Volume-3, Issue-8, August-2014 • ISSN No 2277 - 8160

Research Paper | Economics

Validity the Quantity Theory of Money for Turkish Economy

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ABSTRACT

The aim of this paper is to determine the validity of Quantity Theory of Money for economy of Turkey for the period 1985-2013. For this purposes, validity of Quantity Theory of Money is tested on nominal interest rate, gross domestic product deflator, reel gross domestic product and M2 Money supply by using PP and ADF Unit root tests, Johansen co integration test and Granger causality test. As a result of study, it can be seen that exogeneity of Money supply and neutrality of Money hypothesis that suggested by Quantity Theory of Money was rejected. And also this study shows that the relationship between inflation and money supply is bi-directional causality. At the same time, the effect of inflation on money supply means that money is endogenous for long run improvement of prices.

ÖZ

Çalışmanın amacı, paranın miktar teorisinin geçerliliğinin Türkiye ekonomisi için sınanmasıdır. Bu amaçla ilgili teori, nominal faiz oranı, GSYİH deflatörü, reel GSYİH ve M2 para arzı değişkenleri üzerinde uygulanmıştır. Philips Peron ve ADF birim kök testleri, johansen eş bütünleşme testi ve Granger nedensellik testlerinin kullanıldığı çalışmada paranın teoride iddia edilen paranın dışsallığı ve paranın yansızlığı tezi red edilmektedir. Aynı zamanda çalışma enflasyon ile para arzı arasında çift taraflı bir nedensellik olduğunu ortaya koymaktadır. Aynı zamanda para arzı üzerinde enflasyonun etkisi, paranın uzun dönemde fiyatların gelişimi için içsel bir özelliğe sahip olduğunu göstermektedir.

KEYWORDS :

1.Theorical Framework

Quantity theory of money denotes that there is a direct relationship between the quantity of money in an economy and the level of prices of goods and services sold. In other words, it states that the idea that the supply of money in an economy determines the level of prices and changes in the money supply result in proportional changes in prices. Majority of economists believe that this theory explains the relationships between money supply and inflation. Mentioned economists also believe that constant increase in money supply causes the equal increase in inflation rate. Theory firstly formulated by David Hume (Hume, Online Source). Theory was formulated like by Irving Fisher like below (De Long, 2000):

MV=PY

M and V respectively denote money supply and velocity of money in the left side of equation. In the right side of equation, P and T respectively denote the level of price and the volume of transactions for a given period (Fisher,1911,36).

Fisher reaches the equation (1) by using pass the steps below;

This suggests the following definition:

$$V = \frac{Y}{M} \qquad (2)$$

And using the nominal GDP as a proxy for total transactions;

$$V = \frac{P*Y}{M} \qquad (3)$$

In the equation (3), P*Y indicates the value of output which means the nominal GDP. The quantity equation MV=PY follows from the preceding definition of velocity. Money demand and the quantity

Equation is,

M/P= real money balance, the purchasing power of the money supply. So, a simple money demand function:

$$(\frac{M}{P})^d = kY$$

where k= how much money people willing to hold for each currency of income and exogenous)

2.Literature Survey

Many studies tested the QTM all around the world. In this study many of those which were done for Turkish economy and different countries economy, will be show as a reference of literature survey.

Omanukwue (2010) tested the long-run relationship between money, prices, output and interest rate and ratio of demand deposits/time deposits by using Engle-Granger two stage co integration test. As a result, he saw the existence of indirect and impairment causality from M to core consumer price for Nigeria Economy.

Ozmen(2003) tested if valid or not to monetarist thought which was claim by Kafakis(2002). As a result of study, contrary to Kafakis (2002) , the exogeneity of money in velocity variable system was rejected by using ARDL Bounding and Johansen tests.

Saatçioğlu ve Korap (2008) tested the neutrality of Money by using the variables such as M1, M2,GDP deflator and real GDP for the period of 1987Q1-2007Q2 for Turkish economy. By using co integration tests, they reached the result that neutrality of Money was rejected in relevant periods in Turkey.

Çiçek (2011) examined quantity theory of money by using M2, nominal GDP, interest rates for Turkish economy. Mentioned study was done for the period of 1987Q1-2007Q3. In the end of study, the relationship between money supply and inflation , bi directial causality. And also neutrality of money for related period in Turkey don't work as theory like claimed.

3.Testing the QTM for Turkish Economy

In this section, validity of the quantity theory of Money will be tested by using econometrical model.

3.1.Methodology

Quantity theory of money for Turkey will be tested by using econometric model. Mentioned model consist of unit root test, co integration test and casualty tests. In order to determine stationary, two main unit root test which are Philips Perron (PP) and Augmented Dickey Fuller. Secondly, in order to test the co integration, Johansen method will be used. In the last part of econometric model, granger causality among variables will be analyzed. Covering periods, Turkey economy had had a three economic crisis experience like 1994, 2001 and 2008. Three dif-

ferent crises wasn't omitted and could be seen the effect on QTM.

Data set of variables are annual and obtained from Turkish Central Bank. QTM in Turkey was tested for the period 1985Q4-2013Q4. In study, dummy variable wasn't preferred. weighted interest rate in depostis for three months was used as a nominal interest rate.

Table 1:
Variables and Their Symbols

Variables	Symbols
Price Level	P_1
Nominal Interest Rate	R_1
Money Supply	M_1
Reel GDP	Y_1
Error Term	ε_1

Econometric equation can be express logarithmic like below:

$$logP_t = \beta_0 + \beta_1 logM_l + \beta_2 logR_l + \beta_3 logY_l + \varepsilon_t$$

3.2.Unit root Test

Variables of economic model is expected to be stationary which means should not include unit root. In the parallel of this purposes, it is appealed to unit root tests. In this paper, ADF and PP unit root tests were used and results is presented on table 2 below.

Table 2:
Result of PP and ADF Unit Root Test

Philips Perron Test				
	Without Trend		With Trend	
	T Statistic	Possibility	T Statistic	Possibility
logP	-1.11	0.21	-1.87	0.74
logM	-1.87	0.31	1.94	0.41
R	-1.31	0.32	-3.01	1.00
logY	-4.99***	0.01	-11.12***	0.00
ΔlogP	-16.99***	0.00	-16.11***	0.32
ΔlogM	-4.21***	0.00	-3.17***	0.12
ΔR	-8.44***	0.02	-8.32***	0.00
ΔlogY	-13.541***	0.34	-17.15***	0.02
Augmented Dickey Fuller Test				
logP	-1.22	0.33	-1.22	0.97
logM	-1.99	0.34	1.33	1.00
R	-1.31	0.88	-1.99	0.66
logY	0.81	0.00	-4.99**	0.04
ΔlogP	-17.91***	0.01	-8.21***	0.00
ΔlogM	-5.01***	0.21	-5.21***	0.22
ΔR	-8.21***	0.21	-8.22***	0.00
ΔlogY	-2.11	0.42	-1.14	0.66
Δ(log Y,2)	-3.33**	0.21	-3.47*	0.22

According to table 2,

For ADF Unit root test, none of logarithmic variables except reel GDP has a unit root which mean they are not stationary not only with trend but also without trend at levels. Stationary of variables were provided by getting first degree difference. This result is statistically significant at %1 level. According to PP Unit root test, logarithmic reel GDP is stationary both with trend model and without trend model at %1 significant level. Same variable is stationary at %5 level for model with trend but not stationary for the model without trend.

For logarithmic reel GDP in PP test is stationary both with trend model and without trend model at 1% significant level as well as first differences. Mentioned variable in ADF test is stationary nothing but with trend model at 5% level. Taken first difference of reel income serial has insignificant both models; however, in the case of taken second difference, variables is stationary in the without trend model at 5% level and with trend model at 10%.

3.3.Johansen Co integration Test

In order to test co integration relationships among variables by using Johansen method, stationary level of variables should be same level. According to table (birim kök tablosu) , all-time series are I (1) which means results suitable for Johannes Method. Mentioned method which is based on VAR approach requires determining of lag lengths.

Table 3:
Choosing the Length Lag

Lenght	LogL	LR	FPE	AIC	SC	HQ
0	-421	90	11	16	14	14
1	-51	521	0	3	3	4
2	-4	98	6	1	2*	1
3	16	33	6	1	4	1
4	65	42	2	1	4	1
5	92	34*	7*	2*	5	0*

*** denotes the lenght lag.**

Respectively, LR denotes LR Test, FPE denotes the final prediction error, AIC denotes the Akaike information criterion , SC denotes the Schwarz information criterion and HQ denotes the Hannan–Quinn information criterion.

As can be seen from table (3) that the appropriate length lag is 5 for all criterion except Schwarz information criterion. In this study, length lag was chosen by considering to the Schwarz information criterion.

The maximum Eigenvalue and trace statistics, which denotes the co integration relationships, preseted at the table 4.

Table 4: Determining of the co integration Level

Cointegration Level	Maximum Eigenvalue Test		Trace Test	
	Maximum Eigenvalue	%5 Value	Maximum Eigenvalue	%5 Value
level=0	37.11*	25.12	57.21*	48.11
level ≤1	14.11	24.06	27.11	31.14
level ≤2	15.21	11.14	15.41	16.14
level ≤3	4.11	2.11	4.14	4.11

According to table 4, we can mention only one co integration relationships among variables at 5% critical level. Mentioned long run relationship is being formulated in equation 4 like below:

$$\log P_t = -2.11\ logM_t - 0.03R_t + 7.11\ logY_t \quad (4)$$

According to equation (4), increasing 1% in monetary supply causes decreasing 2.11% in prices. Similarly, increasing 1% in interest rates causes decrease 3% in prices and increase 1 % in Reel GDP causes increasing 7% in prices. Noteworthy points of results are a close relationship between prices and Money supply like quantity theory of Money put forward. Nevertheless direction of results is unsuitable with theory due to take a negative value.

3.4.Granger Causality Test

The Granger causality test is used for determining if one time series is useful in forecasting another (Granger, 1969 :424-438). Time series X is said to Granger-cause Y if it can be shown, usually through a series of t-tests and F-tests on lagged values of X , that those X values provide statistically significant information about future values of Y. Granger causality test is relevant only when the variables involved are either stationary or no stationary. A user specifies the two series, x and y, along with the significance level and the maximum number of lags to be considered. The function chooses the optimal lag length for x and y based on the Bayesian Information Criterion. The function produces the F-statistic for the Granger Causality Test along with the corresponding critical value. We reject the null hypothesis that y does not Granger Cause x if the F-statistic is greater than the critical value

Table (5): Results of Granger Causality

Null Hypothesis	F Statistic	Possibility
ΔR does not granger cause Δ logY	2.92**	0.06
ΔlogY does not granger cause ΔR	2.87*	0.03
ΔlogM does not granger cause Δlog Y	79.12***	0.09
ΔlogY does not granger causeΔlogM	0.3	0.49
ΔlogM does not granger cause ΔR	2.11	0.6
ΔR does not granger cause Δ logM	9.11***	3.21
ΔlogP does not granger cause ΔlogY	41.23	7.23
ΔlogY does not granger cause ΔlogP	2.21	0.4
ΔlogP does not granger cause ΔR	2.11	0.01
ΔR does not grange cause Δlog P	2.11	0.41
Δlog P does not cause ΔlogM	2.21*	0.4
ΔlogM does not cause ΔlogP	7.14***	0.09

*****,** and * denote respectively significance at %1,%5 and % 10.**

It can understand from table 4 that there is a bilateral relationship between interest rate and reel gross domestic product and between inflation and money supply. However, there is no causality between inflation and interest rate.

As a result of econometric model, we can claim that validity of quantity theory of money, which is supports the unidirectional relationships from Money supply to inflation, doesn't work for Turkey in examined periods due to bilateral relationship. According to our results, there is no neutrality because, according to result of table 5, there is unidirectional relationship from inflation to reel GDP, interest rates to Money supply and Money supply to reel GDP at 1% significant level. Neutrality of money is the idea that a change in the stock of money affects only nominal variables in the economy such as prices, wages, and exchange rates, with no effect on real (inflation-adjusted) variables, like employment, real GDP, and real consumption (Patinkin, 1987: 276).

Conclusion

This study showed that quantity theory of money is not supported in Turkish economy for the period of 1985Q4-2013Q4. First of all Quantity theory of money for Turkey was tested by using econometric model. Mentioned model consist of unit root test, co integration test and casualty tests. Following, variables which was issued to study was examined by using Johansen co integration test and Granger causality test. As a result, Quantity theory of money doesn't valid in Turkey for examined periods. As it is known that Quantity theory of money claims the unidirectional relationships from Money supply to inflation and Neutrality of money that that a change in the stock of money affects only nominal variables in the economy such as prices, wages, and exchange rates, with no effect on real (inflation-adjusted) variables, like employment, real GDP, and real consumption. But results of paper does not support these thesis due to bilateral relationship between money supply and inflation and unidirectional relationship from inflation to reel GDP.

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