Testing for breaks in inertia: An alternative approach

Testing for breaks in inertia: An Alternative Approach

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Abstract

This paper tests for breaks in inflation inertia. It proposes an alternative method that can be relied upon when inflation follows a stationary process that fluctuates around a segmented deterministic trend. This method is then applied to the Brazilian case.

Key words: Stabilisation; inflation inertia; persistence; deterministic trend; break in inertia.

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1. Introduction

Since the 1980s a number of developing countries marked by high and chronic inflation have attempted to bring down inflation and keep it at very low levels. A central feature of these inflationary experiences has been inflation inertia. Applied economists have attempted, first, to statistically detect a break in inertia and, second, to assess whether such a break is permanent, as evidence that the stabilisation attempt has been successful.

The literature usually relies upon persistence as the statistical representation of inflation inertia. Several authors have tried to capture persistence in the inflationary process by including a first-lagged dependent variable in a first log-difference price equation (Edwards, 1998; Agenor and Taylor, 1993; Alogoskoufis, 1992). This method seems suitable for low and moderate inflation, whose series normally are stationary. However, high and chronic inflation series tend to be non-stationary due to a higher degree of persistence. This being the case such a method may lead to inconsistent coefficient estimates.

The purpose of this paper is to test for different sorts of breaks in inertia using an alternative approach, relying for that upon the Brazilian experiences with stabilisation programmes between 1986 and 1994. Following this introduction, section 2 proposes such an approach. Section 3 offers an empirical analysis using Brazilian data. Section 4 concludes.

2. An Alternative Approach

Whilst low and moderate inflation series are normally found to be stationary, a series of high and chronic inflation tends to be non-stationary. But high and chronic inflation can in addition fall into two special cases. The first is when inflation is high but constant, with sudden shifts in mean level due to external or policy-induced shocks. And the second is when inflation accelerates at a constant rate. The first case can be best represented by a non-linear stationary series, and the second by a trend-stationary series, in which persistence follows a deterministic rather than stochastic process.

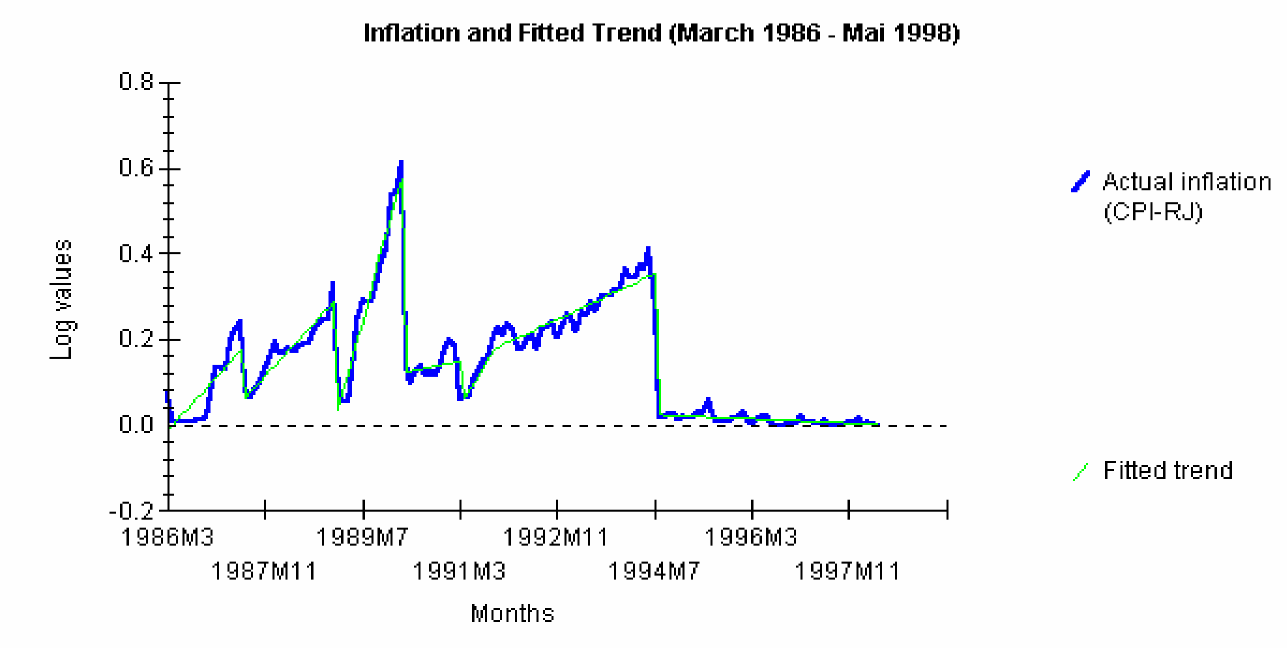
In this section we first hypothesise the special case that Brazilian inflation follows a stationary process that fluctuates around a segmented deterministic trend. This follows Perron’s (1989) approach that takes account of breaks in trend when assessing stationarity in macroeconomic time series. This approach permits us to innovate in relation to the above reported procedure by using a time trend to represent inflation persistence. Moreover, by inferring that inflation persistence follows a deterministic process, we can assess whether there is a break in inertia by looking at possible breaks in the time-trend.

We propose in addition the following interpretation for different types of trend breaks. When there is a downward shift in the trend level, we consider the break in inertia to be temporary. If the downward shift is statistically significant both in level and slope with the latter resulting in a flattened trend segment, we then can infer that the break in inertia is enduring.

3. Empirical analysis

This section tests for breaks in inertia associated with several stabilisation attempts in Brazil between 1986 and 1994: the Cruzado Plan (March 1986), the Bresser Plan (June 1987), the Summer Plan (Jan 1989), the Collor I Plan (March 1990), the Collor II Plan (March 1991) and the Real Plan (July 1994). By looking at figure 1, it is possible to see their immediate effects on the country's inflation level.

Figure 1: Monthly Inflation and Fitted Trend



CPI-RJ: Consumer Price Index of the Rio de Janeiro City.

Notice that the fitted trend is derived from the following OLS equation:

$$y = \alpha + \iota t + \upsilon_1 DL_{87} + \upsilon_2 DL_{89} + \upsilon_3 DL_{90} + \upsilon_4 DL_{91} + \upsilon_5 DL_{94} + o_1 DT_{89} + o_2 DT_{90} + o_3 DT_{91} + o_4 DT_{91B} + o_5 DT_{94} \quad (1)$$

where the level dummy $DL_t = 1$ if $t > T_B$ and 0 otherwise; the slope dummy $DT_t = t - T_B$ if $t > T_B$ and 0 otherwise, T_B being the time the break occurs. The subscripts 87, 89, 90, 91, and 94 of the level dummies DL and slope dummies DT indicate that their time breaks TB occurred in June 1987 (Bresser Plan), January 1989 (Summer Plan), March 1990 (Collor I Plan), March 1991 (Collor II Plan) and July 1994 (Real Plan), respectively.

We can see through figure 1 that each stabilisation plan caused an immediate fall in inflation, which notwithstanding returned soon afterwards. This means that these plans succeeded in breaking inertia only temporarily. The Real plan has been the only stabilisation attempt that managed to bring inflation down and keep it at low levels for a longer period of time. These visual results can be confirmed statistically. The OLS estimation of equation 1, with a time trend and breaks (in level and slope) at the implementation of each stabilisation plan, leads to the following coefficient estimates:

$$INFLAT_t = -0.95 + 0.012\ TIME - 0.12\ DL_{87} - 0.29\ DL_{89} - 0.45\ DL_{90} - 0.10 DL_{91}$$
(-11.48) (12.50) (-6.03) (-14.34) (-18.93) (-3.62)

$$- 0.33\ DL_{94} + 0.029\ DT_{89} - 0.039\ DT_{90} + 0.016\ DT_{91} - 0.013\ DT_{91B} - 0.06\ DT_{94} \quad (2)$$
(-24.53) (12.92) (-12.11) (3.53) (-3.23) (-9.70)

time-period: 1986M3-1998M5

where

INFLAT = consumer price index of Rio de Janeiro City (in first log-difference)[2];

TIME = time trend.

T-values are within rounded brackets. The slope dummy DT_{91B} is aimed at capturing the renewed government commitment to liberalisation policies.

Table 1: Diagnostic tests of equation 2

Test Statistics	*LM Version ($\chi 2$)*	
	Values	Critical values at 5%
Serial Correlation (1)	30.72	21.0
Heteroscedasticity (2)	1.90	3.84
Functional Form (3)	5.80	3.84
Normality (4)	8.06	5.99

(1) Godfrey's test. (2) Based on the squared residuals regressed against the square of fitted values. (3) Ramsey's reset test. (4) Jarque-Bera's test.

All the coefficient estimates of the level and slope dummies are highly significant. The negative constant indicates the initial success of the Cruzado Plan, while the negative coefficient estimates of the level dummies indicate that the subsequent stabilisation plans

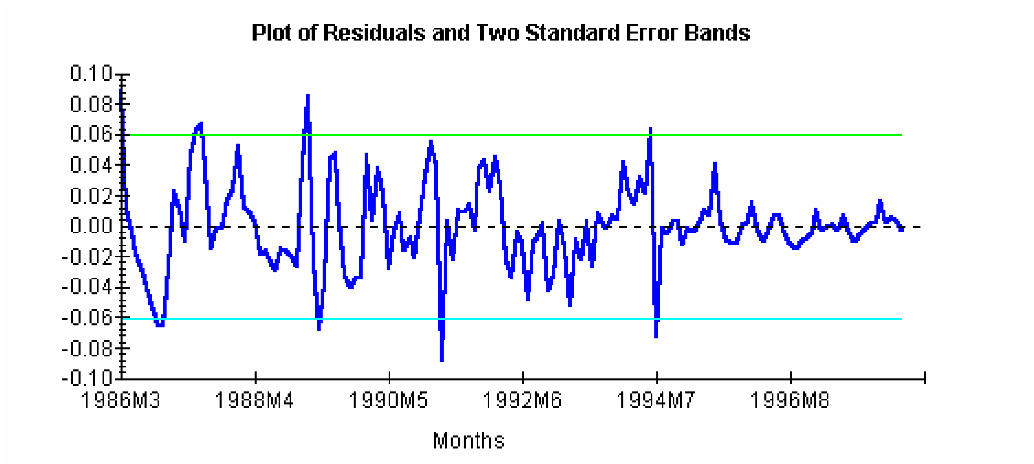
[2] Data source: FGV-Rio.

also succeeded in bringing inflation down significantly. The slopes of the segmented trends indicate in turn the intensity with which inflation persistence returned after each stabilisation attempt. Slopes remained equal from the Cruzado to the Bresser plan, changing in each of the subsequent plans until Collor II's. But all of them remained very steep.[3] The Real Plan is the only one in which both the level and the slope of the segmented trend shifted downwards dramatically - the segment being slightly negatively sloped -, thus being the only case in which an enduring break in inertia took place.

Although inflation in equation 2 was modelled with only a trend and dummies, coefficient estimates appear reliable. This conclusion should be tempered by non-normality and presence of serial correlation (see table 1). But diagnostic results could be improved with the inclusion of lagged dependent variables without significantly changing results. Moreover, the estimated residuals look stationary (see figure 2).

[3] Montoro Filho (1994) who adopted a similar modelling strategy, found that the slopes of all trend segments were equal, except the one observed during the Summer plan, which was steeper.

Figure 2. Estimated residuals of equation 2



A unit-root test confirms our hypothesis that the inflation series is trend-stationary. The equation used for the test was of order 12 (to address serial correlation) and included level and slope dummies to take account of breaks caused by each stabilisation plan.[4] The t-ratio of the relevant variable for unit-root test was -14.22, well above (in absolute terms) any critical value that takes account of breaks in trend.

[4] Besides lagged dependent variables, a constant and a time trend, the following level and slope dummies were included in the equation: DL_{87}, DL_{89}, DL_{90}, DL_{94}, DT_{89}, DT_{90} and DT_{94}.

4. Conclusion

This paper tested for breaks in inflation inertia by detecting breaks in trend in a modelling strategy in which inflation is hypothesised to follow a trend-stationary process, with a segmented trend that represents inflation persistence. By proceeding this way we provided statistical evidence showing that an enduring break in inertia was achieved for the first time with the Real stabilisation plan. It should be noted that Brazilian inflation should be considered a special case. In other inflationary experiences inertia may be better represented by a stochastic (rather than deterministic) trend, or just by a stationary process with breaks. In the former case little can be done whilst in the latter Hamilton's switching procedure (Hamilton, 1989) may be the most appropriate way to address the issue.

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