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Effectiveness of expectation channel of monetary transmission mechanism in inflation targeting system: An empirical study for Turkey

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Abstract

Monetary policy can affect economy through out various transmission mechanisms. One of these transmission mechanisms is expectations channel. The monetary policy can get involved in expectation channel of transmission mechanism by affecting the process of expectations formation. Because of the results of policies to be implemented variously according to the expectations, the main challenge in monetary policy is to correctly manage expectations. Because of the fact that only the systematic component of monetary policy (estimated component) can affect forward looking expectations, systematic behaviour of the central bank has a critical role in determining the economic consequences of monetary policy. In this study, the effectiveness of expectation channel of transmission mechanism was analyzed by VAR model. According to the results, TCMB cannot affect inflation expectations via both the inflation targets and the policy interest. On the other hand, inflation expectations are affected significantly by actualized inflation rates and exchange rates.

Keywords: central bank, expectations, monetary transmission mechanisms, monetary policy.

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1. Introduction

Monetary policy applications of the central bank may affect the economy through different channels by changing the risk and return structure of the assets in the portfolios of economic actors. These channels that the monetary policy affects the economy are called monetary transmission mechanisms. Since the effects of monetary policy on economy are inescapable, having good knowledge of the interaction process will change the outcome in the desired direction. In this regard, it is important for the effectiveness of the monetary policy to know how and through which channels it affects variables such as prices, total demand, production level or in short the whole economy. However, this is a process full of uncertainties. Hence, the empirical literature that examines the effects of the monetary policy describes the monetary transmission mechanism as a "black box" (Bernanke & Gertler, 1995).

Mishkin (1995) classified monetary transmission mechanism channels as interest channel, exchange rate channel, other asset prices and credit channel. However, following the realization of the power of expectations in the emergence of the effects of monetary policy, the expectations channel has also been accepted as one of the monetary transmission mechanisms that should perhaps be given utmost attention since it is shaped amidst a process full of uncertainties.

Monetary transmission mechanism via expectations channel is an important transmission channel that stands out for inflation targeting strategy. According to neo-classical synthesis, there are five generally accepted macroeconomic principles in studies carried out on monetary policy. One of these principles is that *future expectations* play a very important role in monetary policy (Taylor 1998). The success of policies mostly depends on the expectation of economic units. That is, the same policy can result in completely different economic results under different expectations. Expectations may be affected by many different elements. Accordingly, factors such as whether the announced policy is temporary or permanent, the conditions under which it will change, its openness with regard to the preferences of policy makers, reliability of the commitments related with policy goals and the level with which the monetary policy authorities are affected from political and corporate structures play an important role in shaping the expectations (Kucukkale, 2003; Bernanke & Mishkin, 1999).

In this study the success of the Central Bank of the Turkish Republic was examined with regard to directing the inflation expectations via the inflation targets it announced during the intensive cyclical activity of the 2006-2014 period by VAR method

2. Mechanism with which Expectations Affect Economy

Monetary policy Transmission mechanisms are at the center of monetary policy discussions. One of the standard transmission mechanisms in an open economy is the expectations channel. Central banks can influence inflation with a certain lag over the wage and price adjustment behaviors of economic units by directing their inflation expectations (Svensson, 1999).

The importance of expectations in monetary policy has been understood starting from the 1950's. According to Blinder (1998), a successful monetary policy emerges as a result of the effective management of expectations not overnight interest rates. Since only the systematic component (component that can be estimated) of the monetary policy may affect future expectations, the systematic behavior of the central bank plays a critical role in determining the economic results of the monetary policy. Expectations are determinative on wage and price behavior of economic agents. When determining the prices that will stay fixed for a certain period of time, firms take into consideration not only the current economic environment but also future economic conditions with a future oriented perspective. This perspective affects monetary transmission mechanism. The real issue for the monetary policy is how the central bank affects these expectations. Thus, managing expectations is located at the heart of monetary policy (Walsh, 2007; Mishkin, 2011).

Prior to the 1990's, central banks had a mysterious structure and it was believed that this should be the case (Blinder, Ehrmann, Fratzscher, De Haan & Jansen, 2008). However, since monetary policy operates mostly via the expectations channels nowadays, special importance is given to transparency and communication with the public. During the Lionel Robbins courses at the London School of Economics in 1996, Alan S. Blinder has tried to explain via expectations how the communication and transparency of the central bank makes monetary policy more effective as a source of macroeconomic stability as summarized below (Blinder, 1998):

"(…) Short term interest rates differ from long term interest rates. The central bank can generally control only the interbank rate which has almost no connection with any economic transaction. Monetary policy can result in significant macroeconomic effects to the extent of its effect on long term interest rates or financial market prices such as stock exchange and exchange rate (to put it more briefly, long term rates). (…) According to standard theory, any long term rate is obtained by adding a term premium to the weighted average of the expected future values of short term rates. (…) Hence, expectations regarding the future behavior of the central bank comprise the basic correlation between short term and long term rates. (...) A more transparent central bank can affect expectations by providing the markets more information related with the basic elements that direct the monetary policy. This will also make the market reactions against monetary policy changes more predictable. Thus, the central bank which has become more transparent will have started a cycle that requires expertise. Whereas on the one hand it makes itself more predictable against the market actors, on the other hand it makes the market reactions against the monetary policy more predictable thus enabling the economy to be managed in a better way."

As can be understood from the statement by Blinder, directing expectations is the most important factor in increasing economic effectiveness. The task of central banks is to manage and apply the monetary policy for price stability, sustainable growth and stable financial system. However, central banks have to apply the monetary policy in an environment full of inevitable uncertainties. Markets also have to decide by making certain calculations in this environment. It is inevitable that the markets will make wrong calculations ((*will have wrong expectations*) in an environment full of uncertainties. Wrong calculations of markets are made mostly as a result of the wrong predictions regarding the intention of the central bank. Hence, the central bank should take some precautions and decrease this uncertainty. However, there is only one uncertainty that monetary policy makers can decrease. This is the uncertainty created by them. In this regard, *credibility* that is required for the success of monetary policies in the long and short term as well as *transparency* that is required to attain the ability to effectively manage market expectations is essential parts of an effective monetary policy (Blinder, 1998; Cecchetti & Krause, 2002). That is why, it is possible for the central bank to decrease the component of uncertainty due to its own actions by putting forth a more open vision regarding its goals, intention and general strategy even if it is not possible to eliminate the uncertainty completely.

Effectiveness of the monetary policy is dependent on the predictability of its effects (Semenenko & Nilova, 2011). Actually, the mechanism with which transparency increases the effectiveness of the monetary policy is quite simple. When the market is well informed about decisions related with the monetary policy, and when the goals of the monetary policy that monetary authority aims to reach are openly shared with the public, economic units can understand better what central bank try to do. Thus they are able to structure their own policy preferences. This in turn increases the effectiveness of the monetary policy (Oktar & Dalyanci, 2012). Since expectations react more strongly to changes in monetary policy in case of a greater amount of transparency, the effects of the monetary policy on economic variables are also stronger. Hence, greater transparency leads to the central banks to act more carefully and precautionary (Adrian & Song Shin, 2011; Jensen, 2002).

Expectations channel is the monetary transmission channel in which the effects of monetary policy appear fastest. However, expectations channel operates based on the interpretations of economic actors with regard to the type of effect that the policy applications of the central bank will have on the economy. That is why it is the most ambiguous among all monetary transmission mechanisms. Moreover, delays in the appearance of the effects of the monetary policy may vary from country to country and even according to the current status of the economy (Friedman, 1968). Whereas greater transparency shortens the delay time while on the other hand making the effects more predictable.

Transparency can also be used as a mechanism of providing credibility. In that, the central bank can establish a mechanism for strengthening its credibility by first providing sufficient information to the markets with regard to its policies and then ensuring that in reality the applications overlap with the promises (IMF, 1999). This mechanism is especially advantageous in cases when there is a lack of credibility with regard to the central bank and when a market discipline is needed (Jensen, 2002).

3. The Role of Inflation Targets in the Effectiveness of the Expectations Channel and Transmission Mechanism

The strongest argument for inflation targeting (IT) is actually the fact that it provides an element to the monetary policy called as "nominal anchor" by economists. Nominal anchor in a simplest form is *a nominal variable that is used by the monetary authority to peg the price level to a specific value for a certain period of time* (Bernanke & Mishkin, 1999). Since nominal anchor places the obligation of responsibility and accountability to the central bank, it forms a focal point where the monetary authority can inspect itself as well as a reference point for market expectations. Selection of nominal anchor can bring forth significant effects on other economic variables such as income distribution and the credibility of future stabilization policies (Gould, 1999). In inflation targeting, the announcement of an open inflation target to the public provides a functional nominal anchor for influencing inflation expectations.

Nominal anchor can help monetary authority to ensure price stability by fixing inflation expectations directly via the limitation it puts forth on the currency (Mishkin, 1999). Adhering to a nominal anchor that keeps the nominal variable in certain interval supports promotes stability by resulting directly in low and stable inflation expectations. Stable inflation expectations lead markets to carry out most of the work of monetary policy (Mishkin, 2006).

As was stated before, the effect of monetary policy on economy appears mostly as a result of its effect on the expectations of the private sector. The inflation expectations of economic units affect the current pricing behavior as well as the inflation ratios of the next couple of quarters. In this regard, inflation expectations channel is one of the strongest and fastest transmission mechanisms. That is why anchoring the inflation expectations of economic units to the inflation target is a very important precondition for inflation stability. In addition, the anchoring of inflation expectations to targets, those are acting together with the announced goals is mostly dependent upon the credibility, level of transparency of the central bank as well as the character of economic shocks. If *inflation expectations* put forth an unstable structure due to the fact that the central bank is not credible or due to reasons such as political instability or financial crisis; inflation expectations will not operate as economic stability provider. In this case, the inflation expectations that are freed from the anchor will tend to increase with increasing inflation rates and will be the fundamental reason for the increase in inflation in future periods. Hence, credibility of the central bank and its sustainability should be ensured so that inflation expectations can be anchored to inflation targets. In order to do this, monetary authority should ensure that the public has easy access to the loss function and the credibility of the monetary policy should be increased by sharing the planned steps openly with the public (Semenenko & Nilova, 2011)

4. Results of VAR Analysis Related with the Effects of the Central Bank in Turkey on Inflation Expectations

Inflation expectations are among the most important determinants of actualized inflation rates. Hence, the central bank can influence the actualized inflation by directing the inflation expectations. The central bank tries to prevent the adaptation of inflation expectations with regard to the realized inflation rates in addition to other macroeconomic developments such as fluctuations in the exchange rate by providing a reference inflation rate via the inflation targets announced for future periods to economic actors which they might use to shape their expectations. The biggest problem for a central bank that targets inflation is the continuing relationship between inflation expectations and realized inflation rates. In addition, changes in inflation expectations in accordance with changes in macroeconomic variables during periods of large scale macroeconomic fluctuations make it more difficult to reach the goals by disrupting the stability of the inflation expectations. Hence, the real issue for a central bank that targets inflation is to be able to announce inflation targets with high credibility which might be a reference for inflation expectations. In other words, the real issue is an issue of credibility.

4.1. Literature

There are empirical studies in literature which analyze the level at which inflation targets affect inflation expectations. It has been concluded in one of the comprehensive studies carried out by Baskaya, Gulsen and Kara (2012), that the inflation targets in Turkey for the 2006:4-2012:5 period and the actualized inflation rates were significant determinants for 12 and 24 month ahead inflation expectations and that the adaptation of expectations with regard to actualized inflation rates is higher at high inflation rates. Whereas Baskaya, Gulsen and Kaya (2012) carried out analyses for the 2006:4-2009:10 period during which they examined whether the effects of the inflation targets on 12 and 24 month ahead inflation expectations changed following the target revision that took place in June 2008 or not. Whereas no statistically significant relationship was determined during the analyses between the pre-2008 inflation targets and inflation expectations, it was put forth that the effects of inflation targets on inflation expectations increased following the target revision while the role played by inflation rate realization in the formation of expectations decreased.

Binal (2012) carried out cointegration test as a result of which it was concluded that the annual percentile change of CPI (consumer price index) continued to a significant determinant of 12 month ahead inflation expectations during the 2002-2011 period and that the effect of inflation targets on expectations increased after 2006. Other results obtained from the study are that the changes that occurred in the monetary policy interest rate during the 2002-2011 period had no statistically significant effect on 12 month ahead inflation expectations and that the relationship is not as expected for the 2006-2011 period. In addition, it has also been put forth that the exchange rate is a significant determinant of inflation expectations. Cicek *and* Akar (2011) put forth that the level of anchoring by inflation targets on inflation expectations was high until May 2006 after which it was relatively low until November 2008 due to the financial instability in that month which started to increase again following November 2008.

4.2. Model and Data Set

Implicit inflation targeting regime was applied in Turkey during 2002-2005 for which short term interest rates are used as the political instrument. After meeting the conditions for explicit inflation targeting during this period, it was announced by TCMB (Central Bank of Turkey) that explicit inflation targeting regime was applied starting from January 2006. However, the application of the explicit

regime coincided with a period during which the world conjuncture was rapidly changing thus resulting in a series of shocks for Turkey (TCMB, 2008).

Supporters of inflation targeting regime claim that the real success of the regime stems from the fact that it can control the inflation expectations via inflation targets during this period of macroeconomic shocks. The objective of this study is to examine the level of success of TCMB with regard to directing the inflation expectations via the inflation targets it announced during the intensive cyclical activity of the 2006-2014 period and to examine by VAR method.

VAR method is a model for which significant developments have been made among the time series models in recent years and which is widely used. Var model handles all variables included in the analysis within a systemic integrity and examines the mutual relations. That is why, VAR model is the most frequently used model in empirical analyses carried out in the field of monetary policy.

A two variable VAR model can be shown as below:

$$y_t = \propto_1 + \sum_{i=1}^{p} b_{1i}\, y_{t-i} + \sum_{i=1}^{p} b_{2i}\, x_{t-i} + \vartheta_{1t} \quad (1)$$

$$x_t = c_1 + \sum_{i=1}^{p} d_{1i}\, y_{t-i} + \sum_{i=1}^{p} d_{2i}\, x_{t-i} + \vartheta_{2t} \quad (2)$$

P denotes the lag length, whereas ϑ represents the unrelated random error terms with fixed variance and normal distribution. The relations of variables in the VAR model are determined via Granger causality test. However, Granger causality test does not provide information with regard to determining the variable that is the most determinant with regard dependant variable and whether this variable can be used as a proper policy instrument or not. Variance analysis is used to determine the most effective variable on a macroeconomic quantity; whereas impulse-response functions are used to determine whether this effective variable can be used as a policy instrument or not (Ozgen & Guloglu, 2004).

Series including the period of April 2006-March 2014 were used in the study. Other variables used in the study are: 12 month ahead inflation expectations (π^e), inflation targets (T^t), monetary policy interest rate (dint), reel exchange rate (dex) and inflation (π). Overnight borrowing interest rate was used as representative of the monetary policy interest rate of TCMB until May 2010, after which the one week repo rate was used. 12 month ahead inflation expectation series, inflation targets, monetary policy interest rates were acquired from the TCMB internet site. CPI change ratios were used in the analysis to represent inflation rates. These data were acquired from the OECD database at a monthly frequency. Whereas the real exchange rate series included in the analysis to measure the level of adaptation of inflation expectations to the exchange rates were acquired from the TCMB electronic data distribution system. All variables were included in the analysis following the seasonal correction via Census X12 method.

The VAR model handles all variables in the analysis as an interrelated system. That is why; five different VAR models have been generated in which each variable is the dependent variable. However, since the main objective of the study is to determine the effect of TCMB on inflation expectations, the analysis results for the VAR model in which 12-month ahead inflation expectations is the endogenous variable has been interpreted. The variables used in the model have to be first stabilized after which the model has to be stable as a whole in order to accept the results obtained from the VAR model as reliable. The VAR process is accepted as stable if the inverse roots of the characteristic polynomial obtained from the model lie inside the unit circle (Ozgen & Guloglu, 2004).

4.3. Unit Root Analysis

The stability properties of the monthly series to be used in the analysis were first tested via KPSS test prior to the VAR analysis. It was determined as a result of the stability analysis that 12-month ahead inflation expectations, inflation targets and inflation variables were stable at level both the constant and trend model, whereas it was determined that monetary policy interest rate and real exchange have unit root at levels and were included in the analysis by taking their first difference.

Table 1. KPPS Unit Root Test Results

	Level		First Difference	
	Constant	Constant &Trend	Constant	Cons.&Trend
π^e	0.12	0.6		
T^t	0.23	0.13		
dint	1.05	0.20	0.21	0.14
π	0.31	0.07		
dex	0.49	0.11	0.07	0.05

Note: *LM statistics for the constant for the asymptotic critical value constant model were 0.739, 0.463 and 0.347 respectively at significance levels of 1%, 5% and 10%. It was 0.21600, 0.1460 and 0.1190 respectively for significance levels of 1%,5% and 10% (KPSS test).*

Vector autoregressive regression estimates were obtained during the first stage of the analysis. The lag length suitable for the VAR model was determined as two according to the akaike information criterion. It was determined as a result of the examination carried out to determine whether the Var process is stable or not that all inverse roots lie inside the unit circle.

4.4. Causality Test Results

Since the objective of the analysis is to examine whether there is causality towards 12 month ahead inflation expectations from the other variables in the model, the mutual causality relationships between the variables in the VAR model have been reported. The results of the Granger causality test carried out via Wald testing in order to put forth the relationship between 12-month ahead inflation expectations and inflation targets, monetary policy interest rate, real exchange rate and inflation rates have been given in table 2. Whereas according to the acquired results, no causality relationship was found from inflation targets and monetary policy interest rate towards 12-month ahead inflation expectations; a strong causality was found from exchange rate and inflation rates towards 12-month ahead inflation expectations.

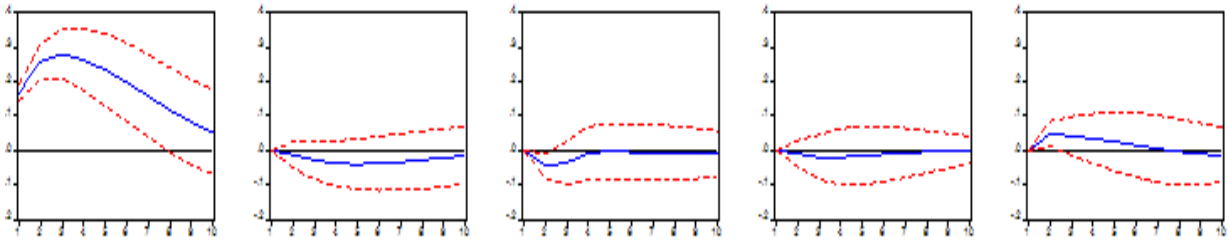
Table 2. Granger Causality Test Results for 12 Month Ahead Inflation Expectation

	π^e	
	X^2	P
T^t	1.473062	0.4788
dex	13.25585	0.0013
dint	0.279275	0.8697
π	8.792683	0.0123

4.5. Impulse-Response Analysis and Variance Decomposition Results

Causality tests are used to determine which variables are effective on a macroeconomic variable. The usability of the effective variables as a policy instrument are determined via impulse-response

functions, whereas the impulse level is determined via variance decomposition. Variance decomposition method decomposes a change that occurs in one of the intrinsic variables as separate shocks that affect all other intrinsic variables in the model. The objective of variance decomposition is to put forth the effect of a random shock on the error variance of the prediction for future periods (Ozgen & Guloglu, 2004). First of all, the graphs of impulse-response functions will be examined with regard to the reactions of 12-month ahead inflation expectations to the shocks on the variables in the model.



(a) (b) (c) (d) (e)

Figure 1. a)Response of π^e to π^e Shock b) Response of π^e to T^t Shock c) Response of π^e to dex Shock d) Response of π^e to dint Shock e) Response of π^e to π Shock

According to Figure 1, 12-month ahead inflation expectations give a negative impulse to a shock on inflation target and the level of this impulse continues onwards in a decreasing manner in later periods. In addition, inflation expectations give a negative reaction that is not statistically significant to a shock on the monetary policy interest rate. Inflation expectations give a negative reaction until the third period to a standard deviation shock on the exchange rate which disappears in later periods. A standard deviation shocks on the inflation variable to which inflation expectations give the highest level of impulse has positive effects on inflation expectations until the seventh period.

Table 3. Variance Decomposition Results

Period	S.E.	π^e	T^t	dex	dint	π
1	0.168421	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.316835	95.39035	0.170005	2.060806	0.080697	2.298146
3	0.428296	95.17216	0.504286	1.820727	0.260306	2.242525
4	0.505186	95.31953	0.933272	1.329447	0.336760	2.080995
5	0.559014	95.37458	1.275297	1.086557	0.349341	1.914229
6	0.594637	95.40512	1.526500	0.967284	0.343596	1.757501
7	0.616093	95.39840	1.711469	0.912969	0.334707	1.642453
8	0.627833	95.35499	1.838849	0.893712	0.326431	1.586014
9	0.633674	95.28317	1.916492	0.896934	0.320821	1.582585
10	0.636300	95.19409	1.957196	0.914082	0.318310	1.616322

According to the results given in Table 3, the 100% of the change in 12-month ahead inflation expectations during the first period occurs due to itself. 2,29% of the change in the inflation expectations during the second period occurs due to the change in inflation rates, whereas 2.06% occurs due to the change in exchange rates. The contribution of inflation rates and exchange rate to the change in the expectations decreases in the following months. On the other hand, the effect of inflation targets on the change in 12-month ahead inflation expectations is limited to 0.17% in the second month. The contribution of inflation targets on the change in inflation expectations reaches up to about 2 % in the following months. Whereas the contribution of monetary policy interest rate on the change in inflation expectations continues in a limited but consistent manner. According to the

variance decomposition results, it is observed that the shares of inflation rate and exchange rate on the estimated error variance related with inflation expectations of future periods are relatively higher. However, the share of inflation targets increases towards the final periods whereas the shares of inflation and exchange rate decrease.

5. Conclusion

In this study, the power of TCMB to influence inflation expectations via inflation targets has been examined. To this end, the relationships between 12-month ahead inflation expectations and inflation targets, monetary policy interest rates, real exchange rate and inflation rates have been analyzed via VAR method. The results obtained from the study can be summarized as such: the results of the Granger causality test obtained from VAR analysis, impulse-response functions and variance decomposition indicate that the inflation targets announced by TCMB are unsuccessful in directing the inflation expectations. In addition, the TCMB monetary policy interest rates do not have a statistically significant effect on inflation expectations. On the other hand, the fact that a strong causality has been determined from inflation rates and exchange rate towards inflation expectations indicates that inflation expectations have been strongly adopted to the changes that occurred in the variables. These acquired results are in accordance with the relevant literature. What is expected from the inflation targets announced in inflation targeting strategy is that they function as a strong reference inflation rate that might act as an anchor for inflation expectations. However, the acquired results indicate that the inflation targets cannot carry out this task that is expected of them. The central bank affects other long term interest rates by directing the other short term interest rates and expectations via changes in the monetary policy interest rate thus influencing the total demand, output level and inflation via transmission mechanisms. The fact that no causality relationship has been determined as a result of the Granger causality test from the monetary policy interest rate to inflation expectations indicates that this process does not function well. This might stem from the fact that the demand shocks and cyclical fluctuations weaken the anchoring property of inflation targets by reaching extraordinary levels, as well as a dominant opinion among the public with regard to the TCMB reaching the inflation targets it announced.

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