods show a very similar trend (Table A.1). Therefore, most of this analysis uses only the average bilateral rate, BRERA. This high degree of correlation is somewhat unusual and is explained by the large proportion of Venezuela’s trade denominated in U.S. dollars.

8. Five Historical Phases of Venezuela’s RER

7. The history of Venezuela’s RER can be divided into five phases: 1948-64, 1965-73, 1974-79, 1979-82, and 1983-90 (see Table 1 and Figure 1).

Table 1

Venezuela: Real Exchange Rate and Selected Macroeconomic Variables, Average Changes in Percent: 1950-1990

<table>
<thead>
<tr>
<th>Period</th>
<th>Real Exchange Rate</th>
<th>Variability*</th>
<th>CPI</th>
<th>Domestic Credit</th>
<th>Money Supply M2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950-90</td>
<td>2.2</td>
<td>9.1</td>
<td>8.9</td>
<td>16.9</td>
<td>14.9</td>
</tr>
<tr>
<td>1950-64</td>
<td>1.7</td>
<td>9.8</td>
<td>1.4</td>
<td>15.6</td>
<td>9.9</td>
</tr>
<tr>
<td>1965-74</td>
<td>1.4</td>
<td>1.7</td>
<td>2.2</td>
<td>11.3</td>
<td>10.1</td>
</tr>
<tr>
<td>1975-79</td>
<td>-1.3</td>
<td>1.3</td>
<td>9.1</td>
<td>56.0</td>
<td>12.7</td>
</tr>
<tr>
<td>1979-82</td>
<td>-5.9</td>
<td>3.3</td>
<td>14.9</td>
<td>18.1</td>
<td>12.3</td>
</tr>
<tr>
<td>1983-90</td>
<td>8.9</td>
<td>13.0</td>
<td>28.0</td>
<td>20.3</td>
<td>23.2</td>
</tr>
</tbody>
</table>

*Calculated as the standard deviation of the real exchange rate changes.

Source: Author’s calculations using data from the World Bank and IMF.

8. Phase I: 1948-64. During this phase the RER was rather variable as a result of the nominal exchange rate policy. Between 1949-58, there were frequent and sizeable fluctuations in the nominal exchange rate, both positive and negative, with an annual maximum nominal devaluation (appreciation) of 14.5 percent (12 percent). In 1959, the authorities ended this by fixing the bolivar at 3.3 per US$, a rate that was maintained until the 1964 devaluation to 4.5 Bs per U.S. dollar.
Figure 1

Venezuela: Five Phases in the Real Exchange Rate History, 1950-90
9. **Phase 2: 1965-73.** This period witnessed remarkable macroeconomic stability, with inflation averaging 2.2 percent per annum. The nominal exchange rate was unaltered and the RER steadily depreciated to an accumulated 12.6 percent. Towards the end of this phase (1971-73), the authorities appreciated the nominal exchange rate in response to the difficulties of the Bretton Woods system. When the system broke down in 1973, the Central Bank was legally allowed to adopt a flexible exchange rate system but did not.

10. **Phase 3: 1974-79.** This period corresponds to the first and second oil shocks. The generally depreciating trend was halted in 1975, when appreciation began (Figure 1). Although this appreciation was moderate, the Dutch-disease effects on the economy became apparent (see Gelb and Bourgnignon, 1988). Much of the appreciation was the result of increases in government expenditures (see Chapter 2).

11. **Phase 4: 1979-82.** This period followed the second oil shock and was characterized by a constant nominal exchange rate and an increase in the RER appreciation that resulted from the oil shock itself and from lax macroeconomic (especially monetary) policy. Major public projects — many with a very low social return — were implemented during this period (Gelb and Bourgnignon, 1989), which ended with the eruption of the debt crisis and the adoption of multiple nominal exchange rates.

12. **Phase 5: 1983-90.** This phase represents the aftermath of the debt crisis. From 1983-89, an inefficient system of multiple rates prevailed, but in February 1989 the exchange system was unified and made flexible. There are two main characteristics of this period: first, since 1983 the RER has been significantly more volatile than before; and second, the RER today — despite the very recent appreciation — is at a level significantly higher, i.e., more depreciated, than the 1974 historical peak. Notice that the opening up of trade requires an equilibrium RER depreciation. When the observations for 1989-90 are omitted from the 1983-90 estimates, the econometric results confirm the effect of the 1989 change in regime. However, additional evidence is needed to establish whether the variability of the RER declined after the exchange regime was unified and allowed to float.

C. **Summary**

13. The average bilateral, rate BRERA, is an appropriate measure of the real exchange rate in Venezuela from 1950-90. Using this index and key macroeconomic indicators, the history of the RER can be divided into five phases that correspond to remarkably different periods in the modern history of the country. The drastic increase in RER variability after 1983 is evident and worth noting because it accentuated the uncertainty of the Venezuelan economy. In fact, cross-country empirical evidence shows that greater RER variability is associated with lower investment, (see Edwards, 1986). The evolution of the log of the REER and the log of the real price of oil (Figure 2) suggest that there has been a negative relationship between the price of oil and the RER in Venezuela. The next three chapters discuss this relationship theoretically and empirically.
Figure 2

Venezuela: Real Exchange Rates and Oil Prices; 1950-90
This chapter provides an empirical analysis of the behavior of the RER in Venezuela as a function of real and monetary variables, and estimates the effects of the oil shocks through regression analysis of the RER dynamics (see Edwards, 1989 a,b.).

A. RER Dynamics

Most modern analyses of real exchange rate behavior distinguish between "fundamental" and monetary determinants of RERs. This distinction is captured empirically in this equation:

\[ \Delta \log e_t = \delta (\log e_t^* - \log e_{t-1}) - \rho [\log M_{t-1}^n - \log M_{t-1}^d] + \phi \text{DEV}_t \]  

where \( e^* \) is the equilibrium RER; \( e \) is the actual RER; \( M_{t-1}^n \) is the (nominal) supply of money in period \( t-1 \); \( M_{t-1}^d \) is the (nominal) money demand in \( t-1 \); \( \text{DEV} \) is the nominal devaluation; and \( \delta, \rho \) and \( \phi \) are positive parameters.

In the equation, the observed RER movements (\( \Delta \log e_t \)) are the result of three forces: \( [\log e_t^* - \log e_{t-1}], - \rho [\log M_{t-1}^n - \log M_{t-1}^d] \), and \( \phi \text{DEV}_t \). The first term, \( [\log e_t^* - \log e_{t-1}] \), is a partial adjustment in response to discrepancies between the equilibrium RER \( \log e^* \) and its lagged actual value. If the equilibrium RER is above (below) its actual value, the RER will increase (decrease) accordingly towards equilibrium. The speed of the adjustment will depend on the parameter \( \delta \). In the case of an overvaluation, \( e^* > e \), the adjustment will be rather slow because an "automatic" decline in \( e \) will normally require a drop in the nominal price of nontradables and wages. To the extent that nominal prices show some degree of downward resistance, the adjustment will take time.

The second term in the equation -- \( -\rho [\log M_{t-1}^n - \log M_{t-1}^d] \) -- captures the impact of the macroeconomic disequilibrium on the RER and indicates that monetary pressures will cause a real RER appreciation \( \Delta \log e_t < 0 \). Empirically, this impact is given by the coefficient \( \rho \). If oil shocks affect the money supply process, changes in the oil market will impact on the \( \log M_t^c \) and, thus, on the RER. This would affect the dynamics in the short run, but not the long-run equilibrium of the RER (see Chapter 3).

The third term in the equation represents the effect of nominal devaluations or appreciations on the RER. Given the other factors, a nominal devaluation will have an impact on the RER equal to \( \phi \). A key feature of the equation is that if a nominal devaluation takes place under conditions of initial RER equilibrium, that is, when \( \log e^* = \log e \), the adjustment in the nominal parity will have no long-run effect on the RER. A long-run effect will occur only if: 1) the RER is overvalued initially, i.e., \( \log e^* > \log e \); and 2) the nominal devaluation is supported by consistent macroeconomic policies, summarized in the model by the behavior of the excess money supply term. In this model, nominal devaluations are neutral in the long-run as they should be.
B. Long-Run Equilibrium RER

19. Equation (3) suggests that an expression for the evolution of the equilibrium RER is required to explain the behavior of the RER. In Appendix 1 a model of the Venezuelan economy is developed, where the following expression for the equilibrium RER is obtained:

\[
\log e_i^* = \lambda_0 + \lambda_1 \log p^o_i + \lambda_2 \log Z_i \\
+ \lambda_3 \log G^N_i + \lambda_4 \text{NKF}_i + \lambda_5 \log \tau_i
\] (4)

where \( p^o_i \) is the real price of oil; \( Z_i \) is the volume of oil production; \( G^N_i \) is government expenditure on nontradable goods; \( \text{NKF}_i \) are the net capital flows, and \( \tau \) is the measure of taxes on tradable goods, i.e., import tariffs. The coefficients \( \lambda_1, \lambda_2, \lambda_3, \lambda_4 \) and \( \lambda_5 \) are expected to be negative. The effects of changes in the fundamentals on the equilibrium RER are explained below.

20. **Real Oil Prices.** An increase in the price of oil will generate an appreciation of the RER. This is mostly the income effect explained in the Dutch-disease literature. The export boom induces higher expenditure on tradables and nontradables, puts pressure on their prices, and appreciates the RER. The key is that the response of nontradable prices to an oil boom will exceed that of tradables. This is independent of the exchange rate system. In Venezuela, because the oil is government owned, the direct impact of a positive price shock on the RER will be smaller than if the resource were privately owned. When the price of the enclave export increases, most of the export revenue goes to the government, in the form of either PDVSA's revenue or central government taxes. Consequently, a significant proportion of the Dutch-disease effects will take place via changes in government expenditure, a channel captured in equation (4) by \( \log G^N_i \). However, a direct oil price effect will take place also, because increases (decreases) in the price of oil will generate a positive (negative) "confidence effect" on consumers, affecting aggregate expenditure. Vaey-Zadeh (1989) made this point using a model based on the "warehouse" approach to oil exploitation. Therefore, this analysis of the effect of oil shocks on the RER considers the multiple channels through which the Dutch-disease operates.

21. **Volume of Oil Production.** For analogous reasons, an increase in the volume of oil produced or exported will result in an appreciation of the RER, given the other factors. The coefficient \( \lambda_2 \) is expected to be negative. However, to the extent that there is a difference between temporary and permanent shocks, changes in \( Z_i \) should have a quantitatively different effect on \( e \) than changes in \( p^o_i \). The reason is that changes in \( Z_i \) are more permanent, while the duration of changes in \( p^o_i \) is uncertain.

22. **Government Expenditures on \( N \).** The dependence of \( G^N \) on the oil tax revenues constitutes an indirect channel through which the oil shocks will tend to affect the RER. An increase in government expenditures on nontradables will raise their demand and relative prices and thus appreciate the RER.

23. **Capital Inflows.** An increase in net capital inflows will result in higher disposable income and aggregate expenditure. If a proportion of this higher expenditure is on nontradable goods, \( P_N \) will increase and the RER will appreciate. See Michaely (1981) for an analysis of the effects of the terms of trade shocks and capital inflows on the RER in a general equilibrium framework.
24. **Trade Restrictions.** The last term in equation (4) refers to the effect of changes in trade impediments on the equilibrium RER. Naturally, import tariffs, licenses, and quantitative restrictions are the more prevalent form of trade barriers. Under most circumstances, tighter trade restrictions would lead to an equilibrium RER appreciation by making importables more expensive, diverting expenditure away from them and towards nontradables. For a discussion on exceptions to this principle see Edwards and van Wijnbergen (1987).

### C. Basic Econometric Results

25. Combining equations (3) and (4) gives the following equation for the dynamics of the RER which, in principle, can be estimated using conventional methods.

\[
\log e_t = \alpha_0 + \alpha_1 \log p_t^0 + \alpha_2 \log Z_t + \\
\alpha_3 \log G_t^N + \alpha_4 \log \tau_t + \alpha_5 \log NKF_t \\
+ \rho (\log M_{t-1}^t - \log M_{t-1}^t) + \phi \Delta v_t + \alpha_6 \log \epsilon_t + \epsilon_t
\]

where \(\alpha_1 = \theta \lambda_1; \ \alpha_2 = \theta \lambda_2; \ \alpha_3 = \theta \lambda_3; \ \alpha_4 = \theta \lambda_4; \ \alpha_5 = \theta \lambda_5;\) and \(\alpha_6 = (1-\theta)\). \(\epsilon\) is an error term.

26. In equation (5) there are at least three channels through which the oil shocks can impact on the RER. The first channel is disposable income and is captured by the coefficients \(\alpha_1\) and \(\alpha_2\). In principle there is no reason why \(\alpha_1\) and \(\alpha_2\) should be equal; however, this is an empirical issue. The second channel is the change in government expenditures \(G^N\). The third channel relates to the monetary disequilibrium and is short-term in nature.

27. Several variants of equation (5) were estimated for 1965-90 or subperiods, depending on data availability. A problem in the analysis of RER behavior is the empirical definition of some of the independent variables. In the absence of data the analyst normally uses proxies or resorts to less than ideal measures. In the results presented below, the data are from the International Financial Statistics (IFS) and the variables are defined as follows:

(a) **Real Exchange Rate.** The three indices discussed in Chapter 1 were used in the analysis. The results obtained were very similar, therefore, the BRER\(^\wedge\) index was chosen. This index has a weighted average of the different nominal exchange rates in effect during 1982-89.

(b) **Real Price of Oil.** This is the nominal price of oil in US$ deflated by the U.S. WPI.

(c) **Volume of Oil Production (Exports).** The regression analysis used two alternative measures of oil volume: oil production and oil exports. The index of production was computed with the IFS line bbaa. The data on export volume (EXVOL) were measured in barrels.

(d) **Government Expenditures on Nontradables.** This is one of the most difficult variables to measure because the statistics on the components of government expenditures are not usually available. This report follows the literature by assuming that the
### Table 2

**Venezuela: The Dynamics of the Real Exchange Rates. OLS Estimates**: 1965-90

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>(Eq. 5.1)</th>
<th>(Eq. 5.2)</th>
<th>(Eq. 5.3)</th>
<th>(Eq. 5.4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONSTANT</td>
<td>5.505</td>
<td>5.538</td>
<td>5.285</td>
<td>3.549</td>
</tr>
<tr>
<td></td>
<td>(3.523)</td>
<td>(3.501)</td>
<td>(3.209)</td>
<td>(2.087)</td>
</tr>
<tr>
<td>log RER_{t-1}</td>
<td>0.598</td>
<td>0.013</td>
<td>0.547</td>
<td>0.718</td>
</tr>
<tr>
<td>log P^0_{t-1}</td>
<td>-0.170</td>
<td>-0.171</td>
<td>-0.156</td>
<td>-0.117</td>
</tr>
<tr>
<td></td>
<td>(-2.448)</td>
<td>(-2.441)</td>
<td>(-1.999)</td>
<td>(-1.630)</td>
</tr>
<tr>
<td>log Z_t</td>
<td>-0.625</td>
<td>-0.641</td>
<td>-0.582</td>
<td></td>
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<tr>
<td></td>
<td>(-3.049)</td>
<td>(-3.073)</td>
<td>(-2.741)</td>
<td></td>
</tr>
<tr>
<td>log EXVOL_t</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>(-1.621)</td>
</tr>
<tr>
<td>log GCY_t</td>
<td></td>
<td></td>
<td>-0.249</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>(-1.511)</td>
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<tr>
<td>log GEXY_t</td>
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<td></td>
<td>-0.176</td>
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<td></td>
<td>(-1.539)</td>
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<td></td>
<td>(-1.279)</td>
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<tr>
<td>TRARES_{t-1}</td>
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<td>(-1.969)</td>
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<td>(-1.111)</td>
<td>(-1.039)</td>
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<td>CAFLOEX_{t-1}</td>
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<td></td>
<td></td>
<td>(-0.761)</td>
<td></td>
<td>(-0.400)</td>
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<tr>
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<td>0.208</td>
<td>0.233</td>
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<tr>
<td></td>
<td>(3.966)</td>
<td>(3.949)</td>
<td>(2.363)</td>
<td>(3.124)</td>
</tr>
<tr>
<td>[log M^c_{t-1} - log M^s_{t-1}]</td>
<td>-0.006</td>
<td>-0.021</td>
<td>-0.044</td>
<td>-0.026</td>
</tr>
<tr>
<td></td>
<td>(-1.363)</td>
<td>(-0.425)</td>
<td>(-0.408)</td>
<td>(-0.413)</td>
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<td>DW</td>
<td>1.772</td>
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<td>1.897</td>
</tr>
<tr>
<td>(\bar{R}^2)</td>
<td>0.935</td>
<td>0.933</td>
<td>0.913</td>
<td>0.910</td>
</tr>
</tbody>
</table>

\(^t\)-statistics in parentheses; DW is the Durbin-Watson statistic.

**Source:** Author's Calculations.
expenditure on \( N \) is proportional to total government expenditures. \( G^N \) was defined in two ways: 1) total government consumption (IFS line 91f) as a proportion of GDP (GCY); and 2) total government expenditure as a proportion of GDP (GEXY).

(e) **Trade Restrictions.** Trade restrictions are difficult to measure for two reasons: 1) it is usually difficult to compile time series on the evolution of the import tariffs; and 2) the import tariffs are only one element in a country's structure of protection. Historically, developing nations like Venezuela have used non-tariff barriers to protect local industries. An index of trade restrictiveness, TRARES, was computed using the IFS Tertiary Rate as the parallel market premium; the measurement error problem associated with this index is discussed below.

(f) **Devaluation.** This is the percentage change of the nominal official exchange rate.

(g) **Capital Flows.** These are net capital flows as a proportion of exports.

(h) **Monetary Disequilibrium.** This variable is the difference between the log of money (M1) and the estimated log of the long-run demand for money. This was calculated with the estimated parameters obtained from a demand for money equation using data for 1950-90 (see Table A.2).

28. Table 2 contains the OLS estimates of variants of equation (5). They have the expected sign, and most coefficients are statistically significant. Several lag structures for the independent variables were used in the estimation. The results in Table 2 are "best" estimates, defined as those with the lowest standard regression error. These results support the hypothesis that in the short run the RER movements in Venezuela have responded to both the real and monetary factors.

29. The estimates in Table 2 also indicate that oil price shocks affect the RER through the three channels: oil price, government expenditures, and monetary disequilibrium. In all regressions the coefficient of the log of the real price of oil is negative as expected and statistically significant. In all regressions the oil production coefficient is negative, significantly so, and its point estimate is larger than that of the log of the real price of oil. In fact, formal tests of the equality of the coefficients of these two variables strongly reject the hypothesis that \( \sigma_1 = \sigma_2 \). A possible explanation of this result might be the different nature of the oil price and volume disturbances. While changes in the output are usually considered long-lasting or quasi-permanent, changes in the oil prices are not. However, when both variables are used with the same lag, the estimated coefficients are not as different as those in Table 2.

30. The results in Table 2 also show that, as expected, trade restrictions and net capital flows have had a negative effect on the RER. However, while the coefficients of TRARES\(_{t+1}\) are statistically significant, those of the net capital flows are not; while the monetary disequilibrium terms have negative coefficients, as expected, their t-statistics are rather low. A possible explanation for this is that monetary policy measures were rather weak in Venezuela throughout most of the period under study (see Chapter 3).

31. Changes in government expenditures are one of the most important determinants of the RER, and the results in Table 2 show that increases as a percentage of GDP — the proxy for real expenditures on nontradables — have resulted in RER appreciations as expected. This is the case
independently of the proxy used for GN. Moreover, these results indicate that reductions in
government expenditures would effectively maintain a more competitive (depreciated) RER.

32. A possible limitation of the results in Table 2 is that some of the independent
variables are measured with error. Additionally, some of them are potentially endogenous, in
particular the index of trade restrictions, TRARES. To address this issue, instrumental variables were
also used in the RER equations. In addition to lagged values of the independent variables, a
subjective index of trade restrictiveness for Venezuela was used as an instrument for TRARES. This
index followed the methodology in Michaely, et al. (1991) and was constructed from the data on trade
restrictions obtained from various sources (see Appendix 2).

33. The instrumental variables estimates (see Table A.3) support the OLS results.
However, this analysis is subject to limitations. First, the discussion has concentrated on the RER,
without looking at other relationships and feedbacks (see, however, Chapter 4). Second, this RER
equation does not incorporate explicitly the role of expectations about the behavior of the oil sector.
In principle, expected changes in the oil prices or volumes produced or exported will affect the RER.
This issue was not addressed because of the difficulties in finding satisfactory data on expectations.

D. Summary

34. The empirical analysis indicates that the RER in Venezuela has responded, in the
short run, to both the real and monetary variables. It suggests alternative ways of generating long-run
changes in the equilibrium level of the RER through policy intervention. In particular, trade
liberalization or a reduction in capital inflows will generate an equilibrium RER depreciation.
Moreover, a reduction in government expenditures could result in a permanent, long-run equilibrium
RER depreciation, and a more competitive environment for the non-oil tradables.
CHAPTER 3: OIL SHOCKS, GOVERNMENT FINANCES, MONETARY DISEQUILIBRIUM AND THE RER

35. This chapter examines the nature of the two indirect channels through which oil shocks affect the RER: 1) changes in government expenditures; and 2) changes in monetary equilibrium. It also explains the relationship between nominal devaluation and public finances.

A. Oil Shocks and Government Finances

36. An important characteristic of the Venezuelan economy is that oil reserves have been fully government owned since the 1970s. Oil activities are managed by the oil company, PDVSA, whose taxes at about 80 percent of earnings constitute part of the ordinary revenue of the central government. In consequence, changes in the oil market significantly affect the government’s ability to spend (see Figures A.3 and A.4).

37. The oil dependence of public finances is illustrated in Table A.4. The first column, TAXRATIO, presents the ratio of oil taxes, excluding royalties, to total tax revenues for the period 1970-91. These figures are very high. With the exception of 1970 and the period from 1986-88, taxes on oil have made up more than 50 percent of total tax revenues. The data suggest that this ratio reached 56 percent in 1991, reflecting in part the oil price increase associated with the Gulf War. Column 2, TAXOIL-N, shows oil taxes as a percentage of the non-oil GDP, and column 3, TAXOIL-Y, shows the ratio of oil taxes to GDP. The TAX/GDP ratios show a significant degree of variability, indicating that the reliance on the oil tax makes the public finance system vulnerable. Table A.5 presents changes in oil tax revenues as a percentage of non-oil and total GDP, the largest occurring in 1974, 1981, 1982, and 1986.

38. Table A.6 presents a series of regressions illustrating the relationship between the oil variables and public finances. The first equation relates the log of the ratio of total tax revenues to non-oil GDP to the log of the oil price and output. In the second regression the dependent variable is the log of the ratio of oil taxes to non-oil-GDP. In the third regression the dependent variable is the ratio of government expenditures to non-oil GDP. In every case the coefficients of the real price of oil and oil production are positive and significant. Similar results were obtained using the log of the volume of oil exported instead of oil production.

B. Nominal Devaluations and Public Finances: Myths and Dangers

39. An important debate in Venezuela centers on the relationship between nominal devaluations and public finances. The argument is that because the government’s revenue from the oil tax depends on the exchange rate, there is a temptation to over-devalue to increase government receipts. Since the Venezuelan treasury receives the tax proceeds on PDVSA’s dollar earnings in bolivars (Bs), devaluation increases the Bs equivalent of a given oil tax revenue. This reasoning is perfectly correct in the short run and when considering receipts only. However, what really matters is how nominal devaluations affect the government deficit, not merely revenues.
Equations (A.23) and (A.24) in Appendix 3 express the government’s revenues and expenditures, respectively. In equation (A.23), revenues in local currency, $E(TAXOIL_{US})$, are equal to oil taxes in Bs, plus other taxes and other revenues. Oil taxes are equal to the product of the nominal exchange rate and oil taxes expressed in US$. The partial effect of a devaluation, or an increase in $E$, on government revenues denominated in Bs will be positive. However, if the analysis concentrated exclusively on the term $E(TAXOIL_{US})$, it would overestimate the net effect on the deficit because a devaluation affects other items in the budget. This is particularly clear on the expenditure side, where nominal devaluations tend to positively affect wages, $W$, domestic prices, $P$, and domestic interest rates, $i$. Moreover, nominal devaluations will result in a one-to-one increase in the Bs-denominated cost of government imports.

In the long run, the effect of nominal devaluations — not translated into real devaluations — will tend to be zero since revenue increases will be offset by approximately equal increases in expenditures. This brings back the issue of the effectiveness of nominal devaluations. Abundant historical evidence emphatically indicates that, for nominal devaluations to impact the RER over the long run, they must be undertaken from an initial condition of disequilibrium and be accompanied by tight macro policies. Otherwise nominal devaluations will only be followed by proportional price increases, with no positive effect on the net budget.

C. Oil Shocks and Monetary Disequilibrium

An important question in Dutch-disease analyses is the monetary impact of resource-based exports. Most discussions on the subject have dealt with non-monetary economies and have focused on "expenditure" and "resource movement" effects (see Corden, 1981). However, oil-export booms are likely to have important short-term monetary consequences through the accumulation of reserves (see Neary and van Wijnbergen, 1984; Edwards, 1984, 1986; Harberger, 1983). If the export boom results in a balance of payments surplus, the international reserves and money supply could increase beyond the demand for money, thus generating a short-term excess money supply. This monetary disequilibrium would put pressure on all markets. Under pre-determined exchange rates these could increase, as would the demand for tradables. This latter force would provide the mechanism to solve the monetary disequilibrium eventually. In the short run, however, the monetary expansion would put additional pressure on the RER. Under flexible exchange rates, the excess money supply would also put pressure on the nominal exchange rate, generating forces towards depreciation. But it is likely that the increase in nontradable prices would exceed the exchange rate depreciation, generating an appreciation of the RER and loss in competitiveness. However, as Harberger (1981) pointed out, this monetary channel will operate only in the short run, affecting the dynamics of the RER; in the long run, the equilibrium RER will respond to changes in the real "fundamentals" only.

Harberger (1983) has provided a clear presentation of the interaction between export booms and the money supply in standard Dutch-disease models. A positive oil shock — that is, an increase in $P_t^e$ — would have a positive impact on the balance of trade and, thus, on the money supply (see Box 1).
Box 1

Money Creation

Denoting the money supply as $M^*$

$$M_t = M_{t-1} + B_t$$  (H.1)

Where $B_t$ is the trade balance defined as:

$$B_t = T_t^s + P^o Z_t - T_t^d$$  (H.2)

where $T_t^s$ and $T_t^d$ are the supply and demand for tradables respectively, $P^o$ is the price of oil and $Z_t$ is, as before, the supply (export) of oil.

44. Harberger’s formulation can be revised to analyze economies where the exports are government-owned, as in Venezuela. In this case, the direct impact of oil export changes on money creation is greatly reduced, when compared with Harberger’s formulation, because oil exports are now multiplied by $(1-\alpha)$. This means that only the percentage of oil exports not collected as taxes will affect money creation. The reason for this is simple: in Venezuela an increase in oil exports has two opposite effects. On the one hand, there is an expansionary force stemming from the accumulation of reserves; on the other hand, there is a restrictive force from a reduction in the public sector’s borrowing requirements. Indeed, a higher oil price increases tax revenues and reduces the need for central bank financing, if expenditures are not increased too (see Appendix 4).

45. Since changes in the money supply are subject to these two offsetting forces, the international reserves and domestic credit should move in opposite directions throughout much of the period. This is shown in Figure A.5, where $\Delta R_x$ represents changes in reserves, $\Delta D^c$ changes in domestic credit, and $\Delta M$ changes in money.

46. According to equation (A.29), to the extent that oil taxes are lower than 100 percent -- that is $\alpha < 1$ -- oil exports will still have some effect on money creation. A series of equations for money growth were estimated to obtain insights on the way the external sector impinges on money creation (see Table A.7). Following the literature, assume that money growth, $DLM_t$, depends both on variables that impact on the balance of payments -- the real price of oil, oil production, and monetary disequilibrium -- and on government expenditures. The external sector variables -- RER, oil prices, and oil volume -- have the expected signs and are statistically significant, suggesting that there has indeed been some feedback from oil to money creation during this period. The results are not significantly affected when oil exports are used instead of oil production. Naturally, this relationship will influence the way in which oil shocks affect the RER dynamics in the short run. The negative sign of the coefficient of log $GEXY$ is unexpected but not statistically significant.
D. Summary

47. Public finances in Venezuela are highly dependent on oil. Nominal devaluations, without changes in the fundamentals, do not result in adjustments in the fiscal stance because the resultant revenue increases will be accompanied by proportional increases in expenditures. Evidence of the impact of oil variables on money creation suggests that there has been some feedback from oil prices to the money supply process, as expected.
The earlier analyses of the RER determination, money creation, government expenditures, and money demand are combined here in simulations to measure the RER consequences of oil shocks. Policy makers need to know not only whether the oil shocks have an effect on the RER, but also whether this effect is sizable enough to require a policy response. The simulations establish Venezuela's likely RER path if in 1976 the international price of oil had experienced a temporary 30 percent positive shock, which although somewhat large, has not been completely unusual in the oil market in the last 25 years.

**A. The Complete Model**

Table A.8 shows the model used in the simulation. Equation I is the RER equation and is based on the analysis in Chapter 2. It shows that in the short run the RER is affected by both real (fundamental) and monetary variables, but in the long run only by the fundamentals. The terms of this equation correspond to equation (5.4) in Table 2. Equation II is the government expenditure equation and follows the discussion in Chapter 3. Its most important feature is that it establishes the positive effect of conditions in the oil market on government expenditures. It is presented in reduced form. Alternatively, separate equations for government budget constraints and for government sources of revenue could be included. Equation III is the demand for money and relates the real quantity of money demanded to real income and the nominal interest rate. Equation IV is the money growth process and follows the discussion presented in Chapter 3. It recognizes the multiple sources of money creation in the Venezuelan economy, and by including the oil variables -- price and volume -- as well as the RER, captures the external sector as one of these sources. Equation V shows the monetary dynamics and states that monetary equilibrium is achieved slowly in this economy. Equation VI states that the rate of growth of oil GDP depends on the behavior of real oil prices and production. Equation VII defines real GDP as the sum of non-oil and oil GDP.

The simulation of the model in Table A.8 requires values for the parameters. The first run used parameters obtained from the actual estimates of these equations, but some of these regressions yielded results that were not fully convincing. Therefore, in the second run some of the parameters, among them the parameter for monetary disequilibrium in the RER equation were changed in directions that seemed plausible. Most estimates were for 1965-90, except for the money demand equation, which used 1950-90 data. Most of the parameters in the basic simulation were obtained from least-squares fits. In most estimates the use of equation IV gave very similar parameter values. The presumption, then, is that using alternative methods to generate the values of these parameters would not alter the simulation results. The money growth equation was estimated using instrumental variables. Table A.10 summarizes the parameterized basic model.

**B. Temporary Price Oil Shocks and The RER: Basic Results**

This section reports the results of a simulation that assumes a temporary real oil price increase of 30 percent. A temporary increase in \( P_0 \) was defined as a situation where the price of oil is
higher than observed for two years in a row. In this simulation the positive oil shock takes place in 1976-77. Figure A.6 depicts the evolution of the log of the real price of oil, LPROIL, as well as the log of the assumed counterfactual price, LPROILEX, from 1970-90. Figure A.7 depicts the log of government expenditures for the base run, LGEXYFI, and for the simulated temporary oil shock, LGEXYSI. As expected, an increase in the price of oil has a positive effect on government expenditures. Figure A.8 shows the actual response of the log of government expenditures computed as the difference between the base run and the simulation results. The temporary increase in the oil price results in an appreciation of the RER that reaches 7 percent at its peak in 1978, declines slowly, and disappears in 1986. The long-lasting effect of this shock results from the dynamic structure of the model, but notice that already by 1980 this effect is very small.

52. Figures A.9 and A.10 show the RER reaction to the temporary oil price increase. Figure A.9 depicts the base-run RER path, LMURERFI, and the simulated path, LMURERSI; Figure A.10 depicts the actual reaction of the log of the RER. In this simulation, the temporary oil price increase generates a temporary RER depreciation that tends to disappear slowly, reaching its peak of 7 percent in 1978. Note that the simulated magnitude of this reaction is larger than what previous researchers obtained, using different models and a shorter time span. The main reason for this difference in results is that in traditional models the important government expenditures channel was ignored.

53. The results in Figures A.9 and A.10 came from simulating the model depicted in Table A.7. The robustness of these results was tested by running a simulation analysis based on a different set of estimates for equations I-VII. The RER equation in this second set is equation (5.1) in Table 2. The difference between equations (5.1) and (5.3) is that in the former the variable used is oil production while in the latter it is oil exports. To get a consistent group of estimates in the second set of simulations, the parameters for every equation corresponded to those obtained from estimates using oil production as the variable. Figure A.11 shows the simulated response of the log of the RER to a temporary 30 percent price increase, using these parameters. Notice that in this case the effect on the RER is larger than before, with the maximum RER appreciation reaching almost 9 percent three years after the oil shock.

C. Oil Shocks Under Alternative Parameterization for Monetary Disequilibrium

54. One of the puzzling results of the RER equations reported in Table 2 is the extremely low value of the estimate of the monetary disequilibrium term. A series of simulations using larger values of this coefficient show that when this parameter was altered, the dynamics followed by the RER after the oil shock are different from that reported above. The long-run effect, however, is the same, proving that the reaction of the equilibrium RER is given by the fundamentals independently of the parameters considered for the money term. Figure A.12 shows the reaction of the RER to the 30 percent temporary oil price increase, under the assumption that the monetary coefficient is 0.2. In this case the temporary RER appreciation is significantly larger, reaching almost ten percent at its maximum. This indicates that with a more plausible value of the monetary parameter the sensitivity of the RER to temporary oil shocks can be significant.
D. Summary

55. The analysis of the magnitude of the impact of temporary oil shocks on the RER includes several counterfactual simulations that assumed the real price of oil was subject to a temporary 30 percent increase. The results suggest that this disturbance would have generated a non-trivial RER appreciation of 7-10 percent, indicating that the oil price shocks do impact on the RER and that the impact is quantitatively important. In fact, the magnitude of the simulated RER reaction to this shock suggests that an institutional arrangement to reduce this variability should be a very high priority of the reforms aimed at improving macroeconomic management.
This chapter presents the results of simulations to quantify the likely effects of changes in government expenditures on the RER level. It also investigates the probable path of the RER if in 1976 the government had decided to invest part of the oil revenue in the international capital markets.

The empirical results in Chapter 2 indicate that changes in government expenditures have had a significant impact on RER behavior. In particular, they show that a reduction in government spending is an effective way of altering the long run level of the equilibrium RER, providing additional incentives for nontraditional exports. An analysis of the real determinants of the equilibrium RER shows that changes in government expenditures allow the greatest flexibility for achieving this goal since further tariff reductions are constrained by the Andean Pact agreement and changes in capital inflows are largely endogenous, leaving government expenditures on nontradables as the easiest policy tool to manipulate.

Figure A.13 shows the results of a simulation that assumes that, starting in 1975, the government had reduced its expenditures relative to non-oil GDP by 10 percent. This simulation used a slightly different version of the model presented in Table A.10. As expected, the results show a depreciation of the RER, the magnitude of which converges to 6 percent in 1988. A limitation of this simulation, however, is that its assumption that the interest income accumulated from the oil fund is not spent may not be realistic.

An alternative scenario is to assume that the accumulated funds yield 5 percent in real terms which is spent in the same pattern as other income. Figure A.14 shows that, in this case, the magnitude of the RER depreciation is not as large nor as permanent as in Figure A.13. As the fund grows its income also increases, and, to the extent that this is spent, puts pressure for an appreciation of the RER. In fact, these figures show that, under these policies, the RER by 1990 would have been only 1 percent more depreciated than in the absence of the fund. However, notice that at its peak after six years, the RER would have been almost as depreciated as in the base-run case. A temporary RER depreciation of the type depicted in Figure A.14 may, however, be sufficient for taking advantage of learning-by-doing type of externalities.

The simulations suggest that changes in government expenditures are indeed a powerful tool affecting the equilibrium level of the RER and, thus, providing improved competitiveness to the non-oil tradables sector. However, this finding must be qualified by four observations: 1) In the absence of the required data, these simulations do not distinguish between government expenditures on tradables and nontradables. 2) This analysis assumes that the values of the relevant parameters are not altered by a change in policy. In this regard, note that an alternative way of facing the RER level issue is by altering the pattern of government expenditures. Indeed, a reduction in the government’s consumption of nontradables would result in decreased pressure in that
market and in a real depreciation of the RER. 3) This analysis assumes a reduction in government expenditures, not in oil-financed expenditures. However, this could easily be incorporated in the analysis. 4) For political reasons, it may not be easy to reduce government expenditures in the measure discussed here.
Chapter 6: Oil Stabilization Funds (OSF) and the RER

61. This chapter analyzes the possible effects of an OSF, specifically, a fund of the Hausmann et al. (1991) type, on the RER level and variability, without considering the technical details of implementation. The simulations assume that the authorities had adopted this type of fund in 1973 and 1975, respectively.

A. Commodity Stabilization Funds

62. The simulation analyses presented in the preceding chapter explained how different shocks and policies are likely to affect the level of the RER. A second preoccupation is RER variability. An OSF would provide an efficient way to reduce the impact of the oil price shocks on the RER and reduce its variability. Although a simple stabilization fund started in December 1990 proved unsuccessful, the idea is being considered again.

63. The economic reasoning behind commodity stabilization funds is rather simple. When commodity prices are highly volatile, risk-averse economic agents will be willing to pay to avoid price variability. In principle, this stability can be accomplished in two ways: 1) through the use of financial instruments such as future contracts, options, and commodity-based bonds; and 2) through the operation of a stock-accumulation mechanism that reduces the effects of price fluctuations (see Newberry and Stiglitz, 1981). Because financial instruments could reduce fluctuation in Venezuela's oil revenues, their usefulness must be assessed.

64. The idea behind commodity stabilization funds is that they provide a form of self-insurance. When the export price of a commodity increases, part of the added revenue goes into the fund to be used by the exporter when the export price declines. The fund is a shock absorber, reducing the impact of world price fluctuations on the domestic economy. How it would operate would depend — among other things — on: 1) the variable(s) that the authorities want to stabilize; and 2) the statistical characteristics of commodity price behavior. An OSF would be an ideal mechanism to regulate the rate of government expenditures.

B. The Hausmann-Powell-Rigsbon OSF and Oil Tax Revenues: A Simulation

65. Hausmann, et al. (1991) have proposed a specific OSF for Venezuela. They derived an optimal spending rule for oil revenues assuming that: 1) the oil prices are non-stationary; 2) Venezuela faces liquidity constraints; and 3) there are macroeconomic adjustment costs associated with oil price changes. By contrasting the spending path obtained from their optimization with the actual behavior of oil revenues, they have determined that the main features of an OSF would be: 1) that the rule is independent of the price of oil; and 2) that it incorporates a maximum rate of growth for government expenditures.
C. The OSF and the RER: More Counterfactual History

To study the effect such an OSF might have had on government expenditures and the RER, two alternative assumptions were made about the starting date:

Case 1: The fund was started in 1973, at its optimal level.

Case 2: The fund was started in 1975, after the first oil price shock, at a level of zero.

The main impact of an OSF on the RER dynamics is that it alters government resources available for expenditures. Thus, the log GEXY in the RER model in Chapter 2 will not be the same when the OSF is in place as when oil shocks are fully absorbed by government expenditures. Consequently, the first step was to compute a new series for the ratio of government expenditures to non-oil GDP, GEXY, assuming that non-oil taxes were not altered by adopting the OSF (see Table A.11).

This series was used in the simulated paths of the RER based on the RER equation in Chapter 2. Figure 3 presents the simulated series LMURERH1 (1973 fund) and LMURERH2 (1975 fund) as well as the data for the actual log of the RER from the base run LMURERH. Table A.12 presents data on the standard deviation of the log of the simulated, actual, and fitted RERs. Several interesting facts emerge:

- In the presence of an OSF starting in 1973, the RER would have been higher (more depreciated) than it was from the early 1970s to 1986 because oil-financed expenditures in every period are subject to the ceiling imposed by the Hausmann rule. Consequently, in this case government expenditures are not only smoothed out, but also reduced relative to the historical level. For LMUEWEH2, a higher RER is observed for 1979-86.

- The acute real appreciation in the actual RER, LMURER, observed in 1979-82 would have been smoothed out significantly.

- The "required" real devaluation of the 1980s would have been smaller in the presence of an OSF.

- The variability of both simulated RERs paths is well below what was actually observed during this period but more so for LMURERH1 — the simulation that assumes that the fund started in 1973.

However, the simulations underestimate the reduction in RER variability attributable to the operation of the fund because, in this example, the fund changes the path of government expenditures only. In reality, an institutional change of this type is also likely to affect other parameters. For instance, if the OSF alters the composition of government expenditures, a reduction of the coefficient of GEXY in the RER equation will follow and the reduction in variability will be greater than the results in Table A.12 suggest. The direction and magnitude of the possible change in these coefficients is an empirical issue. Another consequence of the proposed OSF is that it would increase the predictability of government revenues and expenditures and improve the economic agents' ability to predict RER developments.
Figure 3

Venezuela: Simulation Results - Simulated and Base Run Real Exchange Rate Paths Under the Assumption that the Oil Fund is Implemented.
D. **Summary**

70. An OSF of the Hausmann, et al. type would be greatly beneficial for Venezuela. The simulations indicate that, under some plausible conditions, it would not only reduce RER variability but would also generate a higher, more depreciated, and thus more competitive, RER. It should be stressed again that the level of the simulated LMURERH1 is due to the ceiling imposed on government expenditures by the fund’s rule.
CHAPTER 7: Inflation and Inertial Forces in the Venezuelan Economy

71. This chapter discusses whether the inertia of Venezuela’s inflationary process has increased in the last few years and, in particular, whether the adoption of a flexible exchange rate system — where the authorities make an effort to maintain a "competitive" RER via nominal devaluations that offset past inflationary differentials — has resulted in a structural loss in stability. It also discusses the principles behind the recent recommendation that developing countries adopt nominal exchange rate anchors (see Burton and Gilman, 1991), and derives policy recommendations for Venezuela.

A. Inflation Inertia in Venezuela

72. This section analyzes empirically the relationship between exchange rate policy and inflation in Venezuela, specifically, whether the inertial properties of inflation have changed in the country since the adoption of a more flexible exchange rate regime in the 1980s. The econometric analysis is based on the equation derived from the model in Appendix 5.

73. The regression estimates of the inflationary inertia in Venezuela were obtained using equations of the type of (A.35) in Appendix 5 and quarterly data for the period 1970-90. In the initial analysis, the dummy variable for the regime change was given a value of one, starting with the first quarter of 1983 and ending with the first quarter of 1990. Table A.13 contains the estimates from the basic regression, where INFLA is inflation, USINF is world inflation, GROCC is the rate of growth of domestic credit, and DUMINFI is the product of the dummy and the lagged rate of inflation. The results suggest that the country had virtually no inflationary inertia until 1983 — the coefficient of NFLA(-1) is insignificantly different from zero — when this feature made a forceful appearance in the economy. In fact, it seems clear that since 1983 the inflation process has been losing its anchor — the coefficient of lagged inflation after 1983 being extremely high (0.83).

74. Estimates were obtained with a recursive coefficients technique that, naturally, excluded the dummy term. The estimated coefficients of lagged inflation, the measure of inertia, are depicted in Figure A.15. Until 1979 this coefficient was remarkably low, suggesting that the Venezuelan inflation process lacked any significant inertial component. In mid-1979 there was a structural break, with signs of incipient inertial components. However, the degree of persistence of inflation was still rather low, with the coefficient of lagged inflation between 0.27-0.35. But around 1987 there was a new structural break and a significant increase in inflationary inertia. After this increase, the coefficient of lagged inflation seems to have stabilized at 0.7. Although this is far from a complete loss of anchor — when the coefficient of lagged inflation becomes unity — it is significantly higher than before. The deepening of inertial inflation is likely to make macroeconomic management increasingly difficult.

75. The model in Appendix 5 captures the role of wages and other contracts by adding the rate of devaluation to the basic inertial equation. The coefficient of lagged inflation captures the role of wage rate indexation and is mostly determined by the value of $\gamma$. The higher the degree of
indexation, the closer $\gamma$ will be to one and the higher will be the contribution of wage adjustments to the dynamics of inflation. Table A.14 contains the results of this regression analysis, where DEVMU is the rate of devaluation. Two findings stand out: 1) the coefficient of devaluation is highly significant, indicating that devaluations have affected the rate of inflation during the period under study; and 2) even after controlling for the rate of devaluation the coefficient of DUMINF1 is significantly positive and high, suggesting that the implicit and explicit indexation of wages and other contracts has contributed to increased inflationary inertia. This finding indicates that the elimination of the current exchange rate policy of adjusting the exchange rate to inflation might not be sufficient to lower inflationary inertia.

B. An Exchange Rate Anchor for Venezuela?

Some authors have argued recently that a fixed exchange rate is an efficient way to eliminate inertia and rapidly reduce inflation to international levels, maintaining that governments that have the discretion to alter the nominal exchange rate will tend to abuse their power and introduce an inflationary bias into the economy (see Edwards, 1991; Bruno, 1990). A key implication of the macroeconomic literature on which this argument is based is that constraints that bind the government to low inflation are an improvement over discretionary systems. A fixed exchange rate limits the government's ability to affect inflation through unexpected devaluations.

The most important problem with this view is that the imposition of a fixed or pre-determined exchange rate is no guarantee that the rate will be maintained. The economic history of developing countries, and especially of Latin America, is replete with promises of fixed exchange rates that were quickly abandoned. These repudiations have been related to the inability or unwillingness of governments to solve their fiscal problems (see Calvo, 1986).

It would be a serious mistake for Venezuela to introduce a nominal exchange rate anchor policy before attempting a permanent solution of its fiscal problems. Over the medium term -- or earlier if possible -- it should aim at the rate of inflation prevailing in the developed world. If, and only if, its fiscal problems are tackled effectively, should it consider the adoption of a fixed exchange rate as a means of reducing inflation.

The first priority should be to reduce the current dependence of revenues and expenditures on the variability of oil prices. Moreover, there are institutional requirements for successfully implementing a fixed exchange rate system. The historical evidence from Latin America shows that governments fall into the temptation of altering the parity as a way of taxing the population, a tendency that undoubtedly introduces instability into the system. An effective way to prevent this is to create an independent central bank to run monetary and exchange rate policy, providing an exchange rate anchor that is clearly more credible and helping to develop a more stable macroeconomic environment. The recent experiences of Chile and Colombia suggest that the time for independent or quasi-independent central banks has arrived in Latin America. Such an institution would, in all likelihood, reduce macro instability in Venezuela, and, if it was accompanied by the creation of an OSF of the type discussed above, would effectively restrain the rate of government expenditures.

C. Summary

Empirical analysis shows that 1) Venezuela had virtually no inflationary inertia until 1983; 2) since 1983 the inflation process has been losing its anchor; 3) devaluations have affected the rate of inflation; and 4) indexation has contributed to increased inflationary inertia. Some authors
have argued recently that a fixed exchange rate provides an efficient way to eliminate inertia and rapidly reduce inflation. For Venezuela this would be a serious mistake without first finding a permanent solution for the fiscal problems.
Introduction

The purpose of this appendix is to derive a formal model of real exchange rate behavior in Venezuela. The model emphasizes three channels through which changes in oil prices affect the real exchange rate: (a) a direct income effect; (b) a government expenditure channel; and (c) a short term monetary disequilibrium channel. The model provides the basis for the estimation analysis reported in the text. A difficulty in building an estimable model for Venezuela is that in the 1980s the country underwent a significant change in its exchange rate regime, replacing a fixed exchange rate with a flexible system where the Central Bank intervenes periodically. This problem was tackled by assuming that the nominal exchange rate is exogenous, and by deriving a general enough model that can accommodate both the fixed and more flexible exchange rate cases. In what follows the analysis proceeds in steps. This appendix presents the basic static model and discusses the determinants of the long run equilibrium real exchange rate.

The Basic Model

The basic model has five building blocks -- numbered I through V -- and is given by equations (A.1) through (A.17).

I. Non-Oil Goods Sector

\[ N_t = N^*(e); \quad (\partial N^*/\partial e) < 0 \]  
\[ T_t = T^*(e); \quad (\partial T^*/\partial e) > 0 \]  
\[ N^P_t = N^P(e_t, y_t); \quad (\partial N^P/\partial e) > 0; \quad (\partial N^P/\partial y^P) \]  
\[ T^P_t = T^P(e_t, y_t); \quad (\partial T^P/\partial e) < 0, \quad (\partial T^P/\partial y^P) > 0 \]

where

\[ e = \left( \frac{E^*/P}{P} \right) (1 + \tau) \]  
\[ RER = E^*/P \]  
\[ y_t^d = y_t - T_t + NTA_t \]  
\[ y_t = p_t T_t + p^* t N^P_t + O_t \]
II. Oil Sector

\[ O_t = p_t^o Z_t \]  \quad (A.7)

III. Government Sector

\[ g_t = g_t^N + g_t^T \]  \quad (A.8)

\[ \text{TAXES}_t = \alpha E_P^o Z_t + OT \]  \quad (A.9)

\[ g_t = \left( \frac{\alpha E_P^o Z_t}{y_t} \right) + \left( \frac{OT_t}{y_t} \right) + \Delta \left( \frac{DCPS_t}{y_t} \right) \]  \quad (A.10)

IV. External Sector

\[ \text{BOT} = P_t^o Z_t + \text{NOBT}, \]  \quad (A.11)

\[ \text{NOBT} = f(e_t, y_t^d) \]  \quad (A.12)

\[ \text{BPO} = P_t^o Z_t + \text{NOBT} + \text{NKF} \]  \quad (A.13)

V. Monetary Sector

\[ \left( \frac{M}{P} \right)_t^d = \beta_0 y_t^d e^{-\kappa_t}, \]  \quad (A.14)

\[ \Delta M_t = \Delta \text{BPO}_t + \Delta \text{DCPS}_t \]  \quad (A.15)

\[ P_t = (P_t^N)^{\gamma} (P_t^N)^{1-\gamma} \]  \quad (A.16)

\[ P_t^T = E_t P_{t+1}^T (1 + \gamma) \]  \quad (A.17)

Building block I deals with the non-oil goods sector. Equations (A.1) and (A.2) are the supply functions for nontradables (N) and non-oil tradables, which are assumed to depend on the relative price of tradables to nontradables (\(e\)). This relative price, in turn, is defined in (A.5) where \((E_P^o/P)\) is the traditional, and empirically measurable, real exchange rate.

Equations (A.3) and (A.4) are the demands for tradables and nontradables, assumed to depend on their relative price \(e\) and on disposable income \(y^d\). This, in turn, is defined in equation (A.6) as total income \(y_t\) minus taxes (T) plus net transfers from abroad (NTA). Finally, equation (A.6')
says that real national income is given by the sum of the real contributions of tradables, nontradables and oil.

Building block II is the oil sector and has one equation (A.7) that writes oil’s contribution to national income as the product of the real price of oil \( p^o \) and the quantity produced \( Z^o \). An important simplification of this part of the model is that both \( p^o \) and \( Z^o \) are assumed to be exogenous. In a way, in this simple model oil has a life of its own.

The third building block is the government sector and is given by equations (A.8) through (A.10). Equation (A.8) defines government consumption as a share of GDP (\( g \)) as the sum of government consumption on tradables \( g^T \) and on nontradables \( g^N \), both as proportions of GDP. Equation (A.9) defines total nominal taxes as being composed of two parts: (a) taxes on oil production \( \alpha E P^o Z^o \), where \( \alpha \) is the effective rate of taxation, and (b) other taxes \( OT^1 \). Naturally, when oil taxes are expressed in real terms we obtain \( T^o \) in equation (A.6) on disposable income.

Equation (A.10) is the government budget constraint and says that government expenditure (as percentage of GDP) is equal to tax revenues -- including oil tax revenues -- and banking sector financing \( \Delta(DCPS)/Y_t \).

Equations (A.11) and (A.12) are the external sector and describe the trade balance and balance of payments in foreign currency. Here \( p^o Z^o \) is total oil exports, is the non-oil B balance of trade. This is assumed, in equation (A.12), to be a positive function of the relative price of tradables and a negative function of disposable income. Equation (A.13) is the balance of payments where \( NKF \) are capital flows.

Equations (A.14) through (A.17) are the monetary sector. Equation (A.14) is the demand for money where the notation used is self-explanatory; equation (A.15) is the supply for money defined as the sum of the balance of payments in bolivars \( BPO_t \) and the increase in the Central Bank’s domestic credit to the public sector. Equation (A.16) says that the price level is a weighted average of the domestic currency price of tradables \( P^T \) and of nontradables. Finally, equation (A.17) says that the domestic currency price of tradables is equal to the world price of this type of goods, times the nominal exchange rate and adjusted by taxes on tradables \( \cdot \cdot \cdot \).

In the long run a number of equilibrium conditions have to hold. First, the nontradables market has to clear \( N^* = N^o \) -- in fact, in the tradition of modern open economy macroeconomics we assume that this equilibrium condition has to hold both in the long and short run. Second, in the long run the monetary market should be in equilibrium (i.e., \( M^*_t = M^o_t \).

**The Long Run Equilibrium Real Exchange Rate**

The long run equilibrium real exchange rate \( \text{RER}^* \) is defined as the relative price of (non-oil) tradables to nontradables \( EP^T/P^o \), that, for given values of other determinants of long run equilibrium such as taxes, capital flows and terms of trade (price of oil), is consistent with the simultaneous attainment of internal and external equilibrium. In this context, internal equilibrium is understood as a situation where the domestic (nontradables) market clears every period \( N^*_t = N^o_t \), for all \( t \), and where unemployment does not exceed its natural level. External equilibrium, on the
other hand, is defined as a situation where the current account deficit is financed by sustainable long term capital inflows. The real variables that, jointly with the RER, determine internal and external equilibrium are known as the real exchange rate fundamentals.

A key implication of modern theories of real exchange rate determination is that the equilibrium real exchange rate is not a constant number. Quite the contrary, it is a function of the fundamentals; when there are changes in fundamentals — such as changes in the world oil market conditions — the equilibrium real exchange rate will change.

The model presented in the preceding section can be used to analyze the way in which different changes in fundamentals will affect the long run equilibrium real exchange rate. Domestic or nontradables equilibrium requires:

\[ N_i^e = N_i^d + G_N \]  

(A.18)

where \( G_N \) is the government demand for nontradables. External equilibrium, on the other hand, means that

\[ P^e_i Z_i + T^*_i - T^*_i = -NKF^* \]  

(A.19)

where \( NKF^* \) refers to long run sustainable equilibrium. From equilibrium conditions we can obtain the following expression for changes in the equilibrium RER:

\[ \frac{d\log(RER^*)}{d\log y^d} = \frac{\alpha_1 e}{\varepsilon - \alpha_1 \eta} - \frac{\alpha_2}{\varepsilon - \alpha_1 \eta} d\log y^d + \frac{\tau}{1 + \tau} d\log \tau \]  

(A.20)

where \( \alpha_1 \) and \( \alpha_2 \) are the private and public sectors shares of the demand for nontradables; \( e \) is the price supply elasticity of nontradables and is positive; \( \eta \) is the price demand of nontradables and is negative; and \( \delta \) is the income elasticity of the demand for nontradables and is positive. Using equations (A.6) and (A.6') on real and real disposable income, and equation (A.7) on the oil sector contribution to real income, we can rewrite (A.20) in the following way:

\[ \frac{d\log(RER^*)}{d\log y^d} = \frac{\alpha_1 e}{\varepsilon - \alpha_1 \eta} - \frac{\alpha_2}{\varepsilon - \alpha_1 \eta} d\log y^d + \frac{\tau}{1 + \tau} d\log \tau \]  

(A.21)

1/ For formal analyses of the equilibrium real exchange rate see, for example, Williamson (1985), Edwards (1989).

2/ Where \( RER = \frac{EP^*}{P_N} \); that is it is equal to \( e/(1 + \tau) \).

3/ This assumes, for simplicity, that "other" taxes are zero.
\[ \text{dlog}(\text{RER}^*)_t = \lambda_0 + \lambda_1 \text{dlog } P^0_t \]
\[ + \lambda_2 \text{dlog } Z_t + \lambda_3 \text{dlog } G_t^N + \lambda_4 \text{dlog } \tau + \lambda_5 \text{dlog } NKF_t \]  
(A.21)

where

\[ \lambda_1 = - \frac{\alpha_1 \delta (\beta_1 - \beta_2 \alpha)}{e^{-\alpha_1 \eta}} < 0 \]
\[ \lambda_2 = - \frac{(\beta_1 - \beta_2 \alpha) \alpha_1 \delta}{e^{-\alpha_1 \eta}} < 0 \]
\[ \lambda_3 = \left[ \frac{\alpha_2}{e^{-\alpha_1 \eta}} \right] < 0 \]
\[ \lambda_4 = - \left[ \frac{\tau}{1+\tau} \right] < 0 \]
\[ \lambda_5 = - \frac{\beta_3 \alpha_1 \delta}{e^{-\alpha_1 \eta}} < 0. \]

\( \lambda_0 \), on the other hand, is a parameter that includes the rate of growth of the non-oil components of GDP, assumed to be constant. According to equation (A.21) an increase in the price of oil will result in an equilibrium real exchange rate appreciation, as will an increase in oil production. Notice, however, that since most of the oil revenue is taxed by the government, the magnitude of this direct oil shock effect is rather small. However, according to (A.21) and (A.10) changes in government expenditure on \( N \) goods constitute a secondary -- and in principle more important channel -- through which a change in oil will affect the real exchange rate. As can be seen from (A.21) an increase in \( G^N \) will result in an equilibrium real appreciation. From the government budget constraint (A.10) and definition of government tax revenue (A.9) it is clear that an oil price increase will tend to result in a higher \( G^N \), and thus in the already-mentioned indirect oil effect channel.\(^4\)

\(^4\) This assumes that the increase in government consumption on \( N \) is financed through borrowing. If, however, it is financed through other taxation, the net effect would depend on the way in which private consumption reacts. If \( N^d \) falls by more than the increase in \( G^N \), the real appreciation mentioned above would not take place.
Finally, and in line with earlier equilibrium real exchange rate models, equilibrium (A.21) states that an increase in protection or in capital inflows will result in a real appreciation.$^5$

Integration of (A.21) results in the following expression for the log of equilibrium real exchange rate which was used as one of the building blocks in the estimation of RER dynamics reported in Section III of the paper:

$$\log(\text{RER}^*)_t = k + \lambda_1 \log p^*_t$$

$$+ \lambda_2 \log Z_t + \lambda_3 \log G^t_t + \lambda_4 \log \tau_t + \lambda_5 \log \text{NKF}_t$$

(A.22)

where $k$ is a constant of integration.

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$^5$ See Edwards (1989b) for a formal fully optimizing, general equilibrium, intertemporal derivation of these effects.
EVOLUTION OF EXCHANGE, TRADE AND CAPITAL RESTRICTIONS
IN VENEZUELA: 1958-1989

1958

Exchange: - Preferential buying rate for cacao and coffee exports, government imports and petroleum companies.
- Multiple system: controlled and "official-free" exchange rates.

Trade:  - No payment licenses, only a few import restrictions for protective purposes.
- Iron and Steel imports subject to licenses (Apr. 16).

Capital: - Capital Transfers can be made freely. Mobility is virtually unrestricted. There are no registration procedures for incoming capital.

1959

Trade: - Certain imports were made subject to prior licenses on a quota basis (Jul. 4).
- A number of consumption goods imports were made subject to licenses (Nov. 20).
- Import duties on the above goals were further increased (Dec. 11).

1960

Exchange: - A three-tier exchange rate system: An additional fluctuating free market rate is established (Nov. 8).

Capital: - Except for registered and repatriated capital, all transactions made at "official-free" and free rates. Capital mobility is further promoted (Nov. 8).

1961

Exchange: - Official market becomes controlled (Mar. 17).
- Exchange licenses to support controlled rate (Mar. 17).
- Exchange Stabilization Fund set up (Apr. 1).
- Commercial banks excluded from transacting in fluctuating free market (Apr. 17).

**Trade:**
- List of imports for "essential" items is established and further extended during the year.
- 2,000 $US exempt from licensing requirement (Mar. 17).

**Capital:**
- 100% deposits for imports (Mar. 17).

**1962**

**Exchange:**
- Major portion of payments transferred from controlled to "official-free" market (Apr. 2).

**Trade:**
- 20% of imports subject to "official-free" rate (Apr. 2).

**Capital:**
- Virtually all capital transactions become subject to the "official-free" rate (Apr. 2).

**1963**
- no significant changes took place.

**1964**

**Exchange:**
- Most transactions now made at a 10 points depreciated rate (Jan. 18).
- Petroleum and iron companies no longer subject to preferential rates (Jan. 18).

**Trade:**
- 1.15BS per US$1 subsidy on powdered milk and whea. Previously, 27 import categories had benefitted from such a subsidy (Dec. 30).

**Capital:**
- Preferential rates for repatriation and servicing of capital are abolished, restricting mobility of capital (Dec. 31).

**1965**
- no significant changes took place.

**1966**

**Trade:**
- Further commodity imports subject to licensing during the year.
- Some agricultural imports become prohibited (Jan. 3).

**Capital:**
- Foreign investment and mutual funds related brokerage activity is prohibited (Feb. 11).
Central Bank creates swap facilities to save foreign exchange and enhance incoming capital (Sep. 19).

1967

Trade:
- Further import licenses established.
- Primary imports for manufacturing exports freed from duties (Apr. 25).
- Guaranteed minimum prices for coffee and cacao are revised and extended (Mar. 14).
- Imposition of quota restrictions for textiles and clothing (May 10).

1968

Trade:
- List of import licenses continues to be extended.
- Textile import licenses further tightened (May 28).

Capital:
- Credit deposit restriction for reserves and surplus of multinationals in domestic banks (Apr. 22).

1969

Trade:
- Restrictions are further tightened.
- Coffee and cacao guarantee prices raised (Jul. 3).
- New restrictions on auto imports for personal use (Jul. 7).

1970

Trade:
- The foreign exchange subsidy on some powdered milk and wheat imports is lifted (Jan. 1, Feb. 18 and Jul. 1).
- Imports of motor vehicles for personal and commercial use are prohibited (May 8).

1971

Exchange:
- All exchange rates appreciated by 10 points (Dec. 21).

Trade:
- Export licenses on many manufacturing and processed products eliminated (Jul. 29).
Capital: - Reserve requirements are eased for domestic banks, but tightened for foreign banks (Jan. 1).

- Expropriation of oil and gas companies begins, affecting capital inflows (Aug. 26).

1972 - No significant changes took place.

1973

Exchange: - Following the dollar depreciation, all exchange rates further appreciated by 10 points (Feb. 19).

Trade: - Freely negotiable tax credit certificate for non-traditional exports (Sep. 26).

- Export Finance Fund is created (Sep. 26).

1974

Exchange: - New central bank law empowered it to conduct a flexible exchange rate policy (Nov. 26). This did not affect exchange rate market.

Trade: - Sugar exports become subject to licensing requirement (Apr. 2).

- Non-traditional exports incentives still in place.

- Import quotas for 80 tariff items (mainly foodstuffs) are eliminated (Aug. 6).

- Coffee crops and exports suspended (Nov. 28).

Capital: - Except for regulations on foreigners, all capital transactions remain unrestricted.

- All foreign companies must sell 80% of their shares to Venezuelans (Apr. 30).

1975

Exchange: - Foreign exchange preferential treatment for Petroven (Sep. 11).

Trade: - Many Venezuelan exports become eligible for incentives (Apr. 29)- 50% bonus incentive to agricultural exports (Jul. 1).
Further incentives for national airline exports services (Dec. 12).

Vehicles assembled domestically must contain 75% locally produced parts (May 16).

Import duties on Andean goods reduced (Aug. 1).

Further import restriction are established during the year.

Capital:
- Iron and mining exploration reserved for the state (Jan. 1).

**1976**

Exchange:
- Exchange rates for government and commercial banks are unified. The former no longer has preferential treatment (Jul. 1)

Trade:
- A 20% deposit requirement was in place for virtually all imports (Apr. 27).
- Remaining foreign exchange subsidy, as well as import licenses, on wheat imports are eliminated (Apr. 28, May 6).

**1977**

Trade:
- Public enterprises must buy from local producers (Feb. 1).
- Licenses and duties on private sector imports of food and glass products are suspended (Apr. 18).

**1978**

Trade:
- Most motor vehicle imports prohibited (Jan. 3).
- Import license requirements for iron and steel, and consumer durables (Mar. 1 and 22).
- Import quotas on agricultural products are suspended (Aug. 1).
- Custom tariffs are increased (Aug. 3).
- Most import duties and requirements were tightened, particularly for machinery and equipment (Aug. 15).
1979

Trade: - An important number of import restrictions were tightened, whereas other imports were liberalized during this year.

Capital: - Borrowing from Foreigners from domestic banks is restricted (Jul. 10).

1980

Trade: - Import licenses were eliminated and ad valorem tariffs were reduced for a large number of commodities.

- Ad valorem import duties replaced by specific tariffs on various manufactured imports (May 9).

- Import reference prices were established for motor vehicles (May 9).

- Export licensing restrictions virtually eliminated (Oct. 26).

Capital: - Reserve requirements are imposed on overseas deposits of vennuelan banks, and on domestic deposits of multinational corporations (May 12).

- Profit reinvestment provisions on foreign companies were liberalized (Sep. 11).

1981

Trade: - Import licenses continue to be eliminated.

- Import duties are further reduced, sometimes suspended.

1982

Trade: - Some agricultural exports no longer subject to licenses, clothing imports prohibited (Aug. 9).

- Licensing requirements were eliminated for many items.

- The general revision of the import tariff system continues: duties lowered in 550 items (by as much as 95%), and raised on 300 items (by an average of 30%) on June 11.
1983

Exchange: - All foreign exchange operations suspended (Feb. 20).
- Free convertibility was also temporarily suspended (Feb. 22).
- New three-tier exchange rate system: 2 fixed rates (buying and selling) and a freely fluctuating rate (Feb. 27,28).

Trade: - Advanced deposit of up to 100% an all foreign exchange payments (Feb. 27).
- A more comprehensive listing of "essential imports" subject to preferential rates was announced (Mar. 2).
- All exports proceeds (whether subject to subsidy or not) can be converted at the free rate (May 27).

Capital: - Private and public external debt payments subject to preferential foreign exchange rates (Feb. 28).
- Interest earnings from foreign institutions exempted from Venezuelan income tax (Jul. 14).

1984

Exchange: - a fourth (preferential) exchange rate is introduced (Feb. 24).

Trade: - 200 import items were taken out of the "essential imports" listing and became eligible for another (higher) preferential exchange rate (Jun. 11).

Capital: - The limit to debt rescheduling was raised (Dec. 4).

1985

Trade: - More imports are transferred to a higher exchange rate tier (Dec. 24).
- Some custom restrictions removed (Jul. 12).

Capital: - Zero-coupon foreign bond established for debt rescheduling and service purposes (Jan. 18).
1986

Exchange: - Preferential exchange rate treatment for a range of private sector payments is narrowed (Jul. 17).

Trade: - The number of domestic value added categories was reduced to a few (Oct. 13).

Capital: - Deregulation of foreign investment results in a more liberalized system (Sep. 29).

- Exchange rate guarantee scheme for private sector debt service (Dec. 6).

1987

Trade: - A new foreign exchange rationing scheme is put into place (Jan.-Jun.).

- Fiscal incentives regime for exports, based on domestic value added content (Jul. 8).

Capital: - Debt-Equity conversion scheme for the public sector external debt is established (Apr. 24).

1988

Exchange: - Imports are gradually transferred to less preferential exchange rate (Jan.-Nov.).

- The preferential rate for "essential" imports is eliminated (Nov. 30).

- Foreign exchange receipts from non-traditional exports can be converted at the free rate (Oct. 20).

1989

Exchange: - The four-tier multiple exchange rate system is replaced by a unified, interbank freely fluctuating exchange rate. All forms of exchange controls are virtually eliminated, except for some import and private debt obligations contracted before this system came into place. (Mar. 13).

Trade: - Trade Reform for manufacturing sector was initiated: 1899 licenses and prohibitions representing 77% of all manufacturing imports were lifted (Mar. 15 - May 24).

- Most specific tariffs were replaced by ad valorem tariffs (May 24).
- Custom tariffs and duties eliminated, except for 17 "consumer-basket" goods and all minor assembly parts (May 24).

- The max. ad valorem tax set at 80% for consumer goods, and at 50% for raw materials, intermediate and capital goods (May 24).

- Licensing and prohibitions on manufacturing exports were abolished, except for those decreed as "basic" by the government (May 24).

- The fiscal credit for exports would only apply to exports containing a 30% or more value added. It consists of negotiable bond (applicable for tax purposes). For goods with a value added ranging from 30% to 90%, the tax credit was set at 30%, whereas remaining export items with domestic content of 91% or more would receive a tax credit of 35% (Aug. 17).

Capital:
- The framework for debt-equity conversions was simplified (Mar. 15)
- Auction system for debt conversion is implemented (Sep. 6).

Sources:
1. Annual Report on Exchange Arrangements and Trade Restrictions, IMF.
3. World Currency Yearbook (formerly, Pick's Currency Yearbook), Several Issues.
GOVERNMENT REVENUE AND EXPENDITURE

The public sector budgetary position (revenues and expenditures) can be expressed through the following two equations:

\[
\text{Revenues}^B = E(TAXOIL^US) + OTAXES + \text{OTHER REV}. \quad (A.23)
\]

\[
\text{EXPENDITURES}^B = W(PEMP) + PQ^L + EP^*Q^F + i=DB + i^*ED^F \quad (A.24)
\]

Where:

- Revenues\(^B\) = total revenues in Bolivares;
- \(E\) = Nominal exchange rate;
- TAXOIL\(^US\) = Oil Tax revenues in US dollars;
- OTAXES = Other Taxes;
- OTHERREV = Other Revenues;
- \(W\) = Nominal Wage Rate;
- PEMP = Public Sector Employment;
- \(P\) = Price of domestic (nontradable) goods acquired by the government;
- \(Q^L\) = Quantity of domestic goods acquired by the government;
- \(P^*\) = Price of imported goods acquired by the government;
- \(Q^F\) = Quantity of imported goods acquired by the government;
- \(i\) = Domestic interest rate;
- \(DB\) = Stock of public debt denominated in Bolivares;
- \(i^*\) = Foreign interest rate;
- \(DF\) = Stock of public debt denominated in foreign currency.
Consider the simple balance sheet of the central bank:

\[ H_t = NFA_t + DC_t \]  

(A.25)

Where \( H_t \) is high-powered money or the monetary base, \( NFA \) are net foreign asset (international reserves) and \( DC \) is domestic credit. The monetary expansion \( \Delta H_t \) will then be equal to the balance of payments \( - \) net accumulation of reserves \( - \) plus the change in domestic credit \( \Delta DC_t \). Assume, to simplify the discussion, that central bank domestic credit is used exclusively to finance the fiscal deficit. Then we can write:

\[ \Delta H_t = \text{Balance of Payments} + \text{Public Deficit} \]  

(A.26)

The balance of payment, in turn, is:

\[ BOP = OILEX + NOILEX - IMP + NKF \]  

(A.27)

Where \( OILEX \) are oil export, \( NOILEX \) are other exports, \( IMP \) are total imports, and \( NKF \) stands for net capital flows.

The public sector deficit, on the other hand, is equal to the sum of oil taxes, other taxes, and other revenue minus total expenditures. Oil taxes, in turn, can be written as a percentage \( \alpha \) of oil exports. Using the notation from the previous section, where \( EXP \) refers to the total government expenditure, this expression for the expansion of domestic credit follows:

\[ \Delta DC_t = EXP \left[ \alpha(OILEX)_t + OTAXES_t + OTHERREV_t - EXP \right] \]  

(A.28)

Combining (A.27) and (A.28) into equation (A.26) we have:

\[ \Delta H_t = (1-\alpha) \ OILEX_t + NOILTRADE_t + NKF - \]

\[ \text{OTHERTAXES}_t - \text{OTHERREV}_t + EXP \]  

(A.29)

Where \( NOILTRADE \) stands for the non-oil trade balance.
EXCHANGE RATE FLEXIBILITY, ANCHORS AND INERTIA

1. This appendix illustrates the way in which a policy of adjustments of the nominal exchange rate according to past inflationary differentials will affect the degree of inflationary inertia. Whether the exchange rate policy is carried out under a crawling-peg regime, as in Colombia, or in an indirect way (through market intervention) as in Venezuela is of no consequence for the argument. It shows that when the nominal exchange rate and other contracts are fully indexed the system loses its anchor; in this case inflation can, in principle, drift to dangerously high levels. It also discusses briefly the way in which a policy that fixes the nominal exchange rate will help reduce inflation.

2. Consider the case of an economy that produces two types of goods: tradables and nontradables. Tradable prices are assumed to be linked at least ex-ante, to international prices, while nontradables prices are determined by market clearing conditions. In order to focus on inflationary issues the analysis ignores changes in the RER fundamentals, such as the terms of trade, the degree of protection and capital flows. There are two assumptions: (1) that initially the country follows an exchange rate policy aimed at adjusting the nominal exchange rate by a proportion $\phi$ ($\phi \leq 1$) of lagged inflation differentials; and (2) that wages are indexed to lagged inflation and are adjusted periodically in a proportion $\gamma$ of past inflation, where $\gamma \leq 1$. In the basic set-up monetary policy is assumed to be passive and to accommodate inertial inflationary forces. This stylized economy, can be depicted by the following set of equations:

\[
\hat{P}_t = \alpha \hat{P}_{Tt} + (1-\alpha)\hat{P}_{Nt} \quad (A.30)
\]

\[
\hat{P}_n = \hat{E}_{t-1}(\hat{S}_t + \hat{P}_{Tt}) \quad (A.31)
\]

\[
\hat{S}_t = \phi(\hat{P}_{t-1} - \hat{P}_{Tt}) \quad (A.32)
\]

\[
N^D(P_N/P_T, Z_t) = N^S(W/P_N) \quad (A.33)
\]

\[
\hat{W}_t = \gamma \hat{P}_{t-1} \quad (A.34)
\]

where the following notation has been used:

- $\hat{P}_t$ = rate of change of the domestic price level;
- $\hat{P}_{Tt}$ = rate of change of the price of tradables in domestic currency in period $t$;
- $\hat{P}_{Nt}$ = rate of change of nontradable prices in period $t$;
- $\hat{S}_t$ = rate of devaluation in period $t$;
- $\hat{P}_{Tt}$ = rate of world inflation in period $t$;
E_{t-1} = \text{expectations operator, where expectations are assumed to be formed in period } t-1; \\
\dot{W}_t = \text{rate of change in nominal wages; } \\
Z_t = \text{index of aggregate macroeconomic policies; } \\
N^D,N^S = \text{demand and supply for nontradables; } \\
\phi,\gamma = \text{parameters that measure the degree of indexation in this economy. }

3. Equation (A.30) says that the domestic rate of inflation is a weighted average of tradables and nontradables inflation. Equation (A.31) states that the law of one price holds ex-ante, and that the change in the domestic price of tradables is equal to the expected change in the exchange rate plus the expected rate of world inflation.\textsuperscript{1}

4. Equation (A.32) summarizes the exchange rate policy, and states that the exchange rate is adjusted in a proportion $\phi$ of inflation rate differentials. If $\phi = 1$ we have a typical Purchasing-Power-Parity (PPP) rule aimed at maintaining a constant RER. This type of policy has sometimes been referred to as a "real targets" approach.\textsuperscript{2} Equation (A.33) is the market clearing condition for nontradables. The demand for nontradables is assumed to depend on relative prices ($P^*_n/P^*_r$) and on aggregate demand pressures ($Z_t$); the supply of nontradables is assumed to be a function of real product wages. Finally, equation (A.34) is the wage adjustment rule; for $\gamma = 1$ we have a 100% wage adjustment to lagged inflation.\textsuperscript{3} Although in equation (A.34) $W$ stands for nominal wages, we can think that this variable captures a broader category of "other" costs. In that sense, then, the coefficient $\gamma$ can be interpreted as summarizing the degree of indexation of non-exchange rate contracts in the economy. When $\gamma$ and $\phi$ are equal to one we have a situation of a fully backward indexed economy.

\textsuperscript{1} The presence of the expectations operator reflects the assumption that the domestic price of tradables is set before the rate of devaluation or world inflation are observed.

\textsuperscript{2} This however, is a highly misleading and confusing name since it is used to denote two quite different policies. While some authors refer to a strict PPP rule as a "real targets" policy, others define this "real target" as a policy aimed at accommodating changes in RER fundamentals.

\textsuperscript{3} Notice that no expression has been included for the rate of growth of domestic credit. This responds to the assumption that the monetary authorities follow a passive credit policy that accommodates the inertial inflation.
5. This model can be manipulated in order to find an expression for the dynamics of inflation. Using the fact that from equation (A.32) \( E_{t-1}(\hat{S}_t) = \phi \hat{P}_{t-1}^* - \phi \hat{P}_{t-1}^* \), and assuming that \( E_{t-1}(\hat{P}_{t-1}^*) = \hat{P}_{t-1}^* \), the domestic rate of inflation is the following first order difference equation:

\[
\dot{P}_t = \alpha_1 \dot{P}_{t-1} + \alpha_2 \dot{P}_{t-1}^* + \alpha_3 \dot{\lambda}_t
\]

(A.35)

where

\[
\alpha_1 = \frac{(\eta \phi + \gamma) + \alpha \epsilon (\phi - \gamma)}{\eta + \epsilon},
\]

(A.36)

\[
\alpha_2 = \frac{(\eta + \alpha \epsilon) (1 - \phi)}{\eta + \epsilon},
\]

(A.37)

\[
\alpha_3 = -\frac{\epsilon (1 - \alpha)}{\eta + \epsilon},
\]

(A.38)

and where \( \eta \) is the demand elasticity of nontradables with respect to relative prices \((\eta < 0)\), \( \epsilon \) is the supply elasticity of nontradables with respect to the real product wage \((\epsilon < 0)\) and \( \delta \) is the demand elasticity of nontradables with respect to aggregate demand pressures. In equation (A.34) the coefficient \( \alpha_1 \) measures the degree of persistence or inertia of domestic inflation. The closer is \( \alpha_1 \) to unity the more persistent will inflation be, and the higher the degree of inertia. See the definition of \( \alpha_2 \) in equation (A.35), the degree of inertia in the economy will depend on the different elasticities and on the indexation parameters \( \phi \) and \( \gamma \).

6. From equation (A.35) three important features of the dynamics of inflation emerge. First, if there is full lagged indexation of both the exchange rate and other costs or wages -- that is, both \( \phi \) and \( \gamma \) are equal to one -- the coefficient of \( \dot{P}_{t-1} \) will become unity \( \alpha_1 = 1 \). In this case, the system will have no anchor and the time series of domestic inflation will exhibit a unit root.

7. Second, if \( \phi \) and/or \( \gamma \) are smaller than one, the autoregressive term \( \alpha_1 \) will also be smaller than one, and inflation will be characterized by a stationary process. Consider, for example, the case when \( \phi = 1 \) and \( \gamma = 0 \). In this case, the coefficient of \( \dot{P}_{t-1} \) in equation (A.34) will become \( \left[ \frac{\eta + \alpha \epsilon}{\eta + \epsilon} \right] \) and the domestic rate of inflation will slowly converge to the

4/ The results will not be affected if we make alternative assumptions regarding \( E_{t-1}(\hat{P}_{t-1}^*) \).
world rate of inflation. The speed at which this convergence actually takes place will be a function of the degree of inertia in the economy. Third, a reduction in either $\phi$ or $\gamma$ will result in a decline in the value of $\alpha$ and, thus, in the degree of inflationary inertia. This, of course, has been the rationale for adopting nominal exchange rate anchor policies in a number of countries. An extreme case of this policy is when $\phi$ and $\gamma$ are changed to zero. There domestic inflation will instantaneously be reduced to world inflation.

8. However, a difficulty with this type of stabilization program is that the degree of wage (and other contracts) indexation will depend on the credibility of the program. If it is not fully credible $\gamma$ will be higher than zero and some indexation will remain. In this case, the real exchange rate will appreciate while the inflation rate converges to its long run equilibrium. In a sense, then, the authorities face a tradeoff, on the one hand the exchange rate anchor will reduce inertia and, on the other hand, if it will generate a loss of international competitiveness. Whether the net benefits of this package will have a positive overall effect will depend on several variables, including the initial level of the RER -- an initial condition of undervaluation being preferred -- and the extent to which the degree of inertia (coefficient $\alpha$ in our representation) is actually reduced. As it is argued below, it is possible for the economy to end up with no significant reduction in the degree of inflationary inertia and a substantial loss in competitiveness, due to lack of credibility on government's anchor policy.

9. Two implicit assumptions in the nominal exchange rate anchors approach to disinflation are: 1) that the adoption of a fixed nominal exchange rate is a credible policy; and 2) that the public believes that from the date of the new policy announcement the coefficient $\phi$ will remain lower. In fact, one of the most commonly used arguments for favoring nominal exchange rate anchors over monetary anchors has to do with credibility. It has been argued that since nominal exchange rates are more visible, they provide a more credible policy than if a constant level of monetary base is announced.

10. The structure developed here, and specifically equation (A.34), can be used to analyze whether changes in the exchange rate (or other) policy have affected the inflationary inertia in a particular country. We would expect that if there are changes in the underlying indexation structure, the coefficient of $\hat{P}_{t-1}$ in equation (A.34) will exhibit a structural change. In particular, we can analyze if at a certain moment in time there is a change in the degree of inertia by estimating an equation of the following form:

$$\hat{P}_t = a_0 + a_1 \hat{P}_{t-1} + a_2 (\text{DUMMY} \hat{P}_{t-1}) + a_3 \hat{Z}_{t-1} + u_t, \quad (A.39)$$

---

5/ Assuming that in the steady state $2 = 0$.

6/ Notice that $(\partial \alpha_1 / \partial \phi) = [(\eta + \epsilon \alpha)/(\eta + \epsilon)] > 0$ and that $(\partial \alpha_1 / \partial \gamma) = [(\epsilon - 1)/(\eta + \epsilon)] > 0$.

7/ See Bruno (1990) for related discussions.
where DUMMY is a variable that takes the value of 1 during the period when there has been a change in exchange rate policy. In this equation the coefficient $a_1$ captures the degree of inertia of the inflationary process before the new exchange rate policy, and the coefficient $(a_1 + a_2)$ is a measure of persistence once the new policy is in effect. If the new more flexible exchange rate policy has generated an increase in inertia, $a_2$ would be significantly positive. A zero value would suggest that the new policy has had no impact on inertia. (See chapter 7 for the estimates on Venezuela.)
Table A.1

Venezuela: Correlation Coefficients Between Alternative RER Indices

<table>
<thead>
<tr>
<th>Period</th>
<th>(BRER₀,BRERₐ)</th>
<th>(BRER₀,REER)</th>
<th>(BRERₐ,REER)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950-90</td>
<td>0.987</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1965-90</td>
<td>0.976</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1965-82</td>
<td>1.000</td>
<td>0.950</td>
<td>0.977</td>
</tr>
<tr>
<td>1976-90</td>
<td>0.970</td>
<td>0.967</td>
<td>0.974</td>
</tr>
<tr>
<td>1983-90</td>
<td>0.921</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Author's calculations.
Table A.2

Venezuela: Money Demand, Regression Estimates*: 1950-90

\[
\begin{align*}
\text{log } m_t &= -2.039 - 0.716i_t + 0.234 \log y_t + 0.862 \log m_{t-1} \\
&= (-2.247) (-3.026) (2.402) (14.157) \\
R^2 &= 0.983 \\
D.W. &= 1.297
\end{align*}
\]

*t statistics in parenthesis; DW is the Durbin-Watson statistics.

Source: Author’s calculations.
Table A.3

Venezuela: Real Exchange Rate
Instrumental Variables Estimates*: 1965-90

| log RER_t = 5.155 + 0.600 log RER_{t-1} - 0.160 log P_{t-1} | (2.932) (6.089) (-2.180) |
| - 0.563 log Z_t - 0.085 TRARES_{t-1} - 0.176 log GEXY_t | (-2.251) (-1.096) (-1.420) |
| + 0.194 DEV_t - 0.003 [log M_{t-1} - log M_{t-1}] | (3.310) (0.035) |

\bar{R}^2 = .934 \hspace{1cm} DW = 1.775

The following instruments were used: log RER_{t-1}, log P_{t-2}, log P_{t-1}, log Z_t, Dtv_t, log GEXY_t, log GEXY_{t-1}, [log M_{t-1} - log M_{t-1}] and the restrictions index both lagged once and lagged twice.

*t- statistics in parentheses; DW is the Dubin Watson statistic.

Source: Author’s calculations.
### Table A.4

**Venezuela: Oil Tax Ratios, in Percent: 1971-91**

<table>
<thead>
<tr>
<th>Year</th>
<th>TAXRATIO</th>
<th>TAXOIL-N</th>
<th>TAXOIL-Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971</td>
<td>53.0</td>
<td>10.0</td>
<td>8.0</td>
</tr>
<tr>
<td>1972</td>
<td>53.0</td>
<td>10.0</td>
<td>8.0</td>
</tr>
<tr>
<td>1973</td>
<td>60.0</td>
<td>13.0</td>
<td>10.0</td>
</tr>
<tr>
<td>1974</td>
<td>80.0</td>
<td>33.0</td>
<td>21.0</td>
</tr>
<tr>
<td>1975</td>
<td>72.0</td>
<td>26.0</td>
<td>18.0</td>
</tr>
<tr>
<td>1976</td>
<td>66.0</td>
<td>20.0</td>
<td>16.0</td>
</tr>
<tr>
<td>1977</td>
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<td>1978</td>
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<td>1991</td>
<td>56.0</td>
<td>18.0</td>
<td>14.0</td>
</tr>
</tbody>
</table>

**Source:** Author’s calculations using IMF data.
Table A.5

Venezuela: Changes in the Oil Taxes to GDP Ratio, in Percent: 1971-91

<table>
<thead>
<tr>
<th>Year</th>
<th>DTAXO-N</th>
<th>DTAXO-Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971</td>
<td>4.0</td>
<td>2.9</td>
</tr>
<tr>
<td>1972</td>
<td>-0.4</td>
<td>-0.3</td>
</tr>
<tr>
<td>1973</td>
<td>0.3</td>
<td>2.2</td>
</tr>
<tr>
<td>1974</td>
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<td>1981</td>
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</tr>
<tr>
<td>1983</td>
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<td>-2.7</td>
</tr>
<tr>
<td>1984</td>
<td>2.4</td>
<td>1.5</td>
</tr>
<tr>
<td>1985</td>
<td>-1.8</td>
<td>-1.0</td>
</tr>
<tr>
<td>1986</td>
<td>-7.0</td>
<td>-5.2</td>
</tr>
<tr>
<td>1987</td>
<td>0.5</td>
<td>0.3</td>
</tr>
<tr>
<td>1988</td>
<td>0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>1989</td>
<td>7.7</td>
<td>6.1</td>
</tr>
<tr>
<td>1990</td>
<td>9.6</td>
<td>6.9</td>
</tr>
<tr>
<td>1991</td>
<td>4.3</td>
<td>3.3</td>
</tr>
</tbody>
</table>

Source: Author's calculations using IMF data.
**Table A.6**

Venezuela: Public Sector and Oil, Regression Estimates*

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent Variable</td>
<td>( \log \left( \frac{\text{TAXREV}}{\text{NOILGDP}} \right) )</td>
<td>( \log \left( \frac{\text{OILTAXES}}{\text{NOILGDP}} \right) )</td>
<td>( \log \left( \frac{\text{GOVEXP}}{\text{NOILGDP}} \right) )</td>
</tr>
<tr>
<td>Constant</td>
<td>-5.326</td>
<td>-9.391</td>
<td>-2.443</td>
</tr>
<tr>
<td></td>
<td>(-4.962)</td>
<td>(-2.495)</td>
<td>(-3.491)</td>
</tr>
<tr>
<td>Lagged dependent</td>
<td>0.152</td>
<td>0.115</td>
<td>0.536</td>
</tr>
<tr>
<td></td>
<td>(0.933)</td>
<td>(0.565)</td>
<td>(4.321)</td>
</tr>
<tr>
<td>Log Price Oil</td>
<td>0.435</td>
<td>0.910</td>
<td>0.151</td>
</tr>
<tr>
<td></td>
<td>(4.871)</td>
<td>(5.131)</td>
<td>(3.433)</td>
</tr>
<tr>
<td>Log Oil Production</td>
<td>0.502</td>
<td>0.910</td>
<td>0.151</td>
</tr>
<tr>
<td></td>
<td>(3.147)</td>
<td>(1.653)</td>
<td>(2.525)</td>
</tr>
<tr>
<td>R²</td>
<td>0.732</td>
<td>0.764</td>
<td>0.693</td>
</tr>
<tr>
<td>Rho</td>
<td>--</td>
<td>0.710</td>
<td>--</td>
</tr>
<tr>
<td>DW</td>
<td>1.412</td>
<td>1.750</td>
<td>2.082</td>
</tr>
</tbody>
</table>

* t-statistics in parentheses; DW is the Durbin-Watson statistic.

A: OLS estimates.

B: Cochrane-Orcutt estimates.

Source: Author's calculations.
### Table A.7

**Venezuela: Money Supply, Regression**

**Estimates Using Instrumental Variables**: 1965-90

\[
\begin{align*}
DLM_t &= -4.830 + 0.404 \log e_t + 0.189 \log P_t^0 \\
       &= + 0.442 \log Z_t - 0.139 \log \text{GEXY}_{t-1} \\
       &= + 0.021 (\log M_{t-1} - \log M_t^{p-1}) \\
R^2 &= 0.540 \\
DW &= 2.034
\end{align*}
\]

't statistics in parenthesis; DW is the Durbin-Watson statistic.

**Source**: Author's calculations.
<table>
<thead>
<tr>
<th>Section</th>
<th>Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Real Exchange Rate Dynamics</td>
<td>( \text{Imurer} = \Delta_1 + \Delta_2 \text{Imurer}(-1) + \Delta_3 \text{lproil}(-1) + \Delta_4 \text{loxvol} + \Delta_5 \text{terpre}(-1) + \Delta_6 \text{dev} + \Delta_7 \text{lgexy} + \Delta_8 \text{desm1}(-1) + \Delta_9 \text{caflo}(-1) )</td>
</tr>
<tr>
<td>II. Government Expenditures</td>
<td>( \text{lgexy} = \rho_1 + \rho_2 \text{lgexy}(-1) + \rho_3 \text{lproil} + \rho_4 \text{loxvol} )</td>
</tr>
<tr>
<td>III. Money Demand</td>
<td>( \text{lmode} = \alpha_1 + \alpha_2 \text{discr} + \alpha_3 \text{ly} )</td>
</tr>
<tr>
<td>IV. Money Growth</td>
<td>( \text{dlm} = \gamma_1 + \gamma_2 \text{lproil} + \gamma_3 \text{loxvol} + \gamma_4 \text{Imurer} + \gamma_5 \text{lgexy} + \gamma_6 \text{desm1}(-1) )</td>
</tr>
<tr>
<td>V. Monetary Disequilibrium</td>
<td>( \text{desm1} = (\text{Im1} - \text{lmode} - \text{lcpi}) )</td>
</tr>
<tr>
<td>VI. Growth of Oil-GDP</td>
<td>( \text{dloil} = \beta_1 + \beta_2 \text{dlproil} + \beta \text{dloilp} )</td>
</tr>
<tr>
<td>VII. Log of Real GDP</td>
<td>( \text{ly} = \log (\text{gdp85no} + \text{gdp85o}) )</td>
</tr>
<tr>
<td>VIII. Real Oil - GDP</td>
<td>( \text{gdp85o} = \text{gdp85o}(-1) \times (1 + \text{dloil}) )</td>
</tr>
<tr>
<td>IX. Log of Nominal Money</td>
<td>( \text{Im1} = \log (\text{money}(-1) \times (1 + \text{dlm})) )</td>
</tr>
</tbody>
</table>

**Source:** See variables definitions in Table 10.A
Table A.9

Variables Definition

<table>
<thead>
<tr>
<th>variable</th>
<th>definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>lmode</td>
<td>log of real money demanded</td>
</tr>
<tr>
<td>discre</td>
<td>domestic interest rate</td>
</tr>
<tr>
<td>ly</td>
<td>log of GDP</td>
</tr>
<tr>
<td>gdp85no</td>
<td>non-oil real GDP</td>
</tr>
<tr>
<td>gdp85o</td>
<td>oil real GDP</td>
</tr>
<tr>
<td>dloil</td>
<td>rate of growth of oil GDP</td>
</tr>
<tr>
<td>dlproil</td>
<td>rate of growth of real oil price</td>
</tr>
<tr>
<td>dloilp</td>
<td>rate of growth of oil production</td>
</tr>
<tr>
<td>dim</td>
<td>rate of growth of nominal money (M1)</td>
</tr>
<tr>
<td>loxvol</td>
<td>log of oil exports (volume)</td>
</tr>
<tr>
<td>lmurer</td>
<td>log of real exchange rate</td>
</tr>
<tr>
<td>lgexy</td>
<td>log of government expenditure over GDP</td>
</tr>
<tr>
<td>desm1</td>
<td>monetary disequilibrium</td>
</tr>
<tr>
<td>lcpi</td>
<td>log of domestic CPI</td>
</tr>
<tr>
<td>terpre</td>
<td>proxy for trade restrictions</td>
</tr>
<tr>
<td>dev</td>
<td>nominal devaluation</td>
</tr>
<tr>
<td>caflo</td>
<td>capital inflows as a proportion of exports</td>
</tr>
</tbody>
</table>

Source: See text.
Table A.10

The Parametrized Model

I. Real Exchange Rate Dynamics

\[ \text{Imurer} = 3.548987 + 0.718764 * \text{Imurer}(-1) - 1.160842 * \text{lproil}(-1) \]
\[ - 0.3837219 * \text{loxvol} - 6.921916D - 02 * \text{terpre}(-1) + 0.1903289 * \text{dev} \]
\[ - 0.1760528 * \text{lgexy} - 2.584711D - 02 * \text{desml}(-1) - 4.149566D - 02 * \text{caflo}(-1) \]

II. Government Expenditures

\[ \text{lgexy} = -2.772388 + 0.4887085 * \text{lgexy}(-1) + 0.1841708 * \text{lproil} + 0.2797479 * \text{loxvol} \]

III. Money Demand

\[ \text{Imode} = -14.775 - 0.05189 * \text{discr} + 1.696 * \text{ly} \]

IV. Money Growth

\[ \text{dlm} = -4.772491 + 0.1774844 * \text{lproil} + 0.4404313 * \text{loxvol} + 0.4384672 * \text{Imurer} + \]
\[ 0.598164D - 02 * \text{lgexy} + 0.874236D - 02 * \text{desml}(-1) \]

V. Monetary Disequilibrium

\[ \text{desml} = (\text{Iml} - \text{Imode} - \text{lcpi}) \]

VI. Growth of Oil GDP

\[ \text{dloil} = 0.00464 + 0.65736 * \text{dlproil} + 0.94844 * \text{dloilp} \]

VII. Log of Real GDP

\[ \text{ly} = \log (\text{gdp85no} + \text{gdp85o}) \]

VIII. Real Oil-GDP

\[ \text{gdp85o} = \text{gdp85o}(-1) * (1 + \text{dloil}) \]

IX. Log of Nominal Money

\[ \text{Im1} = \log (\text{money}(-1) * (1 + \text{dlm})) \]

Source: See text.
Table A.11

Venezuela: Government Expenditure, Simulations Implementing the Oil Stabilization Fund in 1973 and 1975, alternatively: Bolivares Billion

<table>
<thead>
<tr>
<th>Year</th>
<th>1973</th>
<th>1975</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1971</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1972</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1973</td>
<td>7,802</td>
<td></td>
</tr>
<tr>
<td>1974</td>
<td>7,776</td>
<td></td>
</tr>
<tr>
<td>1975</td>
<td>8,716</td>
<td>22,854</td>
</tr>
<tr>
<td>1976</td>
<td>9,781</td>
<td>22,907</td>
</tr>
<tr>
<td>1977</td>
<td>10,970</td>
<td>22,102</td>
</tr>
<tr>
<td>1978</td>
<td>12,296</td>
<td>21,295</td>
</tr>
<tr>
<td>1979</td>
<td>13,783</td>
<td>19,039</td>
</tr>
<tr>
<td>1980</td>
<td>15,449</td>
<td>20,158</td>
</tr>
<tr>
<td>1981</td>
<td>17,317</td>
<td>20,184</td>
</tr>
<tr>
<td>1982</td>
<td>19,411</td>
<td>22,624</td>
</tr>
<tr>
<td>1983</td>
<td>27,624</td>
<td>32,198</td>
</tr>
<tr>
<td>1984</td>
<td>37,612</td>
<td>43,838</td>
</tr>
<tr>
<td>1985</td>
<td>48,018</td>
<td>55,967</td>
</tr>
<tr>
<td>1986</td>
<td>63,674</td>
<td>71,500</td>
</tr>
<tr>
<td>1987</td>
<td>113,860</td>
<td>126,968</td>
</tr>
<tr>
<td>1988</td>
<td>139,105</td>
<td>138,573</td>
</tr>
<tr>
<td>1989</td>
<td>311,172</td>
<td>268,547</td>
</tr>
</tbody>
</table>

Table A.12

Venezuela: Real Exchange Rate Variability, Simulation Results
Implementing the Oil Stabilization Fund: 1971-89

<table>
<thead>
<tr>
<th></th>
<th>Standard Deviation of log RER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. LMURERH1</td>
<td>0.117</td>
</tr>
<tr>
<td>2. LMURERH2</td>
<td>0.140</td>
</tr>
<tr>
<td>3. LMURER</td>
<td>0.177</td>
</tr>
<tr>
<td>4. LMURERH</td>
<td>0.175</td>
</tr>
</tbody>
</table>

LUMERERH1 and LMURERH2 are the simulated log of the RER under the CASE 1 and CASE 2 described in the text. LMURER is the log of the actual RER and LMURERH is the log of the RER in the base run.

Source: Author's calculations.
Table A.13

Venezuela: Inflation Inertia
Regression Estimates of the Basic Model: 1970-90

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>T-Stat</th>
<th>2-Tail Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.0030234</td>
<td>0.0083111</td>
<td>0.3637778</td>
<td>0.7171</td>
</tr>
<tr>
<td>INFLA(-1)</td>
<td>-0.1903366</td>
<td>0.3187637</td>
<td>-0.5971076</td>
<td>0.5523</td>
</tr>
<tr>
<td>USINF</td>
<td>1.4108336</td>
<td>0.5789248</td>
<td>2.4369894</td>
<td>0.0172</td>
</tr>
<tr>
<td>GROCC</td>
<td>0.0023997</td>
<td>0.0077699</td>
<td>0.3088495</td>
<td>0.7483</td>
</tr>
<tr>
<td>DUMINF1</td>
<td>0.8281127</td>
<td>0.3064754</td>
<td>2.7020525</td>
<td>0.0085</td>
</tr>
</tbody>
</table>

R-squared 0.464472 Mean of dependent var. 0.035333
Adjusted R-squared 0.435525 S.D. of dependent var. 0.042918
S.E. of regression 0.032245 Sum of squared resid. 0.076942
Log likelihood 161.8031 F-statistic 16.04537
Durb n-Watson stat 2.088322 Prob (F-statistic) 0.000000

Source: Author’s calculations.
**Table A.14**

Venezuela: Inflation Inertia
Regression Estimates of the Expanded Model: 1970-90

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>T-Stat</th>
<th>2-Tail Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-0.0004064</td>
<td>0.0060359</td>
<td>-0.0673380</td>
<td>0.9465</td>
</tr>
<tr>
<td>INFLA(-1)</td>
<td>-0.0103637</td>
<td>0.2303439</td>
<td>-0.0449921</td>
<td>0.9642</td>
</tr>
<tr>
<td>USINF</td>
<td>1.3027073</td>
<td>0.4157628</td>
<td>3.1332945</td>
<td>0.0025</td>
</tr>
<tr>
<td>GROCC</td>
<td>0.0024333</td>
<td>0.0056497</td>
<td>0.4306982</td>
<td>0.6679</td>
</tr>
<tr>
<td>DEVMU</td>
<td>0.1924156</td>
<td>0.0238795</td>
<td>8.0577878</td>
<td>0.0000</td>
</tr>
<tr>
<td>DUMINF1</td>
<td>0.4873368</td>
<td>0.2226501</td>
<td>2.1838014</td>
<td>0.0317</td>
</tr>
</tbody>
</table>

R-squared: 0.720396
Mean of dependent var.: 0.036933

Adjusted R-squared: 0.702001
S.D. of dependent var.: 0.042950

S.E. of regression: 0.023446
Sum of squared resid.: 0.041780

Log likelihood: 194.5117
F-statistic: 39.16255

Durbin-Watson stat: 1.698998
Prob (F-statistic): 0.000000

**Source:** Author's calculations.
Figure A.1
Venezuela: Real Exchange Rate Indices; 1950-90
Figure A.3

Venezuela: Real Price of Oil and Government Expenditure Ratio; 1965-90
Figure A.4

Venezuela: Real Price of Oil and Government Consumption Ratio; 1973-90
Figure A.5

Venezuela: Rates of Growth of Credit, Money and Reserves; 1950-90

Rates of Growth of Credit, Money and Reserves

○ dres
□ gromo
△ grocre
Figure A.6

Venezuela: Simulation Results - Temporary
Real Oil Price Shock
Figure A.6

Venezuela: Simulation Results - Government

Elasticity Response to a Temporary


Figure A.6
Figure A.9
Figure A.10

Venezuela: Simulation Results - Real Exchange Rate Response to Price Oil Shock
Figure A.11

Venezuela: Simulation Results - Real Exchange Rate Response to a Temporary (two years) Thirty Percent Real Oil Price Shock

[Graph showing the real exchange rate response to a temporary thirty percent real oil price shock from 1974 to 1990.]
Figure A.12

Venezuela: Simulation Results - Real Exchange Rate Response Under Alternative Parametrization of the Money Disequilibrium Term
Figure A.13

Venezuela: Simulation Results - Real Exchange Rate Response to a Permanent Ten Percent Reduction in Government Expenditure

--- RERMCHA ---
Figure A.14

Venezuela: Simulation Results - Counterfactual
RER Simulation Under the Assumption that Income from the Fund is Spent by Government

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