KMÜ Sosyal ve Ekonomik Araştırmalar Dergisi (KMUSEKAD)
KMU Journal of Social and Economic Research
Yıl/Year: 2024, 26(47): 1304-1322

Geliş/Received: 24.11.2023
Kabul/Accepted: 25.11.2024

THE RELATIONSHIP OF INFLATION EXPECTATIONS ADJUSTED TO DIFFERENT LEVELS WITH CAPITAL AND MONETARY VARIABLES

Serhat ALPAĞUT[1]

Abstract

This study seeks to answer the question of which macroeconomic variables are used as determinants by individuals with low expectations and individuals with high expectations. For this purpose, inflation expectations were divided into three categories: 0 to 20, 20 to 40 and over 40. In this way, low, medium and high inflation expectations were obtained. The aim was to determine the relationship between different inflation expectations and macroeconomic variables. The study used monthly data for the period 2013-2023. The Phillips-Ouliaris co-integration method was used to determine the long-run relationship and DOLS and FMOLS estimators were used to estimate the long-run coefficients. The results show that the variables credit interest, money supply, inflation and stocks are determinants of low inflation expectations, the exchange rate, money supply and inflation are determinants of medium inflation expectations and the exchange rate, credit interest, money supply, inflation and deposit interest are determinants of high inflation expectations. Two points stand out. The first is that when long-term coefficients are evaluated, the coefficients take insignificantly low values in low inflation expectations. This result indicates that individuals expecting low inflation do not establish a strong sensitivity despite taking into account capital and money variables. The second point is that the capital variable stock is statistically insignificant in medium and high inflation expectations. This result indicates that only monetary variables are taken into account in medium and high inflation expectations.

Keywords: Expected Inflation, Actual Inflation, Money Supply, Interest Rate, Stocks
JEL Classification: E31, E50, D84

FARKLI DÜZEYLERE GÖRE AYARLANMIŞ ENFLASYON BEKLENTİLERİNİN SERMAYE VE PARA DEĞİŞKENLERİ İLE İLİŞKİSİ

Öz

Bu çalışmada düşük beklentilere sahip bireyler ile yüksek beklentilere sahip bireylerin hangi makroekonomik değişkeni belirleyici olarak kullandıkları sorusuna cevap aranmaktadır. Bunun için enflasyon beklentisi 0 ile 20, 20 ile 40 ve 40 üstü olmak üzere üç kategoriye ayrılmıştır. Bu işlem ile düşük, orta ve yüksek enflasyon beklentileri elde edilmiştir. Böylece farklı enflasyon beklentileri ile makroekonomik değişkenler arasındaki ilişki tespit edilmek istenmiştir. Çalışmada 2013-2023 dönemi aylık veriler kullanılmıştır. Uzun dönem ilişkinin tespiti için Phillips-Ouliaris eşbütünleşme yöntemi kullanılmış olup uzun dönem katsayıların tahmini için de DOLS ve FMOLS tahmincileri kullanılmıştır. Çalışma sonucunda düşük enflasyon beklentilerinde kredi faizi, para arzı, enflasyon ve hisse senedi değişkenlerinin belirleyici olduğu; orta düzey enflasyon beklentilerinde döviz kuru, para arzı ve enflasyonun belirleyici olduğu; yüksek enflasyon beklentilerinde ise döviz kuru, kredi faizi, para arzı, enflasyon ve mevduat faizinin belirleyici olduğu tespit edilmiştir. İki dikkat çekici husus bulunmaktadır. İlki, düşük enflasyon beklentilerinde katsayıların önemsiz sayılacak düzeyde düşük değerler almasıdır. Bu sonuç düşük enflasyon bekleyen bireylerin sermaye ve para değişkenlerini dikkate almalarına rağmen güçlü bir hassasiyet kurmadıklarını ifade etmektedir. İkinci husus ise orta ve yüksek enflasyon beklentilerinde sermaye değişkeni olan hisse senedinin istatistiki olarak anlamsız olmasıdır. Bu sonuç orta ve yüksek enflasyon beklentilerinde sadece parasal değişkenlerin dikkate alındığını ifade etmektedir.

Anahtar Kelimeler: Beklenen Enflasyon, Gerçekleşen Enflasyon, Para Arzı, Faiz Oranı, Hisse Senedi
JEL Sınıflandırması: E31, E50, D84

[1] Asst. Prof. Dr., Agri Ibrahim Cecen University, Eleskirt Vocational School, Finance-Banking and Insurance Department, e-mail: salpagut@agri.edu.tr, ORCID: https://orcid.org/0000-0001-7326-4048

1. INTRODUCTION

Expectations exist not only in economic life, but at every stage of life. Economic units form expectations about how the next period should be different from the current period in the face of developing and changing situations. Wrong expectations can cause problems. For example, individuals have expectations that public space should be expanded in the face of a growing population. If roads are not widened or new roads are not opened, traffic congestion may occur because the problem of traffic increases with the population. If mistakes are made in expectations about education, the quality of education may decline as a result of overcrowded classrooms. If firms make mistakes in their sales expectations, problems may arise such as overstocking or production not keeping up with sales (Harvey et al., 1994:203). In macroeconomics, mispricing of inflation can lead to mispricing of real values and mistaken policies.

The first of the main motivations for the preparation of this study was the discrepancy between expected and actual inflation, as shown in Figure 1. Recently, inflation in Turkiye has been rising due to the influence of monetary policy. However, inflation expectations are declining. In this study, we wanted to investigate the main reason for this persistent downward trend in expectations. The second reason is that the participants in the inflation expectation survey have different inflation expectations. While some people have low expectations, others have more moderate expectations and still others do not expect high inflation. This situation is visualised and illustrated in Figure 2. When inflation is high (low), there are individuals with relatively low (high) expectations. In this case, the macroeconomic sources of expectations should be identified.

In economic theory, expectations are divided into two main streams: Adaptive and Rational Expectations. According to adaptive expectations, individuals evaluate the values for which they form their expectations as real, but they experience errors. In addition, they are obliged to change their expectations by the time horizon of the contract. Therefore, they make systematic errors. In the next period, they correct these errors by taking into account the historical data of the value. In the rational expectations hypothesis, there is no systematic error. Individuals examine both past and current real values when forming their expectations. In both theories, individuals update their expectations in the next period. In light of this theoretical knowledge, this study assumes that individuals in Turkiye update their inflation expectations by using money and capital market data.

The main objective of the study is to examine the relationship between inflation expectations and capital and money variables. Inflation expectations are divided into three groups: low, medium and high. Cointegration analysis and long-run coefficient estimation are used to try to identify the macroeconomic factors that influence each inflation expectation.

2. ASSESSMENT OF EXPECTED INFLATION FOR TURKIYE

Figure 1 has been constructed using monthly data for the period from June 2013 to September 2023. It shows realised annual inflation and inflation expectations for the next 12 months. It can be seen that inflation continued to fluctuate between 10% and 20% from 2013 to 2021. The process, which started with the Central Bank of Turkiye reducing the policy rate from 24% to 19.75% in May 2019, continued until May 2023. Inflation is expected to continue to accelerate during this period.

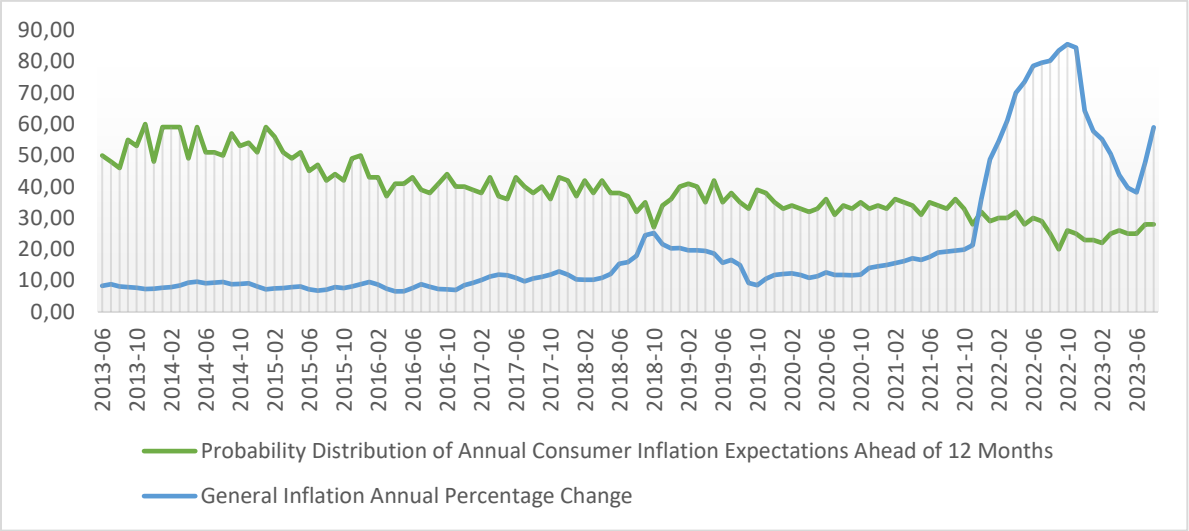

Figure 1. Expected and Actual Rates of Inflation in Turkiye

Resource: Data from the CBRT EVDS Database Have Been Visualised by the Author.

The CBRT (Central Bank of the Republic of Turkiye) collects inflation expectations via a market survey, typically involving participants from various segments, including economic and financial sector professionals, academics, research companies, financial institutions, and business representatives. The chart depicts monthly expectations for the upcoming 12 months. The parties maintain their belief that inflation is declining and will decrease further in 12 months. In our view, this contradicts findings by Ozer and Mutluer (2005), Yerli (2008), Kara and Kuçuk-Tuger (2010), and previous studies like Yilmaz (2012), all of which report a synchronization between inflation and expectations. The identification of macroeconomic variables causing this mismatch is important.

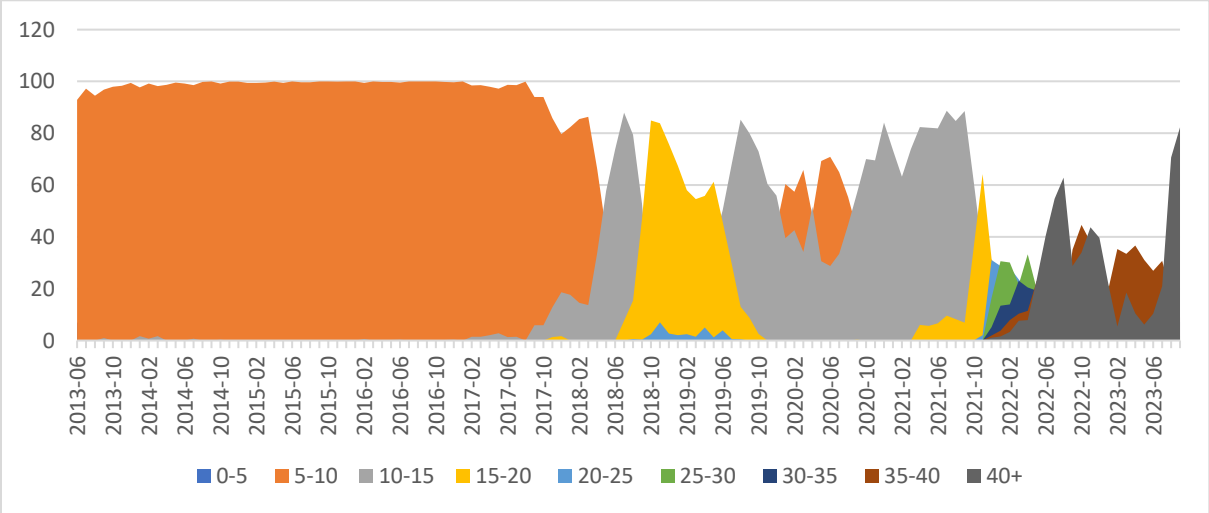

Figure 2. Probability Distribution of Inflation Expectations at Various Levels in Turkiye.

Resource: Data from the CBRT EVDS Database Have Been Visualised by the Author.

Figure 2 displays the various inflation expectations. The probability distribution is shown on the left axis of the graph. During the early stages of the chart, there are low inflation expectations with probabilities close to 100%. Given that inflation was established to be between 10-15% in this period, no disparities in expectations were observed. The likelihood of expectations ranging from 20% to 40% in the medium term is lower compared to the previous period. Actual inflation is on the verge of peaking,

as depicted in Figure 1. This highlights the commencement of incompatibility. Considering the recent period, there is an anticipation of inflation rate wavering between 20-40% to over 40%. Even with August and September 2023 excluded, the expectations still show a low probability. Even though there have been declarations from individuals stating that inflation will increase, the likelihood of it being realized is much lower than expected. These inferences raise the question of which variable holds importance for each level of expectations that macro sources, forming inflation expectations, have. This serves as the initial point of this study.

3. THEORETICAL BACKGROUND

The earliest research we are aware of on expectations about inflation was conducted by Fisher (1930). This idea, known as the Fisher Effect in publications, highlights the influence of inflation expectations on finance markets and consequently on market rates of interest. Fisher states that the rise in expected inflation will have a greater impact on the nominal interest rate than the decline in real interest rate due to inflation (Fahmy and Kandil, 2003:452).

$$\pi_t^e = i_t - r_t \tag{1}$$

In Equation (1), π_t^e denotes the expected inflation rate, i_t denotes the nominal interest rate, r_t denotes the real interest rate, and t denotes the time operator. Fisher assumed that expected inflation was equal to the difference between nominal and real interest. The Fisher effect emphasizes that inflation has a significant impact on economic decisions by affecting nominal interest rates. Investors and economic actors raise nominal interest rates in anticipation of increased inflation. This may negatively affect investments and consumption. Likewise, nominal interest rates may decrease in anticipation of falling inflation. (Panopoulou and Pantelidis, 2016:495). As stated, expected inflation has a close relationship with the interest rate.

Another pioneering piece of research is Nerlove (1958), which analyzed inflation expectations in the agricultural market. The study highlights that inflation expectations are linked to current and previous values of both actual and anticipated inflation.

$$\pi_t^e = \pi_{t-1}^e + \lambda\,(\pi_{t-1} - \pi_{t-1}^e) \quad , \quad 0 < \lambda < 1 \tag{2}$$

The Nerlove Model, which has made a significant contribution to literature, is presented in equation (2). The expected inflation rate is referred to as π_t^e, while $(\pi_{t-1} - \pi_{t-1}^e)$ denotes unpredictable inflation. λ is used to correct for unforeseen inflation in each period, resulting in the development of a partial correction coefficient (Nerlove, 1958:232). Nerlove made the subject dynamic with the lagged values he used in expectations and laid the foundation of adaptive expectations.

Another pioneering study that included inflation expectations in its model is Cagan (1956). Cagan examined the demand for money in a hyperinflation environment. Cagan (1956) explains that hyperinflation generally occurs as a result of emission excessive amounts of money and explains the relationships of this process with money supply, inflation and economic instability. It also offers an important perspective on monetary policy and anti-inflation strategies by focusing on the economic consequences of hyperinflation.

$$ms_t - \pi_t = \alpha.\pi_t^e + \mu_t \quad , \quad \alpha < 0 \tag{3}$$

Equation (3) is the Cagan (1956) money supply model. Accordingly, ms is the money supply; π_t, current inflation; π_t^e, inflation expectations; α, correction coefficient; μ_t, error term; t refers to the time operator (Sargent, 1977:61). There are adaptive expectations in the Cagan model. Based on adaptive expectations, it states that errors in expectations are corrected by economic units taking into

account the value of the data in the previous period and learning from the errors. The correction coefficient α indicates that errors in expectations will decrease in a given period.

Cagan argues that as the money supply expands, people will tend to spend their money quickly, which will further increase inflation. This is thought to raise inflation expectations. In this way, it is emphasized that the increase in expected inflation can create a cycle between money supply and inflation.

One of the other fundamental studies on inflation expectations belongs to Milton Friedman, the founder of orthodox monetary macroeconomic theory. Friedman (1957) developed a money demand function based on the idea that expectations are adaptive.

$$md_t = Y_{p,t} - R_t + H_t - \pi_t^e + \mu_t \quad (4)$$

In equation (4), md_t, demand for money; $Y_{p,t}$, permanent income; R_t, rate of return on financial assets; H_t, human capital; π_t^e, expected inflation; μ_t, is the error term and t is the time operator (Bocutoglu, 2013:178).

Friedman states that individuals follow a path he calls the "portfolio adjustment process" when creating both wealth and financial assets. In this process, he argues that individuals allocate their assets so that their marginal returns are equal. He assumes that this equilibrium of marginal returns deteriorates over time as the money supply increases, and that the allocation between financial and real assets is changed to restore the equilibrium in proportion to the deterioration. In this assumption, financial and real assets are assumed to be close substitutes for each other, so when inflation expectations increase, the amount of money people want to hold decreases. (Bocutoglu, 2013, pp. 178-179). As the marginal return of inflation on monetary products will decrease, there will be a reallocation to other products in the portfolio. Thus, the process of changing the marginal real returns of money and inflation also occurs in inflation expectations.

$$\pi_t^e = f\left(Y_{p,t},\ H_t,\ R_t, m_d\right) \quad (5)$$

The Friedman model is adjusted according to expected inflation and is again given as a function in equation (5). Accordingly, expected inflation depends on changes in permanent income, human capital, money demand and financial assets. The financial assets referred to are bond and equity yields. Given this information, Friedman argues that there is a relationship between capital markets and expected inflation.

4. LITERATURE REVIEW

The relevant theory was used in the selection of variables to be used in the study. However, empirical studies using these variables have produced different results in the literature. This section presents some of these studies and discusses their results.

The monetarist view sees inflation as a monetary process and attributes the cause of inflation to increases in the money supply. The difference between the monetarist view, which is parallel to the classical economic view, is that in the short run, worker errors and wage rigidities cause deviations from equilibrium. Cagan (1956) model established a relationship between money supply and inflation expectations by incorporating the adaptive expectations advocated by the monetarist view into the model. Subsequently, Friedman (1957) developed the relationship between money and expected inflation. According to Friedman, expected inflation is a negative function of money demand (Bocutoglu, 2013:178). Friedman accepts the money supply as an exogenous variable. Therefore, it can be assumed that the money supply will also decrease due to the decreasing demand for money. This

shows that a negative relationship can be established between money supply and expected inflation. The study by Tavlas (1987) examined the relationship between money supply and expected inflation for Greece in the period 1960-1982. In the study, different dependent variables were chosen as measures of money supply. The study found a negative relationship between expected inflation and money supply for all models. The study by Thomas (1999) examined expected inflation data for the USA. The study used two different surveys of expectations. In the results using monthly data for the period 1960-1997 and the Livingston survey, the effect of actual inflation and M1 money supply on expected inflation is negative, while the effect of M2 money supply is positive. In the results of the Michigan Expectations Survey, the effect of actual inflation and M2 money supply on expected inflation is positive. The effect of M1 on expected inflation is negative.

In the study by Mehra (2002), an analysis of expected inflation was carried out for the US with monthly data for the period 1961-2000. As a result of the study, which was conducted using data from the Livingston survey of expectations, it was found that monetary growth and actual inflation had a negative effect on expected inflation. Muth (1961) found significant changes in expectations. Expectations are assumed to be rational. It is rejected that individuals learn from past values of a single data set with a learning coefficient, as in adaptive expectations. There is no systematic error in rational expectations. In addition, individuals use the full set of information. Thus, there is no error in the short run. When the money supply increases, inflation expectations also increase. There is therefore a positive relationship between the variables. In the study by Mullineaux (1980), the relationship between Livingston survey data and money supply growth and inflation expectations for the US in the period 1956-1977 was examined. The results of the study showed a positive relationship between actual and expected inflation. The effect of money supply on expected inflation was found to be positive. As a result of his study examining the determinants of money supply for Germany with monthly data for the period 1920-1923, Webb (1985) concluded that expected inflation is an important determinant of money supply and that there is a positive relationship between the variables. Li and Ji (2011) investigate the relationship between expected inflation and money supply in China for the period 1978-2010. As a result of the study, it was concluded that the increase in inflation expectations will lead to a greater expansion in money supply. In summary, the study found a positive relationship between money supply and expected inflation.

The combination of high inflation and high interest rates in Western countries in the 1960s brought the theory known as the Fisher effect back into discussion. Fisher's theory states that nominal interest rates will rise as expected inflation rises, but real interest rates will remain constant. Studies showing that the Fisher effect is not valid, particularly in the US after the Second World War, drew attention to the Keynesian view of traditional economics (Sargent, 1976:322). Keynes criticized Fisher's theory that the classical assumptions were valid under conditions of full employment and that the Fisher effect would not be valid in the case of idle capacity (Sargent, 1976:304). In the study by Carmichael and Stebbing (1983), the Fisher effect was found to be valid for the USA with monthly data for the period 1953-1978. Feldstein (1983), one of the pioneering studies on the relationship between interest rates and expected inflation, argues that expected inflation should be higher than interest rates. Nelson (1976) examined the relationship between expected inflation and interest rates for the US by performing regression analysis on monthly data for the period 1953-1972. The study divided the data into 10-year periods. The results indicate that the Fisher hypothesis, which predicts a positive relationship between the variables, is rejected and that the variables have a negative relationship. The study by Garbade and Wachtel (1978) carried out an analysis of the validity of the Fisher hypothesis in the USA for the period 1953-1971. The study found evidence against the claim that the real interest rate predicted by the Fisher hypothesis does not change. Carlson (1979) study showed that increases in interest rates reduce expected

inflation. That is, higher interest rates are generally associated with lower expected inflation. In the study by Moazzami (1990), which examined the relationship between nominal interest rates and expected inflation for the period 1953-1985 for the US, the Fisher effect was found to be valid. The study by Diba and Oh (1991) examined the relationship between expected inflation and nominal and real bond interest rates for the period 1955-1990 using U.S. data. The results of the study are that there is a weak positive relationship between the nominal interest rate and expected inflation, while there is a strong negative relationship between the real interest rate and expected inflation. In the study by Levin and Copeland (1992), as a result of the analysis carried out with 1990 data for England, it was found that the nominal interest rate and expected inflation had a positive relationship. Some studies in the literature also show that the Fisher effect does not hold for expected inflation. Shrestha et al. (2002) study the relationship between expected real interest rate and expected inflation for the UK, US and Canada. The study finds a negative relationship between the variables for all three countries.

Looking at the literature between capital markets and expected inflation, the majority of positive results based on the Fisher hypothesis are between the two variables. The possibility of a positive situation with unpredictable inflation shifts the transfer of wealth from creditors to debtors. As firms are in debt, this situation is expected to have a positive impact on stocks and a positive relationship between expected inflation and stocks is expected (Azar, 2010:256). On the other hand, it is expected that stock purchases will increase in the face of rising inflation expectations, and thus stock prices will rise. Thus, individuals will not suffer losses or losses as investors' inflation expectations and asset returns will be equal to each other (Tripathi and Kumar, 2014:648). Loo (1988) found a positive relationship between stocks and expected inflation in his analysis of monthly data over the period 1970-1985 for the US. The study by Fama and Schwert (1977) also found a positive relationship between stocks and expected inflation for the period 1953-1971 for the US. However, there is also a school of thought that argues the opposite. A study by Modigliani and Cohn (1979) concluded that there is a negative relationship between stock prices and expected inflation. According to Modigliani and Cohn, the effect of expected inflation on stock prices is directly related to the valuation of companies and investors' return expectations.

Expected inflation can affect companies' cash flows and profitability. In particular, during periods of high inflation, companies' costs may rise, and profit margins may fall. This can have a negative impact on share prices. In addition, higher expected inflation may change investors' real return expectations. Expectations of high inflation could increase investors' demand for real returns, which could push down share prices. Another study that theoretically examines the possibility of a negative correlation between expected inflation and stock prices is the work of Feldstein (1980). According to Feldstein, the effect of expected inflation on stock prices occurs through two basic mechanisms. The first mechanism is the effect of expected inflation on real interest rates. High expected inflation can lower real interest rates, causing investors to turn to alternative investment instruments. In this case, demand for the stock market may decrease and stock prices may fall. The second mechanism is the effect of expected inflation on corporate profitability. During periods of high expected inflation, companies' costs may rise, and profit margins may fall. This can have a negative impact on stock prices.

There is an accepted and important relationship between exchange rates and inflation. This relationship is based on purchasing power parity. In general, when a country's inflation rate rises, the value of that country's currency falls. This is because high inflation reduces the purchasing power of that country's currency. In this case, foreign investors may reduce their demand for that country's currency, which can put pressure on the exchange rate (Macchiarelli, 2014:242). Another effect is that foreign trade is affected as a result of the decrease in purchasing power in the country, which affects the exchange rate. As a result of the fall in purchasing power, the value of the national currency will fall as exports

fall and imports rise. In other words, it will have an increasing effect on the exchange rate (Liu and Ma, 2023:1). This positive relationship between inflation and the exchange rate also creates a positive relationship between inflation expectations and the exchange rate. In the study by Edison and Pauls (1993), the effects of interest rate, inflation and exchange rate on expected inflation were examined using quarterly data for the years 1975-1990 for the US. They conclude that the effect of interest rate and expected inflation on the exchange rate is positive, while the effect of actual inflation is negative. The study by Minella et al. (2003) examined the relationship between inflation and the exchange rate in Brazil using monthly data for the period 1999-2003. The study concluded that both current inflation and the real exchange rate have a positive effect on expected inflation. García et al. (2011) examined the importance of the exchange rate in relation to inflation in developed and developing countries and carried out simulation analyses, concluding that there is a positive relationship between inflation expectations and the exchange rate and that this effect is stronger in developed countries.

As a result of Macchiarelli (2011) examining the relationship between the real exchange rate and some macroeconomic variables on the US and the UK, it was concluded that although real exchange rate shocks positively and significantly affected the expected inflation in the UK, this effect was not achieved in the US. Nasir et al. (2020) examined the relationship between exchange rate pass-through and inflation expectations in small economies for the Czech Republic with monthly data for the period 1999-2018. The findings of the study are that money supply and actual inflation have a positive impact on expected inflation, while the exchange rate has a negative impact.

The cointegration method to be used in this study has also been used in the literature in studies on expected inflation. For example, Gruen and Wilkinson (1994) examined the relationship between expected inflation and exchange rate. Hudson (1994) examined the relationship between expected inflation and rational expectations. Cashin et al. (1995) examined the effects of expected inflation on the monetary aggregate. Xu (2004) examined the Fisher effect. Gardeazabal and Regúlez (2012) examined the effects of expected inflation on money supply. Ekong and Onye (2013) examined the effects of expected inflation on the monetary exchange rate.

5. METHOD

The purpose of a cointegration test is to determine the cointegration relationship between variables and to test whether this relationship is statistically significant. The Phillips-Ouliaris cointegration test examines a long-run relationship through the residuals obtained from a level or logarithmic regression equation. The presence of a unit root is important for the residuals of the generated regression. Accordingly, if there is a unit root in the residuals, the null hypothesis is accepted. Against the null hypothesis that there is no cointegration, an alternative hypothesis that there is cointegration is established. For this reason, such tests are called cointegration tests (Phillips and Ouliaris, 1990:165). The Engle and Granger (1987) cointegration test, which is a residual-based test, is based on the ADF unit root test.

$$\Delta\mu_t = \alpha.\mu_{t-1} + \sum_{i=1}^{p} \hat{\omega}_i \mu_{t-1} + \upsilon_{ip} \quad (6)$$

The working principle of the ADF test is shown in equation (6). The ADF test performs the analysis by including the lagged value of the variable in the model.

$$\Delta\hat{\mu}_t = \alpha.\hat{\mu}_{t-1} + \hat{k} \quad (7)$$

Another test based on residuals is the Phillips (1987) test. The test shown in equation (7) adds the k parameter to the ADF test. The $\hat{k}$ parameter represents the residuals of the autoregressive regression of the μ_t and μ_{t-1} terms (Phillips and Ouliaris, 1990:171).

$$\hat{Z}_\alpha = T(\hat{a}-1), S_T - \left(\frac{1}{2}\right)\left(S_T^2 - S_k^2\right)\left(T^{-2}\sum_2^T \hat{u}_{t-i}^2\right)^{-1}$$

$$\hat{Z}_t = \left(\sum_2^T \hat{u}_{t-i}^2\right)^{1/2}(\hat{a}-1), S_T - \left(\frac{1}{2}\right)\left(S_T^2 - S_k^2\right)\left[\left(T^{-2}\sum_2^T \hat{u}_{t-i}^2\right)^{\frac{1}{2}}\right]^{-1} \quad (8)$$

The terms S_T^2 and S_k^2 expressed in the equation are shown in equation (9).

$$S_k^2 = T^{-1}\sum_1^T \hat{k}_t^2 \quad ,$$

$$S_T^2 = T^{-1}\sum_1^T \hat{k}_t^2 + 2T^{-1}\sum_{s=1}^l w_{sl} + \sum_{t=s+1}^T \hat{k}_s\,\hat{k}_{s-1} \quad (9)$$

To calculate the terms S_T^2 and S_k^2 expressed in equation (9), the delay operator is calculated using the w_{sl}, (1-s) /(l+1) formulation.

The term S_T^2 is used in the construction of the $\hat{Z}_\alpha$ and $\hat{Z}_t$ tests. This term refers to the error estimate of the first order autoregressive equation, which is the $\hat{k}$ term. It also represents the null hypothesis that there is no cointegration. The difference in errors in estimating S_T^2 is replaced by $\Delta\hat{\mu}_t$ and $\hat{k}$ (Phillips and Ouliaris, 1990:172).

$$\hat{\Omega} = T^{-1}\sum_1^T \phi_t\phi_t + T^{-1}\sum_{s=1}^T w_{sl} + \sum_{t=s+1}^T \phi_t\phi'_{t-s} + \phi_{t-s}\phi'_t$$

$$\hat{\omega}_{11.2} = \hat{\omega}_{11} - \hat{\omega}_{21}\Omega_{22}^{-1}\hat{\omega}_{21}$$

$$\hat{P}_u = T\hat{\omega}_{11.2} \Big/ \left(T^{-1}\sum_1^T \hat{u}_t^2\right) \quad (10)$$

The $\hat{P}_u$ test, which is the basic statistic of the Phillips and Ouliaris cointegration test, is a variance ratio test and is shown in equation (10). The term Φ represents the errors obtained from the least squares estimator. The $\hat{P}_u$ test measures the size of the residual variance obtained from the $T^{-1}\sum_1^T \hat{u}_t^2$ cointegration regression against the direct estimate of the $T\hat{\omega}_{11.2}$ conditional variance (Phillips and Ouliaris, 1990:172).

$$z_t = \hat{\Pi} z_{t-1} + \phi_t \quad (11)$$

$$\hat{P}_z = Ttr\left(\hat{\Omega}M_{zz}^{-1}\right) \quad , \quad M_{zz} = T^{-1}\sum_1^T Z_t Z_t' \quad (12)$$

The covariance matrix Ω was first used to generate the $\hat{P}_u$ and $\hat{P}_z$ estimates. This matrix was made possible by determining the term ϕ_t which is the residual obtained from equation (11). The estimation of Ω is based on the first difference ($\phi_t = \Delta z_t$). The term M_{zz} is the observed sample moment matrix.

6. EMPIRICAL FINDING

The variables used in the study and their explanations are shown in Table 1. In the study investigating the relationship between money and capital variables and inflation expectations, all data were obtained from the CBRT (Central Bank of the Republic of Turkiye) database. Inflation expectations in the source data are between 0 and over 40 and are presented in 0.5 slices. In this study, instead of

using too many dependent variables, the data on inflation expectations divided into these slices have been collected under the short name 020, representing the range from 0 to 20. It is collected under the short name 2040, representing the value between 20 and 40. Finally, data above 40 were used as received from the source. Finally, inflation expectations are presented at 3 different levels: low, medium and high.

Table 1. Presentation of the Variables Used in the Study

Variables	Explanation	Source
Expected Inflation 1 (020)	Inflation expectations express the probability distribution of consumers' annual inflation expectations 12 months ahead. 020 is the mean of the distribution of these expectations between 0 and 20. Compiled by the author.	TCMB- EVDS
Expected Inflation 2 (2040)	Expectations are the average of the distribution between 20 and 40. Compiled by the author.	TCMB- EVDS
Expected Inflation 3 (40+)	The distribution of expectations above 40 is the average of the distribution. Compiled by the author.	TCMB- EVDS
Exchange rate (rexc)	CPI based monthly real effective exchange rate (monthly)	TCMB- EVDS
Credit interest (crd)	Weighted average interest rate on consumer, car and housing loans, including credit deposit account (monthly)	TCMB- EVDS
Money supply (M2)	M2 (M1 plus savings and short-term time deposits) (monthly)	TCMB- EVDS
Inflation (inf)	Price index general level (2003=100) (monthly)	TCMB- EVDS
Deposit interest (dep)	Weighted average interest rate on deposit accounts in Turkish lira with a maturity of up to 1 month (monthly)	TCMB- EVDS
Capital market (bist)	BIST100 (The closing index values for all BIST 100 indices (representing shares of 100 companies traded on Turkiye's stock market) (monthly)	TCMB- EVDS

The variables used in the model were selected on the basis of theoretical knowledge and are detailed in the theoretical part of the study. The expected directions of the selected variables are discussed in the literature section. The study used 5 different variables to represent the money market and one variable to represent the capital market. Descriptive statistics of the data for all variables used are presented in Table 2.

Table 2. Description of Variables.

	Ln 020	Ln 2040	Ln 40+	Ln bist	Ln enf	Ln m2	Ln rexc	Ln crd	Ln dep
Mean	1.765	0.364	0.481	7.641	2.691	21.49	4.360	3.011	2.498
Median	2.004	0.000	0.000	7.196	2.464	21.34	4.348	2.983	2.411
Maximum	2.004	1.948	4.271	10.16	4.448	23.20	4.687	3.583	3.371
Minimum	0.000	0.000	0.000	6.605	1.882	20.50	3.863	2.468	1.781
Std. D.	0.569	0.687	1.144	0.931	0.719	0.724	0.244	0.228	0.362

As the study separates expectations into 3 parts, the aim is to explore how different levels of variables affect expectations. To do this, three models were created, with each inflation expectation as a separate dependent variable (Ln 020, Ln 2040 and Ln 40 +). In these models, it were used the same independent variables.

Model 1

$$Ln\ 020_t = Ln\ \text{rexc}_t + Ln\ \text{crd}_t + \text{Ln m2}_t + \text{Ln inf}_t + \text{Ln dep}_t + \text{Ln bist}_t + \mu \quad (13)$$

Model 2

$$Ln\ 2040_t = Ln\ \text{rexc}_t + Ln\ \text{crd}_t + \text{Ln m2}_t + \text{Ln inf}_t + \text{Ln dep}_t + \text{Ln bist}_t + \mu \quad (14)$$

Model 3

$$Ln\ 40_t = \ Ln\ \mathrm{rexc}_t + \ Ln\ \mathrm{crd}_t + \ \mathrm{Ln\ m2}_t \ + \ \mathrm{Ln\ inf}_t + \mathrm{Ln\ dep}_t + \mathrm{Ln\ bist}_t + \ \mu \qquad (15)$$

In Equation (13), the effects of money and capital variables on low inflation expectations, in Equation (14) on medium inflation expectations, and in Equation (15) on high inflation expectations are investigated. In the equations, μ, represents the error term and t, time parameter.

Before empirical application with the variables, the logarithm of each variable was taken. Additionally, since the data is used monthly, all variables were purified from seasonal effects in order to get rid of seasonal effects. In practice, the STL (Seasonal-Trend decomposition using Loess) method was used. The method is frequently used to separate seasonal, trend and random components in time series data.

For the 3 equations obtained, the long-term relationships of the variables will be tested for cointegration and then FMOLS (Fully Modified Ordinary Least Squares) and DOLS (Dynamic Ordinary Least Squares) estimators will be applied in order to determine the long-term coefficients. Before these applications, the stationarity levels of the variables will be checked to prevent a spurious regression in the model. All econometric tests applied in this study were carried out with the help of Eviews package program.

Table 3. Stationarity Test Results

	PP			
	Level		First Difference	
	Constant	Constant + trend	Constant	Constant + trend
Ln 020	-0.371	-1.470	-7.959***	-8.079***
Ln 2040	-1.256	-2.124	-9.725***	-9.698***
Ln 40+	0.201	-0.998	-9.779***	-10.00***
Ln rexc	-0.588	-2.916	-8.859***	-8.732***
Ln crd	-1.460	-2.149	-5.130***	-5.140***
Ln m2	2.608	-0.606	-10.23***	-10.78***
Ln inf	5.374	1.994	-4.696***	-5.670***
Ln dep	-1.379	-2.445	-6.737***	-6.718***
Ln bist	3.229	0.433	-7.916***	-8.590***
	ADF			
	Constant	Constant + trend	Constant	Constant + trend
Ln 020	4.450	3.263	-2.303	-4.169***
Ln 2040	-1.069	-1.917	-9.733***	-9.706***
Ln 40+	2.408	1.879	-2.006**	-9.741***
Ln rexc	-0.605	-3.164	-9.362***	-9.322***
Ln crd	-0.946	-1.876	-5.295***	-5.315***
Ln m2	2.690	-0.567	-10.16***	-10.77***
Ln inf	3.948	1.168	-4.590***	-5.734***
Ln dep	-0.954	-2.992	-6.660***	-6.651***
Ln bist	2.649	0.185	-7.916***	-8.634***

Note: In the table, the symbols *, ** and *** indicate 10%, 5% and 1% significance levels, respectively.

In Table 3, ADF (Augmented Dickey–Fuller) and PP (Phillips–Perron) unit root tests were applied for the variables. As a result of the tests examined with both constant and constant and trend, the null hypothesis that there is no unit root for 1%, 5% and 10% significance in the level values of the variables could not be rejected. When the tests are reapplied by taking the differences of the variables,

it is seen that the null hypothesis is rejected. Thus, as a result of the tests, it was determined that all variables were stationary at the I(1) level.

Table 4. Phillips-Ouliaris Cointegration Test Results

	tests	stat. value	prob.
Model 1	z stat.	-77.21	0.000
	tau stat.	- 8.33	0.000
Model 2	z stat.	-40.33	0.078
	tau stat.	-4.836	0.098
Model 3	z stat.	-44.15	0.091
	tau stat.	-4.870	0.041

Note: Testing H_0 hypothesis is that there is no cointegration.

Table 4 shows the cointegration test results. The results of model 1, model 2 and model 3, which were created with the equations expressed in Equation (8), Equation (9) and Equation (10) respectively, are given. There are three different forms for the Phillips-Ouliaris cointegration test. These are the forms: no constant or trend, only a constant, and both constant and trend together. The form applied in the study is a constant model for all models. The probability values of the statistical results presented mean that the H_0 hypothesis (No cointegration) will be rejected. When Table 4 is evaluated, it is accepted that there is a cointegration relationship for all three models.

Table 5. Test Results for Long-term Coefficients in Model 1 (Dependent V. is Ln 020)

	FMOLS		DOLS	
Variables	Coeff.	t stat.	Coeff.	t stat.
Ln rexc	-0.001	-0.125	0.004	0.346
Ln crd	-0.010*	-1.778	-0.002	-0.278
Ln m2	-0.009**	-2.445	-0.010*	-1.825
Ln inf	-0.006***	-2.904	-0.008**	-2.296
Ln dep	0.005	1.094	0.004	0.647
Ln bist	0.009***	4.773	0.010***	4.327
c	2.178***	20.93	2.149***	12.93

Note: The FMOLS estimators long-term covariance adjustment obtained robust standard errors with the Bartlett Kernel and Newey West estimators. The table shows significance levels of 10%, 5% and 1%, respectively, denoted by symbols *, ** and ***.

Table 5 shows the outcomes of Model 1, analyzing the correlation between low inflation expectations and variables. The FMOLS and DOLS estimators' coefficients are close to each other. Furthermore, the FOLMS estimator shows that the results of loan interest (crd), money supply (m2), and inflation (inf) are statistically significant. Rising values of these variables have a negative effect on the low level of expectations. The stock market (bist) variable has a positive and significant effect on the dependent variable. Therefore, an increase in the stock market can be viewed as an increase in the low expectation level. While the loan interest variable has no statistically significant impact, the direction and significance of the other variables align with the FMOLS estimator. While the loan interest variable has no statistically significant impact, the direction and significance of the other variables align with the FMOLS estimator. Notably, the coefficients have low values.

Table 6. Test Results for Long-term Coefficients in Model 2 (Dependent V. is Ln 2040)

	FMOLS		DOLS	
Variables	Coeff.	t stat.	Coeff.	t stat.
Ln rexc	2.468***	4.670	2.824***	3.849
Ln crd	0.361	0.663	0.346	0.490
Ln m2	1.055***	2.778	1.388***	2.839

Ln inf	0.981***	6.346	0.906***	4.442
Ln dep	-0.377	-1.016	-0.350	-0.735
Ln bist	-0.250	-1.287	-0.412	-1.709
c	-33.98***	-4.034	-41.32***	-3.761

Note: The FMOLS estimators long-term covariance adjustment obtained robust standard errors with the Bartlett Kernel and Newey West estimators. The table shows significance levels of 10%, 5% and 1%, respectively, denoted by symbols *, ** and ***.

The results in Table 6 examine the relationship between the mean inflation expectations, which represent Model 2, and the variables. According to the results of the FMOLS estimator, the exchange rate, money supply and inflation variables have positive signs and are significant at the 1% significance level. Accordingly, increases in the exchange rate, money supply and inflation are the factors that increase medium-term inflation expectations. The sign of the coefficients, the significance and the direction of the effects are not different from the DOLS estimator. A noteworthy feature of this estimator is that the effect level of the exchange rate is higher than that of other variables.

Table 7. Test Results for Long-term Coefficients in Model 3 (Dependent V. is Ln 40+)

	FMOLS		DOLS	
Variables	Coef.	t stat.	Coef.	t stat.
Ln rexc	4.529***	6.954	3.709***	4.464
Ln crd	1.799**	2.682	1.989**	2.491
Ln m2	1.285***	2.746	1.372**	2.479
Ln inf	1.555***	8.158	1.607***	6.955
Ln dep	-1.738***	-3.802	-2.165***	-4.014
Ln bist	0.197	0.824	-0.063	-0.234
c	-53.67***	-5.172	-49.63***	-3.990

Note: The FMOLS estimators long-term covariance adjustment obtained robust standard errors with the Bartlett Kernel and Newey West estimators. The table shows significance levels of 10%, 5% and 1%, respectively, denoted by symbols *, ** and ***.

The results of model 3, which examines the relationship between high inflation expectations and variables, are shown in table 7. The results of the FMOLS and DOLS estimators are very close. Looking at the results, the exchange rate, lending rates, money supply and inflation variables have a positive and significant impact on the dependent variable. Increases in these variables lead to high inflation expectations. Deposit rates have a negative and significant effect.

In general, the source of low expectations is positive developments in the capital market, while the source of high expectations is mostly developments in the money market. In addition, the coefficient values of the variables increase as inflation expectations rise. This shows that individuals with high expectations examine macro variables more carefully.

Money supply and actual inflation are theoretically the most important determinants of expectations. Although the sign of the coefficients is not as expected in the first model, we see that they have the correct sign in model 2 and model 3. This result shows that the entities that generate medium and high inflation expectations make predictions in line with economic theory.

CONCLUSION

The purpose of this study is to examine the relationship between inflation expectations and some macroeconomic variables for Turkiye.

The study used data for the period 2013m6-2023m9. As the data are monthly, the STL decomposition method was used to eliminate seasonal effects. The study used the Phillips-Ouliaris cointegration test to identify long-run relationships. The DOLS and FMOLS estimators were then used

to determine the direction and strength of the long-run relationships. Prior to the analysis, inflation expectations were divided into three groups: between 0 and 20, between 20 and 40 and above 40. The purpose of this is to separate low, medium and high expectations and to create different inflation expectations. As far as can be ascertained, such a distinction does not exist in literature. The study is a first in this respect and is expected to contribute to the literature.

The first findings of obtained from the study are that there is a long-run relationship, namely a cointegration relationship, between macroeconomic variables and low, medium and high inflation expectations. The result obtained from the DOLS and FMOLS estimators is that credit interest, money supply, inflation and stock variables are determinants of low inflation expectations; exchange rate, money supply and inflation are determinants of medium inflation expectations; and exchange rate, credit interest, money supply, inflation and deposit interest are determinants of high inflation expectations. In addition to these results, the coefficients of low inflation expectations are quite low. This situation shows that the macroeconomic determinants of low inflation can be considered insignificant. In addition, it is noteworthy that the capital variable is not statistically significant in medium and high inflation expectations. When evaluated in general, it is concluded that monetary variables affect inflation expectations at all levels. The effects of the variables are examined one by one in the following part of the section.

BIST100 closing index was used to represent the capital market. The relevant literature predicts that the future value of stocks will be higher than today due to the increase in inflation expectations. Thus, the effect of the increase in expectations on the inflation expectations of the capital market is positive and significant only at low expectations. Statistical significance could not be achieved for other expectations. Accordingly, increases in the BIST100 closing index have an increasing effect on low inflation expectations.

The exchange rate for developing countries such as Turkiye is highly unpredictable and is the key factor affecting costs. Consequently, it is expected to influence prices immensely. According to research, if the exchange rate increases, purchasing power reduces, and inflation rises positively, affecting foreign trade. Although various studies also suggest that such a situation may have an adverse effect due to unique macroeconomic circumstances of countries. Upon evaluation, it was discovered that an increase in exchange rates has a negative impact on expected inflation at low expectation levels but has a positive and statistically significant effect at medium and high expectation levels. As a result, exchange rate increases are a crucial determinant for those who overestimate inflation expectations.

The increase in consumer loan interest rates reduces inflation expectations for low expectation levels and increases inflation expectations for high inflation expectations. As for deposit interest, it has been determined that increasing deposit interest has a lowering effect on inflation expectations for individuals with low inflation expectations. On the contrary, it has been determined that increases in deposit interest rates increase inflation expectations in individuals with high inflation expectations.

In the relationship between actual inflation and expected inflation, the effect of current inflation on expectations is negative for low expectations and positive for high expectations. It is accepted in both the adaptive and rational expectations hypotheses that inflation occurring in a high inflation environment will increase expectations. Accordingly, it is estimated that participants with high inflation expectations display rational behavior in answering the survey questions.

It has been determined that there is a negative relationship at low expectation levels and a positive relationship at high expectation levels in the effect of money supply on expected inflation. Accordingly, it can be interpreted that individuals with low inflation expectations act according to the

adaptive expectations advocated by Friedman (1957) study, while individuals with higher inflation expectations act according to the rational expectations hypothesis advocated by Muth (1961) study.

The central bank should adopt a data-driven approach to monetary policy, taking into account all factors affecting inflation. This is because participants in inflation expectations, especially those with medium and high inflation expectations, take monetary data into account. The public should be informed about how the medium- and long-term effects of monetary policy will be realized, and individuals should be encouraged to believe in the program. Otherwise, there may be a difference between expected and actual inflation.

Ethical Statement

During the writing and publication processes of the study titled "The Relationship of Inflation Expectations Adjusted to Different Levels with Capital and Monetary Variables", the rules of Research and Publication Ethics were complied with, and no falsification was made in the data obtained for the study. Ethics committee approval is not required for the study.

Contribution Rate Statement

All processes of the study were carried out and completed by a single author.

Conflict Statement

No individual or institutional/organizational conflicts of interest were identified in this study.

REFERENCES

Azar, S. A. (2010). Inflation and stock returns. *International Journal of Accounting and Finance, 2*(3-4), 254-274.

Bocutoglu, E. (2013). *Karşılaştırmalı Makro İktisat: Teoriler ve Politikalar*. Ekin Yayınevi. Bursa.

Cagan, P. (1956). The Monetary Dynamics of Hyperinflation. *Studies in the Quantity Theory if Money*.

Carlson, J. A. (1979). Expected Inflation and Interest Rates. *Economic Inquiry*, 17(4), 597-608.

Carmichael, J., and Stebbing, P. W. (1983). Fisher's Paradox and the Theory of Interest. *The American Economic Review*, 73(4), 619-630.

Cashin, M. P., Eken, M. S., Erbas, M. S. N., Martelino, M. J., and Mazarei, M. A. (1995). *Economic Dislocation and Recovery in Lebanon*. International Monetary Fund.

Diba, B. T., and Oh, S. (1991). Bounds for the Correlations of Expected Inflation with Real and Nominal Interest Rates. *Economics Letters*, 36(4), 385-389.

Edison, H. J., and Pauls, B. D. (1993). A Re-Assessment of the Relationship Between Real Exchange Rates and Real Interest Rates: 1974–1990. *Journal of Monetary Economics*, 31(2), 165-187.

Ekong, C. N., and Onye, K. U. (2013). The Failure of the Monetary Exchange Rate Model for the Naira-Dollar. *American Journal of Social and Management Sciences*, 4, 8-19.

Engle, R. F., and Granger, C. W. (1987). Co-Integration and Error Correction: Representation, Estimation, and Testing. *Econometrica: Journal of the Econometric Society*, 251-276.

Fahmy, Y. A., and Kandil, M. (2003). The Fisher Effect: New Evidence and Implications. *International Review of Economics & Finance*, *12*(4), 451-465.

Fama, E. F., and Schwert, G. W. (1977). Asset Returns and Inflation. *Journal of Financial Economics*, 5(2), 115-146.

Feldstein, M. (1980) 'Inflation and the Stock Market', *The American Economic Review*, Vol. 70, No. 5, pp.839–847.

Feldstein, M. (1983). *Inflation, İncome Taxes, and the Rate of Interest: A Theoretical Analysis. In Inflation, Tax Rules, and Capital Formation* (pp. 28-43). University of Chicago Press.

Fisher, I. (1930). *The Theory of Interest*, The Macmillan Company, New York.

Friedman, M. (1957). *Theory of the Consumption Function*. Princeton University Press.

Garbade, K., and Wachtel, P. (1978). Time Variation in the Relationship Between Inflation and Interest Rates. *Journal of Monetary Economics*, 4(4), 755-765.

Garcia, C. J., Restrepo, J. E., and Roger, S. (2011). How Much Should Inflation Targeters Care About the Exchange Rate?. *Journal of International Money and Finance*, *30*(7), 1590-1617.

Gardeazabal, J., and Regúlez, M. (2012). *The Monetary Model of Exchange Rates and Cointegration: Estimation, Testing and Prediction* (Vol. 385). Springer Science & Business Media.

Gruen, D. W., and Wilkinson, J. (1994). Australia's Real Exchange Rate–Is It Explained by the Terms of Trade or by Real İnterest Differentials? *Economic Record*, *70*(209), 204-219.

Harvey, N., Bolger, F., and McClelland, A. (1994). On the Nature of Expectations. *British Journal of Psychology*, 85(2), 203-229.

Hudson, J. (1994). Granger Causality, Rational Expectations and Aversion to Unemployment and Inflation. *Public Choice*, *80*(1), 9-21.

Kara, H., and Küçük-Tuğer, H. (2010). Inflation Expectations in Türkiye: Learning to be Rational. *Applied Economics*, 42(21), 2725-2742.

Levin, E. J., and Copeland, L. S. (1992). Real Interest Rates, Expected Inflation and the Inflation Uncertainty Premium: Evidence from UK Index-Linked Bond Prices. *Economics Letters*, 38(3), 331-334.

Li, X., and Ji, Y. (2011, August). *An Empirical Research on the Money-Supply Effect of Inflation Expectation When Managing Inflation Expectation in China-Based on Cagan Model and Lucas Microeconomic Rational Expectation Equation. In 2011* International Conference on Management and Service Science (pp. 1-4). IEEE.

Liu, T. Y., and Ma, J. T. (2023). Exchange Rate and Inflation between China and the United States: A Bootstrap Rolling-Window Approach. *Economic Systems*, 101152.

Loo, J. C. (1988). Common Stock Returns, Expected Inflation, and the Rational Expectations Hypothesis. *Journal of Financial Research*, 11(2), 165-172.

Macchiarelli, C. (2011). Bond Market Co-Movements, Expected Inflation and the Equilibrium Real Exchange Rate. *European Central Bank*, 1405.

Macchiarelli, C. (2014). Bond Market Co-Movements, Expected Inflation and the GBP-USD Equilibrium Real Exchange Rate. *The Quarterly Review of Economics and Finance*, 54(2), 242-256.

Mehra, Y. P. (2002). Survey Measures of Expected Inflation: Revisiting the Issues of Predictive Content and Rationality. *FRB Richmond Economic Quarterly*, 88(3), 17-36.

Minella, A., De Freitas, P. S., Goldfajn, I., and Muinhos, M. K. (2003). Inflation Targeting in Brazil: Constructing Credibility under Exchange Rate Volatility. *Journal of International Money and Finance*, 22(7), 1015-1040.

Moazzami, B. (1990). Interest Rates and Inflationary Expectations: Long-Run Equilibrium and Short-Run Adjustment. *Journal of Banking & Finance*, 14(6), 1163-1170.

Modigliani, F., and Cohn, R. A. (1979). Inflation, Rational Valuation and The Market. *Financial Analysts Journal*, 35(2), 24-44.

Mullineaux, D. J. (1980). Inflation Expectations and Money Growth in the United States. *The American Economic Review*, 70(1), 149-161.

Muth, J. F. (1961). Rational Expectations and the Theory of Price Movements. Econometrica: *Journal of the Econometric Society*, 315-335.

Nasir, M. A., Huynh, T. L. D., and Vo, X. V. (2020). Exchange Rate Pass-Through and Management of Inflation Expectations in a Small Open İnflation Targeting Economy. *International Review of Economics & Finance*, 69, 178-188.

Nelson, C. R. (1976). Inflation and Rates of Return on Common Stocks. *The Journal of Finance*, 31(2), 471-483.

Nerlove, M. (1958). Adaptive Expectations and Cobweb Phenomena. *The Quarterly Journal of Economics*, 72(2), 227-240.

Özer, Y. B., and Mutluer, D. (2005). Inflation Expectations in Türkiye: Statistical Evidence from the Business Tendency Survey. *Central Bank Review*, 5(2). 73-97.

Panopoulou, E., and Pantelidis, T. (2016). The Fisher Effect in the Presence of Time-Varying Coefficients. *Computational Statistics and Data Analysis, 100*, 495-511.

Phillips, P. C. (1987). Time Series Regression with a Unit Root. *Econometrica: Journal of the Econometric Society*, 277-301.

Phillips, P. C., and Ouliaris, S. (1990). Asymptotic Properties of Residual Based Tests for Cointegration. *Econometrica: Journal of the Econometric Society*, 165-193.

Sargent, T. (1977). The Demand for Money During Hyperinflations Under Rational Expectations: *I. International Economic Review* (18)1, 58-82.

Sargent, T. J. (1976). Interest Rates and Expected Inflation: A Selective Summary of Recent Research. *Explorations in Economic Research*, Volume 3, number 3, 1-23.

Shrestha, K., Chen, S. S., and Lee, C. F. (2002). Are Expected Inflation Rates and Expected Real Rates Negatively Correlated? A Long-Run Test of the Mundell-Tobin Hypothesis. *Journal of Financial Research*, 25(3), 305-320.

Tavlas, G. S. (1987). Inflationary Finance and the Demand for Money in Greece. *Credit and Capital Markets–Kredit und Kapital*, 20(2), 245-257.

Thomas Jr, L. B. (1999). Survey Measures of Expected US Inflation. *Journal of Economic Perspectives*, 13(4), 125-144.

Tripathi, V., and Kumar, A. (2014). Relationship between Inflation and Stock Returns–Evidence from BRICS Markets using Panel Co Integration Test. *International Journal of Accounting and Financial Reporting*, 4(2), 647-658.

Webb, S. B. (1985). Government Debt and İnflationary Expectations as Determinants of the Money Supply in Germany 1919-23. *Journal of Money, Credit and Banking*, *17*(4), 479-492.

Xu, B. (2004). *Threshold Cointegration Test of the Fisher effect*. Iowa State University.

Yerli, B. G. (2008). *Ekonomik Beklentilerin Enflasyon Üzerine Etkisi: Türkiye Örneği* (Doctoral dissertation, Marmara Universitesi (Türkiye)).

Yilmaz, C. (2012). *Türkiye'de Enflasyon Beklentilerini Belirleyen Makroekonomik Unsurlar*. Uzmanlık Yeterlilik Tezi. TCMB İletişim ve Dış İlişkiler Genel Müdürlüğü.

Alpağut, S. (2024). The Relationship of Inflation Expectations Adjusted to Different Levels with Capital and Monetary Variables. *KMÜ Sosyal ve Ekonomik Araştırmalar Dergisi*, 26(47), 1304-1322.

Extended Abstract

The Relationship of Inflation Expectations Adjusted to Different Levels with Capital and Monetary Variables

Aim: This study aims to explain the discrepancy between expected and actual inflation in Turkiye. An approach that has not been used in previous studies was used to investigate the discrepancy. It was assumed that the discrepancy in inflation expectations could be due to different expectation levels of individuals participating in the survey. For this reason, the data source was separated according to the levels of inflation expectations. In this separation, expectations were divided into three groups as low, medium and high. The fact that each expectation level could be affected by macroeconomic variables was taken into account.

Method: In the study, Phillips-Ouliaris cointegration test was applied to determine whether the variables were long-term related. After determining that the variables were cointegrated, DOLS and FMOLS methods were applied to determine the long-term coefficients.

Findings: The first basic model was created in the relationship between different levels of inflation expectations and macroeconomic variables. Then, the dependent variable of the basic model was changed to low, medium and high expectations and 3 different models were obtained. In the selection of macroeconomic variables to be used, variables frequently used in the literature were selected. These variables are exchange rate, loan interest, money supply, inflation, deposit interest and stocks. The variables represent the money market and capital market. The literature has presented that all these variables mentioned are effective in inflation and inflation expectations. All variables in the prepared models were obtained from the Central Bank of the Republic of Turkiye, EVDS database. Then, the logarithms of all variables were taken. Since the data is in a monthly period, there may be seasonal effects. As applied in previous studies, seasonal effects were eliminated with the STL (Seasonal-Trend decomposition using Loess) method. Before applying the econometric analysis, a unit root test was applied in order to determine the stationarity levels of the variables. In the application of the cointegration test, the variables must be stationary in difference. As a result of the applied unit root test, it was determined that all variables were stationary in real time. The cointegration test results showed that the variables were related in the long term. Then, the coefficients were estimated. The first model is related to the estimation of low inflation expectations. According to the results of this estimator, it was determined that low inflation expectations were affected by loan interest, money supply, inflation and stock variables. The second model is related to medium-level inflation expectations. According to the results of this estimator, it was determined that medium inflation expectations were affected by exchange rate, money supply and inflation variables. The third model is related to high-level inflation expectations. According to the results of this estimator, it was determined that medium inflation expectations were affected by exchange rate, loan interest, money supply, inflation and deposit interest variables.

Conclusion: The first finding is related to the capital market variable and inflation expectations. When the findings are evaluated, the effect of the capital market on inflation expectations is positive and significant only in low expectations. Accordingly, participants who estimate inflation expectations by considering the capital market variable estimate inflation low. On the contrary, participants with medium and high expectations do not include capital market developments in their expectations. Another finding is related to the relationship between exchange rates and inflation expectations. When the findings are evaluated, it is determined that increases in exchange rates negatively affect expected inflation at low expectations levels, and positively and statistically significant at medium and high expectations levels. Accordingly, increases in exchange rates are an important determinant for those who estimate inflation expectations high. The other finding is related to interest rates and inflation expectations. When the findings are evaluated, it is determined that increases in consumer credit interest rates reduce inflation expectations for low expectations levels and increase high inflation expectations. In terms of deposit interest, it is determined that an increase in deposit interest rates has a decreasing effect on inflation expectations for individuals with low inflation expectations. On the contrary, it is determined that increases in deposit interest rates increase inflation expectations for individuals with high inflation expectations. Another finding is the relationship between realized inflation and expected inflation. When the findings are evaluated, it is determined that the effect of current inflation on expectations is negative in low expectations and positive in high expectations. This situation shows that increases in current inflation are only effective in the decisions of individuals with high expectations. Another finding is related to money supply and expected inflation. When the findings are evaluated, it is determined that the effect of money supply is negative in low expectation levels and positive in high expectation levels.