Research and Monetary Policy Department
Working Paper No:05/12

Some Evidence on the (Ir)rationality of Inflation Expectations in Turkey

Hakan KARA
Hande KÜÇÜK TUĞER

August 2005

The Central Bank of the Republic of Turkey

SOME EVIDENCE ON THE (IR)RATIONALITY OF INFLATION EXPECTATIONS IN TURKEY*

Hakan KARA

Hande KÜÇÜK TUĞER

August 2005

Abstract

This study aims to add to the understanding of inflation expectations in Turkey. We conduct several tests to understand whether economic agents use all the available information to forecast inflation. The answer is a lucid "NO": Using 5 different quantitative expectations series from 3 different surveys, we find that all the expectations series, except the one month ahead forecasts, are biased and inefficient. Furthermore, forecast errors in many cases are significantly correlated with exchange rate changes, revealing that agents do not take into account the lagged effects of the exchange rate movements on inflation while forming their expectations. That is, the role of exchange rate pass-through, as a determinant of inflation, is not well understood. These results also suggest that some form of deviation from rational expectations may be necessary—at least during the disinflation period—in modeling inflation dynamics.

* The views expressed are those of the authors and should not be attributed to the Central Bank of Turkey. We would like to thank Burç Tuğer for many valuable comments and suggestions.

I. Introduction

Understanding inflation expectations is focal to central banks—especially to those targeting inflation directly—for many reasons. First of all, inflation targeting is forward-looking by its nature; any pro-active central bank has to monitor inflation expectations closely to assess whether the public's perception is consistent with monetary policy commitments. Second, inflation expectations feed into inflation through many channels—both direct and indirect. Inflation expectations affect inflation directly through their influence on the wage and price setting decisions of economic agents. Moreover, expectations affect inflation indirectly by underlying economic decisions such as consumption, saving and investment. In highly debted countries such as Turkey, inflation expectations may play an even more important role through their effect on public domestic borrowing costs, which in turn may affect concerns about debt sustainability and influence other key variables such as the exchange rate and risk premium that feed back into inflation. Hence, inflation expectations provide a key input to the modeling process.

Third, output-inflation trade-off is mostly determined by inflation expectations (Friedman, 1968 and Phelps, 1968). This point is also related to how the conduct of monetary policy is affected by inflation expectations. If inflation expectations of the public are in accordance with the inflation target, the central bank would have an opportunity to ignore short-term fluctuations in inflation and take a more medium-term approach to controlling inflation. However, in an opposite situation where expectations are not in line with the inflation target, the central bank may be forced to conduct a more aggressive monetary policy as to convince wage and price setters that the inflation target will be attained (Ranchhod, 2003). To put it differently, monetary policy credibility, which is revealed by inflation expectations, is an indispensible part of the monetary policy.

Needless to say, any technical assessment of inflation expectations has many different dimensions. In this study, we focus on the "rationality" of inflation expectations in Turkey. We do not explicitly deal with credibility issues or how inflation expectations are formed. Nor we ask the question whether they are backward looking or forward looking. We just seek to answer whether inflation expectations provide an unbiased predictor of future inflation, and/or whether they are formed by making efficient use of all available information in the economy.

We think that assessing the rationality of private agents' expectations is of central importance to a monetary authority both from the modeling and from the communications perspective. If private expectations fail to be rational, either policy models should incorporate some degree of bounded rationality, or the central bank should spend more time to communicate its perception of “true” inflation dynamics (here we assume that central bank itself is rational).

Towards this objective, using 5 different quantitative expectations series from 3 different surveys, we conduct tests for two separate hypotheses—unbiasedness and efficiency—to infer about the rationality of Turkish inflation expectations. We find that all the expectations series, except the one month ahead forecasts, are biased and inefficient, therefore not rational. Furthermore, forecast errors in many cases are significantly correlated with exchange rate changes, revealing that agents do not take into account the lagged effects of the exchange rate movements on inflation while forming their expectations.

Rest of the paper is organized as follows: In Section II, we introduce the basic concepts and our methodology related to the rational expectations hypotheses. In section III, we describe various expectation series and their sources and present the empirical findings, leaving the last section to conclude.

II. Methodology

In this section, we introduce the concepts related to rational expectations and explain the hypotheses of interest. Then, we describe the possible problems related to estimation and testing and explain the methodology used to overcome these problems.

Definitions and Hypotheses:

We adopt Muth’s definition for rationality (Muth, 1961): Expectations are rational if they are equal to mathematical expectations conditional on the set of all information relevant for forecasting. Full rationality implies that all available information has been used in an optimal manner. The *f*-step ahead prediction (expectation) of inflation made at time *t*, π_t^f, is said to be rational, and is optimal in the sense that no other unbiased predictor has smaller variance if

$$\pi_t^f = E\left(\pi_{t+f} \middle| I_t\right), \tag{1}$$

where π_{t+f} is inflation rate at time *t+f*, I_t is the information available at time *t* and *E* is the mathematical expectation operator.

This is equivalent to the statement

$$E\left(\varepsilon_t^f \middle| I_t\right) = 0, \tag{1'}$$

where $\varepsilon_t^f = \pi_{t+f} - \pi_t^f$. If regression analysis shows ε_t^f to be a statistically significant function of I_t, the hypothesis of full rationality can be rejected; in other words, forecasters do not make optimal use of all the available information.

It is a clear fact that in making an inflation forecast only a set of all available information can be utilized, since the use of all information can be costly and infeasible. However, this does not imply that forecasts are not rational at all. This brings us to the concept of partial rationality as defined in Brown and Maital (1981).

Suppose that the prediction π_t^f is incomplete, in the sense that I_t, the relevant information set available at time t, is not fully utilized. Predictions make efficient use of this subset of information when

$$\pi_t^f = E\left(\pi_{t+f} \middle| S_t\right), \tag{2}$$

$$E\left(\varepsilon_t^f \middle| S_t\right) = 0, \tag{2'}$$

where S_t is a proper subset of I_t. This property, which Brown and Maital (1981) refer to as partial rationality means that the information actually used—whether or not it is actually complete—is used in an efficient manner. Partial rationality is a necessary but not sufficient condition for full rationality.

The partial rationality hypothesis, stated in (2') can be broken into the separate hypotheses—as suggested by Brown and Maital (1981) and Keane and Runkle (1990) among many others:

(i) unbiasedness

(ii) efficiency.

A test of unbiasedness of inflation expectations can be performed by running the regression

$$\pi_{t+f} = \alpha_0 + \alpha_1 \pi_t^f + \varepsilon_t^f \tag{3}$$

Unbiasedness requires that, $\alpha_0 = 0, \alpha_1 = 1$ and $E\left(\varepsilon_t^f \middle| \pi_t^f\right)$=0. If the joint hypothesis that $H_0: \alpha_0 = 0$ and $\alpha_1 = 1$ is rejected, then the hypothesis of unbiasedness and, with it, the hypothesis of partial rationality is rejected.

The efficiency of inflation expectations, on the other hand, requires that any variable known at time t or before to be orthogonal to the forecast error. That is, if expectations are efficient, no variable known at time t or before should help to reduce the forecast error.

Thus the joint hypothesis that $H_1 : \beta_0 = \beta_1 = 0$ should hold in equation (4)

$$\pi_{t+f} - \pi_t^f = \beta_0 + \beta_1 X_t + \varepsilon_t^f \tag{4}$$

where X_t is any variable in the information set at time *t*.[1] In the context of equation (4) at least two empirical tests for efficiency of inflation expectations can be carried out as was done in Brown and Maital (1981), Forsells and Kenny (2002) and Lyziak (2003) among many others. In one rather weak test, X_t only includes the past forecast (expectational) errors. In this kind of a test, we see whether forecasters (or agents that form expectations) indeed learn from their past forecast errors or not. If the hypothesis is rejected, we can conclude that the forecast error could have been further reduced if the agents had taken into account the previous forecast errors and that agents have not made efficient use of the past errors. The second test, which is a more revealing one, involves the testing of whether the forecast error is correlated with a broader set of variables whose values were known when the forecast was made. In this case, X_t includes lagged policy and state variables which had known values at the time of the forecast.

If neither the unbiasedness nor the efficiency hypotheses are rejected, we can conclude that expectations are not irrational in the sense that all available, relevant information was in fact optimally used in forming expectations.

Estimation

Although the estimation of the test equations (3) and (4) seem straightforward, there are some problems associated with it. The OLS estimates of the parameters in (3) and (4) would be unbiased, since the null hypotheses imply that $E\left(\varepsilon_t^f \middle| \pi_t^f\right)$=0 for (3) and $E\left(\varepsilon_t^f \middle| X_t\right)$=0 for (4). However, the conventionally computed standard errors under OLS are inconsistent, because the residuals in equation (3) and (4) are shown to be serially correlated for forecast horizons longer than 1- period. As put forth by Hansen and Hodrick (1980) and Brown and Maital (1981), for the forecast error, $\varepsilon_t^f = \pi_{t+f} - \pi_t^f$, it can be verified that $E(\varepsilon_t^f \varepsilon_{t+h}^f) \neq 0$ for

[1] The residuals of equation (3) and (4) are both denoted by ε_t^f, because they are equal to each under the null hypotheses: $H_0 : \alpha_0 = 0$ and $\alpha_1 = 1$ and $H_1 : \beta_0 = \beta_1 = 0$.

$h = 1, 2, ..., f-1$. In other words, the f-period ahead expectation errors would be generated by an $MA(f-1)$ process. Therefore, only for $f=1$, will the expectation error be serially uncorrelated.

To obtain a consistent covariance matrix and thus realiable test statistics for our hypotheses we used OLS but made the appropriate modifications in the estimation of the asymptotic covariance matrix as done by Hansen (1982). We allowed for serial correlation up to a moving average of order $f-1$ in the estimate of the covariance matrix, and used Newey-West covariance matrix to ensure positive definiteness.

III. Data and Empirical Results

In this section we describe the data used in testing the rationality of inflation expectations, giving brief information about the different surveys from which the expectation series are taken from. We then report and evaluate the empirical results for each survey.

In testing for the rationality of inflation expectations in Turkey, we made use of 5 different inflation expectation series taken from 3 different surveys. These three surveys are the Expectations Survey, the Business Tendency Survey and the Manufacturing Industry Monthly Tendency Survey (Table 1).

Table 1: Inflation Expectations Series Used in the Analysis

Inflation Expectation	*Horizon*	*Source*
Current-month CPI	1	Expectations Survey, CBRT
Next 2 months' CPI	3	Expectations Survey, CBRT
Next 12 months' CPI	13	Expectations Survey, CBRT
Next 12 months' WPI	13	Business Tendency Survey, CBRT
Next months' Manufacturing Industry Sales Price	1	Manufacturing Industry Tendency Survey, SIS

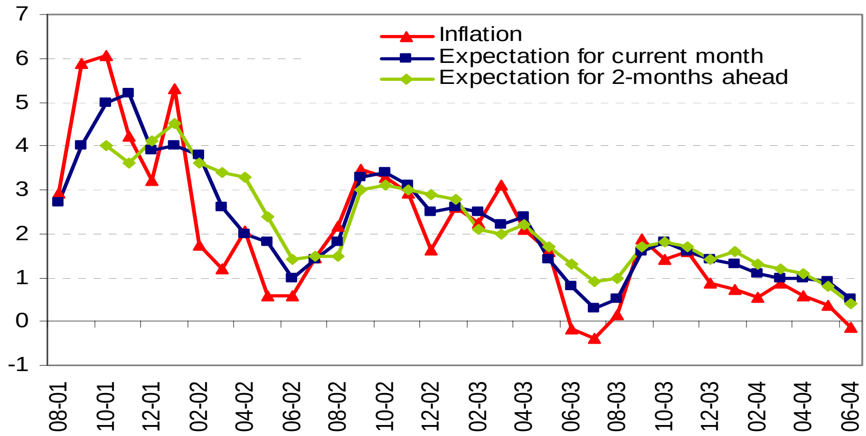
The Expectations Survey :

The Expectations Survey, which is held by the Central Bank of the Republic of Turkey (CBRT), is used to analyze the expectations for CPI inflation in Turkey. The survey, which was first conducted on August 3, 2001, contains the expectations and forecasts of real and financial sector representatives for inflation and other macroeconomic variables. The expectations data are compiled twice a month, once in the first and once in the third week of each month, following the announcement of the previous month's inflation figures at the 3rd of each month. The participants are requested to state their inflation expectations for the current month, 2 months ahead, year-end and 12-months ahead horizons.

In our analysis we used the CPI inflation expectations for the current month, 2-months ahead and 12-months ahead periods and took the results of the first survey – the one that is compiled in the first week – as the inflation expectation of each month.

Graph 1 plots the actual monthly CPI inflation rates with current-month and 2 months ahead inflation expectations. There does not seem to be a systematic bias in either of the expectation series, but there are some periods like the first half of 2002, where the agents consistently overestimated the inflation rates. As one would expect, the current month inflation expectations seem to track inflation better than the two-months ahead expectations. This is also supported by the Root Mean Squared Error (RMSE) statistic.[2] The RMSE of the current month inflation expectations is 0.82, while that of 2 months ahead is 1.02.

Graph 1: Monthly CPI Inflation and Expectations



On the other hand, the plot of the annual CPI inflation and the 12-month ahead annual inflation expectations, reveal that for the whole sample 12-month ahead expectations overshooted the realizations (Graph 2). This is indeed related to the fact that in forming 12-month ahead inflation expectations, agents take into account the last available (known) annual inflation rate as well as the targeted disinflation path. Therefore, 12-month ahead inflation expectations steadily fall complying to the disinflation path, but do not fall enough because

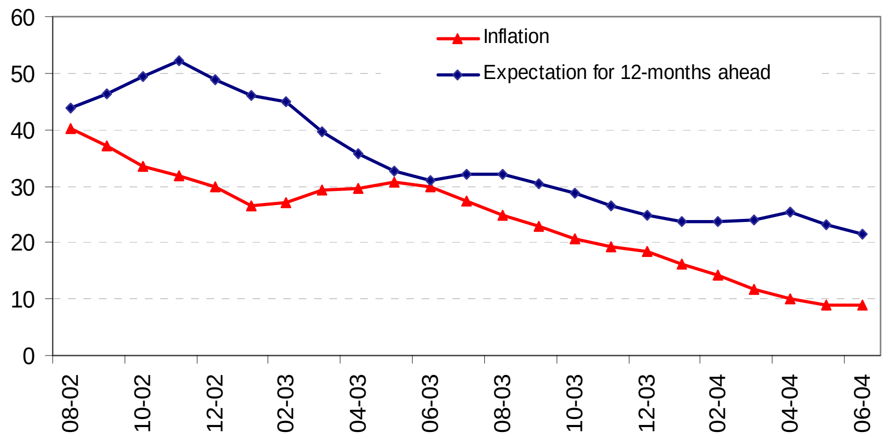
---

[2] $RMSE = \sqrt{T^{-1}\sum_{T=1}^{T}\left(\varepsilon_{t_t}^{f}\right)^2}$ where $\varepsilon_t^f = \pi_{t+f} - \pi_t^f$ is the *f* months ahead forecast error given information I_t available at time *t*, π_{t+f} the realized value at time *t+f* and π_t^f the forecast of π_{t+f} with information set I_t.*T is* the sample size.

they are affected by the realized annual inflation rates.[3] From the plot in Graph 2, we would not expect the unbiasedness hypothesis to hold for 12-month ahead expectations, but nevertheless we held the tests also for this expectational variable.

Before going on with the empirical investigation of the inflation expectations series mentioned above, a few points should be made clear. First of all, because the survey starts in August 2001, the number of observations is quite limited. By the time we made the analysis, there were 35 current-month expectation errors, 33 two-months ahead expectation errors and only 23 twelve-months ahead expectation errors. In fact the asymptotic covariance matrix that we estimate taking into account the serial correlation in the residuals, has desirable properties in large samples.[4] Therefore, it might not be the most efficient estimator, but it is at least consistent.

Graph 2: Annual CPI Inflation and 12-Month ahead Expectations



Source: SIS, CBRT

Another issue is related to the measurement of the expectation horizon. Since the inflation expectation for the current month is based on information available at –the first week of– that month, the forecast horizon seems to be 0 at first glance, i.e. expectation of inflation at time t, based on information at time t. However, since the inflation rate of the month, in which the survey is announced, is not known, the forecast horizon is in fact 1.

The same reasoning is also relevant for the 2-months and 12-months ahead expectations. Take the survey of February 2004 for example. The 2-months ahead expectation corresponds to April 2004. Therefore, the forecast horizon seems like 2 periods, but it is indeed 3 periods, because the February 2004 inflation is not yet known to the agent at the first week of February

[3] For a more detailed explanation see Box II.1 in Monetary Policy Report, October 2003, Central Bank of the Republic of Turkey.

2004, when the expectation is formed. Similarly, the 12-months ahead expectation is indeed a 13-step ahead expectation. This information is important to infer the "true" autocorrelation pattern of the expectation errors: the expectation errors for 2-month and 12-month ahead CPI inflation follow MA(2) and MA(12) processes– rather than MA(1) and MA(11) processes – respectively.[5] The current-month forecast errors have no moving average component.

Table 2 reports the estimation results for equation (3) for the expectations taken from the CBRT Survey of Expectations. While the hypothesis of unbiasedness is not rejected for the current-month expectations (1-step ahead expectations) at 10 percent significance level, it is strongly rejected for the next 2-month's and next 12-month's expectations.

Table 2: Unbiasedness Tests for CPI Inflation Expectations (CBRT Survey of Expectations)

Dependent Variable	**Expectation**	**Sample**	**Sample Size**	α_0	α_1	χ^2	**MA**
Monthly CPI Inflation	Current-month	2001:08-2004:06	35	-0.53	1.14	**2.52**	0
				(0.252)	(0.100)	**(0.10)**	
Monthly CPI Inflation	2-months ahead	2001:10-2004:06	33	-0.69	1.14	**11.39**	2
				(0.301)	(0.178)	**(0.00)**	
Annual CPI Inflation	12-months ahead	2002:08-2004:06	23	-1.65	0.75	**167.8**	12
				(6.220)	(0.156)	**(0.00)**	

Note: Standard errors are in parantheses under coefficients; significance levels are given under χ^2 statistics. The test statistic is an *F*-stat for current-month expectations since the MA order is 0 in that case. $H_0: \alpha_0=0, \alpha_1=1$.

The estimation results revealed that the α_1 coefficient for 2-months ahead expectations is not statistically different from 1 just like the one for current-month expectations.[6] However, the α_0 coefficient on the constant term is more negative and statistically significant for 2-months ahead expectations, leading to the rejection of unbiasedness hypothesis for this series. The negative and significant constant term suggests that 2-months ahead expectations have a tendecy to overestimate inflation. The tendency to overestimate inflation is even more prevelant for next 12 months' expectations, which has an α_1 coefficient statistically not different from 1 at %11 significance level but has a constant more negative than that of both current-month and 2-months ahead expectations, though it is not statistically significant.

To see whether the CPI inflation expectations are efficient, we estimated equation (4) first with only the recent past forecast errors as explanatory variables. We carried out this test only

---

[4] See Chapter 10 of Johnston and Dinardo (1997).

[5] Keane and Runkle (1990) also noticed this issue and stated that in surveys, where π_t is not known when the forecast π^f_t is made, forecast errors will be *MA(f)* rather than *MA(f-1),* as they would be if the forecasters knew π_t when they made their forecasts.

[6] The hypotheses $\alpha_1 = 1$ for current-month and 2-months ahead expectations have p-values 0.16 and 0.42 respectively.

for the current-month and 2-months ahead expectations since the sample size was not enough to do it for the 12-months ahead expectations. The most recent expectation error known when expectations about the current month are formed, is the previous month's expectation error. That is, the expectation error for the current month should not be correlated with the expectation error of the previous month or the months before the previous month, for weak-efficiency to hold. For 2-months ahead expectations, on the other hand, the most recent expectation error that is known at the time of the expectation is the one of three months earlier. That is, when making an expectation about April 2004's inflation in February 2004, the agent observes the expectation error of January 2004 – the difference between the January expectation formed in November 2003 and the realized January inflation. The results are reported in Table 3.1.

Table 3.1: Weak Efficiency Tests for CPI Inflation Expectations
(CBRT Survey of Expectations)

Dependent Variable	**Expectation**	**Sample**	**Sample Size**	β_0	β_1	β_2	χ^2	**MA**
Monthly CPI Inflation	Current-month	2001:10-2004:06	33	-0.31	0.04	-0.14	2.25	0
				(0.13)	(0.16)	(0.16)	(0.10)	
Monthly CPI Inflation	Next 2-months	2002:01-2004:06	29	-0.49	-0.07	-	8.94	2
				(0.17)	(0.18)	-	(0.01)	

Note: Standard errors are in parantheses under coefficients; significance levels are given under χ^2 statistics. The test statistic is an *F*-stat for current-month expectations since the MA order is 0 in that case. H_0:β_0=β_1=β_2 =0. The equations are as follows:

(1) $\pi_{t+1} - \pi_t^1 = \beta_0 + \beta_1(\pi_t - \pi_{t-1}^1) + \beta_2(\pi_{t-1} - \pi_{t-2}^1) + \varepsilon_t^1$

(2) $\pi_{t+3} - \pi_t^3 = \beta_0 + \beta_1(\pi_t - \pi_{t-3}^3) + \varepsilon_t^3$

As suggested by the χ^2 statistics, the weak efficiency holds for expectations about the current month inflation but is rejected for 2-months ahead expectations. A second, stronger test of efficiency for the CPI inflation expectations, can be done by including policy and state variables as explanatory variables in equation (4), whose values were known at the time of the forecast. Following the reasoning in Brown and Maital (1981) we included two types of lagged explanatory variables – those that are believed to reflect monetary and fiscal policy and those that reflect the state of the economy when the expectations are formed.

The three policy variables chosen were: ***onc***, the annual compounded overnight interest rate at the interbank money market, whose value is set by the Central Bank in view of future path of consumer price inflation; ***dps,*** the monthly percentage change in the real primary surplus (consolidated budget); ***ddd*** , the monthly percentage change in the net domestic debt stock of the Treasury.

The state variables chosen were: π_t^{CPI}, π_t^{WPI}, the monthly percentage change in consumer and wholesale prices; ***cu,*** the capacity utilization rate of the manufacturing industry**;** ***sales,*** the monthly percentage change in the sales of the manufacturing industry, ***der,*** the monthly percentage change in the exchange rate, TL/USD. [7]

The proposed variables are lagged appropriately, in a way to be consistent with the information set used in forming the expectations (See **Appendix 1**). For example, in explaining the 1-step ahead (current-month) expectation error, the ***first*** lags of π^{CPI}, π^{WPI}, *der* and *onc* and the ***second*** lags of *dps, ddd, cu* and *sales* are used as explanatory variables, because their values were known at the time of the forecast. With the same reasoning, the ***third*** lags of π^{CPI}, π^{WPI}, *der* and *onc* and the ***fourth*** lags of *dps, ddd, cu* and *sales* are used as explanatory variables in explaining the 3-step ahead (next 2-months) expectation error.

Table 3.2: Strong Efficiency Tests for CPI Inflation Expectations (CBRT Survey of Expectations)

Exp. Var. / Dep.Var	$\pi_{t+1} - \pi_t^1$		$\pi_{t+3} - \pi_t^3$		
	1	**2**	**1**	**2**	**3**
Cons	0.41	-0.20	-1.43	-3.09	-1.99
	(0.94)	(0.97)	(0.82)	(0.56)	(0.74)
π_{t-1}^{cpi}	-0.19	-0.08	-0.13	-0.20	-0.22
	(0.26)	(0.46)	(0.51)	(0.09)	(0.11)
π_{t-1}^{wpi}	0.14	-	-0.06	-	-
	(0.31)		(0.72)		
Der_{t-1}	0.03	0.04	0.11	0.10	-
	(0.35)	(0.14)	(0.00)	(0.00)	
Onc_{t-1}	-0.00	0.01	0.01	0.01	0.02
	(0.47)	(0.35)	(0.59)	(0.40)	(0.25)
Cu_{t-2}	-0.02	-0.01	0.01	0.03	0.01
	(0.82)	(0.91)	(0.87)	(0.61)	(0.85)
$Sales_{t-2}$	0.01	-	0.01	-	-
	(0.50)		(0.73)		
Ddd_{t-2}	0.08	0.08	0.05	0.05	0.05
	(0.13)	(0.12)	(0.37)	(0.37)	(0.42)
Dps_{t-2}	0.00	0.00	0.00	0.00	0.00
	(0.29)	(0.45)	(0.98)	(0.85)	(0.63)
F-stat	1.34	1.47	2.42	3.30	1.49
	(0.26)	(0.22)	(0.04)	(0.01)	(0.22)
Sample	01:08- 04:06	01:08- 04:06	01:10-04:06	01:10-04:06	01:10-04:06
Sample size	35	35	33	33	33
MA	0	0	2	2	2

Note: Parentheses under coefficients and χ^2 statistics are p-values. The test statistic is an *F*-stat for current-month expectations since the MA order is 0 in that case. H_0:β_i= 0.

[7] The annual change in the industrial production index, monthly GDP gap and the treasury bill rate in the primary market are also tried as state variables. Their results are not reported since they do not imply a change in the results.

The estimation results reported in Table 3.2 show that for the current-month expectations the null hypothesis of efficiency is not rejected. Using the full set of variables shown in the first column of Table 3.2, we obtained an *F*-stat with *p*-value 0.26. When we controlled for the effects of strong correlation among some of the variables such as the CPI and WPI inflation, and the capacity utilization rate and manufacturing industry sales by excluding WPI inflation and sales from the first equation, we ended up with a *p*-value of 0.22 for the *F*-stat. [8]

The estimation results with the same variables but with different lag structures consistent with the 3-months horizon show that the null hypothesis of efficiency is strongly rejected for the next 2-month's inflation expectations. The rather surprising part of this result is that the only individually significant variable in explaining the expectation error is the depreciation rate, which is a key variable that is monitored by all agents in the economy. The highly significant positive coefficient of the depreciation rate points out to the fact that when forming expectations about the next two month's inflation rate, agents do not fully incorporate the average depreciation rate of the previous month. That is, agents are not fully aware of the lagged effects of the exchange rate depreciation on monthly inflation. Agents lack information about the true pattern of exchange-rate pass-through to inflation. This may come from the fact that, the Turkish experience with the floating exchange rate regime is limited. Prior to February 2001, there was always some kind of a real exchange-rate peg, which led to an immediate pass-through of exchange rate to inflation since the changes in the exchange rate were perceived to be permanent. However, with the adoption of the floating exchange rate regime, the duration of the exchange-rate pass-through lengthened because there is greater uncertainty concerning the "permanence" of the change in the exchange rate. [9]

When the three-period lagged depreciation rate is excluded from the test equation the χ^2 statistic leads to the non-rejection of the efficiency hypothesis for the next 2 months expectations, but the conclusion should be based on the test-statistic obtained using the complete information set at hand.

The efficiency tests for the next 12 months ahead inflation expectations are carried out but not reported because of very low degrees of freedom. However, the estimations done by using appropriately lagged and differenced variables defined above, lead to a strong rejection of the efficiency hypothesis for 12-month ahead expectations series.

[8] Other alternative nested models were also estimated, none of them led to the rejection of the null hypothesis.
[9] See Kara *et. al.* (2005) for a detailed analysis of how exchange rate pass-through changed with the floating regime.

In sum, only the current-month inflation expectations are found to be unbiased and efficient among the three series taken from the CBRT Survey of Expectations. The full rationality hypotheses are rejected for the next 2-months and next 12-months inflation expectations.

Expectations from the Business Tendency Survey

The Business Tendency Survey (BTS), which has been conducted by the CBRT since December 1987, includes answers of the private industrial enterprises – chosen on the basis of Istanbul Chamber of Industry's ranking of the biggest 1000 firms – on various questions related to orders, stocks, costs, production, selling prices, inflation and interest rates.

There are three inflation expectations in the BTS: One is for the next three month's inflation, which is in the qualitative form, reported as the proportion of respondents expecting a "rise", a "fall" or "no change" in inflation in the next 3 months. The other two are the quantitative expectations for the year-end and the next 12 months' WPI inflation expectations, respectively. To avoid the problems related to quantification of the qualitative data we did not analyze the qualitative next 3 months' inflation expectation. [10] The expectations for the year-end inflation are also not analyzed because the fixed forecast horizon requires modifications in our testing procedure. [11]

Although the BTS has been compiled since December 1987, the quantitative question for the next 12-months inflation was added in January 1999. Therefore the first next 12 months' WPI inflation expectation corresponds to January 2000, leaving us with 54 observations until June 2004.

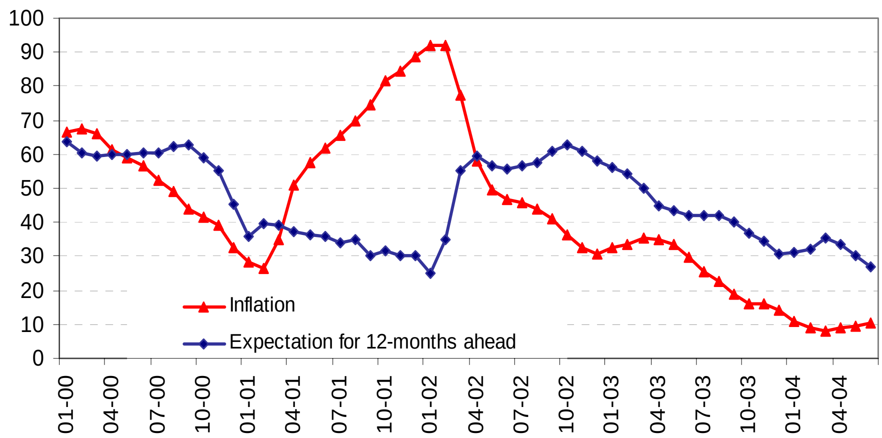
Because of the wider content of the Business Tendency Survey compared to the Survey of Expectations, both in terms of the number of survey questions and the number of respondents, the respondents of the former are given a longer time (almost the full month) to fill out the survey compared to that of the latter. Therefore, although both surveys are announced in the first week of each month, the BTS includes expectations formed in the *previous* month, while the Survey of Expectations include the expectations formed in the *current* month (See Appendix 1).

To be more precise, suppose that we are in the first week of February 2004 and both the BTS and the Survey of Expectations are announced. While the BTS announced in the first

[10] Karadaş and Öğünç (2003) test the rational expectations hypothesis for the *qualitative* next-3-month's inflation expectations. Their results fail to reject rationality for the 1989:04-1998:04 period.

week of February 2004 includes expectations formed at January 2004, the Survey of Expectations includes expectations formed at (the first week of) February 2004. The respondents of the BTS are supposed to send January expectations until the 3rd of February 2004, while that of the Expectations Survey start to fill February expectations after the 3rd of February. Therefore, while the respondents of the BTS announced in February do not know January inflation figures, that of the Survey of Expectations do.[12] However, this does not create an important informational difference because, as the BTS announced in February includes expectations formed in January while the Survey of Expectations announced at the same time includes expectations formed in February, neither the respondents of the BTS nor that of the Survey of Expectations are aware of the inflation figures of the month in which they are forming their expectations. Consequently, the next 12 months' WPI inflation expectations taken from the BTS involves a 13-step ahead expectation error, just like the next 12 months' CPI inflation expectations taken from the Survey of expectations. In other words, both expectation errors have MA(12) autocorrelation patterns.

Graph 3: Annual WPI Inflation and 12-Month ahead Expectations (BTS)



Source: SIS, CBRT

Before going on with the empirical test of unbiasedness, it would be beneficial to take a look at the plot of the next 12 months' WPI inflation expectations and realizations (Graph 3). The plot of the data suggest that there is a high bias proportion in next 12 months' WPI inflation expectations. This bias was downward for the period between March 2001 and March 2002 – because of the currency crisis in February 2001 that led to the acceleration of inflation starting with March 2001. The downward bias diminished in March 2002, because

[11] See Bakshi, Kapetanios and Yates (2003) for a test of rational hypothesis on fixed-horizon inflation forecasts.
[12] Inflation figures of each month are announced on the 3rd of the following month. For example, January inflation figures are announced on the 3rd of February.

agents were aware of the crisis in March 2001 when they were forming 12-month ahead expectations. Following this period, expectations exhibited a systematic upward bias, most probably because of the reasons we discussed for the 12-month ahead expectations taken from the Survey of Expectations, namely the dependence of the agents on past realized inflation rates although the economy is in a continuous disinflation process.

Table 4: Unbiasedness Tests for WPI Inflation Expectations (BTS)

Dependent Variable	Expectation	Sample	Sample Size	α_0	α_1	χ^2	MA
Annual WPI Inflation	Next 12-months	2000:01-2004:06	54	35.3	0.19	6.2	12
				(38.9)	(0.69)	(0.04)	
Annual WPI Inflation	Next 12-months	2002:08-2004:06	23	-15.6	0.91	389.2	12
				(6.40)	(0.10)	(0.00)	

Note: Standard errors are in parantheses under coefficients; significance levels are given under χ^2 statistics. H_0 : α_0=0, α_1=1 for equation (3).

Not surprisingly, the empirical tests of unbiasedness resulted in rejection of the null hypothesis for the whole sample, namely 2000:01-2004:06. The test results did not change when the effects of the crisis in 2001:01 are removed by restricting the sample to 2002:08-2004:06[13] although the coefficient of the expectation term became closer to 1. Indeed, for the latter sample α_1 coefficient is statistically not different from 1 with a significance level (p-value) of 0.35 as shown in Table 4. These results suggest that as in the case of the next 12 months' CPI inflation expectations taken from the Survey of Expectations, the next 12 months' WPI expectations taken from the BTS are good in tracking the trend in inflation but they overestimate the level of inflation. The upward bias shows itself as a significant negative constant term.

Table 5.1: Weak Efficiency Tests for WPI Inflation Expectations (BTS)

Dependent Variable	Expectation	Sample	Sample Size	β_0	β_1	χ^2	MA
Annual WPI Inflation	Next 12-months	2001:02-2004:06	41	1.04	-0.37	13.17	12
				(12.5)	(0.32)	(0.00)	
Annual WPI Inflation	Next 12-months	2002:08-2004:06	23	-19.39	-0.03	22.88	12
				(1.21)	(0.03)	(0.00)	

Note: Standard errors are in parantheses under coefficients; significance levels are given under χ^2 statistics. *H_0*:β_0=β_1=0. The equation is as follows:

(1) $\pi_{t+13} - \pi_t^{13} = \beta_0 + \beta_1(\pi_t - \pi_{t-13}^{13}) + \varepsilon_t^{13}$

The weak test of efficiency, done by estimating equation (4) with the previous forecast error as an explanatory variable, leads to the strong rejection of the efficiency hypothesis,

[13] This is the same sample available for the next 12 months' ahead expectations of CPI inflation taken from the Survey of Expectations. It is used to make the results for the two expectation series comparable.

although the coefficient of the lagged error term is individually insignificant (Table 5.1). The rejection of the null hypothesis implies that the previous error term, if taken into account, could have reduced the expectation error. The results do not change when the sample is restricted to 2002:08-2004:06 to get rid of the effect of the crisis on the expectation error.

For the second test of efficiency based on equation (4), we used the same set of policy and state variables as in the case of tests for the expectations taken from the Survey of Expectations, but this time taking the *annual* differences of the level variables, since expectations are for *annual* inflation. As discussed above, when the BTS expectations are formed, say at time *t*, inflation rates of time *t* are not known. However, it is more likely that the monthly average exchange rate and interest rates of period *t* are known. In addition, the *t-1* values of the the capacity utilization rate, the domestic debt stock and the primary surplus as well as the *t-2* value of the industrial production are known to the agent when forming expectations at time *t*. [14](See Appendix 1).

Table 5.2: Strong Efficiency Tests for WPI Inflation Expectations (BTS)

Exp. Var. / Dep.Var	$\pi_{t+13}-\pi_t^{13}$	$\pi_{t+13}-\pi_t^{13}$	Exp. Var. / Dep.Var	$\pi_{t+13}-\pi_t^{13}$	$\pi_{t+13}-\pi_t^{13}$
Cons	-174.6	-15.8	Cons	-127.8	-5.4
	(0.12)	(0.40)		(0.15)	(0.84)
π_{t-1}^{cpi}	1.4	-	π_{t-1}^{cpi}	1.1	-
	(0.09)			(0.19)	
π_{t-1}^{wpi}	-1.2	0.03	π_{t-1}^{wpi}	-1.2	-0.2
	(0.11)	(0.92)		(0.17)	(0.64)
der_t	0.2	0.42	der_{t-1}	0.4	0.5
	(0.20)	(0.02)		(0.11)	(0.06)
onc_t	0.01	0.01	onc_{t-1}	0.0	0.0
	(0.0)	(0.00)		(0.12)	(0.14)
cu_{t-1}	1.9	-	cu_{t-2}	1.5	-
	(0.18)			(0.25)	
dip_{t-2}	1.3	0.81	dip_{t-2}	0.9	0.7
	(0.08)	(0.28)		(0.06)	(0.27)
dd_{t-1}	0.1	-0.44	dd_{t-2}	-0.09	-0.46
	(0.78)	(0.00)		(0.60)	(0.00)
dps_{t-1}	0.0	0.00	dps_{t-2}	0.00	0.00
	(0.86)	(0.53)		(0.80)	(0.91)
χ^2	3277.8	1571.6	χ^2	581.5	340.9
	(0.0)	(0.0)		(0.0)	(0.0)
Sample	00:01-04:06	00:01-04:06	Sample	00:01-04:06	00:01-04:06
Sample size	54	54	Sample size	54	54
MA	12	12	MA	12	12

Note: Parentheses under coefficients and χ^2 statistics are p-values. The test statistic is an *F*-stat for current-month expectations since the MA order is 0 in that case. H_0:β_i=0.

[14] In order to have a precise understanding of which information was available to the respondents, the responding dates of the agents may be checked. Here, we implicitly assume that most of the respondents fill the surveys in the last week of the month.

Thus, for efficiency hypothesis to hold, the expectation error related to the next 12 months' inflation, should be orthogonal to these appropriately lagged variables. But, as can be seen from Table 5.2 efficiency hypothesis is strongly rejected for the next 12 months' WPI inflation expectations. The results do not change if we exclude CPI inflation, which is highly correlated with WPI inflation, and capacity utilization rate, which is correlated with annual change in industrial production index (second column of Table 5.2).[15] This may be stemming from two facts: First, agents forming expectations about next 12 months' WPI inflation may not really be utilizing the available information in forming expectations. Secondly, the majority of the respondents may be giving back the results before waiting for the last week of the time allowance and thus may not be having a chance to see the recent announced values of the related variables, which could have been used in forming their expectations. To leave out this possibility we reestimated the equations in the first panel of Table 5.2, but this time by lagging some of the variables whose values become known towards the end of the month, such as the percentage change in *average* exchange rate, overnight interest rates, capacity utilization rate and fiscal variables. [16]However, according to the estimation results reported in the second panel of Table 5.2, the efficiency hypothesis is still strongly rejected for the next 12 months WPI inflation expectations.

To conclude the next 12 months' WPI inflation expectations are not rational since the unbiasedness hypothesis is rejected at the first place and at the second place all the available information is not used efficiently by the agents that form these expectations.

Expectations from the Manufacturing Industry Tendency Survey (MITS)

The last survey that we use to analyze inflation expectations is the Manufacturing Industry Tendency Survey (MITS), which is prepared monthly by the State Institute of Statistics since February 1991. The MITS includes production, sales and sales price expectations of nearly 1200 private and public enterprises which produce approximately 70 percent of the total manufacturing industry value added. Since this survey is applied to the manufacturing

[15] Various nested models of the first model are tried, other variables such as the Treasury bill rate and the percentage change in average petroleum price index are added to the models but the test results did not change. What is more, controlling for the effects of the crisis by starting the sample from 2002:05 did not also change the results.

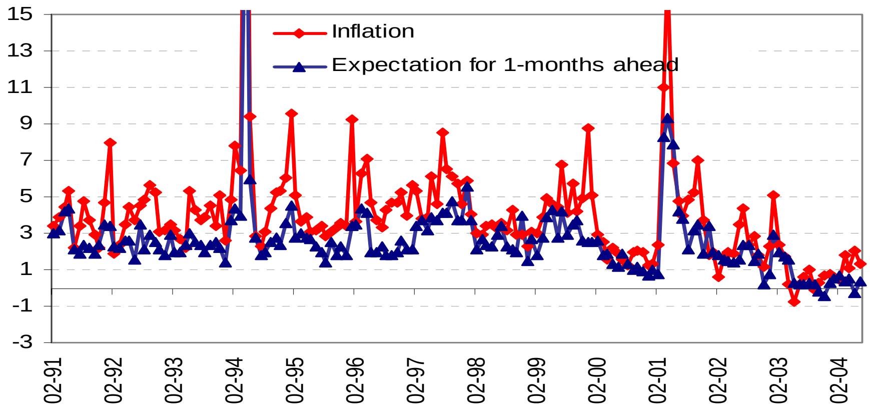
[16] Industrial production index at time *t* is announced in the first week of *t+2*. Capacity utilization rate and domestic borrowing figures at time *t* are announced in the third week of *t+1*, while primary surplus of time *t* is publicly known in the last week of time *t+1*. Although their daily values are known, the monthly averages of the exchange rate and the overnight interest rate become available at the end of each month.

industry, the sales price inflation expectation of the next month can be regarded as total manufacturing industry inflation expectation.

MITS questionnaires are sent to the enterprises in the third week of each month and are expected to be filled and returned until the end of each month. Therefore, when filling the sales price expectation of the next month, inflation rate of the current month is available to the respondent. Therefore, MITS next months' sales price expectation is a 1-step ahead expectation just like the current month expectation of the Survey of Expectations.

The plot of the next month's expected manufacturing industry inflation and the realization show that the expectations track the general trend of monthly inflation well but for most of the time stay below the realizations (Graph 4). This is an interesting observation because the participants of the survey are in fact the actual price setters. The level difference may stem from the fact that each participant reflects the expectation about his own sector's sales price and the weights used in combining each sector to reach the overall manufacturing industry sales price expectation (weights based on value added) are different than the weights used in constructing the official manufacturing sector price index.

Graph 4: Monthly Manufacturing Sector Inflation and Next Month's Expectation (MITS)



Source: CBRT, SIS

In accordance with the plot of the data, the empirical test led to a rejection of the null hypothesis of unbiasedness for both the whole sample and the 2001:08-2004:06 sample as shown in Table 5. However, while the individual α_1 coefficient is found to be significantly greater than 1 for the whole sample, it is statistically not different from 1 for the post-crisis sample with a significance level of 0.35. This points to the fact that, the downward bias in the next month's expectations decreased in the latter sample, but the unbiasedness hypothesis is still rejected for manufacturing sector inflation expectations.

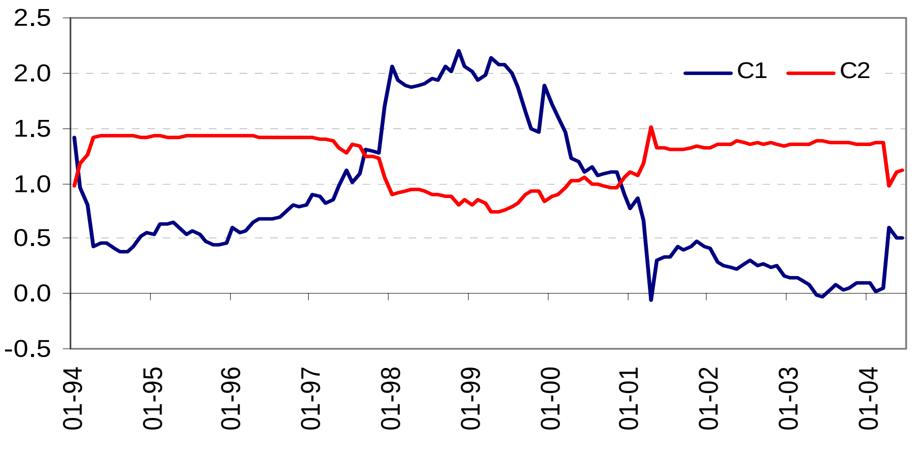
Table 6: Unbiasedness Tests for Manufacturing Sector Inflation Expectations (MITS)

Dependent Variable	Expectation	Sample	Sample Size	α_0	α_1	*F-stat*	MA
Monthly Man. Inf.	Next month	1991:02-2004:06	161	0.35	1.38	125.1	0
				(0.16)	(0.04)	0.00	
Monthly Man. Inf.	Next month	2001:08-2004:06	35	0.46	1.18	6.28	0
				(0.31)	(0.19)	0.00	

Note: Standard errors are in parantheses under coefficients; significance levels are given under ***F***-statistics. The test statistic is an *F*-stat since the MA order is 0 for next month's expectations. $H_0: \alpha_0=0, \alpha_1=1$.

To see how the coefficients of the test equation in Table 6 varied over time, we used three year rolling samples. The first sample is between 1991:02 and 1994:01, for which the coefficient of the expectation term is 0.97 and statistically not different from 1. Rolling the sample three steps and arriving at the 1991:05-1994:04 sample, which is the first sample that includes the 1994 crisis, the coefficient rises to 1.42 and becomes statistically greater than 1 until April 1997. After this date, 1994 crisis falls out of the sample and the coefficient of the expectation term starts to decrease until another upward level shift in 2001, which lasts until March 2004 (Graph 5). For the last three samples that are considered, the α_1 coefficient is statistically not different from 1, but the unbiasedness hypothesis is still rejected. [17]

Graph 5: Evolution of the Unbiasedness Test Equation Coefficients



Notes: i)Rolling samples are marked by ending observations, i.e. the coefficient plotted against 1994:01 comes from the estimation made for 1991:02-1994:01 sample.
ii)C1 and C2 refer to α_0 and α_1 in Table 6, respectively.

The point of this analysis is that the 1994 and 2001 crises play an important role in the rejection of the unbiasedness hypothesis for manufacturing sector inflation expectations. Not only during the crisis months but also in the following months agents in the manufacturing sector systematically underestimated the manufacturing sector inflation. This may be due to the fact that agents underpredicted the exchange-rate pass-through to prices following the crises that both brought about large devaluations.

Table 7.1: Weak Efficiency Tests for Manufacturing Sector Inflation Expectations

Dependent Variable	Expectation	Sample	Sample Size	β_0	β_1	β_2	***F*-stat**	MA
Monthly Man. Inf.	Next month	1991:04-2004:06	159	0.99	0.26	0.02	46.4	0
				(0.18)	(0.08)	(0.08)	(0.00)	
Monthly Man. Inf.	Next month	2001:08-2004:06	35	0.43	0.36	0.03	5.9	0
				(0.23)	(0.18)	(0.18)	(0.00)	

Note: Standard errors are in parantheses under coefficients; significance levels are given under ***F***-statistics. The test statistic is an *F*-stat since the MA order is 0. H_0:β_0=β_1=β_2 =0. The equation estimated for 2 different samples are as follows:

(1) $\pi_{t+1} - \pi_t^1 = \beta_0 + \beta_1(\pi_t - \pi_{t-1}^1) + \beta_2(\pi_{t-1} - \pi_{t-2}^1) + \varepsilon_t^1$

The weak efficiency test is also rejected for the next month's manufacturing sector inflation expectations (Table 7.1). This suggests that in forming expectations about next month, respondents do not take into account their previous expectation error.

Table 7.2: Strong Efficiency Tests for Manufacturing Sector Inflation Expectations

Exp. Var. \ Dep.Var	$\pi_{t+1} - \pi_t^1$		$\pi_{t+1} - \pi_t^1$	
	1	**2**	**1**	**2**
Cons	0.08	0.03	-3.24	-5.55
	(0.97)	(0.99)	(0.68)	(0.41)
π_t^{cpi}	-0.05	-	-0.08	-
	(0.52)		(0.68)	
π_t^{man}	-0.02	-0.06	0.10	0.04
	(0.76)	(0.31)	(0.65)	(0.81)
der_t	0.11	0.12	0.10	0.12
	(0.00)	(0.00)	(0.08)	(0.02)
onc_t	0.00	0.00	0.01	0.01
	(0.02)	(0.02)	(0.62)	(0.51)
cu_{t-1}	0.01	0.01	0.04	0.07
	(0.67)	(0.67)	(0.66)	(0.38)
$sales_{t-1}$	0.01	-	0.02	-
	(0.48)		(0.45)	
dd_{t-1}	-0.01	-0.01	0.04	0.04
	(0.67)	(0.71)	(0.57)	(0.54)
dps_{t-1}	0.00	0.00	0.00	0.00
	(0.97)	(0.90)	(0.26)	(0.25)
F-stat	20.1	25.9	3.2	4.1
	(0.00)	(0.00)	(0.00)	(0.00)
Sample	**91:04- 04:06**		**01:08-04:06**	
Sample size	159	159	35	35
MA	0	0	0	0

Note: Parentheses under coefficients and χ^2 statistics are p-values. The test statistic is an *F*-stat for current-month expectations since the MA order is 0 in that case. H_0:β_i= 0.

[17] The unbiasedness hypothesis is rejected for all (126) of the 3-year width rolling samples that we considered.

For the second test of efficiency the same set of variables that are used in the test for current and next 2 months' monthly CPI expectations are utilized. Estimation results of equation (4) with these variables are given in Table 7.2, first for the whole sample and then for the 2001:08-2004:06 sample – to compare with current month expectations from the Survey of Expectations. The hypothesis of efficiency is rejected for both samples and for alternative specifications nested in model (1) implying that manufacturing sector inflation expectations are not rational.[18] It is worth noting that exchange rate depreciation has a positive and significant coefficient in explaining one step ahead manufacturing sector inflation expectation in both samples for all alternative specifications that we considered as in the case of next 2 months CPI inflation expectations taken from the Survey of Expectations.

IV. Conclusion

We have tested the rationality of inflation expectations in Turkey using 5 distinct inflation expectations data from 3 different surveys. Our empirical results revealed that (partial) rationality hypothesis holds only for the one-month ahead CPI inflation expectations. The test results for the 12 month ahead CPI and WPI expectation series suggest that both tend to track the general trend in inflation, but they consistently overestimate the level of inflation, WPI expectations having a relatively higher bias proportion compared to CPI expectations. Furthermore, while the 2-month-ahead CPI inflation expectations exhibit an upward bias, 1-month ahead manufacturing sector inflation expectations reveal a downward bias. Interestingly, errors related to both the next 2 months' CPI inflation and next months' manufacturing sector inflation expectations are significantly correlated with exchange rate depreciation. In other words, the survey respondents, to a great extent, do not incorporate the impact of exchange rate variations in their expectations! This finding is quite surprising, given that exchange rate movements are one of the main determinants of short run fluctuations in Turkish inflation.[19]

The rejection of the rationality hypotheses for most of the inflation expectations series at hand suggests that private agents' expectations should not serve as the main "response variable" for the monetary authority.[20] This argument echoes Bernanke and Woodford's

[18] Using monthly private manufacturing sector inflation, Us and Metin-Özcan (2005) find that near-rational expectations—as described by optimal univariate expectations where agents use information on past inflation optimally while data on other variables are ignored—fit the data better than the perfectly rational or purely adaptive expectations.
[19] There is ample evidence on exchange rate pass-through weakening in the floating exchange rate period, though. However, the cumulative impact is still sizeable. See Kara *et. al.* 2005 for more details.
[20] Central Bank of Turkey, through its monthly reports and press releases, has expressed this fact several times.

(1997) conclusion that, "although private-sector forecasts may contain information useful to the central bank, ultimately the monetary authorities must rely on an explicit structural model of the economy to guide their policy decisions". Needless to say, central bank, by sharing its view on the transmission mechanism may contribute to the private agents' understanding of the economy. This is particularly important for not going into an "expectation trap".

That said, not all our findings are unpleasant regarding the inflation expectations. In fact, part of our analysis here—of rather long expectation series such as the next 12 months WPI inflation and next months manufacturing sector inflation expectations—conveys that bias proportions are falling and efficiency is increasing since the implementation of the floating exchange rate. In other words, private agents are becoming better inflation forecasters in time. However, some form of deviation from rational expectations may still be necessary—at least during the disinflation period—in modeling inflation dynamics.

REFERENCES

Bakshi, H. , Kapetanios, G., Yates, A. 2003. Rational Expectations and Fixed-event Forecasts: An Application to UK Inflation. *Bank of England Working Paper* 176.

Bernanke, B., and Woodford M. 1997. Inflation Forecasts and Monetary Policy. *Journal of Money Credit and Banking* 29: 653-685.

Brown, B. Y.and Maital, S. 1981. What Economists Know? An Empirical Study of Experts' Expectations. *Econometrica* 49: 491-504.

Forsells, M. and Kenny, G. 2002. The Rationality of Consumer Inflation Expectations: Survey-based Evidence for the Euro-area. *European Central Bank Working Paper* 163.

Friedman, M. 1968. The Role of Monetary Policy. *American Economic Review* 58: 1-17.

Hansen, L. P. 1982. Large Sample Properties of Generalized Method of Moments Estimators. *Econometrica* 50: 646-660.

Hansen, L. P. and R. J. Hodrick. 1980. Forward Exchange Rates as Optimal Predictors of Future Spot Rates: An Econometric Investigation. *Journal of Political Economy* 88: 829-853.

Johnston, J. and Dinardo, J. 1997. Econometric Methods. McGraw-Hill. Fourth Edition.

Kara, H., Özlale, Ü., Tuğer, H., Tuğer, B., Yavuz, D., Yücel. E. 2005. Exchange Pass-through In Turkey: Has It Changed And To What Extent? Central Bank of Turkey, Working Paper 04/05.

Karadaş, E. and Öğünç, F. 2003. An Analysis of Private Manufacturing Industry's Inflation Expectations. *presented* at ERC International Conference in Economics VII.

Keane, M. P. and Runkle, D. E. 1990. Testing the Rationality of Price Forecasts: New Evidence from Panel Data. *American Economic Review* 80: 714-735.

Lyziak, T. 2003. Consumer Inflation Expectations in Poland. *European Central Bank Working Paper* 287.

Muth, J. F. 1961. Rational Expectations and the Theory of Price Movements. *Econometrica* 29: 315-335.

Phelps, E. S. 1968. Money-wage Dynamics and Labor Market Equilibrium. *Journal of Political Economy,* 76: 678-711.

Ranchhod, S. 2003. The Relationship between Inflation Expectations Survey Data and Inflation. *Reserve Bank of New Zealand Bulletin,* 4.

Us, V., Metin-Özcan, K. 2005. Optimal Univariate Expectations under High and Persistent Inflation: New Evidence from Turkey. *Physica A*, 346: 499-517

APPENDIX 1

Table A.1: Time-table of Data Announcements

	t	*t+1*	*t+2*	*Source*
Expectations				
πcpi_t^f	+ (*first week*)			Expectations Survey, CBRT
πwpi_t^f		+ (*first week)*		Business Tendency Survey, CBRT
πman_t^f		+ (*third week)*		Manufacturing Industry Tendency Survey, SIS
State Variables				
πcpi_t , πwpi_t , πman_t		+ (3^{rd} *day*)		SIS
der_t	+			CBRT
cu_t		+ (*third week)*		Manufacturing Industry Tendency Survey, SIS
$sales_t$		+ (*third week)*		Manufacturing Industry Tendency Survey, SIS
ip_t			+ (*first week)*	SIS
Policy Variables				
onc_t	+			CBRT
dd_t		+ (*last week)*		Condolidated Budget Domestic Debt, Treasury
ps_t		+ (*third week)*		Public Accounts Bulletin, Ministry of Finance

Note: *t* refers to a month.

Table A.2: Abbreviations

πcpi_t^f	*f*-step ahead CPI inflation expectations	cu_t	Capacity utilization rate, Manufacturing Industry
πwpi_t^f	*f*-step ahead WPI inflation expectations	$sales_t$	Sales, Manufacturing Industry
πman_t^f	*f*-step ahead WPI inflation expectations	ip_t	Industrial Production Index
πcpi_t	CPI Inflation	onc_t	Overnight borrowing rate at Interbank Money Market
πwpi_t	WPI Inflation	dd_t	Domestic Debt Stock, Consolidated Budget
πman_t	Manufacturing Industry Sales Price Inflation	dps_t	Primary Surplus, Consolidated Budget
der_t	Average Exchange Rate Depreciation		