

Some stylized facts on external shocks and inflation upsurge in Brazil, 1951-1985

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Abstract:

From the late Forties on, the so-called Latin American Structuralist School or Economic Commission for Latin America (ECLA) School developed the idea that Latin American inflation was due to structural characteristics of this region, especially the recurrent balance of payments problems due to external shocks. This paper examines the structuralist hypothesis in the Brazilian case. For this purpose, it develops an historical analysis of the period 1951-1985 and presents some econometric tests. In this context, both the historical analysis and the econometric tests show that the structuralist hypothesis should not be refused in the Brazilian case.

Key words: structuralist school; Brazil; inflation; external shocks.

JEL Classification: N16

Resumo:

A Escola Estruturalista Latino Americana – ou Escola da Comissão Econômica para América Latina (Cepal) – desenvolveu, desde os anos 1940, a teoria que as altas taxas de inflação na América Latina se deviam a problemas estruturais da região. Dentre estes problemas estruturais, um dos mais importantes era os recorrentes problemas de balanço de pagamentos devido a choque externos. O presente trabalho examina a hipótese estruturalista para o caso brasileiro a partir de uma análise histórica do período 1951-85 e de testes econométricos. Neste contexto, em ambos os casos, a evidência encontrada no artigo mostra que a hipótese dos estruturalistas não deve ser rejeitada para o caso brasileiro.

Palavras chave: escola estruturalista; Brasil; inflação; choques externos.

External structural imbalances and Brazilian chronic inflation during the second half of the 20th Century

Introduction

In the second half of the 20th century, most Latin American countries suffered a process of chronic inflation, so that there was a huge debate in these countries on the causes of this problem. One obvious interpretation was the orthodox view that the inflationary process was the result of excess demand due to lax fiscal and monetary policies. This traditional view – usually known as monetarist - was supported by many economists within these countries and by international institutions like the International Monetary Fund (IMF).

From the late forties on, this traditional interpretation was challenged by an alternative view developed by economists associated to the so called Latin American Structuralist School or Economic Commission for Latin America (ECLA) School.

The greatest contribution of ECLA's School to the study of Latin American development has been to put the external constraint as its crucial analytical element. In this sense, from the pioneering work of ECLA's *founding father* Raul Prebisch (ECLA, 1950), Latin American development problems were seen as the result of import capacity's restraint stemming from the tendency of terms of trade deterioration and unfavorable income elasticities of imports and exports. In terms of the inflation causes, the external constraint was once again at the core of the structuralist interpretation (Noyola-Vasquez, 1957, Sunkel 1958). More precisely, ECLA's economists argued that the process of chronic inflation experienced by Latin American economies was fundamentally caused by structural characteristics of this region, and, among them, external shocks due to recurrent balance of payments crisis were crucial.

This paper intends to study the causes of inflation in Brazil from 1951 to 1985, a period when Brazilian inflation rates were among the highest in the world. More precisely, the purpose is to test whether or not the structuralist theory of inflation fits the Brazilian data. Particularly it was a period that registered several episodes of external crisis, or, at least external financing conditions deteriorations, while the domestic institutional setting of monetary and fiscal policy changed quite radically. It is not the aim of the paper to establish a complete model of inflation and test it for the whole period covered by the historical analysis. However, it will reinforce the structuralist analysis if we are able to show that cannot be denied a strong connection between external shocks and inflationary upsurges throughout a long historical period when, as we mentioned, fiscal and monetary policies varied substantially.

The paper is divided in three sections, besides this introduction and the conclusions. The first consists of a theoretical discussion, in which the Latin American structuralist theory of inflation will be presented. The second corresponds to a historical analysis directed to describe a long period narrative that supports the structuralist hypothesis. In this section, one picks all the episodes of inflation upsurge from 1951 to 1985 and analyzes if these episodes were preceded by some kind of external shock, being it exchange rate devaluations or commodity price shocks. Finally, the third section consists on econometric tests. In particular, a VAR model with exogenous variables is estimated and a Granger causality test is calculated, in order to give further evidence of whether or not one can refuse the structuralist hypothesis in the Brazilian case.

I-An overview of cost-push models - The Latin American Tradition

In this section we will firstly present a brief summary of what one may call the *Latin American tradition of cost-push models*. Secondly, we will describe the connections between exchange rate devaluations and inflation. By the latter, we mean a group of explanations for inflation developed by Latin American authors and/or aiming at explaining Latin America's experience. These explanations follow the non-monetarist tradition that could be traced back to Thomas Tooke explanation for the British inflation during Napoleon War and the *German Interpretation* of Germany's 1920's hyperinflation, which contrasted

with the allies (monetarist) diagnosis.¹ The Latin American cost-push models analyze inflationary histories focusing on the dynamic of some basic elements of costs instead of mismatches between full-capacity production and demand. The basic ideas were, broadly speaking, developed around ECLA in Santiago, Chile.

The seminal paper that marks the beginning of the so-called ECLA's School is the *Estudio Económico de América Latina* written in 1949 by Dr. Raul Prebisch. This paper - an authentic watershed in theoretical terms - was followed by a strong body of work, whose most important consequence was the support to Import Substitution policies by almost all Latin America's countries. Although these policies became almost the trademark of the ECLA School in Latin America, this institution had also some interesting things to say about inflation².

Prebisch is said to have drawn from his experience as president of Argentina's Central Bank the conclusion that "...the control of the inflation in our countries demand specific diagnosis for each case and not the adoption tout court of measures related with money and credit expansion." (Gamboa 1978, pp. 9). This is a basic and important characteristic of the Latin American structuralist interpretation: inflation is a particular phenomenon and thus it has to be studied according to the particular institutional and historical setting of each country. In other words, it has to be studied according to its structural components.

In search for *structural* factors, several authors examined the causes of inflation as supply elements, or factors influencing costs formation. The latter follows precisely the theoretical approach that we think provides a good explanation for Latin American inflationary experiences³. Moreover, consistently with ECLA's general approach sketched above, several structural factors that explain inflation also play an important role on the analysis of problems or barriers to economic development. Two main sets of arguments can be presented, as follows.

Firstly, there was the idea of imbalances that stem from rapid economic growth. Despite the fact that *imbalanced growth* could have positive dynamic properties, as Albert Hirschman stressed in his work, it might create some sectoral imbalances resulting in eventual cost pressures even when the economy operates below full employment. This type of sectoral imbalance analysis has great importance within the structuralist tradition. The paper written by Olivera (1964) limits the structuralist interpretation within these rather strict boundaries, meaning that the approach should basically refer to structural imbalances and rigidities on specific economic sectors. What structuralist authors and particularly Olivera (1964) proposes is that Latin America economies were likely to present sustained inflation, what would be well described by this structural reason, namely the growth process that characterizes developing countries.

An example of specific sectoral imbalance that was repeatedly singled out by structuralist authors as the most important is the agricultural bottleneck, especially the production of foodstuff directed to internal consumption. Taking into consideration that foodstuff is a sizable portion of workers real wage⁴ it

¹ See for Arnon (1991) Tooke's main ideas. On the debate around the 1920's hyperinflations see Bastos (2002) and Franco (1986).

² It is important not to confuse the positive contribution that we will study in the next paragraphs with the allegedly *inflationist* bias of economic policies inspired by ECLA's theories. The latter is the result of a conservative criticism developed since the 1980's, which links policies that are intended to spur economic growth with the existence of several cases of persistent inflation in Latin America. This conservative position became increasingly popular following the neoliberal tide of the 1980's. It does not develop any structural relation between development and inflation, and relies heavily on the excess of demand approach, which is exactly the position that we do not follow.

³ It is important to recognize though that the work of structuralist authors mixed up strictly supply factors with demand considerations as "structural" causes for inflation. See for example Sunkel (1958) p. 574, where an alleged chronic savings deficiency is meant to be a persistent explanation for inflation in Chile.

⁴ The backwardness of Latin countries implied that the share of foodstuff in the consumption basket of workers was high in relation to more developed countries.

was expected that workers would fight to index their wages to the variation of such prices. Therefore the mechanism of wage indexation would then transmit this initial cost push to the rest of the economy (including sectors where agricultural products were not direct inputs). Of course the argument had a decreasing importance as agriculture in Latin America advanced in terms of productivity in almost every country; on the other hand, the relation between commodity prices and internal inflation got even stronger as modernized agriculture became fully integrated with world markets, and international prices have a direct effect on domestic food prices and agricultural inputs prices. This mechanism gives to the international commodity prices in local currency - multiplied by the exchange rate- a strong influence on internal inflation.

A second, and for our purposes more relevant point raised by the structuralist authors, is the relation between external conditions and inflation. As Latin American economies face persistent deficits on the current account, any deterioration of external trade conditions not matched by increased external financing (and unfortunately for the periphery trade and financing crisis are usually two faces of the same coin), will bring recurrent exchange rate devaluations. This instability, and recurrent crisis would trigger a exchange rate-nominal wage spiral and the structural external imbalances would make it very difficult to stop this process by adopting some sort of fixed nominal exchange rate policy.

Even though several Latin American authors stressed the connection between external conditions and inflation it was a British economist, Nicholas Kaldor (1978) that presented this question in a very systematic and organized way. As a consequence of the persistent pressure on import capacity of certain countries, Kaldor divided the latter in two types: inflationary ones (that present this tendency) and non inflationary. Therefore there is an endogenous cause for persistent exchange rate devaluation. The combination of exchange rate devaluations with some degree of distribution conflict explains the recurrence and persistence of inflationary episodes in the continent.

Pazos (1972) provided an interesting analysis within the structuralist approach discussed in this subsection. Even though he affirms that inflation is a multi factor process, in several passages of the book, for example, he doesn't support the interpretation that there is a persistent relation between an acceleration of economic growth and inflation. In fact, due to the very nature of chronic inflation the accelerationist idea that is present in the monetarist model is dismissed by Pazos. On the contrary, he argues that the causality usually runs in the opposite direction by showing that the distortions induced in the economic system by persistent (and high) inflation are elements that usually "discourage production and hinder economic growth" (Pazos 1972: 37⁵). He also uses the concept of economies and diseconomies of scale as an argument to support his criticism to the usual direction of causation⁶⁷.

However, the most important contribution of this author is the idea of *inertial* inflation, whose name was later associated with authors that became highly influential in policy prescriptions during the 1980's, mainly in Brazil.⁸

⁵ In fact Pazos notices that since inflation in Latin America is a persistent phenomena through the economic cycle it might vary also its cause: from cost push elements to demand pull ones.

⁶ When criticizing contractionary policies he says: "When aggregate demand increases proportionately less than the inertial rise in costs, enterprises restrict sales and output rather than permit a reduction in their profits per unit of output by raising prices less than costs. As sales go down, costs per unit of output go up, thus giving a further push to prices." (Pazos 1972: 135)

⁷ Based on the empirical evidence from 1950 and 1970, Pazos (1972) also suggested that investment levels are not directly correlated with inflation in any sense: "It is clear that the figures on fixed investment ... do not correlate closely with the rates of inflation; hence they do not support the ideas most frequently held regarding the relationship between the two series. Neither do the figures substantiate the theory that inflation facilitates the financing of a high-level volume of investment by forcing up savings, nor the idea that it keeps investment down discouraging voluntary savings." (Pazos 1972: 41)

⁸ The first stabilization program to openly use the concept of inertial inflation in Brazil was the Cruzado Plan. After the latter every plan implemented in Brazil adopted some formula to bring wages to their previous real value (or its average over a specific period of time) and some mechanism to eliminate the inertial component.

Even though the wage and administered prices mechanism that explain inflation inertia deals clearly with the dynamic of cost elements it is also true that the existence of such inertia indicates some degree of equilibrium, or the absence of an external force that accelerates the rate of inflation. This distinction is useful to briefly discuss the distinction of stable and high (and accelerating, or highly unstable) inflation.

According to Pazos's "...rapid accelerations are usually associated with foreign currency crisis." (Pazos 1972: 136). In this context, one may ask: What happens after an exchange rate devaluation?

If it is a once and for all movement, there would be an inflation spike that gradually subsides bringing, in the end, a lower wage rate and a real exchange rate devaluation smaller than the initial value. However, as it is the case in Latin American economies, the exchange devaluation is the consequence of serious international crisis; terms of trade deterioration would imply, or require, a series of new nominal exchange rate devaluation until the new real exchange rate settles in an *equilibrium value*, with the real wage bearing the burden for the change in external conditions.

However, it is highly unlikely that the resulting fall of wages and other changes in internal distributive variables would be met without any kind of resistance. Usually both nominal wages and nominal interest rates react to the increase of exchange rate, setting in motion several rounds of nominal increases of all relevant distributive variables. If there is no accommodation, or if wage resistance were so strong that workers could increase nominal wage by the same rate of other distributive variables, then a hyperinflation can result. This highly unstable case is not of interest for most practical cases, and specifically not for our study. What happened in real historical cases, or what the exchange rate devaluation triggers, is a sequence of nominal increases that at some point start to converge to some nominal *stable* variation rates, corresponding to real, or average, values for the relevant distributive variables, e.g., real exchange rate, real wage and real margin of profit (Bastos, 2002).

This is exactly what we are going to develop in this paper, first in a highly schematic way through a brief review of the inflation process from 1951 to 1985 and finally applying quantitative methods to test our basic hypothesis in section 3.

II – Exchange rate devaluation and inflation upsurge in Brazil, 1951-1985

II.1 – Overview

The aim of this section is to analyze Brazilian historical data, in order to evaluate the possible connections between external shocks and episodes of inflation upsurge. Episodes of inflation upsurge are characterized by situations wherein the inflation rate (accumulated in 12 months) starts a period of several months (more than 6 months) of continuous or almost continuous rise, resulting in an inflation rate (accumulated in 12 months) at least 50% higher than its initial value. External shocks are identified by a period of successive nominal exchange rate devaluations, a maxi-devaluation and/or a commodity price shock. The goal here is to identify episodes of inflation upsurge and to analyze whether or not these episodes were preceded or concomitant to some kind of external shock.

Our analysis starts in the post Second World War, when a rapid industrialization process was already underway, since the early 1930s. As Furtado (1965) wrote in "The Economic Growth of Brazil", in the 1930s there had been in Brazil a definitive "displacement of the economy's dynamic center" from export-gear agricultural activities to domestic market activities. In a context of huge scarcity of foreign currency all along this decade, limited import capacity forced industrialization and urbanization processes to be supported by the (poorly efficient) previous productive capacity and by imports of used equipment from countries in recession, as well as by indigenous supply of capital goods in its low-efficiency infant stage of production – all of them acting as constraints that should have probably increased throughout the war. This resulted in a generalized claim for infrastructure investment among entrepreneurs and government officials.

By the end of the war and for a couple of years there has been widespread hope that the international market would quickly start to operate normally under the rules of the Bretton Woods system. In this context, Brazilian policy-makers were confident that the foreign exchange reserves accumulated during the war, the export expansion prospects and the support of the United States to their Latin American war allies would make possible the implementation of large infrastructure projects. This would soon prove to be a too

optimistic bet and was replaced by growing frustration in the context of dollar shortage and of the North American emphasis in reconstruction of Europe and Japan, careless of Latin American and Brazilian needs. “Economic Reequipment” was the expression obsessively used for many years to refer to infrastructure requirements, as shows the fact that many years later, when the Banco Nacional do Desenvolvimento (National Development Bank – BNDE) was installed in 1952, its funding came from a newly created “Fund for Economic Reequipment”.

The period that we will analyze in this section starts in 1951 within this context of internal and external changes and ends in 1985, when once again important changes were happening both internally and externally. It starts in 1951 because during Eurico Dutra’s presidency (1946-51) the nominal exchange rate was kept fixed and there was no major external shock. It ends in 1985 because from this year on there were several (failed) stabilization plans, causing too many structural breaks in the data and leading to a situation of a near-hyperinflation by the end of the Eighties. In such a context, the data are not at all reliable and it is hard to identify any causal relationship between variables, especially when it comes to econometric studies as the one we will develop in section 3.

II.2 – Historical Record (1951-1985): eight out of the nine episodes of inflation upsurge were preceded by external shocks

The data analysis shows that from 1951 to 1985 there were 8 episodes of inflation upsurge and that 7 of these episodes were preceded by some kind of external shock. This evidence shows that we can’t refuse the hypothesis that inflation upsurge in Brazil is strongly related to difficulties in the external sector⁹.

A first phase can be identified in the period running from 1951 until 1964. This phase was all along one of scarce foreign currency availability. The increase of coffee prices (Brazil’s most important exports good) between 1949 and 1954 and large direct foreign investment in the second half of the decade alleviated the dollar shortage, but the fast economic growth until 1962 and poor access to finance throughout the whole period resulted in continuous pressure on nominal exchange rates, and thereby on inflation. Throughout this period there were four episodes of inflation upsurge. Three out of them were preceded by some sort of external shock (see figure 1). The sole exception was the episode of 1955-56¹⁰.

Insert Figure 1 here

The first episode took place in 1953-54 and was caused by the 103% maxi-devaluation of February 1953, which was then reinforced by the establishment of a multiple exchange rate system in October of the same year¹¹. This devaluation was the lasting result of a long period in which the exchange rate was kept fixed and overvalued: shortly after World War II, the nominal exchange rate was fixed in an appreciated level in real terms and was not changed throughout Eurico Dutra’s government (1946-51). In 1951, Getúlio Vargas presidency (1951-54) started with the Finance Minister, Horácio Lafer, attempting to bring inflation rates down, so that the exchange rate was not devalued and the import’s license system was relaxed. The combination of this less protectionist system and an appreciated real exchange rate resulted in an imports boom, so that the international reserves in convertible currency fell sharply. From this point on, the

⁹ For a complete list of the inflation upsurge episodes, see Annex 1.

¹⁰ The exchange rate devaluations for the entire period 1951-1985 were calculated based on the monthly change (%) of the average nominal exchange rate. This choice was due to the fact that all along the Fifties Brazil had multiple exchange rates. The inflation rate used as a reference was the IGPDI (*Índice Geral de Preços*, General Price Index) 12 months accumulated inflation rate. The IGPDI was the most important inflation index in Brazil after the Second World War.

¹¹ Shortly after the adoption of the multiple exchange rates regime, there was a 38% maxi-devaluation in the average nominal exchange rate in December 1953.

government tried to restore the former import's license system, but the currency shortage was not overcome (Vianna, 1990: 126-28).

After so long a process of real appreciation and in a context of balance of payments crisis, the nominal exchange rate devaluation became inevitable. In early 1953, there was a huge devaluation and the exchange rate system was changed first with the Law 1807 of March 1953, which in practice instituted a multiple exchange rate system (Vianna, 1990: 134). The system was changed again in October 1953 when the Instruction 70 of the Superintendência da Moeda e do Crédito (Money and Credit Superintendency, SUMOC)¹² launched officially multiple exchange rates¹³.

After an episode not related to any external shock in 1955-56, there was a new episode of inflation upsurge preceded by nominal exchange rate devaluations starting in February 1958. The devaluations took place in the second semester of 1957 and were likely to have been due to the changes in the exchange rate system caused by the Law 3244, which reduced from five to two the number of categories under the variable surcharge rule. The new rules were set in August 1957 and the devaluation in the average nominal exchange rate started from this point on. There was a 40% devaluation of the average nominal exchange rate from July 1957 to February 1958, which was followed by a further 26% nominal devaluation from March 1958 to May 1958. There was altogether an 83% nominal devaluation from July 1957 to May 1958. This was all along a period of growing difficulties in the balance of payments due to a 33% fall in the international price of coffee (average import price in the United States) from 1954 to 1958 (Bacha & Greenhill, 1992).

In 1961, there was once again an inflation upsurge episode due to an external shock. This time the causes were the 51% nominal exchange rate devaluation (from December 1960 to April 1961) and the reduction in the import's subsidies (for oil and wheat) in the first months of the year. According to Malan (1981), these measures had an immediate impact on inflation rates, so that wholesale prices grew 15,5% in the first semester (Malan, 1981: 94). Moreover, it is also worth mentioning that the multiple exchange rate system was further dismantled throughout 1961 by a series of "measures that brought greater unity to the foreign exchange system" (Baer, 2001: 58).

After inflation rates slowed down a bit for a very short period in mid 1962, they accelerated again in November 1962 following an exchange rate devaluation of 30% from July 1962 to October 1962, which was again reinforced by a new devaluation in the first semester of 1963. At this time the country was experiencing a period of political unrest and economic crisis. In a context wherein annual inflation rates were around 50%, the cost shocks due to the exchange rate devaluation led to a wage-price spiral, enhanced by political difficulties that João Goulart's presidency was facing. On the one hand, he didn't have the support of the US authorities to get the funds to face debt payments in the short run. On the other hand, his connections with the labour movement did not leave him many degrees of freedom to impose restrictive wage policies or to adopt other contractionary policies. This turbulent context led to the military *coup d'état* of April 1964 and annual inflation rates reached 90% by then.

The dictatorship implemented in 1964 faced much better international conditions and the 1964-73 period was one of abundant foreign currency. At the climax of the so-called *golden age of capitalism*, fast export growth and unprecedented access to booming international finance availability has allowed for low

¹² At that time, Brazil had no Central Bank and the monetary authority duties were divided by two institutions: Sumoc and *Banco do Brasil* (Bank of Brazil). In general, Sumoc had normative rules, while the Bank of Brazil had the role of implementing the policies and norms.

¹³ According to this Instruction, exporters would receive the official rate (Cr\$ 18,50/ US\$) plus a bonus of Cr\$5/US\$ in the case of coffee exports and of Cr\$10/US\$ in the case of the other exports. In terms of the imports, there were three different exchange rates depending on the imported good: 1) official exchange rate (without surcharge) for special imports like for instance wheat and newsprint; 2) official exchange rate plus a fixed surcharge for oil and direct imports of the federal, state and county governments; 3) official exchange rate plus a variable surcharge for the other imports being the level of these variable surcharges was defined in auctions for which the imports belonging to the third group were divided in five different categories according to a criteria of essentiality established by the government (Vianna, 1990: 139-41).

pressure on the exchange rate and relatively low inflation rates – especially from 1968 to 1973 - in a context of fast growth. Furthermore, the military regime had the support of the US government, allowing a renegotiation of the external debt conditions that helped the country to get more external funds. For example, Brazil was the fourth largest receiver of funds from AID from 1964-67, coming after only India, Pakistan and South Vietnam (Lara Resende, 1982, p. 782-783). Under these favourable external conditions, it was not surprising that the adjustment program launched by the authoritarian government in 1964 - the so-called *Programa de Ação Econômica do Governo* (Government's Economic Action Programme, PAEG) - was successful in bringing inflation rates down. From 1967-8 until 1973, inflation rates were around 15-20%, a reasonably low level for Brazilian standards at that time.

It is worth mentioning that PAEG's strategy has included at its start an exchange rate devaluation, which was supposed to correct a long time overvalued exchange rate. It is nonetheless also important to point out that PAEG's policy-makers feared an exchange rate-prices-nominal wages spiral due to this cost push shock. Therefore, they introduced a regressive wage rule that caused a huge real wage fall in the following years. This policy was intended to bring down inflation stepwise using an ingenious wage indexation scheme. Wages were adjusted to their past two years average plus the expected future rate of inflation. If the expected inflation had been exactly equal the actual one this indexation scheme would have been able to bring inflation down without real wage losses. This was however not the case, due to several reasons as, for example, a deliberate increase in administered public prices intended to reinforce public enterprises revenues. Therefore, inflation was brought down by controlling nominal wages, or sub-indexing them, combining lower inflation and real wages.

In 1967 the government established a crawling peg regime which had two basic purposes. First, it was intended to establish a competitive real exchange rate. Second it aimed at smoothing out the international capital flows that at this moment were beginning to pick up with the development of the international "Eurodollars" market. The shortening of exchange rate indexation lag could have affected positively the rate of inflation in the period but the aforementioned nominal wages sub-indexation prevented a price/wages spiral.

Figure 2 shows inflation rates falling during the 1964-73 period until the 1973 First Oil Shock. Brazil had to import most of its oil, so that the oil prices hike meant a major cost shock, which was possibly reinforced by the government's decision not to halt economic growth through restrictive monetary or fiscal policies. The First Oil Shock was a turning point in the international economic conditions for countries like Brazil.

Insert Figure 2 here

In this new context, inflation rates rapidly grew in 1974 leading to a new episode of inflation upsurge: there was an increase in the rate of inflation accumulated in 12 months from 15% in November 1973 to 35% in December 1974. According to Serra (1982) commodity prices increase pushing internal basic costs and aggravated by the oil shock was already in its way in the second semester of 1973. It should also be pointed out that in 1974 nominal wage indexation rule have changed adding an extra cost element to push up inflation rates. The previous rule of nominal adjustment, based on the two previous years' average was changed for one year. In a period when inflation was accelerating this measure represented a nominal upward push on wages and consequently on prices.

By the end of 1975, the 12 months accumulated inflation rate moved slightly upward around 25-30%, to a new *plateau* close to 50% (see Figure 3). Once again the explanation for this episode is a cost-push element associated to the foreign sector, namely the imposition of a compulsory deposit of 100% for 360 days on every import purchase. One might call it *effective* nominal exchange rate devaluation (Bastos, 2002). The consequence of this measure, as observed by Belluzzo and Coutinho (1982, p.160-161), was that inflation accelerated in 1976. In terms of the impact on import prices, it had a similar effect to an exchange rate devaluation but without the negative consequences on capital flows, which the country was in dire need in this period. Apart from this change, other sources of cost- push inflation were relatively stable during these years. The exchange rate kept its crawling peg pattern and there was no change in the

wage indexation policy. In brief, what seems most likely is that a change of *inflation plateau* has occurred, by means of a shock transmitted to the whole economy through the indexation mechanisms, with the establishment of a higher “stable” inflationary level.

In 1979, Brazil suffered external and internal shocks. More importantly, there was a further change for worse in the international economic environment that would set new parameters for all Latin American economies in the next decade.

The first important exogenous shock was the 110% increase in international oil prices from June 1979 to February 1980. It is interesting to notice that this price hike was not as sharp as the previous one in 1973. However, its impact was greater in Brazil. In 1974 the change in internal prices of oil products (gas and motor oils) was 65.7% while external prices changed 257.32%. In 1979, the increases were 160.1% and 110%, respectively. This difference is explained by the strong subsidies to oil prices in the first shock.

The increase in international interest rates also created a new external pressure on the Brazilian economy, as it made the international capital market less prone to lend money to Latin American countries, which were already indebted countries and also facing renewed current transactions problems. This lower enthusiasm regarding lending led to an increase in the value of the spreads (over the increasing base interest rates) and the shortening of loan terms. The combination of such elements resulted in a *snowball type* of indebtedness with strong negative impacts over the external balance. In such a difficult external situation, it was not possible to avoid a stronger internal impact from the external shock, as it had been the case five years before. The economic authorities, in an attempt to cope with the critical external situation, devalued the exchange rate by around 28% in December 1979, which was an extra cost shock posing inflationary pressures in the economy.

At the same time, there was a change in the nominal wage adjustment rule. The new policy established by the Law nº 6.708 of September 30th, 1979, was not designed to maintain the real wage (as the previous one), or the average wage obtained in a past period, but to restore a past peak value, adjusting the nominal value using the inflation of the period. This adjustment was not horizontally applied to every wage level. It was designed to have a distributive effect in favor of the lower wages. Workers that received up to 3 minimum wages had their wages adjusted by a value 10% superior to the past inflation. The adjustment decreased inversely with the value of wages¹⁴. The most important element of this new wage policy was the change in the adjustment periodicity, from a yearly basis to a semester-to-semester one, which concurred to the upsurge of the inflation rate.

As a result of these four cost-push shocks (oil shock, interest rates hike, wage readjustments and exchange rate devaluation) happening almost at the same time, it is no surprise that the rate of inflation leaped to a new *plateau* (Bastos, 2002). In numerical terms, as these shocks were distributed over a certain period of time¹⁵ we can only see their full effect in the 1980's rate of inflation. For instance, the average monthly inflation rate in the second semester of 1979 was 3.8%, whereas the monthly average of the first semester of 1980 was 6%. In this context, the inflation rate accumulated in 12 months evolved from 41% in December 1978 to 77% in December 1979 and then moved forward to 110% in December 1980. It kept increasing until March 1981 when it reached 121%.

¹⁴ The adjustment was, in fact, a bit more complicated in the case of wages above three minimum wages. For example, in the case of workers that received “twelve minimum wages”, the adjustment would be: 10% above inflation for the “three wages “part” of the total wage; the full inflation for the part between three and ten and 80% for the remainder “two wages”. Workers and firms would freely negotiate the productivity growth rate. This wage policy was altered by the Law nº 6,886 from December 10th, 1980. The new rule did not change the main characteristics of the previous one (periodicity and adjustment to replace the past nominal peak) but just the percentage of past inflation associated with different wage levels brackets.

¹⁵ The oil price increase extended from the second semester of 1979 through 1980, the same applying to other commodities prices. The new wage adjustment rule, as we said before, was enacted in October and finally the exchange rate devaluation happened in December.

Moreover, the erratic daily administration of the Brazilian economy between 1979 and 1982 made entirely ineffective the 1979 exchange rate maxi-devaluation, and consequently, there was no impact on trade balance. It's deficit in 1980 was almost the same as in 1979. Meanwhile, the current account deficit was rising due to the snowball indebtedness described above. In brief, with the external situation worsening - the current account deficit jumped from US\$ 10 billion in 1979 to US\$ 16 billion, approximately, in 1982 - the government was forced¹⁶ to devalue the exchange rate, once again by a large amount. In February 1983, there was a new maxi-devaluation of the Brazilian currency with respect to the dollar.¹⁷

Aware of the inflationary impacts of this exchange rate devaluation, the authorities tried to curb the existing wage indexation and hence the price-wages spiral. However, the National Congress refused such proposals and finally established (by the Law n° 2,065) that the automatic wage adjustment would be effective only in the range of 3 to 15 minimum wages. Yet these attempts were not able to prevent the inflation to double in 1983 and the purchase power of wages to fall 15%.

In sum, as it can be seen in figure 3, there were three episodes of inflation acceleration within the period 1974-85 and all of them were preceded by some sort of external shock. In this context, it is also possible to see that the 1979 and 1983 shocks led inflation rates in Brazil to levels never reached before. Finally, looking at figure 3 it is also possible to notice that the inflation rates in the years 1983, 1984 and 1985 were *stabilized* around 200%. As previously noticed, such a behavior was common during the indexation period: after an external shock, inflation rates would move upward from an old *plateau* and then stabilize in a new *plateau*. At this time, however, quite distinct macroeconomic circumstances were at stake. The most important one was the extremely auspicious performance at the external front. After the first sizable trade surplus of 1983, the result for 1984 and were even larger, with mega-surpluses of around US\$ 13 billion. Even more importantly, such values were obtained with the economy growing at a rate of 5.4% and 7.8% in 1984 and 1985, respectively. The positive performance at the external front allowed the authorities to keep the exchange rate almost constant in real terms¹⁸.

Insert Figure 3 here

The inflation rates kept in a high *plateau* during the following years. At this point, stabilization was increasingly becoming the government top priority. In February 1986, the government launched a stabilization plan (Cruzado Plan), which intended to stabilize prices by dismantling the indexation schemes. It was the first of a series of failed stabilization programs until stabilization was finally achieved by Plano Real (Real Plan) in 1994.

III – Econometric tests

¹⁶ At this point - after the Mexican and Polish default - the debt crisis for the developing countries was installed. Brazilian and IMF authorities initiated their conversations by the end of 1982 and the exchange rate devaluation was part of the agreement. The exchange rate devaluation was enacted while the first formal letter of intentions (the adjustment plan proposed by the Brazilian government) was still being studied by the IMF bureaucracy.

¹⁷ According to Batista Junior (1983) this value corresponded to the appreciation of the exchange rate after the previous maxi-devaluation.

¹⁸ The second and third phases correspond to a period wherein inflation was deeply connected to generalized indexation and the resulting inflationary *inertia*. This is what happened when inflation jumped from a 20% to a 30 % “plateau” in 1973-74, to a 40% one in 1976, and further to 100% in 1979 and to 200% in 1983. This is a point of the differences when one compares these two phases with the first one.

This section is devoted to empirical tests regarding nominal exchange rates and inflation rates in Brazil from 1951 to 1985. It is interesting to notice that we did not find a lot of empirical econometric work on the subject covered in this paper. One of the few exceptions is Barbosa (1983) where the author attempts to develop, and test econometrically, a structuralist model for inflation. Basically, the model has, as the forces that explain inflation, an excess of demand on agricultural internally consumed goods, and the external prices of export agricultural goods and imported goods. However, in his theoretical model the variable for external prices incorporates both the change in international prices in US dollars and the change of real exchange rate (the value above past inflation). Besides this divergence, among other details that make his inflation mechanisms distinct from the assumed here, when the author tests empirically the model his best specification has some important differences with respect to his own theoretical tenets. Due to limitations of data availability the best specification has, as exogenous variables, the rate of change of government consumption, the acceleration of the increase in oil and gas prices, and the gap between the rate of growth of agriculture production and its post war trend. Definitely, this kind of result has almost no relation to our basic hypothesis and tests since the exchange rate is not tested and variable that represents some degree of excess demand is included.

Modiano (1988) estimated a reduced form of a structuralist inflation model with exchange rate shock, nominal wages, import tariffs and subsidies on oil imports, the output gap, the domestic food supply gap, and commodities price index as the exogenous variables from 1966 to 1982. The exchange rate shock had strongest elasticity, a 1.4 coefficient. Even though, the exchange rate variable differs from the adopted in this paper, the results for a shorter period of time support the hypothesis of a central role played by the trajectory of the exchange rate on Brazilian inflation. It is also, interesting to notice that the size of the multiplier effect of exchange rate on inflation depends on the level of the inflation itself. The idea is that an increase in a given high level of inflation would lead to a higher wages indexation. The idea of it is that the losses of real wages would be much more difficult to bear by workers than the lost when inflation grows starting from a lower rate.

In this paper, we will develop a Vector Autoregressive (VAR) model with exogenous variables and apply a Granger causality test. The data employed are % monthly changes of the average nominal exchange rate and % monthly changes of the inflation rate

The analysis starts with unit root tests on the two series. However, this analysis won't be restricted to the conventional Augmented Dickey-Fuller (ADF) test. Brazilian data are full of structural breaks and the two series employed here do show this pattern. As structural breaks may bias the traditional unit root tests towards false non-rejection of the null of non-stationarity, it is thus advisable to employ tests that take breaks into consideration as a way of properly dealing with them (Patterson, 2000: 277-78).

The literature of unit root tests with structural breaks was started by the pioneering paper of Perron (1989), who assumed a single breakpoint affecting the level or the growth or both. This paper had as a major setback which is the fact that the breakpoint is assumed to be known, what leads to the criticism of *data-mining*. Zivot and Andrews (1992) developed then a test that was not subject to this criticism since the breakpoint was treated as unknown and calculated in a way that maximizes the chances of the alternative hypothesis. However, this test didn't include the hypothesis of structural break in the null (Patterson, 2000: 277-85). Finally, Lee and Strazicich (2003) developed a test that allowed up to two breakpoints, treated both of them as unknown and included them in the null hypothesis¹⁹. In this context, this paper applies the Zivot & Andrews (1992) and Lee & Strazicich (2003) tests, besides the traditional ADF test. All of them were calculated in R.

The test results can be seen in table 1. All tests showed that the exchange rate series does not present unit root.

Insert Table 1 here

¹⁹ For a good summary of unit root tests with structural breaks prior to the 2000s, see Patterson (2000). For a brief summary of these tests including Lee and Strazicich (2003) test, see Greasley and Oxley (2011).

However, the results were not conclusive when it comes to the inflation rate data. ADF (for 5%) and Zivot & Andrews (ZA) tests showed that the series is stationary, but Lee & Strazicich (LS) test showed the opposite result (see table 2).

Insert Table 2 here

Due to the inconclusive results, it was decided to develop two VAR models, one in level and another with the inflation rate series in differences. These models included intercept, a trend and the significant dummies suggested by the LS test as the structural break points of the two series. According to the LS results, there is a trend break in the inflation rate series in February 1977, while the exchange rate series presented a trend and level break in August 1964. In the case of the differentiated inflation rate series, there was a trend break in February 1961 and another trend break in June 1982²⁰.

The VAR that included the differentiated inflation rate series performed very poorly. For instance, it had a low R^2 , autocorrelation, heteroscedasticity and nonnormality in the residuals. The VAR in level proved to perform much better. We started with a VAR without exogenous variables²¹. Based on this model, we analyzed the lag length criteria (table 3). According to these criteria, it was decided to incorporate 12 lags in the model.

Insert Table 3 here

Then, a VAR in level was estimated, including intercept, trend and the dummies for the inflation and exchange rate series as exogenous variables. This VAR model had a high R^2 for instance²². Moreover, based on the AR root table, it satisfies the stability condition (see table 4).

Insert Table 4 here

The next step was then to apply the VAR Granger Causality/Block Exogeneity Wald Test. As it can be seen in figure 8, the results were in line with the interpretation that is being set in this paper: the exchange rate change Granger-causes the inflation rate, but the inflation rate does not Granger cause the exchange rate change. This result does not imply of course that the exchange rate change actually causes the inflation rate: it simply implies that the exchange rate cannot be treated as an exogenous variable in relation to the inflation rate. In any case, it is an additional sign that we cannot refuse the structuralist hypothesis.

Insert Table 5 here

²⁰ All three unit root tests showed that the differentiated inflation series is stationary.

²¹ The VAR models were calculated in E-Views 8.0.

²² The exchange rate equation was not well estimated. However, this is a traditional problem in the econometric literature on the exchange rate.

Nevertheless, it is also mandatory to make a series of tests in the residuals, in order to ensure the above results. In this sense, autocorrelation, heteroscedasticity and normality tests were applied. In terms of the autocorrelation problem LM tests were used. No autocorrelation in the residuals was found (see table 6).

Insert Table 6 here

When it comes to the normality test, the results were not so positive. As it can be seen in figure 9, the normality hypothesis was rejected for both equations and for the model as a whole.

The heteroscedasticity test had also negative results, It showed a high probability of heteroscedasticity in the residuals of the inflation equation (res1^2), but also in the correlation of the residuals of the two variables ($\text{res2} \cdot \text{res1}$).

The result is particularly negative since the presence of heteroscedasticity invalidates the Granger causality test used before. Therefore, it became necessary to correct this heteroscedasticity problem, otherwise the former result of the Granger test would not stand.

For this purpose, we estimated two systems through different estimation methods, but both were estimated following the same specification of our original VAR in level with exogenous variables. The first system was estimated through weighted least squares with weights - in each of the equations - equal to the inverse of the variance of the residuals estimated through minimum least squares. In the second system, the Seemingly Unrelated Regression (SUR) methodology was used. This alternative was chosen due to the correlation in the residuals of the two equations that was detected by the heteroscedasticity test. In order to test for Granger causality, the Wald test was used for all the lags of the exchange rate change variable in the inflation equation. In the same way, restrictions for all the inflation lags were specified in the exchange rate change equation.

The tests pointed out no change in terms of the former Granger causality tests results. Therefore, inflation does not Granger-cause the exchange rate change, but the exchange rate change does Granger-cause inflation (see table 7).

Insert Table 7 here

In other words, the evidence shows that the former result is not invalid.

Conclusions:

This paper examined - in the Brazilian case - the structuralist hypothesis that high inflation rates in Latin America during the second half of the 20th century were the result of external shocks that triggered an internal reaction of distributive variables generating a cost price spiral. For this purpose, it presented an historical analysis of the Brazilian data and some econometric tests.

From eight episodes of inflation upsurge detected from 1951-1985 seven were preceded or concomitant to an external shock (foreign exchange devaluation, or commodity price-shocks, or both), suggesting that external shocks were an important trigger to inflation upsurge episodes.

The econometric analysis presented in the paper gave evidence that such a strong sign of the structuralist hypothesis should not be refused. A VAR model with exogenous variables for the period 1951-1985 was estimated, using as endogeneous variables the % monthly changes of the average nominal exchange rate and the % monthly changes of the inflation rate. In this context, the Granger causality test showed that inflation does not Granger-cause the exchange rate change, but the exchange rate change does Granger-cause inflation. The residual tests showed heteroscedasticity, challenging the validity of the

Granger test results, but systems estimated by weighted minimum squares and the SUR methodology proved that the Granger test result holds.

This paper did not aim to estimate a closed model for inflation, given the complexity of institutional and political changes of the long period analyzed. Further econometric developments may be necessary to establish a quantitative relation between exchange rate movements and inflation. However, the broad picture presented by the econometrical test has a particular interest insofar: it shows the persistence of the impact of the exchange rate on inflation, during a long period when internal public financing (both institutional instruments and the value of the deficit) changed markedly. Besides that, along the period studied monetary policy also varied a lot, as well the structural conditions of particular components of the aggregate supply, like agricultural supply and energy production.

Therefore, the test suggests that, in spite of other macro and microeconomic changes, the external factor has an undeniable role to explain the persistent and predominately high inflation through the period analyzed. The majority of episodes described here were of external shocks or external devaluations, that followed the deterioration of terms of trade, sometimes accompanied by the deterioration of external financial conditions (both international rates of interest and the limitation of external voluntary financial flows to Brazil). Therefore, this historical pattern suggests that the external conditions are crucial to explain a long period inflationary process in Brazil. The detailed sub period studies will show the impact of the exchange rate devaluation on inflation, based on its interaction with other internal variables like the wage resistance by workers.

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Annex 1: Episodes of Inflation Upsurge

The first month of each episode is the month of the lowest inflation rate before inflation rates started to increase.

Episode 1:

July 1953 – May 1954

Lowest rate: 12%

Highest rate: 32%

Episode 2:

April 1956 – January 1957

Lowest rate: 14%

Highest rate: 28%

Episode 3:

February 1958 – August 1959

Lowest rate: 4%

Highest rate: 42%

Episode 4:

February 1961 – April 1964

Lowest rate: 28%

Highest rate: 94%

Episode 5:

November 1973 – December 1974

Lowest rate: 15%

Highest rate: 35%

Episode 6:

December 1975 - January 1977

Lowest rate: 29%

Highest rate: 47%

Episode 7:

June 1979 – March 1981

Lowest rate: 45%

Highest rate: 121%

Episode 8:

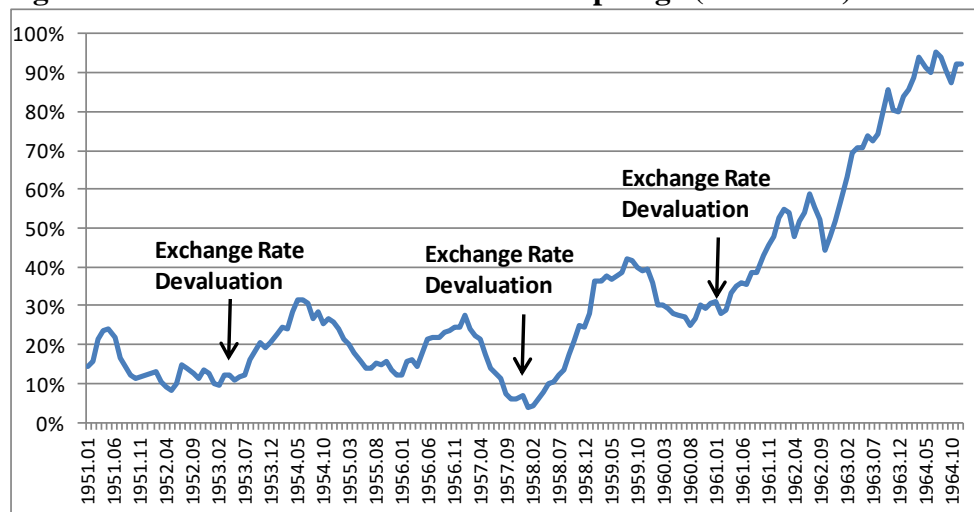
February 1983 – May 1984

Lowest rate: 104%

Highest rate: 236%

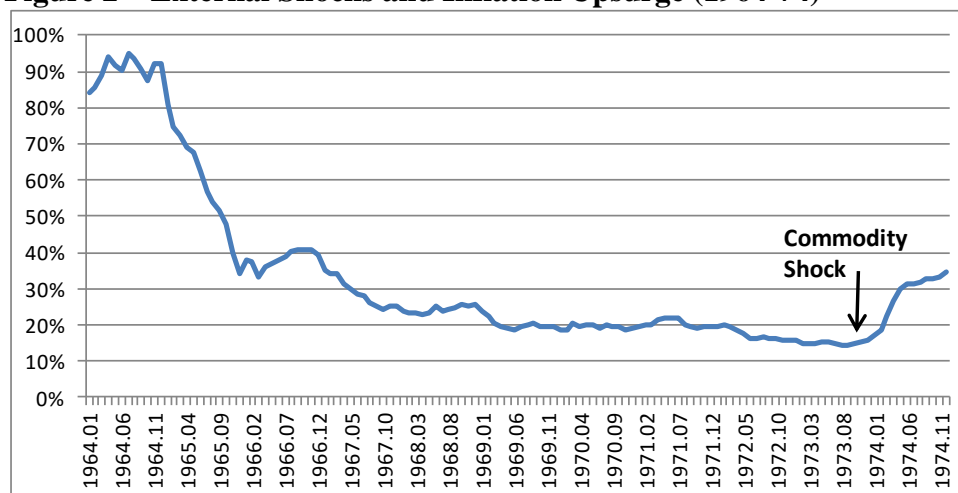
Annex 2: Figures and Tables

Figure 1 – External Shocks and Inflation Upsurge (1951-1964)



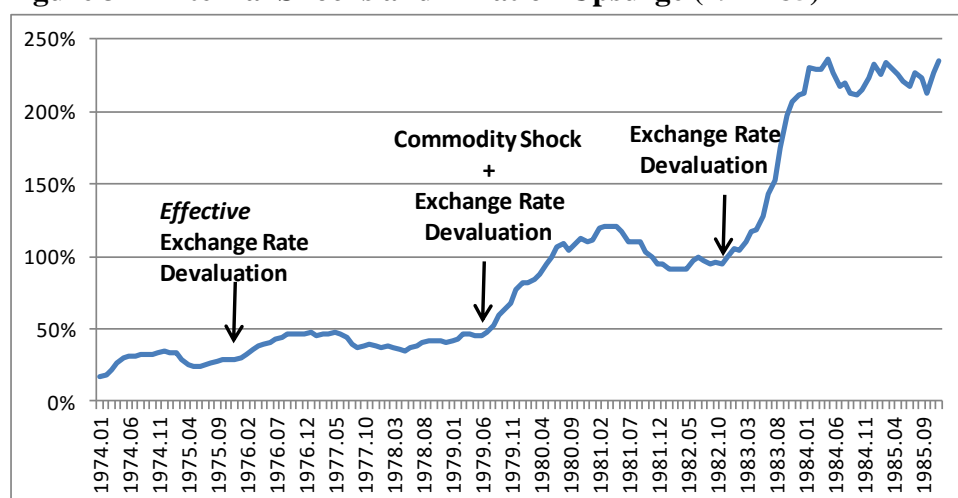
Source: author's elaboration from Ipeadata.

Figure 2 – External Shocks and Inflation Upsurge (1964-74)



Source: author's elaboration from Ipeadata.

Figure 3 – External Shocks and Inflation Upsurge (1974-85)



Source: author's elaboration from Ipeadata.

Table 1 – Unit root tests (exchange rate)

Test statistic		Critical values		
		1%	5%	10%
ADF	-17,14	-3,98	-3,42	-3,13
ZA	-18,44	-5,57	-5,08	-4,82
LS	-9,20	-6,42	-5,65	-5,32

Table 2 – Unit root tests (inflation rate)

Test statistic		Critical values		
		1%	5%	10%
ADF	-3,48	-3,98	-3,42	-3,13
ZA	-6,26	-5,57	-5,08	-4,82
LS	-4,98	-6,42	-5,65	-5,32

Table 3 – VAR Lag Order Selection Criteria**VAR Lag Order Selection Criteria**

Endogenous variables: IGPDI CAMBIO

Exogenous variables: C

Sample: 1951M01 1985M12 Included observations: 408

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2408,48	NA	464,21	11,82	11,84	11,82
1	-2151,31	510,57	134,19	10,58	10,63	10,60
2	-2132,02	38,11	124,50	10,50	10,60	10,54
3	-2115,27	32,92	116,96	10,44	10,58 *	10,49 *
4	-2108,79	12,67	115,55	10,43	10,60	10,50
5	-2106,90	3,67	116,75	10,44	10,65	10,52
6	-2100,78	11,85	115,55	10,43	10,68	10,53
7	-2099,51	2,44	117,11	10,44	10,73	10,56
8	-2096,23	6,29	117,52	10,44	10,78	10,57
9	-2093,89	4,46	118,49	10,45	10,82	10,60
10	-2080,88	24,68	113,37	10,41	10,82	10,57
11	-2080,37	0,97	115,34	10,42	10,88	10,60
12	-2069,07	21,21 *	111,29 *	10,39 *	10,88	10,58

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Table 4 – Vector Autoregression Estimates**Vector Autoregression Estimates**

Sample (adjusted): 1952M01 1985M12

t-statistics in []

Included observations: 408 after adjustments

	IGPDI	CAMBIO		IGPDI	CAMBIO
IGPDI(-1)	0,37 [7.4]	-0,05 [-0.2]	CAMBIO(-4)	0,03 [2.6]	-0,02 [-0.4]
IGPDI(-2)	-0,02 [-0.4]	0,50 [1.7]	CAMBIO(-5)	0,01 [0.7]	-0,05 [-1.0]
IGPDI(-3)	0,12 [2.2]	0,19 [0.7]	CAMBIO(-6)	0,03 [2.6]	0,01 [0.1]
IGPDI(-4)	-0,02 [-0.3]	0,05 [0.2]	CAMBIO(-7)	0,01 [0.5]	-0,07 [-1.3]
IGPDI(-5)	-0,04 [-0.6]	-0,08 [-0.3]	CAMBIO(-8)	0,02 [2.4]	-0,03 [-0.5]
IGPDI(-6)	0,05 [0.9]	-0,08 [-0.3]	CAMBIO(-9)	0,02 [1.6]	-0,05 [-0.9]
IGPDI(-7)	-0,05 [-0.9]	-0,18 [-0.6]	CAMBIO(-10)	0,00 [0.4]	0,19 [3.7]
IGPDI(-8)	-0,05 [-0.9]	0,25 [0.8]	CAMBIO(-11)	0,00 [0.5]	0,00 [-0.1]
IGPDI(-9)	-0,03 [-0.6]	0,12 [0.4]	CAMBIO(-12)	0,01 [1.3]	-0,09 [-1.7]
IGPDI(-10)	0,09 [1.6]	-0,29 [-1.0]	C	-0,38 [-1.5]	2,68 [1.9]
IGPDI(-11)	-0,07 [-1.3]	-0,14 [-0.5]	TT	0,01 [3.9]	-0,01 [-0.5]
IGPDI(-12)	0,20 [3.8]	0,38 [1.4]	DC	-1,33 [-3.9]	-0,74 [-0.4]
CAMBIO(-1)	0,02 [1.7]	0,08 [1.5]	DTC	-0,01 [-2.3]	0,00 [02]
CAMBIO(-2)	-0,01 [-0.6]	0,00 [-0.1]	DTI	0,02 [2.8]	0,06 [1.2]
CAMBIO(-3)	0,00 [-0.1]	-0,06 [-1.2]	R-squared	0,81	0,19
			Adj. R-squared	0,79	0,13
			F-statistic	56,15	3,19
Roots of Characteristic Polynomial				First root (Modulus)	
				0,926	
				0,907	
No root lies outside the unit circle.				0,897	
VAR satisfies the stability condition.				0,897	

Table 5 – VAR Granger Causality/Block Exogeneity Wald Tests**VAR Granger Causality/Block Exogeneity Wald Tests**

Dependent variable: IGPD

Excluded	Chi-sq	df	Prob.
CAMBIO	24,17	12	0,02

Dependent variable: CAMBIO

Excluded	Chi-sq	df	Prob.
IGPDI	11,12	12	0,52

Table 6 – Residuals Tests

Endogenous variables: IGPD CAMBIO

Exogenous variables: C TT DC DTC DTI

Lag specification: 1 to 12

LM Test		White Test	
Lag	Probs (chi-square, 4 df)	Joint Test (Chi-sq, 165 df)	
1	0,10	Individual components Chi-sq(55)	Prob.
6	0,25		0,00
12	0,23		
Jarque-Bera		Dependent	Prob.
df	Prob.	res1*res1	0,00
4	0,00	res2*res2	0,95
		res2*res1	0,03

Table 7 - System SUR/Wald Tests**System SUR/Wald Tests**

Dependent variable: IGPD

Excluded	Chi-sq	df	Prob.
CAMBIO	26,02	12	0,01

Dependent variable: CAMBIO

Excluded	Chi-sq	df	Prob.
IGPDI	11,97	12	0,45

System Weighted Least Squares/Wald Tests

Dependent variable: IGPD

Excluded	Chi-sq	df	Prob.
CAMBIO	26,02	12	0,01

Dependent variable: CAMBIO

Excluded	Chi-sq	df	Prob.
IGPDI	11,97	12	0,45