

# The regularity of Brazilian inflation

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Summary: 1. Introduction; 2. The recent history; 3. Graphic evidence; 4. The econometric tests; 5. Analysis of the results; 6. Conclusions.

## 1. Introduction

A most remarkable characteristic of Brazilian economy, over the last decades, is the continuance of very high rates of price inflation. Nearly since the end of the World War II, substantial prices increases have been a permanent and constant phenomenon in Brazil.

Despite this fact, and at least until the 1980's, the country presented a very good performance in terms of economic growth. There was a pacific coexistence of price inflation and economic growth.

Nevertheless, the concern about inflation has always existed. Several stabilization policies were attempted but the results were clearly unsatisfactory. It is fair to say that the struggle against inflation never became an absolute priority.<sup>1</sup>

The main reason for this lack of strong commitment on price stability is that inflation did not hurt economic growth. In some peculiar way and over this long period, the Brazilian society learned to have a peaceful relationship with the inflationary process. It is also worth to notice that until 1979 the rate of price increases rarely exceeded the barrier of 50 percent a year.

From the beginning of the 80's on, this situation changed dramatically. The process of growth lost its dynamism and inflation accelerated. In fact, economic growth stopped and prices increases almost exploded. The real GNP per capita in 1993 was less than in 1982 and the inflation rate was, in this year, above 3,000 percent.

The peaceful relationship between economic growth and inflation disappeared, and accelerated increases of prices has become a real problem and a priority. Although inflation reduction is now a permanent objective of the federal government, prices increases have not been halted. Nor, at least, reduced to the patterns of the previous decades, which were already quite high for international standards.

The purpose of this paper is not to explain the whole dynamic of inflation in Brazil. Rather, my purpose is much more modest: to present a very interesting peculiarity of the behavior of inflation rates over the last eight years: its astonishing regularity.

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<sup>1</sup> The only conceivable exception was the 1964-66 Campos-Bulhões policy, under Castelo Branco's government.

## 2. The recent history

Brazil has a very long and fascinating, for economic research, inflation history. In this paper I will concentrate the analysis on the behavior of the Brazilian inflation from March 1986 to June 1994.

On February 28, 1986, to be specific, the Brazilian government announced a stabilization program called the Cruzado Plan. According to the authors of this plan, the cause of Brazilian inflation, then, was basically inertial. Therefore, the most important measures to overcome inflation were an across-the-board price freeze, which included the exchange rate and an adjustment scale (*tablita*) and desindexation rules.

During the first months, this stabilization policy was successful. The monthly inflation rate dropped, especially when compared to the rates of previous periods. However, these rates started to increase gradually, reaching approximately 30 percent a month by the end of the second quarter in 1987.

Then, on June 1987, a new stabilization program, the Bresser Plan, named after the new Finance minister, was initiated with another price freeze. This plan tried to repair some failures of the Cruzado Plan. For instance, the necessity of a fiscal adjustment was emphasized; the wage policy changed from a 20 percent trigger point to quarterly out-of-date readjustments; the exchange rate became more flexible<sup>2</sup> and the monetary policy tried to be more restrictive.

The results of this stabilization program were similar to the Cruzado Plan: a sudden drop in the monthly inflation rates followed by a gradual acceleration of general price increases until another freezing policy was adopted, with a new Finance minister, by the end of January 1989.

This new plan, the so-called Summer (*Verão*) Plan, not only changed the wage policy and established desindexation rules, but strongly emphasized high interest rates policy as an essential instrument for price stability. The result of this stabilization program was similar to others plans, but with a faster acceleration of inflation.

The more rapid growth on the inflation rate may be explained by the fact that 1989 was the year of the first direct election for president since 1960. For some it brought positive expectations, for others a fear that a leftist candidate would be elected. It seems likely that this election process has had a pro-inflation effect.<sup>3</sup>

In March 1990, the new president announced a severe program against inflation: the Collor Plan. Besides a new price freeze, this plan blocked 80 percent of all privately held financial assets, including demand and time deposits<sup>4</sup> for 18 months, after which they would be returned in 12 installments. All blocked assets would have the same remuneration as savings deposits: 6 percent a year plus monetary correction.

The Collor Plan also included:

(a) an administrative reform with the dismissal of thousands of public employees;

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<sup>2</sup> The Cruzado Plan adopted a fixed exchange rate which caused a severe contraction of international reserves.

<sup>3</sup> It may be added that by the end of 1988, the Brazilian Congress promulgated a new Constitution with several novelties, most of them with a "popular" appeal, but not realistic.

<sup>4</sup> Demand deposits above Cz\$50,000.00 (approximately US\$1,000) were blocked. Deposits below these figures could be freely handled, those above this amount would be held under the same conditions as the financial assets.

- (b) the institution of a hard extraordinary tax on financial assets;
- (c) the extinction of administrative barriers to imports and the accomplishment of a new and more flexible exchange rate policy (market determined or rather a dirty float);
- (d) the reduction of import tariffs through a predetermined gradual plan;
- (e) the prohibition of check emission and bearer bonds (including shares and stocks); and
- (f) a stronger emphasis on privatization programs that, despite their long existence, had narrow scope.

All these measures were aimed at, according to the president own words, eliminating, with just one shot, the tiger inflation represented.

Despite that arsenal of measures that many considered of extreme violence, the inflationary tiger resisted and once more presented the same behavior of the previous plans: sudden initial reduction in the rate of inflation followed by continuous acceleration in that rate.

This continuous increase in the inflation rate lasted until January 1992. Then a new price freeze was adopted, along with changes in the financial system that had the objective of reducing the liquidity of financial assets. There also were renewed promises of monetary and fiscal austerity.

This new plan against inflation, called Collor II, can be divided into two phases. The first one at the command of the same team that ran Collor I and developed it. This team managed this plan for only until May 1991.

The second phase was under the administration of new economic authorities, headed by minister Marcílio Marques. This new group adopted an orthodox and traditional stabilization policy. Their basic strategy was the strict control of the public budget, high interest rates and an attitude of no surprises, which means, rejection to extreme measures such as price freezes and/or the confiscation of financial assets. In addition they developed rather successful efforts to normalize Brazilian international financial relations.

In August 1992, with Collor's impeachment, there was another change in the federal government economic team and the Marcílio group was substituted. The behavior of inflation within this period, that is, after the price freeze of January 1991 until the August 1992 impeachment (let us call it the Marcílio period), was similar to that observed in the former plans: a sudden drop of the inflation rate due to price freezing and increases in the rate during following months.

It is worth to notice that most of the inflation rates increase occurred at the beginning of this period. After a sharp increase in October 1991 the inflation rate remained relatively constant until August 1992.

Under the new president, Itamar Franco, the stabilization policies, followed by his several economic ministers until June 1994, stressed the fiscal equilibrium as an essential precondition for inflation control. Moreover, given the extreme difficulties in achieving budget equilibrium, a policy of high interest rates was adopted, despite the president's hard feelings against "exorbitant" interest rates.

In December 1993, Finance minister Fernando Henrique Cardoso announced a new stabilization plan, the Real Plan, which encompassed three phases or steps:

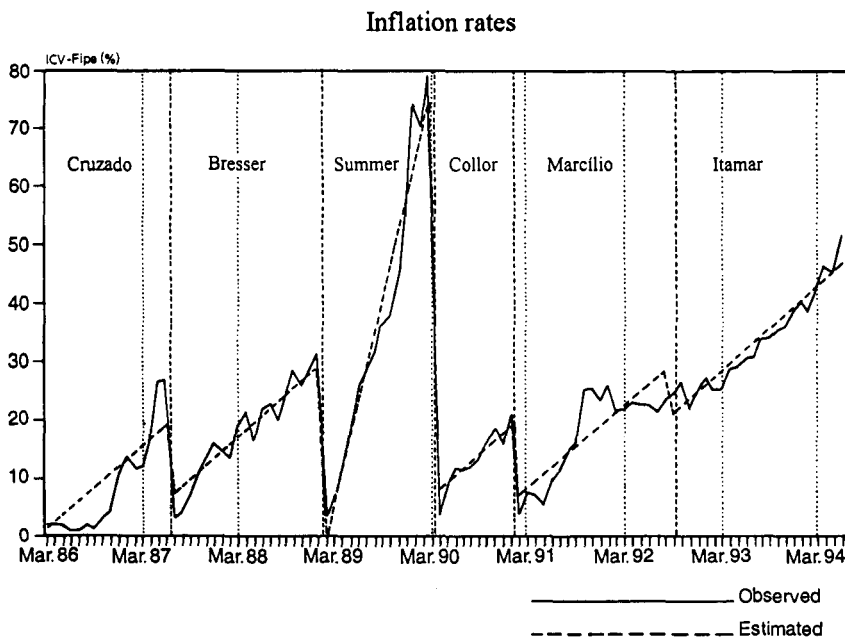
- (a) a fiscal adjustment program;
- (b) a transitional period; and
- (c) the introduction of a new and (expected) stable currency — the Real.

The Real was finally launched in July 1994 and this inaugurated a new stabilization plan period.

For obvious reasons the Real period will not be discussed in this paper. The previous period, that is the pre-Real or the Itamar period, followed a pattern very similar to others periods: a gradual increase in the inflation rates.

### 3. Graphic evidence

The path of recent Brazilian inflation is shown in the figure. The Fipe's consumer price index (ICV-Fipe) was used as the indicator for Brazilian inflation. This index, despite its regional scope — São Paulo City — is considered a good indicator of national inflation. Besides being technically well developed, it is based on the price behavior in the most important city in Brazil, economically speaking.<sup>5</sup>



<sup>5</sup> The city of São Paulo and its surrounding areas are responsible for about 10 percent of the Brazilian population and 1/6 of its GDP. Generally speaking, all price indexes in Brazil, especially the more generic ones, have presented very similar patterns; therefore, the choice of one particular index is not a critical matter for a trend study like this one.

The figure shows monthly rates of Fipe's consumer price index changes (ICV-Fipe) between March 1986 and June 1994. The graph is divided into six periods corresponding to different stabilization plans. From this picture it is possible to notice a permanent increase of the inflation rate, interrupted with sudden drops at the occasion of the several freezes.

Excluding the period between the announcement of the Summer Plan in February 1989, and the beginning of the Collor I Plan (March 1990), when price increases were even faster, the graph suggests a behavior of inflation rate acceleration extremely similar in all periods.

The figure suggests the hypothesis that the inflation rate behavior, within this time frame, obeyed the same generator process. Therefore, it seems that the basic causes of Brazilian inflation were not affected by the different stabilization policies and plans adopted.

To evaluate this hypothesis, econometric tests were performed. In advance to what will be presented in the following section, these tests did not reject the hypothesis of equal inflation rate acceleration behavior in all the periods considered, except the Summer Plan period.

#### 4. The econometric tests

Ordinary least square methods were used to estimate and to test linear regression between the rate of change of Fipe's consumer price index and a time variable. Dummy variables were included in the regression equation with double objectives. The first one was to eliminate from the series (or to capture) the variations caused by the introduction of the five stabilization plans (and the corresponding price freezes) after the Cruzado Plan. For this, five dummy variables for the  $y$ -axis interception were introduced.

The second objective was to test if the acceleration of the increases in the rate of inflation was different among the several (six) periods between stabilization plans and freezes. Here five (one for each period after the Cruzado) dummy variables, for the regression equation declivity, were tested.

According to the  $t$  statistic, all  $y$ -axis interception dummy variables were not rejected. They have shown themselves significantly different from zero. In relation to the declivity dummy variables only for the Summer Plan period the dummy variable presented a value statistically different from zero. The explanation power of the regression was very high: adjusted  $R^2$  of 94.06 percent for 100 observations. The regression equation declivity estimated value was 1.20.<sup>6</sup> This value would represent the linear rate of inflation acceleration over the whole period of one hundred months. The exception was the Summer Plan period, when the acceleration would have been much higher: 5.80.

The detailed results of this regression are presented in the Statistical Appendix. In there, it can be observed that the Durbin-Watson statistic indicates the presence of an autocorrelation process in the residuals. In the identification of this process it was found a high first degree autocorrelation. Besides this, the "Q-statistic" showed a high value: 34,499 for 19 degrees of freedom, suggesting the lack of independence of the residuals.

For these reasons, we calculated a new regression introducing an autoregressive variable of first degree  $[AR(1)]$ .<sup>7</sup> The results are shown in the appendix. Within this specification

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<sup>6</sup> In this equation, the constant term was not included in the regression equation. With a constant term, that showed itself barely significant at 3 percent level, the estimated declivity value was 1.29.

<sup>7</sup> Cochrane-Orcutt Technique. In this configuration the constant term was not statistically different from zero.

all the coefficients are significant. The  $R^2$  is again very high, 95.69 percent, and the autocorrelation of the residuals was eliminated as shown by the Durbin-Watson value near two. The "Q-statistic" of the correlogram, with 19 differences, presented a value of 11.118, confirming the independence of the residuals.

## 5. Analysis of the results

In the first place, we should to acknowledge the excellent degree of explanation of the estimated regression equation. A very naive specification, e.g., the time variable, only corrected by the changes in y-axis intercept caused by new stabilization plans (and the price freezes), explained 95 percent of the variations observed in the rate of inflation in Brazil over a very long period (100 months).

The key variable of our analysis is the declivity of the estimated equation. It represents the linear acceleration of the inflation rate over time.<sup>8</sup> The econometric results show their constancy over this long period — one hundred months.

To be more specific, during the analyzed period, except the Summer Plan period (February 1989 to March 1990), the monthly inflation rate had uniform behavior. The monthly inflation rate increases were constant and approximately equal to 1.2 percentage points per month. As discussed in the previous section, all the declivity dummy-variables, except one period (Summer Plan), were not statistically different from zero. It is this fact that leads us to conclude that the (linear) acceleration of the inflation rate was the same in these one hundred months.

The period that did not follow this rule can be regarded as atypical. It was the last year of a government that had little endorsement; the first year of a Constitution considered, by important business areas, inadequate, old fashioned, statizing and nationalist; the first direct presidential election in almost 30 years and there was a fear that a leftist candidate could be elected. All of these political and psychosocial factors, not different economic policies, must have caused the faster acceleration of the inflation rates.

Besides this, the expectation, in the last months of the period, which was later confirmed, that the new president would take harsh measures to fight inflation stimulated defensive attitude<sup>9</sup> by the economic agents with unmistakable impacts that accelerated inflation.

It is also important to comment the question of the autocorrelation of the residuals. Its correction, by the incorporation of an autoregressive variable of the first degree, did not alter significantly (in a statistic sense) the course not even the value of the estimated declivity of the regression equation. This econometric inference indicates that the divergences observed between the estimated inflation and the effective inflation act as an adjustment parameter of the level of the dependent variable. But they do not change its temporal trend, that is, they do not alter the linear growth of the inflation rates.

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<sup>8</sup> In the estimated regressions equations, it is the *tempo* (time) variable coefficient.

<sup>9</sup> These defensive actions include preventive price increases and a high demand for stocks, durables consumer goods, real estates, gold and dollars.

## 6. Conclusions

The econometric tests executed show, with great statistic significance, that five of the six analyzed sub-periods (Cruzado, Bresser, Collor, Marcílio and Itamar) present identical behavior. This behavior is characterized by a tendential growth of approximately 1.2 percentage points per month. This indicates a decrescent geometric rate of acceleration of inflation.

This is a surprising conclusion. Despite the various price freezes, the different processes of prices unfreezing, the variable sociopolitical supports received, the likely expectation changes and, foremost, despite all the several and distinct stabilization policies pursued (monetary, fiscal, exchange rate, trade, wage), the Brazilian rate of inflation did not change its pattern of behavior: constant linear growth.

In previous paragraphs I have briefly described (or rather sketched) the stabilization programs and the economic policies implemented in this period. Our summary might not be enough to present the enclosure and diversity of the instruments used or the struggle of the various economic teams.<sup>10</sup> In addition, due to the extreme popularity that would have been conquered by the team that could defeat inflation,<sup>11</sup> this target became the golden dream of all responsible for the economic area. In spite of this, Brazilian inflation continued its acceleration rate unaltered as if nothing was happening.

It is equally intriguing that the economic agents, in their aggregate, have not incorporated this linear growth of inflation into their behavior. If there had been the incorporation of this growth, the linear regularity would cease to exist and we would have an inflationary explosion.<sup>12</sup>

### *How can we explain this phenomenon?*

The most obvious answer is that all that has been done until today has not reached the basic generating causes of Brazilian inflation. I understand that the main reason for this failure resides in the political and institutional conditions required for the success of stabilization policies. The lack of success in all the policies tried in Brazil derives from difficulties in implementing the measures that were supposedly "technically" correct.

In this reasoning, a logical interpretation of the econometric results is that the political institutional picture only makes viable policies that prevent the losing of control and/or an inflationary explosion, but not its elimination, nor even its reduction to "civilized" levels. In this regime, all that would be possible to have would be a high, growing but well behaved inflation rate.

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<sup>10</sup> A research done by the National Banks Association showed that from 1980 to 1992 there were 156 economic measures of great impact on the economic life. Among them: four new monetary units (currencies); eight stabilization programs; 15 wage policies; 19 presidential expenditures cuts proposals; 18 changes in the exchange rate policies; 15 different wage policies; 54 changes in the price control system; and 22 proposals for the external debt negotiation.

<sup>11</sup> This popularity can be inferred from the public approval that president Sarney and the Cruzado Plan team had with the success of the beginning of the plan.

<sup>12</sup> Something close to this incorporation happened during the Summer Plan period.

## Statistical Appendix

LS – Dependent variable is ICV

Date: 8 May 1994/Time: 18:01

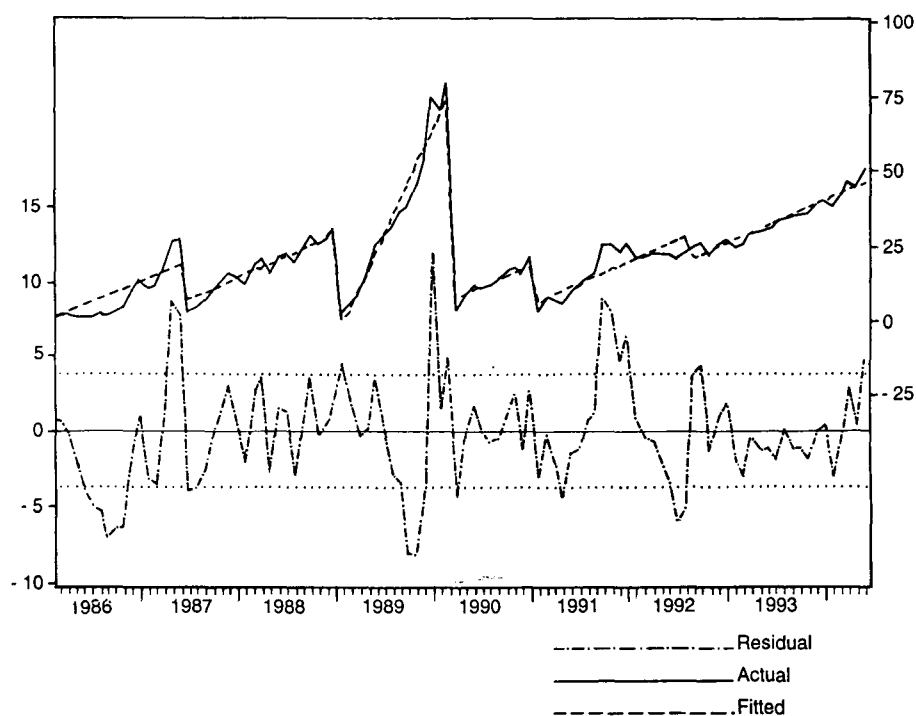
SMPL range: 1986.3-1994.6

Number of observations: 100

Heteroskedasticity-Consistent Covariance Matrix

Variable	Coefficient	Std. error	T-stat.	2-Tail sig.
Tempo	1.1964734	0.0728231	16.429863	0.000
Dibres	-13.278834	2.0146175	-6.5912432	0.000
Diverão	-209.77638	13.683241	-15.330898	0.000
Dicol 1	-52.084798	4.0383886	-12.897421	0.000
Dimar	-65.155609	5.0399111	-12.927928	0.000
Diita	-73.665729	6.5432491	-11.258280	0.000
Ddverão	4.6001641	0.3516864	13.080301	0.000

R-squared	0.944207	Mean of dependent var.	21.83950
Adjusted R-squared	0.940608	S. D. of dependent var.	15.31545
S. E. of regression	3.732458	Sum of squared resid.	1295.606
Durbin-Watson stat.	1.092430	F-statistic	262.3136
Log likelihood	-269.9720		





Ident resid

Date: 8 May 1994/Time: 18:17

SMPL range: 1986.3-1994.6

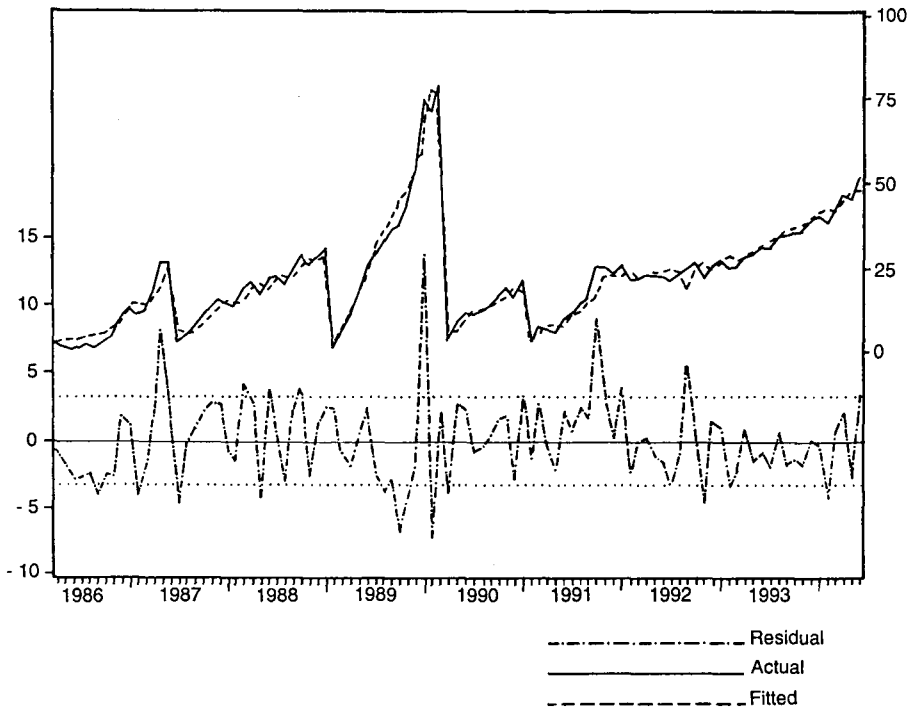
Number of observations: 100

Autocorrelations		Partial autocorrelations		ac	pac
.	*****	.	*****	1	0.441 0.441
.	**	.	*	2	0.129 -0.081
.	.	.	*	3	-0.034 -0.075
.	*	.	.	4	-0.039 0.020
.	*	.	*	5	-0.078 -0.075
.	**	.	*	6	-0.129 -0.090
.	**	.	*	7	-0.147 -0.062
.	**	.	**	8	-0.190 -0.128
.	**	.	.	9	-0.131 -0.012
.	*	.	**	10	0.040 0.124
.	*	.	.	11	0.073 -0.027
.	**	.	*	12	0.122 0.080
.	.	.	**	13	-0.002 -0.123
.	.	.	.	14	0.017 0.037
.	.	.	.	15	0.029 0.012
.	*	.	**	16	-0.077 -0.159
.	*	.	*	17	-0.059 0.052
.	.	.	.	18	-0.038 0.023
.	.	.	.	19	0.007 0.019
Q-statistic (19 lags)		34.499	S. E. of correlations		0.100

LS – Dependent variable is ICV  
 Date: 8 May 1994/Time: 18:18  
 SMPL range: 1986.4-1994.6  
 Number of observations: 99  
 Convergence achieved after 9 iterations

Variable	Coefficient	Std. error	T-stat.	2-Tail sig.
Tempo	1.3159307	0.0952907	13.809646	0.000
Dibres	-18.329242	2.8587647	-6.4115952	0.000
Diverão	-222.00518	16.412410	-13.526665	0.000
Dicol 1	-59.359078	5.9641080	-9.9527167	0.000
Dimar	-75.732111	7.0218645	-10.785186	0.000
Diita	-82.722714	8.4150460	-9.8303341	0.000
Ddverão	4.8098403	0.4123114	11.665552	0.000
AR (1)	0.6357735	0.0937716	6.7800232	0.000

R-squared	0.956903	Mean of dependent var.	22.04162
Adjusted R-squared	0.953588	S. D. of dependent var.	15.25876
S. E. of regression	3.287251	Sum of squared resid.	983.3478
Durbin-Watson stat.	2.018955	F-statistic	288.6482
Log likelihood	-254.1191		



Ident resid

Date: 8 May 1994/Time: 18:18

SMPL range: 1986.3-1994.6

Number of observations: 100

Autocorrelations		Partial autocorrelations		ac	pac
.	.	.	.	1	-0.016 -0.016
.	.	.	*	2	-0.038 -0.039
.	.	.	.	3	0.019 0.018
.	**	.	**	4	0.123 0.123
.	*	.	*	5	0.040 0.047
.	.	.	.	6	-0.005 0.005
.	*	.	*	7	0.046 0.045
*	.	.	*	8	-0.087 -0.104
*	.	.	*	9	-0.090 -0.105
.	*	.	*	10	0.061 0.047
.	.	.	.	11	0.015 0.004
.	*	.	**	12	0.090 0.124
**	.	.	**	13	-0.150 -0.118
.	.	.	.	14	0.009 0.002
.	*	.	*	15	0.092 0.084
**	.	.	***	16	-0.162 -0.199
*	.	.	*	17	-0.071 v0.071
.	.	.	.	18	-0.022 -0.026
.	.	.	.	19	-0.002 -0.024
Q-statistic (19 lags)		11.186		S. E. of correlations 0.100	