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Evaluation of Endogeneity of Money Supply under Inflation Targeting Implementation in Turkey

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ABSTRACT

This study aimed to question how successful the CBRT could be in the process of determining the money supply by acting in all these motivational conditions. To achieve this aim M3 as a proxy variable to the money supply, the banking sector loan volume as a proxy for the money demand has been dealt with. The study tested the causality relationship between variables using the Granger Causality Test and Error Correction Model.

According to the results of the Granger Causality Test, in the long run, the direction of causality between the money supply and credit expansion is straightforward from the money supply to the credit extension.

According to the findings of the Error Correction Model, there is a positive and statistically significant relationship between money supply and credit expansion in the short term. Credit expansion increases money supply.

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Introduction

The implementation of inflation targeting is a system in which the direct target of inflation is taken as the nominal anchor without intermediate targets. Under this system, the main task of the Central Bank is to ensure price stability. In this system, the Central Bank's main policy instrument is the policy interest rate. The determination of the policy interest rate is based on the Taylor Rule, which we can express as a rule.

Taylor Rule has a stance close to the views we can express as Classical-Neo Classical / Monetarist or Neo Classical-Keynesian synthesis. Because pure Keynesian thought accepts activist / fine tuning politics instead of politics according to the rule. According to the rule, the money supply is determined externally by the Central Bank.

On the other hand, the Central Bank does not control the money supply in the implementation of inflation targeting, which is based on the Central Bank's use of vehicle variable policy rate.

This reinforces the idea that monetary supply may be intrinsic under inflation targeting, that is, money supply may be determined by money demand.

Turkey in the 2002-2005 period since 2006, while implicitly has the ability to be examples of countries that fully implement inflation targeting these studies. After the implementation of the inflation targeting, the CBRT (Central Bank of Republic of Turkey) uses the policy interest rate as the main policy instrument.

However, after 2010, the CBRT, which also took financial stability alongside the price stability target, began to use liquidity management as a policy tool. The basic motivation of this work also emerged after this point. The extent to which the CBRT's liquidity management, which uses the policy phase as its main policy tool, can dominate the money supply is a matter of debate. Especially the failure of inflation targets excluding 2009 strengthens this debate.

This study aimed to question how successful the CBRT could be in the process of determining the money supply by acting in all these motivational conditions. To achieve this

aim M3 as a proxy variable to the money supply, the banking sector loan volume as a proxy for the money demand has been dealt with. The study tested the causality relationship between variables using the Granger Causality Method.

Literature Survey

The issue of endogenous money supply is addressed in Post-Keynesian theory. According to Post Keynesian, money supply is determined by credit demand. Post Keynesian Macroeconomics provides provides a critical linkage between the financial and real sectors, with the link running predominantly from credit to money to economic activity. (Palley, 2008).

Money Politics; such as money supply, short-term interest rates or exchange rates, which are based on the control of variables that are determinants of production and inflation, and control belongs to the central banks. In the long run, while the monetary policy is only effective on the general level of prices, the monetary policy in the short run can affect both the inflation and the production level, since prices and wages cannot be adjusted quickly (TCMB 2013)

Sabri Nayan et al (2013) paper, data from 177 countries were analyzed using panel data method from 1970 to 2011. The findings are that the money supply is endogenous as the Post Keynesian theory explains.

Ahmad and Ahmed (2006) show that using the standard Granger causality method, the money supply of Pakistan for the period of 1980-2003 is determined endogenously in the shortest period. This paper also shows that the Central Bank of Pakistan is influencing the money supply in the long run.

Cepni and Güney (2017) paper in period from 2006 to 2015 using data analysis that has acted in accordance with what the theory of money supply in Turkey. This paper's the direction of the findings that money supply determined by of bank loans in Turkey. So, in Turkey's economy and banks' central bank that fully satisfies the total money demand is supporting the endogenous opinion in a sense.

The Model and Data Set

In this study, we refer to the model used in the study of Ahmed and Ahmed (2006). The econometric model of this study is as follow:

$$Ms_t = \beta_0 + \beta_1 Ms_{-1_t} + \beta_2 CRD_t + \varepsilon_t \qquad (1)$$

Where, Mst; Money Supply, Mst-1; Monetary Base, CRD; Total Credit of Turkish Economy and ε_t is Error Term.

The data has been collected from CBRT dataset and the descriptive statistics of the series are reported in Table 1.

Table 1. Statistic (2015-2018 daily data).

	MS	MS$_{-1}$	CRD
Mean	1275495.	1342151.	1528497.
Std. Dev.	425994.8	506901.0	497916.6
Skewness	-1.920906	-1.539024	-1.762173
Kurtosis	5.800932	4.602379	5.788249
Jarque-Bera	141.2796	75.76426	126.2209
Probability	0.000000	0.000000	0.000000
Observations	152	152	152

Note: Jargue-Bera shows the test results of normal distribution, and null hypothesis depicts that series is normally distributed. The results Show that all serias are normality.

We now turn the issue of formal tests of whether an observed data series is generated by a stationary or non-stationary process, such as, ADF. In this study, the Augmented Dickey Fuller (ADF) (Dickey and Fuller, 1979) test was applied. The findings of the unit root tests can be found from Table 2.

Table 2. Unit Root Test.

Variables	ADF test Level	ADF test First Differance
Ms	-9.70***	-9.68***
Ms-1	-10.77***	-14.77***
CRD	-6.11***	-9.94***

Note: ***, ** and * indicate the 1%, 5% and 10% levels of significance, respectively; the null hypothesis is rejected and the alternative hypothesis, saying that series is stationary is not rejected. The lag order for ADF test is selected.

The results from Table 2 show that all variables are stationary at the level.

Granger Causalty Test: Long Run Analyses.

"Using Daily data described above, we use Granger causality test to examine the endogeneity of money supply. Granger (1969) causality test is used to infer statistical precedence of information. 'y' is said to be granger caused by 'x' if 'x' helps in the prediction of 'y'. In Two-way causality there is a feedback mechanism. 'x' granger causes y does not imply that 'y' is the manifestation of 'x'. Following is the formulation of granger causality test: The fundamental assumption of granger causality test is that the concerned series should be a stationary process" (Ahmed and Ahmed, 2006).

$$Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \text{-----} + \alpha_T Y_{t-T} + \beta_1 X_{t-1} + \text{------} + \beta_T X_{t-T} + \varepsilon_t \ (1)$$

$$X_t = \alpha_0 + \alpha_1 X_{t-1} + \text{-----} + \alpha_T X_{t-T} + \beta_1 Y_{t-1} + \text{------} + \beta_T Y_{t-T} + \mu_t \ (2)$$

Where T is the time lag and (ε_t, μ_t) are independently and normally distributed random variables with zero mean and constant variance. Our result reported in Tablo 3.

Table 3. Granger Causality Test Results.

Sample: 2/16/2015 1/08/2018

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
CRD does not Granger Cause MS	150	1.67627	0.1907
MS does not Granger Cause CRD		6.20106	0.0026***

Note: ***, ** and * indicate the 1%, 5% and 10% levels of significance. A lag of r=2 for VAR was selected before Granger Causality test.

Error Correction Model: Short Run Analyses

The basis of the error correction mechanism is the assumption of a long-term equilibrium relationship among economic variables. In the error correction model, differences of non-stationary variables are taken, and error correction parameter is included as an explanatory variable, which shows long-run equilibrium agreement between variables.

The fact that the error correction coefficient has a negative sign means that the shocks will come to the balance in the long run. Accordingly, the delay value (1) of the error terms obtained from the 1 th equation is added to the calculus as an independent variable in the equation (2) we used in the next step. Findings obtained using the error correction model are summarized in Table 4.

$$\Delta Ms_t = \beta_0 + \beta_1 \Delta Ms_{-1_t} + \beta_2 \Delta CRD_t + ecm_{-1} + \varepsilon_{t-1} \tag{2}$$

Where Δ first difference equation given by (1), β0 ... β2 is the parameter values in the intersection and independent variables, respectively. Here, when εt represents the error tem, ecm represents the error correction term.

Table 4.

Dependent Variable: DMS

Method: Least Squares

Sample (adjusted): 3/30/2015 1/08/2018

Included observations: 146 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3805.222	33911.57	0.112210	0.9108
DCRD(-4)	-0.061405	0.098164	-0.625536	0.5327
DCRD(-5)	0.151476	0.073121	2.071576	0.0403**
DMS$_{-1}$(-4)	-0.103338	0.085698	-1.205829	0.2300
DMS$_{-1}$(-5)	-0.038276	0.066346	-0.576914	0.5650
ECM(-1)	-0.856153	0.087382	-9.797827	0.0000***
R-squared	0.484743	Durbin-Watson stat		2.030889
Adjusted R-squared	0.433997	Prob(F-statistic)		0.000000

Note: ***, ** and * indicate the 1%, 5% and 10% levels of significance

Results

According to the results of the Granger causality test, in the long run, the direction of causality between the money supply and credit expansion is straightforward from the money supply to the credit extension.

According to the findings of the error correction model, there is a positive and statistically significant relationship between money supply and credit expansion in the short term. Credit expansion increases money supply.

The fact that the error correction term is negative and statistically significant indicates that the model has stable equilibrium.

As a results, the CBRT, as the lender of last resort, accommodates to the borrowing demands of banks, setting the cost of borrowing rather than its quantity. If the Central Bank

refuses to lend to banks, money markets will collapse and a credit crunch will occur. Therefore, the Central Bank cannot control the money supply in the short run, but can effect the cost of credit through interest rate policy.

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