

A Quarterly Macroeconometric Model of the Turkish Economy

Cem Aysoy^{*,**} and Ahmet N. Kıpıcı^{*,**}

**Research Department
Central Bank of the Republic of Turkey
İstiklal Caddesi No: 10
06100- Ankara, Turkey*

*cem.aysoy@tcmb.gov.tr
Phone: 90 312 311 99 46*

*ahmet.kipici@tcmb.gov.tr
Phone: 90 312 324 25 17*

Abstract

This paper aims at describing a small-scale quarterly model for the Turkish economy. It differs from previous work in two respects; (i) the explicit treatment of the expectations in the inflationary process; (ii) the effect of public borrowing on inflation via interest rates. We conclude that expectations have the greatest importance in the determination of inflation along with the exchange rate in Turkey. In addition, to use the overnight interest rate as an effective policy tool, it seems to be essential to accomplish the structural reforms so as to eliminate risk premium due to the concerns about the debt sustainability.

JEL Classification: C50, C51, C52, C53.

Keywords: Econometric Modeling; Financing Public Borrowing; Expectations

^{**} We would like to thank Hüseyin Çilli for his helpful suggestions and help in writing Section 2. We also would like to thank Cevriye Aysoy, İlker Domaç, Ayşe Peker and Zafer Yükseler for their valuable comments. Erdal Yılmaz was very helpful with his research assistance at various stages of the study. The authors are solely responsible for any remaining errors. The findings, interpretations and conclusions expressed are those of the authors and should not in any manner be attributed to the Central Bank of the Republic of Turkey.

1. Introduction

Formulation of economic policies requires utilizing all the available sources that provide insight into the working of the economy. As a policymaker, the central banker has variety of such sources. Surveys, statistics, judgments are just to name a few. Another important source is, of course, macro econometric models. They are useful both in understanding the dynamics of the economy and for prediction purposes. In fact, one can argue that without the use of models, other information sources may be of limited use.

Yet, as stated by Klein (1991), "... there is no unique way to study economic issues from a quantitative point of view. All such studies are approximations to reality, and it seems natural to explore alternative systems". As such, this paper aims at describing a small-scale quarterly macroeconomic model of the Turkish economy. In so doing, we have utilized the various studies on modeling. (Bank of England 1999), (Markowski 1988), and (Willman, Kortelainen, Mannistö and Tujula 1998) are some examples. In the past, The Central Bank of the Republic of Turkey, (CBRT), has also employed variety of models. An example is due to (Uygun 1991). Other work with monthly data, some for the economy as a whole and some is in partial equilibrium nature, has been carried out for internal use. Aside from the models used at the Central Bank, there have been various efforts for modeling the Turkish Economy. For example, (Özatay 2000) constructs a quarterly macroeconomic model. His model is in disequilibrium monetary model nature focusing on the credibility issue and currency substitution. (Özmucur 1980), and (Uygun 1987) are some other examples.

To the best of our knowledge, this model differs from the others in two important respects. As we explain in section three, the first distinction is related to the explicit treatment of the expectations in the inflationary process. The second distinction relates to the effect of public borrowing on inflation via interest rates and expectations mechanism. The reason for treating these variables explicitly is the enormous transformations that the Turkish economy has undergone over a decade. Therefore, in the next section, we would like to provide a brief description of the Turkish economy. In section three, we describe in detail the characteristics of the model. Section four exposes the results of some policy simulations. Finally, section five concludes.

2. A Brief Overview of Developments in the Turkish Economy¹

The early attempts to stabilize the economy began with a program initiated on January 24, 1980. The steps taken in this program were concerned mainly with the problem of foreign exchange bottleneck, and maintaining the external balance. This required liberalizing the foreign trade and increasing the productive capacity of the economy. The program was considerably successful in achieving the stated objectives. In the next stage, the financial sector was liberalized to increase efficiency in the financial intermediation and to achieve financial deepening. Final step of the liberalization efforts was the liberalization of the capital account in 1989.

The later stabilization programs aimed basically to stabilize inflation. The basic elements of the disinflation programs were various forms of nominal anchoring and monetary tightening without any serious effort to reduce the public sector borrowing requirement. This policy choice was implemented basically by offering higher real interest rate on domestic assets, and keeping the rate of depreciation of the domestic currency within a predictable band to attract short run foreign capital. This disinflationary policy strongly pronounced itself after the liberalization of the capital account in 1989.

Since there was no remarkable improvement in the public sector borrowing requirement, real interest rates remained high for most of the time. Coupled with the requirement of rolling over the existing debt stock through borrowing, high real interest rates turned out to be an important contributing factor to the excessive growth of the domestic debt stock. The unsustainable nature of the domestic debt stock led to major crisis in 1994. Afterwards, a stabilization program was put into effect in April 1994. Since the political support to this program was weak, the program was not implemented successfully, and came to an end in 1995.

In July 1998, another stabilization program under the guidance of an IMF Staff Monitored Program was initiated. This program was relatively successful in stabilizing inflation and fiscal imbalances, but the real interest rates remained high. In the later years, the Russian Crisis of 1998, general elections in 1999, and the earthquake in 1999 led to the further deterioration in the fiscal balance of the public sector.

¹ This section draws heavily on (Selçuk and Ertuğrul 2001).

After the general elections in April 1999, the government started to implement a disinflation program. With this program, a substantial reduction in the rate inflation, and an improvement in the fiscal balance were aimed. The three main elements of the last program were (i) a strict commitment to a predetermined exchange rate basket; (ii) a tight fiscal policy; and (iii) an incomes policy consistent with the inflation target. Although a considerable improvement in the public sector debt finance was achieved during the first ten months of the year 2000, the program was interrupted by the liquidity crisis of November 2000. The program induced the weak financial sector to take excessive foreign currency and interest rate risks both by committing to a predetermined path for a foreign currency basket, and by linking the liquidity injection of the Central Bank to foreign capital inflows. Finally, the interest rate risk borne by the weak financial sector was materialized with the interruption of the foreign capital inflow in November 2000. After a short interruption, the program came to an end in February 2001, with the decision to float the value of the domestic currency following a political turmoil.

3. The Model

The main motivation for the model comes from the need for both understanding and quantifying the reasons behind the high and persistent inflationary process in Turkey. As such, we have tried to construct a model so as to take into account the main factors that we believe the driving force behind the inflationary process in Turkey. Indeed, the main contributions of the paper arise in these areas.

In constructing the model, we have faced a difficult choice. Needless to say, any model cannot be ignorant of the theory. In working with the data, however, if one goes with the pure theory, it is almost impossible to meet all the conditions that the econometrics requires in an equation. There comes the choice: pure theory vs. econometrics. We have made our choice for econometrics, since we intend to use the model for projection purposes. We would like to stress, however, that this is not to say that we have ignored the theory. But, the reader may not find a well defined, for example, expectations-augmented Phillips curve.

An important contribution of this work is the handling of the relation between the government bonds, as a financing item of the debt stock, and the inflation using the expectations. Again to the best of our knowledge, there is no empirical study for the Turkish economy analyzing the effect of the borrowing on inflation via interest

rates and expectations mechanism. (Sargent and Wallace 1981) lie down the theoretical foundation of the effect of borrowing on inflation as follows:

“...where the monetary authority faces the constraint imposed by the demand for government bonds, the form of this demand is important in determining whether or not the monetary authority can control inflation permanently. In particular, suppose the demand for government bonds imply an interest rate on bonds greater than the economy’s rate of growth. Then, if the fiscal authority runs the deficit, monetary authority is unable to control either the growth rate of monetary base or inflation forever. [...] Sooner or later, in a monetarist economy, the result is additional inflation.”

We believe that the quotation above describes the situation in Turkey. Indeed, the necessity of financing the high level of government debt results in higher real interest rates, in turn, giving rise to a second round effect of higher borrowing. This process leads to increase in the inflationary expectations due to the possible monetization of the government debt. The process repeats itself resulting in higher inflation, which in turn, bring about higher nominal interest rates.

Another important feature of the model is an explicit treatment of the expectations. To this end, we have used the CBRT business survey. The CBRT conducts this survey, which is in qualitative nature, on a monthly basis since December 1988. In one of the questions, the respondents are asked for the “average price for the new orders received from the domestic market”. By the well-known methodologies, (Peseran 1987), we have quantified the data, (Kıpıcı 2002). Besides, we have endogenized the expectations within the model.

Having said these features of the model, we would like to discuss its technical characteristics. Data for this study are taken from publicly available sources. Model was estimated by OLS.² Related to the discussion above on the choice between the econometrics and pure theory, the choice of variables and functional forms of equations are made on the basis of theoretical, econometrical, institutional and data

² At this point we should mention that we are fully aware of the drawbacks of estimating simultaneous structural equation models by OLS. Yet, employing alternative estimation techniques would require no misspecification in all equations of the system. Considering the complex dynamics of the Turkish economy would make it difficult to specify the correct structure, and by taking into account the methodology used by other Central Banks, we preferred to use OLS.

availability criteria as exploited in (Palanivel and Klein 1999). In the model, we have used quarterly data covering the period from the first quarter of 1987 to the third quarter of the 2002. The data used are the period averages. We have performed the unit root tests for all variables, although we have not reported here.³ We have used the variables in the equations so as to take into account the time series properties of the series obtained from these unit root tests. In the model, in addition to 17 behavioral equations, we have 14 identities. The number of the exogenous variables is 22 of which, 11 are dummy variables including 3 seasonal dummy variables.

The model includes four blocks: (i) price, (ii) money, (iii) foreign trade, (iv) public finance. In addition, we have an equation for the overall economic activity, namely real GDP. In the price block, we have three measures of inflation, (i) WPI, (ii) CPI, (iii) GDP deflator. Besides, we have estimated TL/USD rate, 3-month deposit rate, T-bill rate and the price expectations.

Price block: The general characteristics of the equations in this block are as follows;

$$i_t^{T-bill} = i \left(\frac{CPI_t}{CPI_{t-1}}, \Delta_1(\log(borrowing)), i_{t-1}^{T-bill}, dollar\ volatility, i_t^{O/N} \right) \quad (1)$$

$$\frac{e_t}{e_{t-1}} = e \left(\frac{WPI_t}{WPI_{t-1}}, \Pi_{t-2}^e, \Pi_{t-1}^e, \Pi_t^e, i_t^{O/N} \right) \quad (2)$$

$${}_{t-1}\Pi_t^e = \Pi^e \left({}_{t-1}w_t^e, i_t^{T-bill}, {}_{t-2}\Pi_{t-1}^e, \frac{WPI_t}{WPI_{t-4}} \right) \quad (3)$$

$$\frac{WPI_t}{WPI_{t-1}} = WPI \left({}_{t-1}\Pi_t^e, \frac{e_t}{e_{t-1}} \right) \quad (4)$$

$$\frac{CPI_t}{CPI_{t-1}} = CPI \left({}_{t-1}\Pi_t^e, \frac{e_t}{e_{t-1}}, i_{t-1}^{T-bill} \right) \quad (5)$$

$$\frac{DEF - GDP_t}{DEF - GDP_{t-4}} = DEF - GDP \left(\frac{WPI_t}{WPI_{t-4}} \right) \quad (6)$$

³ The unit root tests are available upon request.

In the equations above the variables are as follows:

- i^{T_bill} : Weighted average of Treasury auction rate;
- CPI: Consumer Price Index, (1994=100);
- Borrowing: Treasury borrowing, (net);
- Dolar_volatility: Volatility in TL/USD exchange rate, measured by the moving averages of the standard deviations of yearly increases in TL/USD rate;
- $i^{O/N}$: Overnight interest rate;
- e: TL/USD exchange rate;
- WPI: Wholesale Price Index, (1994=100);
- ${}_{t-i}\Pi^e_{t-j}$: Inflation expectations for period $(t-j)$, based on the information set in period $(t-i)$;
- ${}_{t-i}W^e_{t-j}$: Wage expectations for period $(t-j)$, based on the information set in period $(t-i)$;
- DEF_GDP: GDP deflator;
- M1: Money supply, (narrow definition).

Now, let's briefly explain the logic behind the equations above. In the equation for the interest rate on T-bill, the CPI variable reflects the interaction mechanism described above, between the inflation and the interest rate. The second variable, borrowing, also reflects the concerns about the sustainability of the debt stock. Combined with the fact that there are concerns about the debt sustainability, positive net borrowing give rise to higher interest rates. We have used the volatility in the exchange rate, as a measure of uncertainty. Since the CBRT uses the overnight interest rate mostly as a policy variable, we have included it in the equation.

As for the interpretation of the sign and magnitudes of the coefficients, all the endogenous variables have the expected signs and the coefficients are statistically significant. The inflation rate turns out to have the greatest effect on the nominal interest rate. As an indicator of the uncertainty, the volatility in dollar also plays an important role in the determination of the interest rate. The amount of borrowing and the overnight interest rate affect the interest rate positively, and have coefficients approximately in equal magnitudes.

In addition to the variables above, we have two dummy variables. One is for the regime change in the beginning of 2000. The second dummy variable for the fourth quarter of 1998 is for the effects of the Russian crises and legal amendments in tax legislation, also known as “financial millennium”.

The first two variables in the exchange rate equation come from a practical observation. For a long time, the process of the determination of the exchange rate in Turkey has been as follows: agents have some estimate of inflation in the beginning of the period (t), but, the actual inflation figure for that period is not available. The movement of the exchange rate for period (t) corresponds mostly to the available inflation estimate. When the period ($t+1$) arrives, the inflation rate for the period (t) is announced. Then, the exchange rate in period ($t+1$) moves so as to take into account the difference between the actual inflation rate for period (t) and the inflation estimate for the same period, plus the inflation estimate for period ($t+1$).

We have included a third variable, the overnight interest rate. It turns out to have a positive effect on the exchange rate. In other words, an increase in the overnight interest rate results in a depreciation of the Turkish Lira. One might argue that an increase in the interest rate should result in appreciation of the domestic currency due to the capital inflows. It is true that higher interest rates will bring about a capital inflow and result in the appreciation of the Turkish Lira, in the short run under normal conditions, i.e. worries about the sustainability of domestic debt stock are at minimum. However, in the case of Turkey that experienced various crises during the estimation period, one should consider the role of the risk premium.

As stated in (Furman and Stiglitz 1998, 74), there might be some problems with the notion that an increase in the interest rate should bring about the appreciation of the exchange rate. Two of these problems are as follows:

- (i) “...it is not the promised nominal interest rate that matters but the expected return, which must take into account the probability of default itself an endogenous variable. An increase in the nominal interest rate could lead to a decrease in the expected interest rate, in which case the dynamic effect on today’s exchange rate is negative. Although it may be reasonable to neglect this point in examining, say, the relationship between the U.S dollar and German mark, it is not at all valid to do so in potential or actual

economic crises, when concern about repayment is usually the central cause of loans not being rolled over and of capital outflow”;

- (ii) “A third problem that the market may be risk averse. Moreover, both willingness to bear risk and perceptions of risk might change dramatically and could be adversely affected by policies that might be seen as inducing a recession, such as an increase in interest rates.”

Indeed, this is the situation in Turkey, as we have explained above. They, then, combine these effects in a revised uncovered interest parity equation:

$$(1 - \delta)(1 + i_t) - \nu = \frac{e_{t+1}^E}{e_t} (1 + i_t^*) \quad (7)$$

where (δ) is the probability of bankruptcy, and (ν) is the risk premium, and both are increasing functions of domestic interest rates. Therefore, it is possible to have a positive effect on the exchange rate in the face of an increase in the interest rates, depending upon the magnitudes of (δ) and (ν).

Following (Furman and Stiglitz 1998), (Cho and West 2001) consider the effect on exchange rates of an exogenous change in interest rates in a two-equation model. Using weekly data from 1997 and 1998 for Korea, the Philippines and Thailand, they find that exogenous increase in interest rates leads to exchange rate appreciation in Korea and the Philippines, depreciation in Thailand. According to the preliminary results for Turkey, (Kotan and Mendoza 2001) also reports that in crises periods an increase in interest rates is more likely to cause a depreciation of the exchange rate.⁴

In addition to the variables above, we have two dummy variables and a seasonal dummy in the equation. We have used the first dummy variable for the second quarter of 1991, Gulf War. The second dummy variable for the first quarter of 1995

⁴ Still, based on the explanations and findings above, one possible objection to the positive coefficient on the interest rate variable in the exchange rate equation might be that the case established is valid only for crises periods. Of course, it is possible to work with other variables. In fact, we have experimented a little bit excluding the crises periods. The coefficient that we have found was as what the theory suggest with a magnitude of -0.50 . However, in addition to the forecast performance, when one considers the crises that Turkey has undergone over the estimation period, and high possibility for others in the future, we have preferred to preserve the equation as it is in this version of the model.

is for the elimination of once-for-all-taxes in the first quarter of 1994. Again, the equation passes all the diagnostic tests.

In equation (3), we have modeled the inflationary expectations as a function of the expected wages, interest rate on T-bill and its lagged value. We have obtained the expected wages from the CBRT survey. Equations (4), (5), and (6) are for the inflation rates measured by WPI, CPI, and GDP deflator. We believe that the expectation variable in equations (4), and (5) reveals the importance of expectations in the inflationary process. And finally, in equation (6), we explain the GDP deflator as a function of the WPI inflation.

Monetary block: This block contains the following equations:

$$\frac{R_CI_t}{R_CI_{t-4}} = R_CI \left(\frac{R_GDP_t}{R_GDP_{t-4}}, \frac{{}_{t-1}\Pi_t^e}{{}_{t-5}\Pi_{t-4}^e}, \frac{R_CI_{t-1}}{R_CI_{t-5}} \right) \quad (8)$$

$$\frac{R_M1_t}{R_M1_{t-4}} = R_M1 \left(\frac{R_GDP_t}{R_GDP_{t-4}}, \frac{{}_{t-1}\Pi_t^e}{{}_{t-5}\Pi_{t-4}^e}, \frac{R_M1_{t-1}}{R_M1_{t-5}} \right) \quad (9)$$

$$\frac{R_TDEP_t}{R_TDEP_{t-4}} = R_TDEP \left(R_i_t^{DEP}, \frac{e_t}{e_{t-4}}, \frac{R_TDEP_{t-1}}{R_TDEP_{t-5}} \right) \quad (10)$$

$$\frac{DTH_DOLAR_t}{DTH_DOLAR_{t-4}} = DTH_DOLAR \left(R_i_t^{O/N}, \frac{DTH_DOLAR_{t-1}}{DTH_DOLAR_{t-5}} \right) \quad (11)$$

In the equations above the variables are as follows:

R_CI:	Real Currency issued deflated by WPI;
R_GDP:	Real Gross Domestic Product at 1987 prices;
R_M1:	Real Money supply, (narrow definition), deflated by WPI;
R_TDEP:	Real time deposits, deflated by the WPI;
R_i_t ^{DEP} :	Real 3-month deposit rate, deflated by WPI;
DTH_DOLAR:	F/X deposits in US dollar terms;
R_i_t ^{O/N} :	Real overnight rate, deflated by WPI.

In Equation (8), we have modeled the real demand for currency issued as a function of the real GDP, change in price expectations and its lagged value. The same variables explain the variation in narrowly defined money supply, M1, in equation (9).

We have modeled the real time deposits by its own yield, and the annual change in the exchange rate as a measure of its alternative yield in equation (10). Finally, the F/X deposits in US dollar is explained by the overnight interest rate in real terms and its lagged value in equation (11).

Foreign trade block: We have two equations in this block, one for the real imports and the other for the real exports. The equations are as follows:

$$\frac{\frac{M_t}{PM_t}}{\frac{M_{t-4}}{PM_{t-4}}} = M \left(\frac{R_GDP_t}{R_GDP_{t-4}}, \frac{\frac{e_t}{WPI_t}}{\frac{e_{t-1}}{WPI_{t-1}}}, AR(1) \right) \quad (12)$$

$$\frac{X_t}{M_t} = X \left(\frac{R_GDP_t}{R_GDP_{t-4}}, \frac{\frac{e_t}{WPI_t}}{\frac{e_{t-1}}{WPI_{t-1}}}, \frac{X_{t-1}}{M_{t-1}} \right) \quad (13)$$

where (M_t) and (X_t) denotes imports and exports, and (PM_t) stands for import prices at time(t). Although, it is not the best way to proceed, we have used the AR(1) term in the real import equation to take into account the serial correlation which seems to be in persistent nature.

Consolidated budget block: In this block, we have three equations. One is for the budgetary expenditures, excluding the interest payments. The other two equations are for estimating the direct and indirect taxes. We have taken the interest payments and other revenues as exogenous. The equations are as follows:

$$\frac{\frac{BEEIP_t}{DEF_GDP_t}}{\frac{BEEIP_{t-4}}{DEF_GDP_{t-4}}} = BEEIP \left(\frac{R_GDP_t}{R_GDP_{t-4}}, \frac{\frac{BEEIP_{t-1}}{DEF_GDP_{t-1}}}{\frac{BEEIP_{t-5}}{DEF_GDP_{t-5}}} \right) \quad (14)$$

$$\frac{\frac{DT_t}{DEF_GDP_t}}{\frac{DT_{t-4}}{DEF_GDP_{t-4}}} = DT \left(PS_TAX_RATE*(R_GDP_t - R_GDP_{t-4}), \frac{\frac{DT_{t-1}}{DEF_GDP_{t-1}}}{\frac{DT_{t-5}}{DEF_GDP_{t-5}}} \right) \quad (15)$$

$$\frac{\frac{T_TAX_REV_t}{DEF_GDP_t}}{\frac{T_TAX_REV_{t-4}}{DEF_GDP_{t-4}}} = T_TAX_REV \left(\frac{\frac{T_TAX_REV_{t-1}}{DEF_GDP_{t-1}}}{\frac{R_GDP_t}{R_GDP_{t-4}}}, \frac{\frac{T_TAX_REV_{t-5}}{DEF_GDP_{t-5}}}{\frac{T_TAX_REV_{t-5}}{DEF_GDP_{t-5}}} \right) \quad (16)$$

$$\frac{\frac{T_REV_t}{DEF_GDP_t}}{\frac{T_REV_{t-4}}{DEF_GDP_{t-4}}} = T_REV \left(\frac{\frac{T_REV_{t-1}}{DEF_GDP_{t-1}}}{\frac{R_GDP_t}{R_GDP_{t-4}}}, \frac{\frac{T_REV_{t-5}}{DEF_GDP_{t-5}}}{\frac{T_REV_{t-5}}{DEF_GDP_{t-5}}} \right) \quad (17)$$

where

BEEIP: Budgetary expenditures, excluding interest payments;

DT: Direct taxes.

PS_TAX_RATE: Implicit tax rate, obtained as a ratio of the direct taxes to nominal GDP.

T_TAX_REV: Total tax revenues;

T_REV: Total budget revenues;

And finally, we use the following equation for the overall economic activity, namely for the real GDP.

$$\frac{R_GDP_t}{R_GDP_{t-4}} = R_GDP \left(\frac{(1 + i_t^{T_bill})}{\frac{DEF_GDP_t}{DEF_GDP_{t-4}}}, \frac{\frac{CPS_{t-1}}{DEF_GDP_{t-1}}}{\frac{CPS_{t-5}}{DEF_GDP_{t-5}}}, \frac{PCU_t}{PCU_{t-4}}, \frac{R_GDP_{t-1}}{R_GDP_{t-5}} \right) \quad (18)$$

where

CPS: Total credit in real terms extended to the private sector;

PCU: Private sector's capacity utilization rate.

The capacity utilization rate of the private sector and the volume of the credits in real terms extended to the private sector turn out to be most important determinants of the annual growth rate. We should also mention that we have experimented with the real exchange rate. Since, however, the coefficient has unexpected sign, we excluded the real exchange rate variable from the equation.

4. Policy Simulations

Before discussing the policy simulations, we would like to mention briefly about the assumptions on the exogenous variables underlying our baseline scenario and its forecasts:

(i) For the credit extended to the private sector and the year-end 3-month deposit rate for 2003 and 2004, we have used the assumption of 5 percent real growth rate and the announced inflation rates of 20 percent and 12 percent. Namely, we have extended the series by the formula: $(1+i_t) = (1+g_t)(1+\Pi_t)$. Therefore, we increased the variable for the years in 2003 and 2004 by 26 and 17.6 percent in nominal terms.

(ii) As for import prices, we have arbitrarily guessed the values on the basis of the judgment that the world economy will be in a downturn state and begin to recovery in 2004.

(iii) Projected growth rates of 5 percent in 2003 and 2004, have been used for the extension of capacity utilization rate series.

(iv) For overnight interest rate, we have used the projected inflation rate.

(v) Another assumption is that the private sector tax rate maintains its level and seasonal pattern in 2000 until the end of 2004.

(vi) On the consolidated budget side, we have assumed that the interest rate payments declined to 15 percent compared to the same period of the previous year for 2003 and 2004.

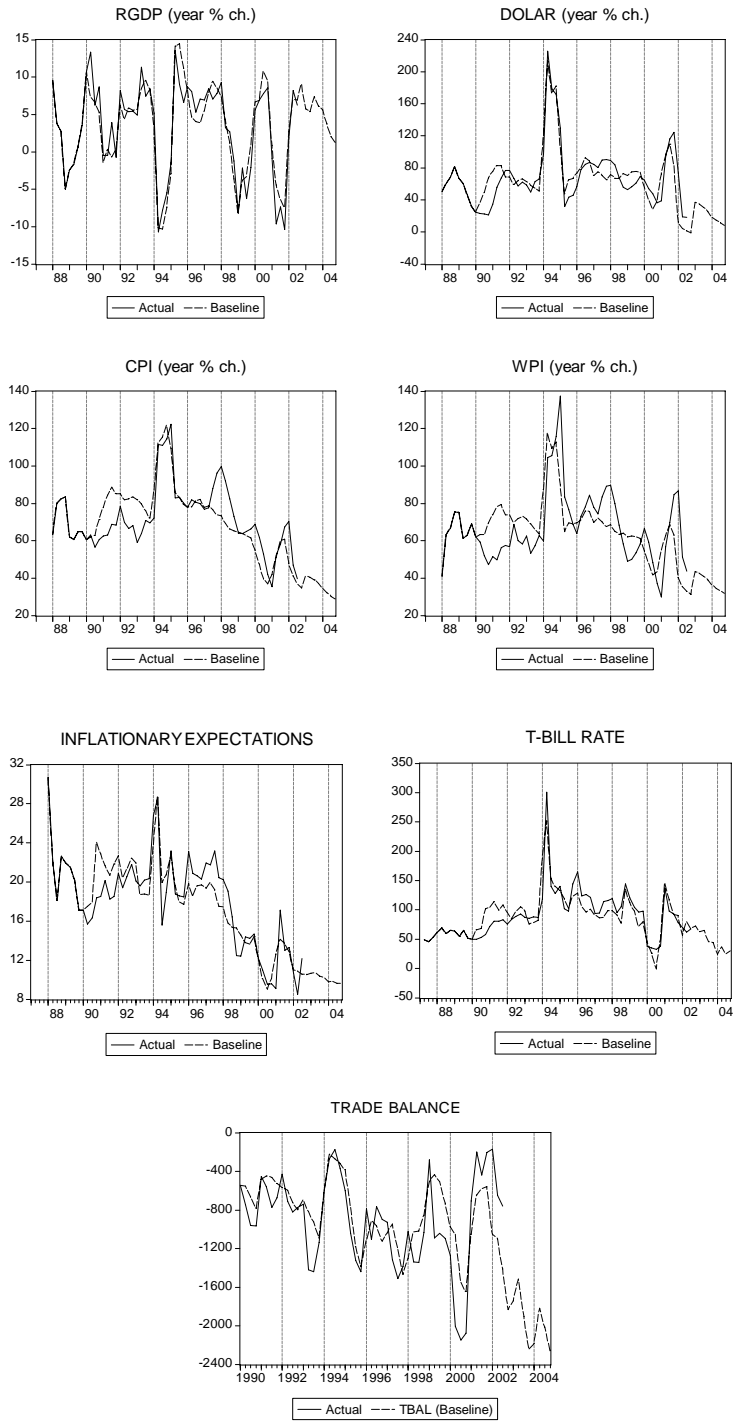
(vii) For the expected wages, we have assumed a gradual increase to the 1998 level at the fourth quarter of 2004, was envisaged.

(viii) Lastly, dollar volatility is assumed to be constant.

The following figure compares the actual values and the results from the dynamic simulation of this baseline scenario.⁵

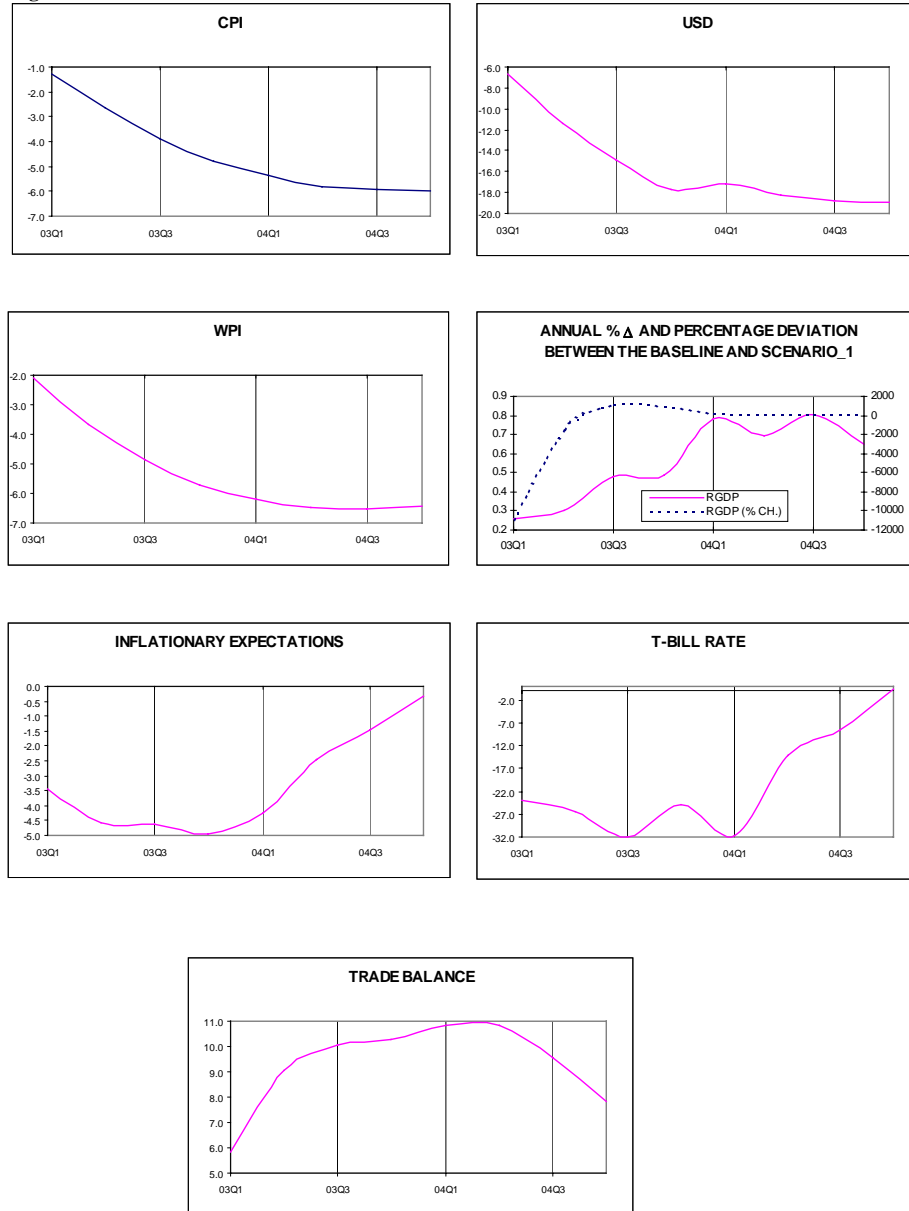
⁵ We present the core variables that the model is based on. The results for the other variables are available upon request.

Fig. 1.



In addition to our baseline scenario, we have experimented with the model to examine the effects of certain policy actions. The experiments involve giving shocks to three variables, separately. The first variable is the overnight interest rate. In this experiment, we have assumed once-for-all decline to 20 percent starting from 2003Q1. The results based on the baseline and scenario are as follows:

Fig. 2.



The figures represent the percentage change of the variables from the baseline scenario, in levels. The figure on the real GDP also shows the percentage deviation of the growth rates between the actual and the baseline scenario on the right scale. The reason for inclusion of this variable in the figure is to track the development of the growth rate between alternative scenarios during the course of time. It is possible to conclude two major points from the figures:

a. The decline in the overnight interest rate results in a decrease in the inflation. This point deserves some discussion. Contrary to our findings, what one should expect is a decline in inflation in the face of an increase in the interest rate, within the textbook context. However, we believe that our finding reflects the following mechanism: First, the decline in the interest rate results in an appreciation of the exchange rate causing a reduction in inflation through the cost structure. Further, the decline in the interest rate leads to a decrease in expectations via the concerns on debt sustainability.

b. The decline also brings about important decreases in the other variables. The effect on these variables, however, seems to be transitory. Specifically, it is possible to observe that the effect of the decrease in the overnight interest rate on the inflationary expectations and the T-bill rate diminishes after the first year. We believe that the main reason for this phenomenon is again related to the high level of government debt. While the decline in the overnight interest rate is around 20 percent that of inflation is around 6 percent causing an increase in the real interest rates. The increase in the real rates leads to increase in inflationary expectations after the first year due to the possible monetization of the government debt.

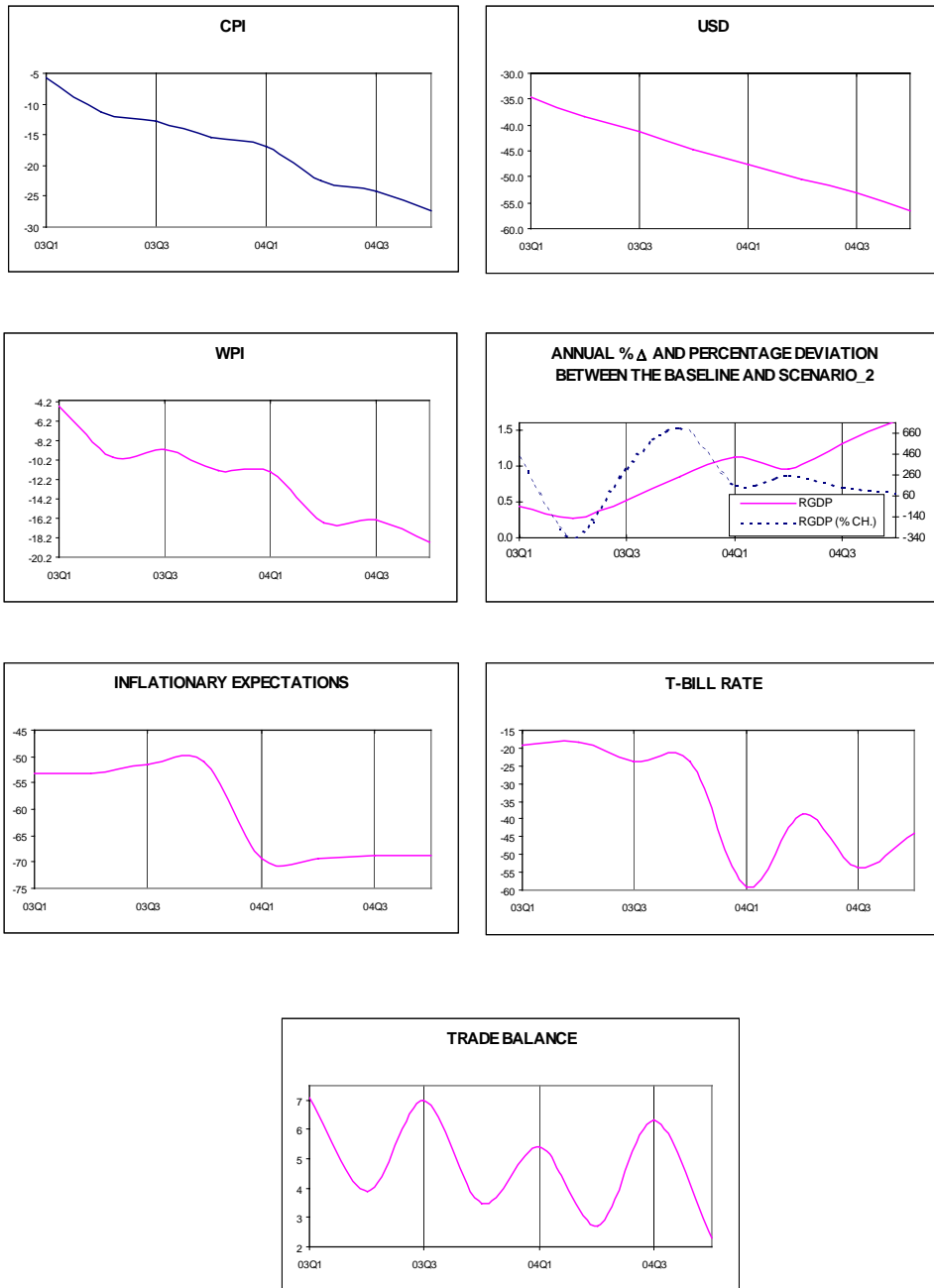
The natural conclusion from the discussion above is that in order to use the interest rate as an effective policy variable, it is inevitable to accomplish the structural reforms so that to eliminate the concerns about the debt sustainability and banking system fragility.

The second experiment assumes a sharp decrease in inflationary expectations, starting from 2003Q1 and another decrease in 2004Q1.

The figures from this scenario point to a quite strong result that is the role of the expectations in the inflationary process. Although this is commonly accepted view for Turkey, it is quite striking to observe this feature by comparing the results with those of the first scenario. As compared to the first scenario the reduction in inflationary expectations give rise to decline in the price variables. The magnitudes

of the declines are much stronger than that of the first scenario. And the effects are more permanent. There is also a strong and continued expansion in the real GDP.

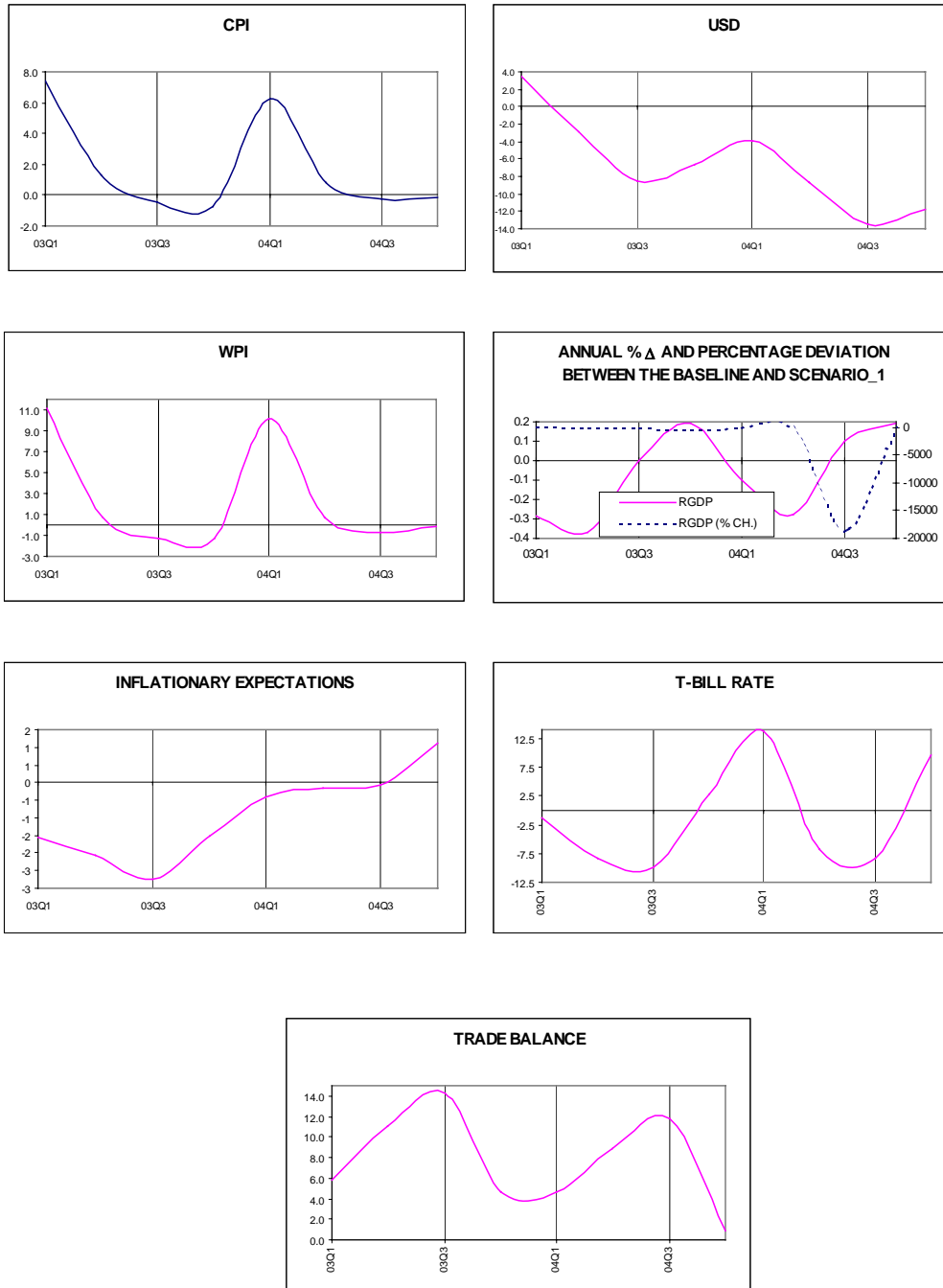
Fig. 3.



At this point, we should mention about another interesting feature that emerges when we evaluate the results related to the trade balance from the two scenarios. While in both cases, we observe deterioration in the trade balance compared to that of the baseline scenario, the magnitude of the deterioration is lower in the case of decline in expectations. It is possible to observe the reason for this result when we look at the figure 2 and figure 3. Figure 2 reveals that the effect of the interest rate decline on real gross national product is limited and temporary. In contrast, the effect of the decrease in expectations has a lasting effect due to the importance of expectations on inflation and therefore on the overall economic performance. The result is that the effect on the real gross national product is in permanent nature leading to a higher increase in the export performance of the country.

And finally, we have tried to see the effect of a managed exchange rate regime. To this end, we have increased the level of the exchange rate consistent with the announced WPI inflation rates.

Fig. 4.



The results point to strong seasonality. Concerning the seasonality in the figures from this experiment, we should mention that the projections that we have used do not take into account the seasonal factors. The results again show a decline in the price variables that are higher than that of the first scenario but lower than the second scenario.

5. Conclusions and Policy Implications

Our findings mainly point to three major conclusions. The first one relates to the limited use of the overnight interest rate in the sense that its effect on other variables is in transitory nature. Furthermore, it is inevitable to accomplish the structural reforms so as to eliminate the concerns about the debt sustainability and banking system fragility for the effective usage of the interest rates under the inflation targeting regime.

The second conclusion is, as expected, the role of the expectations in the inflationary process in the Turkish economy has utmost importance. Therefore, the policy maker has to invent ways to build up credibility to contain the inflation.

And the last but not least important conclusion is that the exchange rate also plays an essential role in the inflationary process. Its effect is higher than the overnight interest rate. But when compared in magnitude with the expectations, it seems to be lower.

Appendix 1. Variable List

- BEEIP: Budgetary expenditures, excluding interest payments;
 Borrowing: Treasury borrowing, (net);
 CPI: Consumer Price Index, (1994=100);
 CPS: Total credit in real terms extended to the private sector;
 DEF_GDP: GDP deflator;
 Dolar_volatility: Volatility in TL/USD exchange rate;
 DT: Direct taxes.
 DTH_DOLAR: F/X deposits in US dollar terms;
 DUM9101: Dummy variable for the Gulf War =1 for 1991Q1, 0 otherwise;
 DUM9501: Dummy variable for the elimination of once-for-all-taxes in the first quarter of 1994,, =1 for t=1995Q1, 0 otherwise;
 DUM9701: Dummy variable for the practice of pooling the deposits of public institutions in state banks to prevent their usage in repo transactions, =1 for t=1997Q1, 0 otherwise;
 DUM9801: Dummy variable for
 DUM9804: Dummy variable for the “financial millennium” and the aftermath of the Russian crises. =1 for t=1998Q4, 0 otherwise.
 DUM00Q1: Dummy variable for the tax regulations, =1 for t=2000Q1, 0 otherwise;
 DUM00Q1: Dummy variable for the tax regulations, =1 for t=2002Q1, 0 otherwise;
 DUM_ELEC: Dummy variable for elections =1 for pre-election quarters, 0 otherwise;
 e: TL/USD exchange rate;
 $i^{O/N}$: Overnight interest rate;
 IT: Indirect taxes;
 i^{T_bill} : Weighted average of Treasury auction rate;
 M: Imports;
 M1: Money supply, (narrow definition);
 PCU: Private sector’s capacity utilization rate.
 PM: Import prices;

- PS_TAX_RATE: Implicit tax rate, obtained as a ratio of the direct taxes to nominal GDP.
- R_CI: Real Currency issued deflated by WPI;
- R_GDP: Real Gross Domestic Product at 1987 prices;
- $R_{i_t}^{DEP}$: Real 3-month deposit rate, deflated by WPI;
- $R_{i_t}^{O/N}$: Real overnight interest rate, deflated by WPI;
- R_M1: Real Money supply, (narrow definition), deflated by WPI;
- R_TDEP: Real time deposits, deflated by the WPI;
- RS2000: Dummy variable for regime shift =1 for t=2000Q1-2000Q4, 0 otherwise;
- S1: Seasonal dummy variable for the first quarter;
- ${}_{t-i}w_{t-j}^e$: Wage expectations for period ($t-j$), based on the information in period ($t-i$);
- ${}_{t-i}\Pi_{t-j}^e$: Inflation expectations for period ($t-j$), based on the information in period ($t-i$)
- WPI: Wholesale Price Index, (1994=100);
- X: Exports;

Appendix 2. Equations**Dependent Variable: $i_t^{T_bill}$ (T-BILL RATE, COMPOUNDED)**

Method: Least Squares

Sample(adjusted): 1990:1 2002:3

Included observations: 51 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-10.14577	10.48772	-0.967396	0.3388
$\Delta(\log(\text{borrowing}))$	14.22250	6.232316	2.282058	0.0275
$(\text{CPI}_t/\text{CPI}_{t-1})-1$ *100	2.710804	0.546668	4.958774	0.0000
$(\text{USD_volatility})_t$	0.358397	0.147587	2.428379	0.0194
$i_{t-1}^{T_bill}$	0.241497	0.076933	3.139052	0.0031
i_t^{ON}	0.494812	0.093136	5.312772	0.0000
RS2000	-19.53623	10.71263	-1.823664	0.0752
DUM9804	44.04735	19.52994	2.255376	0.0293
R-squared	0.827567	Mean dependent var		97.56909
Adjusted R-squared	0.799497	S.D. dependent var		42.35862
S.E. of regression	18.96716	Akaike info criterion		8.866395
Sum squared resid	15469.38	Schwarz criterion		9.169426
Log likelihood	-218.0931	F-statistic		29.48183
Durbin-Watson stat	2.123870	Prob(F-statistic)		0.000000
LM(1)	= 0.57	LM(4)	=	0.42
Jarque-Berra	= 0.90	ARCH(1)	=	0.12

Dependent Variable: $((e_t/e_{t-1})-1)*100$ - (TL / US Dollar F/X rate)

Method: Least Squares

Sample(adjusted): 1990:1 2002:3

Included observations: 51 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.041538	0.227643	-0.182470	0.8561
$1+i_t^{ON}/100$	0.158185	0.033067	4.783730	0.0000
$((\text{WPI}_t/\text{WPI}_{t-1})-1)*100$ - $\tau_2\Pi_{t-1}$	1.186707	0.130875	9.067515	0.0000
$1+i_{t-1}\Pi_t^o/100$	0.798618	0.214447	3.724082	0.0006
S2	0.043697	0.018867	2.316045	0.0254
S3	0.059505	0.019699	3.020743	0.0042
DUM0101	-0.133114	0.073129	-1.820261	0.0757
DUM0201	-0.174780	0.056310	-3.103895	0.0034
R-squared	0.856994	Mean dependent var		1.143659
Adjusted R-squared	0.833714	S.D. dependent var		0.130754
S.E. of regression	0.053319	Akaike info criterion		-2.881942
Sum squared resid	0.122246	Schwarz criterion		-2.578910
Log likelihood	81.48952	F-statistic		36.81237
Durbin-Watson stat	1.713977	Prob(F-statistic)		0.000000
LM(1)	= 0.35	LM(4)	=	0.17
Jarque-Berra	= 0.39	ARCH(1)	=	0.47

Dependent Variable: ${}_{t-1}\Pi_t^e$ (EXPECTED INFLATION)

Method: Least Squares

Sample(adjusted): 1990:1 2002:3

Included observations: 51 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.613257	2.353257	0.260599	0.7956
$i_t^{T_bill}$	0.016414	0.007576	2.166670	0.0355
${}_{t-1}W_t^e$	0.525620	0.065356	8.042459	0.0000
${}_{t-2}\Pi_{t-1}^e$	0.222765	0.093869	2.373152	0.0219
WPI_t/WPI_{t-4}	2.599443	1.710545	1.519658	0.1354
R-squared	0.841569	Mean dependent var		17.59206
Adjusted R-squared	0.827793	S.D. dependent var		4.532647
S.E. of regression	1.880952	Akaike info criterion		4.194327
Sum squared resid	162.7471	Schwarz criterion		4.383722
Log likelihood	-101.9553	F-statistic		61.08694
Durbin-Watson stat	1.684476	Prob(F-statistic)		0.000000
LM(1)	= 0.26	LM(4)	=	0.82
Jarque-Berra	= 0.86	ARCH(1)	=	0.81

Dependent Variable: $((WPI_t/WPI_{t-1})-1)*100$ (WPI INFLATION)

Method: Least Squares

Sample(adjusted): 1988:1 2002:3

Included observations: 59 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.668101	2.274288	1.173159	0.2458
${}_{t-1}\Pi_t^e$	0.318780	0.133670	2.384832	0.0206
$((e_t/e_{t-1})-1)*100$	0.323314	0.052594	6.147410	0.0000
S2	2.779641	1.307823	2.125395	0.0381
R-squared	0.625472	Mean dependent var		13.68638
Adjusted R-squared	0.605043	S.D. dependent var		6.675919
S.E. of regression	4.195521	Akaike info criterion		5.771301
Sum squared resid	968.1320	Schwarz criterion		5.912151
Log likelihood	-166.2534	F-statistic		30.61715
Durbin-Watson stat	1.804162	Prob(F-statistic)		0.000000
LM(1)	= 0.54	LM(4)	=	0.10
Jarque-Berra	= 0.67	ARCH(1)	=	0.97

Dependent Variable: $((CPI_t/CPI_{t-1})-1)*100$ (CPI INFLATION)

Method: Least Squares

Sample(adjusted): 1988:1 2002:3

Included observations: 59 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.816959	0.037898	21.55685	0.0000
$((e_t/e_{t-1})-1)*100$	0.185360	0.035803	5.177281	0.0000
${}_{t-1}\Pi_t^e$	0.005298	0.000926	5.722022	0.0000
$i_{t-1}T_{bill}$	0.000211	9.33E-05	2.265166	0.0276
S3	-0.034917	0.009457	-3.692089	0.0005
S4	0.037870	0.009561	3.960755	0.0002
R-squared	0.769560	Mean dependent var	1.144087	
Adjusted R-squared	0.747820	S.D. dependent var	0.057743	
S.E. of regression	0.028997	Akaike info criterion	-4.147099	
Sum squared resid	0.044564	Schwarz criterion	-3.935824	
Log likelihood	128.3394	F-statistic	35.39887	
Durbin-Watson stat	1.833042	Prob(F-statistic)	0.000000	
LM(1)	= 0.92	LM(4)	= 0.94	
Jarque-Berra	= 0.14	ARCH(1)	= 0.27	

Dept. Var: DEF_GDP/DEF_GDP_{t-4} (ANNUAL % Δ IN GDP DEFLATOR)

Method: Least Squares

Sample(adjusted): 1988:1 2002:3

Included observations: 59 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.007494	0.085930	0.087209	0.9308
WPI/WPI(-4)	1.012941	0.051161	19.79902	0.0000
R-squared	0.873052	Mean dependent var	1.698169	
Adjusted R-squared	0.870824	S.D. dependent var	0.205280	
S.E. of regression	0.073780	Akaike info criterion	-2.342155	
Sum squared resid	0.310277	Schwarz criterion	-2.271730	
Log likelihood	71.09358	F-statistic	392.0012	
Durbin-Watson stat	1.334270	Prob(F-statistic)	0.000000	
LM(1)	= 0.09	LM(4)	= 0.11	
Jarque-Berra	= 0.37	ARCH(1)	= 0.56	

Dependent Variable: (CI_t/WPI_t)/(CI_{t-4}/WPI_{t-4})

Method: Least Squares

Sample(adjusted): 1989:1 2002:3

Included observations: 55 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.252351	0.154199	1.636523	0.1080
RGDP _t /RGDP _{t-4}	0.358133	0.126820	2.823939	0.0068
$\frac{\pi_{t-1}}{\pi_{t-5}} / \frac{\pi_{t-4}}{\pi_{t-8}}$	-0.143972	0.034038	-4.229708	0.0001
DUM9101	0.171269	0.056149	3.050263	0.0037
Lagged dependent var.	0.530718	0.080247	6.613523	0.0000
R-squared	0.666980	Mean dependent var		1.029567
Adjusted R-squared	0.640338	S.D. dependent var		0.091349
S.E. of regression	0.054783	Akaike info criterion		-2.884351
Sum squared resid	0.150061	Schwarz criterion		-2.701866
Log likelihood	84.31966	F-statistic		25.03524
Durbin-Watson stat	1.883326	Prob(F-statistic)		0.000000
LM(1)	= 0.67	LM(4)	=	0.36
Jarque-Berra	= 0.84	ARCH(1)	=	0.89

Dependent Variable: R_M1_t/R_M1_{t-4} (M1, REAL)

Method: Least Squares

Sample(adjusted): 1989:1 2002:2

Included observations: 54 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.259262	0.203338	1.275027	0.2083
R_GDP _t /R_GDP _{t-4}	0.282780	0.183296	1.542753	0.1293
$\frac{\pi_{t-1}}{\pi_{t-5}} / \frac{\pi_{t-4}}{\pi_{t-8}}$	-0.197476	0.048236	-4.093926	0.0002
R_M1 _{t-1} /R_M1 _{t-5}	0.648730	0.078952	8.216774	0.0000
DUM9701	0.226887	0.078466	2.891550	0.0057
R-squared	0.702248	Mean dependent var		1.028563
Adjusted R-squared	0.677942	S.D. dependent var		0.136406
S.E. of regression	0.077411	Akaike info criterion		-2.191365
Sum squared resid	0.293628	Schwarz criterion		-2.007200
Log likelihood	64.16686	F-statistic		28.89165
Durbin-Watson stat	1.615659	Prob(F-statistic)		0.000000
LM(1)	= 0.15	LM(4)	=	0.15
Jarque-Berra	= 0.44	ARCH(1)	=	0.54

Dependent Variable: R_TDEP_t/R_TDEP_{t-4} (TIME DEPOSITS, REAL)

Method: Least Squares

Sample(adjusted): 1988:2 2002:3

Included observations: 58 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.210609	0.130260	-1.616835	0.1117
R _i ^{DEP} _t	0.465305	0.088200	5.275587	0.0000
$\epsilon_t/\epsilon_{t-4}$	-0.071435	0.026261	-2.720234	0.0088
R_TDEP _{t-1} /R_TDEP _{t-5}	0.673412	0.070251	9.585856	0.0000
R-squared	0.755921	Mean dependent var		1.084098
Adjusted R-squared	0.742361	S.D. dependent var		0.144953
S.E. of regression	0.073576	Akaike info criterion		-2.314536
Sum squared resid	0.292321	Schwarz criterion		-2.172437
Log likelihood	71.12155	F-statistic		55.74660
Durbin-Watson stat	1.583567	Prob(F-statistic)		0.000000

LM(1)	=	0.07	LM(4)	=	0.32
Jarque-Berra	=	0.64	ARCH(1)	=	0.80

Dependent Variable: DTH_\$/DTH_\$(DTH in USD terms)

Method: Least Squares

Sample(adjusted): 1990:1 2002:2

Included observations: 50 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.577251	0.144375	3.998278	0.0002
R _i ^{ON} _t	-0.150510	0.064254	-2.342424	0.0234
DTH_\$/DTH_\$(_{t-5})	0.647310	0.104559	6.190837	0.0000
R-squared	0.488060	Mean dependent var		1.188100
Adjusted R-squared	0.466275	S.D. dependent var		0.154952
S.E. of regression	0.113203	Akaike info criterion		-1.461149
Sum squared resid	0.602298	Schwarz criterion		-1.346428
Log likelihood	39.52873	F-statistic		22.40382
Durbin-Watson stat	1.919973	Prob(F-statistic)		0.000000

LM(1)	=	0.72	LM(4)	=	0.17
Jarque-Berra	=	0.11	ARCH(1)	=	0.11

Dependent Variable: $(M_t/PM_t)/(M_{t-4}/PM_{t-4})$, (REAL IMPORTS)

Method: Least Squares

Sample(adjusted): 1988:2 2002:3

Included observations: 58 after adjusting endpoints

Convergence achieved after 8 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.196658	0.578493	-0.339950	0.7352
R_GDP _t /R_GDP _{t-4}	1.823440	0.417158	4.371095	0.0001
$(e_t/WPI_t)/(e_{t-4}/WPI_{t-4})$	-0.577713	0.187462	-3.081761	0.0032
AR(1)	0.633171	0.118438	5.345997	0.0000
R-squared	0.836966	Mean dependent var		1.099179
Adjusted R-squared	0.827909	S.D. dependent var		0.249835
S.E. of regression	0.103641	Akaike info criterion		-1.629290
Sum squared resid	0.580042	Schwarz criterion		-1.487191
Log likelihood	51.24942	F-statistic		92.40639
Durbin-Watson stat	1.860987	Prob(F-statistic)		0.000000
LM(1)	= 0.44	LM(4)	=	0.13
Jarque-Berra	= 0.95	ARCH(1)	=	0.62

Dependent Variable: X_t/M_t (EXPORTS/IMPORTS)

Method: Least Squares

Sample(adjusted): 1988:1 2002:3

Included observations: 59 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.819574	0.348598	2.351056	0.0223
R_GDP _t /R_GDP _{t-4}	-0.729115	0.201292	-3.622176	0.0006
$(e_t/WPI_t)/(e_{t-1}/WPI_{t-1})$	0.242134	0.165823	1.460191	0.1499
X_{t-1}/M_{t-1}	0.564134	0.099130	5.690827	0.0000
R-squared	0.612298	Mean dependent var		0.708480
Adjusted R-squared	0.591150	S.D. dependent var		0.126148
S.E. of regression	0.080660	Akaike info criterion		-2.131748
Sum squared resid	0.357836	Schwarz criterion		-1.990898
Log likelihood	66.88657	Durbin-Watson stat		1.666810
LM(1)	= 0.16	LM(4)	=	0.08
Jarque-Berra	= 0.88	ARCH(1)	=	0.39

Dependent Variable: (T_REV_t/DEFGDP_t)/(T_REV_{t-4}/DEFGDP_{t-4})
(TOTAL BUDGET REVENUES = TOTAL TAX REVS + OTHER ITEMS)

Method: Least Squares

Sample(adjusted): 1990:1 2002:3

Included observations: 51 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.360379	0.166818	-2.160315	0.0360
RGDP _t /RGDP _{t-4}	0.923108	0.151634	6.087749	0.0000
Lagged dependent var.	0.458702	0.072782	6.302400	0.0000
DUM00Q1	0.410122	0.068469	5.989923	0.0000
DUM02Q1	-0.270485	0.070047	-3.861487	0.0004
R-squared	0.772709	Mean dependent var		1.101587
Adjusted R-squared	0.752945	S.D. dependent var		0.135812
S.E. of regression	0.067505	Akaike info criterion		-2.460333
Sum squared resid	0.209619	Schwarz criterion		-2.270938
Log likelihood	67.73849	F-statistic		39.09598
Durbin-Watson stat	1.790036	Prob(F-statistic)		0.000000
LM(1)	= 0.43	LM(4)	=	0.07
Jarque-Berra	= 0.79	ARCH(1)	=	0.14

Dependent Variable: (T_TAX_REV_t/DEF_GDP_t)/(T_TAX_REV_{t-4}/DEF_GDP_{t-4})
(TOTAL TAX REVENUES = DIRECT TAXES + INDIRECT TAXES)

Method: Least Squares

Sample(adjusted): 1988:2 2002:3

Included observations: 58 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.390830	0.149287	-2.617971	0.0115
RGDP _t /RGDP _{t-4}	0.973070	0.152247	6.391398	0.0000
Lagged dependent var.	0.426243	0.068241	6.246147	0.0000
DUM00Q1	0.545669	0.067232	8.116164	0.0000
R-squared	0.778054	Mean dependent var		1.081627
Adjusted R-squared	0.765723	S.D. dependent var		0.137273
S.E. of regression	0.066443	Akaike info criterion		-2.518471
Sum squared resid	0.238393	Schwarz criterion		-2.376371
Log likelihood	77.03565	F-statistic		63.10074
Durbin-Watson stat	1.989842	Prob(F-statistic)		0.000000
LM(1)	= 0.70	LM(4)	=	0.67
Jarque-Berra	= 0.86	ARCH(1)	=	0.19

Dependent Variable: (DT_t/DEF_GDP_t)/(DT_{t-4}/DEF_GDP_{t-4}) – (DIRECT TAXES)

Method: Least Squares

Sample(adjusted): 1990:1 2002:3

Included observations: 51 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.607549	0.070076	8.669882	0.0000
PS_TAX_RATE _t *(RGDP _t -RGDP _{t-4})	0.000354	9.40E-05	3.762747	0.0005
Lagged dependent var.	0.407657	0.064772	6.293740	0.0000
DUM00Q1	0.689427	0.082088	8.398657	0.0000
DUM9801	0.383436	0.082383	4.654332	0.0000
DUM9501	-0.297868	0.081924	-3.635916	0.0007
DUM0201	-0.322189	0.082884	-3.887220	0.0003
R-squared	0.832430	Mean dependent var		1.070405
Adjusted R-squared	0.809580	S.D. dependent var		0.185062
S.E. of regression	0.080756	Akaike info criterion		-2.067902
Sum squared resid	0.286945	Schwarz criterion		-1.802750
Log likelihood	59.73151	F-statistic		36.42953
Durbin-Watson stat	1.897120	Prob(F-statistic)		0.000000
LM(1)	= 0.76	LM(4)	=	0.81
Jarque-Berra	= 0.06	ARCH(1)	=	0.40

Dependent Variable: (BEEIP_t/DEF_GDP_t)/(BEEIP_{t-4}/DEF_GDP_{t-4})**(BUDGETARY EXPENDITURES, EXCLUDING INTEREST PAYMENTS)**

Method: Least Squares

Date: 12/11/02 Time: 11:14

Sample(adjusted): 1988:2 2002:3

Included observations: 58 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.459519	0.246963	-1.860682	0.0682
RGDP _t /RGDP _{t-4}	0.967894	0.246380	3.928454	0.0002
Lagged dependent var.	0.495877	0.096418	5.142997	0.0000
DUM_ELEC	0.139373	0.057045	2.443202	0.0179
R-squared	0.534864	Mean dependent var		1.081593
Adjusted R-squared	0.509023	S.D. dependent var		0.156971
S.E. of regression	0.109989	Akaike info criterion		-1.510399
Sum squared resid	0.653270	Schwarz criterion		-1.368300
Log likelihood	47.80158	F-statistic		20.69837
Durbin-Watson stat	2.105650	Prob(F-statistic)		0.000000
LM(1)	= 0.52	LM(4)	=	0.06
Jarque-Berra	= 0.42	ARCH(1)	=	0.79

Dependent Variable: R_GDP/R_GDP_{t-4}

Method: Least Squares

Sample(adjusted): 1988:2 2001:3

Included observations: 54 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.159282	0.067125	2.372931	0.0213
$(1+(r_{t_bill}/100))/(DEF_GDP_t/DEF_GDP_{t-4})$	-0.027740	0.017307	-1.602851	0.1149
$(CPS_{t-1}/DEF_GDP_{t-1})/(CPS_{t-5}/DEF_GDP_{t-5})$	0.062262	0.021367	2.913912	0.0052
PCU _t /PCU _{t-4}	0.550878	0.049290	11.17636	0.0000
RGDP _{t-1} /RGDP _{t-5}	0.279595	0.073225	3.818295	0.0004
R-squared	0.851547	Mean dependent var		1.031036
Adjusted R-squared	0.840343	S.D. dependent var		0.061533
S.E. of regression	0.024587	Akaike info criterion		-4.490936
Sum squared resid	0.032040	Schwarz criterion		-4.313312
Log likelihood	135.2371	F-statistic		76.00384
Durbin-Watson stat	2.217841	Prob(F-statistic)		0.000000
LM(1)	= 0.33	LM(4)	=	0.15
Jarque-Berra	= 0.76	ARCH(1)	=	0.58

	MAPE	THEIL	Bias Proportion	Variance Proportion	Covariance Proportion
BEEIP					
Static	7.5	0.03	0.00	0.00	0.99
Dynamic	16.2	0.11	0.14	0.67	0.19
CI					
Static	4.0	0.02	0.00	0.06	0.93
Dynamic	7.4	0.04	0.01	0.01	0.98
CPI					
Static	1.8	0.00	0.00	0.00	0.99
Dynamic	6.5	0.02	0.25	0.00	0.75
DEFGDP					
Static	3.4	0.03	0.07	0.37	0.56
Dynamic	8.0	0.03	0.14	0.01	0.85
DT					
Static	4.9	0.03	0.04	0.22	0.74
Dynamic	8.4	0.05	0.09	0.13	0.78
DTH Dollar					
Static	6.5	0.04	0.02	0.04	0.94
Dynamic	13.0	0.07	0.34	0.06	0.61
Exc. Rate (USD)					
Static	3.4	0.02	0.01	0.05	0.94
Dynamic	9.2	0.04	0.37	0.44	0.19
...IT_t					
Static	8.4	0.05	0.00	0.04	0.96
Dynamic	8.8	0.05	0.00	0.06	0.94
EXPORTS					
Static	9.0	0.05	0.00	0.01	0.99
Dynamic	12.0	0.07	0.00	0.01	0.99
IMPORTS					
Static	7.2	0.04	0.00	0.00	0.99
Dynamic	20.6	0.11	0.31	0.04	0.65
M1					
Static	6.0	0.04	0.01	0.13	0.86
Dynamic	9.8	0.07	0.01	0.03	0.96
RGDP					
Static	1.8	0.01	0.00	0.05	0.95
Dynamic	4.2	0.02	0.06	0.12	0.81
T BILL RATE					
Static	16.6	0.08	0.00	0.05	0.95
Dynamic	17.1	0.08	0.00	0.04	0.96
TIME DEPOSITS					
Static	5.2	0.05	0.05	0.26	0.69
Dynamic	22.3	0.10	0.19	0.14	0.67
TOTAL REVENUES					
Static	4.6	0.03	0.03	0.12	0.84
Dynamic	11.1	0.03	0.17	0.02	0.81
TOTAL TAX REVENUES					
Static	4.9	0.03	0.02	0.18	0.80
Dynamic	9.4	0.05	0.00	0.13	0.87
WPI					
Static	2.8	0.02	0.00	0.01	0.99
Dynamic	6.3	0.03	0.12	0.08	0.80

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