# THE MACROECONOMIC EFFECTS OF PUBLIC SECTOR DEFICITS: ARGENTINA

by

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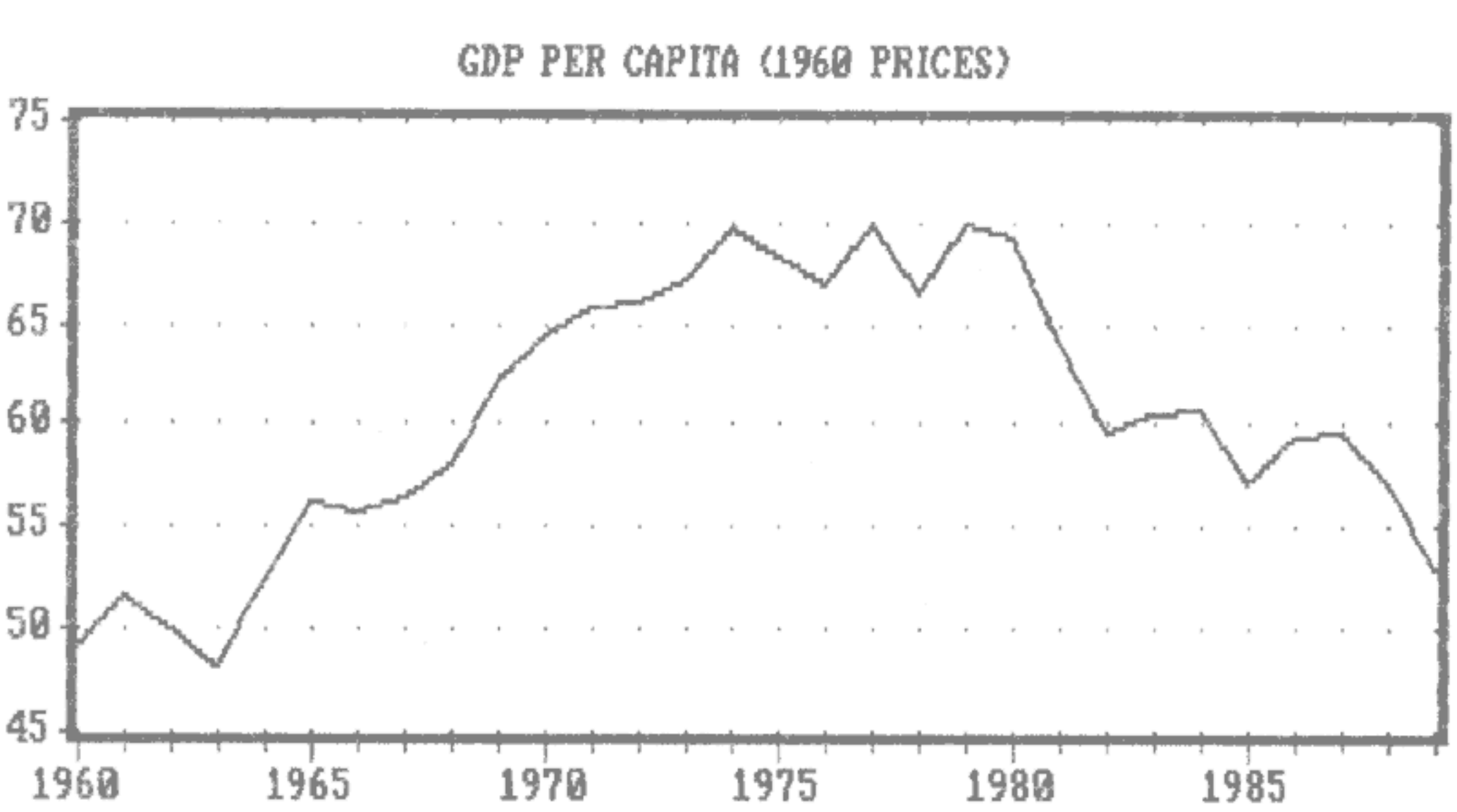
(*) I would like to thank the very useful comments and suggestions of Aquiles Almansi, who provided invaluable help for the econometric analysis presented in the Appendix. This paper was financed through a Research Grant of the Country Economics Department of the World Bank. The findings reported here, should not be attributed to the World Bank.

# I.INTRODUCTION

Argentina has had a sad economic history in recent decades. As of 1989 real per-capita GDP stays at a level similar to that of the early 1960's. This means a quarter of a century without growth at a time when the rest of the world has seen one of the most glowing periods in terms of economic achievements. Per-capita GDP reached a historical level in 1974 and has never again been able to surpass this level in spite of reaching it again in 1977 and 1979. Since 1980 GDP per capita starts a steep decline that results in an accumulated fall of 23.5% in the ten year period 1979-88. During the same decade, the price level increased by a factor of 3.36 million, equivalent to an annual compound rate of inflation of 349%.

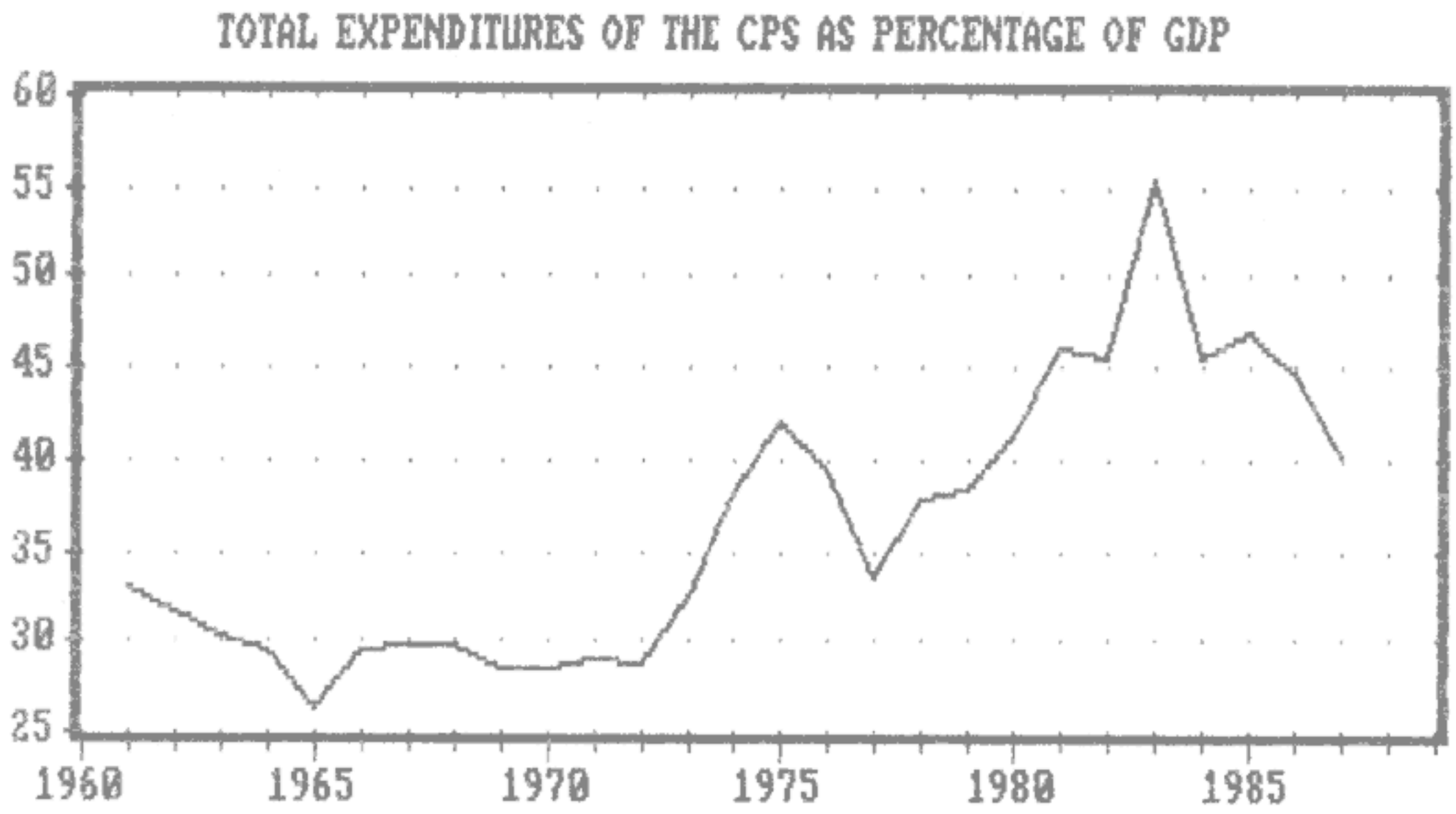
It is not our objective to explain the reasons for the economic stagnation of Argentina but to concentrate on the role that public sector behavior may have had in that process. In particular, we shall be concerned with the role of government spending, taxation and deficit financing on the rest of the economy. We shall not be concerned with the effects of government regulation, a topic that deserves a volume on itself.

FIGURE 1



Government has a very important role in Argentine society. It taxes, spends, produces a wide variety of goods and services, regulates financial markets and supplies financial services, systematically resorts to incomes policies and regulates foreign trade. While the regulatory aspects of government action defy any possible quantitative measure, we can get a feeling about the size of government in economic activity by looking at the relative participation of government spending in GDP. Figure 2 shows that government spending has systematically tended to grow faster than GDP until the final crisis of the Argentine economy started to develop in 1982. Since then it has started to fall, more as a consequence of a resource constraint than as a consequence of a deliberate political action.

FIGURE 2




The fall in the relative size of government spending, however, came too late to avoid a crisis that was already well into the working and that brought the country into a state of hyperinflation in 1989, when the inflation rate approached 5000% and GDP fell by about 7%. The inflation rate in Argentina defies being graphed because of the significant changes in levels reached in the late 1980's. The December to December values of the rate of inflation in the CPI are as shown in Table 1a. It is clear that inflation has been an ever present phenomenon in recent decades and that it has followed an exploding path, of which the recent hyperinflation of 1989 does not necessarily

appear to be the end of the story. In fact, after the peak of 195% monthly inflation rate in July 1989, inflation goes back to the one-digit monthly level until December 1989. Then a new hyperinflation starts, which reaches a peak of 95% in March 1990 and apparently ends in April 1990 with a monthly rate of "only" 11.5%. The monthly inflation rates since 1982 can be seen in Table 1b.

If one were to give a quick characterization of government action in Argentina it would be that government has systematically tended to increase spending and to run deficits. It is well known that governments do not need to run fiscal surpluses all of the time, and much less in the context of a growing economy. The fact of the matter is, however, that the Argentine economy has been stagnant in the last two decades and the government has run fiscal deficits for every year at least since 1961. In fact, the government has run a primary deficit (not including any interest payments) for every year in our sample dating back to 1961. This means that for every year of the last 28 years, after paying for the current and capital spending the government has not had any genuine resource left to service any interest on its debt (internal or external; this issue has been raised by Dornbusch and de Pablo (1987) and by Rodriguez(1989) in the context of explaining the fiscal nature of the country's apparent inability to serve her foreign debt that is mostly public). In consequence the government has resorted systematically to issuing money and interest earning debt. This deficit policy resulted in a systematic tendency of the economy to run high inflation and high real interest rates as a consequence of the pressure in the credit markets of the incremental government borrowing.

For an economy that does not grow and faces a positive real rate of interest, running a positive primary deficit implies an ever growing stock of public debt in relation to GDP. Of course, in an ex-post sense real government debt did not grow continuously because every once in a while the existing stock of debt has been melted down by outbursts of inflation in excess of nominal interest rates fueled by large devaluations in the face of foreign exchange crisis (on the relation between deficits and devaluations, captured by increases in the level or in the rate of change of the exchange rate, see Calvo(1981), Fernandez (1989) and Rodriguez(1978))

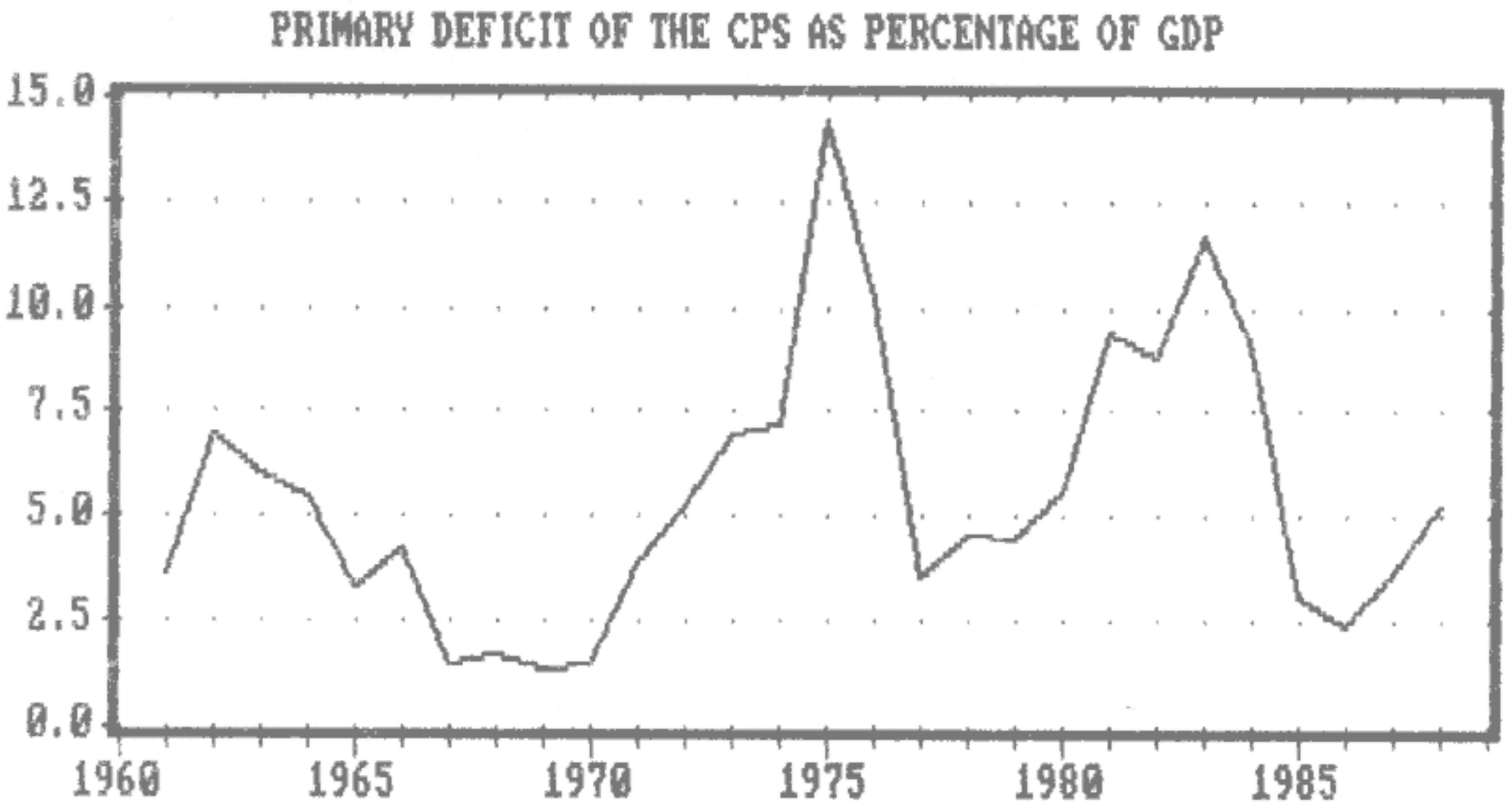
TABLE 1a: ANNUAL INFLATION RATES IN CPI (1961-1989)

| | | | | | |
|---|---|---|---|---|---|
| 1960 | | 16.5 | 30.4 | 23.9 | 18.2 |
| 1965 | 38.2 | 30.0 | 27.3 | 9.6 | 6.6 |
| 1970 | 21.7 | 39.1 | 64.2 | 43.8 | 40.1 |
| 1975 | 335.1 | 347.6 | 160.4 | 169.8 | 139.7 |
| 1980 | 87.6 | 131.3 | 209.7 | 433.7 | 688.0 |
| 1985 | 385.4 | 81.9 | 174.8 | 387.7 | 4923.7 |

TABLE 1B: MONTHLY INFLATION RATES IN CPI (JAN.1982-APRIL 1990)

| | | | | | | |
|---|---|---|---|---|---|---|
| 1982.01 | 11.9 | 5.3 | 4.7 | 4.2 | 3.1 | 7.9 |
| 1982.07 | 16.3 | 14.7 | 17.1 | 12.7 | 11.3 | 10.6 |
| 1983.01 | 16.0 | 13.0 | 11.3 | 10.3 | 9.1 | 15.8 |
| 1983.07 | 12.5 | 17.2 | 21.4 | 17.0 | 19.2 | 17.7 |
| 1984.01 | 12.5 | 17.0 | 20.3 | 18.5 | 17.1 | 17.9 |
| 1984.07 | 18.3 | 22.8 | 27.5 | 19.3 | 15.0 | 19.7 |
| 1985.01 | 25.1 | 20.7 | 26.5 | 29.5 | 25.1 | 30.5 |
| 1985.07 | 6.2 | 3.1 | 2.0 | 1.9 | 2.4 | 3.2 |
| 1986.01 | 3.0 | 1.7 | 4.6 | 4.7 | 4.0 | 4.5 |
| 1986.07 | 6.8 | 8.8 | 7.2 | 6.1 | 5.3 | 4.7 |
| 1987.01 | 7.6 | 6.5 | 8.2 | 3.4 | 4.2 | 8.0 |
| 1987.07 | 10.1 | 13.7 | 11.7 | 19.5 | 10.3 | 3.4 |
| 1988.01 | 9.1 | 10.4 | 14.7 | 17.2 | 15.7 | 18.0 |
| 1988.07 | 25.6 | 27.6 | 11.7 | 9.0 | 5.7 | 6.8 |
| 1989.01 | 8.9 | 9.6 | 17.0 | 33.4 | 78.5 | 114.5 |
| 1989.07 | 196.6 | 37.9 | 9.4 | 5.6 | 6.5 | 40.1 |
| 1990.01 | 79.2 | 61.6 | 95.0 | 11.6 | | |

FIGURE 3




The tendency to melt down the existing stock of debt by means of implementing unexpected devaluations was eventually discounted by the market and in recent years the market has demanded, and obtained, an increasing degree of indexation of the public debt by either the price level or the price of foreign exchange. As this happened, the government could not melt down any longer the stock of real debt and had to face the critical problem of a growing real debt in the face of a persistent tendency to run primary deficits.

The primary deficit starts falling since 1983 as a result of reduced spending and higher revenues. This late effort, however, is not enough to reverse the increasing reluctance of the public to hold the internal government debt as well as the domestic currency. The government must resort increasingly to the use of forced investments of the banking system (depositos indisponibles). The fall in demand for domestic-currency denominated assets induces real interest rates that are inconsistent with the real equilibrium of the economy. The shift out of the domestic currency results in an increasing degree of dollarization of the economy and a tendency for recurrent currency runs that result in frequent macro devaluations. At this

point the government is forced to continuously raise interest rates in order to induce the public to keep holding the domestic currency and to roll-over the public debt.

The higher interest rates are paid back issuing more debt and money, and the service of the debt becomes the major source of money creation. The system finally explodes when the country enters into hyperinflation in May 1989. The hyperinflation however, was not able to melt down the stock of interest-earning debt of the government, as much of it was placed with a maturity of between 1 and 7 days and interest rates actually had a tendency to anticipate devaluations. In January 1990 the government mandatorily canceled all interest earning obligations in the financial system (government debt plus all interest-earning deposits) with an issue of dollar-denominated government paper paying LIBO rate and with a 10 year maturity. It remains to be seen whether the needed fiscal adjustment is actually implemented and turns out to be enough to induce the public to keep holding what was left remaining of the money supply denominated in local currency.

This paper is concerned with the effects of public sector deficits and the ways of financing on several variables of the economy: inflation, interest rates, the real exchange rate, private savings and investments and external balance. Section II deal with the issue of the measurement of the deficit, distinguishing between the conventional deficit of the Consolidated non-financial public sector (II.1) and the quasifiscal deficit originating in the financial operations of the monetary authorities( II.2). Section III looks at the use of monetary vs. debt financing and provides a measure of the inflation tax(III.1) as well as some statistical estimates of the effects on inflation of deficit financing(III.2). Section IV briefly describes the structure of financial markets with emphasis on the menu of debt instruments of the government that form the internal public debt. This section is also concerned about the peculiar role that public debt plays in a financial system where the Central Bank has practically become the borrower of about 80% of all the lending power of the private banks. In this context, a policy of tight money to reduce aggregate demand basically increases the transfers from the public to the private sector on account of the higher deficit that the raise in interest rates generates.

Section V provides estimates of demand for money and of the relation between the revenue from inflation and the inflation rate. The issue of interest rate determination in the context of a market where the government is practically the only debtor is dealt in Section VI. In the short run (VI.1), interest rates are determined by the amount of liquidity the Central Bank is willing to provide to the system ( basically captured by the relation between remunerated and non-remunerated bank deposits). Estimates of the interest elasticity of demand for deposits and public debt are provided in VI.2. The long run inflation rate (VI.3) is determined by the rate of monetary expansion required to finance the deficit, including the service on the real interest on the public debt. Short run sterilization of liquidity by issuing more debt reduces inflation for a while but eventually as the interest has to be served, the rate of monetary expansion is raised and the net effect of the sterilization policy is more long run inflation because of the now higher quasifiscal deficit.

Section VII deals with the external effects of the public sector deficits and the composition of government spending.The Real Exchange rate determination is dealt in the context of a theoretical model (VII.1) that is later estimated empirically (VII.2). Theoretical aspects of the process of determination of the Trade Balance are presented in VII.3 and the empirical estimates are shown in VII.4. The empirical estimates do adjust to what is expected from the theoretical analysis except in the case of the effects of external indebtedness on the external balance: basically the empirical results indicate that the economy has not adjusted to the need to service the higher level of debt by reducing the level of expenditure relative to income. Section VIII presents a general summary and the main conclusions of the study.

Finally, the Appendix studies in detail the long run empirical relation between the fiscal deficit and the rates of private sector savings and investment.

## II. MEASUREMENT OF THE PUBLIC SECTOR DEFICIT IN ARGENTINA

In the last 15 years many important changes occurred in the distribution of revenues and expenditures among different levels of government in Argentina. These changes were due to: i) the transfer of important expenditure items, like education (elementary and secondary) and local transport systems (like the Buenos Aires metro), from the central to the provincial and city governments; and ii) changes in the tax laws and the rules under which tax revenues are distributed among the central and the provincial governments (the Federal Coparticipation Law). Provincial and local governments have no well-defined budget constraints in Argentina, and the distribution of resources (which are collected mainly by the central government) is subject to a highly unpredictable pattern. This makes very important, in the Argentine case, to work on the basis of the consolidated non-financial public sector data. Among the studies dealing with the behavior of the consolidated non-financial public sector in Argentina we may mention the study by FIEL(1987) and also Schenone(1987).

In the Argentine case it is also very important to account for the operations of the Central Bank as sources of substantial amounts of revenue (due to inflationary money creation) and no less substantial losses, due to: i) the purchase of international reserves (including those required to service the foreign debt), ii) the offering of swaps and other "exchange insurance" mechanisms, which have been frequently used to attract short term foreign financing, and iii) losing operations with the domestic financial system (including the bailout of failing financial institutions). In subsection II.2 below we present estimates made by F.I.E.L. of losses made by the Central Bank of Argentina, which should be considered as components of public sector expenditures.

### II.1 Consolidated Non-Financial Public Sector

This subsection presents the official data on the consolidated non-financial public sector ("above the line") expenditure, revenue, and financing needs (deficit), according to the so called "international methodology," as well as the "below the line" financing flows. The international methodology does not consider the current revenue and expenditure of public enterprises as components of the public sector's revenue and expenditure; it only computes as such their operating surpluses or deficits.

Table 2 presents the following "above the line" items:

A. Current Revenue
B. Current Expenditure
C. Capital Revenue
D. Capital Expenditure
E. Total Revenue (including remanent of prev. Fiscal Years and contributions)
F. Total Expenditure (incl. contributions)
G. Deficit or Financing Needs (F-E)

TABLE 2. Consolidated Nonfinancial Public Sector "Above the Line" Data (%GDP)

| Item / Year | A. | B. | C. | D. | E. | F. | G. |
|---|---|---|---|---|---|---|---|
| 1961 | 23.17 | 17.41 | 0.55 | 10.68 | 28.67 | 33.03 | 4.36 |
| 62 | 18.63 | 17.84 | 0.76 | 9.32 | 23.85 | 31.61 | 7.76 |
| 63 | 18.47 | 17.93 | 0.68 | 8.22 | 23.37 | 30.37 | 7 |
| 64 | 18.00 | 18.11 | 0.37 | 6.89 | 22.81 | 29.43 | 6.62 |
| 65 | 18.86 | 16.88 | 0.35 | 6.41 | 22.31 | 26.39 | 4.08 |
| 66 | 20.13 | 18.98 | 0.36 | 6.45 | 24.52 | 29.45 | 4.93 |
| 67 | 23.35 | 18.26 | 0.48 | 7.65 | 27.78 | 29.86 | 2.08 |
| 68 | 22.8 | 17.24 | 0.54 | 8.33 | 27.58 | 29.81 | 2.23 |
| 69 | 22.53 | 16.53 | 0.45 | 8.21 | 26.67 | 28.42 | 1.75 |
| 70 | 22.83 | 16.65 | 0.43 | 8.48 | 26.68 | 28.55 | 1.87 |
| 71 | 20.51 | 17.04 | 0.34 | 8.2 | 24.72 | 29.12 | 4.4 |
| 72 | 18.35 | 15.66 | 0.32 | 8.81 | 23 | 28.8 | 5.8 |
| 73 | 19.01 | 19.11 | 0.11 | 7.5 | 25.07 | 32.55 | 7.48 |
| 74 | 22.12 | 21.87 | 0.49 | 8.81 | 30.09 | 38.17 | 8.08 |
| 75 | 15.87 | 22.16 | 0.15 | 8.94 | 27.1 | 42.18 | 15.08 |
| 76 | 18.14 | 16.92 | 0.15 | 13.06 | 27.78 | 39.47 | 11.69 |
| 77 | 22.93 | 14.78 | 0.4 | 13.26 | 28.85 | 33.56 | 4.71 |
| 78 | 25.44 | 19.75 | 0.35 | 12.54 | 31.29 | 37.79 | 6.5 |
| 79 | 24.44 | 21.1 | 0.25 | 10.51 | 31.84 | 38.35 | 6.51 |
| 80 | 26.89 | 25.75 | 0.31 | 9.51 | 33.75 | 41.22 | 7.47 |
| 81 | 24.39 | 29.11 | 0.25 | 9.65 | 32.95 | 46.21 | 13.26 |
| 82 | 22.53 | 29.9 | 0.49 | 8.56 | 30.51 | 45.63 | 15.12 |
| 83 | 23.08 | 29.03 | 0.23 | 9.68 | 40.24 | 55.39 | 15.15 |
| 84 | 22.49 | 27.03 | 0.24 | 7.82 | 33.65 | 45.57 | 11.92 |
| 85 | 26.96 | 26.9 | 0.25 | 7.06 | 40.92 | 46.94 | 6.02 |
| 86 | 26.17 | 24.54 | 0.21 | 7.48 | 40.1 | 44.83 | 4.73 |
| 87 | 23.33 | 23.23 | 0.25 | 6.13 | 34.59 | 40.13 | 5.54 |
| 88 | na | na | na | na | na | na | 7.39* |

*:For 1988 the data available does not include the deficit of Provinces and the city of Bs.As..For the rest of the CPS the deficit is 6.93% of GDP. We estimate a deficit of Provinces and Bs.As. equal to the one in 1987 that was 0.46% of GDP.

FIGURE 4

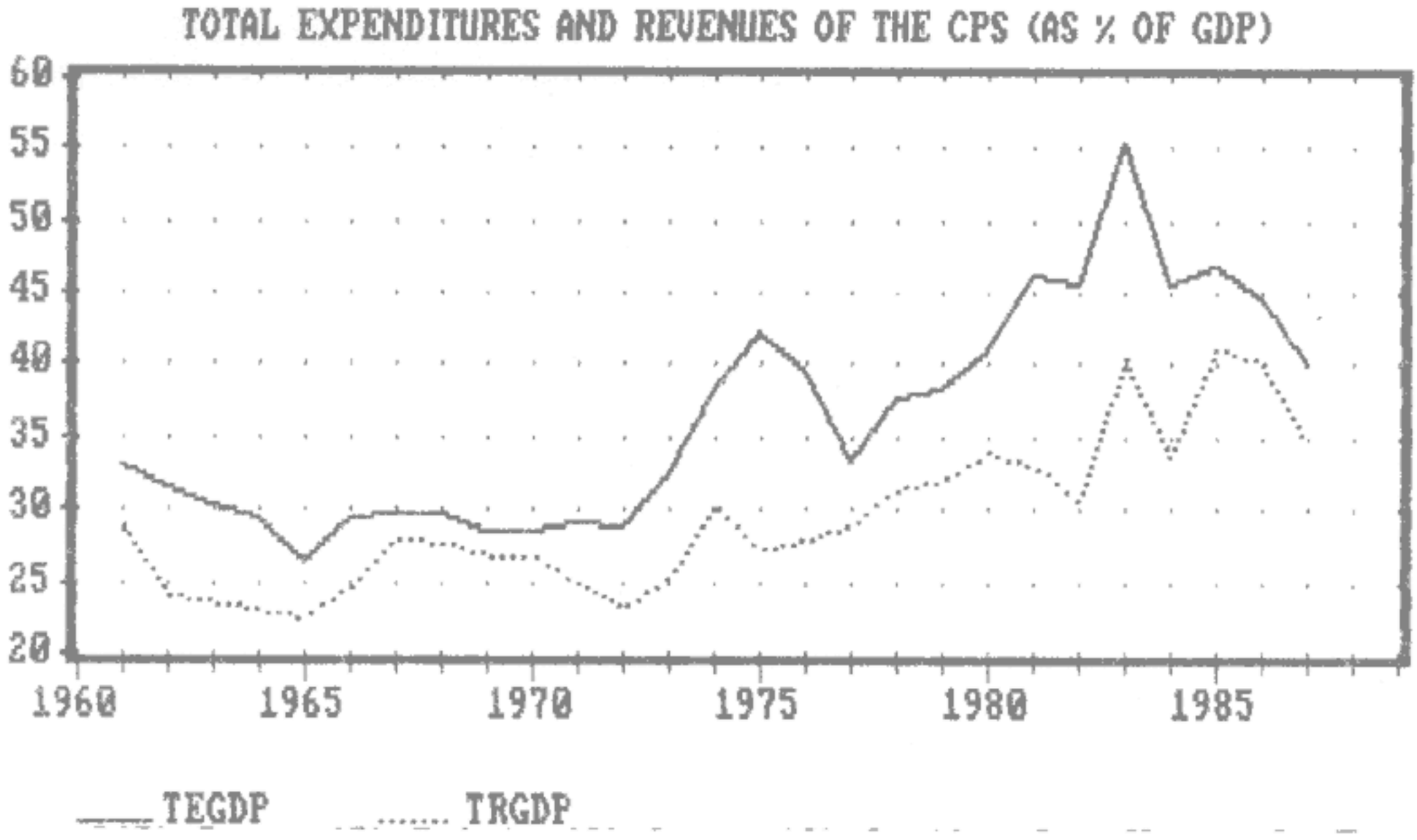



Figure 4 shows the evolution of total expenditures and revenues (as percentage of GDP) of the Consolidated Non-Financial Public Sector (CPS). The first thing to notice is that Revenues have historically shown a growing trend similar to that of Expenditures while being systematically below them. Total Revenues rose from a low level of about 23% in 1962/65 to a high of 41% in 1985. It should be mentioned that the Revenue measure does not incorporate the Current Revenues from Public Enterprises. This high growth in fiscal revenues in the face of a stagnant economy should be enough to invalidate the commonly held claim that the basic problem in Argentina is that the public does not pay taxes. The fact of the matter is that not only is fiscal pressure very high but it has grown at a much faster rate than that of GDP in the last 25 years.

It is the case that even though fiscal pressure has been high, fiscal spending has also grown and has systematically exceeded revenues. Expenditures of the CPS got to a level of 55% of GDP in 1983 (up from a level of 30% in the decade of the 1960s) before a serious attempt was started to reduce government spending. Since then government spending was reduced by 11% of GDP but this reduction was wiped out by the increased quasifiscal spending done by the Central Bank in order to service the accumulated level of financial liabilities of the institution.

The Financing Needs column (Column G in Table 2) represents the difference between globally defined Expenditures and Resources. As such it has to be financed through increases in short and long run debt (domestic or foreign), advances from suppliers or, finally, money creation in the form of credit from the Central Bank and increases in short term financial liabilities.

Table 3 presents the "below the line" items that describe the composition of the financing of the fiscal deficit.

It can be seen that in every year since 1961 up to 1988 the Financial Result has been negative, meaning that there has always been the need to resort to printing money or issuing short term financial liabilities in order to balance the budget. According to the official data there has been no financing of the CPS from the Central Bank since 1986 onwards. Up to mid-1985 Central Bank financing to the CPS was recorded in an account labeled Advances to the Treasury. Since the stabilization attempt launched in June 1985, no more drawings were made to that account and this is what the official statistics reflect. The fact of the matter, however, is that since then the CPS has borrowed from the Central Bank by obtaining Rediscounts for Public Banks and other Public Enterprises, that have not been paid back. It has also resorted to placing dollar denominated Treasury Bills at the Central Bank in exchange for local currency, an operation that has been labeled as external financing but that is actually fully equivalent to printing money, particularly because these dollar denominated Treasury Bills will very likely never be paid back. The Central Bank also has become the recipient of a large fraction of the service of the foreign debt.

TABLE 3. Consolidated Nonfinancial Public Sector "Below the Line" Data (%GDP)

| Item Year\ | A | B | B1 | B1a | B1b | B1c | C | C1 | C2 |
|---|---|---|---|---|---|---|---|---|---|
| 61 | 4.36 | 2.86 | 2.86 | 2.38 | 0.48 | 0 | -1.5 | 0.19 | 1.32 |
| 62 | 7.76 | 4.52 | 4.52 | 3.77 | 0.75 | 0 | -3.24 | 0.71 | 2.53 |
| 63 | 7 | 3.15 | 3.15 | 2.26 | 0.89 | 0 | -3.85 | 1.37 | 2.49 |
| 64 | 6.62 | 1.09 | 1.09 | 0.71 | 0.38 | 0 | -5.53 | 0.49 | 5.04 |
| 65 | 4.08 | 1.2 | 1.2 | 0.5 | 0.7 | 0 | -2.88 | 0.83 | 2.04 |
| 66 | 4.93 | 0.31 | 0.31 | 0.01 | 0.3 | 0 | -4.62 | 0.28 | 4.35 |
| 67 | 2.08 | -0.17 | -0.17 | 0.12 | -0.29 | 0 | -2.25 | 1 | 1.26 |
| 68 | 2.23 | 0.42 | 0.42 | 0.47 | -0.05 | 0 | -1.81 | 0.71 | 1.1 |
| 69 | 1.75 | 0.94 | 0.94 | 0.57 | 0.37 | 0 | -0.81 | 0.72 | 0.1 |
| 70 | 1.87 | 0.86 | 0.86 | 0.05 | 0.81 | 0 | -1.01 | 3.38 | -2.36 |
| 71 | 4.4 | 1.92 | 1.92 | 0.73 | 1.19 | 0 | -2.48 | 2.43 | 0.06 |
| 72 | 5.8 | 1.93 | 1.93 | 0.89 | 1.04 | 0 | -3.87 | 1.81 | 2.06 |
| 73 | 7.48 | 0.91 | 0.91 | 0.79 | 0.12 | 0 | -6.57 | 4.47 | 2.1 |
| 74 | 8.08 | 1.87 | 1.87 | 1 | 0.87 | 0 | -6.21 | 5.6 | 0.62 |
| 75 | 15.08 | 1.88 | 1.88 | 1.77 | 0.11 | 0 | -13.2 | 9.74 | 3.46 |
| 76 | 11.69 | 4.14 | 4.14 | 3.03 | 1.11 | 0 | -7.55 | 3.41 | 4.13 |
| 77 | 4.71 | 2.83 | 2.83 | 1.54 | 1.29 | 0 | -1.88 | 2.44 | -0.56 |
| 78 | 6.5 | 5.49 | 5.49 | 3.54 | 1.95 | 0 | -1.01 | 0.86 | 0.16 |
| 79 | 6.51 | 5.53 | 5.53 | 3.77 | 1.76 | 0 | -0.98 | -0.3 | 1.27 |
| 80 | 7.47 | 2.99 | 3.41 | 1.53 | 1.88 | -0.42 | -4.48 | 3.59 | 0.89 |
| 81 | 13.26 | 8.03 | 8.27 | 3.97 | 4.3 | -0.24 | -5.23 | 5.32 | -0.09 |
| 82 | 15.12 | 6.3 | 6.39 | 5.07 | 1.32 | -0.09 | -8.82 | 7.29 | 1.51 |
| 83 | 15.15 | -1.63 | -1.34 | -1.89 | 0.55 | -0.29 | -16.78 | 16.6 | 0.19 |
| 84 | 11.92 | -1.49 | -1.48 | -0.59 | -0.89 | -0.01 | -13.41 | 6.19 | 7.22 |
| 85 | 6.02 | 0.58 | 0.63 | -0.3 | 0.93 | -0.05 | -5.44 | 2.33 | 3.11 |
| 86 | 4.73 | -0.02 | 0.04 | -1.01 | 1.05 | -0.06 | -4.75 | 0 | 4.74 |
| 87 | 5.54 | 4.17 | 4.22 | 1.03 | 3.19 | -0.05 | -1.37 | 0 | 1.37 |
| 88 | 7.39 | | | | | | | | |

A. Deficit or Financing Needs
B. Net Financing
B1. Net use of credit
B1a. Net use of domestic credit
B1b. Net use of foreign credit
B1c. Net Use of Advances from Suppliers
C. Result (B minus A)
C1. Central Bank
C2. Increase of Net Financial Liabilities

## II.2 Cuasifiscal Expenditures

In countries like Argentina, the Central Bank often suffers substantial losses due to loans to the private financial system which can never be recovered, or to the bailout of failing financial institutions. The Central Bank started in 1977 to collect interest on the fraction of Reserve Requirements that corresponded to non-remunerated bank deposits (Demand Deposits) and to pay interest on the reserve requirements made on account of interest-earning Time Deposits. The balance of these operations is denominated the Monetary Regulation Account, that has proven to be a source of additional deficit as the interest paid has exceeded the interest collected. In 1985 the Monetary Regulation Account was modified by a system that incorporated remunerated and non-remunerated reserve requirements; in addition, the Central Bank started to sterilize liquid funds by issuing a variety of short term liabilities that included short term CD's and lump-sum mandatory deposits that absorbed part of the Commercial Banks liquidity.

The Central Bank is also subject to losses derived from swaps and different "exchange insurance" mechanisms, which are frequently used to attract short term foreign financing. Finally, the accumulation of international reserves is an important item of public capital expenditure, which obviously does not show up anywhere in the consolidated non-financial public sector accounting.

Table 4 below presents estimates by F.I.E.L. of the cuasifiscal expenditures of the Central Bank of Argentina in the period 1960-85.

It is difficult to determine ex-ante when the Quasi-Fiscal deficit will result in additional money creation as much of the interest on the Central Bank's Liabilities has been paid with the creation of more of those liabilities. This mechanism gave raise to a situation in which gradually the Central Bank started to absorb a growing fraction of the lending capability of Commercial Banks. As of 1989, it is reported that above 80% of the Assets of the Commercial Banks were placed in liabilities of the Central Bank. Instead of being the "Lender of Last Resort", this mechanism of liabilities management generated a situation in which the Central Bank become the "Borrower of First Resort". The implications of this mechanism for monetary policy and the eventual development of a hyperinflation will be discussed later in the Section dealing with monetary policy.

TABLE 4. Cuasifiscal Expenditures of the Central Bank (% GDP)

| Year\Item | A | B | C | D | Total |
|---|---|---|---|---|---|
| 60 | -0.32 | | | 2.09 | 1.77 |
| 61 | 1.82 | | | -2.26 | -0.44 |
| 62 | 0.34 | | | -3.08 | -2.74 |
| 63 | -0.85 | | | 0.92 | 0.07 |
| 64 | -0.52 | | | -0.81 | -1.33 |
| 65 | 0.11 | | | 0.28 | 0.39 |
| 66 | -0.39 | | | -0.16 | -0.55 |
| 67 | -1.24 | | | 2.66 | 1.42 |
| 68 | -0.03 | | | -0.14 | -0.17 |
| 69 | 0.94 | | | -1.33 | -0.39 |
| 70 | -0.54 | | | 0.48 | -0.06 |
| 71 | 0.66 | | | -1.75 | -1.09 |
| 72 | -0.51 | | | 0.69 | 0.18 |
| 73 | -1.83 | | | 0.77 | -1.06 |
| 74 | -2.79 | | | -1.14 | -3.93 |
| 75 | -2.27 | | 0.16 | -1.3 | -3.41 |
| 76 | -6.21 | | 5 | 3.46 | 2.25 |
| 77 | -5.86 | 1.28 | 0.57 | 3.59 | -0.42 |
| 78 | -2.36 | 2.72 | | 1.98 | 2.34 |
| 79 | -0.82 | 0.86 | | 2.8 | 2.83 |
| 80 | 3.17 | -0.61 | | -3.43 | -0.87 |
| 81 | 2.94 | -1.38 | 3.99 | -5.33 | 0.22 |
| 82 | 7.57 | 4.98 | 16.63 | -3.74 | 25.45 |
| 83 | -3.69 | 1.04 | 8.59 | -1.06 | 4.87 |
| 84 | 3.8 | 4.06 | 10.01 | -0.3 | 17.56 |
| 85 | -1.78 | 1.56 | 4.63 | 2.99 | 7.0 |

A. Annual changes in loans to the financial system minus annual changes in reserve requirements.

B. The Interest Equalization Account (Cuenta de Regulación Monetaria) introduced in 1977 and the cost of remunerated reserve requirements and other remunerated liabilities introduced in its place in 1985.

C. Losses for Swaps and other "exchange insurance" mechanisms.

D. Accumulation of International Reserves.

Source: FIEL (1986) "El Gasto Público en la Argentina 1960-1985."

Table 5 summarizes the results concerning the fiscal deficit, showing the Primary Deficit of the Consolidated Non-Financial Public Sector (net of interest payments), and the Quasi-Fiscal Deficit of the Central Bank.

Another important source of Quasi-Fiscal deficit were the losses from Swaps and other exchange rate insurance mechanisms. These operations were concentrated in the 1982-85 period and resulted in the Central Bank absorbing most of the outstanding external debt of the private sector (this process is described in detail in Rodriguez(1989)). The FIEL figures reported in Column C of Table 3, corresponding to this period, overestimate the Quasi-fiscal expenditure impact of these policies, because the exchange losses they implied were not presently realized but simply documented as public external debt. In addition, these figures include interest accrued, although not actually paid, on that debt. To the extent that the external debt was not fully serviced, this new liability did not result in money creation. Some took place, however, through the implementation of a variety of debt conversion mechanisms, including debt-equity swaps and onlending, that in effect implied the repurchase of external debt with newly printed money or short term financial liabilities issued in local currency.

TABLE 5 Summary Results on Fiscal Deficit

| Year | Interest CPS | Primary Deficit | Total CPS Deficit | Quasi Fiscal Deficit | TOTAL DEFICIT |
|---|---|---|---|---|---|
| 61 | 0.67 | 3.69 | 4.36 | -0.44 | 3.92 |
| 62 | 0.83 | 6.93 | 7.76 | -2.74 | 5.02 |
| 63 | 0.88 | 6.12 | 7 | 0.07 | 7.07 |
| 64 | 1.11 | 5.51 | 6.62 | -1.33 | 5.29 |
| 65 | 0.75 | 3.33 | 4.08 | 0.39 | 4.47 |
| 66 | 0.75 | 4.18 | 4.93 | -0.55 | 4.38 |
| 67 | 0.59 | 1.49 | 2.08 | 1.42 | 3.5 |
| 68 | 0.53 | 1.7 | 2.23 | -0.17 | 2.06 |
| 69 | 0.39 | 1.36 | 1.75 | -0.39 | 1.36 |
| 70 | 0.41 | 1.46 | 1.87 | -0.06 | 1.81 |
| 71 | 0.48 | 3.92 | 4.4 | -1.09 | 3.31 |
| 72 | 0.57 | 5.23 | 5.8 | 0.18 | 5.98 |
| 73 | 0.53 | 6.95 | 7.48 | -1.06 | 6.42 |
| 74 | 0.81 | 7.27 | 8.08 | -3.93 | 4.15 |
| 75 | 0.69 | 14.39 | 15.08 | -3.41 | 11.67 |
| 76 | 1.47 | 10.22 | 11.69 | 2.25 | 13.94 |
| 77 | 1.14 | 3.57 | 4.71 | -0.42 | 4.29 |
| 78 | 1.92 | 4.58 | 6.50 | 2.34 | 8.84 |
| 79 | 2.03 | 4.48 | 6.51 | 2.83 | 9.34 |
| 80 | 1.85 | 5.62 | 7.47 | -0.87 | 6.6 |
| 81 | 3.88 | 9.38 | 13.26 | 0.22 | 13.48 |
| 82 | 6.28 | 8.84 | 15.12 | 25.45 | 40.57 |
| 83 | 3.5 | 11.65 | 15.15 | 4.87 | 20.02 |
| 84 | 2.93 | 8.99 | 11.92 | 17.56 | 29.48 |
| 85 | 2.93 | 3.09 | 6.02 | 7.40 | 13.42 |
| 86 | 2.37 | 2.36 | 4.73 | N.A. | N.A. |
| 87 | 1.88 | 3.66 | 5.54 | N.A. | N.A. |
| 88 | 2.09 | 5.30 | 7.39 | N.A. | N.A. |

# III. THE INFLATIONARY FINANCING OF THE DEFICIT

## III.1 Measuring the Inflation Tax

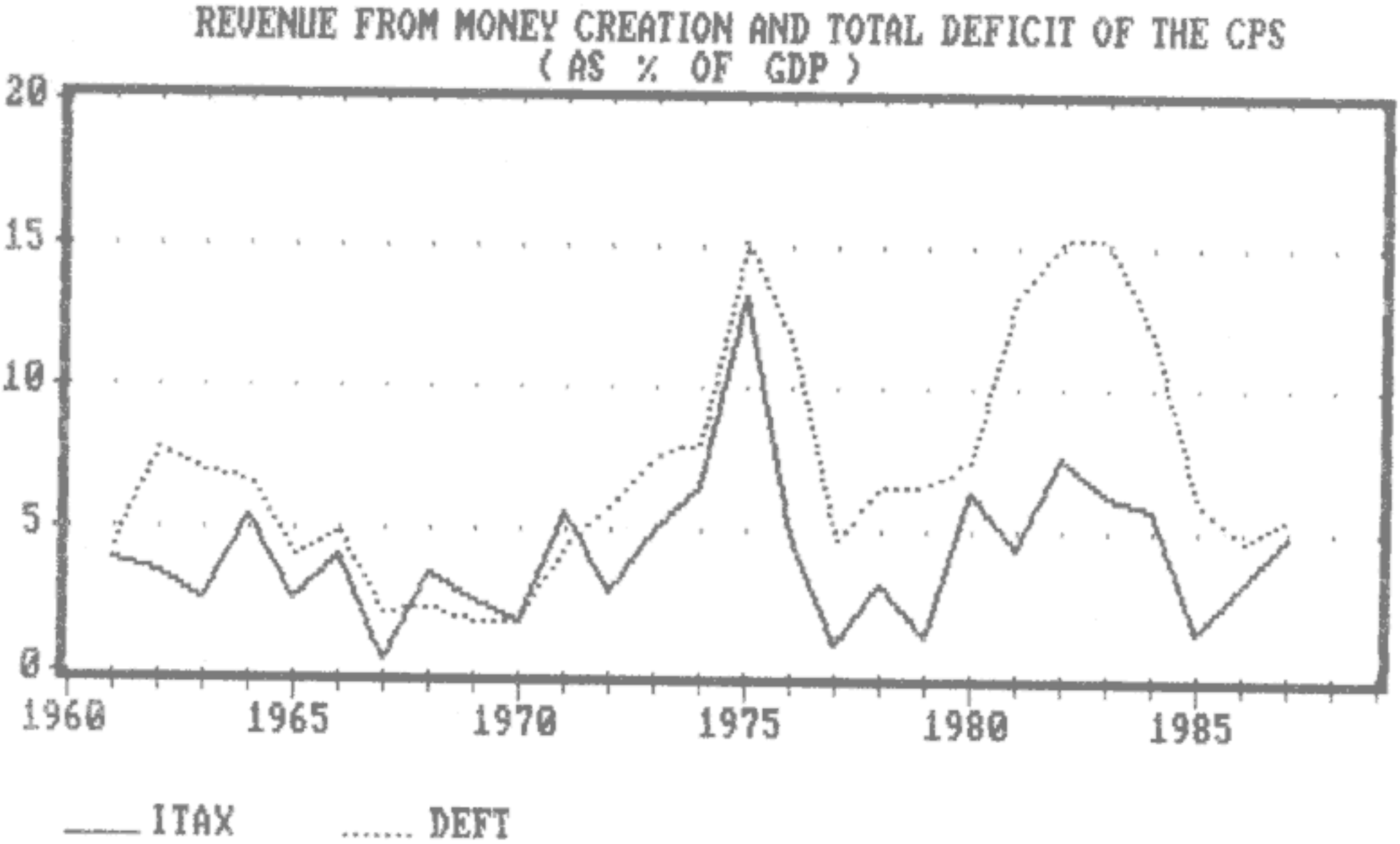
In the previous section we have presented data regarding alternative measures of the fiscal deficit. As it was already mentioned before, we have doubts about the relevance of the data presented in Table 3 showing the official information regarding the actual financing of the deficit. In particular that information indicates that there is no Central Bank financing to the Consolidated Non-Financial Public Sector during the years 1986-87. We do know there were several ways through which direct Treasury borrowing from the Central Bank was diverted in such a way that it did not show openly in the accounts. The granting of Rediscounts to Public Enterprises or placing Treasury paper denominated in dollars were some of the ways used to avoid direct borrowing in Australes by the Treasury from the Central Bank. Public construction programs were implemented by the Banco Hipotecario (the state mortgage bank) and fully financed through Central Bank rediscounts that were never returned. Banco Hipotecario is alleged to have lost about one billion dollars in 1987-88 because of these operations and all of this was financed with money creation.

Because of the above questions we have resorted to measure the fraction of the deficit that was financed with printing of money directly from the accounts of the monetary sector.

We measured the revenue from money creation as the absolute monthly change in M1 (non-interest bearing money) divided by the exchange rate for the dollar in the free market. This provide us with a monthly series of dollar revenue from money creation. We then added up those series over each year to get the annual revenues. Finally we divided nominal GDP of each year by the average exchange rate in the free market to get the estimate of dollar GDP. Dividing both series we get the revenue from money creation as a percentage of GDP.

The series constructed above has one serious problem that makes it not comparable with our series of the CPS deficit. Since the Central Bank intervenes in the foreign exchange market by buying or selling foreign exchange, in many instances the changes in M1 are due to increases in money demand that are provided through purchases of international reserves. Conversely, when the reserves are lost, we observe a significant fall in the revenue from money creation as measured. Since Reserve purchases or sales are not considered a public expenditure in the accounts of the CPS, we have resorted to subtracting those reserve changes from our series of revenue from inflation.

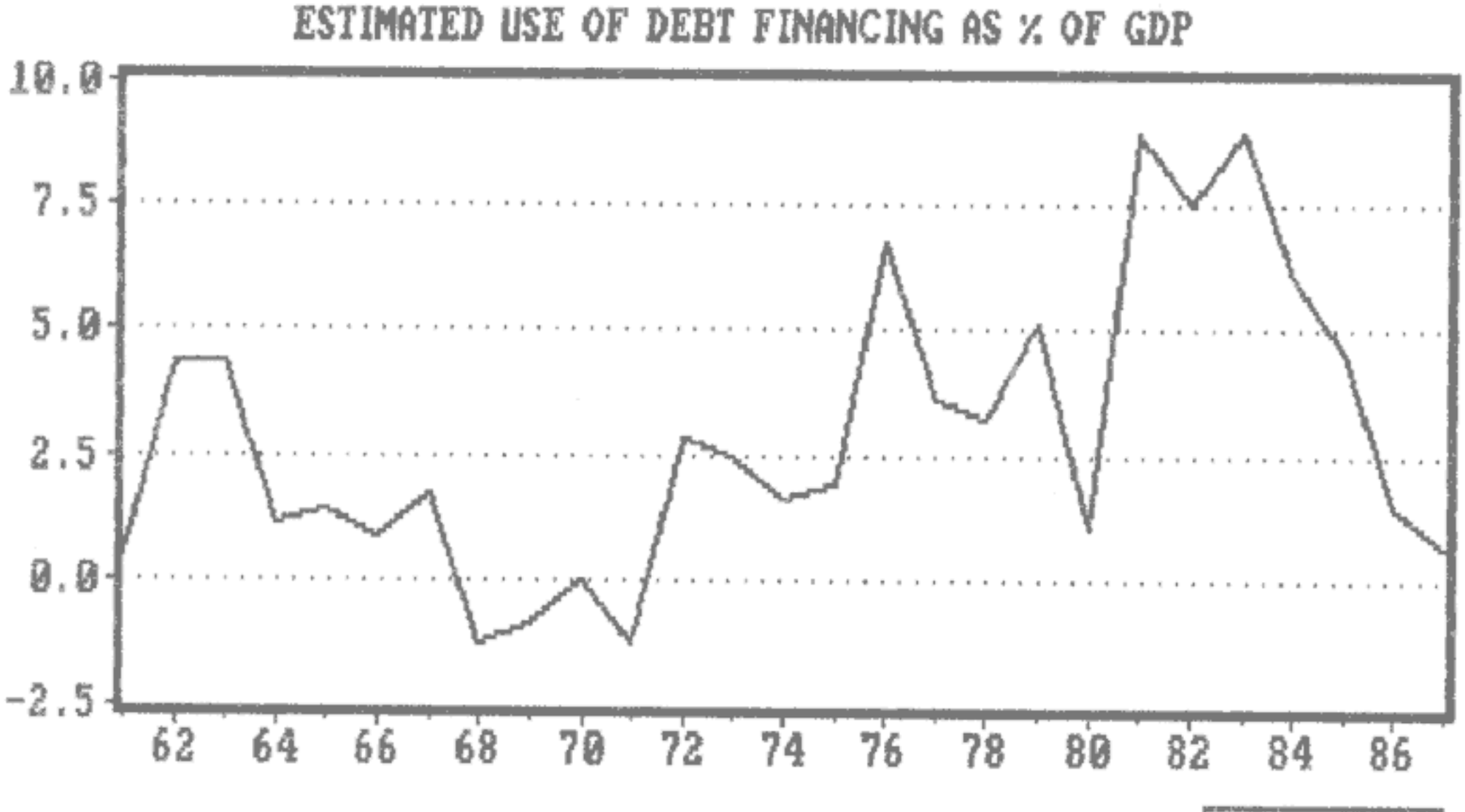
Figure 5




With the correction described above the series of the revenue from money creation obtained from the monetary data shows a clear correlation with the series of the deficit of the CPS obtained from the fiscal data. Both series are shown in Figure 5. Almost systematically, the Deficit of the Consolidated Public Sector (DEFT from column 5 in Table 4) exceeds the Revenue from Money Creation. The difference between both series can be taken as an approximation to the part of the total deficit that was financed through the issuing of interest earning debt. The generation of public debt should have been larger than this amount on the account that the Central Bank had its own quasifiscal deficit that also had to be financed. While we have the FIEL data in Table 4, we do not feel it is comparable with our series because that part of what FIEL calls quasifiscal expenditures may actually be indirect financing of the CPS deficit through the variety of mechanisms that were previously discussed. The FIEL data also considers the changes of Reserves as part of the quasifiscal expenditures.

With the above caveats, the data in Figure 5 describes quite closely the events insofar as the actual ways of deficit financing that took place over recent years. It can be seen that from 1964 through 1975 the deficit of the CPS did not exceed significantly the revenue from money creation. This means that the fiscal deficit was mainly financed through monetary creation rather than issuing debt. The situation changes drastically from 1976 onwards when debt financing apparently becomes a significant part of the total. This change coincides with the fall of the Peronist Government and the initiation of the military regime. In 1977 there was a significant financial liberalization that opened the domestic financial market to foreign investors. The period 1977-79 is signed by foreign borrowing and the revenue from money creation falls well below historical levels. The banking crisis of early 1980 set the end to this stage of foreign financing of the deficit and opens the way for the next stage of internal debt financing that lasts up to 1985. From 1985 onwards starts a serious effort of reduction of the total deficit of the CPS. The use of the inflation tax, however, does not fall proportionately to the deficit of the CPS because of the increasing financing pressures of the service of the internal debt concentrated mostly in the Central Bank.

Figure 6



## III.2 The Fiscal Deficit and The Inflation Tax: Statistical Evidence

In the previous section we saw that the revenue from money creation appears to be closely associated to the deficit of the Consolidated Public Sector. This should not surprise us since the printing of money is one of the only two ways to finance the deficit of the CPS, the other being issuing new interest earning debt. In this section we will try to identify more closely the nature of this relationship using regression analysis.

Our methodology consists in considering the revenue from money creation as an endogenous variable that is explained, among other things by the CPS need to finance its deficit. We therefore consider the deficit of the CPS as the exogenous variable that gives raise to the need of resorting to the inflation tax. Because of the possibility of financing the deficit with internal or external debt one should not expect a one-to-one stable relation between the inflation tax and the deficit. In fact, as our discussion above indicates, there were periods in which it was apparent that debt financing was much more used than in others. Nevertheless, one should consider that debt generation in excess of real growth will eventually have to be canceled or financed through inflation as the market for placing new debt eventually dries out.

Since it was also obvious from the inspection of the data that a change in the financing modality took place from 1976 onwards (towards using more debt financing), we have included a dummy (D76 equal zero up to 1975 and one afterwards). Regression III.1 reports the results concerning the relation between the inflation tax (ITAX) and the total deficit of the Consolidated Non-Financial Public Sector(DEFT).

==========

REGRESSION III.1

```
ITAX =    1.248 - 2.138 D76 + 0.564 DEFT
          (1.82)  (-2.85)     (6.19)

R2 Adj.:0.6
D-W.Stat.:2.31
Sample: 1963-1987
The regression was also tried with correction for first order
autocorrelation of residuals but the AR(1) coefficient did not
turn out as significant.
```

==========

The coefficient of the DEFT variable is 0.56 meaning that 56% of the CPS fiscal deficit tends to be financed through money creation. The coefficient of DEFT on ITAX is highly significant and justifies the presumption that deficit financing is a significant factor explaining the need for the inflation tax. The negative coefficient on the D76 variable indicates that since that year there has been a tendency to use less inflationary financing for any amount of DEFT and in consequence that there has been a shift towards more debt financing.

We have also tried to use the Primary Deficit of the CPS (PD, not including any interest service) as the explanatory variable for ITAX and found the surprising result that it works much better than the total deficit (DEFT). The results are reported in Regression III.2.

==========

REGRESSION III.2

ITAX = 0.936 - 1.21 D76 + 0.70 PD
(1.5) (-1.98) (7.47)

MA(1) = -1.12 ( T value:-2.4)
R2 Adj.: 0.69
D-W.Stat.:1.59
Sample Period:1963-1987

==========

The results of Regressions III.1 and III.2 suggest the possibility of a tendency to finance the Primary deficit with money and to roll over the interest expenditures in the form of new debt. In order to check for that possibility we have included the interest expenditure of the CPS as an additional explanatory variable, together with the Primary Deficit. If all deficits, independently from its source received the same treatment we should expect the coefficient on the interest expenses (IE) to be the same as the coefficient on the Primary Deficit. This does not turn out to be the case, as the results of Regression 3 show. As shown, the Primary Deficit retains the same coefficient of 0.7 while the interest expenditures turns out to be insignificant in explaining the inflation tax. We conclude that over the sample period authorities have used the inflation tax to finance primary expenditures while interest expenditures that result from the existing stock of Government Debt have tended to be refinanced through the issue of more debt.

```
==========================================================================
REGRESSION III.3
ITAX = 0.929 - 1.26 D76 + 0.697 PD + 0.027 IE
       (1.4)  (-1.4)      (6.78)     (0.08)

MA(1) = -0.62 (T-Value:-2.36)
Adj.R2= 0.68
D-W Stat.:1.59
Sample Period: 1963-1987
==========================================================================
```

In order to determine the effects of the Public Sector deficit on inflation the next natural step is to ascertain the relation between the inflation rate and the revenue from money creation. Such link is provided by the demand for real cash balances that has the inflation rate as one of its determining variables (taken as a measure of the opportunity cost of holding money). Precise estimates of money demand for Argentina will be derived in the next section but we can already derive some preliminary estimates by running a regression of the inflation rate on the series of revenue from money creation.

The response of the inflation rate to the printing of money in order to finance the deficit need not be instantaneous as there may be lags in the adjustment of prices to changes in the money supply. We therefore include inflation lagged one year as an explanatory variable for current inflation in addition of current revenue from money creation. The results are presented in Regression 4 that indicates a clear association between the revenue from money creation and the resulting inflation rate. Here we have assumed a linear relation between ITAX and the inflation rate, a fact that may not be valid for high inflation rates because as inflation raises the base of the tax, real cash balances falls and actual revenue may actually fall. In the next section we derive the precise non-linear relationship using an estimate of the demand for money. Our results here are therefore an approximation valid for inflation rates to the left of the maximum of the revenue curve.

The results of Regression III.4 indicate that the long run effect of raising 1% point of GDP from money creation is associated with an additional 97% inflation rate.

Regressions 2 and 4 provide a structural framework for the relation between the Public Sector Deficit and inflation. A 1% point of Primary Deficit is financed with 0.7% of revenue from money creation (the rest with debt), and the effect of collecting this revenue from money creation is around 67.9% of additional inflation( 97*0.7).

==========

REGRESSION III.4

INF = -84.98 + 0.751 INF(-1) + 29.34 ITAX
(1.76) (5.89) (3.60)

R2 Adj.:0.63
D-W.: 1.898
SAMPLE: 1964-1987

IMPLIED LONG RUN RELATION:

INF = -340 + 97.2 PD

==========

## IV. INFLATION, THE REVENUE FROM MONEY CREATION AND THE STRUCTURE OF FINANCIAL MARKETS

As it could be expected in an economy subject to frequent shocks as Argentina, the financial markets are highly volatile and cannot be easily described by a simple set of instruments. The financial reform of 1977 freed interest rates and allowed banks to capture interest earning deposits called "Plazos Fijos"\1/. Previous to the 1977 reform, interest rates were set by the Central Bank and credit was normally rationed as the interest rates tended to be negative in real terms.

The financial wealth of Argentines can tentatively be divided between five main groups of assets:

1- Currency plus demand deposits, or the aggregate M1.

2- Time Deposits (Plazos Fijos) denominated in local currency.

3- Dollar denominated bonds of the Government called BONEX.

4- Foreign financial assets, mostly denominated in U.S.currency.

5- A whole variety of local-currency-denominated Government paper including at times Treasury Bills and Central Bank CD's.

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\1/ The financial liberalization was but one of the many policy instruments of what came to be known as the Stabilization Plan of December 1978. The plan started being instrumented after the military coup of March 1976; the financial opening of 1977 was followed by the Tabla Cambiaria (prefixed exchange rate path) and the trade reform of 1978. The Plan was abandoned after March 1981 in the middle of a set of serious disadjustments, among them currency overvaluation, persistence of inflation and the external debt problem. The lack of fiscal adjustment has been blamed as the main reason for the failure of this stabilization attempt that aimed at making structural adjustment the centerpiece of the policies being followed. Literature covering developments during this period include Calvo(1981,1987), de Pablo(1983), Rodriguez(1982,1983), Fernandez(1982), Fernandez and Rodriguez(1982) and Sjaastad(1982). The sequential order of financial and trade liberalization has also been mentioned as a factor contributing to the failure of the plan, an issue that is analyzed in Edwards(1984).

==========

The above list roughly describes the alternatives open to the public since the reform of 1977. Unfortunately we do not have reliable data describing assets holdings prior to that reform. Loosely speaking, however, we can say that the Argentine economy has experienced a sustained process of demonetization (dollarization?) in recent decades. The real amount of M1 (non-interest bearing money) has systematically decreased since 1970 as shown in Figure 7 (the apparent real increase in M1 during 1973-75 was really due to the price freeze imposed during the period that resulted in the inflationary explosion known as "Rodrigazo" in mid-1975). The time path of real M2 (M1 plus time deposits) has depended more on the evolution of interest rates paid on time deposits.

FIGURE 7

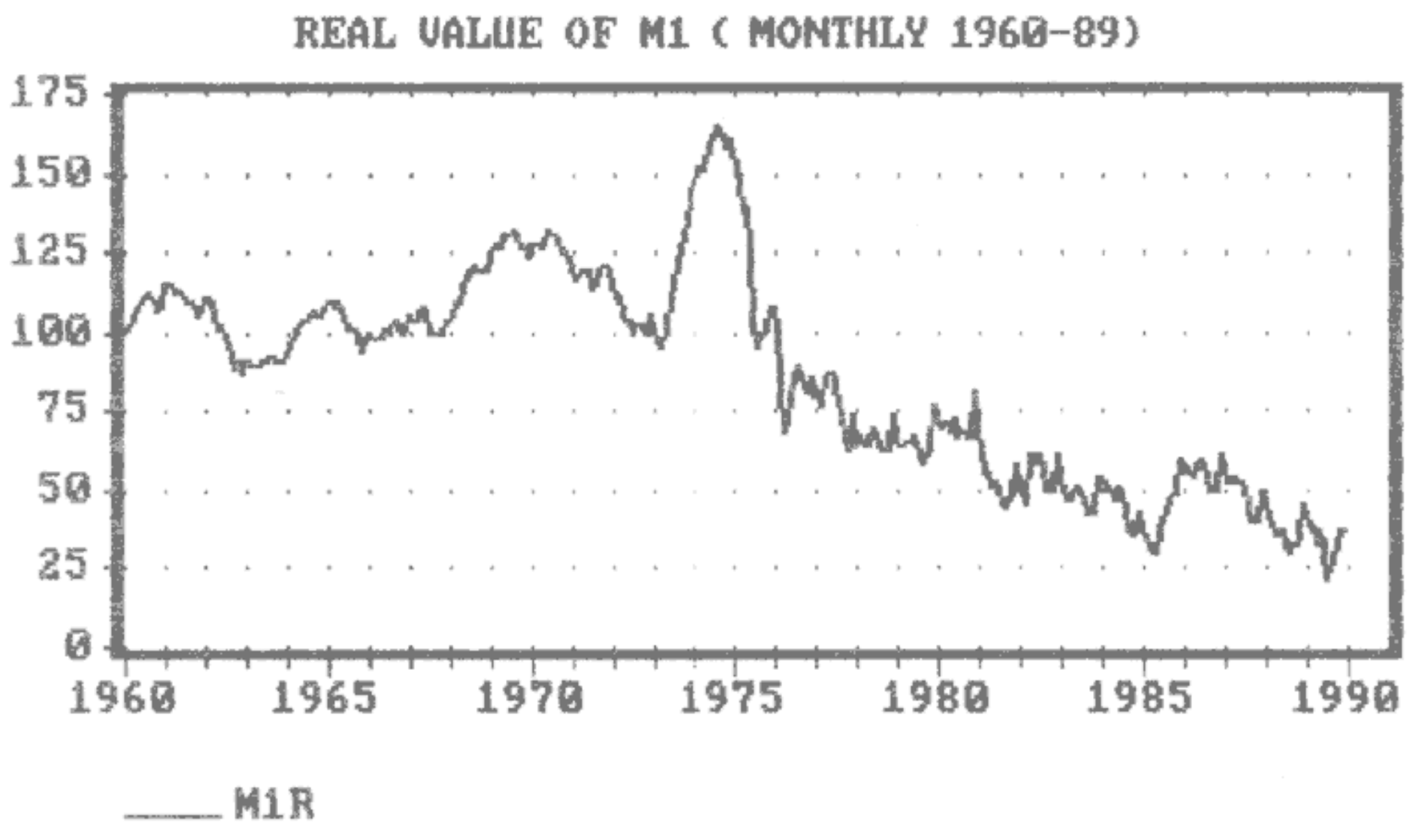
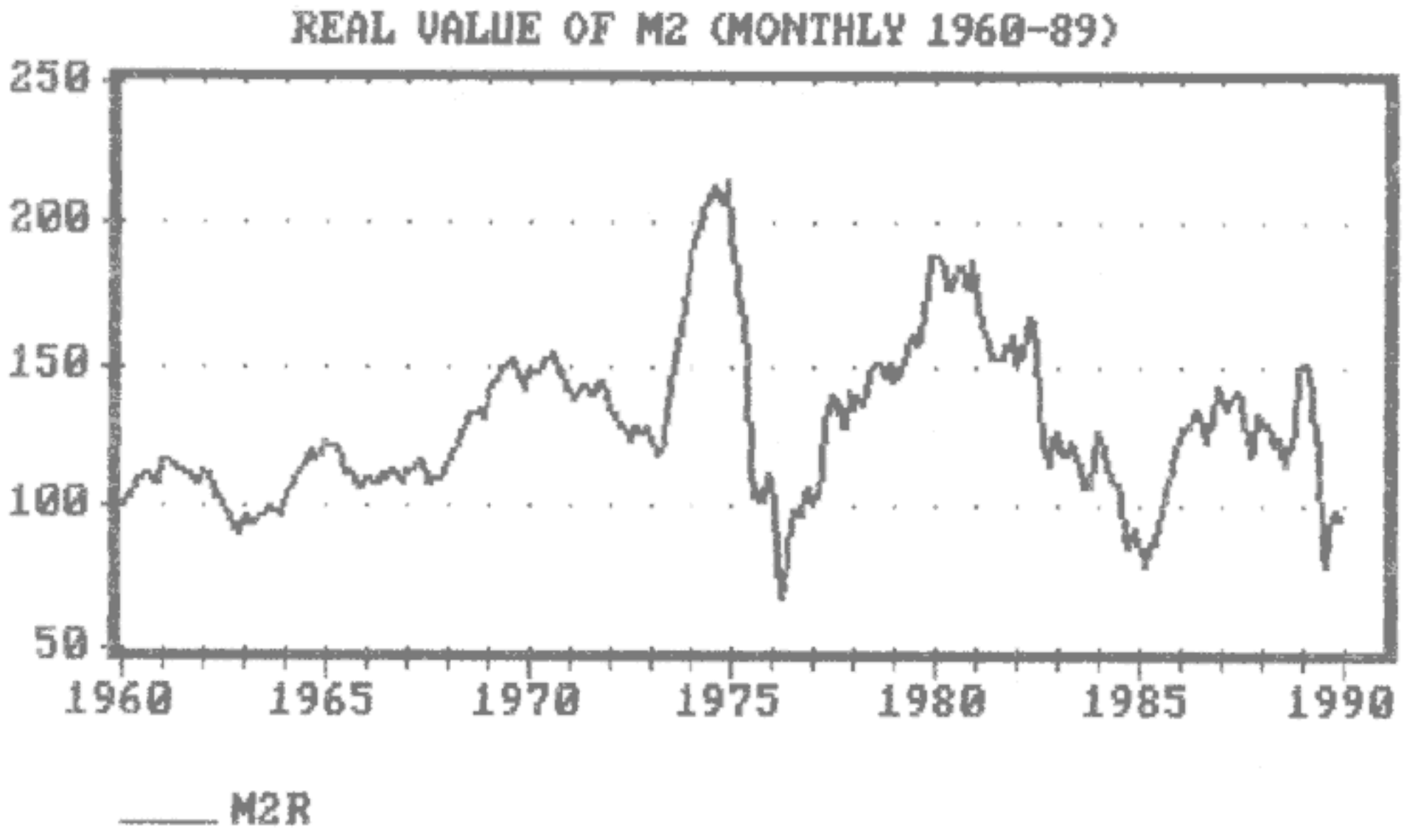


FIGURE 8




The debt policy of the government has much to do with the performance of the financial portfolio of the private sector, the reason being that the government has gradually become the "borrower of first resort" of the economy and as a consequence most of the financial assets of the private sector are either directly or indirectly the result of loans to the public sector (except, of course, the holdings of foreign exchange).

Tables 6 and 7 provide estimates of the domestic interest earning debt of the Treasury and the Central Bank. Practically all of the Central Bank debt is directly held by commercial banks under the form of compulsory reserve requirements ("depositos indisponibles") or, at times, under voluntary holdings of Central Bank's CD's. The commercial banks, in turn, obtain their funds by raising interest earning deposits from the public. What we therefore observe in practice is a system in which most of the public's deposits at commercial banks are lent to the Central Bank and used to finance the fiscal deficit. Part of the deposits of the public may be lent to the private sector, but that amount has been gradually displaced in favor of lending to the Central Bank as it can be appreciated from data in Table 9 from where it follows that most of the lending capability generated by the public's demand for M2 is absorbed in the form of domestic liabilities of the Central Bank.

The pressure put on the financial markets by the government debt is best captured by evaluating this debt at the commercial exchange rate. Normally authorities try to stabilize the economy by fixing the exchange rate at the level given by the Commercial Rate. As credibility in the plan decreases, interest rates raise and the stock of government debt tends to raise in terms of dollars. When the stock of debt, particularly the short term debt of the central Bank, gets out of line with the available Reserves, pressures mount against the currency and a devaluation finally follows. Normally devaluations are successfull in reducing the dollar value of the government debt denominated in Australes but not so much in reducing the interest rates in dollar equivalent paid on the remaining stock. As a consequence, immediately after the devaluation the remaining stock of debt continues raising at rates far beyond the level consistent with a fixed exchange rate and a new crisis starts to develop.

Table 8 shows the evolution of the total domestic liabilities of the Central Bank and the total value of M2 (Currency plus Demand and Time deposits). The ratio between both concepts has oscillated between 50% and 82% depending on the degree of the absorption by the Central Bank of the credit availability at the Commercial Banks.

The Primavera Plan started in August 1988 with a stock of internal debt of 8.6 billion dollars and brought it up to 18 billion dollars after 8 months, in March 1989. Since GDP stands around 70 billion dollars, it is clear that a rate of debt accumulation on the part of the Public Sector of 13% of GDP in only 8 months was unsustainable and a foreign exchange crisis was called for. The collapse of the Primavera Plan in February started a series of devaluations that melted down the debt up to 5.7 billion by July 1989 when the Bunge and Born Plan started with a big devaluation and the announcement of a fixed exchange rate for ever since. In the next four months the level of domestic debt rose to 7.9 billion dollars (evaluated at the new exchange rate) mostly on account of the interest service of the inherited debt. This time the market was aware of the final effects of rapid rates of debt accumulation and did not wait for debt to reach levels similar to those of the prior stabilization attempt. A new crisis took place in December that forced the abandonment of the BB Plan and the conversion of all Time Deposits (and the Reserve Requirements that backed them) into a 10 year BONEX on January 1, 1990. As a counterpart of the conversion of the liabilities of commercial banks into Bonex, all government debt with the banks was also turned into BONEX, as well as most of the government paper in the hands of the public (exemptions were cash, demand deposits, time deposits up to about 300 dollars and the already existing stock of BONEX from previous years).

TABLE 6
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INTEREST EARNING DEBT OF THE PUBLIC SECTOR (Millions of Australes) INCLUDES ONLY INTERNAL DEBT

| Date | TREASURY DEBT | CENTRAL BANK DEBT | TOTAL DEBT |
|---|---|---|---|
| DE85 | 312 | 3427 | 3739 |
| JA86 | 315 | 3383 | 3698 |
| FE86 | 316 | 3829 | 4145 |
| MA86 | 307 | 4293 | 4600 |
| AP86 | 313 | 4079 | 4392 |
| MY86 | 302 | 4782 | 5084 |
| JN86 | 300 | 5039 | 5339 |
| JL86 | 308 | 5316 | 5624 |
| AG86 | 319 | 5765 | 6084 |
| SE86 | 322 | 6250 | 6572 |
| OC86 | 334 | 5616 | 5950 |
| NO86 | 330 | 6742 | 7072 |
| DE86 | 1297 | 7072 | 8369 |
| JA87 | 1666 | 7505 | 9171 |
| FE87 | 1798 | 8035 | 9833 |
| MA87 | 2409 | 8399 | 10808 |
| AP87 | 2724 | 9226 | 11950 |
| MY87 | 2898 | 9139 | 12037 |
| JN87 | 3311 | 9796 | 13107 |
| JL87 | 3630 | 10523 | 14153 |
| AG87 | 5277 | 11853 | 17130 |
| SE87 | 5743 | 11859 | 17602 |
| OC87 | 8040 | 13016 | 21056 |
| NO87 | 8086 | 14146 | 22232 |
| DE87 | 9117 | 16755 | 25872 |
| JA88 | 11103 | 17488 | 28591 |
| FE88 | 13152 | 20160 | 33312 |
| MA88 | 12200 | 27318 | 39518 |
| AP88 | 13997 | 31358 | 45355 |
| MY88 | 15282 | 38226 | 53508 |
| JN88 | 18572 | 47956 | 66528 |
| JL88 | 22666 | 60905 | 83571 |
| AG88 | 24503 | 80441 | 104944 |
| SE88 | 21400 | 97737 | 119137 |
| OC88 | 22629 | 107146 | 129775 |
| NO88 | 22635 | 118341 | 140975 |
| DE88 | 23657 | 130517 | 154174 |
| JA89 | 28434 | 152794 | 181228 |
| FE89 | 45542 | 170508 | 216050 |
| MA89 | 76457 | 202606 | 279063 |
| AP89 | 143719 | 307604 | 451323 |
| MY89 | 207980 | 707948 | 915928 |
| JN89 | 500913 | 1558682 | 2059595 |
| JU89 | 877854 | 2363255 | 3241109 |
| AU89 | 912544 | 3216690 | 4129234 |
| SE89 | 989721 | 3767581 | 4757302 |
| OC89 | 995725 | 4155349 | 5151074 |
| NO89 | 1432058 | 3743756 | 5175814 |

INTEREST EARNING DEBT OF THE PUBLIC SECTOR (Millions of Dollars at the Commercial Exch.Rate) INCLUDES ONLY INTERNAL DEBT

TABLE 7
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| Date | TREASURY DEBT | CENTRAL BANK DEBT | TOTAL DEBT |
|---|---|---|---|
| DE85 | 389 | 4278 | 4668 |
| JA86 | 393 | 4223 | 4616 |
| FE86 | 395 | 4780 | 5175 |
| MA86 | 383 | 5360 | 5742 |
| AP86 | 378 | 4927 | 5306 |
| MY86 | 356 | 5629 | 5985 |
| JN86 | 343 | 5768 | 6111 |
| JL86 | 340 | 5882 | 6223 |
| AG86 | 331 | 5974 | 6304 |
| SE86 | 307 | 5950 | 6257 |
| OC86 | 305 | 5135 | 5441 |
| NO86 | 287 | 5858 | 6145 |
| DE86 | 1069 | 5831 | 6900 |
| JA87 | 1289 | 5805 | 7094 |
| FE87 | 1300 | 5809 | 7109 |
| MA87 | 1563 | 5450 | 7014 |
| AP87 | 1768 | 5987 | 7755 |
| MY87 | 1822 | 5745 | 7566 |
| JN87 | 1941 | 5741 | 7682 |
| JL87 | 1916 | 5555 | 7472 |
| AG87 | 2495 | 5604 | 8099 |
| SE87 | 2337 | 4826 | 7163 |
| OC87 | 2479 | 4013 | 6492 |
| NO87 | 2304 | 4030 | 6334 |
| DE87 | 2579 | 4740 | 7319 |
| JA88 | 2872 | 4524 | 7396 |
| FE88 | 3034 | 4651 | 7686 |
| MA88 | 2510 | 5619 | 8129 |
| AP88 | 2437 | 5459 | 7895 |
| MY88 | 2269 | 5674 | 7943 |
| JN88 | 2301 | 5941 | 8242 |
| JL88 | 2348 | 6309 | 8657 |
| AG88 | 2042 | 6703 | 8745 |
| SE88 | 1783 | 8145 | 9928 |
| OC88 | 1851 | 8766 | 10617 |
| NO88 | 1786 | 9337 | 11123 |
| DE88 | 1802 | 9943 | 11745 |
| JA89 | 2081 | 11181 | 13262 |
| FE89 | 3143 | 11766 | 14909 |
| MA89 | 4999 | 13248 | 18247 |
| AP89 | 2811 | 6017 | 8829 |
| MY89 | 1671 | 5686 | 7357 |
| JN89 | 2382 | 7411 | 9792 |
| JU89 | 1546 | 4163 | 5710 |
| AU89 | 1393 | 4911 | 6304 |
| SE89 | 1511 | 5752 | 7263 |
| OC89 | 1520 | 6344 | 7864 |
| NO89 | 2186 | 5716 | 7902 |

TABLE 8

| | DOMESTIC LIABILITIES OF THE CENTRAL BANK (1) | TOTAL STOCK OF DOMESTIC MONEY(m2) (2) | RATIO (1)/(2) |
|---|---|---|---|
| DE85 | 8581 | 10033 | 0.86 |
| JA86 | 8365 | 10538 | 0.79 |
| FE86 | 8366 | 10971 | 0.76 |
| MA86 | 9443 | 11517 | 0.82 |
| AP86 | 9319 | 12079 | 0.77 |
| MY86 | 10214 | 13044 | 0.78 |
| JN86 | 10863 | 13840 | 0.78 |
| JL86 | 11447 | 14675 | 0.78 |
| AG86 | 12351 | 15336 | 0.81 |
| SE86 | 12532 | 15876 | 0.79 |
| OC86 | 11615 | 17288 | 0.67 |
| NO86 | 13184 | 18176 | 0.73 |
| DE86 | 14015 | 20120 | 0.70 |
| JA87 | 14867 | 21126 | 0.70 |
| FE87 | 14978 | 21964 | 0.68 |
| MA87 | 15593 | 23011 | 0.68 |
| AP87 | 16619 | 24097 | 0.69 |
| MY87 | 17286 | 25765 | 0.67 |
| JN87 | 18082 | 27679 | 0.65 |
| JL87 | 19717 | 29898 | 0.66 |
| AG87 | 21095 | 31530 | 0.67 |
| SE87 | 21568 | 34314 | 0.63 |
| OC87 | 24881 | 38811 | 0.64 |
| NO87 | 26139 | 42602 | 0.61 |
| DE87 | 30274 | 48075 | 0.63 |
| JA88 | 31864 | 52343 | 0.61 |
| FE88 | 33752 | 56984 | 0.59 |
| MA88 | 42924 | 65494 | 0.66 |
| AP88 | 48575 | 74191 | 0.65 |
| MY88 | 58660 | 85827 | 0.68 |
| JN88 | 71448 | 102730 | 0.70 |
| JL88 | 92428 | 120617 | 0.77 |
| AG88 | 117793 | 150250 | 0.78 |
| SE88 | 143378 | 175167 | 0.82 |
| OC88 | 155276 | 193011 | 0.80 |
| NO88 | 174917 | 215552 | 0.81 |
| DE88 | 200514 | 259270 | 0.77 |
| JA89 | 221780 | 287405 | 0.77 |
| FE89 | 243199 | 315141 | 0.77 |
| MA89 | 277949 | 368864 | 0.75 |

(*) Millions of Current Australes. End of month data.
Source: M2 data from FIEL; Remunerated CB liabilities from IBRD; Non Remunerated Monetary Base from IFS.

## V. THE DEMAND FOR MONEY AND THE LIMITS TO THE INFLATION TAX

Households have a pure transactions demand for real cash balances of local currency, which we can expect to be positively related to real income and negatively related to the cost of holding those balances, that is, the expected rate of inflation. In this module, we assume that the expected rate of inflation equals its realized value in the current period.

To know the demand for real cash balances is critically important to estimate the effect on inflation of deficit-induced money creation, as well as to estimate the limits of this means of financing.

Given the level and volatility of the Argentine rates of inflation, as well as the unending series of more or less radical changes in monetary policy, one would not expect to find stable demand-for-money parameters for extended periods of time. This means that we should expect to see the revenue maximizing rate of inflation, and the maximum revenue itself, changing over time. For this reason, we have chosen here to estimate de demand for real cash balances using two different approaches:

(1) Using a sample of monthly data for the period January 1984-June 1988. This period covers from the return to democracy to the onset of the Primavera Stabilization Plan, which ended in the first hyperinflationary episode of 1989. The most important monetary event of this period was the Austral Stabilization plan, launched in June 1985.

(2) Using long term series of annual data (1960-1988) allowing for a time dependent dummy variable to capture the possibility of a structural change taking place. We found that an additive dummy variable (D77) taking the value of one for 1977 onwards (and zero otherwise) captures best the structural change that took place as a consequence of the financial liberalization of 1977.

The estimation on the basis of monthly data precludes the use of income series to estimate a velocity function. Consequently, we estimate a demand for real cash balances with the inflation rate as the only explanatory variable in our regressions. To avoid the simultaneous determination problem (between current period real cash balances and current period inflation), we have used a Two Stage Least Squares estimation procedure using lagged inflation up to three periods as instruments. TSLS is also used in the estimation using annual data.

Tables 9 and 10 report the regression results for the annual and monthly data respectively.

In Figure 9 we can appreciate the significant changes that have occurred over time in the demand for real M1 as measured by its velocity of circulation. From 1960 through 1974 velocity remained approximately stable in the range of 6-7. In 1975 velocity starts an upward trend that does not show signs of stopping, taking it to a value of 33 in 1988. Unofficial data estimates put velocity around 50 as of the second half of 1989, after the hyperinflation of June-July of that year. The raise of 1975-76 may have been caused by the high price instability during those two years; we have reasons to believe, however, that a structural change took place in 1977, when interest rates were totally freed for the first time in decades and the public could invest in short term time deposits at market determined interest rates. This structural change is bound to reduce the real demand for M1 as the supply of alternative assets was now open. Our empirical results confirm this presumption as the value for the structural change dummy is of 0.67, meaning that there was a 95% (exp(.67)-1) upward shift in velocity due to the financial liberalization experience.

The estimates from the monthly data yield long run estimates of the semi-log elasticity (coefficient a1 corrected for the effect of lagged M1) ranging between -2.83 and -3.01, implying a monthly revenue maximizing inflation rate between 33%-35%. The regression using annual data yields a comparable estimate for a1 of -4.54, compatible with a maximum revenue rate of 21.9% per month. All of the above estimates of maximum revenue inflation rate should be subtracted the monthly real growth rate if any real growth is to be assumed.

Our estimates of the semi-log elasticity of demand for M1 fall within the range of other empirical studies. For example, Kiegel and Neumayer(1989), using monthly data for the period July 1982-March 1985, find values for a1 in the range -2.4 -3.8. Their estimates of a1 for the fixed exchange rate period of the Tabla Cambiaria (Jan.1979-January 1981), when there was a high degree of capital mobility, yields somehow higher estimates in the range of -4.9 -6.0 .

In order to estimate the possible range for the revenue from money creation we have decided to use the results from the regression using annual data since this allows for a direct estimate of velocity.

FIGURE 9

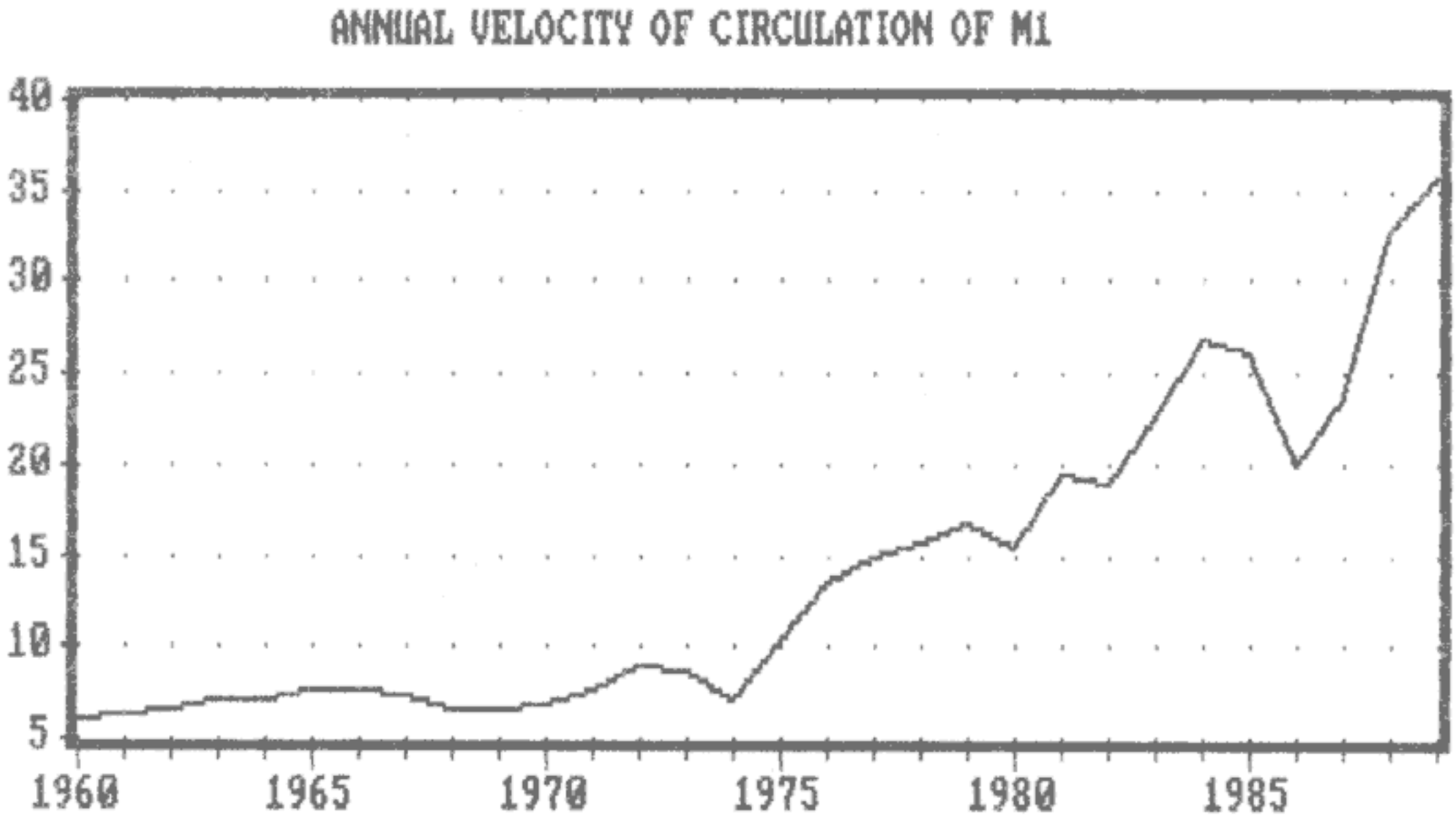



TABLE 9

ANNUAL MONEY DEMAND FUNCTION

LV = a0 + a1.INF

LV = Ln(GDP/M1)
V = Annual Velocity of Circulation of M1.
GDP= Annual Nominal GDP
M1= Average of Monthly holdings of Nominal M1.
INF= Equivalent monthly inflation rate for the year.
D77= Financial reform dummy (1 from 1977-88, 0 otherwise)
SAMPLE= 1960-1988
METHOD: Two-Stage Least Squares
INSTRUMENTS: INF(-1) INF(-2) LV(-1) D77

LV = 1.9090 + 4.5484 INF + 0.67087 D77
(49.49) (5.83) (9.89)

MA(1) = 0.925 (T-value=3.98)
R2 ADJ.= 0.96
D-W.Stat.= 1.85
F= 206

TABLE 10
MONTHLY MONEY DEMAND REGRESSIONS

LM1 = C + a0 LM1(-1) + a1 INF

LM1= Ln(M1/CPI)
INF = CPI/CPI(-1) -1
SAMPLE: Monthly 1984.02-1988.06

| | REG.5 | REG.6 | REG.7 |
|---|---|---|---|
| C | 13.213<br>(195) | 13.185<br>(346) | 8.202<br>(5.4) |
| LM1(-1) | --- | --- | 0.378<br>(3.29) |
| INF | -3.01<br>(-6.04) | -2.85<br>(-10.2) | -1.763<br>(-4.29) |
| MA(1) | --- | 0.50<br>(3.4) | 0.45<br>(2.8) |
| AR(1) | 0.308<br>(2.56) | --- | --- |
| ESTIMATED LONG RUN A1 COEFFICIENT | -3.01 | -2.85 | -2.83 |
| R2 ADJ.: | 0.61 | 0.67 | 0.81 |
| D-W.: | 1.31 | 1.92 | 1.89 |
| F: | 42 | 55.9 | 75 |

METHOD OF ESTIMATION: TWO STAGE LEAST SQUARES

INSTRUMENTS: INF(-1) INF(-2) INF(-3) and LM1(-1) (only in R7).

## Computing the Maximum Revenue from Money Creation

In this section we shall be concerned with the derivation of an estimate of the relation between monetary financing of the deficit and the resulting inflation rate. In particular, we will derive an estimate of the maximum revenue that can be obtained from the inflation tax before the economy enters into hyperinflation.

Consider a demand for high power money of the following form:

(V1) $M.V(Ie) = Y = p.Q$,

where Q=GDP

p= Price level

V= Velocity

M=Stock of High Power Money.

By issuing high power money, the government can finance part of its current expenditures in the amount (dM/dt)/p. As a fraction of GDP, the revenue from money creation is:

(V2) $IR = \{-(1/V)(dV/dt) + ( I + g )\}/ V(Ie)$

We shall be concerned here with the possibility of sustainable deficit financing from the inflation tax. Leaving aside the transitory effects derived from the transition from one equilibrium to another, the sustainable steady rate of deficit financing through the inflation tax is derived from (V2) assuming that velocity remains constant at the level determined by the actual inflation rate and we also assume that expectations have adjusted so that actual and expected inflation rates are identical. Under those circumstances, the steady-state sustainable revenue from inflation becomes:

(V3) $IR = (I + g)/V(I)$

There is a maximum to the amount of revenue that can be raised with the inflation tax before generating a hyperinflation. This amount corresponds to the solution to the maximum value for the equation: Max.Inf.Tax= max (I+g)/V(I). Attempts to raise a higher revenue than this maximum will require ever increasing rates of money creation and inflation.

Assume the following form for the velocity function:

(V4) $\text{Log}(V) = Vo + b.I$

In terms of the standard form for Velocity shown in (V4), the steady state revenue from inflation is:

(V5) $IR = (I+g)/V(I) = (I+g).\text{Exp}[-Vo - bI]$

The function IR takes a maximum when

(V6) $d(IR)/dI = \text{Exp}[ -Vo - bI] \ -(I+g).b.\text{Exp}[-Vo-bI] = 0$ .

The solution to this expression yields the maximum revenue inflation tax:

(V7) $Imax = (1/b)-g,$

as the continuous time rate of inflation over the period over which velocity is defined.

The corresponding Maximum Revenue is derived as:

(V8) $IRmax = \text{Exp}[-Vo-1+b.g]/b$ ,

It is clear from the above analysis that (V5) is valid provided the expression in brackets is less than IRmax. Any deficit in excess of IRmax. cannot be financed through the inflation tax as (V5) will not have a solution, meaning that ever increasing rates of monetary expansion, and inflation, will be necessary to finance it and the system would enter into hyperinflation.

The estimate of money demand using annual data yields the following expression for the sustainable revenue from the inflation tax as percentage of annual GDP:

$$IR = 12* (INF + g)*exp( -2.5798 - 4.5484*INF)$$

where INF and g are the equivalent monthly inflation and growth rates and IR is the annual revenue from the inflation tax as a fraction of annual income.

Assuming a real growth rate of 2% per year, g takes a value of 0.00165 per month. With this value for g, the rate of monthly inflation that maximizes R/Y is equal to:

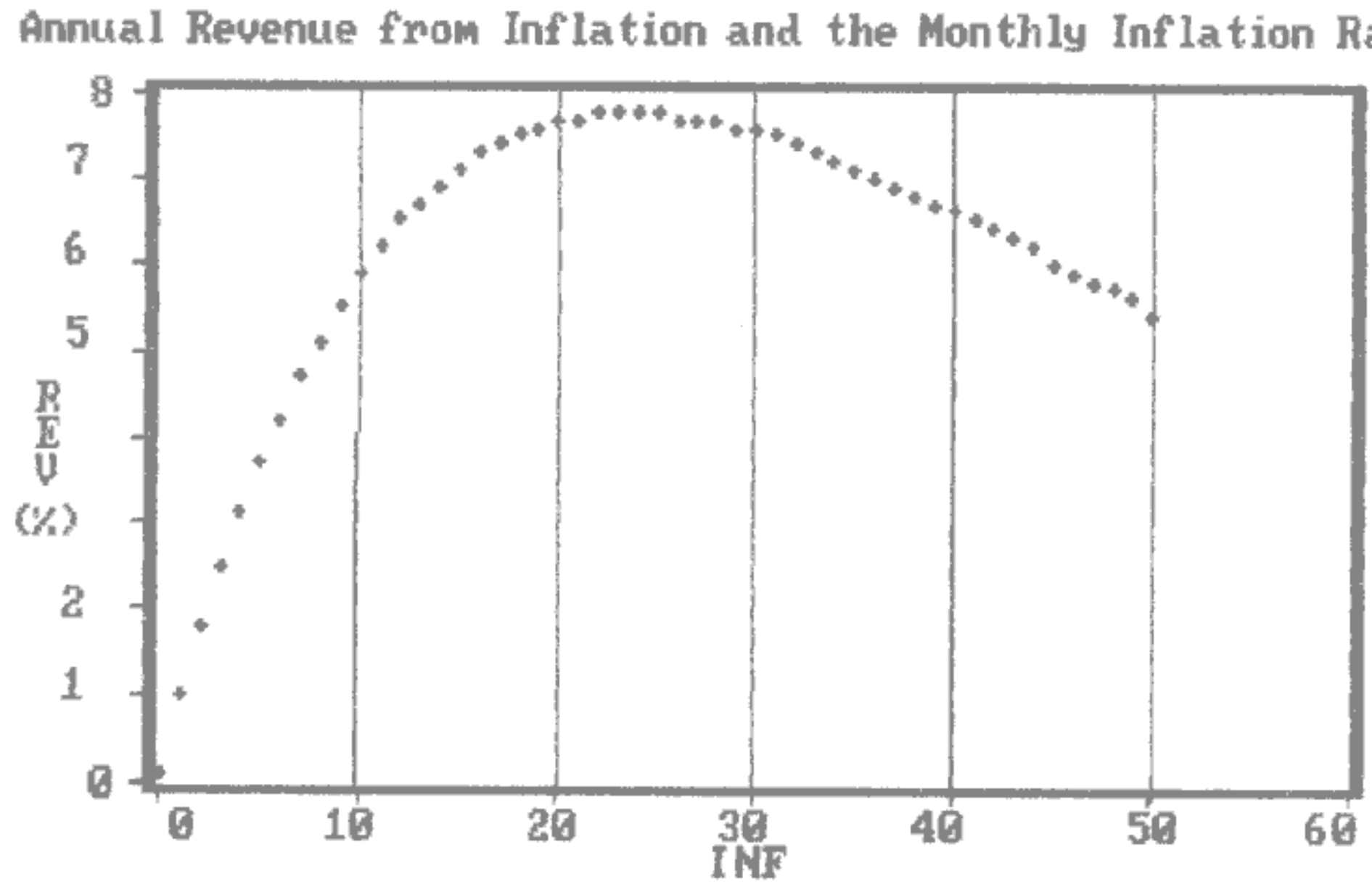
$$INF* = (1/b) - g = 0.2184$$

This maximum revenue rate is equal to 21.8% per month, an amount equivalent to 966% per year. The associated maximum revenue from money creation is equal to 7.4% of GDP and velocity at this inflation rate takes the value of 35.5.

To illustrate the workings of the maximum inflation tax assume a GDP of 70 billion dollars (about the level of GDP in 1989). With velocity at about 36, money demand is 1945 million dollars. With a monthly inflation rate of 21.8%, revenue from inflation is 424 million dollars per month ( .218*1945) or 5088 million per year that is equivalent to 7.3% of annual GDP.

It should be noticed that as the inflation rate approaches INF*, the revenue function becomes increasingly elastic with respect to the inflation rate. This means that small changes in revenue require large changes in inflation. In the limit, as the revenue reaches the maximum level, there is no increase in the inflation rate capable to generate any sustainable increase in the rate of revenue. Figure 10 shows the relation between revenue and inflation derived from our estimated revenue function above and assuming a growth rate of 2% per year. The Figure shows that here there is little gain and much costs from raising inflation above levels of 10% per month. At 10% per month the revenue is about 6% of annual GDP. Raising the maximum extra amount possible of 1.3% requires increasing the inflation rate from 10% to 21.8% per month. Therefore, in the margin, the extra 1.3% point of GDP in additional revenue requires increasing the annual inflation rate from 213% to 966%. Raising the first six points of revenue only needs 213% inflation.

FIGURE 10




In conclusion, our estimate for the money demand equation for Argentina yields an estimate of the maximum-revenue inflation tax of about 22% per month and a maximum revenue of 7.3% of GDP. The revenue estimate should be modified if all of the tax on M1 is not collected by the monetary authorities. As of December 1988 the monetary base was 52 billion Australes and M1 was 53 billion australes suggesting that our estimate of the revenue from inflation is approximately correct since the M1 multiplier of the monetary base is about unity.

# VI. PUBLIC DEBT AND INTEREST RATE DETERMINATION

## VI.1 Short-Run Analysis

There are two financial markets in Argentina, the formal market and the informal one. The informal market consists of the "mercado interempresario" (interfirm financial market) where firms borrow and lend among themselves through a set of institutions called "money-market desks". No record on the volume of these transactions exists although newspapers do quote the interest rates at which transactions are settled in this market. There is no accepted estimate as to the size of this market and most of the transactions are done on a one to seven days basis.

The formal financial market is concentrated in the commercial banks and financieras, both subject to Central Bank regulation, which includes the right to the deposit guarantee and the obligation to establish reserve requirements. The foremost instrument on the borrowing side of the banks and financieras is the interest earning Time Deposit. From time to time a variety of other instruments have been offered to the public, including a wide range of indexed deposits (indexed to the dollar, CPI or some of the components of the price index). Time deposits are sold to the public and traditionally bear a maturity ranging from 7 to 30 days. The average maturity for the deposits of the system has rarely exceeded 14 days and in recent years has been close to seven days. During 1989, following several episodes of long weekends coupled by forced bank holidays it has been not uncommon to have days in which 90% of the Time Deposits of the system came due on a single day.

Banks use their deposits to grant credit to the private sector or to acquire Central Bank assets (some compulsorily and some voluntarily). In 1989, about 80% of all assets of the commercial banks consisted of liabilities of the Central Bank. Regulations on how are those Central Bank liabilities remunerated have changed through time but on average we can say that these liabilities have paid an interest rate equal to the average cost to the commercial banks of raising the funds plus a spread. We have detected evidence that in some instances Banks were interested in having their liquid funds absorbed by the Central Bank through increases in remunerated reserve requirements. In a country subject to the uncertainties of Argentina, it may actually be safer to lend to the one entity that regulates the industry (the Central Bank), particularly when such lending is done at the cost of obtaining the funds plus a profitable spread (on the dynamics of the financial system that lead to the hyperinflation of 1989, see Almansi and Rodriguez (1989) and Fernandez(1990).

From the above description we can jump to the conclusion that for all practical purposes commercial banks raise deposits in order to lend them to the Central Bank. The rate paid by the Central Bank is the cost of obtaining those deposits plus a spread that allows banks to run its costs of operation plus profits. The result of such operations was a grossly distorted financial system in which about 2500 bank branches with 140000 employees administered an amount of 4700 million dollars of deposits as of December 1989 (or 33600 dollars per employee). After the melt down of January 1990, approximately the same number of employees were trying to retain their jobs when the amount of bank deposits was reduced to only 1384 million dollars which means about 9885 dollars of deposits per bank employee!. About one half of the bank deposits and the employees are in state banks, which obviously should lead in a restructuring of the Argentine financial system. Such restructuring has not yet taken place in spite of the grossly oversized financial system.

In such a system it is very difficult to ascertain what is the mechanism through which the interest rate on deposits is determined. One could say that the marginal 20% of private borrowers will generate a tendency for rates to approximate the productivity of investment but this is not so. Most of the private creditors are borrowing on a daily basis to finance temporary financial disequilibria through the use of overdraft on their checking accounts and not for investment purposes.

The interest rate appears to be determined by the short run liquidity available in the system.

We have found a significant relation between the stock of time deposits outstanding and the level of the real interest rate that these deposits yield. The general rule for banks in determining interest rates is to set them at the level required for all deposits (principal plus interest) to be rolled over unless the Central Bank intervenes by providing the required cash for the banks to reduce the outstanding level of deposits.

In terms of the standard money-supply multipliers, the monetary base of the Central Bank (its liabilities) is equal to the sum of reserve requirements:

$$MB = a_1 M_1 + a_2 D \quad (VI.1)$$

where a1 is the average reserve requirement on M1, very close to unity since the reserve requirement on demand deposits has tended to equal unity. The coefficient a2 of reserve requirements on interest earning deposits (D) is also close to unity as a result of the policy of the Central Bank of gradually absorbing most of the lending capability of commercial banks.

The demand for M1 is assumed to take the form:

(VI.2) M1= p L(pie), where pie is expected inflation.

The demand for real interest earning bank deposits depends on the expected real return to be earned :

(VI.3) D/p = d(i - pie)

The growth rate of the total monetary base, in turn equals:

(VI.4) d(MB)/dt = (i+s).a2.D + DEF

where s is the spread paid over the cost to the banks of raising the deposits and DEF is the financing needs of the non financial public sector.

Equations (VI.1) to (VI.3) are not enough to determine the four endogenous variables: M1, D, p and i. The fourth missing equation is the key to determine the interest rate. This equation depends on the structure of operation of financial markets. If there is still enough link with the real sector through bank credit, we can assume that the real interest rate is determined by the marginal productivity of capital. Given inflationary expectations, this condition determines i, and the equations (VI.1)-(VI.3) will determine the remaining variables M1, D and p.

If there is perfect capital mobility the real interest rate will be determined by the external rate and therefore also the nominal interest rate will be exogenously determined given inflationary expectations.

For the most recent years (1982-1989), however, the currency in general has not been convertible and we do not observe any close link between the productivity of capital and the cost of bank credit. For practical purposes, most of bank credit goes to the Central Bank who simply pays the cost of raising it. In such a system we are still missing one behavioral equation. Such equation is given by the policy of the Central Bank with respect to the level or the cost of its interest earning debt. The growth rate of the Central Bank debt depends on the interest rate and the composition of the Total Monetary Base between remunerated and non-remunerated liabilities. We advance the hypothesis that the Central Bank at times aims at the control of the ratio of remunerated to non remunerated Monetary Base so that its total liabilities grow at the desired rate. This means that at a point in time the total amount of interest earning deposits in the system is fixed in nominal terms. Since the public can freely shift from D to M1, the constancy of D means that banks must offer whatever interest rate is needed to induce the public to roll-over all of its deposits at a point in time (principal plus interest).

The alternative to the prior mechanism is to aim at keeping constant the nominal interest rate by allowing depositors to shift freely between M1 and interest earning deposits.

Consider the trade off faced by the Central Bank when there is a fall in demand for interest earning deposits. The bank has the option of keeping the interest rate constant by allowing depositors to convert all of their excess supply of D into M1. If that is done, however, the price level must jump given that the real demand for M1 has not changed. Therefore, if there is a fall in interest earning deposits and the Central Bank feeds the run by substituting non-remunerated for remunerated monetary base, the price level increases (or, in more day-to-day terms, the currency devalues in the black market). This behavior characterizes the periods of low interest rates and high black market premium.

The alternative is to keep M1 and D constant and to allow the nominal interest rate to adjust so that the run is stopped by raising the return on deposits. The higher real interest rate reduces pressures in the parallel foreign exchange market and the black market premium initially falls. In this case there is no effect on M1 (we have assumed it depends only on expected inflation, otherwise, some minor adjustment to the following story should be made, but the thrust of the analysis will not be changed) but since the nominal interest rate has increased, the growth rate of the monetary base is now higher (according to (VI.4)). This behavior characterizes periods of high real

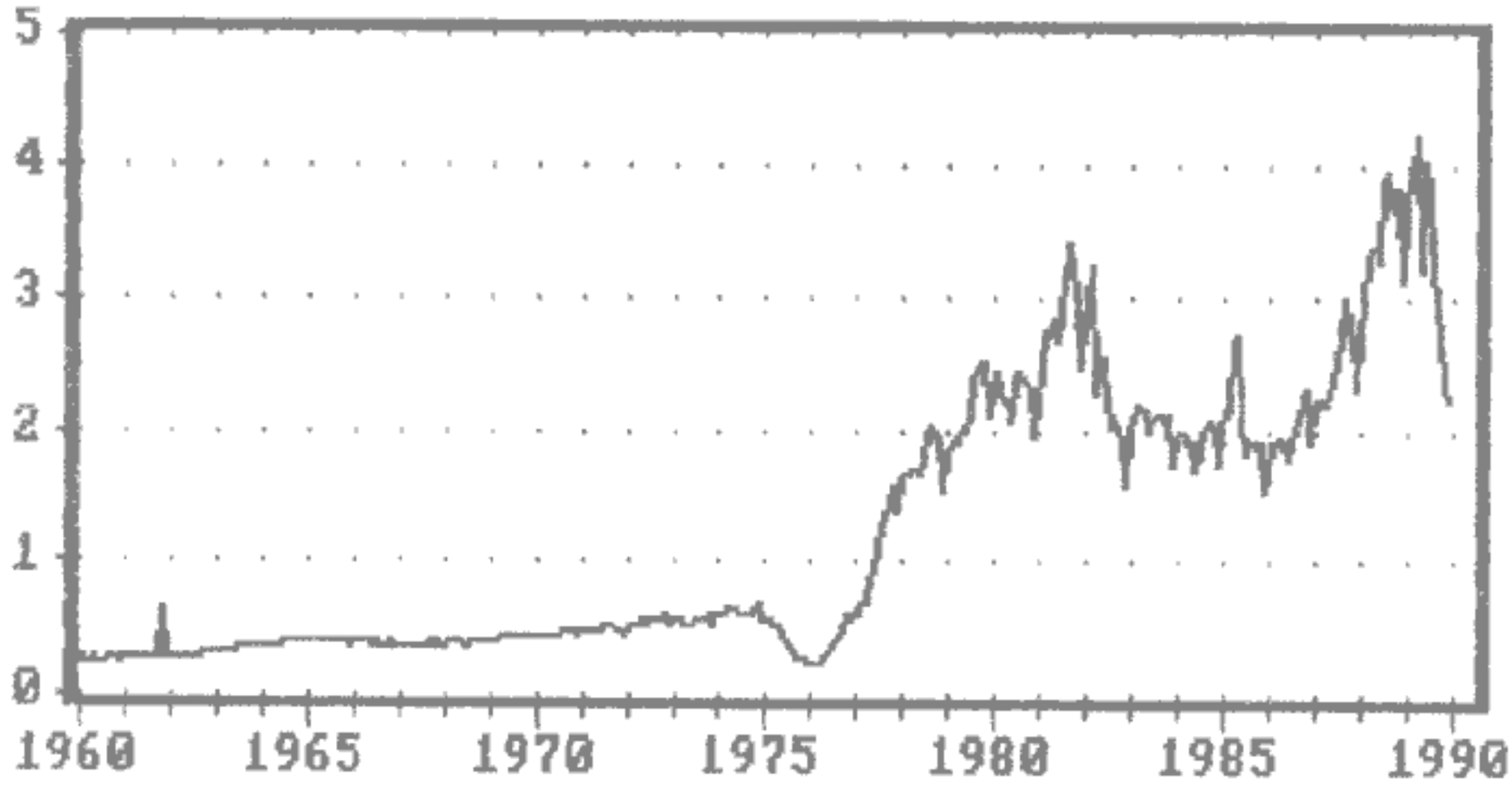
interest rates and low black market premium for the currency. This situation is however, unsustainable as the monetary base starts growing at rates inconsistent with price stability and the black market exchange rate starts to depreciate. Eventually the system breaks down as the Central Bank is forced to devalue the official exchange rate and to allow the raise in M1 in order to reduce interest rates and the pressure of the quasi-fiscal deficit.

The inherently unstable system implies wide oscillations in real interest rates and the real exchange rate as depositors try to anticipate sudden devaluations (the preferred instrument for the melting down of the quasifiscal deficits) by exchanging their deposits for cash with which to buy dollars in the black market. If the government tries to stop the portfolio shift it must resort to higher interest rates in order to force the roll over of the deposits. This mechanism reduces the short run pressures on the currency but increases the rate of growth of the monetary base and therefore generates expectations of even larger devaluations. The run feeds on itself until authorities give up to pressures and devalue.

## VI.2 Empirical Estimates

The magnitude of the changes in the interest rate needed to accommodate fluctuations in the demand for deposits is bound to depend on the interest elasticity of such demand. The more inelastic the demand is, the larger should be the required increase in the interest rate necessary to induce the roll over of the deposits in the face of an exogenous fall in the demand for them. We have attempted to estimate this elasticity using data for the period following the financial reform of 1977 since then it took place a fundamental structural change by allowing the free market determination of interest rates. The result was an unprecedented change in the ratio of M2 to M1 as a result of an increase in the demand for the former and a fall in the demand for the latter as it can be appreciated in Figure 11 showing the time path of the (M2-M1)/M1 ratio. The increase in the ratio of interest earning deposits to M1 started in 1977 and was approximately completed by mid-1980. Since then this ratio has oscillated in response to the relative returns to both assets.

FIGURE 11: RATIO OF INTEREST EARNING DEPOSITS TO M1




Regression (a) in Table 11 shows the estimates of the real demand for interest earning deposits using OLS estimation method and monthly data covering the period 1978.01-1988.12. Regression (b) estimates the same demand for the later subperiod 1984.01-1988.12. We assume the real demand for deposits depends on the current month nominal interest rate and the expected inflation rate. The regressions shown use the current period inflation rate as the measure of the expected inflation rate. No significant changes were found when the next period inflation that actually took place was used. The high value and significance of the coefficient for the lagged endogenous variable strongly indicates the presence of a slow adjustment process. Regressions (a) and (b) are made with OLS estimation methods and use the data for the longer and shorter periods respectively. Regression (c) is done for the longer period using instrumental variables in order to correct for the problem of simultaneous determination of interest rates and inflation rates.

In all cases the sign of the nominal interest rates and inflation rate is equal to what was theoretically expected: the nominal interest rates come out as positive and the inflation rate comes out as negative and with an absolute value equal to that of the interest rate. The results confirm the presumption that the demand for real deposits depends on the real interest rate paid on them. The coefficients are significant at the 1% confidence level and do not differ, in the OLS estimations, in absolute value between the two periods, indicating that no significant structural change took place along those 10 post-financial reform years.

The estimates for the longer period using instrumental variables ,Regression (c), remain highly significant but their absolute values for the interest elasticity are higher than in the OLS estimate. In this case the semi-log interest elasticity with respect to the monthly real interest rate is about 1.1 in the short run and 11 in the long run. These estimates mean that a 10% fall in the demand for deposits requires, for them to be rolled over, an increase of 9 percentage points in the monthly interest rate in the short run and 0.9 percentage points in the long run. Unfortunately, the instrumental variables technique did not yield satisfactory results for the later period, probably because the instruments used could not capture the sharp fluctuations experienced in both nominal interest rates and inflation rates during this period.

In the system we have described above, the real interest rate on time deposits of the institutionalized financial system depends on a delicate equilibrium between expectations of melt downs and the need of the government to refinance its debt with the financial system that is the counterpart of most of the interest earning deposits at the commercial banks.

If we assume that the government controls the rate of devaluation and can always outsmart the market by devaluing by more than what was expected, we arrive to the conclusion that to a certain extent the government determines the ex-post real rate of interest. The ex-post real interest rate in the financial system is basically determined by the only significant creditor of the system: the Central Bank. This is certainly not done on a monthly basis but it is actually obtained through the inevitable melt-downs that systematically take place.

TABLE 11

DEMAND ESTIMATES FOR INTEREST EARNING DEPOSITS

LOG(D/P) = C + A1.LOG(D/P)(-1) + A2.INT + A3.INF

D= M2-M1 (Interest earning deposits from FIEL databank)

P= Consumer Price Index

INT= Nominal Interest on Deposits, monthly basis (IFS Line 60L)

| | R(a) | R(b) | R(c) |
|---|---|---|---|
| C | 0.981 | 0.758 | 0.991 |
| | (4.6) | (2.1) | (4.0) |
| A1 | 0.929 | 0.946 | 0.928 |
| | (60) | (35) | (51) |
| A2 | 0.629 | 0.524 | 1.10 |
| | (6.0) | (3.92) | (3.59) |
| A3 | -0.765 | -0.659 | 1.09 |
| | (-9.6) | (-6.2) | (-4.52) |
| R2 ADJ.: | 0.977 | 0.964 | 0.973 |
| D-W : | 1.72 | 1.87 | 1.83 |
| F : | 1876 | 530 | 1601 |
| N: | 132 | 60 | 132 |
| PERIOD : | 1978.01/ 1988.12 | 1984.01/ 1988.12 | 1978.01/ 1988.12 |
| METHOD: | OLS | OLS | TSLS |

Instruments for Regression (c): Log(DP-1),INF(-1),INF(-2),INT(-1) INT(-2)

Why do depositors agree to remain into such an uncertain asset?. Partly because they are systematically tempted with attractive ex-ante real interest rates. Devaluations always happen, but they are usually done by the newly appointed Minister, the previous Minister having been just fired because of his now obvious policy mistakes!. Why do people believe in the new Minister and accept from the begining the roll over of the remaining deposits in spite of having been just melted down remains unexplained. The fact is that credibility in new Ministers is decreasing over time as the same experiment is repeated over and over again.

Consider the initial nominal interest rates after the last full-fledged stabilization plans, all of which were based on a large devaluation promised to be the last ever. The Austral Plan (June 1985) devalued by 40% and the interest rate immediately after the devaluation was around 7% per month. The Primavera Plan (August 1988) devalued by 24% and the resulting interest rate was around 10%. The Bunge Born I plan devalued by 200% and the initial interest rate was set at 17%. The Bunge and Born Plan II (December 1989) devalued by 54% and the initial interest rate after the devaluation was around 60% per month. Finally, in January 1989, the Erman Plan converted mandatorily all Time Deposits into a 10 year dollar denominated government bond (that started trading at about 30-40% of par value) and the interest rate in the initial days was around 100%. In the days prior to the announcement of the Erman Plan, monthly interest rates reached levels of 600% per month for large depositors because of the expectations of a forthcoming melt down. After the melt down, that took place on January 2 1990, interest rates only fell to 100% per month which is an indicator of how little confidence the market still had in the success of this new plan.

It is clear that the institutionalized credit market in Australes performs no significant role insofar as the generation of new credit. All of the potential credit tends to be absorbed by the government as a result of the need to finance its deficits and since 1985, at least, its primary role has been that of refinancing the stock of public debt that has its counterpart in the stock of bank deposits. A change may have taken place after March 1990, when the government announced still another fiscal adjustment effort and a reform of the Charter of the Central Bank started to be devised for the second time in less than a year. It is however still too soon to open judgement of the possibilities of success of this new set of promises.

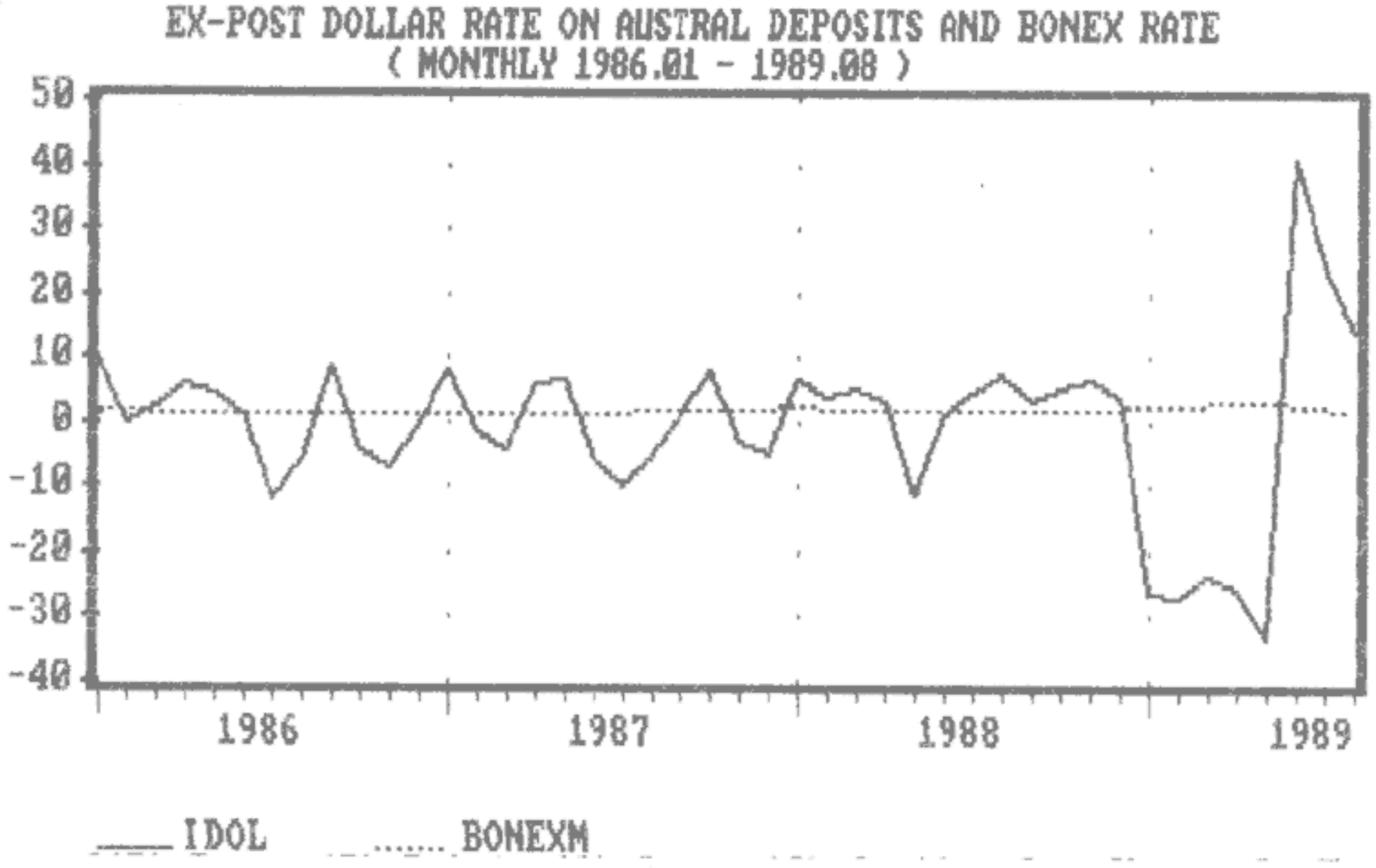
There has been an additional source of credit to the government in Argentina provided by the issuance of different types of Treasury debt and Central Bank instruments that are either indexed to prices or most commonly to the dollar. One such kind of government paper is the series of bonds denominated BONEX, that started being issued in 1980. These BONEX pay LIBO rate, have a ten year maturity and usually trade below par in spite of the fact that all BONEX have been regularly served so far. The internal rate of return on the BONEX (if held to maturity) is usually taken as a measure of the marginal cost of borrowing in dollars for Argentina.

BONEX have a strong demand by Argentines as they are widely held as collateral for loans in the informal financial market. Since BONEX can be legally traded in secondary markets for either Australes or dollars, they are the mechanism through which firms and individuals can buy or sell dollars legally (holding dollars is legal, transacting them at the free market rate has been usually illegal, and the BONEX provides the way for doing it legally). Because of its wide acceptability, the IRR of the BONEX provides us with a good measure of the equilibrium dollar interest rate in Argentina as the other dollar or indexed rates tend to use the BONEX rate as the preferred reference rate. Most other instruments that are subject to devaluation risk, or have dubious possibility of collection, pay rates higher than the BONEX IRR. The BONEX rate puts a floor on other dollar rates in the informal system as nobody would lend in Argentina at less than this rate that is supposed to be the preferred rate for the Argentine market.

The IRBONEX (IRR on the BONEX) has shown significantly less variability than the ex-post realized dollar rate on Austral deposits. Both rates are shown in Figure 12.

Presently the stock of outstanding BONEX (series from 1980 up to 1987) stays at about 2200 million dollars, an amount larger than the dollar value of M1 (as of January 1990). The BONEX rate sets the reference rate for an even wider informal market for dollar indexed operations. The BONEX rate is not affected by exchange rate expectations (it is already set in dollars) and is the last of the assets that the market expects to be melted down by default. Changes in the BONEX rate can be assumed to be determined by changes in world dollar rates and in the creditworthiness of the Government.

FIGURE 12




The creditworthiness of the Government is not something to be taken for granted. The Government has stopped serving its external debt with commercial banks since 1987 and this debt traded at below 20% of par in 1988 (it fell to 12% in early 1990). The BONEX trades at parities above 70% because it has attained some type of a preferred status when the moment of servicing the debt comes about. Other supposedly preferred instruments have already been subject to forced refinancing and melting down, such as the LEDOL, a 90-day dollar bill issued by the Central Bank in August 1989 that was refinanced compulsorily with a Treasury bond with 10 years maturity that immediately started trading at 30% of par. Before it could even be issued, the Treasury Bond was changed in January for the new issue of BONEX 1989 used to purchase most of the outstanding Austral denominated government debt (and the plazo fijos) under the Erman I plan of January 2, 1990.

The best measure for the creditworthiness of the government is its ability to generate a fiscal surplus relative to its level of indebtedness. As we have already seen, the government has systematically been running a primary deficit in recent years. As a result, the government was eventually forced to practically default on its external debt, a process that starts gradually in 1982. The service of the BONEX actually competes with all other instruments of the internal debt. We therefore propose the existence of a positive trade-off between the Internal Rate of Return on the BONEX and the stock of Internal Debt of the Government. In addition, we would expect also that the BONEX rate be related to the opportunity cost of external funds as measured by a risk free rate such as PRIME or LIBOR.

In defining the relative value of the stock of government debt three deflators come to mind: the price level and the official and free market exchange rate. We have found that the official exchange rate is the deflator that yields the best econometric results in the sense that the real stock of debt (measured in dollars at the official exchange rate) is the one measure best associated to the interest rate on BONEX. This may be explained by the fact that much of the stock of government debt was generated by the Central Bank as a result of attempts to maintain constant the nominal value of the official exchange rate. The dollar value of the stock of debt in terms of dollar at the official exchange rate is therefore a measure of the pressures against the sustainability of such a rate. The higher is the stock of government debt evaluated at the official exchange rate, the less likely that the current set of policies may be maintained and therefore the risk premium of lending to the government increases.

The regression results assessing the link between the BONEX rate and the stock of internal government debt are shown below in Table 12. The regression estimates indicate a strong effect of the level of the government debt on the BONEX rate. In the long run, a 10% increase in the dollar value of the government debt results in an increase of 3.2 percentage points in the annual BONEX rate.

The external interest rate, measured by the monthly U.S. PRIME rate did not come out as significant in previous regressions so that it is not included there. Part of the reason may be due to the fact that since 1982 the country has not had access to external credit and therefore one should not expect any link between domestic and external interest rates. The fact is, however, that Argentines do hold considerable amounts of their assets in terms of foreign exchange. There are estimates of holdings in excess of 30 Billion dollars by Argentines in foreign assets (as compared to 2-3 billion for M1 in local currency). Since Argentines can freely shift the composition of their portfolio between foreign assets and local paper, we should expect some association between the local and external interest rates. We have no doubt that such a relationship exists, except that it is difficult to capture it statistically for a short period such as the one analyzed here and where the PRIME rate did not experience any significant variation as compared with the sharp oscillations in the BONEX rate that were induced by changes in the market's evaluation of the risk of lending to the government.

FIGURE 13

**STOCK OF GOVERNMENT DEBT (IN OFFICIAL DOLLARS) AND BONEX RATE (NORMALIZED VALUES)**

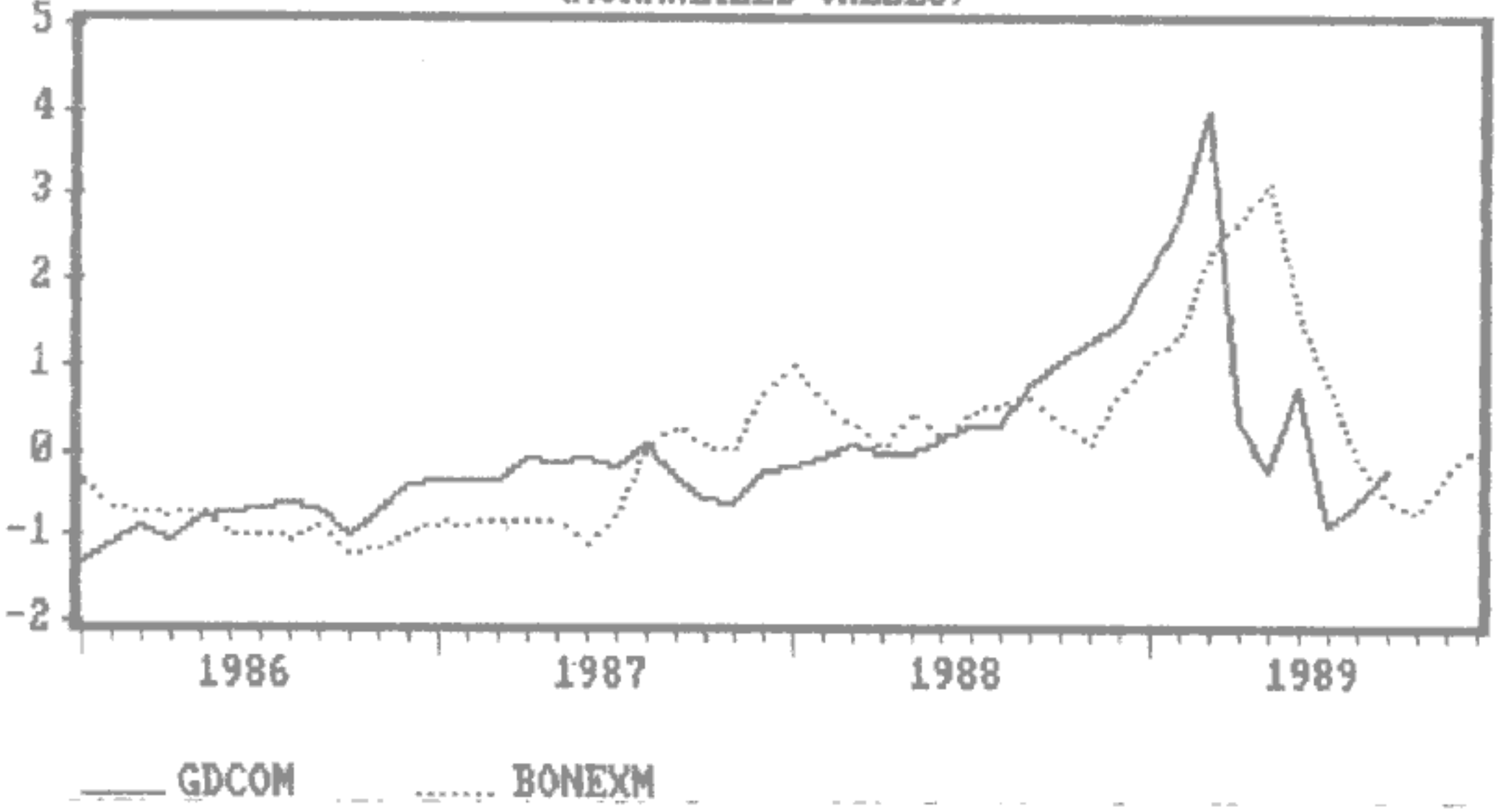


TABLE 12

THE BONEX RATE AND GOVERNMENT INTERNAL DEBT

IRRBONEX= -9.13 + 0.797 IRRBONEX(-1) + 6.53 Log(DGCOM)
(-2.5) (11.7) (3.37)

DGCOM: Dollar value of the stock of internal public debt evaluated at the Commercial Exchange Rate.

IRRBONEX: Annual equivalent of the IRR on BONEX.

R2 ADJ.: 0.84
D.W.:1.66
Durwin H:1.23
METHOD: OLS

Correction for first order autocorrelation did not yield a statistically significant AR(1) and it is therefore not reported here. The Durwin H test also does not show any significant autocorrelation.

PERIOD: 1986.04 1989.09

## VI.3 Interest Rates and Inflation in the Steady State

In the previous section we have been concerned about the short run trade-off between nominal and real interest rates and the Central Bank policy about the composition of its debt between remunerated and non-remunerated. We shall now describe the long run steady state trade off between interest rates and government debt policy.

In order to focus on the essential elements of the process, mainly that interest is being paid on money by means of printing more money, we will assume there is a 100% reserve requirements on both remunerated, D, and nonremunerated, M1, money. Under this assumption, we can write the monetary base, MB, as follows:

$$(5) \qquad MB = M1 + D$$

We also assume the following behavioral relationships between the demand for the two kinds of monies, and the inflation and nominal interest rates:

$$(6) \qquad M1 = P.L(pi), \qquad L'<0$$

$$(7) \qquad D = P.F(i-pi), \qquad F'>0$$

The change over time of the monetary base is given by:

$$(8) \qquad d(MB)/dt = i.D + def,$$

where the variable def represents the nominal budget deficit, and i.D represents the Central Bank's remuneration of the interest-bearing deposits D.

The real budget deficit, g, is of course given by:

$$(VI.) \qquad g = def/P$$

Finally, we use the Fisher equation to define the real interest rate, R, as follows:

(VI.10) $$R = i - pi,$$

In the steady-state the following equality must hold:

(VI.11) $$(d(MB)/dt).(1/MB) = pi$$

Dividing (VI.8) by MB, and using (VI.9), we can write:

(VI.12) $$(d(MB)/dt).(1/MB) = i.D/MB + g.P/MB$$

From (VI.5), (VI.6), and (VI.7), we can express the real monetary base as:

(VI.13) $$MB/P = L(pi) + F(R)$$

Hence, using (VI.7), (VI.10), (VI.12) and (VI.13) we can rewrite the steady-state equilibrium condition, (VI.11), as follows:

(VI.14) $$L(pi).pi = F(R).R + g$$

In an economy where the real sector, or the international capital market, determines the real interest rate, the equilibrium condition established by equation (VI.14) determines the inflation rate. The equilibrium inflation rate is the one which delivers the inflation-tax revenue required to pay for the real budget deficit, g, and the real service of the Central Banks's debt (the real quasifiscal deficit), F(R)R.

There are, of course, real interest rates for which equation (VI.14) has no solution. This corresponds to the situation where the amount of resources required by the sum of the two deficits exceeds the maximum stationary inflation tax.

There will normally be many real interest rates for which there are two solutions for (VI.14). For these cases we assume that the monetary authority chooses the lowest inflation-rate, or efficient, solution. This assumption is important because -as we will see next- it determines the sign of the equilibrium relationship between the real interest rate and the inflation rate. Differentiating (VI.14) we observe that along the steady-state equilibrium relationship between r an pi we must have:

(VI.15) $d(pi)/d(R) = (F+R.F')/(L+pi.L')$

As long as the economy stays on the efficient side of the inflation-tax Laffer curve, the right hand side of (VI.15) must be positive -that is, to an increase in the real interest rate it corresponds an increase in the equilibrium inflation rate.

It is obvious from our model that in an economy where the real sector does not determine the real interest rate, the financial sector alone cannot determine both the real interest rate and the inflation rate. The financial sector provides us with one equation, (VI.14), but we have two unknowns, R and pi. The Argentine economy seems to be precisely such kind of an economy. In one hand, the supply of loanable funds comes from deposits, both remunerated and non remunerated, that people hold not as an alternative investment but just for liquidity reasons. In the other hand, the demand for loanable funds is related just to the short-term liquidity needs of business firms. Saving and investment in Argentina -the capital market- no longer function in local currency.

As we describe in this paper, the Argentine monetary authorities tried to use the apparent degree of freedom provided by the lack of connection between the financial market and the real sector during the 1982-1989 period, to manipulate the real interest rate in order to control the composition of the Central Bank's liabilities. In particular, they have tried to prevent the expansion of the Central Bank's nonremunerated liabilities by rising the real interest rate as much as required by the market to hold remunerated liabilities. This has been done under the belief that it is only the expansion of the nonremunerated liabilities what causes prices to rise over time.

The result of this monetary policy has been a sort of "unpleasant monetarist arithmetic," because by rising the real interest rate they have increased the required inflation-tax revenue, thus making necessary an increase in the equilibrium inflation rate.

By choosing the composition of its liabilities between remunerated and non-remunerated the Central Bank chooses a point in the trade-off given by (VI.15). This can be seen by dividing (VI.7) by (VI.6) and denoting by $\sigma$ to the ratio of remunerated to non-remunerated Central Bank debt. The relationship between $\sigma$, pi and R is given by:

(VI.16) $\sigma = F( R )/L(pi)$

Assuming the equilibrium is at the efficient side of the Laffer revenue curve, (VI.14) describes an upward slopping relationship between R and pi. For a given σ, (VI.16) describes a downward slopping relation between R and pi. The intersection of both schedules determines the unique steady state values of R and pi. A higher σ is associated with a rightward shift in the downward slopping schedule (VI.16) and therefore with a higher R and pi in the new steady state.

The nature of the trade off between remunerated debt and inflation is now clear. In the short run, increasing σ (reducing liquidity by issuing interest earning debt) helps reduce pressures on inflation. In the long run, the rate of nominal monetary expansion must be higher in order to finance not only the previous deficit but the real interest service on the larger remunerated debt.In consequence, the inflation rate must be higher, as well as the real interest rate since the real stock of debt is higher and depositors in the banks should be induced to hold the extra deposits with which to finance the extra government debt (call it remunerated reserve requirements or Treasury Bills held by banks or compulsory bank investments, etc.).

## VII. THE EXTERNAL EFFECTS OF PUBLIC SECTOR DEFICITS

The external effects of the public sector deficits can be analyzed in a two-step process: first, the effects of the fiscal deficit on the level of aggregate spending and therefore on the trade balance deficit and, second, the effects of the changes in aggregate spending, measured by the trade balance on the real exchange rate. Additional side effects are those of portfolio shifts induced by changes in the rate of inflation that result in changes in the desired rate of accumulation of foreign assets and therefore on the Trade Balance. Finally, the rate of government spending may also affect the Real Exchange Rate if the government has a different propensity to consume non-traded goods than the private sector.

We shall first discuss the process of determination of the real exchange rate and then continue with the analysis of the fundamental determinants of the Trade Balance.

## VII.1 The Theoretical Framework for the Determination of the Real Exchange Rate.

Consider an economy with three broad aggregates of goods: exportables, import competing and non-traded,with nominal prices Px, Pm and Ph respectively. The concept of the Real Exchange Rate intends to be a measure of some aggregate of nominal prices of traded goods (Px and Pm) in terms of non-traded goods (Ph). In general, however, this economy must have two relevant relative prices : Px/Ph and Pm/ph, to which we shall refer as the export and import real exchange rates (RERX and RERM respectively).

Being relative prices, both RERX and RERM are endogenously determined. As such, they cannot be considered as policy variables. It is the case, however, that for a given (equiproportional) change in the equilibrium values of the RER's, an accommodation can be made in the nominal exchange rate so that the RER's get to their new equilibrium values without need for variations in domestic prices of non-traded goods. It is also the case that a nominal exchange rate policy that indexes this nominal variable to some aggregate price level may force the RER measures to depart from their equilibrium levels for long periods of time. It is important, therefore, to have available a structural model of determination of the equilibrium values of the RER so that nominal exchange rate policy does not force this previous studies on Real Exchange Rate determination in Argentina were done in Cavallo and Peña( 1984), Diaz-Alejandro(1981) and Rodriguez and Sjaastad(1979).

The model used here follows the one presented in Rodriguez(1989). Basically this model assumes that for internal balance to be achieved, there must be an equilibrium relation between the three nominal prices and the rate of nominal spending. Such relation can be interpreted as the condition for equilibrium in the market for non-traded goods.In functional form, such equilibrium can be expressed as:

(VII.1) $Dh(Ph, Pm, Px).A - Sh(Ph,Pm,Px).Y = 0$ , where

A: nominal rate of Absorption
Y: Nominal Income
ts= (Y-A)/Y : Trade Balance surplus normalized by GDP.

where Dh(.) is the fraction of total absorption of goods devoted to the purchase of non-traded goods and Sh is the fraction of the value of the output of non-traded goods in the total nominal GDP.

In (VII.1) we have assumed that supply and demand for non-traded goods are homogeneous of degree one with respect to the levels of nominal output or absorption respectively.

Since (VII.1) must be homogeneous of degree zero in all nominal variables, we can deflate by Ph to obtain:

(VII.2)

$$Dh\{Pm/Ph, (Px/Pm).(Pm/Ph)\}.(1-ts) = Sh\{Pm/Ph,(Pm/Px).(Px/Pm)\}$$

or:

(VII.3)

$$RERM = G\{ (Pm/Px), ts).$$

In logarithmic form, (VII.3) can be expressed as:

(VII.4)

$$Log(RERM) = Co + w.Log(Pm/Px) + z.ts.$$

Since Log(RERM) = Log(Pm/Ph), we can interpret (VII.4) as the equation determining the equilibrium value of Ph given the exogenous values of Px, Pm and ts. Both Px and Pm are determined by foreign prices and commercial policy, whereas ts is determined by macroeconomic variables related to the equilibrium rate of foreign savings (to be analyzed later). From this perspective, we expect w to be positive and between zero and one, as it is the elasticity of Ph with respect to an increase in the nominal price of exports, holding ts and Pm constant (a detailed analysis of these relationships may be seen, among others, in Sjaastad(1978), Dornbusch(1974) or Harberger(1988)).

Since RERM= RERX.(Px/Pm) it follows that (VII.4) can also be expressed as:

(VII.5) $Log(RERX)= Co + (1-w).(log(Px/Pm) + z.ts.$

In general, we expect the parameter z to be positive, as it represents the effect on Ph of an increase in absorption relative to income (as some extra spending falls on Qh, Ph raises and thus RERX and RERM must fall; in terms of (11), as ts rises, absorption falls and so does Ph, from where it follows that z must be positive).

In general, it is usual to refer to THE Real Exchange Rate, this being defined as the relative price of some average price of traded goods. Assume this average is formed in the following way:

(VII.6) $\text{Log}(PTA) = a.\text{Log}(Px) + (1-a).\text{Log}(Pm)$.

The Average Real Exchange Rate would then be:

(VII.7) $\text{Log}(AVRER) = a.\text{Log}(Px) + (1-a).\text{Log}(Pm) - \text{Log}(Ph)$

Since $\text{Log}(Ph) = -Co + w.\text{Log}(Px) + (1-w).\text{Log}(Pm) - z.ts$, we can substitute it into (VII.7) to obtain:

(VII.8) $\text{Log}(AVRER) = Co + z.ts + (a-w).\text{Log}(Px/Pm)$.

It follows from (VII.8) that if the aggregation parameter "a" is chosen identical to the structural parameter w, then the AVRER will not depend on the terms of trade or commercial policy. In general, depending on the aggregation weights used, an average RER could depend on the terms of trade in any conceivable way.

Assume now that the government also demands non-traded goods in a proportion Gh.Ag, where Gh is the share of expenditure of the government in non-traded goods and Ag is total spending done by the government. Market equilibrium is now given by:

(VII.9) $Dh.Ap + Gh.Ag = Sh$

where Ap is the level of private sector absorption.

Defining the total level of absorption as $A = Ap + Ag$, it follows that all of the prior analysis is still valid if Gh is identically equal to Dh, e.g. if the demand of the government is identical to the demand of the private sector. If $Gh > Dh$, an increase in government spending, for a constant total absorption, implies that the demand for non-traded goods will raise and therefore the RER must fall (there has been a shift in the composition of absorption towards the sector with the higher propensity to consume non-traded goods). Conversely, if $Gh<Dh$, an increase in government spending, for constant total absorption, will mean a higher equilibrium RER. In consequence, the relation between the RER and the rate of government spending is subject to empirical determination.

The final expression to be tested empirically, incorporating the possibility of government spending at a rate different from the private sector is therefore:

(VII.10) $Log(RERM) = Co + w.Log(Pm/Px) + z.ts + \epsilon.Ag$

where the sign of $\epsilon$ is the same as the sign of the difference between the government and the private sector propensities to consume non-traded goods. If the government has a higher demand for N-T goods than the private sector, an increase in government spending for a given level of total demand implies a shift in demand towards N-T goods and therefore a fall in the import real exchange rate.

Unfortunately, we do not have available quarterly or monthly series of government spending so we were restricted to the use of annual data for the period 1964-87. The results below show the estimation of the structural relation for the import real exchange rate. This variable is constructed as the ratio of the imported component of the Wholesale price index to the Consumer Price Index:

LRERM= Log(Price of Imports from WPI/Consumer Price Index).

The explanatory variables are:

(1) TSGDP: Ratio of the Trade Account Balance to GDP (since the Trade Account is denominated in dollars, the nominal GDP was converted into dollars using the official exchange rate for commercial transactions from the FIEL data bank). The expected sign of the effect of this variable on RERM is positive.

(2) Internal terms of trade (in logarithm:LPXM:Log(PX/PM), equal to the ratio of the agricultural component of the WPI to the imported component of the same price index. This variable incorporates the substitution effects due to the external terms of trade and of taxes and subsidies to foreign trade. The expected sign of the effect of this variable on RERM = PM/PH is negative (a raise in PX raises PH by a smaller proportion and thus reduces PM/PH).

(3) Government spending, captured by the ratio of nominal government spending to nominal GDP. The expected sign of this variable is negative under the reasonable assumption that the government has a larger propensity to consume non-traded goods than the private sector.

The empirical results show that all the three variables have the expected signs and are highly significant in the determination of the Import Real Exchange Rate of Argentina. The trade surplus coefficient equals 0.07 indicating that a 1% percentage point increase in the trade surplus to GDP ratio is associated with a 7% increase in the import real exchange rate. The coefficient of the internal terms of trade is approximately equal to 0.5. This means that a 10% raise in the price of imports (or of exports) results in a 5% raise in the CPI that is our measure of the Non-Traded goods price index. Finally, the coefficient of the ratio of government spending to GDP is equal to -0.02 meaning that a one percent increase in this ratio is associated with a 2% decrease in the real exchange rate. This result implies that the government has a higher propensity to spend in Non-Traded goods than the private sector.

In order to correct for simultaneous determination bias the regression was estimated with two stage least squares. Instrumental variables were used for the trade surplus to GDP ratio (instruments where the current and lagged primary deficit of the public sector, lagged trade balance to GDP ratios and current and lagged remaining explanatory variables). All of the coefficients are significantly different from zero at the 2% confidence level or less. Figure 14 shows the actual relation between the Trade balance to GDP ratio and the import real exchange rate (both variables are normalized by their means).

Since the late 1970's, the Argentine foreign debt rose from a negligible level up to close to 100% of GDP (in 1990, when the debt, including the arrears accumulated since 1988 reached a level of 66 billion dollars). Servicing this debt would require a Trade Surplus of about 10% of GDP just for the nominal interest (assuming an interest rate of 10% per year, and the additional assumption that the government, who is the main debtor, has a fiscal surplus large enough to purchase the required trade surplus in order to pay its debt).

According to our regression results, generating a TSGDP of 10% as required for the full servicing of the nominal interest on the Argentine foreign debt would imply a real exchange rate 70% higher than the one prevailing in the absence of the need to service the external debt. The fact is, however, that the real exchange rate is in 1989 at similar levels than the ones that prevailed in the early 1970's when the debt was non-existent, partly a reflection of the fact that Argentina has not serviced her external debt since 1988.

Other factors also have worked towards the maintenance of a relatively low real exchange rate, particularly the increase in real government spending that, according to our results, is biased towards non-traded goods and therefore tends to lower the equilibrium real exchange rate. Government spending as a fraction of GDP has increased from about 27% in the early 70's to 43% in 1987, after having reached a maximum of 56% of GDP in 1983. According to the empirical results in Table 13, each additional point of GDP in government spending is associated with 2.1% fall in the real exchange rate.

TABLE 13 : REAL EXCHANGE RATE DETERMINATION

TSLS // Dependent Variable is LRERM

SMPL 1964 - 1987

24 Observations

Instrument list: C TSGDP(-1) TSGDP(-2) PD PD(-1) LPXM LPXM(-1) TEGDP TEGDP(-1)

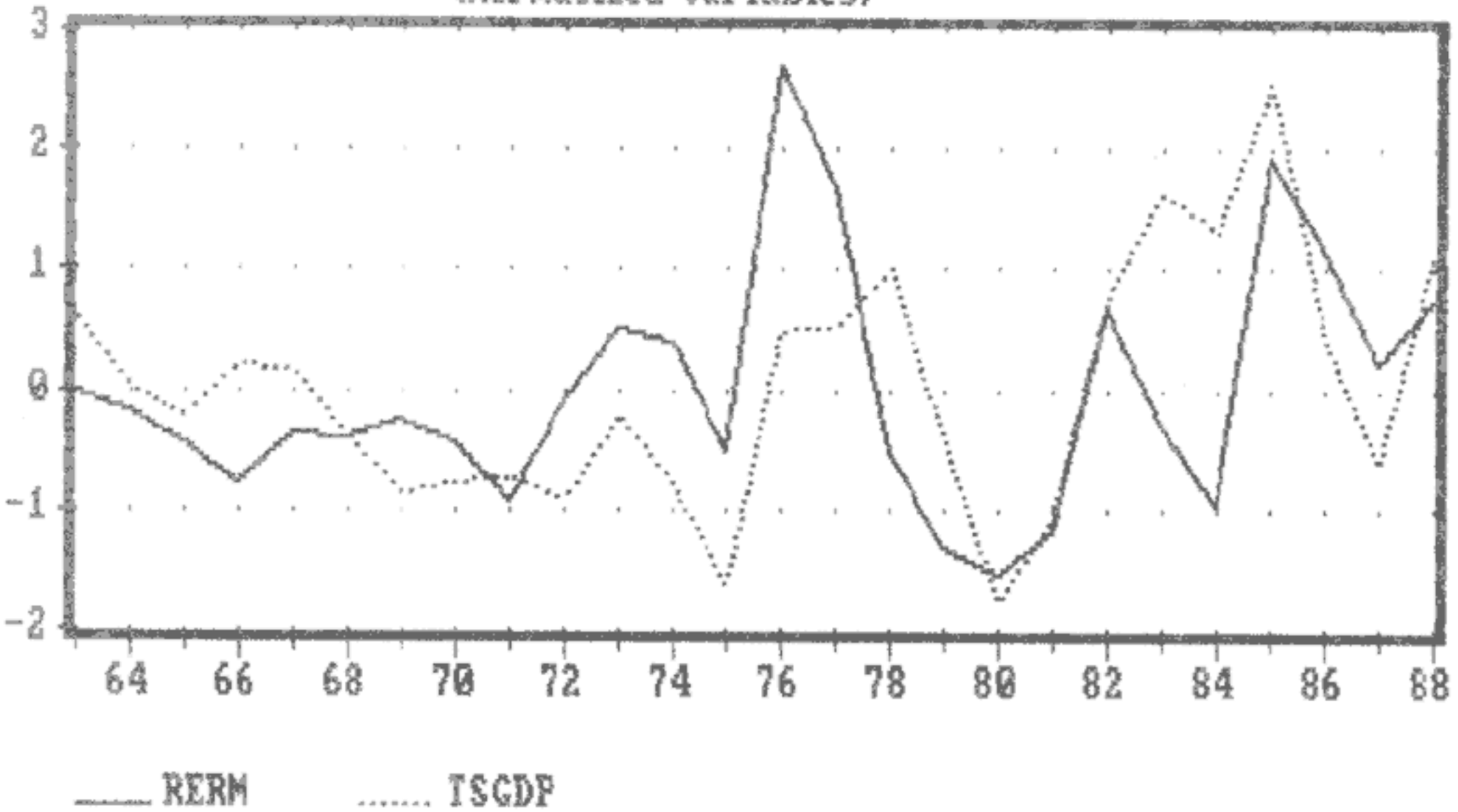
Convergence achieved after 4 iterations

| VARIABLE | COEFFICIENT | STD. ERROR | T-STAT. | 2-TAIL SIG. |
|---|---|---|---|---|
| C | 5.1585589 | 0.2979595 | 17.312952 | 0.000 |
| TSGDP | 0.0713868 | 0.0290358 | 2.4585765 | 0.024 |
| LPXM | -0.4925328 | 0.1745254 | -2.8221277 | 0.011 |
| TEGDP | -0.0212179 | 0.0072522 | -2.9257233 | 0.009 |
| AR(1) | 0.3487151 | 0.2224754 | 1.5674318 | 0.134 |

| | | | |
|---|---|---|---|
| R-squared | 0.612430 | Mean of dependent var | 4.392807 |
| Adjusted R-squared | 0.530836 | S.D. of dependent var | 0.214294 |
| S.E. of regression | 0.146782 | Sum of squared resid | 0.409352 |
| Durbin-Watson stat | 1.637667 | F-statistic | 7.505844 |
| Log likelihood | 14.80027 | | |

FIGURE 14

RELATION BETWEEN THE REAL EXCHANGE RATE AND THE TRADE BALANCE
(Normalized Variables)



## VII.2 The Trade Balance and the Fiscal Deficit

The deficit of the public sector, as measured by the Public Sector Borrowing Requirements, is the result of the difference between government spending and government tax revenues. It is therefore imperative in describing the effects of a given deficit to separate the effects of the financing of the deficit from those derived from the given levels of government spending or taxation. In order to do so we have to design a conceptual experiment. In our case we shall assume that there is available a neutral tax, e.g. a value added tax or a consumption tax such that changes in the level of this tax do not affect the relative structure of demand for goods or assets. The deficit is then generated by reducing this neutral tax and increasing accordingly the level of debt financing, either external or internal. From this perspective, what we will be analyzing is the effects of tax vs. debt financing in the context of an open economy. In the case of internal debt financing the government may resort to issuing interest bearing debt (bonds) or non-interest bearing debt (money).

The issue of tax vs. debt financing has received a lot of attention in the literature in reference to the well known Ricardian equivalence proposition. The general thrust of the Ricardian proposition is that a tax reduction financed with debt will have no real effects on the economy if the public discounts the future taxes to service the debt and therefore increases savings by the exact amount of taxes reduced. The empirical validity of the Ricardian equivalence is, however, quite inconclusive.\1/

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1/For a survey on issues related to the Ricardian Equivalence see Leiderman and Blejer(1988).

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In the context of an open economy, the real exchange rate is a crucial relative price for the allocation of resources in the external sector. This relative price will certainly be affected by the composition of government spending and may also be affected, depending on the validity of the Ricardian equivalence proposition, by the way of financing of such spending through its effects of the Trade Balance. Next we shall discuss the general issues involved in the analysis of the Ricardian equivalence proposition in relation to the external effects of debt vs. tax financing. After establishing the theoretical aspects of the process of determination of the Trade Balance we shall present empirical estimates of the actual relationships for the Argentine data.

We are concerned here with the short run effects of deficit financing on the levels of the real exchange rate, The Trade and Current Account, the levels of domestic and foreign indebtedness and, finally, the inflation rate to the extent that the deficit is financed with money creation.

Define the following variables:

(VII.11) Y= GDP

(VII.12) Fpg= Net financing from private sector to government: Taxes plus acquisition of domestic paper (debt or currency minus interest collected on domestic debt).

$$Fpg = T + dC/dt + dD/dt - i.D$$

where C represents Money and D Internal Gov.Debt.

(VII.13) Fep= Net Financing from foreign to private sector:Gross borrowing minus interest paid on foreign private debt.

$$Fep = E.dD^*p/dt - i^*.E.D^*p$$

where D*p is the external private debt and E the exchange rate.

(VII.14) G= Government spending on goods

(VII.15) Feg= Net financing from foreign to government sector.

$$Feg = E.d(D^*g)/dt - i^*.E.D^*g$$

where D*g is the external government debt.

Private Sector Budget Constraint
==========

(VII.16) Gp = Y + Fep -Fpg = Private spending on goods.

Government Budget constraint
==========

(VII.17) Gg = Fpg + Feg = Government spending on goods

Total Spending on goods
=======================

(VII.18)  GT = Gp + Gg = Y + Fep + Feg

Starting from (VII.18) we can derive a set of propositions that will be the basis for the subsequent analysis.

PROPOSITION (1) : TOTAL SPENDING ON GOODS CAN EXCEED TOTAL OUTPUT
================ ONLY IF IT IS EXTERNALLY FINANCED. Follows from (VII.18)

PROPOSITION (2) : FOR A GIVEN COMPOSITION OF TOTAL SPENDING ON
================= GOODS BETWEEN TRADED AND NON-TRADED, THE REAL EXCHANGE RATE DEPENDS ON THE DIFFERENCE BETWEEN TOTAL SPENDING AND TOTAL OUTPUT OF GOODS, I.E., ON THE TRADE BALANCE DEFICIT THAT IS EQUAL TO THE AMOUNT OF NET EXTERNAL FINANCING. Follows from (VII.10)

PROPOSITION (3) : GOVERNMENT FINANCING STRATEGIES WILL AFFECT THE
================= REAL EXCHANGE RATE ONLY IF THEY AFFECT THE TRADE BALANCE. Follows from P2.

PROPOSITION (4) : GOVERNMENT FINANCING STRATEGIES WILL AFFECT THE
================  TRADE BALANCE ONLY IF THE RICARDIAN EQUIVALENCE PROPOSITION DOES NOT HOLD. IF THIS IS THE CASE A TAX REDUCTION FINANCED THOUGH INCREASED DEBT (INTERNAL OR EXTERNAL) WILL RESULT IN SOME INCREASE IN PRIVATE SPENDING. IN CONSEQUENCE THE TRADE SURPLUS WILL DETERIORATE AND THE REAL EXCHANGE RATE SHOULD FALL. WE WOULD THEREFORE OBSERVE THAT A FISCAL DEFICIT GENERATES A REAL APPRECIATION.

Proposition (4) is our starting point of analysis. The relevant question is whether the government financing strategies can affect the level of private spending, i.e., the issue of the crowding out, in this case referring also to external borrowing. In order to discuss the effects of deficit financing on the real exchange rate we have to define a neutral experiment through which the deficit increase does not affect the composition of total spending which, of course, would be a very obvious way to affect the real exchange rate. The experiment will be a tax reduction coupled by an equivalent increase in government indebtedness (internal or external). In this way, we are assuming that a deficit is generated without a corresponding increase in the rate of government spending.

There are three ways to finance such a deficit: increase domestic debt, increase external debt or increased rate of money creation. In what follows we shall discuss each case separately.
(a)Tax Reduction financed by external government borrowing

Consider a situation where the government switches from tax financing to external financing. If the private sector reacts by investing the tax savings in foreign assets, there will be no effect on total spending or in the trade surplus. The real exchange rate will not be affected because government borrowing was unable to affect the Trade Balance. In terms of Eqn(8), the increase in Feg is matched exactly by a decrease in Fep, so that their sum remains unchanged.

The above conclusion follows from a straightforward generalization of the Ricardian Equivalence Theorem for foreign borrowing. This issue was analyzed in the context of an optimal model by Auernheimer(1987), Leiderman and Blejer(1988), and Frenkel and Razin (1986), and has some empirical confirmation in the Argentine experience during 1978-81.

During 1978-81, the Argentine government acquired a substantial external debt that was to a great extent matched by private capital outflows. The private capital outflows, however, took place later in time when it was already perceived that the governments borrowing and exchange rate policy was doomed to failure. There was a transitional period, however, when the government debt was building up, during which the trade deficit deteriorated substantially (although part of it may have been due to the trade liberalization that took place coupled with the cuasi-fixed exchange rate policy being followed). It is therefore not clear whether the private capital outflow observed was a private compensation for the increased government debt or a simple speculative movement induced by expectations of a large devaluation.

As mentioned in Leiderman and Blejer (op.cit.) there is a wide variety of reasons why the Ricardian equivalence proposition may not hold to its full extent, even in the open economy. Among these reasons they mention the existence of borrowing constraints, distortionary taxation, uncertainty about the imposition of the required future taxes, differences in planning horizons for the private and public sectors, and we might add risk induced differentials in rates of interest at home and abroad and differences in spending propensities among taxpayers and bondholders.

(b) Tax reduction financed by internal borrowing

A similar result regarding substitutability can be described if the government deficit is financed with internal debt. If Ricardian equivalence holds, the lower taxes will be used by the private sector to acquire the increased internal issue of debt so that total private spending will not be increased. There might be, however, indirect effects due to portfolio composition effects that may affect the composition of spending between consumption and investment goods.

However, if the private sector purchases the internal debt with increased foreign indebtedness, we will observe an increase in external financing and therefore the trade balance and the real exchange rate will be affected. In this case the Ricardian proposition would not hold since private spending has increased to the exact amount of the tax reduction. Here again, the issue should be subject to empirical verification: is government borrowing intermediated externally by the private sector or not?. This case corresponds to the standard version of the open economy with perfect international capital mobility, as presented by Mundell or Fleming in models in which Ricardian equivalence does not hold. In this context, any increased domestic borrowing by the government will tend to raise the domestic interest rate and induce private capital inflows in the exact amount of the government borrowing so that the interest rate remains unchanged.

(c) Tax reduction financed through inflation tax

This is the most obvious example of neutrality since it amounts to the substitution of a tax by another so that we should not expect any direct effect on the rate of private spending. However, a differential tax has been instrumented on a single financial asset, money, and this may have short and long run effects on the desired rates of acquisition of the other assets, in particular external assets. The higher inflation rate may stimulate larger desired holdings of external assets by the private sector. In the short run this implies larger capital outflows and therefore, through the reduced rate of private spending, a larger Trade Surplus (and higher real exchange rate). In the long run, as foreign private assets are larger, the interest income will be larger. This means that the Trade Surplus must be lower than otherwise since the interest earned must be spent on foreign goods. The long run effect should therefore be to lower the real exchange rate. The dynamic aspects of inflationary financing on the Real Exchange Rate and the Trade Balance have been analyzed in several works, among which we may mention: Calvo and Rodriguez(1977), Frenkel and Rodriguez (1982) and Calvo (1985).

The above analysis suggests that the non-neutrality of the deficit in the case of the inflation tax is due to the use of a non-neutral tax on one domestic asset, namely money, and not to the validity or lack of validity of the Ricardian equivalence proposition.

## General Conclusions

A deficit financed with debt, be it domestic or foreign, is bound to affect the Trade Surplus only if the reduced taxes do affect the rate of private spending. If the private sector uses the reduced taxes to acquire the new issues of internal debt (if the deficit is internally financed) or to acquire foreign assets (if the deficit is externally financed), there will be no effects on the rate of private spending and therefore there will be no relation between the deficit and the Trade Balance or the real exchange rate. In this case, the Ricardian equivalence proposition will be valid, and the choice of tax or debt financing will be totally neutral, also in the case of an open economy.

Inflationary financing of the deficit will affect the external sector through the portfolio induced effects on desired private holdings of foreign assets. We expect totally opposite effects of a higher inflation rate on the Trade Balance in the short run and in the long run. In the short run higher inflation should improve the Trade Balance while the opposite should be valid in the long run.

## Empirical Analysis

The above discussion suggests that the expected rate of inflation and the real stocks of assets held by the private sector should be among the variables in the equation of determination of the Trade Balance, as they are linked to the desired rate of accumulation of foreign assets.

Another variable that theoretically belongs in the Trade Balance equation is the Terms of Trade (Laursen-Metzler effect). An improvement in the Terms of Trade increases real income and this may induce an increase in the desired stock of foreign assets to be held. However, the relation is not that clear since a debtor country facing an increase in real income may decide it can support a larger stock of foreign debt. The final answer on the relation between the Terms of Trade and the Trade Balance, therefore, will be empirical.

The deficit variable chosen consists of the deficit of the Consolidated Public Sector before any interest service (primary deficit), this being normalized by GDP. The Terms of Trade series are from ECLA. There is no series available on the stock of foreign assets held by argentines. As proxies we have tried two variables: (i) the balance on the service account of the Balance of payments and (ii) a measure of foreign assets held build by the accumulated sum of Current Account surpluses.

None of the variables trying to capture the effects of the level of foreign indebtedness turned out to be significant in the explanation of the Trade Balance. One would expect a positive sign from the level of foreign debt (or its service) on the trade balance surplus, indicating that the economy does some adjustment in order to service its debt.

In Regression A1, the debt service variable has the correct sign but is not significantly different from zero as the T-value of only 0.83 shows. In Regression A2 we try the series generated for the stock of foreign debt by accumulating the past current account deficits from 1960 onwards (and assuming the initial level of debt was arbitrarily equal to zero). This variable (lagged one period in order to represent the initial level of debt during the current period) also has the correct sign but again the coefficient is not statistically significant. This results simply verify the obvious observation that the Argentine economy has not paid up its external debt and therefore has not faced up the need to adjust the level of the external trade surplus.

It turns out that only two of the variables, inflation and the Fiscal Deficit are significant in the explanation of the Trade Surplus. In both cases the coefficients of the variables have the theoretically expected signs and are significantly different from zero at the 2% or less confidence level. Higher current inflation improves the trade balance surplus (it is not possible to illustrate the opposite long run effect because of the insignificance of the coefficient of the foreign assets held) in accordance to what is theoretically expected from the portfolio model discussed before. The primary deficit of the CPS is shown to deteriorate the trade balance surplus, as expected in an economy where the Ricardian equivalence proposition is not fully valid. The coefficient value of 0.32 indicates that one third of the value of a primary fiscal deficit results in a trade deficit. The trade deficit in turn requires a lower real exchange rate (a real appreciation) for the home goods market to clear. We therefore find a negative relationship between the real exchange rate and the primary deficit of the CPS.

TABLE 14 : TRADE BALANCE REGRESSIONS

LIST OF VARIABLES:

TSGDP: Trade Balance Surplus to GDP ratio.
INF: December to December inflation rate in CPI.
PD: Primary Deficit to GDP ratio of the CPS.
FASGDP: Ratio of Foreign Assets to GDP (built accumulating Current Account Surpluses).
SERGDP: Ratio of the Service Account Surplus to GDP.
MU:Rate of expansion in M1 (instrumental variable for inflation).
All regression were done with two stage least squares in order to correct for the simultaneous determination of TSGDP and inflation (PD, FASGDP and SERGDP were considered as exogenous variables).

REGRESSION (1)

TSLS // Dependent Variable is TSGDP

SMPL 1963 - 1988

26 Observations

Instrument list: C SERGDP INF(-1) PD PD(-1) MU MU(-1)

| VARIABLE | COEFFICIENT | STD. ERROR | T-STAT. | 2-TAIL SIG. |
|---|---|---|---|---|
| C | 1.6313156 | 0.7027608 | 2.3212957 | 0.030 |
| SERGDP | 0.1447856 | 0.1725432 | 0.8391266 | 0.410 |
| INF | 0.0094151 | 0.0037333 | 2.5219420 | 0.019 |
| PD | -0.2884181 | 0.1301306 | -2.2163746 | 0.037 |

| | | | |
|---|---|---|---|
| R-squared | 0.489888 | Mean of dependent var | 1.921335 |
| Adjusted R-squared | 0.420327 | S.D. of dependent var | 2.029074 |
| S.E. of regression | 1.544861 | Sum of squared resid | 52.50513 |
| Durbin-Watson stat | 1.597845 | F-statistic | 7.042588 |
| Log likelihood | -46.02899 | | |

REGRESSION (2)
==============

TSLS // Dependent Variable is TSGDP
SMPL 1963 - 1988
26 Observations
Instrument list: C FASGDP(-1) INF(-1) PD PD(-1) MU MU(-1)

| VARIABLE | COEFFICIENT | STD. ERROR | T-STAT. | 2-TAIL SIG. |
|---|---|---|---|---|
| C | 1.9033460 | 0.7615812 | 2.4992030 | 0.020 |
| FASGDP(-1) | -0.0049962 | 0.0534776 | -0.0934258 | 0.926 |
| INF | 0.0114581 | 0.0036119 | 3.1723557 | 0.004 |
| PD | -0.3277107 | 0.1460646 | -2.2436013 | 0.035 |

| | | | |
|---|---|---|---|
| R-squared | 0.433926 | Mean of dependent var | 1.921335 |
| Adjusted R-squared | 0.356734 | S.D. of dependent var | 2.029074 |
| S.E. of regression | 1.627396 | Sum of squared resid | 58.26522 |
| Durbin-Watson stat | 1.653531 | F-statistic | 5.621386 |
| Log likelihood | -47.38222 | | |

REGRESSION (3)
==============

TSLS // Dependent Variable is TSGDP
SMPL 1963 - 1988
26 Observations
Instrument list: C INF(-1) PD PD(-1) MU MU(-1)

| VARIABLE | COEFFICIENT | STD. ERROR | T-STAT. | 2-TAIL SIG. |
|---|---|---|---|---|
| C | 1.9422587 | 0.6129288 | 3.1688161 | 0.004 |
| INF | 0.0113377 | 0.0024997 | 4.5355624 | 0.000 |
| PD | -0.3247722 | 0.1193733 | -2.7206441 | 0.012 |

| | | | |
|---|---|---|---|
| R-squared | 0.435609 | Mean of dependent var | 1.921335 |
| Adjusted R-squared | 0.386532 | S.D. of dependent var | 2.029074 |
| S.E. of regression | 1.589257 | Sum of squared resid | 58.09196 |
| Durbin-Watson stat | 1.654023 | F-statistic | 8.875948 |
| Log likelihood | -47.34350 | | |

## VIII. GENERAL SUMMARY AND CONCLUSIONS

Argentina has had a sad economic history in recent decades, and the behavior of her public sector may have been instrumental in that process. In this paper we discuss the role of government spending, taxation and deficit financing on the rest of the Argentine economy.

Government spending grew systematically faster than GDP until the final crisis of the Argentine economy started to develop in 1982. Since then it has started to fall, due more to resource constraints than to deliberate political action.

The fall in the relative size of government spending came too late, however, to avoid the financial crisis which brought the country into a state of hyperinflation in 1989.

The government run a primary deficit (not including any interest payments) every year from 1961 to 1989. In consequence, the government had to resort to the issuing money and interest-bearing debt. This in turn resulted in a systematic tendency of the economy to experience high real interest rates and inflation.

A permanent positive primary deficit, coupled with high real interest rates and a stagnant economy would lead, it seems, to an ever growing stock of public debt in relation to GDP. Real government debt did not grow continuously, however, because every once in a while the existing stock of debt would be melted down by outbursts of inflation driven by the large devaluations accompanying a foreign exchange crisis.

Revenues of the consolidated non-financial public sector (CPS) have historically shown a growing trend similar to that of expenditures, while being systematically below them. This high growth in fiscal revenues in the face of a stagnant economy should be enough to invalidate the commonly held claim that the basic problem in Argentina is that the private sector does not pay taxes. The fact of the matter is that not only fiscal pressure is very high, but it has also grown at a much faster rate than that of GDP in the last 25 years. It is the case that even though fiscal pressure has been high, fiscal spending has also grown and has systematically exceeded revenues during the three decades covered by this study.

The Central Bank has been an additional source of public

spending, due to loans to the financial system which could never be recovered, different "exchange-insurance" mechanisms occasionally used to attract short term foreign financing, the purchase of foreign-exchange reserves and the bailout of failing financial institutions. Since 1977 the Central Bank has also had a system of remunerated reserve requirements, which has produced a significant cuasifiscal expenditure, and which is at the root of the hyperinflationary process recently developed.

## The Inflationary Financing of the Deficit

Because of doubts about the quality of public-sector accounting, we measured the fraction of the deficit that was financed with money creation directly from the accounts of the monetary sector, subtracting changes in foreign-exchange reserves.

From 1964 through 1975 the deficit of the CPS did not exceed significantly the revenue from money creation. This means that the fiscal deficit was mainly financed through monetary creation rather than issuing debt. The situation changes drastically from 1976 onwards when debt financing becomes a significant part of the total. This change coincides with the fall of the Peronist Government and the initiation of a military regime. The period 1977-79 is characterized by foreign borrowing and the revenue from money creation falls well below historical levels. The banking crisis of early 1980 set the end to this stage of foreign financing of the deficit and opens the way for the next stage of internal debt financing that lasts up to 1985. From 1985 onwards starts a serious effort of reduction of the total deficit of the CPS. The use of the inflation tax, however, does not fall proportionately to the deficit of the CPS because of the increasing financing pressures of the service of the internal debt concentrated mostly in the Central Bank.

Over our sample period authorities have used the inflation tax to finance primary expenditures while interest expenditures that result from the stock of Government Debt have tended to be refinanced through the issue of more interest-bearing debt.

Our regression study provides a structural framework for the relation between the Public Sector Deficit and inflation. A 1% point of Primary Deficit is financed with 0.7% of revenue from money creation (the rest with debt), and the effect of collecting this revenue from money creation is around 67.9% of additional inflation.

## Public Debt and the Structure of Financial Markets

The government has gradually become the "borrower of first resort" of the economy and as a consequence most of the financial assets of the private sector are either directly or indirectly the result of loans to the public sector (except, of course, the holdings of foreign exchange).

Practically all of the Central Bank debt is directly held by commercial banks under the form of compulsory reserve requirements ("depositos indisponibles") or, at times, under voluntary holdings of Central Bank's CD's. The commercial banks, in turn, obtain their funds by raising interest-bearing deposits from the public. What we therefore observe in practice is a system in which most of the public's deposits at commercial banks are lent to the Central Bank and used to finance the fiscal deficit. Part of the deposits of the public have been lent to the private sector, but that has been gradually displaced in favor of lending to the Central Bank: most of the lending capacity generated by the public's demand for M2 is absorbed in the form of domestic liabilities of the Central Bank.

The pressure put on the financial markets by the government debt is best captured by evaluating this debt at the commercial exchange rate. Normally authorities try to stabilize the economy by fixing the exchange rate at the level given by the commercial rate. As credibility in the plan decreases, interest rates raise and the stock of government debt tends to raise in terms of dollars. When the stock of debt, particularly the short term debt of the Central Bank, gets out of line with the available reserves, pressures mount against the currency and a devaluation finally follows. Normally devaluations are successful in reducing the dollar value of the government debt denominated in Australes but not so much in reducing the interest rates in dollar equivalent paid on the remaining stock. As a consequence, immediately after the devaluation the remaining stock of debt continues raising at rates far beyond the level consistent with a fixed exchange rate and a new crisis starts to develop.

## The Demand for Money and the Limits to the Inflation Tax

From 1960 to 1974 velocity remained approximately stable in the range of 6-7. In 1975 velocity starts an upward trend that does not show signs of stopping, taking it to a value of 33 in

1988. Unofficial data estimates put velocity around 50 as of the second half of 1989, after the hyperinflation of June-July of that year. The raise of 1975-76 may have been caused by the high price instability during those two years; we have reasons to believe, however, that a structural change took place in 1977, when interest rates were totally freed for the first time in decades and the public could invest in short term time deposits at market determined interest rates.

The estimates from the monthly data yield long-run estimates of the semi-log elasticity which imply a monthly revenue-maximizing inflation rate between 33 and 35%. The regression using annual data yields a revenue-maximizing rate of 21.9% per month, equivalent to 966% per year. The associated maximum revenue from money creation is equal to 7.4% of GDP and velocity at this inflation rate takes the value of 35.5

## Public Debt and Interest Rate Determination

The interest rate appears to be determined by the short run liquidity available in the financial system.

The magnitude of the changes in the interest rate needed to accommodate fluctuations in the demand for deposits is bound to depend on the interest-elasticity of such demand. In our analysis we assumed that the real demand for deposits depends on the current-month nominal interest rate and the expected inflation rate.

In all our regressions the sign of the nominal interest rates and inflation rate is equal to what one expect theoretically: the nominal interest rates come out as positive and the inflation rate comes out as negative with absolute value equal to that of the interest rate.

The semi-log interest elasticity with respect to the monthly real interest rate is about 1.1 in the short run and 11 in the long run. These estimates mean that a 10% fall in the demand for deposits requires, for them to be rolled-over, an increase od 9 percentage points in the monthly interest-rate in the short run an 0.9 percentage points in the long run.

Regression results assessing the link between the BONEX rate and the stock of internal government debt indicate a strong

effect. In the long run, a 10% increase in the dollar value of the government debt results in an increase of 3.2 percentage points in the annual BONEX rate.

The external interest rate, measured by the monthly US prime rate did not come out as significant in our regressions.

External Effects of Public Sector Deficits

The empirical results show that the trade surplus to GDP ratio, the internal terms of trade and the government spending to GDP ratio are highly significant in the determination of the Import Real Exchange Rate in Argentina. The trade-surplus coefficient equals 0.07 indicating that a 1% percentage point increase in the trade surplus to GDP ratio is associated with a 7% increase in the import real exchange rate. The coefficient of the internal terms of trade is approximately equal to 0.5. This means that a 10% raise in the price of imports (or of exports) results in a 5% raise in the CPI, that is our measure of the non-traded goods price index. Finally, the coefficient of the ratio of government spending to GDP is equal to -0.02, meaning that a one percent increase in this ratio is associated with a 2% decrease in the real exchange rate. This result implies that the government has a higher propensity to spend in Non-Traded goods than the private sector.

According to our regression results, generating a trade surplus to GDP ratio of 10%, as required for the full servicing of the nominal interest on the Argentine foreign debt, would imply a real exchange rate 70% higher than the one prevailing in the absence of the need to service the external debt. The fact that the real exchange rate was in 1989 at similar levels than the ones prevailing in the early 1970's, when the debt was non-existent, is partly a reflection of the fact that Argentina has not serviced her external debt since 1988.

Other factors that have also worked towards the maintenance of a relatively low real exchange rate, particularly the increase in real government spending which, according to our results, is biased towards non-traded goods and therefore tends to induce a lower equilibrium real exchange rate. Government spending, as a fraction of GDP, has increased from about 27% in the early 70's to 43% in 1987, after having reached a maximum of 56% of GDP in 1983. According to our empirical results, each additional point of GDP in government spending is associated with 2.1% fall in the real exchange rate.

Only two variables, inflation and the fiscal deficit, are significant in the explanation of the trade surplus. Higher current inflation improves the trade balance surplus in accordance with the model discussed in this paper. The primary deficit of the CPS is shown to deteriorate the trade balance surplus, as expected in an economy where the Ricardian equivalence proposition is not fully valid. The coefficient value of 0.32 indicates that one third of the value of a primary fiscal deficit results in a trade deficit. The trade deficit in turn requires a lower real exchange rate (a real appreciation) for the home goods market to clear. We therefore find a negative relationship between the real exchange rate and the primary deficit of the CPS.

# APPENDIX

## The Fiscal Deficit and Private Savings and Investment

This part of our study complements the asset market discussion by assessing the impact of fiscal policy variables on private saving and investment.

### Private Consumption

The question we address here is how Argentine private consumption reacts to an increase in the public sector needs of financing (deficit), due to either an increase in public expenditure, or a decrease in public revenue. A critical issue to discuss in this context is whether domestic public debt can or cannot be considered net private wealth in Argentina. Assuming rational economic behavior, the question becomes whether capital market imperfections are strong enough to produce net private wealth effects from changes in public financing strategies (debt vs. taxes).

Due to data limitations, what we present here is a simplified version of the framework proposed in the project. It consists in the estimation of a private-consumption function, which depends on fiscal expenditures and revenues.

In contrast to the usual practice, we do not include the real interest rate as an argument of the consumption function. Between the forties and the early seventies there was nearly permanent financial repression in Argentina, rendering the government-imposed interest rate (charged in the formal financial market for rationed credit) meaningless from a resource-allocation point of view. This situation changed after the financial reform of 1977, which eliminated the old direct regulation of credit. As we argue in another section, however, the interest rate in local currency, determined in a financial market working with a horizon of seven days or less, reflects basically the state of short-run liquidity rather than the intertemporal trade-offs faced by economic agents in Argentina.

### Data

In the regressions reported below we have used the Fundacion Mediterranea 1913-1984 annual database. The original variables taken from that database were:

PBIPM: GNP at market prices (real)
CONSUMP: Private Consumption (real)
GGN: National Government Expenditures (nominal)
IGN: National Government Revenues (nominal)
PPBICF: GNP implicit prices (factor costs)

Using the GNP Implicit Prices (PPBICF) series as deflator, we constructed the National Government real expenditure (RGGN) and revenue (RIGN) series.

Regressions

To account for the structural change, all the regressions were done for the entire database sample, 1914-1984, and for 1960-1984 period. The private consumption functions we estimated are the following:

Equation #1 1914-1984

CONSUMP(t) =

50.51 +0.79PBIPM(t-1) - 61.08RGGN(t-1) - 22.51RIGN(t-1)
4.21) (17.80) (-2.79) (-0.66)

R**2 .98 RBAR**2 .98
DURBIN-WATSON 1.36

Equation #2 1960-1984

CONSUMP(t) =

176.81 + 0.70PBIPM(t-1) - 46.18RGGN(t-1) - 38.70RIGN(t-1)
(3.11) (9.88) (-1.62) (-0.83)

R**2 .927 RBAR**2 .916
DURBIN-WATSON 1.98

In both regressions only public expenditure has a coefficient significantly different from zero. Furthermore, such a coefficient is negative as we would expect either from a simple

wealth effect or from combined wealth and substitution effects. Government revenue has no significant effect, which is consistent with the Ricardian hypothesis.

Correcting for first-order autocorrelation does not change our results. Only public expenditure has a significant, negative impact on private consumption.

Given that both the consumption and fiscal series are quite autocorrelated, we have also tried the alternative procedure of normalizing the private consumption and public expenditure and revenue data with GNP. The normalized variables are:

```
ncon 1913:1 1984:1    = consump(T)/pbipm(T)
nggn 1913:1 1984:1    = 100*(ggn(T)/ppbicf(T))/pbipm(T)
nign 1913:1 1984:1    = 100*(ign(T)/ppbicf(T))/pbipm(T)
```

In this case we have included the one-period lagged value of normalized private consumption, and both past and current values of normalized government expenditure and revenue, as explanatory variables. The ordinary least squares regression estimates for both sample periods are the following:

Equation #3 1914-1984

```
**********************************************************************

NCON(t) = 0.49 + 0.46NCON(t-1)
          (5.44)  (4.75)

        + 0.03NGGN(t) - 0.72NGGN(t-1)
          (0.12)        (-2.30)

        - 0.10NIGN(t) + 0.08NIGN(t-1)
          (-0.24)       (0.21)


R**2:              .58     RBAR**2 : .55
DURBIN-WATSON  1.85
**********************************************************************
```

Equation #4 1960-1984

**********

NCON(t) = 0.36 + 0.53NCON(t-1)
(2.89) (3.82)

+ 0.41NGGN(t) - 0.86NGGN(t-1)
(1.74) (-3.76)

- 0.25NIGN(t) + 0.59NIGN(t-1)
(-0.88) (1.64)

R**2 .673 RBAR**2 .587
DURBIN-WATSON 2.078

**********

Again, the lagged value of public expenditure has a negative impact on private consumption, while public revenue shows no statistically significative effect. Based on this evidence, it would be tempting to declare Argentina a Ricardian economy. That is not possible, however, because in Argentina changes in (conventional) tax revenues have been normally associated with changes in inflation-tax revenue. To see this fact, we have regressed the revenue from money creation, computed as INFT(t) = (M1(t)-M1(t-1))/PPBICF(t), against the Government deficit (DEF=RGGN-RIGN), obtaining the following results:

Equation #5 1915-1984

**********

INFT(t) = 0.12 + 0.78DEF(t)
(2.11) (9.55)

AR(1) = 0.56
R**2 .866 RBAR**2 .864
DURBIN-WATSON 2.07

**********

As equation #5 shows, a substantial fraction of the Government deficit, as conventionally measured, has been financed by money creation. Actually, as it has been explained in other section of this work, only in the seventies it became common practice to finance the deficit in the capital markets. As equation #6 shows, about 90% of the deficit seems to have been financed with money creation between 1914 and 1970.

Equation #6 1914-1970

**********

INFT(t) = 0.03 + 0.90DEF(t)
(0.79) (7.00)

AR(1) = 0.53
R**2 .762 RBAR**2 .758
DURBIN-WATSON 2.08

**********

Clearly, the traditional choice in Argentine public finances was, for most of this century, between conventional taxes and the inflation tax, and no between conventional taxes and debt, as a test of the Ricardian hypothesis would require.

Equation #7 below shows very neatly the shift to debt financing in the seventies. As we have discussed elsewhere, the shift can be dated in 1977. Unfortunately, lack of private consumption data with a quarterly frequency prevents us from testing the Ricardian hypothesis for the only period (the last 12 years) for which it would really make sense to test it.

Equation #7 1970-1984

**********

INFT(t) = 0.49 + 0.62DEF(t)
(4.07) (5.55)

AR(1) = 0.05
R**2 .707 RBAR**2 .682
DURBIN-WATSON 2.09

**********

Taking into account the importance of inflationary finance in Argentina, we have also estimated equations #1 and #2 computing the revenue from money creation as part of the total tax revenues of the Argentine government. In this form we make sure that any change in "revenues," given public expenditure, must mean a change in public debt. In equations #8 and #9 below, the variable TAX is the sum of conventional public revenues (RIGN) and the revenue from money creation (INFT).

Equation #8 1915-1984

**********

CONSUMP(t) = 76.55 + 0.69PBIPM(t-1)
(4.35) (15.54)

- 110.39RGGN(t-1) + 81.63TAX(t-1)
(-3.13) (2.26)

AR(1) = 0.37
R**2 .986 RBAR**2 .986
DURBIN-WATSON 2.1

**********

Equation #9 1961-1984

**********

CONSUMP(t) = 259.42 + 0.54PBIPM(t-1)
(2.74) (5.40)

-116.07RGGN(t-1) + 109.70TAX(t-1)
(-2.08) (1.61)

AR(1) = 0.26
R**2 .922 RBAR**2 .911
DURBIN-WATSON 1.998

**********

We again observe the negative impact of public spending. The revenue variable, TAX, is significantly different from zero, but it is positive, which probably captures the expansionary effect of money creation, rather than the contractionary effect that the inflation tax would produce if the Ricardian hypothesis were not valid.

C.2. Private Investment

In this section we expect to find a negative impact of deficit financing on investment, due to rising domestic interest rates, or stricter credit rationing in the case of financial repression.

Data

We use here the same database described in the section on consumption behavior. The additional original variables taken from that database were:

INVEST: aggregate investment
INVSTGOB: government investment
PUBCON: public consumption

From aggregate (INVEST) and government (INVSTGOB) investment we calculated private investment (PINV), and normalized private investment (NPINV) as follows:

PINV = INVEST - INVSTGOB
NPINV = PINV/PBIPM

Regressions

Following a similar procedure to that used with consumption, we regressed normalized private investment against the normalized fiscal variables.

The results of regressing normalized private investment against current normalized public expenditure and revenue, for the 1914-1984 sample, are the following:

Equation #10 1914-1984

NPINV(t) = 0.78NPINV(t-1) - 0.10NGGN(t) + 0.49NIGN(t)
10.49 (-0.73) (2.45)

R**2 .67 RBAR**2 .66DURBIN-WATSON 1.58

As we expected, there is a significant positive impact of public revenue on private investment. Given public expenditure, an increase in public revenue reduces the deficit and this has a positive impact on investment. Since we saw in the consumption module that changes in public revenue do not have effects on private consumption, and hence on private saving, it is likely that the positive impact on investment comes from a freer or perhaps just a smoother working of the capital market. The introduction of lagged values of public revenue and expenditure does not change the conclusion in any fundamental way.

Equation #11 below shows the results of regressing normalized private investment against the current values of normalized public expenditure and revenue for the 1960-1984 sample period.

Equation #11 1960-1984

**********

NPINV(t) = 0.70NPINV(t-1) + 0.02NGGN(t) + 0.48NIGN(t)
(3.71) (0.11) (1.45)

R**2 .238 RBAR**2 .169 DURBIN-WATSON 1.77

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We can see that the results are considerably weaker than for the larger sample. The coefficient of revenue still has the right sign, and has a substantially larger t-statistics value. It is not, however, significantly different from zero at a 5% significance level.

Both in equations #10 an #11 the coefficient of public spending turns out to be not significant. To see if aggregation made a difference, we regressed private investment against public consumption and government investment. Equations #12 and #13 below show the results. Again, as we observed with normalized variables, public revenue has a significant positive impact on private investment. The difference comes here from the expenditure side: public consumption has, for both sample periods, a significant negative impact on private investment. Contrary to what one would expect, if we were to assume that government investment is bound to produce positive externalities on private economic activity (as it definitely did in the XIX century with the railroads), government investment has no significant effect on private investment.

Equation #12 1915-1984

**********

PINV(t) = - 14.87 + 0.24PBIPM(t-1) - 1.35PUBCON(t-1)
(-1.26) 5.28 (-2.72)

+ 39.07RIGN(t-1) + 0.24INVSTGOB(t-1)
(1.77) (0.52)

AR(1) = 0.42

R**2 .947 RBAR**2 .944

DURBIN-WATSON 1.85

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Equation #13 1961-1984

**********

PINV(t) = 61.75 + 0.23PBIPM(t-1) - 1.99PUBCON(t-1)
(1.16) (3.29) (-3.15)

+ 45.85RIGN(t-1) + 0.49INVSTGOB(t-1)
(1.37) (0.68)

AR(1) = 0.20
R**2 .789 RBAR**2 .745
DURBIN-WATSON 1.93

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