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**MACROECONOMIC POLICY AND CREDIBILITY: A COMPARATIVE STUDY
OF THE FACTORS AFFECTING BRAZILIAN AND ITALIAN INFLATION
AFTER 1970**

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Macroeconomic Policy and Credibility: a comparative study of the factors affecting Brazilian and Italian inflation after 1970.

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1. Introduction

Inflation in Brazil has been very high by the standards of industrialized and even developing countries since the 1960s. It averaged 44.6% per year in the 1960's, 20.9% in 1970-74, 46.5% in 1975-79, 148% in 1980-84 and an astonishing 707.4% in 1985-89. In November 1993 it was running at about 35% per month or 3564% on an annual basis. During this period there were no lack of attempts to stabilize inflation. Since 1986 four plans were implemented to try to control inflation (The Cruzado Plan in February 1986, the Bresser Plan in June 1987, the Summer Plan in January 1989 and the Collor Plan in March 1990) but to no avail. The plans had the effect of reducing inflation for a while but after a time span stretching from a few to six months it always accelerated again. They seem to have increased the variability of inflation and to have led to its overshooting with respect to the path one would have observed without the plans. The plans in general had the tendency to suppress the inflationary phenomenon by means of wage and price freezes and by suspending indexation rather than attacking its fundamental causes: high budget deficits and their monetary financing. Under such circumstances it is not surprising that once the wage and price freeze became unsustainable suppressed inflation became again manifest in its full force.³ The variability of inflation was therefore particularly high in the second half of the 1980's. For instance in 1985 inflation was 235%. It dropped to 65% in 1986 (Cruzado Plan of February 1986); to jump again to an all time yearly high of 416% in 1987. In 1989 despite the Summer plan it reached 1783%. In 1993 it was about 2800%.

These high inflation rates and especially their high variability raise the question of their effects on the distribution of income and on the size of the deadweight losses. While inflation in Brazil has not yet reached the peaks of the German hyperinflation of the early 1920's (over 10000% in the year ending in November 1923) we feel that the deadweight losses must be enormous and the effects on the distribution of income perverse, despite the relatively high sophistication of the Brazilian financial system and the very low transaction cost of transferring funds from interest-bearing financial assets (which fully hedge against inflation and often yield a high positive real interest rate) to checking accounts which do not pay interest. Brazil's economic growth which was very high in the sixties and

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² The authors benefitted from discussions with Joachim Levy, Fernando de Holanda Barbosa, Sergio Ribeiro da Costa Werlang and Renato Fragelli. Giuseppe Tullio gratefully acknowledges the financial support of the Italian National Science Foundation (CNR) and the Brazilian counterpart (CNPq). The paper was written while the first author was visiting fellow at the Fundação Getulio Vargas in Rio.

³ For a theoretical model explaining the overshooting of inflation in such circumstances see Eliana Cardoso (1987).

seventies (6.8% from 1965-73 and 7.9% from 1973-80) slowed down considerably to 3.5% per year on average in the period 1981-86 largely as a result of the external debt problem of the country, but in the late 1980's and early 1990's its dismal performance (average real GDP growth rate of 0.46% from 1987 to 1992) must not be unrelated to the very high and variable inflation rates and the deadweight losses and the uncertainty caused by them.

This paper focuses on the Brazilian inflation and its dynamics. We demonstrate that the main economic cause (as opposed to the political causes) of the Brazilian inflation is the excessive growth of money in turn caused by too high budget deficits. Oil and exchange rate shocks also played a role, together with the increased political dependence of Brazilian Central bank governors from the governments which became themselves increasingly unstable. We measure this political instability with the variable "turnover of central bank governors" defined as the inverse of the number of months in office. The effect of this variable on inflation is found to be highly significant and positive. In this respect Brazil has something to learn from the Italian experience since the early 1970's.

Italian inflation was relatively high and variable in the 1970's and early 1980's peaking three times at around 20% per year, mainly as a result of excessive monetary financing of increasing budget deficits, two oil shocks (1974,1980) and one major exchange rate shock (1976). The substitution of a more independently minded Central Bank governor in 1975 (Paolo Baffi) led slowly to significant changes first in the financial system (development of the Treasury bill and bond market, started in 1976), then in the behaviour of the Central Bank towards the monetary financing of the government (1978) and finally to an important institutional change which increased the independence of the Italian Central Bank (the so called divorce of July 1981 between the Bank and the Government which removed for the former the compulsory purchase of unsold Treasury bills and bonds in the primary market.). Another important institutional change was the creation of the European Monetary System in March 1979, which by linking the lira to the Deutsche Mark, made it a lot easier for the Italian Central Bank to control money and change interest rates to defend the currency.⁴ These changes made it possible for Italy to control inflation in the course of the 1980's and by 1993 inflation was around 4 percent per year, about the same as in West Germany and less than in United Germany, despite the fact that Italian nominal budget deficits have exceeded 10% of GDP for the whole 1980's and were still around the same order of magnitude in 1993.

This paper is divided into five sections. Section 1 contains the introduction, Section 2 compares Italy and Brazil as far as three economic/institutional aspects which are important for inflation is concerned, namely: a) the degree of independence of the Bank of Italy with that of the Banco Central do Brazil and its changes through time; b) the size of bank liabilities, government liabilities and financial markets in relation to GDP c) the degree of openness of the two economies. The relevance of point a) for inflation is evident; point b) is important as a larger financial market makes the non-monetary financing of large budget deficits easier; finally, the more open an economy the greater the incentive on the part of exporting and importing firms and of the government to pursue a policy of stable nominal and real exchange rates. Italy is very much more open than Brazil and this explains why in 1979 Italy joined the European Monetary System (EMS) which provided a nominal anchor for Italian inflation (the anchor being the Deutsche Mark and the anti-inflation stance of the Bundesbank), while Brazil limited itself most of the time to the indexation of the nominal exchange rate to domestic prices, a policy which left the monetary system without an anchor for decades.

Section 3 tries to explain the inertia of Brazilian inflation and its tendency to accelerate by analysing who gains and who loses from inflation and the political strength of gainers and losers. Big gainers are the government and the banking system which earn large inflation tax revenues, and

⁴ For a deeper analysis of the views of governor Baffi on inflation and on his crucial role in starting the changes which finally led to the control of Italian inflation see Fratianni and Spinelli (1991)

large private corporations which have enjoyed and still enjoy a large degree of monopoly or oligopoly power and do not have to rely heavily on the banking system for loans to finance investment. They are relatively independent from commercial banks because the large monopoly profits allow them to rely mainly on self-financing. Small and medium sized firms are instead penalized by the very high and increasing real interest rates they have to pay on bank loans. At the end of 1993 real interest rates on interbank loans were about 30 percent per year and those on bank loans probably higher. They have been very high and positive in all years since 1986, except in the first half of 1990 and 1993. Thus while the Brazilian industry, agriculture and service sectors are already heavily concentrated also thanks to the lack of competition from abroad, one of the side effects of inflation may be to increase the degree of concentration even more. Public corporations being less efficient rely less than large private ones on self-financing. However their losses are covered by the government budget and high real interest rates do not put them out of business.

The big loser is the poorer part of the population which does not have access to the banking system and has to rely only on currency to make all the payments. The medium and large income groups use instead heavily credit cards and checks and keep demand deposit at a trivial level by using telephone or automatic transfer services from high interest yielding deposits to demand deposits. It was estimated that "Brazil cleared in 1989 about 7 billions checks 95% of which were cleared in 24 hours. By comparison American Express processed on a world wide basis 28 million items a months, about the same number of checks cleared in Brazil in a single day" (Lees, Botts and Cysne., 1990, p. 134). At the time of writing it was not unusual in Brazil to write checks for less than the equivalent of two US dollars.

The poorer classes have almost no political representation, while the gainers from inflation mentioned above are very powerful and this fact contributes to explain the persistence of inflation in Brazil. In this connection it is worth mentioning that labour unions are indeed powerful in Brazil, but they are mainly interested in defending the income of the workers in the São Paulo region who enjoy an after tax wage which is very close to the after tax wage of industrial workers in the most industrialized countries of Western Europe. The workers in the São Paulo region belong already to the middle classes of Brazil.

Section 4 presents a very simple model of inflation in which monetary policy is the main driving force behind inflation (the quantity theory) but supply shocks (oil, taxes and agricultural supply) and inertial factors are also important. In turn money growth is caused by budget deficits, balance of payments surpluses, the business cycle and/or lagged inflation. We estimate the reaction function of monetary authorities for both countries in sub-section 4.1, then the equation for inflation for Brazil from 1980 until the first quarter of 1993 in sub-section 4.2; sub-section 4.3 contains the estimates of the inflation equations for Italy separately for the period 3rd quarter of 1973 (just after the beginning of floating) until the first quarter of 1983 (the general realignment of March 1983, when the French U-turn occurred and the exchange rate mechanism (ERM) of the EMS became more credible) and for the period 2nd quarter of 1983 to the beginning of 1992, when the determinants of Italian inflation changed completely as German inflation became more and more important and Italian money lost most of its explanatory power. The reaction functions estimated turn out to be remarkably similar for the two countries, except for the fact that from 1978 onwards Italy experienced a substantial reduction in the degree of monetary financing of the government budget deficit (the Baffi effect). In addition the reaction functions are remarkably stable over time.

The inflation equations and reaction functions estimated for each country support the amended quantity theory explanation of inflation for Brazil in the 1980's and early 1990's and for Italy from 1973 to 1983. In addition they support what Spinelli calls the "fiscal dominance hypothesis" of inflation (Spinelli and Fratianni, 1991 and Spinelli and Favero, 1992) for Brazil for the whole period considered in this study and for Italy only up to the end of 1977.

Section 5 contains concluding comments.

2. Some relevant comparisons between Brazil and Italy: monetary constitutions, size of financial markets and the degree of openness of the economy

2.1. Comparing Monetary Constitutions

2.1.1. A monetary explanation for the Brazilian inflation

In the last two decades, we have witnessed the downfall of the monetary regime established in 1964-67. At that time, Roberto Campos and Octavio Gouvea de Bulhoes conducted far-reaching monetary and fiscal reforms.⁵ An autonomous Central Bank was set up with powers to conduct monetary policy. Its board of governors could not be fired. To assure a better coordination between the fiscal and monetary policies, a National Monetary Council was also established and presided by the Finance minister where the members of the Central Bank had majority vote.⁶ Therefore, the monetary authority had a strong say on policy affairs at that time. As a matter of fact, the Central Bank's governor voted against many Ministry of Finance's measures.

However, soon after Campos and Bulhões left, in 1967, the Central Bank governor had a confrontation with the military government and he was removed. In 1971, the Government ordered the Central Bank to finance automatically the public deficit.⁷ There was no more need to make provisions in the public budget to pay interest on debt which was financed either by issuing money or public debt. That left the door open to imprudent fiscal policies. Nevertheless, inflation was low until the first oil shock in 1973 because of the lasting effects of the Campos-Bulhões institutional reforms: as the budget deficits were small and the economy was growing, they were easily financed without pressing the monetary base too much. In 1974, the constitution of the Monetary Council was changed to give the Ministry of Finance an overwhelming control over the Central Bank.⁸

The expansion of public investment during the Seventies and early Eighties made it extremely difficult to control public expenditures and, as a result, the federal government had to resort to printing money to finance itself. Once there was no monetary authority to impose fiscal discipline, monetary policy followed the fiscal policy passively.⁹

Using the turnover of Central Bank governors as a proxy for the institutional independence of the monetary authority, we verify that the situation had deteriorated a great deal (see table 1): there were 12 governors in Brazil compared to only one governor in Italy during the 1979 to 1993 period.

During the Eighties, the Central Bank financed the Treasury on a daily basis. As inflation rose, the private sector demand for financial instruments which allowed only a partial protection from inflationary erosion declined. On the other hand, the increasing public borrowing requirements forced the Central Bank to roll over the public debt daily and finance those financial institutions which lacked reserves to carry over their holdings of public bonds. The Central Bank made repurchasing agreements with the financial institutions thanks to which if a financial intermediary

⁵ Here we are going to examine only the most important aspects of the monetary reform of 1964-67. For a detailed analysis of the fiscal reform, see Barbosa *et alii* (1989).

⁶ See Law No. 4,595 of December 31, 1964.

⁷ See Complementary Law No. 12 of November 8, 1971.

⁸ See Law No. 6,045 of May 15, 1974.

⁹ See sub-section 4.1 below for Granger-causality test showing that budget deficits caused money growth.

could not finance its portfolio of treasury bills the Central Bank automatically bought it back. This mechanism amounted to an instantaneous monetization of the public debt. Money became completely endogenous.

As financial institutions could transform treasury bills into currency and vice-versa without any significant risk of capital loss and the administrative costs were low owing to the use of computers, the public debt acquired such a high degree of liquidity that it could be considered money for all practical purposes. In addition the development of checking deposits backed up by Treasury bills paying daily interest and allowing instantaneous convertibility into currency became widespread. The holdings of M1 fell from 15.6 percentage points of GDP in 1970 to 2.4 percentage points in 1992 and the domestic holdings of public debt increased from 5 to 14 percent of GDP during the same period (Fig.1). The holdings of monetary base fell further to a mere 0,8 per cent of GDP in March 1993 and those of M1 to a mere 1.3 per cent of GDP.¹⁰

¹⁰ By way of comparison in Germany the real stock of monetary base was about 1 percent of GDP at the peak of the hyperinflation in November 1923.

TABLE 1 Turnover of Central Bank's governors

Brazil	Italy
Denio Nogueira (1964-1967)	Luigi Einaudi(1945-1948)
Ruy Leme (1968)	Donato Menichella (1948-1960)
Ernane Galveas (1968-1974)	Guido Carli (1960-1975)
Paulo Lira (1975-1978)	Paolo Baffi (1975-1979)
Carlos Geraldo Langoni (1979-1981)	Carlo Azeglio Ciampi(1979-1993)
Affonso Celso Pastore (1982-1984)	Antonio Fazio (1993-)
Antonio Carlos Lemgruber(Mar 1985 to Aug 1985)	
Fernao Carlos Bracher (Apr 1985 to Feb 1987)	
Francisco Roberto Gros(Feb 1987 to Apr 1987)	
Fernando Milliet de Oliveira(May 1987 to Mar 1988)	
Elmo de Araujo Camoes(Mar 1988 to June 1989)	
Wadico Waldir Bucchi(Oct 1989 to Mar 1990)	
Ibrahim Eris (Mar 1990 to Mar 1991)	
Francisco Roberto Gros(Apr 1991 to Sep 1992)	
Gustavo Loyola (Oct 1992 to Jan 1993)	
Paulo Cesar Ximenes(Jan 1993 to Sep 1993)	
Pedro Malan (Sep 1993-)	

Source: Central Banking Directory, 1993.

This institutional framework turned out to be very unstable. The situation was aggravated by the confiscation of a fraction of government securities holdings on the part of the government upon the announcement of each stabilization plan.¹¹ These measures brought about distrust in Treasury bills and demand shifted towards other assets, forcing the government to finance more of the deficit by money creation and leading to large increases in the risk premium on Treasury bills demanded by the public that further aggravated the deficit.

Another institutional feature making monetary control difficult in Brazil is that there are still up to this day *de facto* two central banks: The Banco Central do Brazil, the institution issuing currency and supervising commercial banks since 1965 and the Banco do Brazil, a large government owned commercial and development bank, which was performing the functions of government agent up to the creation of the Banco Central in 1965. From 1979 to 1986 the Banco do Brazil had unlimited access to the printing press of the Banco Central, much like the government through the so-called "movement account". In March 1986 the access to the printing press on the part of the Banco do Brazil was legally limited to the sum approved by the Secretary of the Treasury, but the *facto* the issues of currency on behalf of the Banco do Brazil continued on a large scale (Lees, Botts and Cysne, 1990).

It is not surprising that under the institutional setting described above of passive monetary financing of government budget deficits and of development expenditures by the Banco do Brazil and the Banco Central do Brazil, inflation became very high and variable after the mid 1980's (Fig. 2). As inflation increased and became more variable gross fixed capital formation dropped sharply as

¹¹ The actual loss of capital due to changes of indexation rules was estimated in 1991 (check!) to be at 70% of its real face value since 1980.

a percentage of GDP (Fig. 3) and the growth of real GDP per capita followed similarly a downward trend (Fig. 4).

2.1.2 Italian Monetary Institutions since 1945

The Italian Central Bank has been legally rather dependent from the Government up until the so-called "divorce" of July 1981 which relieved the Bank from compulsory purchase of unsold treasury bills and government bonds in the primary market. The negative consequences of this compulsion for the control of the monetary base were enhanced by the lack of a developed secondary government security market until 1976.

The development of this market which started in 1976, the joining of the Exchange Rate Mechanism (ERM) of the EMS albeit with a larger margin (+ 6 percent) than other members (+ 2.25 percent),¹² the divorce in 1981 and the abolition of capital controls, achieved by mid 1990, represent important changes in the direction of more independence from the Government and grater acceptance of German anti-inflationary policies.

More recently in connection with the obligations of the Maastricht Treaty signed in 1991 other measures were taken or are about to be taken. In 1992, discount rate changes became the sole responsibility of the Bank of Italy, while before they were decided by the Finance Minister after consultation with the Governor of the Bank of Italy. On the other hand, the reform of the rules governing the "conto corrente di Tesoreria" (the overdraft facility of the Treasury on its account with the Bank of Italy) is still under discussion.

Since the late 1940's the overdraft facility cannot exceed 15 percent of planned budgetary expenditures for the year. With the large annual nominal increases in government expenditures especially in the 1970's and 1980's this facility represented and still represents a major channel through which monetary base is created. It is worth pointing out that the interest cost to the Treasury on the overdraft is only 1 percent and it goes without saying that the Treasury has generally tendend to make use of it up to the legal ceiling.

According to the law of January 4th 1945 later amended on April 19th 1948 the Governor and the other three members of the Directorium (the Director General and two Deputy Directors General) are proposed by the Prime Minister in agreement with the Ministry of Finance, after consultation with the Council of Ministers and nominated by the President of the Republic. Thus all higher positions of the Bank are political nominations. However, there is no time limit to the appointments nor a compulsory age of retirement.

The "de facto" dependence of the Bank of Italy from the Government changed substantially from 1945 to 1981, despite a roughly unchanged legal framework; the economic philosophy of the Governor, the size of the budget deficits to be financed, as well his personality and political sympathies played a big role. As pointed out by Spinelli and Fratianni (1991), the Italian post-war period can be divided into three sub-periods: the first one from the stabilization of 1947 to 1960 under Governor Menichella, the second one under Governor Carli (1960 to 1975), the third one under Baffi (1975-80) and Ciampi (1980-1993).

¹² The margin was reduced to + 2.25 percent at the end of 1990 and remained at this level until the lira left the ERM on September, 16th, 1992.

During the first period price stability was an important objective of the Bank, monetary policy was geared towards the medium to long run and the control of the supply of money was also considered important. Money was assumed to influence prices and the balance of payments in line with the classical view.

During Carli's period the increase in employment was considered more important than the control of inflation, inflation was partly viewed as fostering economic growth, money was not considered to play a role in controlling inflation, the latter being considered to be mostly of a cost-push type. As a result monetary policy became incapable to counteract the destabilizing shocks that hit the Italian economy during this period (wage, fiscal and oil shocks); worse than that, according to Spinelli and Fratianni, it becomes itself a source of instability. From a market oriented monetary policy during Minichella's period, Italy moved to direct credit and exchange controls, an almost total financial isolation of the country from abroad¹³ and at times a stubborn control of nominal interest rates which were kept much too low to control inflation (Fig. 5), mainly to please the political forces backing the governments and thriving on large and increasing budget deficits. The real interest rate dropped to about -9 percent in 1974 and again to about -5 percent in 1976 and 1980.

It should not be forgotten that of the four governors mentioned above only Carli joined the Bank as Director General barely a year before the appointment as Governor of the Bank. The others, especially Baffi and Ciampi started their career in the Bank at a relatively early age.

The third period which started in 1975 with Baffi represents a reversal towards the classical school, although it took a very long time to dismantle controls on credit and foreign exchange transactions, to regain enough flexibility in leading interest rates, to implement control of monetary aggregates and to reduce inflation to acceptable levels. Baffi also had to face budget deficits that were among the highest in Italian post-war history (about 13 percent of GDP in 1978, see Fig. 6). However, only Ciampi managed to complete the work started by Baffi despite the increasing constraints coming from public finances.¹⁴ The change in the Bank's objectives can be best summarized by Ciampi's statement in May 1981: "The return to a stable currency requires a real change in the monetary constitution... The first condition is that the power to create money should be completely independent from the agents that determine expenditure."¹⁵

After the divorce of July 1981 Italian real interest rates became positive and high, hovering at somewhat over 5 percent per year for the rest of the eighties and early nineties. In addition, compared to the seventies, they were very stable (Fig.5). The exchange rate constraint of the ERM and a gradual capital flow liberalization certainly helped in this respect. The high real interest rates managed to break the vicious circle running from high budget deficits to high money growth. The latter declined sharply in the 1980's despite continuing high budget deficits and it stopped to a large extent leading inflation and its turning points as it had done in the 1970's (Fig. 7).

¹³ Exports of capital become a crime in 1976, punishable with imprisonment.

¹⁴ In 1992 the government budget deficit and total public debt outstanding were still about 10 and 110 percent of GDP, respectively.

¹⁵ See Goodman (1992) p. 170.

Table 2 - Comparing Monetary Institutions

Brazil	Italy
1) The Central Bank does not have statutory responsibility to stabilize prices.	1) The Central Bank does not have statutory responsibility to stabilize prices.
2) Governor can be dismissed at any time and has a ministerial status.	2) Governor cannot be dismissed and has a lifetime mandate.
3) Governor is appointed by the President of Republic and approved by the Senate.	3) the Governor is proposed by the Prime Minister and nominated by the President of the Republic
4) Staff is poorly prepared and there is no research department.	4) Staff is well prepared. The Bank has one of the best research departments in Europe. The Bank provides the government with economic advice.
5) Since its creation in 1965, the Bank has been dominated by a development bank attitude and regards credit for development and its most important role.	5) Apart from the 1960-75 period, the Bank has been dominated by economists who regard control of money and stable prices as important functions of the Bank.
6) Although the 1988 Constitution prohibits the Central Bank to finance the government, the Bank finances the public deficit on a daily basis. There is no effective monetary control.	6) The Bank is not compelled to finance government deficits since the "Divorce" in 1981.

The historical evidence presented suggests that the degree of independence of the monetary authority is an important factor to explain the divergent inflationary paths of Brazil and Italy in the 1980's. While the Italian inflation was brought down to 4 percent a year in 1993 from 22 percent in 1974 (Fig.7), the Brazilian inflation was still over 2,000 percent in the 12 months ending in November 1993. Although wage indexation and supply shocks have played a role in propagating inflation, the absence of a thoroughly independent monetary authority able to force fiscal adjustment on weak governments is of paramount importance. The Brazilian Central Bank is today an agency serving the purposes of the Ministry of Finance and a state bank of last resort to roll public sector debts, while the monetary institutions in Italy have undergone changes that have strengthened the Central Bank's mandate to pursue price stabilization.

2.2. Comparing the depth, breath and resiliency of financial markets

Two necessary but not sufficient conditions for the non-monetary financing of large budget deficits are the existence of a large and developed financial market and a government policy that creates rather than destroys confidence. The difference in the size of financial markets in Brazil and Italy is very large. According to an estimate of the Banco do Brazil the ratio of financial assets to GDP averaged 34.4 percent of GDP from 1971 to 1979 and 33 percent from 1980 to 1987 (Lees, Botts and Cysne 1990, Table 5.4 p. 123). No clear trend is discernible until 1989, when the ratio fell

sharply, as inflation accelerated from 1038 percent in 1988 to 1783 percent in 1989. M1 fell from 4.9 percent of GDP in 1987 to 1.3 percent in March 1993 (Table 3); the stock of Federal, State and Municipal bonds fell from 12.8 percent of GDP in 1987 to 6.6 percent in March 1993 despite the very high real interest rates, because the public lost its confidence in the government after President Collor froze in 1990 a large fraction of outstanding government securities and holders had lost about 80% of the real value of their holdings by the time the frozen assets were freed (see penultimate column of Table 3). It is estimated that true GDP in Brazil may be substantially higher than the official measures because of a developed hidden economy. The ratios reported in Table 3 may therefore be overestimated.

Table 4 gives an overview of the size of Italian financial markets. In 1991 M2 amounted still to about 70 percent of GDP and M2 plus government bonds outstanding to 161 percent of GDP (last column of Table 4). The figures reported in table 4 exclude private securities, which are instead included in Brazilian M4. Italian financial markets are at least 7 times larger in relation to GDP than Brazilian financial markets. What is interesting to notice is that even during the gold standard the size of Italian financial markets was well in excess of 100 percent of GDP.

Table 3 - Brazil: Monetary Base Money Supply and Financial Assets in Relation to GDP ¹

End Period of	Monetary Base	M1	Financial Investment Fund	Federal Bonds and Bills	State and Municipal Securities	Special Earnings Deposits	M2	Savings Deposits	M3	Private Securities	M4	Finan.Assets Frozen at the Central Bank ²	Financial Assets
1987 - Dec.	2.4	4.9	-	10.9	1.9	-	17.7	10.5	28.1	4.9	33.0	-	33.0
1988 - Dec	1.5	2.9	-	10.7	1.4	-	15.0	10.8	25.8	4.1	29.9	-	29.9
1989 - Dec.	1.1	1.7	-	10.2	2.0	-	13.9	5.4	19.3	2.7	22.0	-	22.0
1990 - Dec.	2.1	3.3	-	2.6	1.2	-	7.1	3.1	10.2	3.5	13.7	6.3	20.1
1991 - Dec.	1.4	2.4	2.3	1.8	1.1	0.9	8.4	3.6	12.0	3.9	15.9	2.8	18.7
1992 - Dec.	1.2	1.9	2.3	4.3	2.3	1.5	12.2	4.4	16.6	7.9	24.5	-	24.5
1993 - March	0.8	1.3	2.2	4.4	2.2	1.3	11.5	4.4	15.9	7.6	23.5	-	23.5

¹ Financial Aggregates: End of period data.

² Federal Bonds and Bills frozen as a result of the 1990 Collor plan.

Source: Central Bank of Brazil.

Table 4 - Italy: Monetary Base, Money Supply and Government Debt in relation to GDP

	Monetary Base (1)	M2 (2)	Total public debt (3)	Public debt outside of central bank (4)	M2 + Public debt outside of central bank (5)
1870	22.9	28.7	111.6	-	-
1913	15.5	58.1	88.6	-	-
1970	20.0	74.6	34.2	24.1	98.7
1980	16.6	79.1	54.9	41.2	120.3
1991	15.0	69.6	103.4	91.5	161.1

Sources: Spinelli and Fratianni (1991) for the gold standard years. Banca d'Italia for the post-war period.

Italian financial markets are at present quite sophisticated. A developed secondary market for government securities exists where bonds up to 10 years can be traded at very low transaction costs. There are also futures markets in Italian government securities in Italy, London and Paris. A 30 year government bond will be issued before the end of 1993. Instead in Brazil financial markets have excelled in developing sophisticated means to cope with the desire of the public to hold a very low amount of non interest bearing means of payments (rapid transfer services to move funds from interest yielding bank deposits and Treasury bills to checking accounts, the disproportionate development of checks even for very small denomination payments, the use of credit cards). The welfare costs of these developments must be very large.

In addition there are large misallocations of resources by banks and travel agencies to exchange US dollars into cruzeiros and viceversa, as the population holds and uses more and more dollars as a means of payment, as a unit of account and as an abode of purchasing power (especially in tourist resorts).

As to the second necessary but not sufficient condition, confidence in government securities has been badly shaken after the Collor freeze of 1990, as shown by the fall in the public's holdings of government securities despite the high real interest rates that the government is now paying on them. The average maturity of domestically held Brazilian public debt is very short.

2.3. The degree of openness and the usefulness of a monetary anchor

The degree of commercial openness of Brazil has been very low in the post world war II period and the tendency has been to decline trough the decades. Imports of goods and services were only 5.5 percent of GDP in 1991 (Table 5) despite a new policy of commercial opening started in February 1991 which led to a reduction of average tariffs on imports from 40 percent in 1991 to 14 percent in the second semester of 1993. In Italy the share of exports of goods and services was about the same as the Brazilian one in the early 1950's. By 1970 it had, however, doubled in connection with the creation of the Common European market in 1958.

The higher the degree of commercial integration the greater is the incentive to have nominal and real exchange rate stability on the part of importers and exporters. In addition the pass through of exchange rate depreciations on domestic inflation is very high and fast in open economies like Italy. This explains why the EMS was created in 1979 and why Italy had a strong incentive to join the ERM of the EMS. Even though the ERM has not always guaranteed real exchange rate stability, it has provided Italy with a useful nominal anchor for inflation by importing credibility from the German Bundesbank. This was particularly important in the early 1980's when, after about a decade of high inflation and high nominal and real exchange rate instability, it was felt that inflation had to be brought under control. Had Brazil been a more open economy, the incentive to peg the nominal exchange rate to the dollar would have been higher. Instead apart from a short spell in the early 1980's when the exchange rate depreciated by about 30 percent in real terms, the Brazilian government was satisfied to index the nominal exchange rate to domestic inflation and to keep the real exchange rate more or less constant. Thus, in the absence of an independent central bank strongly committed to keeping inflation low, the Brazilian monetary system was left without a domestic and a foreign (exchange rate) anchor. As in the course of the 1980's inflation moved to higher levels as a result of the monetary financing of budget deficits, political powerful gainers from inflation realised how beneficial inflation was for them and as a result had little incentive to lobby for the control of inflation, while the losers, being without political representation and lacking an understanding of the phenomenon, had no choice other than accepting passively the course of events. In the next section we turn to an analysis of the large gains from inflation for the government, the banks, and the big private enterprises.

Table 5 - The degree of opress of the economy
(Ratio of imports and exports of goods and services to GDP in selected years)

	Brazil		Italy	
	Imports	Exports	Imports	Exports
1950	7.6	9.2	9.9	9.0
1960	6.4	5.3	16.8	16.8
1970	7.5	7.0	18.7	18.8
1980	11.2	9.0	27.4	22.8
1990	5.5	7.2	19.7	19.2
1991	6.5	8.5	18.3	18.0

Sources: For Brazil: Conjuntura Econômica, Instituto Brasileiro de Economia, Fundação Getulio Vargas, Nov. 1993, vol. 47, n. 15. For Italy: IFS, IMF, various issues.

3. The politically powerful gainers from inflation: the government, commercial banks and large private enterprises.

In this section we analyze the gains from inflation of three sectors: the government, commercial banks and the large private enterprises which hold dominant positions in their markets and can finance investment to a larger extent than small and medium sized enterprises through oligopoly profits rather than through bank loans.

3.1. Inflation tax revenues of the government and commercial banks

Table 6 reports data on inflation tax revenues of the government and of commercial banks as a percentage of GDP. Total inflation tax revenues peaked in 1963 at 9 percent of GDP of which 5.4 percent accrued the government and 3.6 percent to commercial banks. For the period 1961-70 they amounted to 5.2 percent per year on average of which 3 percent accrued to the government. Despite the sharp drop in the base of the tax (the monetary base for the government and the stock of checking deposits for commercial banks (see Fig. 1 and Table 3), inflation tax revenues were higher on average in the 1986-92 period than before. It seems that the government aims at collecting for

itself and commercial banks inflation tax revenues in the order of 4-6 percent of GDP, whatever the inflation needed to achieve this goal. After the peak collection of 6.6-6.7 percent per year of GDP in 1987-89 tax revenues fell to 4.6 percent of GDP in 1992. It is not clear whether the elasticity of inflation tax revenues to the tax (inflation) has become negative (i.e. whether the downward sloping section of the Laffer curve has been reached yet). However, the game may come soon to a dangerous dead end with the base of the tax vanishing and inflation exploding. The current Brazilian inflation rate could be on a highly unstable path.

Table 6 - Brazil : Inflation tax revenues as a percentage of GDP
(arithmetic averages)

	Annual Inflation	Government	Commercial Banks	Total
1947-50	8.9	1.2	0.7	1.9
1951-60	20.9	2.0	1.5	3.5
1961-70	43.5	3.0	2.2	5.2
1971-80	42.8	1.8	2.0	3.8
1981-85	172.9	2.1	2.5	4.6
1986	65.0	1.3	1.9	3.2
1987	415.8	3.3	3.4	6.7
1988	1037.6	3.5	3.1	6.6
1989	1782.9	4.4	2.4	6.7
1990	1476.6	3.4	1.9	5.3
1991	480.2	3.1	2.1	5.2
1992	1157.9	2.7	1.9	4.6

Sources: Less, Botts and Cysne (1990) Table 2.6, p.38-39 and Cysne (1993).

In general the inflation tax revenues of the government have been slightly higher than those of commercial banks. However, the revenues from the inflation tax accruing to commercial banks may underestimate the contribution of inflation to their profits, if they manage to increase the average interest rate wedge between assets and liabilities when inflation goes up. Real share prices of commercial banks have in fact been found to be positively related to inflation in Brazil (Novaes Filho, 1988). In addition, as the use of checks, credit cards, telephone and automatic transfer services and the need of exchange of foreign banknotes increases with inflation, their profits from the supply of these services are also likely to increase.

The sectoral contribution of financial institutions to GDP increased from about 5 percent in 1970 to about 11 percent in 1990. (Table 7). The number of people employed in financial institutions almost doubled between 1979 and 1984. (Table 7).

Table 7 - Contribution of financial institutions to GDP and employment

A - Contribution to GDP (in %)

1970	5.4
1975	6.3
1980	7.9
1985	11.9
1990	11.1

Source : Brazilian National Account

B - Employment of private commercial banks (in thousands)

1979	269.6
1980	282.7
1981	307.0
1982	340.0
1983	385.0
1984	426.6

Source : Walter Novaes Filho (1988)

The revenues of the Italian government from the inflation tax on the monetary base never reached the same levels as those of the Brazilian government. Table 8 contains the inflation tax revenues of the Italian government from 1975 to 1978. Inflation tax revenues on the monetary base reached a maximum of 3.7 per cent of GDP in 1974 when inflation peaked at 24.5 per cent (december on december). Also in 1976 they were quite high (3.25 per cent of GDP).

Table 8 - Italy : Inflation tax revenues as a percentage of GDP; (arithmetic averages)

Years	Annual ¹ Inflation	Tax on monetary base ²	Tax (+) or transfers(-) on interest bearing public debt	Total (1) + (2)	Tax on income and wealth
	(1)	(2)	(3)	(4)	(5)
1965-'69	2.80	0.53	-4.34	0.19	6.82
1970	5.20	0.65	-6.92	1.57	6.13
1971	4.70	0.50	-1.14	0.64	6.37
1972	7.40	1.08	-4.21	0.87	7.02
1973	12.50	1.95	-1.32	2.27	6.70
1974	24.50	3.70	-4.76	8.46	6.83
1975	11.20	1.67	-6.10	1.77	7.38
1976	22.0	3.25	-2.40	5.60	7.71
1977	14.0	1.93	-1.34	2.27	8.74
1978	11.6	1.56	-4.74	0.82	10.54

¹ Measured by the consumer price index; december on december of previous year.

² Currency in circulation, liquidity of banks and required bank reserves; the latter include treasury bills, taking into account the interest paid on them.

Source : Masera Rainer S. (1979), Chapter 4.

Because in the 1970's real interest rates on public debt were often quite negative the losses suffered by Italian public debt holders because of inflation were very high, especially in 1974 and 1976. The sum of the inflation tax on the monetary base and on public debt reached 8.46 per cent of GDP in 1974 and 5.6 in 1976. It is worth noting that in 1974 the proceeds from the sum of these two inflation taxes as computed by Masera (1979) were higher than those from income and wealth taxes (cfr. last column of Table 8). In the 1980's the revenues from the inflation tax on the monetary base fell from 1.3 per cent in 1980 to 0.2 per cent in 1987. Also the government revenues from the inflation tax on public debt holders disappeared. In fact they turned into a substantial net transfer as real interest rates became very high and the holders of public debt were over-compensated for the reduction in the real value of government bonds.

In Italy the effect of inflation on profits of banks was not extremely strong first because they pay interest also on checking accounts, second because they are large holders of government bonds and treasury bills and third because they have paid part of the inflation tax on the monetary base as the interest rate they receive on their high required reserves never exceeded 5 per cent.

3.2 The structure by size of firms of Brazilian industry and the dependency from bank loans of small and medium sized enterprises.

Real interest rates were hovering around 1 percent per month on average in 1987 and 1988 (Table 9). On an annual basis these real interest rates were extremely high at about 13 percent. After 1988 except in the year 1990 when they were distorted by the Collor plan and the freezing of Treasury bills they averaged 2.1 percent per month or about 28 percent on an annual basis. Monetary policy became quite expansionary in the first 9 month of 1993 and as a result inflation accelerated from about 25 percent in the second semester of 1992 to 37 percent in September 1993 and the economy recorded a high rate of growth. In the fourth quarter monetary policy became again restrictive as real interest rates returned to very high levels.

The behaviour of the central bank in 1993 shows that it reacts to the acceleration of inflation by raising real interest rates and slowing down the rate of growth of money, as if it had as a target a given monthly inflation rate, which may change through time depending on the optimal rate of inflation needed to achieve targeted inflation tax revenues. We shall see in the next section that the central bank has been quite consistent in the 1980's in reacting with a two quarter lag to changes in inflation in the manner described above,¹⁶ which supports the hypothesis that they know exactly what they are doing and that they do it in a very professional way.

Real interest rates in the order of 28 percent per year maintained for several years (except for short spells) must be very damaging for existing firms that have to borrow heavily to finance investment and working capital and for potential new entrants in any branch of activity, be it agriculture, industry or services. Since Brazilian economic sectors are very concentrated and large private corporations need to rely relatively less on bank loans and external borrowing than small and medium sized firms, the policy of high real interest rates especially since 1989, may have increased the degree of concentration of Brazilian industry or at least prevented its reduction. State owned corporations which are all large do rely heavily on bank loans. However their losses are covered by the government budget and therefore the high real interest rate policy will not really affect their chances of survival. Foreign multinationals, to the extent that they need external financing can rely on borrowing in foreign currencies or capital injections from their parent companies.

Unfortunately we could not find reliable data on self-financing and bank financing of Brazilian enterprises by size of firms. Taking the sample of the 100 largest private Brazilian corporations in 1992 external debt amounted to 37 percent of sales for the first 10 and 42 percent for the 10 ranking from the 91st to the 100th position¹⁷. However, the difference of five percentage points may be too small to be significant and the 91st to the 100th firm too large to represent the universe of the small and medium sized firms.

¹⁶ See the estimates of the Brazilian monetary authorities' reaction function in sub-section 4.2 below.

¹⁷ Own calculation based on data published by Gazeta Mercantil, Balanço Anual, 1993.

Table 9 - Brazil: Real Interest Rates on certificates of deposits (CDB) issued by banks; (arithmetic averages of monthly data).

Quarter	Nominal Rates	Inflation (IPC)	Real Rates ¹	Monthly average for the year
1986	3	2.6	1.1	1.4
	4	5.9	1.6	
1987	1	16.5	1.2	1.1
	2	25.4	1.6	
	3	5.0	0.8	
	4	13.1	0.9	
1988	1	17.9	0.9	0.9
	2	19.7	0.7	
	3	24.0	0.9	
	4	29.0	1.0	
1989	1	18.9	-4.1	2.1
	2	18.2	3.7	
	3	35.2	2.9	
	4	52.5	5.8	
1990	1	56.4	-8.6	-2.5
	2	10.2	-8.7	
	3	14.5	1.7	
	4	22.5	5.5	
1991	1	15.3	-0.7	2.1
	2	11.6	3.0	
	3	16.7	1.7	
	4	29.9	4.3	
1992	1	27.9	3.1	2.1
	2	22.9	1.7	
	3	27.0	1.7	
	4	26.8	2.0	
1993	1	27.5	-0.2	0.1
	2	31.3	0.7	
	3	34.0	-0.2	
	oct.	-	2.4	

¹ Calculated as $r = [(1+i)/(1+\pi)] - 1$ where r = real rate, i = nominal rate and π the rate of inflation measured by the consumer price index (IPC) until the third quarter of 1990 and by the general price index (IGP) afterwards.

Sources: Central Bank of Brazil, Programa Economico, various issues. Note that the interest rates and the rate of inflation are on a monthly basis. For October 1993 real rate: Journal do Brasil, Nov. 19, 1993.

As an additional piece of incomplete evidence we report in Table 10 the self-financing and the borrowing from third parties of three groups of firms as a percentage of total sources of funds (internal and external, including share issues): foreign controlled, private national and state controlled firms. For the sample of foreign controlled firms which contains data on 84 of them one can assume that the average firm size is larger than for the 799 firms in the sample of private national firms in the 1978-84 period. The degree of self-financing was on average significantly smaller for the group of private national firms (65.6%) than for the group of foreign controlled firms (80.7%). In addition the borrowing from third parties (bank loans and issues of bonds) was almost four times as large for the sample of private national firms. State enterprises rely much less on self-financing (41.4%) and borrow much more than the other two groups of firms. However very high real interest rates barely affect them since they have no binding budget constraint.

Table 10 - Self-financing and external borrowing of Brazilian firms: 1978-84,¹ annual averages

	Self-financing as % of total sources of funds	Borrowing from third parties ² as % total sources of funds
Foreign controlled firms(84)	80.7	2.0
Private national firms(799)	65.6	7.2
State enterprises(117)	41.4	22.3

¹ Number of firms in sample in parenthesis.

² Excluding share issues.

Source: Lees, Botts and Cysne (1990) Table 11.7, p. 330-331.

The Italian industry is much less concentrated than the Brazilian one; in addition large corporations are highly exposed to foreign competition. Furthermore they are usually highly indebted with banks.

In this section we have tried to present evidence on the groups that gain from inflation. In Brazil they are all politically very powerful: the government or the parties in power, commercial banks, large private enterprises including foreign multinationals.

The losers are particularly the poorer classes who have no access to banking facilities and whose income is too small to invest whatever small savings in interest bearing financial assets. They have no other way to hedge against inflation than to buy all goods they can buy soon after they receive their wage or in the tourist areas to buy US dollars. The poorer classes have also been hit by the high variability of real wages in the 1980's and by the fact that by 1992 the real wage was not higher than at the beginning of the previous decade.

The overall costs of the Brazilian inflation are difficult to quantify. There are dead weight losses in terms of personal inconvenience and a partial return to barter caused by a stock of money below the social optimum, the costs related to the blowing up of the banking sector, the costs caused by the reduced signaling function of the price system, greater accounting costs, menu costs and the negative affect on the degree of concentration in industry. The fall in the investment rate (Fig.3) and the virtual halt in the growth of GDP per capita (Fig. 4), since 1987 must not be unrelated to the uncertainty caused by the high and variable inflation rates. One is left with the impression that this inflation must imply enormous costs for the society as a whole and that a serious stabilization program would create the conditions for a very large once-and-for all jump in real GDP and higher growth thereafter.

In the next section we shall present a two equation model of the Brazilian inflation, which will be tested using quarterly data for Brazil in the 1980's and early 1990's and for Italy from 1973 to 1983.

4. A Model of inflation and the Central Bank's reaction function and estimates for Brazil and Italy

4.1 The model

We assume that inflation is determined by costs of production as well as aggregate demand, in particular monetary policy. Both for Brazil and Italy it has been shown that wage dynamics, indexation rules, oil and/or agricultural supply shocks and exchange rate shocks play an important role. In addition monetary policy and velocity changes are crucial in phases of high inflation as suggested by the quantity theory.¹⁸ For Italy especially in the 1980's, when the tax pressure increased continuously also tax changes (both direct and indirect) may have become significant. So has German inflation after the nominal exchange rate became quite stable (from March 1983 to September 1993)

Equation (1), says that inflation is determined by the rate of growth of nominal wages corrected for productivity growth and by the rate of change of the price of oil expressed in domestic currency

$$(1) \quad Dp_t = a_1[Dw_t - Dq_t] + a_2[Dp^*_{oil,t} + Ds_t] + Du_t$$

where: D = first difference operator

p = log of the price level measured by the consumer price index

q = log of productivity of labour

w = log of nominal wage

p* oil = log of the price of oil in US dollars

s = log of the exchange rate of the domestic currency with the US\$

u = other cost shocks like agricultural price, tax, cost of capital shocks and foreign inflation

The Phillips curve is given by:

$$(2) \quad Dw_t = Dq_t + \sum_{i=1}^n \alpha_{o,i} Dp_{t-i} + \alpha_1 h_t$$

where: h_t = output gap, measured as % deviation from potential output

¹⁸ For interesting econometric studies for Brazil see de Holanda Barbosa and McNelis (1990) and for Italy Micossi and Papi (1993) and Favero and Spinelli (1992).

The demand side of the economy is influenced by the rate of growth of money, adjusted for changes in real money demand (velocity). We can either write a money demand function and solve it for inflation or start directly with the quantity theory:

$$(3) \quad Dm_t + Dv_t(i_t) + De_t = Dp_t + Dy_t$$

where: m = log of the stock of money

v = log of income velocity

i = nominal interest rate

e = demand shock

y = log of real GDP

Substituting (2) into (1) and assuming that velocity is a positive linear function of the nominal rate of interest one can combine the supply determined inflation equation with the quantity theory to obtain the following transfer function for the rate of inflation:¹⁹

$$(4) \quad Dp_t = b_0 + b_1 Dm_t + b_2 Di_t - b_3 Dy_t + \sum_{i=1}^n b_{4,i} Dp_{t-i} + b_5 h_t + b_6 Dpoil + b_7 Du_t + b_8 e_t$$

where a constant term b_0 has been added and $poil$ is expressed in domestic currency (p^*oil+s). All coefficients $b_0 - b_8$ are expected to be positive and most explanatory variables are expected to influence inflation with lags which we introduced explicitly in (1) - (4) only for inflation to simplify the notation.

Money is not assumed to be exogenous. The central bank is assumed to react with the lags to the government budget deficit, past inflation, the development of external accounts (either the balance of payments or the current account) and the business cycle. Thus the reaction function of the central bank is given by:

$$(5) \quad Dm_t = c_0 + c_1 g_t + c_2 Dp_t + c_3 bopy_t + c_4 h_t.$$

where: g = nominal government budget deficit divided by GDP

$bopy$ = balance of payments or current account divided by GDP

The idea behind introducing the external accounts into the reaction function (5) is that when they are in surplus the central bank feels more relaxed about reducing interest rates and expanding money or more simply that they behave passively by the "rules of the game" and do not sterilize completely international reserve flows; c_3 is therefore assumed to be positive. So is c_1 . As to the reaction to inflation and the business cycle the central bank can either behave in an accomodating way ($c_2, c_4 > 0$) or in a stabilizing way ($c_2, c_4 < 0$).

In Section 4.2 we present first causality tests between g , Dm , Dp and Ds for Brazil and Italy. Then we present estimates of the reaction functions (5) for the two countries. In Section 4.3 we present estimates of the inflation equation for Brazil and Section 4.4 contains the estimates of equation (4) for Italy.

¹⁹ For a model using an inflation transfer function, see de Holanda Barbosa and McNelis (1990).

4.2 The monetary authorities' reaction function

Our main hypothesis is that monetary policy and inflation are dominated by fiscal policy (fiscal dominance model). In order to test this hypothesis we estimate a general version of the monetary authority reaction function (equation (5) of section 4.1) with 4 lags for each variable and then simplified it using F-tests according to Hendry's method. The results for Brazil are reported in Table 11. The sample period is 1981.3 or 1983.1 to 1993.1, depending on data availability. The endogenous variables used are alternatively the rate of change of the monetary base (Dm_0), of M_1 (Dm_1) and of an extended monetary aggregate including securities issued by the Federal, state and local governments, saving deposits and private securities (Dm_4). All the explanatory variables have been already defined in section 4.1, except for $res2y$ which is the ratio of convertible currencies to GDP and is substituted for $bopy$ in regressions (2),(3) and (4)²⁰.

²⁰ We also performed Granger causality tests between the deficit, money growth and inflation. In general for Brazil we find that the deficit causes money and prices, for Italy we find that money and the exchange rate cause prices, and that money causes the exchange rate with shorter lags (tests not shown here to save space).

**Table 11 - Brazil: Reaction function of monetary authorities, quarterly data,
1981.3 or 1983.1 to 1993.1**

Dependent var.	Regr. (1) Dm ₀	Regr. (2) Dm ₀	Regr. (3) Dm ₁	Regr.(4) Dm ₄
constant term	0.19 (3.07)	0.09 (1.13)	0.08 (0.98)	0.16 (2.39)
g(-1)	0.70 (2.90)	0.83 (3.41)	0.85 (3.32)	1.22 (5.90)
g(-2)	1.52 (4.87)	1.44 (4.47)	1.27 (3.73)	-0.33 (-1.19)
Dp(-2)	-0.49 (-3.46)	-0.50 (-3.27)	-0.39 (-2.42)	-0.003 (-0.02)
bopy	1.03 (1.70)	-	-	-
res2y	-	0.81 (1.60)	0.69 (1.30)	0.87 (2.04)
Q1	-0.33 (-5.11)	-0.33 (-4.39)	-0.31 (-3.92)	-0.10 (-1.50)
Q2	-0.36 (-5.27)	-0.33 (-4.26)	-0.32 (-3.82)	-0.15 (-2.29)
Q3	-0.26 (-3.69)	-0.23 (-2.82)	-0.24 (-2.75)	-0.01 (-0.18)
R ²	0.81	0.80	0.77	0.69
R ² adj.	0.77	0.76	0.73	0.62
S.E.of regr.	0.16	0.17	0.18	0.14
D.W.	1.87	1.87	1.91	1.28
F.stat	24.04	19.15	16.22	10.34
No of obs./smpl.per	47/81.3-93.1	41/83.1-93.1	41/83.1-93.1	41/83.1-93.1

t - statistics are indicated in parenthesis.

Regressions (1) and (2) are very satisfactory and well behaved. The LM test indicates the absence of autocorrelation of the residuals, they are also normally distributed (Jarque-Bera test) and are not heteroskedastic (Arch-test). Chow forecast tests which break the sample in 89.4, 90.1 and 90.4 indicate stability of the estimated relationship. So does the cusum test. Regressions (1)-(3) are cointegrated. The results of these tests are not reported here to save space. We did not perform recursive parameter estimates, because the number of observations is not large enough.²¹ Fig 8 shows the residuals and actual and fitted values of regression (1).

When Dm₁ or Dm₄ are used as dependent variables the results are less satisfactory (regressions (3) and (4)). This is especially the case for Dm₄ in regression (4) for which the residuals are autocorrelated and not normally distributed. From now on we shall therefore use mainly the monetary base as the relevant monetary aggregate for Brazil.

The coefficients of regression (1) imply that a one percent increase in the ratio of the deficit to GDP leads within 3 quarters to an increase in the annualized growth of M₀ of 9.2 percentage points, that Brazilian monetary authorities tend to react in a stabilizing way and quite strongly to an increase in inflation with a two quarter lag and that an increase in the balance of payments surplus leads to a relaxation of domestic monetary conditions. The negative and significant coefficient of Dp(-2) suggest that Brazilian monetary authorities have had during the sample period a policy of stabilising inflation, increasing interest rates and restricting credit conditions when inflation was increasing too much and viceversa relaxing credit conditions when it was dropping below certain

²¹ For previous estimates of a reaction function for Brazil see Montesano (1989).

levels. One such episode of inflation moving above a desired level and the monetary authorities restricting credit occurred in the autumn of 1993 and was described above in section 3.2. (see also Table 9). This may be an additional indication that the main objective of Brazilian monetary authorities, besides the mere monetary financing of the budget deficit, is the maximization of the revenues from the inflation tax. Brazilian inflation is not an uncontrolled phenomenon, but an explicit target of monetary policy and regressions (1) -(3) of Table 13 suggest that the Banco do Brazil knows exactly what it is doing and that it is doing it quite professionally.

For Italy we have reliable quarterly data from the beginning of the 1970's; hence our estimates cover the period 1971.2 to 1992.1 (the last observation available). 5 observations are lost at the beginning owing to the way we have defined percentage changes (with respect to the same quarter of the previous year) and to lags. $D_4 m_2$ is defined as $\log m_2 - \log m_2(-4)$. It is therefore a rate of change with respect to the same quarter of the previous year. All percentage changes for Italy are defined in this way, while for Brazil they are defined as the change with respect to the previous quarter. Hence $Dm_0 = \log m_0 - \log m_0(-1)$. With inflation and money growth being much lower in Italy, changes of nominal variables with respect to the previous quarter tend to be dominated by seasonal factors and contain therefore too much noise. Seasonality has also changed substantially in Italy in the course of the sample period.

The estimated reaction function for Italy is:

$$D_4 m_2 = 0.0084 + 0.79 D_4 m_2(-1) + 0.23 g + 0.15 g +$$

(0.99) (17.72) (4.85) (2.87)

Regr. (5)

$$0.36DDh + 0.31 cays(-2) + 0.04D74-1$$

(2.09) (3.23) (2.69)

$$R^2 = 0.92, R^2 \text{ adj.} = 0.91, \text{ S.E. of regr.} = 0.014, \text{ D.W.} = 1.94,$$

$$\text{F-statistic} = 137.90, \text{ no. of obs} = 84; \text{ Sample period} = 1971.2 \text{ to } 1992.1$$

$$\text{DF-test} = -8.70, \text{ ADF-test} = -5.40$$

Where g is seasonally adjusted, $D77$ is a dummy variable taking a value of 1 up to 1977.4 and zero otherwise, DDh is the second derivative of the real output gap, $cays(-2)$ is the seasonally adjusted ratio of the current account to GDP lagged two quarters and $D74-1$ is a dummy for the first oil shock which is equal to 1 in 1974.1 and zero otherwise.

The degree of monetary financing of the government budget deficit fell significantly after 1977. This is what we call the Baffi effect. It evidently took Governor Baffi somewhat more than two years to gain greater control of the monetary base²². We searched for the breaking point in the monetary financing of Italian budget deficits by trying alternatively with $D75$, $D76$, $D78$, $D79$, $D80$, $D81$, where these dummies are defined in a similar way as $D77$.

Until the end of 1977 an increase in the deficit to GDP ratio of 1 percent led to an annualized 1.8 percentage points increase in money growth after 5 quarters; after 1977 it led to an increase of only 0.7 percentage points. Recalling that the figure we found for Brazil (regr.(1) of Table 13) was 9.2 percentage points, we see that the degree of monetary financing was 13 times higher and much faster (one quarter as opposed to 5) in Brazil in the 1980's compared with Italy after 1977.

²² Paolo Baffi was appointed governor in mid 1975.

The positive coefficient of DDh implies a policy of accommodation of the Italian monetary authorities to fluctuations in the real business cycle, a behaviour which is confirmed by a casual analysis of turning points in Italian interest rate policy. The turning points have always been linked with a lag to turning points in the external accounts, as confirmed by the positive and very significant coefficient of the variable cay .²³ Italian monetary authorities try to accommodate booms in investment activity and aggregate demand until the external constraint is hit. This behaviour was particularly evident in 1973-74 and in 1980-81. The residuals of the Italian reaction function (regr.(5) are not autocorrelated (LM-test), they are normally distributed (Jarque-Bera test) and not heteroskedastic (Arch test). The equation is cointegrated at the 1% significance level, both according to the DF and the ADF-test. The cusum-test indicates that the function is stable at the 5% significance level. The residuals and actual and fitted values from regression (5) are shown in Fig. 9.

As the sample period of the Italian reaction function is sufficiently long we could perform recursive estimates of the individual parameters to check their stability through time. Figures 10, 11 and 12 show the recursive parameter estimates of the coefficients of g , DDh and $cays(-2)$. The coefficient $c(4)$ of g is stable through time except for a brief two year period in 1982-83 when the degree of monetary financing of the deficit tended to increase around the general ERM realignment of March 1983. The coefficient $c(5)$ of DDh has a slight tendency to increase through time, while the coefficient $c(6)$ of $cays(-2)$ has a tendency to decline. These two opposite movements may be related to the increased confidence in the ERM and the increased degree of capital mobility in Europe after 1983-84. These changes relaxed somewhat the current account constraint by making the financing of current account deficits easier. They allowed therefore the Banca d'Italia to give more importance to the financing of domestic investment and aggregate demand booms. The greater cohesion of business cycles in European countries may also have contributed to the slight changes in these coefficients which, however, remain well within the ± 2 S.E. range.

Reaction functions are in general thought to be quite unstable, as in most countries monetary and fiscal authorities are believed to change objectives or the weight of objectives frequently. Yet the monetary reaction functions for Dm_0 for Brazil and $D_4 m_2$ for Italy presented above do not support this view. Despite the high and variable inflation rates in Brazil and the changes in the exchange rate system for Italy (from fixed to flexible exchange rates in March 1973 and to the ERM in March 1979) we manage to explain the growth in monetary aggregates as a function of three objectives for both countries: a) the financing of the government deficit; b) a domestic target be it inflation (Brazil) or the passive financing of investment booms (Italy) and c) an external (balance of payments, international reserves or current account) objective. In this respect the two equations estimated are very similar indeed. There are however, important differences in behaviour, between the two central banks. First Brazilian monetary authorities are much more prone to financing budget deficits passively than the Italian ones. Secondly the Brazilians react in a stabilizing way to inflation, while the Banca d'Italia seems to believe more in the "real bills" doctrine. Third, the external constraint is much more important for Italy than for Brazil, as is to be expected for a much more open economy. Fourth, inflation being much lower in Italy the Banca d'Italia adjusts actual to desired money growth much more slowly. As shown by the large coefficient of lagged money growth in regression (5), the average adjustment period is about 5 quarters. For Brazil lagged money growth never turns out to be significantly different from zero which implies that all the adjustment takes place within one quarter.

²³ A one percentage point increase in the ratio of the current account to GDP leads in the long run to a 1.5 percentage points increase in money growth.

4.3. Brazil: the inflation equation, 1980.3-1993.1

In Table 12 we present estimates of equation (4) of section 4.1 for Brazil, using quarterly data from 1980.3 to 1993.1. We experimented both with the error correction and partial adjustment models but the more simple equations shown in the table were much more satisfactory. To the explanatory variables given in equation (4) we added the variable "turnover of central bank governors" defined as the inverse of the number of months in office of each central bank governor, obtained from Table 1 of section 2.1. This variable is assumed to be negatively related to credibility of the government and hence positively related to inflation. All variables except "turnover" were lagged up to four quarters, before simplifying the regression using Hendry's method.

Drpoil is the rate of change of the real price of oil in cruzieros. The nominal price of oil in domestic currency is too highly correlated with domestic inflation as the Brazilian currency followed a crawling-peg for most of the sample period. D86 and D90 are two dummies reflecting the wage and price freeze and improved expectations during the cruzado and Collor plans. The first one assumes a value of 1 in the second and third quarter of 1986 and zero otherwise and the second one the value of one in the second, third and fourth quarter of 1990. The rate of change of the real price of agricultural products was included in the regression but is never had a significant coefficient. Also the rate of change of the ratio of government expenditures to GDP was included as a proxy for tax-supply shocks, but with no success. The business cycle, the changes in real GDP, changes in interest rates and lagged inflation always had insignificant coefficients.

Table 12 - Brazil: Estimates of the inflation equation (4), quarterly data, 1980.3 - 1993.1

No. of regression	(6)	(7)	(8)
Definition of money	M_0	M_0	M_1
constant term	0.09 (2.07)	0.10 (2.14)	0.11 (2.69)
Dm	0.40 (3.69)	0.44 (3.91)	0.54 (6.32)
Dm(-1)	0.28 (2.59)	0.17 (1.59)	0.18 (1.63)
Dm(-2)	-	-	-0.13 (-1.68)
Drpoil (-1)	0.30 (1.79)	0.36 (2.27)	0.28 (2.06)
Turnover	1.28 (3.65)	1.22 (3.68)	1.22 (3.60)
h(-1)	-	0.004 (0.70)	0.003 (0.65)
Dp(-1)	-0.001 (-0.006)	-0.005 (-0.03)	-0.003 (-0.02)
D86	-0.32 (-2.31)	-	-
D90	-0.31 (-2.72)	-	-
D86.2	-	-0.48 (-2.67)	-0.47 (-3.04)
R ²	0.73	0.70	0.78
R ² adj.	0.69	0.65	0.75
S.E. of regr.	0.16	0.17	0.15
D.W.	1.85	1.82	1.78
F.stat	16.93	14.07	19.60
No of obs.	51	51	51

t - statistics are indicated in parenthesis.

The fact that lagged inflation never turned out to have a positive and significant coefficient deserves some explanation. In Brazil the theory that inflation had a strong inertial component has been very popular. In particular de Holanda Barbosa and McNelis (1990) show in a very interesting study that the degree of inertia changed though time with the legal changes relating to wage indexation clauses: The degree of inertia increased as indexation lags became shorter.²⁴ We were unable to find significant effects of lagged inflation suggesting that the inertial theory has no empirical foundation, at least for the 1980's. However, de Holanda Barbosa and McNelis' study covers the period 1963.1-1985.1, while ours the period 1980.3-1993.1. In addition they use real money as an explanatory variable rather than nominal money like we do thus biasing the results against the quantity theory.

The most important variables affecting inflation are according to our estimates current and lagged money growth, oil shocks and the "turnover" variable. The null hypothesis that the sum of the coefficients of Dm_0 and $Dm_0(-1)$ is equal to 1 in regr. (6) cannot be rejected at the 5% significance level. It is however, rejected at the 1% level of significance (Wald-test). The explanatory power of the regressions is higher when M_1 is used as independent variable (Regr. (8)). All three equations are

²⁴ The lags changed from annual to monthly in the last 30 years or so.

cointegrated at the 1% level and their residuals satisfy the standard tests for autocorrelation, normality and homoskedasticity. In addition the cusum test indicates that the relationships are stable. Chow forecast tests performed for equations (7) and (8) by breaking the sample period in 1990.4 confirm the hypothesis of no structural break after that date.

The estimates presented in Table 12 suggest that money is by far the main determinant of Brazilian inflation and that the lags are very short, as one would expect in such a high inflationary environment. However, also the "turnover" variable turns out to be very significant confirming our analysis of section 2.1 that the monetary constitution, central bank independence and stability of governors do matter and influence in an important way expectations of inflation and inflation. Our estimates also lead us to reject the inertial theory of Brazilian inflation, at least for the 1980's and early 1990's.

4.4 Italy: the inflation equation, quarterly data, 1972.3 - 1992.1

Table 13 contains the estimates of eq.(4) for Italy for consumer and wholesale prices. We experimented with the error correction model and with the partial adjustment model, before choosing the more simple specification of eq. (4), but with all the variables expressed in terms of accelerations. Our data bank starts in 1970.1 and ends in 1992.1. However, because of the definitions of the variables (accelerations of percentage changes with respect to the same quarter of the previous year) and because of much longer lags for the explanatory variables than we found for Brazil, 10 observation are lost. p_2 stands for the logarithm of wholesale prices, $DD_4 p_2$ for the acceleration of wholesale prices (regr.(10)).

A number of supply shock variables were added as explanatory variables. First we have a variable reflecting tax increases: the seasonally adjusted ratio of total tax revenues to GDP (tys). To be more precise, this variable is introduced as follows in the regressions:

$$D_4 \text{ tys} = \log(\text{tys}) - \log \text{tys}(-4) \quad \text{and}$$

$$DD_4 \text{ tys} = D_4 \text{ tys} - D_4 \text{ tys}(-1).$$

All other variables are defined in the same way. Second we have the acceleration of German consumer price inflation ($DD_4 pg$), reflecting the degree of openness of the Italian economy and EMS effects.

**Table 13 - Italy: estimates of the inflation equation, quarterley data,
1972.3 - 1992.2**

Regr. No.	(9)		(10)	
Dependent variable	DD4p		DD4p2	
Constant term	0.0003	(0.24)	-0.0002	(-0.06)
DD4pg	0.53	(0.79)	0.33	(0.53)
DD4pg(-1)	-0.16	(-0.51)	0.04	(0.07)
DD4m ₂ (-2)	0.08	(0.99)	0.06	(0.36)
DD4m ₂ (-3)	0.22	(2.91)	0.53	(3.26)
DD4m ₂ (-4)	0.08	(1.02)	-0.07	(-0.41)
DD4m ₂ (-5)	0.14	(1.70)	-	
h	0.003	(3.69)	-	
Dh	-		0.017	(5.39)
DD4 poil	-		0.05	(3.70)
DD4 poil (-3)	0.014	(2.18)	-	
DD4tys	0.014	(1.57)	0.03	(1.54)
DD4i	-		0.008	(2.64)
R ²	0.49		0.64	
R ² adj.	0.42		0.60	
S.E. of regr.	0.011		0.023	
D.W.	1.53		1.78	
F.stat	7.30		13.79	
No of observ.	79		79	
ADF - test	-7.14		-7.75	
LM(4) test: F-stat.	10.89		6.81	
Arch(4) test: F-stat.	4.41		1.54	
Jarque-Bera Norm.test	0.73		7.29	

t - statistics are indicated in parenthesis.

Regressions (9) and (10) of Table 13 are the best we could estimate for the whole period. Significant explanation variables are only money lagged three quarters, the bussiness cycle, oil shocks with much longer lags for consumer prices than for wholesale prices, the current interest rate, reflecting probably more cost of capital changes than changes in velocity. The regressions do not pass all the standard statistical tests. For instance the residuals of regression (9) for consumer prices pass the tests of cointegration and normality but they are serially correlated and heteroskedastic. The cusum and cusum-square tests indicate however stability of the function at the 5% level.

These largely unsatisfactory results are caused by the hybrid nature of regressions (9) and (10) which in turn arise from the hybrid nature of the sample period chosen. We have flexible exchange

rates since March 1973 and then starting in March 1979 the ERM of the EMS. During the ERM period the German inflation should be expected to increase its influence on Italian inflation and Italian money to loose gradually its importance as the system becomes more credible. The constant term should also be expected to fall as the ERM becomes more credible.

The main reason why we present regressions (9) and (10) for the whole sample period is to perform recursive parameter estimates to be able to say something about how the relative importance of Italian money versus German inflation changed through time and about turning points in the credibility of the ERM. The recursive parameter estimates will also enable us to say something about the theory of inflation relevant for each subperiod.

Figure 13 shows the recursive parameter estimates of the coefficient $c(1)$ of the constant term in regression (9) of Table 13. It drops sharply in 1977-78 around the time the Baffi effect was making itself felt and in the run-up to the creation of the EMS. However, the frequent realignments in the early phases of the life of the ERM and the second oil shock pushed it up again until a clear downward trend starts only after the March 1983 realignment and the French U-turn. The pattern of $c(1)$ suggests that the credibility of the ERM was firmly established only after March 1983.²⁵ Fig. 14 shows that the coefficient $c(2)$ of German inflation jumped to about 0.7 at the time of the creation of the EMS, fell back in 1982-83 and then stabilized at about 0.6-0.7. The coefficient $c(5)$ of lagged money declined steadily in the course of the 1980's with an interruption again in 1982-83. (Fig. 15). The time pattern of these coefficient suggest that the parameters estimated were quite unstable during the sample period, that the determinants of inflation changed as the EMS became more credible with the quantity theory loosing in importance and German inflation becoming the dominant factor. It also suggests that the EMS became credible only after March 1983 and that the first quarter of 1983 is a better breaking point to test eq. (4) for Italy than the first quarter of 1979 when the EMS was created. We shall therefore present in Table 14 below estimates of equation (4) for the period 1973.3 - 1983.1.

Both for consumer prices (regr. 11) and for wholesale prices (eq. 12) the results strongly support the quantity theory explanation of Italian inflation. The length of the lags for money and oil are very plausible. Both equations are cointegrated and pass all the standard tests on the residuals. The business cycle is a very significant determinant of Italian inflation. Real GDP growth reduces inflation by increasing the real demand for money. Taxes are not significant at the 10 percent level but have the right sign.²⁶ The regression for consumer prices is the more satisfactory. A Wald test for the null hypothesis that the sum of the coefficients of money is not significantly different from one cannot be rejected at 1 percent significance level for regr.(12) and for a modified version of regression (11) in which oil (which contains the exchange rate) is removed from the explanatory variables.

²⁵ For a similar interpretation of changes in the constant term in inflation equations see Eelke de Jong (1993).

²⁶ Regr. (11) has also three dummies among the explanatory variables assuming respectively the value of 1 for 1978.1, 1982.2 and 1982.3. Regr. (12) has one dummy assuming the value of 1 in 1982.3. The latter two have to do with wide swings in US interest rates that were transmitted to Italy (check).

Table 14 - Italy: estimates of the inflation equation for the flexible exchange rate period,
quarterly data - 1973.3 - 1983.1.

Regr. No.	(11)		(12)	
Dependent variable	DD4p		DD4p2	
Constant term	0.002	(2.01)	0.0005	(0.16)
DD4m ₂ (-2)	0.03	(0.62)	0.10	(0.52)
DD4m ₂ (-3)	0.24	(4.88)	0.77	(3.99)
DD4m ₂ (-4)	0.14	(2.82)	-0.30	(-1.56)
DD4m ₂ (-5)	0.29	(5.66)	-	
DD4 poil (-3)	0.02	(4.81)	-	
Dh	0.006	(5.68)	0.02	(5.77)
Dh(-2)	0.003	(3.82)	-	
DD4y(-1)	-0.43	(-5.59)	-	
DD4i	0.009	(9.57)	0.018	(5.36)
DD4 tys	0.007	(1.41)	0.027	(1.32)
DD4 poil	-	-	0.05	(3.39)
R ²	0.96		0.85	
R ² adj.	0.94		0.82	
S.E.of regr.	0.005		0.02	
D.W.	1.84		1.71	
F.stat	45.71		22.84	
No of observ.	39		39	
ADF - test	-5.89		-5.00	
LM(4) test: F-stat.	0.56		1.64	
Arch(4) test: F-stat.	1.54		2.29	
Jarque-Bera Norm.test	0.37		0.72	

t - statistics are indicated in parenthesis.

Fig. 16 shows the residuals and the actual and fitted values from regression (11) of Table 14. We performed an out of sample forecast with this regression starting from 1983.2. It turns out that this regression tends to strongly overpredict inflation after 1983.1. Fig. 17 shows the out of sample forecast and compares it with the actual values. The cumulated error of the forecast amounts to about 17 percent at the end of the sample period, which implies that the model overestimates inflation on average by about 0.5 percentage points per quarter or about 2 percentage points per year, which is a substantial error. This confirms the conclusions drawn above that after 1983.1 there was a structural break in the equation determining inflation in Italy and that this break must have

been caused by the increased credibility of the ERM and the increased importance of German inflation in determining the Italian one.²⁷

If the quantity theory breaks down as an explanation of Italian inflation after 1983.1, what explains it then? Under perfectly fixed exchange rates goods arbitrage is expected to bring about a tendency towards equalization of consumer price inflation between Italy and Germany; in terms of accelerations of inflation we have in the long run:

$$(6) \quad DD_4p = b_0 + b_1 DD_4pg$$

Where $b_1 = 1$ and $b_0 = 0$. We report below the results of estimating eq. (6) with the addition of lags for DD_4pg , oil shocks (because they may affect Italy differently than Germany) and the business cycle:

$$DD_4p = -0.002 + 0.67DD_4pg + 0.12 DD_4pg(-1) + 0.003 DD_4poil$$

(-2.26) (4.39) (0.78) (0.99)

$$0.001 h(-1) - 0.01 D_{83.3} - 0.01 D_{91.3}$$

(2.09) (-3.51) (-3.23)

Reg.(13)

$$R^2 = 0.71 ; R^2_{adj} = 0.66 ; S.E. \text{ of regr.} = 0.004; D.W. = 1.80 ; F\text{-stat.} = 11.66;$$

$$\text{sample period} = 1983.2 - 1992.1 ; \text{number of obs.} = 36.$$

$$LM(2) F\text{-stat} = 0.47; LM(4) F\text{-stat} = 2.92 ; \text{Jarque-Bera Norm test} = 2.68$$

$$Ach(4) F\text{-test} = 0.84 ; DF\text{-test} = -5.30 ; ADF\text{-test} = -3.27$$

In the credible ERM money plays no role any more. Only German inflation, the business cycle and to some extent oil matter. A Wald test for the null hypothesis that the sum of the two coefficients of German inflation is equal to one is accepted at the 1% significance level (F-statistic = 1.03, Prob. = 0.32). The null hypothesis that the constant term is equal to zero and that the sum of the coefficients of German inflation is equal to 1 is rejected at the 5% significance level (F-stat. = 3.29, Prob. = 0.0514).

²⁷ For a similar interpretation see Eelke de Jong (1993).

5. Summary and conclusions

The main conclusions of this paper are the following:

- 1) the quantity theory of money explains very well Brazilian inflation in the 1980's and early 1990's and Italian inflation during the flexible exchange rate period which goes from 1973 to 1983, despite the creation of the EMS in March 1979. Neither for Brazil nor for Italy we found support for the so called inertia-hypothesis of inflation.
- 2) In Brazil money growth is strongly influenced by fiscal deficits throughout period in the presence of a central bank which is highly dependent on the government (the fiscal dominance theory). In Italy the first steps towards the control of inflation were taken at the beginning of 1978 by governor Baffi when he managed to reduce significantly the degree of monetary financing of the deficit a change which was later honored by his successor and "institutionalized" by making the central bank more independent from the government. The most important step in this direction was the divorce between the Treasury and the Banca d'Italia in July 1981. In this respect Brazil has a lot to learn from Italy.
- 3) The government of Brazil has a strong credibility problem, as suggested by the high significance of the variable "turnover" in the explanation of Brazilian inflation, while Italy managed to make large gains in credibility after the policy of passive monetary financing of the deficits was ended at the end of 1977.(the Baffi-effect) and the ERM became a more binding constraint.
- 4) Despite the very different average level of inflation and the different institutional settings the set of variables that the two central banks target is remarkably similar, as suggested by the estimates of the reactions function in Section 4.2. The estimates suggest also that both central banks have a very "rational" and stable behaviour. In particular the Brazilian central bank knows exactly what it is doing: it "stabilizes" inflation at a high level in such a way as to maximize government and commercial banks revenues from inflation. The game may, however, be very close to a dangerous end as the stock of M1 had fallen by March 1993 to a trivial 1.3 percent of GDP and the base of the inflation tax is continuing to fall thus contributing to increase inflation further.
- 5) There is a strong presumption that the costs of this reckless policy are very high for the country as we see no other reasons for the negative growth of real GDP per-capita in the last 7 years or so other than the deadweight losses caused by the virtual disappearance of money and the uncertainty created by inflation. The cumulated costs may amount to 15-20 percent of GDP.
- 6) The efficiency of the Brazilian banking system in the automatic transfer of funds between various accounts and in processing an enormous amount of small denomination cheks is perverse in the sense that it has slowed down the return of the economy to barter and by doing so it has reduced the welfare losses of inflation for a given stock of real M1. This must have retarded stabilization.
- 7) As in the 1980's inflation in Brazil accelerated, the politically powerful gainers from inflation (the government, commercial banks and big corporations) realized how useful inflation was for them and started enjoying the status quo and hence resisting stabilization. The high and accelerating inflation in Brazil and its persistence has therefore to be explained mainly in political terms as a struggle between the already very rich and the others.
- 8) Besides the lack of central bank independence and government and central bank credibility there are other two structural weaknesses which make the non-monetary financing of budget deficits difficult in Brazil: the thinness of Brazilian financial markets and the very small degree of openness

of the economy. The latter makes the stability of the nominal exchange rate a not so important issue for those that matter in the country.

- 9) The resolution of the Brazilian inflation problem depends on the political will to attack the problem at its roots, a will which has so far been lacking, even at the time of the implementation of the various stabilization plans since 1986.

Appendix I - Description and sources of data used

A) Brazil

BOP = balance of payments in US \$million. Source: Conjuntura Economica, published by Fundação Getulio Vargas.

CA = current account in US \$ million. Source: Conjuntura Economica.

DEF = government deficit in current prices. Source: Brasil Programa Economico, published by the Central Bank of Brazil.

D86 = dummy for Cruzado plan equal to 1 in 1986. 2 and 1986.3 and zero otherwise

D90 = dummy for Collor plan equal to 1 in 1990.2 - 1990.4 and zero otherwise

EP = private market exchange rate. Source: Conjuntura Economica.

$g = DEF/YN$

$h = (\text{real GDP} - \text{trend real GDP})/\text{trend real GDP}$

M_0 = monetary base, end of period. Source: Central Bank of Brazil (BCB)

M_1 = Currency and checking deposits. Source BCB.

M_4 = extended money including financial investment funds, federal, state and municipal securities, special earning deposits and private securities. Source BCB. (see also Table 3)

P = general price index equal to an average of consumer and wholesale prices. Source: Conjuntura Economica.

PA = agricultural price index. Source: Conjuntura Economica.

POIL = price of oil in US dollars, converted into domestic currency at the private market exchange rate. Source: International Monetary Fund, International Financial Statistics(IFS).

RES = international reserves. Source: BCB.

RES2 = liquid international reserves. Source: BCB.

Y = quarterly GDP at constant prices. Source: Boletim Conjuntural, published by IPEA Instituto de Pesquisa Economica e Aplicada, Rio de Janeiro.

YN = quarterly GDP at current prices. Source: Boletim Conjuntural.

TURNOVER = inverse of the number of months of Central Bank's governor in office (see Table1).

Dx = first difference operator; lower case letters indicates logs or ratios (like g and h above). All percentage changes for Brazil are defined as changes with respect to the previous quarter for instance as $Dx = \log X - \log X(-1)$

B. Italy

cal = current account in lira. Source: International Financial Statistics (IFS) of IMF

cays = current account surplus/Y, seasonally adjusted.

DEF = Treasury financing requirement. Source: Banca d'Italia (BI)

D77 = dummy = 1 from 1970.1 to 1977.4

EDM = official exchange rate of the lira with the Deutsche Mark. Source: IFS

g = seasonally adjusted DEF/Y

h = (real GDP - real YT)/real YT

i = nominal interest rate on private medium term bonds; average for last month in quarter, in percent per year.

M₀ = monetary base, end of period. Source B.I.

M₂ = money stock (currency plus bank deposits), end of period. Source: BI.

P = consumer price index, last month of quarter. Source: ISTAT.

P₂ = wholesale price index, last month of quarter. Source: ISTAT

PD₁ = total public debt. Source: B.I.

PD₃ = total public debt debt held by the Banca d'Italia. Source: B.I.

PG = German consumer price index, last month of quarter. Source: IFS, line 64.

POIL = price of oil, in US dollars converted into liras at the official lira US-\$ exchange rate

S = official exchange rate of lira with the US dollar. Source: IFS

tys = ratio of total government revenues to nominal GDP, seasonally adjusted separately from 1970.1 to 1981.4 and 1982.1 to 1992.1

Y = GDP real. Source: ISTAT.

YN = GDP nominal. Source: ISTAT.

YT = trend of real GDP computed separately for the 1970's and the 1980's by regressing Y on a constant and time

TGR = government revenues.

Dx = first difference operator; lower case letters indicate logs of ratios or variables (like g and h above). All percentage changes for Italy are defined with respect to the same quarter of the previous year; thus $D_4x = \log x - \log x(-4)$.

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Fig. 1 Brazil: Money and Public Debt
(as percentage of GDP)

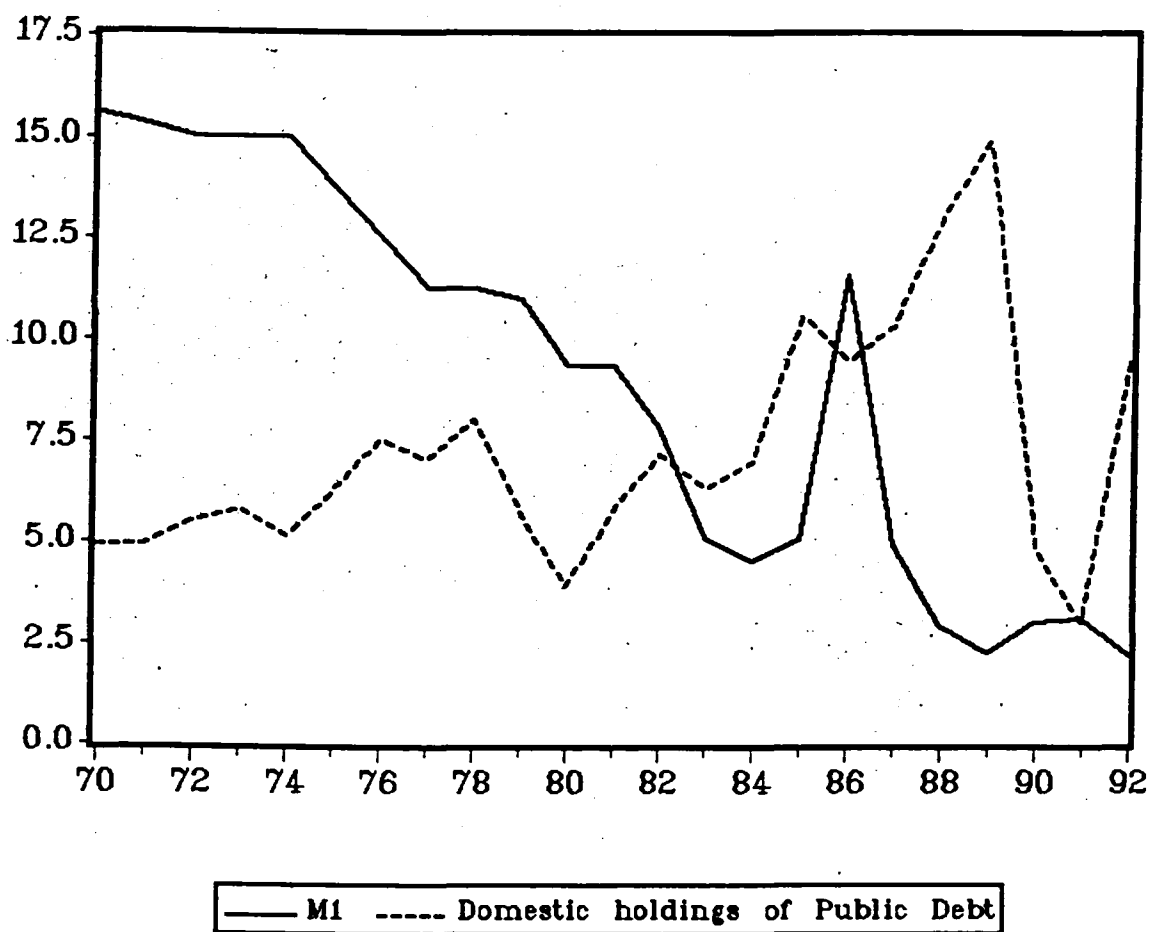


Fig. 2 Brazil: IGP-DI Inflation
(monthly percentual change)

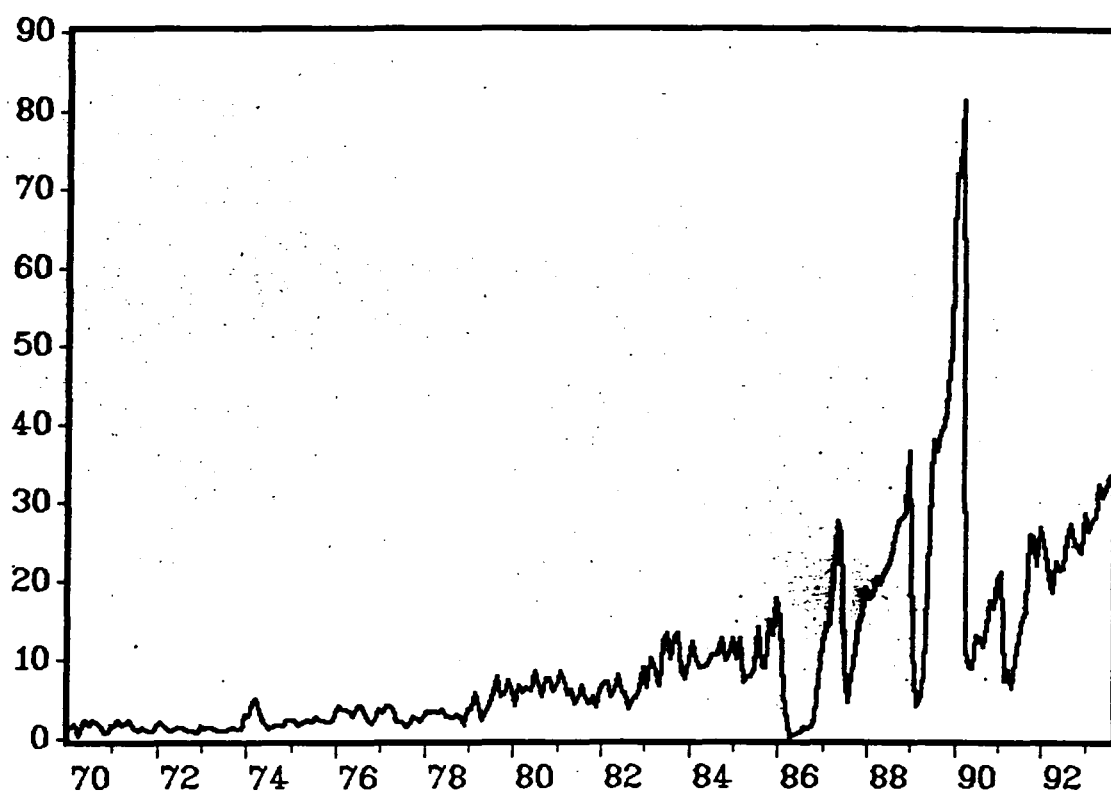


Fig. 3 Brazil: Gross Fixed Capital Formation
(as percentage of GDP)

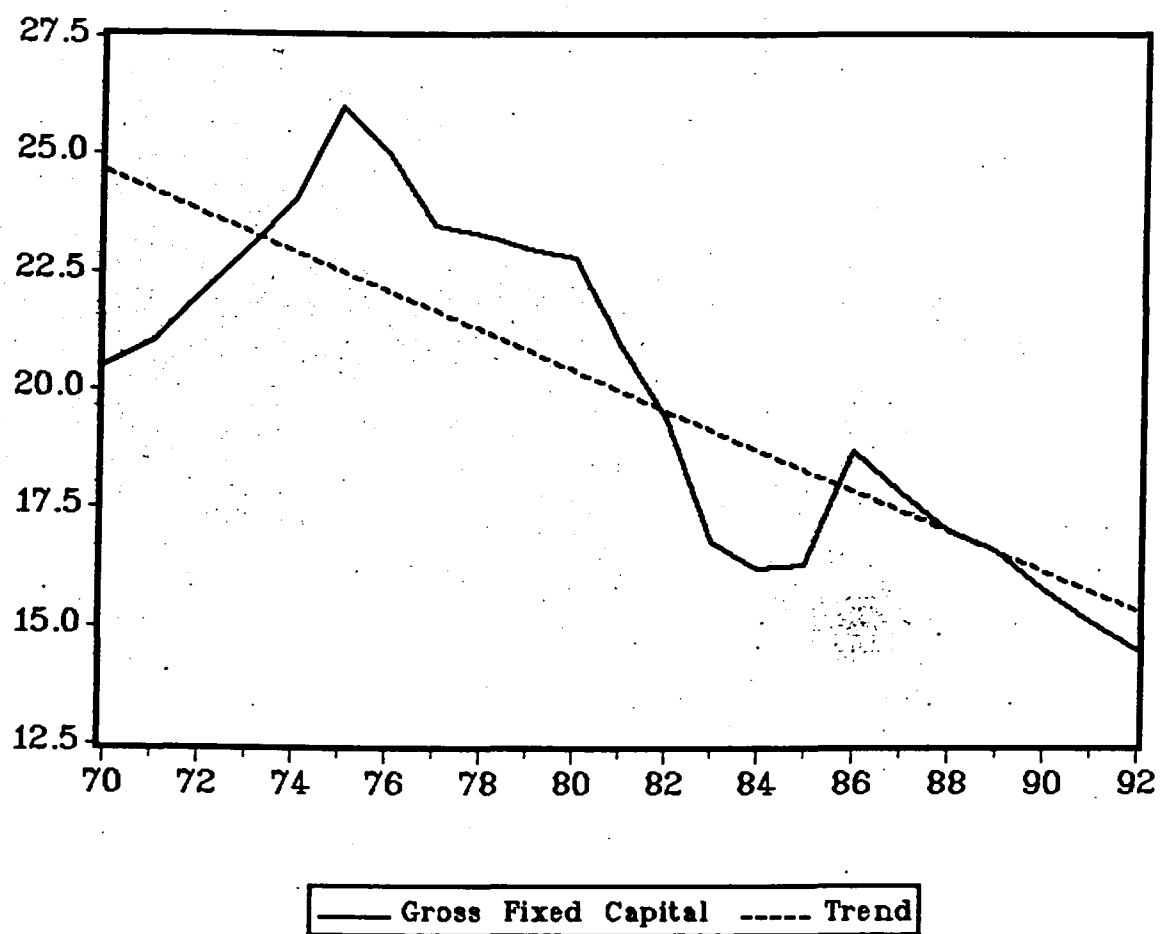


Fig. 4 Brazil: GDP per capita growth
(Annual percentage change)

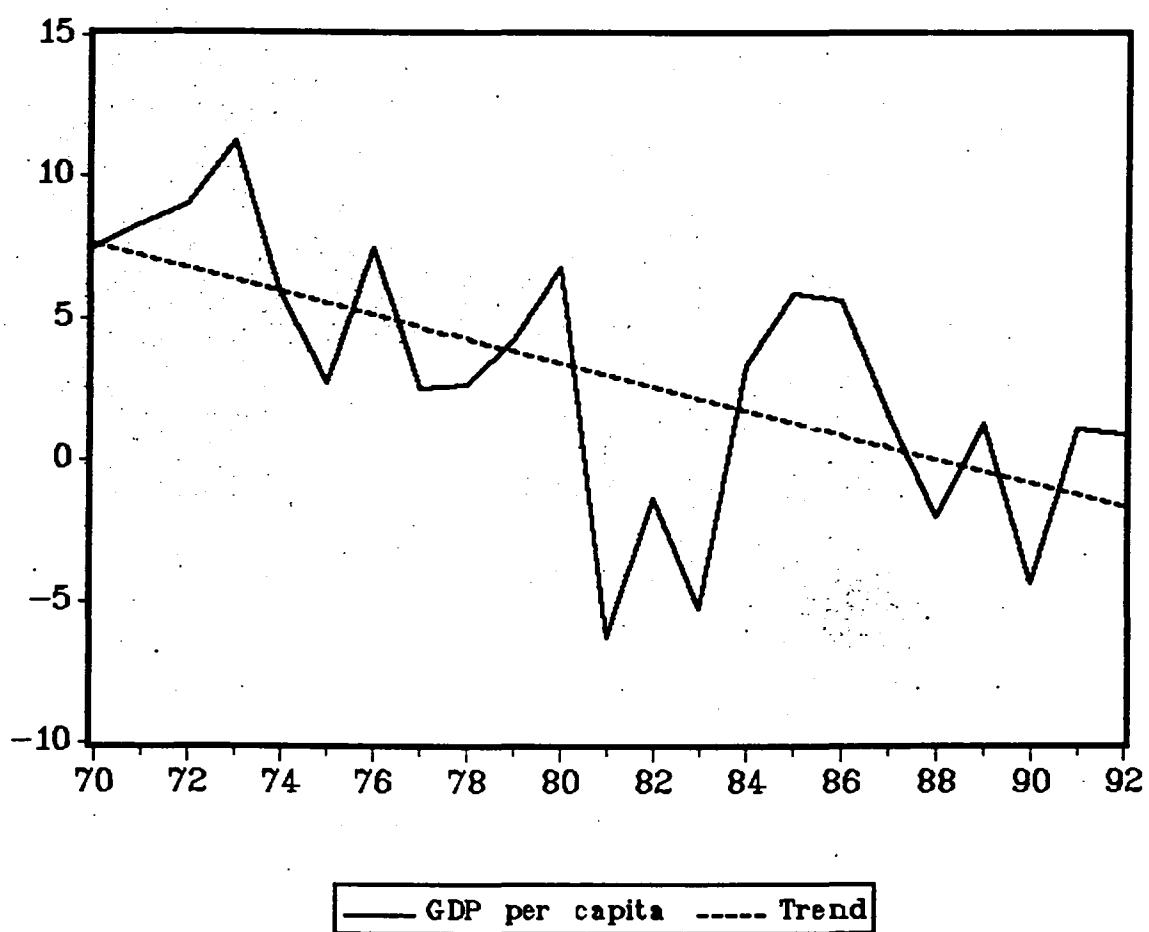


Fig. 5 Italy: Real interest rate and
Public Debt

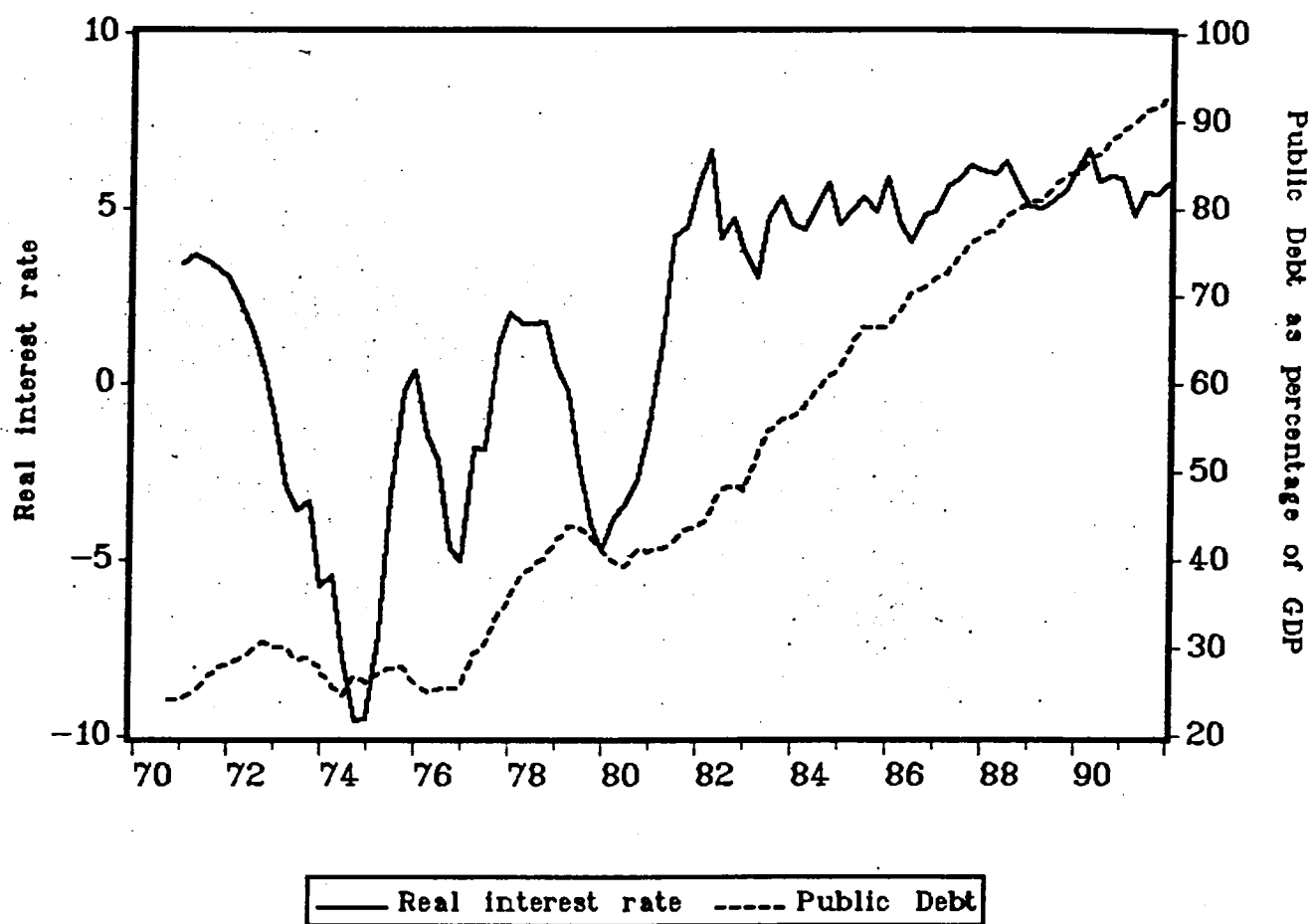


Fig. 6 Italy: Public Deficit and Debt
(as percentage of GDP)

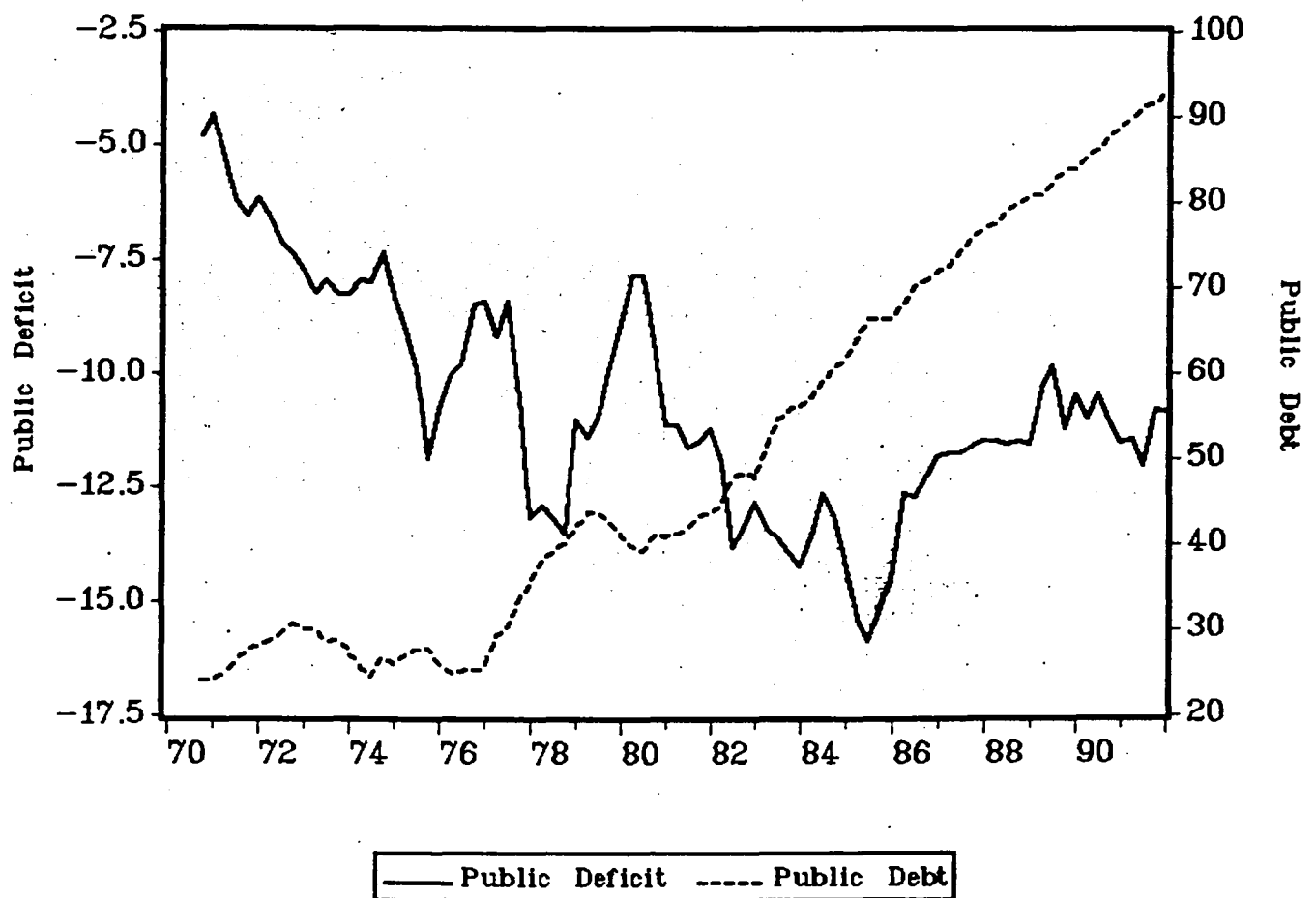


Fig. 7 Italy: Inflation and M2 growth

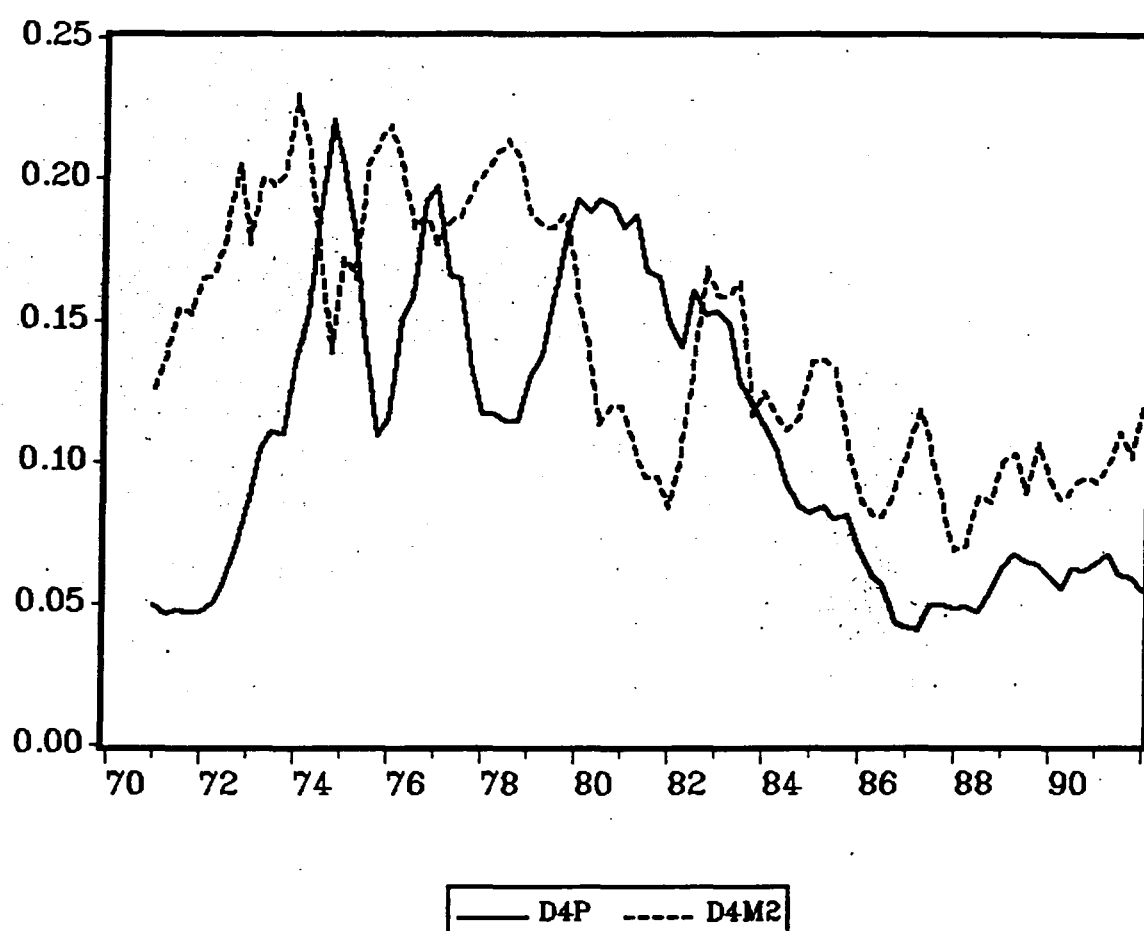


Fig. 8 Brazil: DM0 Reaction Function

(regression 1)

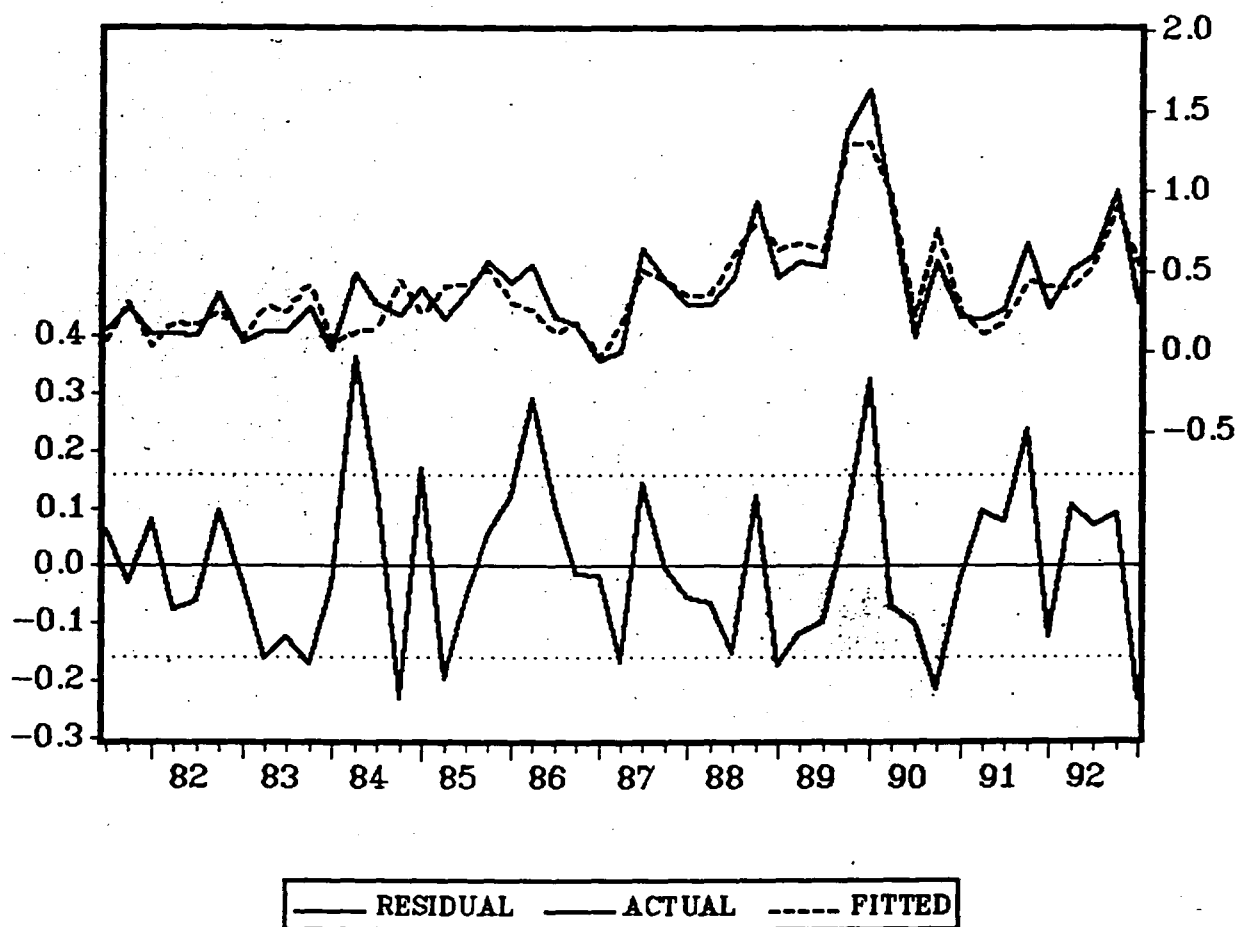


Fig. 9 Italy: D4M2 Reaction Function

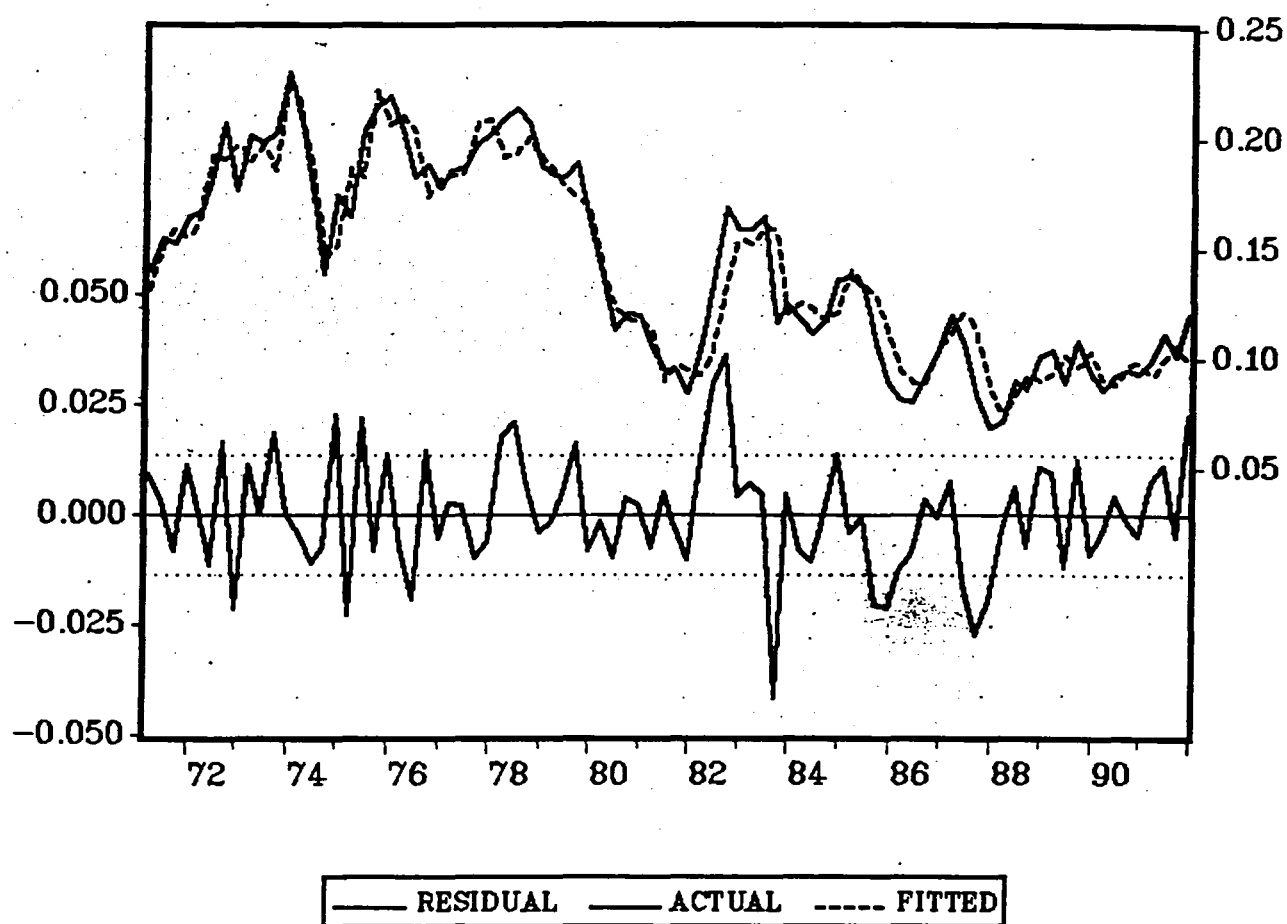
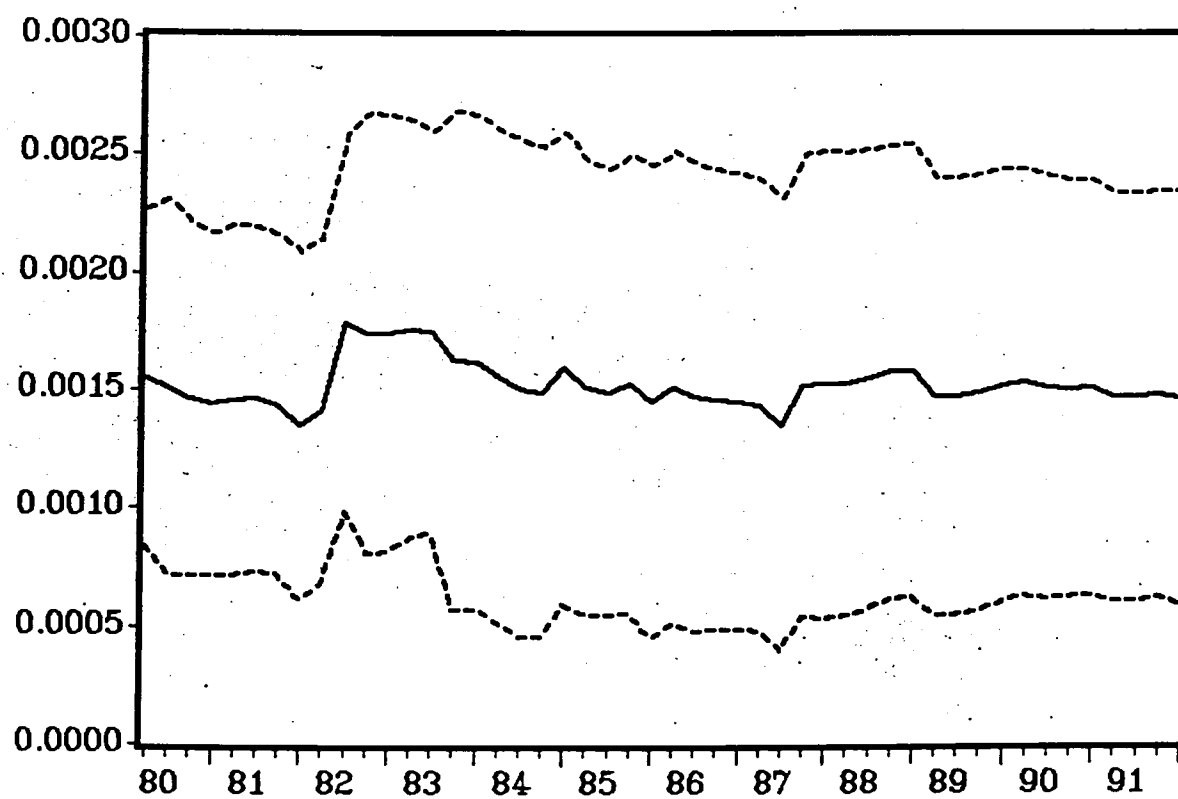
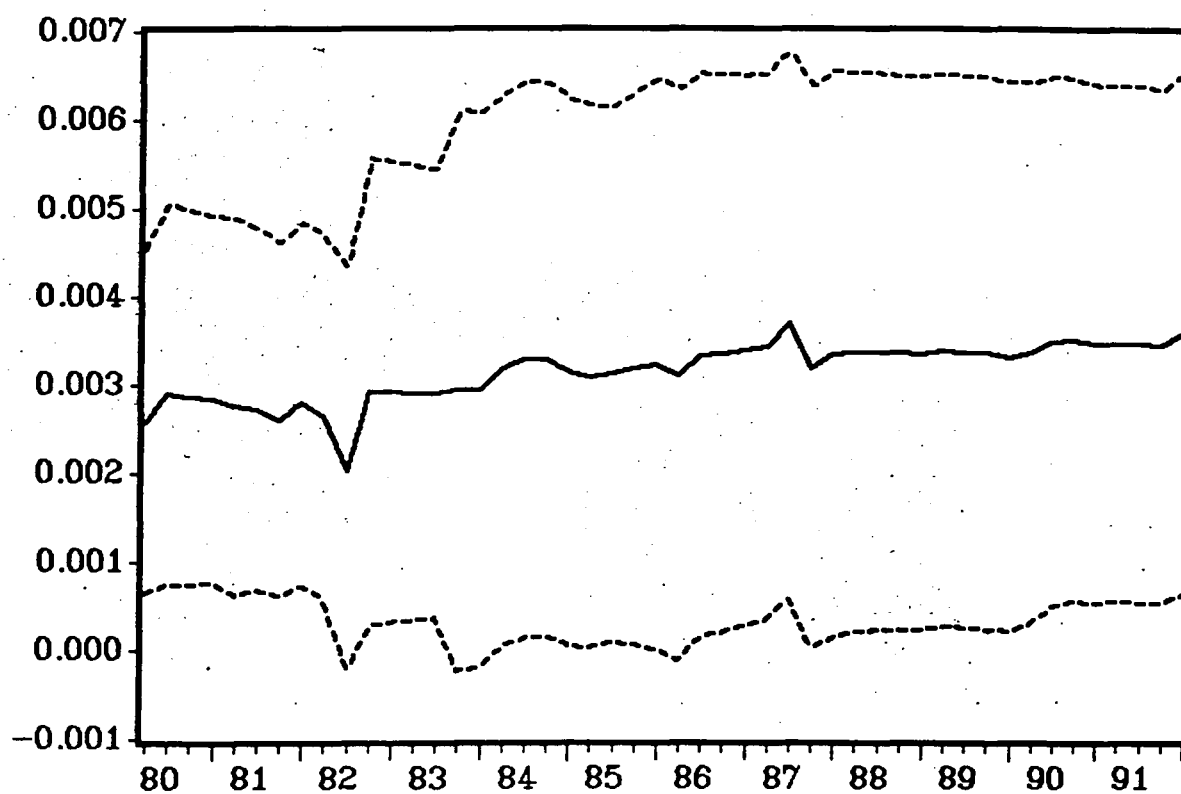


Fig. 10 Italy: Recursive C(4) Estimates for
D4M2 Reaction Function



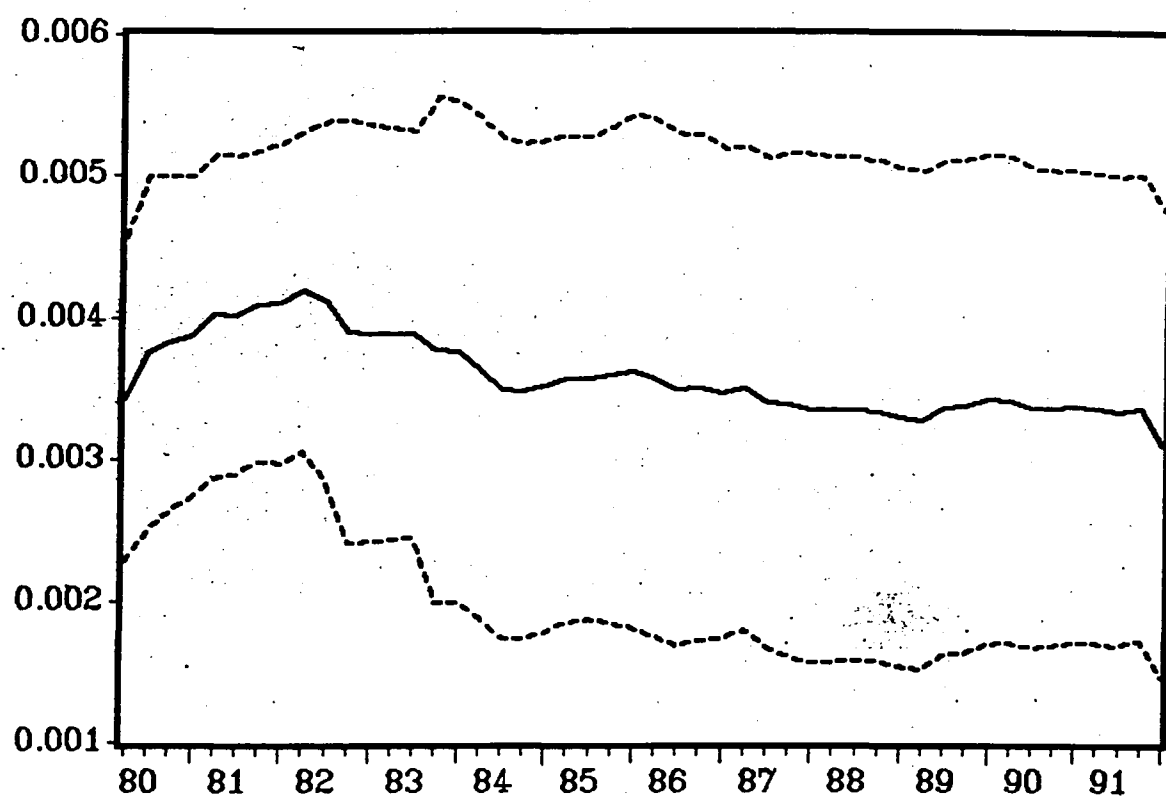
— Recursive C(4) Estimates - - - - + - 2 S.E.

Fig. 11 Italy: Recursive $C(5)$ Estimates for
D4M2 Reaction Function



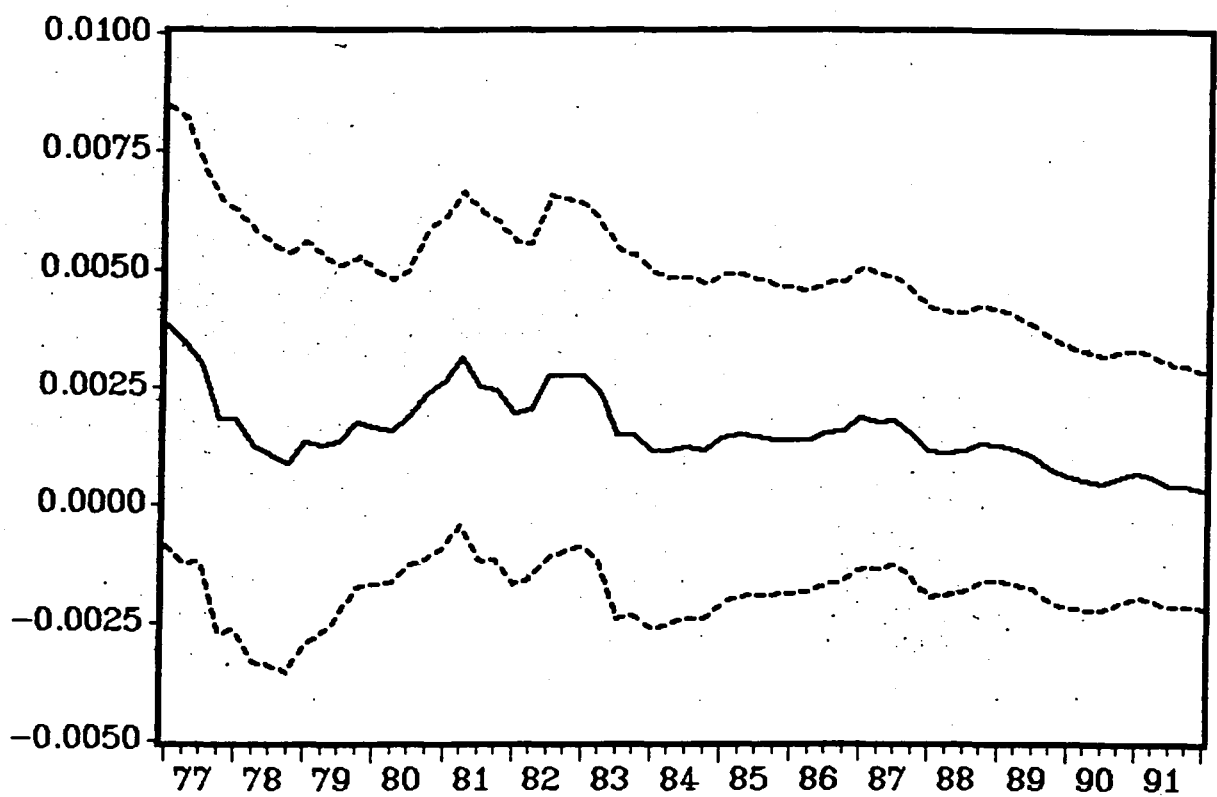
— Recursive $C(5)$ Estimates - - - - + - 2 SE.

Fig. 12 Italy: Recursive $C(6)$ Estimates for
D4M2 Reaction Function



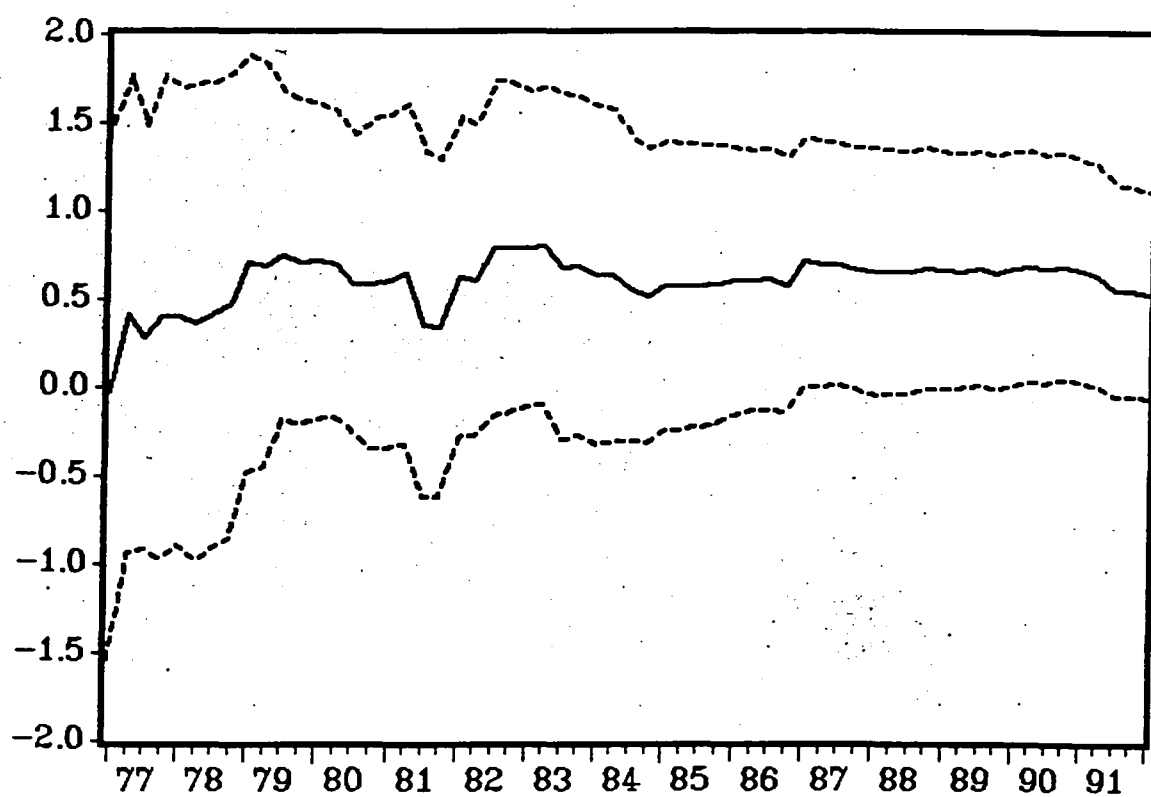
— Recursive $C(6)$ Estimates - - - - ± 2 SE.

Fig. 13 Italy: Recursive $C(1)$ estimates for
regression 9



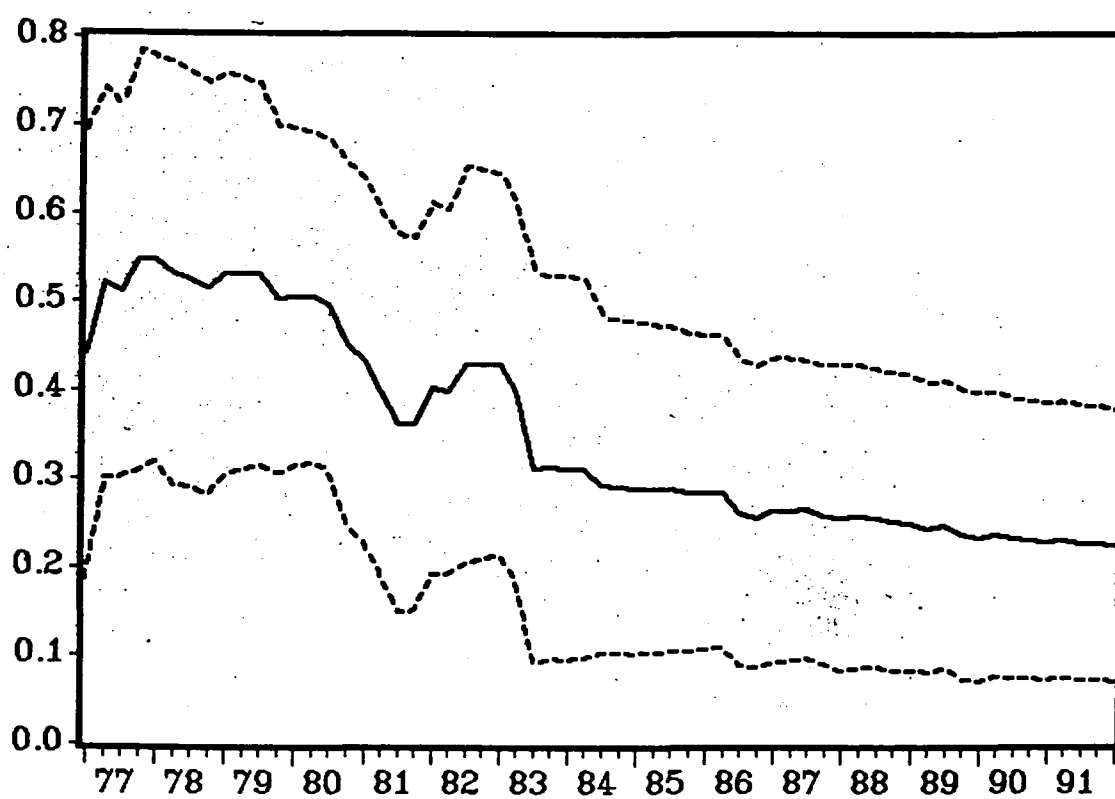
— Recursive $C(1)$ Estimates ---- ± 2 S.E.

Fig. 14 Italy: Recursive $C(2)$ estimates for
regression 9



— Recursive $C(2)$ Estimates ---- ± 2 S.E.

Fig. 15 Italy: Recursive $C(5)$ estimates for
regression 9



— Recursive $C(5)$ Estimates ---- ± 2 S.E.

Fig. 16 Italy: DD4P, regression 11

(1973.3 - 1983.1)

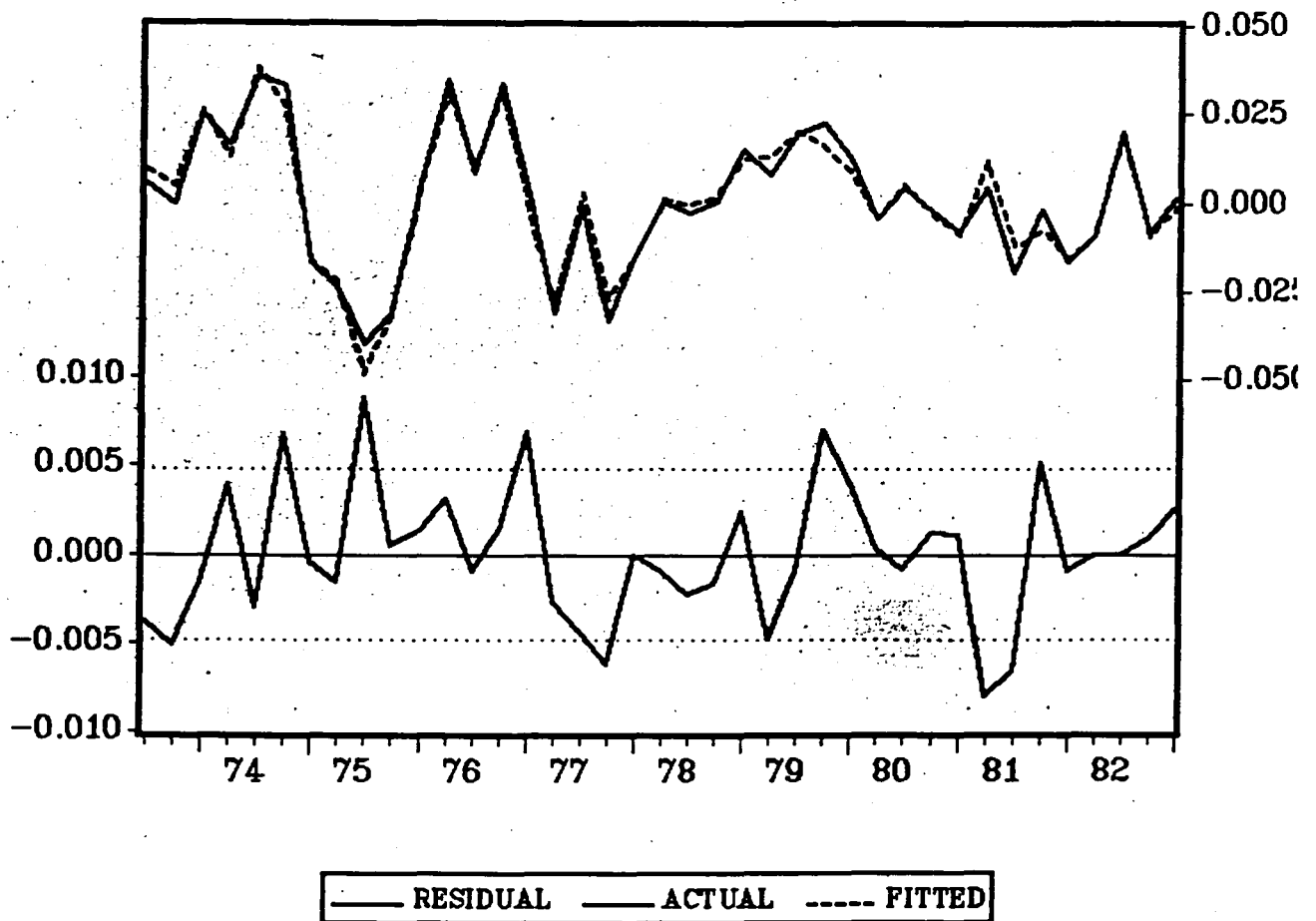
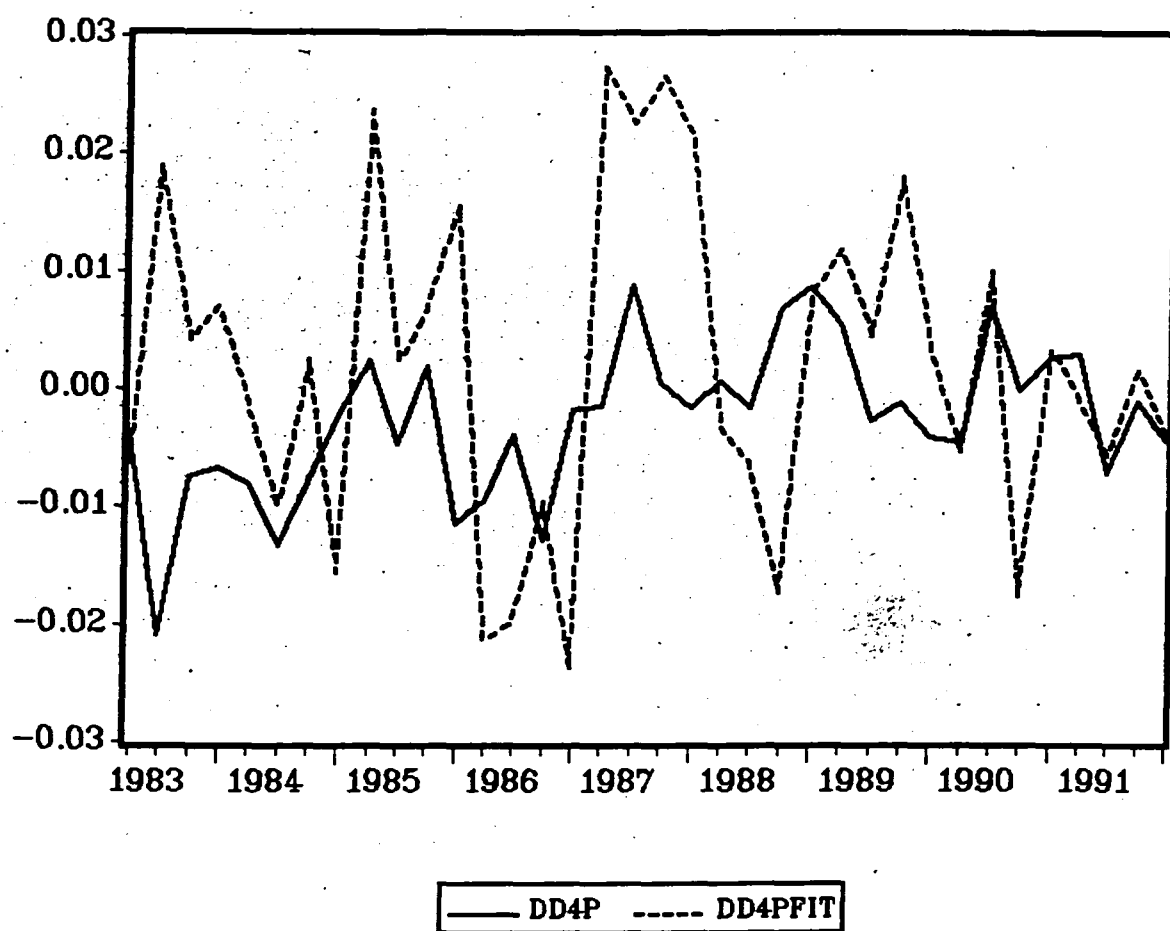


Fig. 17 Italy: Out of sample forecast for
regression 11



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