Journal of Economic Cooperation **25**, 3 (2004) 63-86

DYNAMICS OF INFLATION AND INFLATION INERTIA IN TURKEY

Kıvılcım Metin-Özcan[*], Hakan Berument and Bilin Neyaptı

This paper investigates the inflation dynamics in Turkey between 1988 and 2000. Using model-free techniques, we first observe that there is strong inertia in Turkish inflation. Next, we look at the correlations between Consumer Price Index (CPI) inflation and the leads and lags of the various possible determinants of CPI inflation. The evidence indicates that there are significant positive correlations between the dynamics of housing rents and the CPI, and both the US Dollar and German Mark exchange rates and the CPI. Contrary to expectations**,** however, data show both a negative relationship between wage and price dynamics and a negative lagged effect of import price inflation on the CPI inflation. The evidence also indicates a negative lagged impact of inflation received by farmers on CPI inflation and a positive lagged response of the CPI to it.

1. INTRODUCTION

Experiencing a high level of inflation for more than 25 years, Turkey provides a unique environment to analyse the dynamics of inflation. A vast number of empirical studies analyse the monetary, fiscal and open economy aspects of Turkish inflation[1]. Recent studies have proposed that there is strong inflation inertia in Turkey [see, for example, Alper and Ucer (1998), Jalel (1997), Baum, Barkoulas and Çağlayan (1999) and Tutar (2001)]. The way the inertial inflation is modelled in the existing studies is theory-based, either by using reduced form models, such as a vector autoregressive (VAR) model, or structural econometric models, such as an error correction model (ECM), along with model-free measures. Using VAR models, both Alper and Uçer (1998)

[*] Bilkent University, Department of Economics, Ankara, Turkey.

[1] See Akyüz (1973), Ertuğrul (1982), Olgun (1982), Fry (1986), Gazioğlu (1986), Togan (1987), Anand and van Wijnbergen (1989), Öniş and Özmucur (1990), van Wijnbergen (1991), Özatay (1992), Uygur (1992), Metin (1995a, b, 1998), Akçay, Alper and Özmucur (1996), Selçuk (2001), Sayan, Abay, Miran, Bayaner and Uçarı (1999), Çağlayan and Filiztekin (2001).

and Jalel (1997) show that CPI was inertial from the mid-1980s until 1997. Using an ECM, Tutar (2001) also shows that there was a large inertial component in Wholesale Price Index (WPI) inflation between 1984:1 and 1999:12. Long memory in the CPI- and WPI-based inflation rates are general phenomena for Turkey. In a study of inflation persistence in 27 countries, including Turkey, Baum, Barkoulas and Çağlayan (1999) use the concept of fractional integration to test whether CPI and WPI series have unit root. Erlat (2001), using autoregressive fractionally integrated moving average (ARFIMA) models, showed that Turkish monthly CPI and WPI inflation rates are essentially stationary but have generally significant long memory components.

Unlike the previous studies, this study investigates the price dynamics in the Turkish economy using only a model-free framework[2]. We prefer a model-free framework rather than a theory-based modelling, with a focus on analysing the behavior of the dynamic relationship between inflation and its various determinants.[3]

This paper also goes beyond the existing studies in that it examines the dynamics of inflation vis-à-vis its various determinants, namely various other price indexes, wages rates, and exchange rates. The primary purpose of our paper is to explain the behavior of CPI inflation by looking at the dynamics of its determinants. To this end, the current study employs the workers and civil servants' inflation; inflation received by the farmers; import price inflation; housing rent inflation and the growth rate of the Dollar and Mark exchange rates vis-à-vis the CPI inflation.

We first investigate the inertia in CPI inflation using univariate techniques, namely autoregression, unit root, and variance ratio tests.[4] While all three techniques show that the CPI inflation, as well as almost

[2] See Edwards (1998) and Obstfeld (1995) for model-free analysis of inflation. Neither Edwards (1998) and Obstfeld (1995) nor the authors of this manuscript claim that a model-free analysis is a better alternative to the theory-based modelling.

[3] The analysis of the dynamics of inflation is not complete without taking the role of demand-side and supply-side determinants of inflation explicitly into account. However, that kind of analysis requires the identification of a model among the macroeconomic variables of interest, which we do not endeavour to do in this analysis.

[4] Edwards (1998) uses these methods as the model-free measures of inflation inertia. Obstfeld (1995) argues that this approach should be used in the empirical analyses of inflation inertia across exchange rate regimes.

all the other price inflations included in this study, has strong inertia, autoregression tests indicate that civil servant salaries' inflation and rent inflation do not. This is consistent with the staggered nature of rents and the lack of full indexation of the civil servant salaries to the inflation rate.

In addition, we observe that the monthly CPI inflation and the leads and lags of the monthly inflation in rents and the increase in both US Dollar and German Mark exchange rates all show positive correlations. Furthermore, the evidence indicates a negative relationship between wages and the CPI inflation as well as between import price inflation and the CPI inflation. Backward looking, wage indexation and staggered age and price setting, which inhibit economic agents from incorporating the observed inflation rate in their nominal contracts, are generally proposed to explain the negative relationship between real wages and prices. As inflation is volatile but stationary, its fluctuations are mimicked by wage inflation only with a lag. This explains the cross-correlations observed here rather than indicating a causal relationship. As for the negative relationship observed between the import price and CPI inflation, one can argue that the income effect of an increase in import price on domestic non-tradables, which dominates the CPI, surpasse the substitution effect. In addition, we observe that the negative response of the inflation received by the farmers to CPI inflation turned into a positive lagged response after 1994.

The organisation of the rest of the paper is as follows: Section 2 provides a framework for analysing the sources of inflation inertia. Developments in the various determinants of the Turkish CPI are summarised in Section 3. Data, methodology and empirical findings are reported in Section 4. Concluding remarks are presented in Section 5.

2. SOURCES OF INERTIAL INFLATION

Inertial inflation can be defined as a process where the current inflation is determined by its past history. Inertia itself is caused by inflationary expectations, relative price adjustments, institutional arrangements that support the indexation of wages and financial contracts and monetary and exchange rate policy frameworks [see Nadiri (1987), Taylor (1998), Edwards (1998), Durewall (1999), and Alper and Uçer (1998), Baum et al (1999), Çağlayan and Filiztekin (2001)].

There are two main macroeconomic determinants of inertial inflation. First, the traditional approach which emphasises the role of indexation interacting with staggered wage setting. This may happen through an imposed wage rule in which the wage adjustments of today are based on the inflation over the past six months or the past year. Second, exchange-rate-based stabilisation programmes which have generally been introduced as means of eliminating or reducing inflationary inertia[5]. While the speed of reduction in inertia is important for the success of the stabilisation programmes, a slow decline in inertia under the fixed exchange rate regime creates serious exchange rate overvaluation and results in the failure of the whole programme. The success or failure of an exchange rate anchor in bringing inflation down will be affected by the credibility of the policy shift. If it is believed that the new regime is permanent, inflationary inertia may decline rapidly.

It is clear that the mechanisms outlined above may be interdependent in reality. However, empirical work can easily overcome this difficulty by including the relevant dynamics into the model or into the model-free framework, which is what this paper endeavors to do.

Wage indexation in Turkey has a limited effect on driving inertia, largely owing to a flexible labour market [see Alper and Uçer, (1998) and Metin (1995a)]. Indexation of financial contracts is also not common and relative price variability is not a driving source of inflation [see Alper and Uçer (1998)]. However, an empirical examination of the source of inertia is still a very attractive exercise for the Turkish economy. The remainder of this paper is devoted to the model-free investigation of inertial inflation and the dynamics of CPI inflation in Turkey.

3. DEVELOPMENTS IN PRICES

In the following subsections, we will discuss the relationship between CPI inflation and the developments in the receipts of farmers, workers' wages, civil servant salaries, housing rents and exchange rates for the sample period of this study.

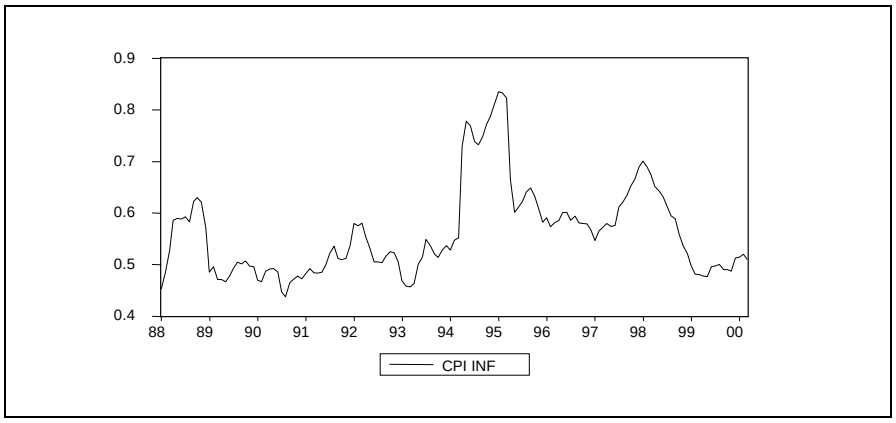
---

[5] See Mexican currency crisis of 1994 and the Chilean crisis of 1982 discussed in Edwards (1998).

3.1. The Pattern of CPI Inflation and Its Relationship with the Receipts of Farmers

CPI inflation, an important factor in individual income and purchasing power, showed an increasing trend starting from 1988 until the 1994 financial crisis (annual CPI inflation is given in Figure 1[6]). During the crisis, it had a sharp break and then exhibited a sharp increase. Then it slowed down and stabilised around 60 to 65 percent for a short period from 1995 until 1997, increasing again to around 75 to 80 percent at the end of the 1990s. The main goal of the disinflation programme in 2000 was to bring CPI inflation down to 25 percent by the end of the year[7]. Indeed, the monthly increases of the CPI for the first five months of the year 2000 were below the average of the former ten years.

Figure 1: Annual CPI Inflation



Source: The Central Bank of the Republic of Turkey.

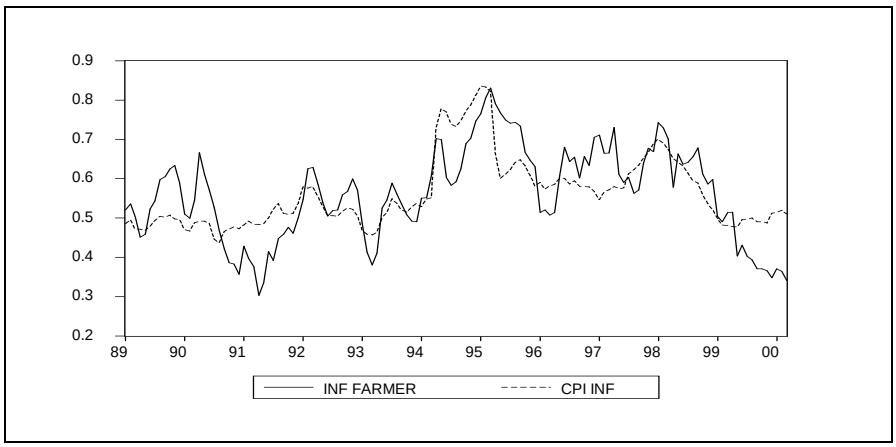
Agriculture is one of the sectors where seasonal effects play an important role in price developments and the food item group makes up a large component of the CPI. However, as Figure 2 shows, CPI inflation and the inflation received by farmers did not move together except during the 1992-1995 and 1997-1999 periods. There was an increase in inflation received by farmers (i.e. percentage change in the

[6] We use twelve-month percent changes in the monthly data to eliminate seasonal patterns and for visual aid for the figures in this section, while we consider monthly percent changes for the rest of the empirical analysis in the following subsections.

[7] (see Letter of Intent; December 9, 1999, www.imf.org/external/loi/120999.htm)

series of receipts by farmers) parallel to the target inflation rate in the 1998-1999 period. During this period, Turkish public purchases of wheat, barley, cotton, sugar beets, and hazelnut dropped significantly due to a decline in agricultural production after 1998, which is reflected in the drastic drop in inflation received by farmers in the year 2000.

Figure 2: CPI Inflation and the Inflation Received by Farmers

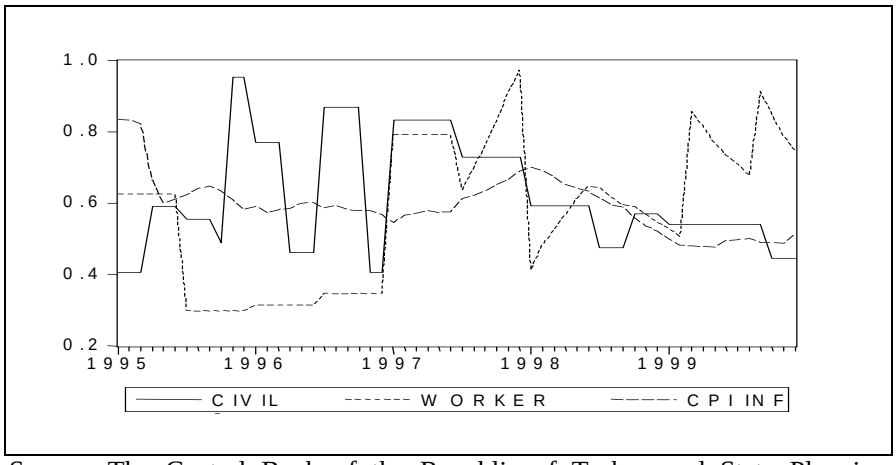


Source: The Central Bank of the Republic of Turkey and State Statistical Institute.

3.2. Relationship Between CPI Inflation and the Wages and Salaries of Workers and Civil Servants

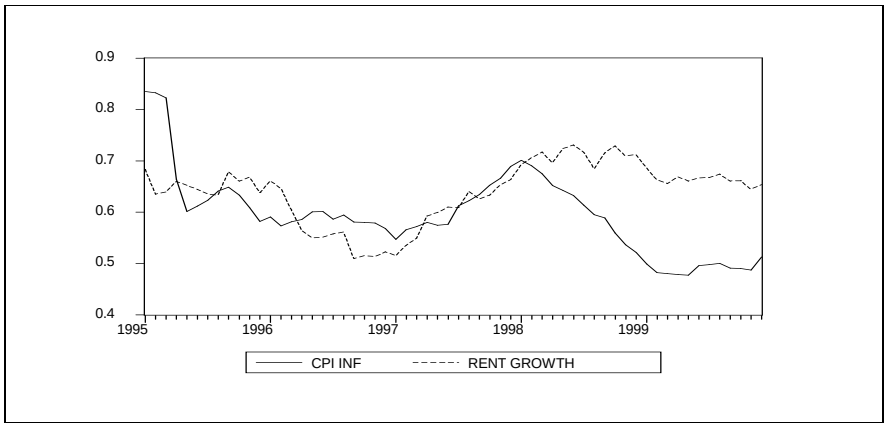
The wages and salaries of all employees, except those of private sector workers involved in a collective bargaining process, decreased in 1998. However, in 1999, wages, which were generally determined by backward indexation, were realised above the inflation rate that had been targeted relatively lower and had been more or less attained. Wages of public sector workers and the minimum wage, thus, increased rapidly compared to the civil servant wages (see Figure 3). As shown in Figure 4, the decline in the wage rates of public sector workers in real terms during the 1994-1998 period were effective in raising private sector wages above inflation rate via the collective bargaining process carried out in 1999.

Figure 3: CPI Inflation and Workers and Civil Servants' Wage Inflation (in %)



Source: The Central Bank of the Republic of Turkey and State Planning Organization, Main Economic Indicators.

Figure 4: Rent Inflation and CPI Inflation



Source: The Central Bank of the Republic of Turkey.

3.3. CPI Inflation and the Behaviour of Rents

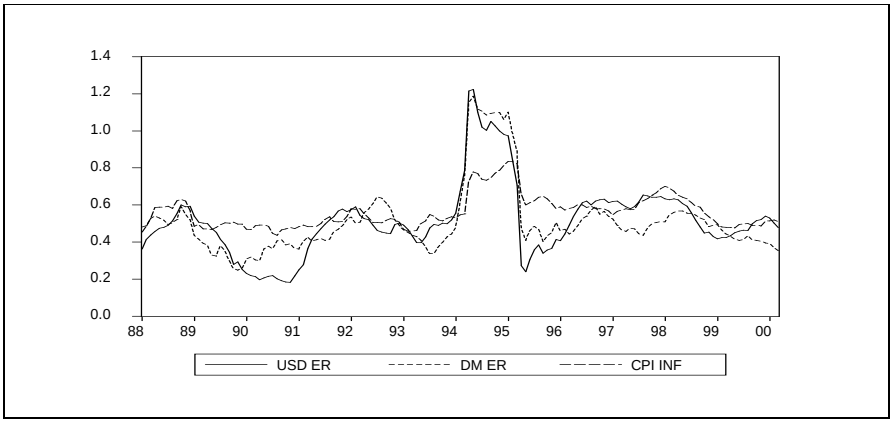
As shown in Figure 4, CPI inflation and housing rent inflation follow the same path. Along with the disinflation programme of 2000, the

implementation of several income policies was started. One of these was to control housing rent increases. According to the rent control law, rent increases were limited to 25 percent in 2000 and 10 percent in 2001. The first impact of this law was realised in March 2000 when the annual rent inflation turned out to be higher than the CPI inflation. To avoid the continuation of a decline in rents, the reaction of house owners was to turn from backward indexation to foreign exchange indexation, which was abandoned after the programme was abolished in February 2001 (see CBRT Inflation Report, 2000, p. 17).

3.4. Import Prices and Exchange Rate Channel

At the beginning of December 1999, the Central Bank announced its daily crawl in the exchange rate defined over a basket of foreign currencies with the expectation that this would slow down inflation rate. The slowdown in the exchange rate was expected to affect inflation in the Turkish economy through three channels (see CBRT Inflation Report, 2000, p. 17). First, the slowdown in the exchange rate would reduce the input costs in the manufacturing sector significantly. Second, the manufacturing sector prices have been implicitly indexed to the exchange rate, leading to a rapid pass-through from exchange rate to prices. Third, foreign currency pricing of commodities is a common practice due to the persistent high inflation, and fixing the exchange rate helps hamper the inflation further.

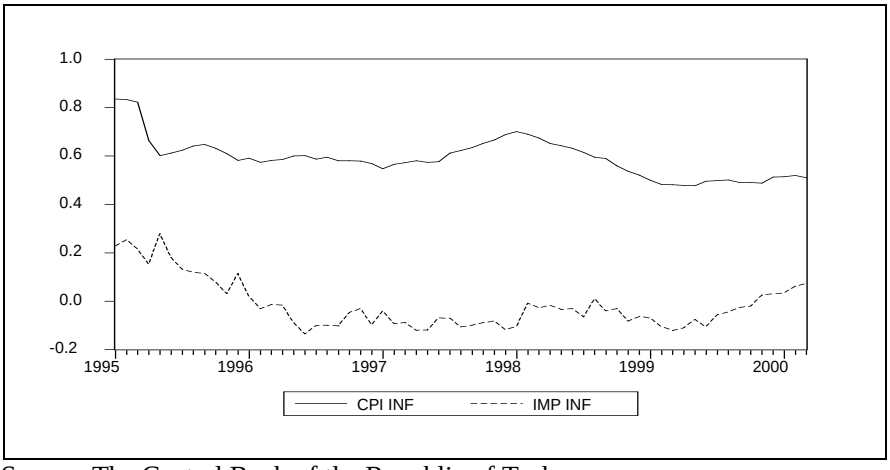
Figure 5: CPI Inflation and the Exchange Rates of USD and DEM



Source: The Central Bank of the Republic of Turkey.

After the programme was announced in January 2000, the TL depreciated against the US Dollar (USD) and the German Mark (DEM). Figure 5 shows that the USD and DEM moved together since 1988 (see Figure 5 for the co-movement between the USD and the CPI inflation). Therefore, the appreciation of the USD against the DEM created an adverse effect on price developments after the programme was announced[8].

Figure 6: CPI and Import Price Inflation



Source: The Central Bank of the Republic of Turkey.

From Figure 6, we can observe that import price inflation declined dramatically until the middle of 1996. The slowdown in the world economy in 1998, that resulted in a decline in primary product prices and energy prices, was followed by an increase in food, agricultural product, crude oil and metal prices around the world in 2000. This trend resulted in an increase in import price inflation in 2000 (see CBRT Inflation Report, 2000. p. 25).

4. DATA AND EMPIRICAL FINDINGS

The time coverage of this study is between 1988:1 and 2000:12[9]. Due to

[8] Appreciation started just after the 7th month of 1995 [see Kipici and Kesriyeli (2000)].

[9] Following Rossana and Seater (1995), we preferred to use a monthly data set. The authors examined the effect of temporal aggregation on the estimated time-series properties of economic data. Theory predicts that temporal aggregation loses information about the

the structural break after the 1994 financial crisis, we also look at the sub-period from 1995:1 till 2000:12 separately. The latter time period thus eliminates the 1994 financial crisis period (Berument and Malatyalı, 1997). However, this division of the sample period is not very meaningful for worker (WORKER) and civil servant wages (CIVIL SERVANT), rents (RENT) and import prices (IMPORT), on which data are available for the second period only. Data on worker and civil servant wages are available for the period between 1994:1 and 1999:12. Data on rents and import prices are available for the period between 1994:1 and 2000:12; prices received by farmers (FARMER) are available for the period between 1988:1 and 2000:3; and finally the data on CPI are available for the period between 1987:01 and 2000:12. Due to the possible seasonal elements that may differently affect the various determinants of CPI inflation, we use seasonally adjusted data for both the full sample and the sub-sample (see Appendix Table for the sources of the variables).

4.1. Testing for Inertia: Univariate Analysis

We investigate the inertia of inflation in Turkey by using autocorrelation, unit root and variance ratio tests. It has been a common practice to use autoregressive representations for inflation in order to test for inertia [see, for example, Bruno and Fisher (1986)][10]. Tables 1 and 2 below contain data on the autocorrelations for the monthly inflation rates of CPI and other variables of interest, both for the whole period (1988:2 - 2000:3) and for the sub-period (1995:1-2000:12), respectively. It can be observed that autocorrelations start at a relatively high level and decay slowly with increased lags (see Leiderman (1993:45), Alper and Uçer (1998), Tutar (2001) for a similar result). This illustrates the existence of very strong inertia in workers' salaries inflation; inflation received by farmers; import price inflation and CPI inflation in both the full and sub-samples[11].

---

underlying data processes. Monthly and quarterly data are governed by complex time-series processes with much low-frequency cyclical variation, whereas annual data are governed by simple processes with virtually no cyclical variation.

[10] Bruno and Fisher (1986) state that in case of quarterly inflation, if the size and sum of the coefficients on the first and second lags have increased over time with the inflation rate, the evidence supports that there is considerable inertia in the inflationary process and that this inertia has been growing.

[11] The conclusion of strong inflation inertia is certainly not new for the Turkish economy. Previously Jalel (1997), Alper and Uçer (1998), Baum et al (1999) and, very recently, Tutar

The trends in the civil servant salaries inflation and rent inflation, however, are particularly interesting since they suggest that there was an important decline in the autocorrelations after 1 to 2 lags. This observation conforms to the relatively weak position of civil servants in negotiating wage contracts and the staggered nature of both these contracts and of rent changes in Turkey.

Table 1: Autocorrelations: Full Sample[*]

Full Sample: 1988:2-2000:3	Lag 1	Lag 2	Lag 3	Lag 4	Lag 5	Lag 6
CPI	0.89	0.75	0.60	0.50	0.44	0.39
FARMER[a]	0.94	0.88	0.83	0.78	0.75	0.73
RENT[a]	0.80	0.63	0.49	0.41	0.32	0.25
WORKER[a]	0.96	0.92	0.88	0.84	0.81	0.75
CIVIL SERVANT[a]	0.69	0.39	0.23	0.21	0.31	0.44
IMPORT	0.87	0.80	0.76	0.67	0.60	0.56
USD	0.95	0.88	0.81	0.74	0.69	0.64
DM	0.95	0.88	0.80	0.74	0.69	0.64

[*] First difference of the log levels of the monthly seasonally adjusted data.
[a] Data starts at 1994:1.

Table 2: Autocorrelations: Sub-sample*

Sub-sample 1995:1-2000:12	Lag 1	Lag 2	Lag 3	Lag 4	Lag 5	Lag 6
CPI	0.90	0.78	0.66	0.57	0.50	0.43
FARMER	0.88	0.77	0.67	0.58	0.47	0.41
RENT	0.84	0.72	0.56	0.48	0.37	0.31
WORKER	0.90	0.80	0.73	0.66	0.60	0.54
CIVIL SERVANT	0.65	0.32	0.15	0.17	0.33	0.50
IMPORT	0.91	0.86	0.83	0.79	0.73	0.70
USD	0.86	0.72	0.60	0.53	0.48	0.41
DM	0.90	0.78	0.66	0.57	0.50	0.44

[*] First difference of the log levels of the monthly seasonally adjusted data.

Nevertheless, we have limited capability in making an assessment of

(2001) tested inertia in Turkey. All three former studies use model-based methodology (VAR or ECM) while Baum et al. (1999) follow a concept of fractional integration. The latter tested whether CPI and WPI series have unit root and whether inflation is persistent in industrial as well as developing countries.

inertia based solely on autoregressions since all the variables used in this study exhibit nonstationarity. Hence, some of the observed autocorrelations may be spurious and may not be able to capture the inertia. Thus, we next test for the unit roots in all these price series.

One implication of the inertial inflation hypothesis is that inflation must be a random walk and must have a unit root. Several empirical studies tested this hypothesis and found evidence in its favor [see, for example, Novaes (1993)]. Table 3 reports the ADF unit root tests due to Dickey and Fuller (1981).

Table 3: Augmented Dickey-Fuller (ADF) Unit Root Tests+

	ADF (Log levels)	ADF (First difference of log levels)	ADF (Second difference of log levels)
CPI	-2.34	-2.63	-6.07**
FARMER[a]	-2.08	-2.18	-6.04**
RENT[a]	-2.72	-1.24	-3.32*
WORKER[a]	-1.77	-1.95	-3.67**
CIVIL SERVANT[a]	-0.22	-2.24	-3.59**
IMPORT[a]	-2.54	-2.38	-2.95*
USD	-1.29	-3.53**	
DM	0.67	-3.57**	

+ Monthly not-seasonally adjusted data.
* Hypothesis of a unit root is rejected at the 5% critical level.
** Hypothesis of a unit root is rejected at the 1% critical level.
[a] Data starts at 1994:1.

The tests indicate that the hypothesis of inflation following a random walk cannot be rejected for either of the series reported below. In other words, evidence indicates the existence of a unit root in the log-level of all prices and of exchange rate series. On the other hand, unit roots are also detected in all price inflations, but not in the rate of change in the exchange rates[12]. Since both the unit root and the autoregression tests point to the same evidence, we can thus conclude that there is a strong degree of inertia in all series.

[12] Log levels of all prices are I(2) (i.e. integrated of order 2) whereas their first differences and the log levels of the exchange rates are I(1) (i.e. integrated of order 1).

Having established the inertia in the series via the autoregression and unit root tests, we further investigate the degree of the inertia in the series by employing Cochrane's variance ratio tests which measure the importance of the random walk components of the series (see Cochrane, 1988). Cochrane's variance ratio, V(k), is calculated as

$$V(k) = (1/k)\{[var(\pi_t - \pi_{t-k})] / [var(\pi_t - \pi_{t-1})]\}$$

The higher (lower) the value of V(k), as k gets larger, the more (less) important is the permanent component of changes in inflation (π). A large value of V(k) reflects a significant degree of inertia. A low value of V(k) will capture an absence of inertia.

Table 4: Variance Ratio Test*

Indicators	Lags:1	2	3	4	5	6	7	8	9	10	11	12
CPI	1.56	1.77	1.88	1.55	1.42	1.80	1.04	1.75	1.44	0.94	6.21	1.56
WORKER[a]	1.02	1.04	1.01	1.03	0.47	0.91	0.94	0.82	0.84	0.57	3.29	1.02
CIVIL SERVANT[a]	1.01	0.91	1.04	1.05	0.45	0.88	1.09	1.03	1.14	0.58	1.02	1.01
IMPORT[a]	0.79	0.62	0.73	0.77	0.72	0.75	1.04	0.59	0.66	0.73	1.00	0.79
RENT[a]	0.93	1.06	0.92	1.15	1.23	1.16	1.06	1.05	0.94	0.78	6.93	0.93
FARMER[a]	1.10	1.28	1.26	1.15	1.31	1.16	1.00	1.06	1.09	0.65	5.53	1.10

* First difference of the log levels of the monthly seasonally adjusted data.
[a] Data starts at 1994:1.

The calculated variance ratios for all the series are given in Table 4. The figures indicate that in most of the inflation series, inertia is quite high and the permanent component of inflation never gets close to zero. This evidence further confirms that all inflation series have large inertial components.

Being motivated by these findings, in the following sub-sections we develop a model-free analysis of the dynamics among the variables of our interest. In the basic wage-price spiral context, it can be seen that both the past and future wages are taken into account by firms when setting prices, and similarly past and future prices are taken into account by workers when setting wages. It is also possible to generalise the wage rule so as to incorporate backward elements (see Taylor, 1980). Here however, we use a simplified framework that enables the investigation of the lead-lag relationships between the variables of interest and the

CPI inflation using a simple correlation analysis. This analysis enables us to analyse the effects of changes in wages, prices and exchange rates individually on the inflationary process.

4.2. Inflation Dynamics: Full and Sub-sample Periods

We report the pattern of correlations between the seasonally adjusted CPI inflation and other variables of interest, which are also seasonally adjusted. Tables 5.a and 5.b show the cross correlations between the CPI inflation at time *t* and the lagged ahead rates of all the other variables.

4.2.1. Full Sample

The emerging patterns in the full sample (from 1988:1 to 2000:3) are as follows: Firstly, we find a significant[13] and positive correlation between the inflation received by the farmers and CPI inflation, which reaches its peak at the 10 months lagged. This finding is in line with the CBRT Inflation Report (2000, p. 22) but contradicts Sayan et al. (1999), where they argue that inflation received by farmers do not lead to CPI inflation. On the other hand, the CPI inflation appears to lead to a reduction in the inflation received by the farmers. This is due to the fact that farmers' subsidies, that constitute the largest part of off-balance spending, tend to get hit hardest by disinflationary policies.

Secondly, the rate of depreciation of the TL against both the USD and DEM has positive correlation with CPI inflation showing peaks contemporaneously with CPI inflation. This is due to the fact that since foreign exchange rates play a significant role in economic dynamics in Turkey, both as a unit of account and a store of value, the Central Bank plays a significant role in stabilising the real exchange rate volatility through its monetary-exchange policy rule (Berument, 2001).

The emerging patterns in variables with short time series (from 1994:1 to 2001:3) are as follows. Firstly, civil servant wages inflation increases CPI inflation, peaking after 8 months. CPI inflation, on the other hand, does not lead to civil servant wage inflation at statistically significant levels. Secondly, correlations between the workers' wages inflation and the CPI inflation are negative. This observation conflicts

[13] The level of significance is taken as 5% throughout the study, unless otherwise mentioned.

Table 5.a: Cross Correlations of CPI Inflation with Other Variables+: Full Sample

Lead & Lag	FARMER[a]	RENT[a]	WORKER[a]	CIVIL SERVANT[s]	IMPORT[s]	USD	DM
-12	0.343*	0.157*	-0.160*	0.009	-0.414*	0.114	0.237*
-11	0.379*	0.204*	-0.179*	0.088	-0.387*	0.161*	0.284*
-10	0.401*	0.224*	-0.220*	0.221*	-0.373*	0.222*	0.330*
-9	0.393*	0.225*	-0.264*	0.327*	-0.356*	0.288*	0.373*
-8	0.359*	0.237*	-0.309*	0.367*	-0.348*	0.330*	0.402*
-7	0.317*	0.254*	-0.349*	0.343*	-0.349*	0.371*	0.432*
-6	0.278*	0.286*	-0.388*	0.261*	-0.330*	0.412*	0.472*
-5	0.245*	0.323*	-0.429*	0.205*	-0.308*	0.457*	0.514*
-4	0.205*	0.365*	-0.482*	0.201*	-0.290*	0.498*	0.549*
-3	0.166*	0.412*	-0.537*	0.205*	-0.277*	0.551*	0.585*
-2	0.135	0.458*	-0.544*	0.145	-0.249*	0.627*	0.630*
-1	0.111	0.525*	-0.540*	0.090	-0.170*	0.710*	0.685*
0	0.080	0.610*	-0.551*	0.048	-0.117	0.782*	0.729*
1	-0.016	0.647*	-0.582*	0.018	-0.040	0.738*	0.699*
2	-0.112	0.707*	-0.621*	0.015	0.056	0.662*	0.630*
3	-0.188*	0.622*	-0.574*	0.049	0.031	0.578*	0.549*
4	-0.246*	0.490*	-0.494*	0.058	-0.042	0.510*	0.478*
5	-0.277*	0.369*	-0.434*	0.048	-0.087	0.466*	0.427*
6	-0.292*	0.295*	-0.397*	0.030	-0.109	0.427*	0.391*
7	-0.300*	0.259*	-0.375*	0.031	-0.115	0.385*	0.361*
8	-0.314*	0.226*	-0.353*	0.044	-0.107	0.330*	0.325*
9	-0.327*	0.176*	-0.328*	0.041	-0.109	0.266*	0.284*
10	-0.359*	0.104	-0.288*	0.085	-0.131	0.208*	0.246*
11	-0.395*	0.034	-0.242*	0.112	-0.157*	0.158*	0.212*
12	-0.436*	-0.032	-0.201*	0.151	-0.179*	0.134	0.188*

+ First difference of the log levels of the monthly seasonally adjusted data (1988:1-2000:3).

[a] Data starts at 1994:1.

* Indicates the level of significance at the 5% level according to Box-Pierce test statistics.

with economic predecessors. One explanation for this anomaly is that there is a large measure of discrepancy between the cost of a worker to an employer and the wage the worker receives. This discrepancy arises since firms' payments of taxes, social security and extra compensations are costs to the firm and are not accounted for in the wage payments.

Another explanation is that this evidence does not reflect a causal relation. Rather it reflects the backward indexation of wage contracts in the face of fluctuations in the rate of inflation (as Turkish inflation is high and volatile, its fluctuations are mimicked by wage inflation only with a lag).

Thirdly, the positive correlation between the lagged values of the rent inflation and CPI inflation peaks in the second month. This suggests that rents and CPI present an inflation spiral. Finally, lagged import price inflation appears to lead to CPI inflation negatively. One reason for this is that due to the income effect, higher import prices mean lower demand on domestic goods; the income effect of an increase in import price on domestic non-tradables, which dominates the CPI, possibly surpasses the substitution effect. Hence, the demand-side approach suggests a negative relationship between domestic prices and import prices[14]. Kıpıcı and Kesriyeli (2000) show that there is a persistent decrease (appreciation) in the real exchange rate for the post-1994 period by considering eight different definitions of real exchange rate. This observation and the increasing trend in the inflation rate during the same period support the negative relationship observed here between import price inflation and CPI inflation.

4.2.2. The Sub-Sample: 1995-2000

This section reports and compares the findings for the post-1994 period with those in the full and short samples reported above. The first observation is that there is a significant positive correlation between the lagged rates of inflation received by farmers and CPI inflation. However, unlike the full sample, we also observe that CPI inflation also accelerates the inflation received by farmers, where this positive correlation reaches its peak in the 11^{th} month. The pattern of rent inflation and CPI inflation in the sub-sample is parallel to that in the full sample. However, the effect of CPI inflation on future rent inflation is less sustainable than in the short sample, dying out after the 5^{th} month.

The correlations of both civil servant and workers' wage inflations with CPI inflation lose their significance in the sub-sample. Also

[14] However, we observe that the lead and lag correlations between import price inflation and private manufacturing price inflation are positive, which supports the initial expectations.

Table 5.b: Cross Correlations of CPI with Other Variables+: Sub-Sample

Lead & Lag	FARMER	RENT	WORKER	CIVIL SERVANT	IMPORT	USD	DM
-12	0.199	0.204	0.218	-0.035	-0.131	0.146	0.238*
-11	0.238*	0.258*	0.215	-0.1	-0.181	0.15	0.263*
-10	0.281*	0.312*	0.197	-0.168	-0.202	0.148	0.297*
-9	0.303*	0.347*	0.176	-0.104	-0.229	0.165	0.332*
-8	0.336*	0.388*	0.16	-0.041	-0.312*	0.212	0.365*
-7	0.349*	0.397*	0.138	0.01	-0.375*	0.261*	0.408*
-6	0.348*	0.434*	0.105	0.04	-0.426*	0.31*	0.457*
-5	0.338*	0.48*	0.074	-0.006	-0.468*	0.355*	0.512*
-4	0.345*	0.53*	0.038	-0.045	-0.509*	0.401*	0.58*
-3	0.331*	0.578*	-0.004	-0.085	-0.531*	0.464*	0.649*
-2	0.311*	0.63*	-0.038	-0.035	-0.542*	0.564*	0.721*
-1	0.281*	0.671*	-0.084	0.037	-0.549*	0.67*	0.8*
0	0.251*	0.646*	-0.148	0.094	-0.533*	0.782*	0.86*
1	0.25*	0.567*	-0.14	0.056	-0.547*	0.81*	0.803*
2	0.256*	0.502*	-0.121	0.02	-0.552*	0.802*	0.715*
3	0.265*	0.439*	-0.111	0.015	-0.528*	0.696*	0.631*
4	0.274*	0.368*	-0.085	-0.004	-0.523*	0.603*	0.552*
5	0.293*	0.276*	-0.074	-0.018	-0.509*	0.541*	0.494*
6	0.347*	0.211	-0.08	-0.023	-0.511*	0.488*	0.45*
7	0.402*	0.151	-0.092	0.005	-0.516*	0.431*	0.421*
8	0.449*	0.079	-0.111	0.046	-0.534*	0.376*	0.402*
9	0.48*	-0.009	-0.118	0.049	-0.554*	0.313*	0.379*
10	0.501*	-0.107	-0.101	0.095	-0.556*	0.266*	0.349*
11	0.528*	-0.182	-0.087	0.123	-0.56*	0.222	0.321*
12	0.45*	-0.238*	-0.092	0.172	-0.558*	0.216	0.309*

+ First difference of the log levels of the monthly seasonally adjusted data (1995:1-2000:3).

* Indicates the level of significance at the 5% level, according to Box-Pierce test statistics.

different from the full sample, we observe that there is a persistent negative correlation between the CPI and both the lagged and future import price inflations. This is in line with the explanation provided in the foregoing section. Otherwise, the empirical evidence on both civil servant and workers' wage inflations and the growth rate of both of the exchange rates are parallel to those in the full sample.

5. CONCLUDING REMARKS

As a laboratory for price developments for the last 25 years, Turkey is an interesting case to look into inflation dynamics. Although in the existing studies inertial inflation in Turkey is modelled either by using reduced form models such as VAR or structural models such as ECM, this study attempts to investigate the matter using a model-free framework. Thus, the primary purpose of this paper is to explain the behaviour of CPI vis-à-vis inflation in the receipts of farmers, import price inflation, housing rent inflation and depreciation of the TL against the USD and DEM. The study first investigates the inertia in CPI inflation using univariate techniques, namely autoregression, unit root and variance ratio tests.

The analyses with the univariate techniques show that CPI inflation and all the selected price inflations in this study have strong inertia. Also, we see that monthly CPI is in positive correlation with the monthly depreciation of the TL against the USD and DEM and inflation in housing rents. On the other hand, a negative relationship between wages and price inflation, as well as between import price inflation and the CPI inflation, is detected. For the wages, the explanation of such a behaviour might be staggered wage and price setting practices. On the other hand, the relation of import prices with the CPI inflation might be ascribed to the dominating income effect on the substitution effect in the face of an increase in import prices and its repercussions on domestic non-tradables. Finally, after the 1994 crisis, we detect that the relation among the receipts of farmers and CPI inflation convey a positive pattern.

All in all, the evidence in the paper indicates that both CPI inflation and its basic determinants are persistent and they affect each other. This suggests the presence of considerable inertia in the CPI inflation. We observe a highly significant relationship between the CPI inflation and its various determinants that involve up to 10 periods' lead and lag. Hence, the evidence here implies that hampering the CPI inflation requires freezing some of the prices considered for more than 20 months. However, such an extensive price freeze is not feasible. Therefore, a further empirical investigation is needed that looks for an

external factor affecting both CPI and its determinants that are shown to move together.

REFERENCES

Akçay, C., E. Alper and S. Özmucur, "Budget Deficit, Money Supply, and Inflation: Evidence from Low and High Frequency Data for Turkey", Boğaziçi University Research Papers, SBE (1996), 96-12.

Akyüz, Y., *Money and Inflation in Turkey 1950-1968*, Ankara Üniversitesi, Siyasal Bilgiler Fakültesi Yayınları No: 361, 1973.

Alper, A. and M. Uçer, "Some Observations on Turkish Inflation: A "Random Walk" Down the Past Decade", *Bogazici Journal: Review of Economic and Administrative Studies* 12, (1998), pp. 7-38.

Anand, R, and S. van Wijnbergen, "Inflation and the Financing of Government Expenditure: an Introductory Analysis with an Application to Turkey", *The World Bank Economic Review*, Vol.3, No.1 (1989), 17-38.

Baum, R. T., J. T. Barkoulas and M. Çağlayan, "Persistence in International Inflation Rates", *Southern Economic Journal*, 65, (1999), 900-913.

Berument, H., *Measuring Monetary Policy for a Small Open Economy*, unpublished manuscript, 2001.

Berument, H. and K. Malatyalı, "Correlation between Monetary and Real Aggregates: A Turkish Study", State Statistical Institute, *Conference Proceedings*, (1997) pp. 191-194.

Bruno, M. and S. Fisher, *The Inflationary Process: Shocks and Accomodation in The Israeli Economy: Maturing Through Crises*, ed. Y. Ben-Porath, Cambridge: Harward University Press, 1986.

CBRT Inflation Report , 2000, www.tcmb.gov.tr/~research/inflation.

Cochrane, J. H., "How Big is the Random Walk in GNP?" *Journal of Political Economy*, 96 (5), (1998), 893-920.

Çağlayan, M. and A. Filiztekin, "Relative Price Variability and Inflation: New Evidence from Turkey", University of Liverpool, Dept. of Economics and Accounting, *Working Paper*, No. 01-02, (2001).

Dickey, D. A. and W. A. Fuller, "Likelihood Ratio Statistics for Autoregressive Time series with a Unit Root", *Econometrica*, 49, (1981), 1057-1072.

Durewall, D., "Inertial Inflation, Indexation and Price Stickiness: Evidence from Brazil", *Journal of Development Economics*, 60 (1999), 407-421.

Edwards, S., "Two Crises: Inflationary Inertia and Credibility", *The Economic Journal*, 108 (1998), 680-702.

Erlat, H. (2001), "Long Memory in Turkish Inflation Rates" http://gsb.luc.edu/depts/economics/meea/volume3/HErlat/

Ertuğrul, A., *Kamu Açıkları, Para Stoku ve Enflasyon*, Yapı ve Kredi Bankası Yayını, Formül Matbaası, İstanbul, 1982.

Fry, M. J., "Turkey's Great Inflation", *METU Studies in Development*, 13 (1, 2), (1986), 95-116.

Gazioğlu, S., "Government Deficits, Consumption and Inflation in Turkey", *METU Studies in Development* 13 (1,2), (1986), 117-134

IMF Country Report (2000), Turkey: Selected Issues and Statistical Appendix, IMF Staff Country Report No. 00/14, Washington D.C.

Jalel, H., "Modelling the Public Sector Deficit and Inflation Relationship in Turkey", unpublished M.A. Thesis, Bilkent University, Ankara, Turkey, 1997.

Kıpıcı, A. and M. Kesriyeli (2000), "The Real Exchange Rate Definitions and Calculations", Central Bank of the Republic of Turkey, Working Paper.

Leiderman, L., *Inflation and Disinflation in Israel,* Chicago University Press, Chicago, Illinois, 1993.

Metin, K., *The Analysis of Inflation: The Case of Turkey (1948-1988),* Nurol Publishing Co., Capital Markets Board Publication No: 20, (1995a).

---------, "An Integrated Analysis of Turkish Inflation", *Oxford Bulletin of Economics and Statistics* 57, 513-531, (1995b).

--------, "The Relationship Between Inflation and the Budget Deficit in Turkey", *Journal of Business and Economic Statistics*, 16, 1998, 412-422.

Nadiri, M. I., Price Inertia and Inflation: Evidence and Theoretical Rationale. In: Pasinetti, L. and P. Lloyd (eds.), *Structural Change, Economic Interdependence and World Development* (Proceedings of the Seventh World Congress of the IEA, Madrid, Spain), Volume 3: *Structural Change and Adjustment in the World Economy*, pp. 329-357. London: Macmillan Press, 1987.

Novaes, A.D.,"Revisiting the inertial inflation hypothesis for Brazil", *Journal of Developmet Economics* 42 (1), (1993), 89-110

Olgun, H., *Türkiye'de Ödemeler Dengesi, Para ve Enflasyon: (1963-1976) (Balance of Payments, Money and Inflation in Turkey: (1963-1976),* Ortadoğu Teknik Üniversitesi, Yayın No: 38, Ankara, 1982.

Obsfeld, M., "International Currency Experience: New Lessons and Lessons Relearned", *Brookings Papers on Economic Activity*, 1, (1995), 119-220.

Öniş, Z. and S. Özmucur, "Exchange rates, Inflation and Money Supply in Turkey; Testing the Vicious Circle Hypothesis", *Journal of*

Development Economics, 32, (1990), 133-154

Özatay, F., "The Role of Public Sector Prices in Price Dynamics in Turkey" in H. Ersel (ed.), Papers Presented In a "*Price Dynamics*" Workshop Held in Antalya, on may 7-10, 1990, TCMB Publication, Turkey, 1992.

Rossana, R.J. and Seater, J.J., "Temporal Aggregation and Economic Time Series", *Journal of Business and Economic Statistics*, 13, 4 (1995), 441-451.

Sayan, S., C. Abay, B. Miran, A. Bayaner and N. Uçar, "An Investigation into the Nature of the Relationship between Agricultural Support Spending and the Rates of Inflation in Turkey: Is There a Link Through the Budget Deficit?", 3rd METU/ERC International Conference in Economics, Ankara, September 8-11, 1999.

Selçuk, F., "Seigniorage, Currency Substitution and Inflation in Turkey", *Russian and East European Finance and Trade*, 2001, forthcoming.

Taylor, J., "Aggregate Dynamics and Staggered Contracts", *Journal of Political Economy*, 88 (1988), 1-23.

Taylor, J. B., "Staggered Price and Wage Setting in Macroeconomics", National Bureau of Economic Research, *Working Paper* No. 6754 (1998).

Togan, S., "The Influence of Money and Interest Rate on the Rate of Inflation in a Financially Repressed Economy: the Case of Turkey", *Journal of Applied Economics*, 19 (1987), 1585-1601

Tutar, I., "Inertial Inflation and Exchange Rate Based Anchoring", Unpublished PhD. Thesis, The Middle East Technical University, Ankara, 2001.

Uygur, E., "Price, Output, and Investment Decisions of Firms: An Explanation on Inflation and Growth in Turkish Industry" in H. Ersel

(ed), Papers Presented In a "Price Dynamics" Workshop Held in Antalya, on may 7-10, 1990, TCMB Publication, Turkey, 1992.

Van Wijnbergen, S., "Fiscal Deficit, Exchange Rate Crises and Inflation", *Review of Economic Studies*, 58 (1991), 81-92.

Appendix Table

Variable	*Base Year*	*Sources*	*Period*
CPI	(1987=100 average)	SIS*	1988:1-2001:3
FARMER	(1987=100 average)	SIS	1994:1-2000:3
RENT	(1994:1=100)	SIS	1994:1-2001:3
CIVIL SERVANT	(1994:1=100)	SIS	1994:1-1999:12
WORKER	(1994:1=100)	SIS	1994:1-1999:12
IMPORT	(1994:1=100)	SIS	1994:1-2000:12
USD		CBRT+	1988:1-2001:3
DM		CBRT	1988:1-2001:3

* SIS: State Institute of Statistics.
+CBRT: Central Bank of the Republic of Turkey.