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# Inflation Expectation Dynamics: A Structural Long-run Analysis for Turkey

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**ABSTRACT**

This study analyses the relationship between inflation and inflation expectations for the period from 2006 to 2017 with monthly data for Turkey. We used current month inflation expectations, inflation expectations for 1 month ahead and inflation expectations for 2 months ahead. Those three expectations give us the chance to understand the effect of time on expectations and also understand how well the economic agents generate or change their expectations in time. We used TAR-VEC model for testing the long run relationship between the variables that we take into consideration. This method is selected because of the threshold structure of variables in this analyzing period. Our empirical findings show that inflation has positive effect on inflation expectations for current month. However expected inflation values for 1 and 2 months ahead are effected negatively from inflation realizations.

**Keywords:** Inflation, Inflation Expectations, TAR-VEC Model
**JEL Classifications:** C32, E31

## 1. INTRODUCTION AND LITERATURE REVIEW

The term of "expectation" is one of the most significant aspects for the economy. Especially for financial markets and institutions, both individuals and firms are trying to guess these expectation's results to situate themselves for a new market structure. Owing to these reasons, rationality hypothesis behind the expectations has being tested in many areas of the economy. For instance, Rich (1989) used consumer survey data for testing the rationality of expectations and so, properties of unbiasedness, efficiency and orthogonality are not rejected for this data series as a result. Another growing literature on inflation and inflation expectations is on the basis of monetary policy implications. Those studies generally test the consistency of expectations and inflation targeting experiences. For instance, Capistrán (2008) studied on the bias in federal inflation forecasts. They concluded that The Federal Reserve's inflation forecasts are rational. Van der Cruijsen and Demertzis (2007) work on the impact of central bank transparency on inflation expectations. They collect data from both the International Financial Statistics of the international monetary fund and the consensus economic forecasts. While consumer price indices are taken from the international financial statistics of the international monetary fund, they take inflation expectations from consensus economic forecasts. They used the data whose period ranges from the second half of 1989 to the first half of 2004. As a result, they find evidence that transparency is a helping factor for fixing private sector's inflation expectations. Pierdzioch and Rülke (2013) investigate the effects of inflation expectations on inflation targeting. They use private-sector inflation forecasts published by consensus economics for 22 inflation targeting countries. The data cover the period between the introduction of inflation targeting and December 2011 for every country. In conclusion, Pierdzioch and Rülke find that forecasters scatter their inflation forecasts away from the inflation target for many countries.

Monetary policy studies started taking into account the uncertainties and the expectations and the effect of expectations on especially monetary policy performance. Some of the studies on inflation and the effect of output growth on inflation also studied on the effect of inflation uncertainty. Another question need to be answered in those studies is the effect of high inflation periods on expectations. From this perspective one of the most important studies on this topic is Ball (1992). His study represents a model which shows that a rise in inflation also raises the uncertainty on future inflation. On the other hand his shows that low inflationary periods decrease the inflation expectations because of the idea that monetary authority will try to keep inflation low. His starting point studies are Okun (1971) and Friedman (1977) which have the similar idea as; high inflation creates uncertainty about future monetary policy. Ungar and Zilberfarb (1993) study is also tested this relationship but their study indicates the results on the relationship between high inflation periods and the relationship between predictability of inflation. Their finding suggests that the significant positive relationship between inflation and its unpredictability is valid for high inflationary periods. From this point of view they concluded that there may be a threshold value for this type of relation. They used absolute forecast error, squared forecast error and mean squared error to test the relationship between inflation and its unpredictability. Holland (1995) study tests the long and short run relationship between inflation and inflation uncertainty for the period of 1954-1990. Co-integration and ECM is used for this testing procedure and indicates that higher inflation precedes greater inflation uncertainty and greater inflation uncertainty precedes lower inflation. Another important issue on this topic is the proper model used to model the inflation uncertainty.

Grier and Perry (1998), Berument and Dincer (2005) and Omay et al. (2009) are studies which used GARCH family models to generate a measure of inflation uncertainty. Grier and Perry (1998) studies on G7 countries for the period from 1948 to 1993. This study used GARCH model and Granger causality and find the evidence to explain the rising inflation uncertainty depending on increasing inflation. They found increased inflation uncertainty lowers inflation for three countries however for two countries increased inflation uncertainty raises inflation. Berument and Dincer (2005) also studied for G7 countries and used GARCH models but they tested this relationship for the period 1957-2001. They found that inflation Granger causes inflation uncertainty for all G7 countries. However inflation uncertainty Granger causes inflation for 5 countries. For four countries increased uncertainty lowers inflation while one country (Japan) increased uncertainty raises inflation. Payne (2008) studied on this topic for three Caribbean countries; Bahamas, Barbados and Jamaica. He used ARMA-GARCH model and Granger causality tests for different periods for those three countries. His findings suggest that increase in inflation has positive impact on inflation uncertainty for each country. On the other hand an increase in inflation uncertainty yields a decrease in inflation for Jamaica. Another causality investigation study between those variables for the Friedman-Ball hypothesis is Hartmann and Herwartz (2012) study. They study on 22 countries for the period from 1975 M1 to 2011 M5 and find evidence for this hypothesis. Javed et al. (2012) study this topic for Pakistan economy and used ARMA-GARCH model to estimate conditional volatility of inflation and Granger causality test for the period of 1957 M1-2007 M12. They found empirical evidence for the positive effect of inflation on inflation uncertainty but this finding is not valid for the opposite direction.

The literature on inflation and expected inflation relation for Turkish economy is also analyzed for various time intervals. We summarized some of the important studies on this topic for Turkey. One of the earliest studies for Turkey on this topic is written by Telatar and Telatar (2003). They also improved the method used for estimating the inflation uncertainty. They used Markov-switching heteroscedastic disturbances to derive measures of monthly inflation uncertainty for the period 1995-2000. They made a distinction between the determinants of uncertainty. They found that inflation is granger cause of inflation uncertainty arising from time varying parameters of the inflation model. However the correlation between those variables is not detected due to the heteroscedasticity in disturbance terms. Artan (2006) study is also stated the importance of estimation technique for the inflation uncertainty and used GARCH models to estimate the inflation uncertainty values. This study analyzed the relationship between inflation, inflation uncertainty and growth with using quarterly data for the period of 1987-2003. The negative impact of inflation and inflation uncertainty on growth is found. Omay et al. (2009) also used GARCH models and Granger causality but unlike others they used VAR-GARCH model to understand the relationship between inflation and output and their uncertainties. They tested not only the relationship between inflation and its uncertainty they also take into account the output in this system and found that inflation is affected by the output growth through the nominal uncertainty channel in Turkey. Berument et al. (2011) study used stochastic volatility in mean models for gathering the dynamic link between inflation and inflation uncertainty for the period from 1984 to 2009. For this period they found that inflation uncertainty has positive effect on inflation. Another study for Turkey belongs to Keskek and Orhan (2010). Their study covers the period from 1984 to 2005 and GARCH-M models are used for analyzing the relation between inflation and inflation uncertainty. Their study implies that higher inflation leads to high inflation uncertainty. On the other hand they found negative effect of inflation uncertainty on inflation. Another important implication of their study is the evidence of successful power of inflation oriented monetary policy on reducing inflation persistency and uncertainty. Karahan (2012) studied this topic for the period from 2002 to 2011 with ARMA-GARCH models and Granger Causality analysis. The empirical evidence shows that high inflation increases inflation uncertainty. Erdem and Yamak (2013) study used Kalman filter estimation technique for estimation of inflation uncertainty with using time varying residual variances for the period from 1980 to 2012. They found bi-directional causality between inflation and inflation uncertainty. Erdem and Yamak (2014) study also used the Kalman filter estimation technique for different periods and find empirical evidence for Friedman-Ball hypothesis in high inflationary periods however Cukerman-Meltzer hypothesis is valid for low inflationary periods in Turkey. Doğru (2014) study also used GARCH model for estimating inflation uncertainty and Granger causality for testing this relationship but the annual data for the period from 1923 to 2012 is used. The results indicates that high inflation increases inflation uncertainty in long run and increase in inflation uncertainty decreases inflation in short run for this period.

We aim to understand the structure and the relationship between inflation and expected inflation in Turkey. As it is seen from the literature, this topic is widely analyzed. We used TAR-VECM model for testing the relationship between inflation and inflation expectation. Threshold structure helps us to understand the relationship between those variables for various values of differences between actual and expected values.

In next part we give information about the data and econometric methodology and in third part we summarize the empirical results. Than finally we go through to the conclusion.

## 2. DATA AND ECONOMETRIC METHODOLOGY

### 2.1. Data

In this study monthly inflation values (CPI) values announced by Central Bank of Republic of Turkey (CBRT), values of inflation expectations estimated and announced by CBRT for the period of 2006:5-2017:12 are used. This period is selected because of the availability of 1 month ahead inflation expectation data. Using same estimation period also give us the ability to compare the effect of time interval up to the realization time. Data were collected from the electronic data delivery system of the CBRT. The variables subject to the analysis are the CPI values, CPI expectations for the current month, CPI expectations for the next month, CPI expectations for 2 months ahead.

### 2.2. TAR-VEC Model

Balke and Fomby (1997) study is the first study for threshold cointegration where the authors study asymmetric adjustments towards a long-run equilibrium. Following this work a number of contributions were made to the TAR cointegration and TAR-VEC literature. In this framework, the adjustment does not need to occur instantaneously, but only when the deviations exceed some critical value. Some of the important studies in this context are Balke and Wohar (1998), Baum and Karasulu (1997), Enders and Falk (1998), Lo and Zivot (2001). We used Hansen and Seo (2002) (H-S VECM) test procedure for testing the long run relationship between inflation, inflation expectations and different types of inflation expectations.

H-S VECM approach use (MLE) Maximum likelihood estimation of the threshold model. They also test the presence of a threshold effect. Two regime threshold model where the $\gamma$ is the threshold parameter takes the following form,

$$\Delta x_t = \begin{cases} A_1' X_{t-1}(\beta) + u_t, & v_{t-1}(\beta) £ \gamma \\ A_2' X_{t-1}(\beta) + u_t, & v_{t-1}(\beta) > \gamma \end{cases} \tag{2.1}$$

Where

$$X_{t-1}(\beta) = \begin{pmatrix} 1 \\ v_{t-1}(\beta) \\ \Delta x_{t-1} \\ \Delta x_{t-2} \\ M \\ \Delta x_{t-1} \end{pmatrix}$$

There are two regimes defined by the error correction terms value. As described in Hansen and Seo (2002) the parameters $A_1$ and $A_2$ are coefficient matrices in different regimes. If $P(v_{t-i} \leq \gamma)$ and $P(v_{t-i} \leq \gamma) < 1$ this shows threshold effect, otherwise the model characterizes linear cointegration. And also they form theis $\pi_0 \leq P(v_{t-i} \leq \gamma) \leq 1\_\pi_0$ constraint where the trimming parameter is defined as $\pi_0 > 0$.

## 3. ECONOMETRIC RESULTS

We first report unit root analysis for all used variables which are tested for long term equilibrium relation. Stationarity of the variables are tested by Caner and Hansen's (2001) TAR unit root and Augmented Dickey Fuller (ADF) unit root analysis. In the final step, we report the long run equilibrium results between expected and realized values of CPI.

### 3.1. Unit Root Test Results

We used conventional and non-linear unit root tests for testing the stationarity structure of variables. Using non-linear unit root tests is also important for testing the linearity structure of variables. We used ADF unit root test and Caner and Hansen (2001) unit root tests. ADF test results are given in Table 1 and Caner and Hansen (2001) unit root test results are given in Table 2.

Numbers in parenthesis point out the lag length that are chosen based on the AIC information criterion. As the table is analyzed, it is seen that differenced inflation variables; CPI, CPIC, CPI_1 are stationary at 5% significance level and CPI_2 is non stationary. Before considering and choosing the estimation methodology for the relationship between those variables we tested the nonlinearity structure of those variables and test the stationarity structure with this type of unit root test. Caner and Hansen (2001) test procedure is used for testing both non-linearity and unit-root. C-H (2001) test results are given in Table 2.

Caner and Hansen (2001) developed an asymptotic theory for a two-regime TAR model with possible unit root. According to their study when the process is in nonlinear form, the unit root test suggested by the authors indeed is more powerful than the ADF test.

The OLS estimate of the TAR model for each $\gamma \in \Gamma$ is as follows:

$$\Delta y_t = \hat{\theta}_1(\gamma)' x_{t-1} I_{\{z_{t-1} < \gamma\}} + \hat{\theta}_2(\gamma)' x_{t-1} I_{\{z_{t-1} \geq \gamma\}} + \hat{e}_t(\gamma) \tag{3.1}$$

The threshold effect is tested by the joint hypothesis: $H_0: \theta_1 = \theta_2$. The hypothesis is tested by using Wald statistics. The first raw for each variable in Tale 2 gives the Wald statistics and bootstrap threshold test probability values. Those results indicates that against the

**Table 1: ADF unit root test results**

| Variables | ADF | ADF critical values | |
|---|---|---|---|
| CPI | −3.46 (11) | 1% | −3.480 |
| CPIC | −3.27 (12) | 5% | −2.884 |
| CPI_1 | −2.92 (12) | 10% | −2.579 |
| CPI_2 | −2.63 (12) | | |

ADF: Augmented Dickey Fuller

**Table 2: Caner and Hansen (2001) unit root test results**

| CPI m=1 (12) | | | | |
|---|---|---|---|---|
| **Threshold Estimate: 0.93** | **Variable** | **Wald statistics** | **Bootstrap P** | **Asymptotic P** |
| Bootstrap threshold test | CPI | 47.93 | 0.02 | 0.05 |
| Two sided Wald test ($R_2$) | CPI | 15.38 | 0.00 | 0.02 |
| Two sided Wald test ($R_1$) | CPI | 10.75 | 0.00 | 0.11 |
| Unit root test ($t_1$) | CPI | 3.28 | 0.00 | 0.05 |
| Unit root test ($t_2$) | CPI | 2.16 | 0.98 | 0.38 |
| CPIC m=5 (12) | | | | |
| **Threshold estimate: 0.04** | **Variable** | **Wald statistics** | **Bootstrap P** | **Asymptotic P** |
| Bootstrap threshold test | CPIC | 50.87 | 0.05 | 0.01 |
| Two sided Wald test ($R_2$) | CPIC | 14.8 | 0.05 | 0.04 |
| Two sided Wald test ($R_1$) | CPIC | 14.8 | 0.05 | 0.04 |
| Unit root test ($t_1$) | CPIC | 0.86 | 0.47 | 0.89 |
| Unit root test ($t_2$) | CPIC | 3.75 | 0.05 | 0.03 |
| CPI_1 m=11 (12) | | | | |
| **Threshold estimate: −0.01** | **Variable** | **Wald statistics** | **Bootstrap P** | **Asymptotic P** |
| Bootstrap threshold test | CPI_1 | 54.72 | 0.00 | 0.00 |
| Two sided Wald test ($R_2$) | CPI_1 | 10.47 | 0.12 | 0.13 |
| Two sided Wald test (R1) | CPI_1 | 10.47 | 0.09 | 0.11 |
| Unit root test ($t_1$) | CPI_1 | 3.18 | 0.03 | 0.09 |
| Unit root test ($t_2$) | CPI_1 | 0.61 | 0.58 | 0.93 |
| CPI_2 m=4 (12) | | | | |
| **Threshold estimate: 0.07** | **Variable** | **Wald statistics** | **Bootstrap P** | **Asymptotic P** |
| Bootstrap threshold test | CPI_2 | 44.6 | 0.01 | 0.02 |
| Two sided Wald test ($R_2$) | CPI_2 | 6.15 | 0.33 | 0.48 |
| Two sided Wald test ($R_1$) | CPI_2 | 6.15 | 0.31 | 0.43 |
| Unit root test ($t_1$) | CPI_2 | 2.48 | 0.47 | 0.72 |
| Unit root test ($t_2$) | CPI_2 | 0.024 | 0.70 | 0.96 |

linearity hypothesis, we accept the alternative hypothesis that indicates the presence threshold effect for all variables. After this threshold test two types of unit root tests are made for unit root either in the entire process or in each regime.

In the analysis, the components $\theta_1$ and $\theta_2$ are discussed separately and the vectors are partitioned as,

$$\theta_1=\begin{pmatrix}\rho_1\\ \beta_1\\ \alpha_1\end{pmatrix},\ \theta_2=\begin{pmatrix}\rho_2\\ \beta_2\\ \alpha_2\end{pmatrix} \qquad (3.2)$$

Where $(\rho_1,\rho_2)$ are the slope coefficients on $\gamma_{t-1}$; $(\beta_1,\beta_1)$ are the slopes on the deterministic components, and $(\alpha_1,\alpha_2)$ are the slope coefficients on $(\Delta\gamma_{t-1},\ldots,\Delta\gamma_{t-k})$ (Caner and Hansen, 2001).

The existence of the unit root is tested by $H_0:\rho_1=\rho_2=0$ hypothesis. When this hypothesis holds, equation (3.1) indicates existence of unit root in $\gamma_{t-1}$. If standard Wald statistics for this hypothesis is represented by $R_T$, Wald statistics for $\gamma$ is $R_T=R_T(\hat{\gamma})$. $R_T$ statistics is standard Dickey-Fuller statistics generalized for two parameters. From estimation of equation (3.1), threshold effect and presence of unit root is tested by Wald tests $W_T$ and $R_T$ and with the parameter restrictions.

When equation (3.1) and parameter restrictions are valid, $\rho_1$ and $\rho_2$ parameters test the stationarity of $\gamma_t$. In this case the $H_0:\rho_1=\rho_2=0$ hypothesis is tested and not rejected, then the model given in (3.1) could be written as stationary TAR model with $\Delta\gamma_t$ being a stationary variable.

In this case, $\gamma_t$ follows an I (1) unit root process. If the series is stationary and ergodic, in the special case of $\rho=1$, if $\rho_1<0$, $\rho_2<0$ and $(1+\rho_1)(1+\rho_2)$ then the model is stationary (Caner and Hansen, 2001).

The alternative hypothesis is set as $H_1:\rho_1<0$ and $\rho_2<0$. But a third case is also present. In case of partial unit root, the valid hypothesis is in the following form:

$$H_2:\begin{cases}\rho_1<0 & \text{and}\ \ \rho_2=0,\\ & \text{or}\\ \rho_1=0 & \text{and}\ \ \rho_2<0.\end{cases} \qquad (3.3)$$

If $H_2$ holds, then the process $\gamma_t$ will behave like a unit root process in one regime, but will behave like a stationary process in the other. Under $H_2$, the process is nonstationary, but it is not a classic unit root process.

The method used to test $H_0$ is Wald statistics. And unrestricted alternative is $\rho_1\neq 0$ or $\rho_2\neq 0$. The tests statistics is $R_{2t}=t_1^2+t_2^2$ where $t_1$ and $t_2$ are the t ratios for $\hat{\rho}_1$ and $\hat{\rho}_2$ obtained from the OLS equation from the estimated equation (3.1). $H_1$ and $H_2$ here are one-sided. However, this two-sided Wald statistics may be less powerful than a one-sided version. The one-sided Wald statistics for $\rho_1<0$ and $\rho_2<0$ is calculated with $R_{1T}=t_1^2 I_{\{\hat{\rho}_1<0\}}+t_2^2 I_{\{\hat{\rho}_2<0\}}$

Caner and Hansen (2001) mentions that $R_{1T}$ and $R_{2T}$ tests have more power against the $H_1$ and $H_2$ alternatives. If one of $t_1$ and $t_2$

statistics is statistically significant, then the partial unit root case would be consistent, which allows us to distinguish among the hypothesis $H_0$, $H_1$, and $H_2$.

Lag length, k is determined according to AIC criteria for all variables. Lag length parameter, m is determined according to Caner and Hansen (2001) tests which choses the values that minimize SSR. Results and probabilities for lag length m is given in Table 2.

In the next stage we investigate $R_1$ and $R_2$ and of $t_1$ and $t_2$ tests. $t_1$ and $t_2$ tests indicates unit root structure for all regimes for inflation and inflation expectation variables.

As mentioned in Caner and Hansen (2001) two sided Wald ststistics is less powerful than the one sided version; accordingly the final decision is given based on the one sided and $t_1$, $t_2$ tests. One-sided $R_1$ test indicates presence of unit root for CPI, CPIC, CPI_1 and CPI_2 variables. $t_1$ and $t_2$ tests analyzes the presence of unit root in each of the two regimes.

According to those unit root test results we can test the long run relationship with TAR VEC model for the variables; CPI, CPIC, CPI_1 and CPI_2.

### 3.2. Results of the TAR VEC Model

We used CPI and the expectation variables CPIC, CPI_1 and CPI_2 for testing the long run relation. This selection is made according to the results of TAR unit root tests.

The first relation that examined is between expected values of current month CPI (CPIC) and CPI. The long run equilibrium relation is observed to be positive and 0.27. The threshold value is estimated as 0.71. This shows that if the difference between the CPI value and the current months expected CPI change positively and <0.71 the first regime occurs, but if it shows greater differences the second regime occurs.

The first regime covers the 86% of the examination periods, and therefore named as the typical regime. The second regime covers the 14% of the observations at the examination period and called the extreme regime.

First regime "typical regime," $CPIC_t \leq 0.27CPI_t + 0.71$ 86%

Second regime "extreme regime", $CPIC_t > 0.27CPI_t + 0.71$ 14%

$$\Delta CPIC_t = \begin{cases} \underset{(0.08)}{0.47} - \underset{(0.19)}{0.94}v_{t-1} + \underset{(0.16)}{0.69}\Delta CPIC_{t-1} - \underset{(0.06)}{0.19}\Delta CPIC_{t-2} \\ + \underset{(0.12)}{0.18}\Delta CPI_{t-1} - \underset{(0.04)}{0.14}\Delta CPI_{t-2} + u_{1t}, \quad v_{t-1} \leq 0.71 \\ \underset{(0.22)}{-0.69} + \underset{(0.32)}{0.87}v_{t-1} - \underset{(0.24}{1.13}\Delta CPIC_{t-1} + \underset{(0.09)}{0.29}\Delta CPIC_{t-2} \\ - \underset{(0.21)}{0.77}\Delta CPI_{t-1} - \underset{(0.10)}{0.02}\Delta CPI_{t-2} + u_{2t}, \quad v_{t-1} > 0.71 \end{cases}$$

$$\Delta CPI_t = \begin{cases} \underset{(0.21)}{0.43} - \underset{(0.49)}{0.78}v_{t-1} + \underset{(0.42)}{1.66}\Delta CPIC_{t-1} - \underset{(0.15)}{0.85}\Delta CPIC_{t-2} \\ + \underset{(0.30)}{0.12}\Delta CPI_{t-1} - \underset{(0.11)}{0.47}\Delta CPI_{t-2} + u_{1t}, \quad v_{t-1} \leq 0.71 \\ \underset{(0.79)}{-0.66} + \underset{(1.25)}{1.80}v_{t-1} - \underset{(0.91)}{2.90}\Delta CPIC_{t-1} + \underset{(0.33)}{0.57}\Delta CPIC_{t-2} \\ - \underset{(0.63)}{1.47}\Delta CPI_{t-1} - \underset{(0.33)}{0.19}\Delta CPI_{t-2} + u_{2t}, \quad v_{t-1} > 0.71 \end{cases}$$

As VEC models are examined, it is seen that the error correction coefficients are negative and statistically significant for the first regimes of both system equations while they are insignificant in second regime equations. The error correction mechanism operates faster in first regime of CPIC equation than the first regime of CPI equation. This result signs that if the difference between expectation and realization for the CPI of current month is smaller than 0.71 speed of adjustment is valid and the turning to equilibrium is faster for CPIC equation. On the other hand adjustment or equilibrium for second regime is not statistically significant which covers the 14% of the analyzing period.

The second system we analyzed is the relation between expected values of CPI for 1 month ahead and the realized values of CPI. Long run equilibrium relationship is obtained as "−0.18." The first regime is observed if the difference between the CPI value and the expected CPI values for 1 month ahead change <0.88 the first regime occurs, but if it shows greater differences the second regime occurs. If CPI increases for one unit CPI_1 expectation decrease by −0.18. The second regime is observed in case the difference between two variables is > 0.88.

First regime "typical regime", $CPI\_1_t \leq -0.18CPI_t + 0.88$ 68%

Second regime "extreme regime," $CPI\_1_t > -0.18CPI_t + 0.88$ 32%

$$\Delta CPI\_1_t = \begin{cases} \underset{(0.07)}{0.32} - \underset{(0.11)}{0.32}v_{t-1} + \underset{(0.13)}{0.35}\Delta CPI\_1_{t-1} + \underset{(0.03)}{0.08}\Delta CPI\_1_{t-2} \\ - \underset{(0.15)}{0.04}\Delta CPI_{t-1} + \underset{(0.03)}{0.017}\Delta CPI_{t-2} + u_{1t}, \quad v_{t-1} \leq 0.88 \\ \underset{(0.23)}{0.76} - \underset{(0.22)}{0.90}v_{t-1} + \underset{(0.18)}{0.22}\Delta CPI\_1_{t-1} - \underset{(0.05)}{0.075}\Delta CPI\_1_{t-2} \\ + \underset{(0.12)}{0.23}\Delta CPI_{t-1} - \underset{(0.05)}{0.02}\Delta CPI_{t-2} + u_{2t}, \quad v_{t-1} > 0.88 \end{cases}$$

$$\Delta CPI_t = \begin{cases} \underset{(0.17)}{0.61} - \underset{(0.27)}{0.63}v_{t-1} + \underset{(0.41)}{0.61}\Delta CPI\_1_{t-1} \text{-} \underset{(0.09)}{0.21}\Delta CPI\_1_{t-2} \\ + \underset{(0.39)}{0.019}\Delta CPI_{t-1} - \underset{(0.09)}{0.17}\Delta CPI_{t-2} + u_{1t}, \quad v_{t-1} \leq 0.88 \\ \underset{(0.72)}{2.72} - \underset{(0.66)}{3.07}v_{t-1} + \underset{(0.71)}{2.93}\Delta CPI\_1_{t-1} - \underset{(0.22)}{0.66}\Delta CPI\_1_{t-2} \\ + \underset{(0.46)}{1.78}\Delta CPI_{t-1} - \underset{(0.15)}{0.51}\Delta CPI_{t-2} + u_{2t}, \quad v_{t-1} > 0.88 \end{cases}$$

VEC models shows negative and statistically significant error correction coefficients especially for the first regimes. The error correction mechanism operates faster in second regime of the first equation but the highest error correction speed is detected in second regime of the CPI_1 expectations equation. Unfortunately long run equilibrium is not valid for second regime of second system equation. Like in first relation we tested, higher difference between expectation and realization (second regime) do not conclude with significant error correction mechanism.

Third relation we analyzed is the relation between expected values of CPI for 2 months ahead and the realized values of CPI. Long run equilibrium relationship is obtained as "−0.1". The first regime is observed if the difference between the CPI value and the expected CPI values for 2 months ahead change <0.69 the first regime occurs, but if it shows greater differences the second regime occurs. If CPI increases for one unit, CPI_2 expectation decreases by −0.1. The second regime is observed in case the difference between two variables is >0.69.

First regime "typical regime," $CPI\_2_t \leq -0.1CPI_t + 0.69$ 56%

Second regime "extreme regime," $CPI\_2_t > -0.1CPI_t + 0.69$ 44%

$$\Delta CPI\_2_t = \begin{cases} 0.28 - 0.25v_{t-1} + 0.42\Delta CPI\_2_{t-1} + 0.04\Delta CPI\_2_{t-2} \\ (0.07) \quad (0.13) \quad (0.11) \quad (0.03) \\ -0.17\Delta CPI_{t-1} + 0.02\Delta CPI_{t-2} + u_{1t}, \quad v_{t-1} \leq 0.69 \\ (0.15) \quad (0.03) \\ 0.86 - 1.16v_{t-1} + 0.38\Delta CPI\_2_{t-1} + 0.01\Delta CPI\_2_{t-2} \\ (0.17) \quad (0.2) \quad (0.14) \quad (0.03) \\ +0.36\Delta CPI_{t-1} - 0.03\Delta CPI_{t-2} + u_{2t}, \quad v_{t-1} > 0.69 \\ (0.11) \quad (0.03) \end{cases}$$

$$\Delta CPI_t = \begin{cases} 0.16 + 0.33v_{t-1} + 0.76\Delta CPI\_2_{t-1} - 0.24\Delta CPI\_2_{t-2} \\ (0.20) \quad (0.38) \quad (0.34) \quad (0.09) \\ -0.30\Delta CPI_{t-1} - 0.17\Delta CPI_{t-2} + u_{1t}, \quad v_{t-1} \leq 0.69 \\ (0.41) \quad (0.09) \\ -3.24 - 3.24v_{t-1} + 3.14\Delta CPI\_2_{t-1} - 0.61\Delta CPI\_2_{t-2} \\ (0.66) \quad (0.66) \quad (0.63) \quad (0.18) \\ +1.5\Delta CPI_{t-1} - 0.35\Delta CPI_{t-2} + u_{2t}, \quad v_{t-1} > 0.69 \\ (0.37) \quad (0.12) \end{cases}$$

VEC model error correction coefficients for the third relation shows that first regime of first equation is negative and statistically significant. Unfortunately others are insignificant for 2 months ahead expectations. Although tested TAR co-integration relation against non-linear co-integration is accepted and the best AIC criteria estimated for two lag length the ECM coefficients are generally insignificant. However most of the results for ECM coefficients are insignificant long run structure and first regime ECM mechanism are similar with 1 month ahead estimations of expectations.

## 4. CONCLUSION

We analyzed the relationship between CPI and the expected values of CPI for three different time dimensions. Studying with expectations for different time dimensions gives us the opportunity to compare the results as well as the relationship between expectation and realization for CPI. Our study covers the Turkey CPI data for the time period from 2006:5 to 2017:12. After 2002 CBRT followed implicit inflation targeting regime and inflation targeting regime after 2006. Especially before 2002 CPI in Turkey was quite high. We think that we should take in to account the inflation structure of the period we analyzed and the routine before this period. The economic agents, who faced and adopted living with higher than 30-35% annual inflation rates after 1980, experienced pretty lower inflation rates for the period 2002-2006.

The first relation we obtained is the positive relation between CPI and its expectation for the current month. The magnitude of this relation is 0.27 which means if the CPI value increases, the current month expectation also increases for 0.27 point. Another important implication is the threshold value we estimated for this long run relation. If the difference between actual and expected inflation is smaller than 0.71, the first regime dominates and for the higher differences, second regime dominates. Short term structure, in other words error correction mechanism, shows that first regime is dominant and valid for this relationship. In our opinion if this difference is smaller, the uncertainty about CPI is also smaller relative to second regime. This relation justifies the Friedman-Ball hypothesis.

Second and third relation we obtained shows us the negative relation between CPI and CPI expectations for 1 and 2 months ahead. This relation also signed and accepted in literature under specific circumstances like presented by Ungar and Zilberfarb (1993) study. We think that this relationship has also another implication for our study. For this period, economic agent's expectation decreases while the CPI values increases. The relation is about 0.1 and 0.2. Thus the effect is negative and small but economic agents believe that the policy maker will provide against high inflations. The economic agents expect that if inflation gets higher within 1 or 2 months, it will come back to its lower values. Also this relation is valid for the first regime which signs a threshold value that is smaller than 0.88 for 1 month ahead and 0.69 for 2 months ahead.

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