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RELATIONSHIP BETWEEN EXPECTED AND ACTUAL INFLATION IN TÜRKİYE

Serhat ALPAĞUT [1]

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Abstract

Expectations are an important component that directly or indirectly affects all macroeconomic indicators. The final results in the economy are a realization of the predictions made previously. Decision units make a prediction with their information set, whether they have Adaptive or Rational expectations, and make economic decisions according to these predictions. Thus, expectations become a reality. Relevant theories show that there is a positive relationship between inflation and expected inflation and that there are transmission channels that ensure positivity. However, in some special cases (Central Banks' policy preferences, devaluations, monetary policy errors, or temporal errors in policy implementation), this positivity may be disrupted. While some studies indicate that until a certain period, there was a positive and harmonious movement between expected and actual inflation in Türkiye, some recent studies provide evidence that this harmony and positivity has deteriorated. This study also re-evaluates the relationship between expected and actual inflation. As a result of the study, it was determined that there is a negative relationship between the variables and unidirectional causality from expected inflation to actual inflation.

Keywords: Expected Inflation, Actual Inflation, GMM Estimate

JEL Code: E30, E31, E37

[1] Assistant Professor, Ağrı İbrahim Çeçen University, salpagut@agri.edu.tr, ORCID: 0000-0001-7326-4048

1. Introduction

Türkiye has experienced inflationary processes for many years. High public deficits and monetary expansions were accepted as the reasons for this situation (Tunay, 2001, p. 211). Inflation, which is accepted as a monetary phenomenon, is controlled by the Central Bank of the Republic of Türkiye (CBRT) with the target of price stability focusing on production and employment. This control primarily uses open-market operations. These transactions are controlled by short-term interest rates. The Central Bank intervenes in the market by expanding or narrowing the monetary base with policy instruments in light of variables and cyclical developments, such as investment, consumption, commodity prices, and exchange rates, thus ensuring price stability. In the case of such monetary expansion or contraction by Central Banks, the new monetary base, interest rates, and inflation levels that will occur will cause economic units to create new positions. This situation forms the basis of future expectations of economic decision-making units.

Theoretically, the relationship between expected and actual inflation is considered positive. Nerlove (1958) added a partial correction coefficient to the model while calculating the future value of expected inflation. This indicates that the coefficient must be positive. The determinant of the coefficient is the difference between actual and expected inflation. This theoretical approach indicates a positive relationship between these two variables. Additionally, the studies by Cagan (1956) and Friedman (1957) express a similar situation. According to the monetarist approach, workers have misconceptions regarding money. Employers can reflect an increase in the general level of prices for their products by addressing the relative price increases. Although both parties take real wages into account, they do not reduce labor supply because they perceive employers' nominal increases as real increases. However, after a while, workers realize the situation and demand a wage increase as a result of increasing their inflation expectations (Phelps, 1969, p. 151; Bocutoğlu, 2013, p. 184). Another issue that underlies this situation is the contracts. Even if workers know that real wages are below the expected inflation, they cannot reflect this in their wages because their employment contracts are limited to a limited period. For this reason, wage increase demands and therefore inflation expectations are realized in the next period. Workers learn from their mistakes and adjust their expectations in the next period. This idea forms the basis of the Adaptive Expectations hypothesis. (Bocutoğlu, 2013, p. 193). Thus, a positive relationship is predicted between expected and actual inflation. This perspective is independent of the monetary policy. In a period when expected inflation is low, an expansionary monetary policy increases actual inflation. Ultimately, a negative relationship is observed between the two variables. However, this situation can be considered an uncommon situation and policy choice (Nelson, 1976, p. 471). Apart from these situations, factors such as policy changes in Central Banks, strong communication with markets, and implementation of policies at the right time may cause changes in the relationship of the variables. Sargent and Wallace (1975) emphasized the role of Central Banks in creating correct expectations in their study, where they investigated how the optimum money supply should be under

the Rational Expectations hypothesis. This study touches upon the distorting effect of policies that are incompatible with expectations of actual inflation. Mishkin (1982), on the other hand, evaluates the effects of monetary policy practices on expected inflation by stating that if the monetary policies implemented in inflation expectations are the expected policies, the inflation expectations of economic units will be consistent. In summary, the relationship between expected and actual inflation is theoretically expected to be positive. Although the opposite situation is uncommon, it is emphasized that it may occur with a monetary policy choice or unexpected (shock) policy in monetary policy.

After the 2001 crisis in Türkiye, inflation was reduced from three digits to single digits in the 2001-2005 period, and the inflation targeting regime was introduced by the CBRT (Central Bank of the Republic of Türkiye). Among the academic studies examining this disinflationary period and its aftermath, Özer and Mutluer (2005), Local (2008), Kara and Küçük-Tuğer (2010), Yılmaz (2012) concluded that there was harmony and a positive relationship between expected and actual inflation. Çiçek and Akar (2014) found that there was no convergence between expected inflation and actual inflation in high inflation brackets. Başkaya et al. (2012) stated that the sensitivity of inflation expectations to actual inflation has decreased since 2011. Among the recent studies, Buyun (2021) found that there is an asymmetric relationship between inflation and expectations. It can be seen from the studies that while the relationship between expected and actual inflation was compatible and positive in previous periods, this relationship has deteriorated and is moving in a negative direction in the recent period. This differentiation is clearly seen in the 2013-2023 monthly data shown in Figure 1. This study aims to revisit the relationship between these two concepts, examine it with recent current data, and confirm whether the direction of the relationship between expected and actual inflation turns from positive to negative, as can be seen in the course of studies in the literature. The empirical analysis confirmed that the relationship between expected and actual inflation in the near term is negative.

Little research is available on the subject, as per the literature review based on Türkiye's studies. This study aims to enhance the existing research by providing current data and investigating the relationships between the variables in further studies.

The subsequent stages of this study provide a theoretical account of expected inflation. Later on, we will summarise the literature. Then, we share the empirical findings and finally evaluate the results.

2. Expected and Actual Inflation in Türkiye

Effective communication and long-term economic strategies play important roles for decision-makers in the economy. In recent years, economic units have monitored closely the statements made by central banks during the execution of their monetary policies. They keep track of the financial targets set and programs implemented for renewed positions according to current situations. (Coibion et al., 2020, p. 1).

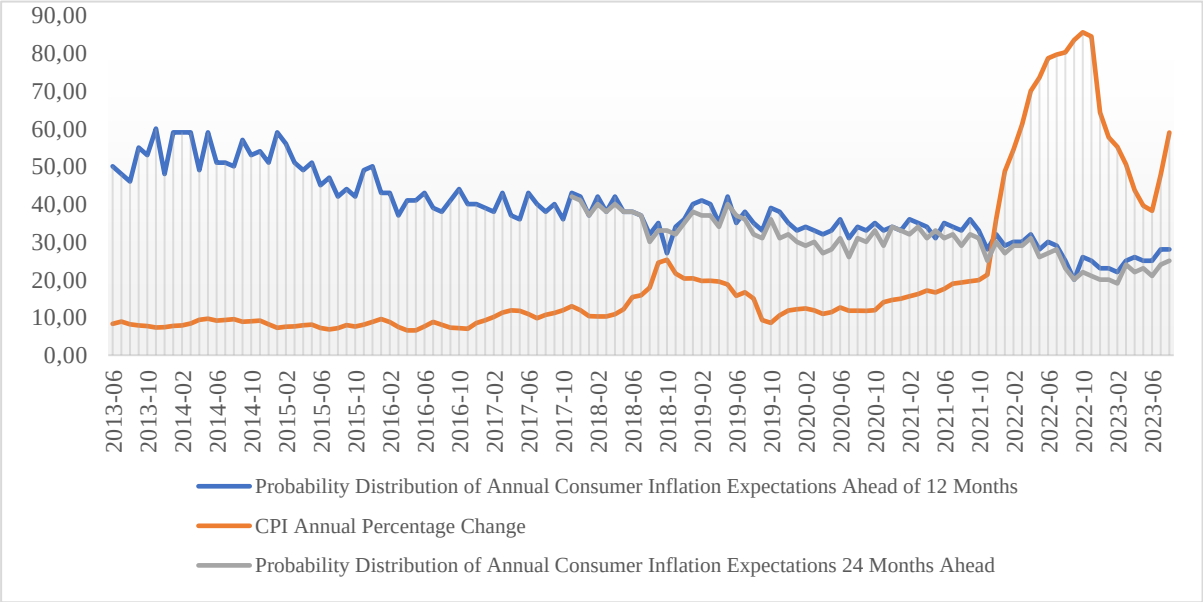

Figure 1: Expected and Actual Inflation Historical Data.

When the inflation expectations and actual inflation data shown in Figure 1 are evaluated, it is seen that the inflation expectation data has a decreasing trend from the 6th month of 2013, which is the first year data presented by the CBRT (Central Bank of the Republic of Türkiye), to the 6th month of 2023. Inflation expectations data are obtained by the CBRT as a result of surveys conducted by experts in both the finance and real sectors. In the graph with 120 observations over 10 years in Figure 1, although there are changes in many macroeconomic factors in Türkiye and different levels are realized in macro and micro data affecting inflation, survey participants have persistent expectations of a decrease in inflation. It is noteworthy that this situation is not compatible with the actual inflation data. A negative expected inflation-actual inflation relationship is a rare occurrence and can often be the result of certain economic conditions or policy choices (Nelson, 1976, p. 471). In general, economic actors' expectations and price adjustments show a positive relationship and an increase in expected inflation leads to an increase in actual inflation.

3. Theoretical Background

The first empirical example regarding inflation expectations is the Fisher hypothesis put forward by Fisher (1930). This hypothesis is an approach known as the Fisher Effect, which suggests that expected inflation is equal to the difference between nominal and real interest (Fisher, 1930, p. 27).

$$\pi_t^e = i_t - r_t \qquad (1)$$

This approach predicts a positive relationship between nominal interest rates and expected inflation. Fisher modeled expected inflation as a weighted average of current and past inflation (Binder & Kamdar, 2022, p. 132).

In a macroeconomic context, the importance of long-term expectations about potential investment returns and asset prices was highlighted by John Maynard Keynes in 1936. While Keynes emphasized the central role of expectations in shaping output and employment, he did not provide a clear model for the formation of expectations. Indeed, he even suggested that attempts to predict events in the very distant future can sometimes overshadow rational calculation (Evans & Honkapohja, 2001, p. 5061).

The mention of economic expectations by Milton Friedman in his speech to the American Economic Association in 1968 put the issue back on the economic agenda and made it the subject of research to this day (Buyun, 2021, p. 186). In an environment where it was generally accepted to use expansionary monetary policy to reduce unemployment in order to control inflation, based on the accepted relationship between unemployment and inflation, Friedman argued that the equilibrium between unemployment and inflation was actually temporary because it was caused not by inflation per se but by unpredictable inflation, i.e. actual and expected inflation. He claimed that it was due to the difference in inflation. (Friedman, 1968, p. 11). Friedman argues that expected inflation is a determinant of unemployment and actual inflation.

$$\pi_t^e = \pi_{t-1}^e + \lambda\,(\pi_{t-1} - \pi_{t-1}^e) \qquad (2)$$

In equation (2), π represents current inflation; π^e is expected inflation; t refers to the current period, t-1 refers to the lagged value, and λ refers to the error correction coefficient. Thus, if the unpredictable inflation ($\pi_{t-1} - \pi_{t-1}^e$) is a certain error coefficient, it is equal to the difference between the expected inflation and its lagged values (Lawson, 1980, p. 306). Inflation expectations are closely related to their lagged values, as the λ coefficient is corrected for errors in unpredictable inflation. In summary, economic units that make forecasts use past inflation data to forecast inflation and make unsystematic errors (Colasante et al., 2017, p. 989). In addition, if the actual inflation in the equation is above the expected inflation, it can be concluded that the expected inflation will be positively affected.

Another hypothesis about expectations is the Rational Expectations Hypothesis (REH). This hypothesis suggests that people experience repeated situations and tend to repeat past behaviors and deal with problems in the same way (Bray & Kreps, 1987, p. 601). For this reason, it recommends the use of data from past periods in predicting the future. People make mistakes in making these predictions. It is accepted that people can make mistakes, as in the theory of adaptive expectations. The main difference is that these errors are not systematic and that individuals reduce their errors by considering current period data. Because individuals make decisions based on past experience and available information, most of the time their decisions will be correct. If their decisions are correct, they will have the same expectations for the future. If their decisions are wrong, they will adjust their behavior based on past mistakes. When the RBH is evaluated in terms of inflation, there will be no fluctuations in inflation expectations if the central bank does not target price stability and implements its policies accordingly, does not make shock decisions, and shares information with parties in a transparent and secure manner (Karaçor, 2014, p. 148). In other words, there will be no unpredictable inflation. Here, individuals must have full confidence in the central bank's policy. If a mistake occurs, individuals will correct their mistakes in the long run and will not make a waiting mistake.

Inflationary expectations of economic units are reflected in the form of higher prices for goods and services due to demands for wage level increases. Demands for pricing future transactions, such as rent hikes, contract maturity prices in commercial agreements, and price levels in future asset transactions, constitute inflation expectations. Consequently, increases in inflation expectations lead to elevated inflation rates, and high inflation rates, in turn, reinforce inflation expectations (CBRT, 2013, p. 5). Generally, in an economy with high inflation expectations, nominal values like prices and salaries tend to rise. For instance, a labor union negotiating a multi-year contract is likely to demand larger wage increases if they anticipate inflation. The resulting rise in labor costs prompts companies to increase prices, thereby propagating inflation throughout the economy. Moreover, individuals' expectations of wage increase due to high inflation further contribute to higher incomes. As a consequence of these effects, inflation remains high (Binder & Kamdar, 2022, p. 131). What occurs here is referred to as cost inflation. As previously mentioned, the primary transmission channel between expected and actual inflation operates through wages and salaries.

The second impact channel is the demand inflation created by individuals through consumption. If consumers expect prices to rise further in a short time in a high-inflation environment, they will make their future consumption today. This will increase total consumption expenditures and increase actual inflation. In this case, there will be an increase in demand inflation. Thus, increases in expected inflation will increase actual inflation (Duca-Radu et al., 2021, p. 123).

The third effect is the effect caused by monetary policies. Especially in periods when central banks

implement tight monetary policies, economic actors can expect future inflation to decrease. In this case, while expected inflation rates are low, actual inflation rates may also be low (Moreira, 2015, p. 437). This effect is the third transmission mechanism, the monetary policy effect. The concept of expectation is ultimately based on predicting the intuitive behavior of decision-makers. In this context, it does not represent a definitive result. However, factors such as the correct interpretation of the changes in the factors that form the expectations by everyone, their stability, and the Central Banks' open, transparent, and highly predictable communication level ensure that the expectations are realized or the realized value is close to the expectations (Carotta et al., 2023, p. 2). This situation can be interpreted as a relationship between inflation expectations and the success of the Central Bank. So much so that banks' failure to manage expectations may cause economic decision-making units to form incorrect expectations. Apart from this, it is expected that the policies implemented by Central Banks will be timed correctly and act in line with the markets. Otherwise, significant differences between expected and actual inflation may be observed. In their study examining the decisions of Central Banks during the Covid period on developed and developing countries, Wang and Dizioli (2023) state that the Central Banks of developing countries exhibited early tight monetary policy transition, and therefore the expected inflation remained higher than it should be compared to developed countries.

4. Literature Review

Since inflation expectations have a significant impact on final inflation rates, stable inflation expectations are important for central banks to achieve price stability, which is their main goal. For this reason, it is important to evaluate whether central banks will affect actual inflation through the inflation expectation channel (Aßhoff et al., 2021, p. 3).

Özer and Mutluer (2005), the authors who examined the expected inflation for Türkiye with the logistic regression method, used 2004 cross-sectional data. As a result of the study, it was determined that the expected and actual inflation series tend to move together and expectations remained higher than actualization.

Yerli (2008) examined the effect of expected inflation on actual inflation in the 2001m1-2008m1 period. When the data in the mentioned period was examined graphically, it was determined that inflation and expectations moved in line with a decreasing trend. As a result of the empirical analysis, the basic model was expanded with interest rate, exchange rate, and M1 money supply. In the study, it was seen that compliance with the Rational expectations model was sought, as past inflation expectations were not used in the model. As a result of the forecast, it is seen that increases in expected inflation have a positive impact on actual inflation.

Kara and Küçük-Tuğer (2010), in their study examining inflation expectations in Türkiye, show that there is harmony between expected and actual inflation in the 2001-2007 period. What is meant here is the same directional relationship between expected and actual inflation, unlike the reverse relationship found in the recent period, especially in the period covered by this study.

The study, in which Badurlar (2011) examined the relationship between inflation expectations and macroeconomic variables for Türkiye, was conducted using data for the period 2003m1-2009m12. Causality analysis was applied in the study. As a result, unidirectional causality from expected inflation to actual inflation was found.

Başkaya et al. (2012), in their study examining the relationship between inflation expectations and some macroeconomic variables in Türkiye in the period 2006m4-2012m5, concluded that lagged values of actual inflation negatively affect 12-month inflation expectations. The authors interpreted their results as an indication that the sensitivity of inflation expectations to inflation realizations has decreased in Türkiye.

Yılmaz (2012) examined the macroeconomic factors affecting inflation expectations in Türkiye in two periods, 2002- 2011 and 2006 - 2011. As a result of the study, it was found that lagged values of inflation had a positive effect on expectations. As the monetary policies implemented after 2006 had a positive effect on expectations and the interest rate cuts implemented during this period were not perceived as an inflation risk by the respondents, they revised their expectations downwards.

According to the study of Çiçek and Akar (2014), actual and expected inflation in the period 2002m1-2013m1 have a decreasing trend and move together in Türkiye. Furthermore, as a result of the quantile autoregression analysis in the study, it was concluded that expected and actual inflation converge in the low inflation bracket, but not in the high inflation bracket.

As a result of the study in which Çiçek and Alkan (2019) evaluated monetary policy on the uncertainties of actual and expected inflation in Türkiye, it was determined that when a shock occurs to expected inflation, this effect spills over to actual inflation and vice versa. The results are mostly valid for the sub-items that make up inflation. The authors comment that the central bank has not been successful in managing inflation expectations through monetary policy because of these spillovers between expected and actual inflation.

Karanfil and Eroğlu (2019), as a result of their study examining the relationship between monetary policy and inflation for the period 2010-2018 for Türkiye, found that the effect of expected inflation on actual inflation is positive in the short run.

Göcen (2020) examined the relationship between inflation and expected inflation for Türkiye in the period 2005:01-2020:09 using causality analysis. While the results of the symmetric causality test found a mutual causality, the results of the asymmetric causality test concluded that negative shocks to expected inflation caused negative shocks to actual inflation and vice versa.

Buyun (2021) applied the nonlinear ARDL method in their analysis for the period 2016m1-2021m3. In the created model, the effect of actual inflation and exchange rate on expected inflation was studied. As a result of the study, it was concluded that an increase in actual inflation increases inflation expectations, while an increase in expected inflation has a negative effect on actual inflation.

Another important issue is that it can prevent stability or large fluctuations in inflation expectations. The policies that central banks design and implement in the face of a negative shock, and the accurate and transparent communication of these policies to the parties that form expectations, will lead to accurate and stable expectations. In this sense, inflation expectations and the fulfillment of these expectations can be considered as criteria for the success of central banks' policies. Studies that examine the relationship between expected and actual inflation in Türkiye are limited. However, the literature has shifted to the rationality of expected inflation and the impact of expectations on inflation uncertainty and monetary policy (Çiçek & Alkan, 2019, p. 85).

Alp and Alp (2017) examined the detailed analysis of expected and actual inflation in Türkiye in the form of the current month, one month, two months, and twelve months. In the study, those whose inflation expectations were kept at the maximum level were considered pessimistic and those whose inflation expectations were kept at the minimum level were considered optimistic. As a result of the study, it is generally concluded that the probability of expectations being realized at the minimum level is higher than the probability of expectations being realized at the maximum level. Therefore, the likelihood of these actors' expectations being realized is greater with more optimistic expectations. These results lead to the conclusion that high estimates in expectations surveys are not consistent. This raises the question of whether inflation expectations in Türkiye are rational. Bilgili (2001) examined whether expectations are rational in his research using the CBRT inflation expectations survey. As a result of the study, it was found that the respondents did not have rational expectations and did not efficiently use information about the production history (production index) in forming their expectations. Kara and Küçük-Tuğer (2005) carried out a similar study. They tested whether inflation expectations are rational using CBBM survey data. 3 different surveys and 5 different inflation expectations were used in the study. The study was examined in the form of inflation expectations after one month, two months, and 12 months. As a result, it was concluded that while the predictions made

for one month ahead are rational, the predictions made for 12 months ahead are not rational and that the participants tend to follow the general trend of inflation, but they consistently estimate the inflation level higher than it is. Another striking finding of the study is that the errors related to the manufacturing sector's inflation expectations for the next month in the 2-month inflation expectations forecasts showed a significant correlation with the exchange rate. This result means that the role of exchange rate pass-through, which is an important determinant of inflation and its expectations in Türkiye, is not fully understood. In the study by Özer and Mutluer (2005), in their analysis of inflation expectations, it was found that according to the results of the horizontal section in 2004, the expectations of exporting firms were lower than those of non-exporting firms, and firms with more employees tended to have lower inflation expectations. Abdioğlu and Yılmaz (2013), in their study investigating the rationality of inflation expectations for the period 2005-2013, found that inflation expectations were not rational. After evaluating the results obtained in this study, they concluded that the predictability of the outcome of the policies implemented by the central bank is weak due to irrational expectations. These studies show that rational expectations do not apply to inflation expectations in Türkiye. Therefore, it is concluded that individuals and firms make systematic mistakes. In light of these studies, although expected inflation has been higher than actual inflation in previous periods and they have moved together, it can be taken as a sign that the relationship will change negatively in the near future.

5. Data and Method

Inflation and expected inflation data were used in the study. It was obtained from the CBRT as shown in Table 1.

Table 1: List of Variables Used in the Study

Variable	Description	Source
Actual Inflation (GE)	CPI (Annual Percentage Change)	Central Bank of the Republic of Türkiye EVDS Data Bank
Expected Inflation (BE)	Probability distribution of post-12 annual consumer inflation expectations on market experts and individuals in the market participants survey conducted by the CBRT	Central Bank of the Republic of Türkiye EVDS Data Bank

Descriptive statistics for the variables are presented in Table 2. The variables used are series with 123 observations. The maximum value of actual inflation is 64.27 and the minimum value is 1.02. The maximum value of expected inflation is 60 and the minimum value is 20. The average expected inflation in Türkiye is 11 and the average actual inflation is 38.85. The median is 6.43 for expected inflation and 38 for actual inflation.

Table 2: Descriptive Statistics of the Variables

	Number of Observations	Average	Median	Standard error	Maximum	Minimum
GE	123	11.08	6.43	12.89	64.27	1.02
BE	123	38.85	38.0	9.23	60.00	20.0

In the OLS method, it is expected that there is no correlation between the independent variables and the error terms (E (Xİ μİ) ≠ 0). If there is autocorrelation, it means that the strict exogeneity assumption is violated. Thus, the fact that the variables are endogenous means that the OLS results are inconsistent. The GMM method can be used when autocorrelation and heteroskedasticity problems occur in the built model. The GMM model does not require the conditions of constant variance and autocorrelation (Kaplan & Bulut, 2011, p. 48). The basic criterion in the GMM method is that the instrumental variables used in the equations are not related to the error terms. Otherwise, the prediction results will be biased. For this reason, the 'j' test developed by Hansen (1982) is used. The main hypothesis of the J-test is that there is no correlation between the instrumental variables and the error terms.

The number of instrumental variables is important in the GMM model built using instrumental variables. If the number of instrumental variables is insufficient, the desired externality may not be obtained. If there are too many, there may be problems of over-identification. For this reason, it is expected that the number of instrumental variables will not exceed the number of independent variables. It is recommended that the total number of variables be equal to the rank minus one (Hansen, 2001, p. 7).

Achieving effectiveness in GMM management depends on the use of the weight matrix. The aim is to minimize the asymptotic variance. In the estimator, a gradual and renewed process is applied to ensure efficiency with the weight matrix. It is shown that the asymptotic deviation can be reduced by using kernel weights appropriate to the moment conditions. An additional advantage of kernel weighting is that it simplifies the instrument selection problem to a bandwidth selection problem, similar to that encountered in the HAC estimation literature (Kuersteiner, 2012, p. 400).

If the appropriate instrumental variables are selected, Hansen J test exogeneity is ensured, and the appropriate weighting matrix is applied, then the GMM estimator is as described in equation (3).

$$\beta_{GMM}^{est} = (X'ZWZ'X)^{-1} X'ZWZ'y \qquad (3)$$

6. Empirical Findings

In this section, after determining the degree of stationarity of the variables, appropriate estimators will be applied.

Table 3: Unit Root Test Results

PP		
	Level	First Difference
	Constant and trend	Constant and trend
BE	-7.6347***	-11.9016***
GE	-3.5871***	-11.8910***
ADF		
	Constant and trend	Constant and trend
BE	-4.2654***	-19.2887***
GE	-3.8020***	-3.2897*

Note: The table shows significance levels of 10%, 5%, and 1%, respectively, denoted by symbols *, ** and ***.

In Table 3, the ADF and PP unit root tests were applied to the variables. It was decided to choose constant and trend models of the variables since graphical examinations of both variables showed that there was a trend in the model. According to the results of both tests, the variables are stationary at the I (0) level in the constant and trend structure.

Since the variables are stationary in level, it was desired to investigate the short-term relationships between these two variables, and a VAR model was first constructed. In addition to reflecting the interrelationships between the variables, the model should also incorporate the information that individuals benefit from delayed data in line with the adaptive expectations hypothesis. As the autoregressive structure in the VAR model fulfills this, the graph of the generalized impulse response functions obtained in the VAR model, generated with one lag according to the AIC criteria, is presented in Appendix 1. No statistical significance was found between the variables.

The adaptive expectations model states that individuals take into account past data when predicting their future expectations (Colasante et al., 2017, p. 1000; Seay et al., 2004, p. 57; Pesaran & Weale, 2006, p. 14). This is because the data in question do not refer to a single year in the past, but assume several years of past data. The one and two-lag terms of the dependent variable were used as instrumental variables and the GMM estimator was constructed. In addition to Model 1, which examines the effect of expected inflation on actual inflation, Model 2 was also constructed to examine the effect of actual inflation on expected inflation. The estimation results are presented in Table 4.

Table 5: Results of the GMM Estimation

Model 1				
Variables	Coefficient	St. Dev.	T stat.	Prob.
BE	-2.164064	0.422847	-5.117848	0.0000
Constant	95.67417	15.89725	6.018285	0.0000
J stat 1.337505 (0.247474)	JB Normality 4.40 (0.11)	R^2 :0,70	Rank:3	
Model 2				
Variables	Coefficient	St. Dev.	T stat.	Prob.
GE	-1.191125	0.167155	-7.125856	0.0000
Constant	52.02517	2.217501	23.46117	0.0000
J stat 0.038908 (0.843631)	JB Normality 77.53 (0.00)	R^2 :0.98	Rank:3	

Note: The first and second lags of the dependent variable were used as instrumental variables. The prediction weighting matrix HAC (Newey-West) was used in both models.

For the GMM estimator to be applicable, the number of parameters must be equal to the number of moment conditions. If the number of parameters is large, over-estimation occurs. If the number of parameters is small, the estimator overidentifies. For this reason, a maximum of two instrumental variables were used ($n \geq k-1$), as recommended by Hansen (2001). The j-test used in the model indicates whether or not the instrumental variables used are valid and the correlation between the instrumental variables and the error term in the model. Accordingly, in the GMM results presented in Table 5, the H_0 hypothesis cannot be rejected for the j test in both models, and the models are valid, indicating that there is no correlation between the instrumental variables and the error quantity. However, Wooldridge states that normal distribution should not be sought in the GMM estimator (Wooldridge, 2001, p. 96).

Table 5 shows that, according to the results of model 1, increases in expected inflation have a negative and statistically significant effect on actual inflation. In Model 2, increases in both actual and expected inflation are negative and statistically significant.

Table 6: Results of the Granger causality test

	Chi-Square	Prob.	Decısıon
BE → GE	4.85	0.0884	There is causality.
GE → BE	1.64	0.4404	There is no causality.

Granger causality test was carried out to support the prediction results obtained. The results are presented in Table 6. Accordingly, one-way causality from expected inflation to actual inflation was found.

7. Conclusion

Expectations are an important component that directly or indirectly affects all macroeconomic indicators (Johnson, 2003, p. 1076). The final results in the economy are a realization of the predictions made before. Decision units make a prediction with the information set they have, whether they have Adaptive or Rational expectations, and make economic decisions according to these predictions. Thus, expectations turn into reality.

Relevant theories show that there is a positive relationship between inflation and expected inflation and that there are transmission channels that ensure positivity. However, in some special cases (Central Banks' policy preferences, devaluations, monetary policy errors, or temporal errors in policy implementations), this positivity may be disrupted.

When the expected and actual inflation data for Turkiye are examined, it is seen that, although recent inflation has increased rapidly, inflation expectations have not increased or even decreased (Figure 1). When the relevant literature was examined, it was determined that the expected inflation in Türkiye was higher than the actual inflation rate until a certain period and that there was harmony between the two variables (Özer & Mutluer, 2005; Yerli, 2008; Kara & Küçük-Tuğer, 2010; Yılmaz, 2012). In subsequent studies, Çiçek and Akar (2014) found that convergence among the variables was disrupted, and there are also studies stating that the sensitivity of inflation expectations to actual inflation has decreased since 2011 (Başkaya et al., 2012; Buyun, 2021).

Since we think that it is important for the literature to examine this change in the relationship between variables with current data, the analysis was carried out with data received from the CBRT and monthly data between May 2013 and August 2023. In this study, the unit root test was first performed, and it was determined that the variables were stationary at this level. As a result of the Vector Autoregressive (VAR) model, no statistical significance could be obtained from Impulse Response analyses. This is then estimated using the GMM estimator. According to the results of the two models, a negative relationship is detected between the variables. Increases in expected inflation reduce actual inflation and increases in actual inflation reduce expected inflation. According to the Granger Causality test, which was applied because it was complementary, one-way causality was detected between expected inflation and actual inflation.

According to the adaptive expectations hypothesis, if the actual inflation is higher than the expectations, it is expected to adjust the expectations upward, and if the opposite happens, the expected inflation is adjusted downwards. However, while the expectations in Türkiye before September 2021 were higher than the actual inflation, the inflation realized after this date remained above. It is known that this is the date when CBRT started to reduce interest rates. Studies show that interest rate cuts have a positive impact on inflation. In this case, the economic reason for the persistent decrease in inflation expectations

needs to be thoroughly investigated.

Our policy recommendations on this issue cover 4 different dimensions. These are monetary policy corrections, fiscal policy corrections, correct and effective use of communication strategies, and monetary policy independence. Recently, Turkey has been pursuing an expansionary monetary policy with low-interest rates and an increasing money supply. It is known that monetary expansion has a positive effect on inflation. However, the economic management insists that inflation will decline. The persistently low level of expected inflation compared with actual inflation suggests that these discourses have an effect on survey respondents. In this case, we can say that monetary policy communication strategies are effective. In this case, in order to eliminate the negative impact of low inflation expectations on economic agents, the CBRT's use of a strong communication strategy to bring expectations to where they should be can be given as a policy recommendation. However, this strategy should be clear, transparent and understandable. Moreover, it is important for the credibility of the CBRT among economic agents that inflation data are announced in such a way that their accuracy cannot be doubted. If the aim is to reduce actual inflation to the level of expected inflation, the CBRT should be determined to keep inflation under control by implementing a contractionary monetary policy. It is also important that policymakers back this up with a contractionary fiscal policy. The combination of monetary and fiscal policies in controlling inflation has a significant impact on aggregate demand. Another policy recommendation is the independence of the CBRT. Changes in monetary policy should be in line with the requirements of the market. Inflation will increase if the money supply is increased more than it should be. In such a case, the use of secondary instruments to control inflation is useless. For this reason, the most important tool for controlling inflation is the decision of the monetary authorities to formulate monetary policy according to the evolution of macroeconomic variables.

In light of these evaluations, we believe that future studies will be useful to deepen the subject by determining whether expectations in Türkiye are based on Adaptive or Rational expectations and the contribution of macroeconomic variables to expectations.

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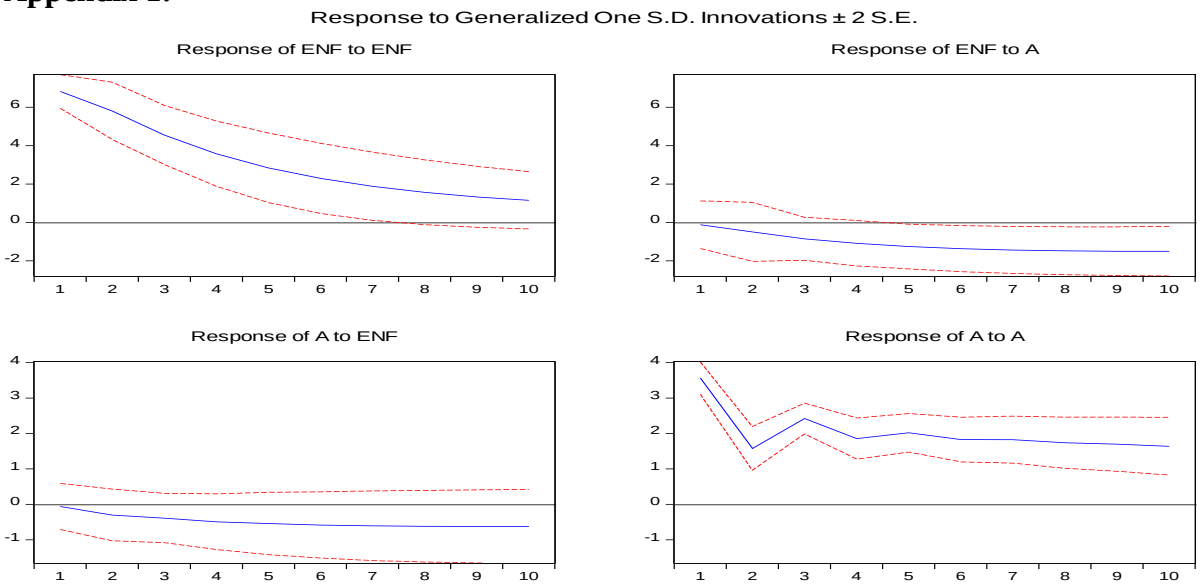
Appendix 1:


Response to Generalized One S.D. Innovations ± 2 S.E.
Response of ENF to ENF
Response of ENF to A
Response of A to ENF
Response of A to A