Original article

The Relation of Money Supply and Economic Growth: Panel Granger Causality Test for Developing Countries

Para Arzı Ekonomik Büyüme İlişkisi: Gelişmekte Olan Ülkeler Üzerine Panel Granger Nedensellik Testi

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Abstract

This study aims to investigate the relationship between money supply and economic growth as applied in developing countries. For this purpose, Panel Cointegration and Panel Causality Analyses are performed by using the monthly data of 1997-2017 period. In these analyses, real GDP is used as dependent variable; M1, M2 and M3 money supply measures are used as independent variables. In accordance with the results of stationarity, cross sectional dependence and homogeneity tests, econometric analysis is done by Gengenbach, Urbain & Westerlund EC Cointegration and Dumitrescu & Hurlin Panel Granger Causality Tests. According to the results of the analysis, in developing countries, while there is a causality from money supply to economic growth in the short run, there is no relationship between these variables in the long run.

Keywords: Money Supply, Economic Growth, Panel Granger Causality Test.

Özet

Bu çalışma gelişmekte olan ülkelerde para arzı ile ekonomik büyüme arasındaki ilişkiyi uygulamalı olarak araştırmayı amaçlamaktadır. Bu amaçla, 1997-2017 dönemi aylık verileri kullanılarak Panel Eşbütünleşme ve Panel Nedensellik Analizleri yapılmaktadır. Bu analizlerde bağımlı değişken olarak reel GSYİH; bağımsız değişkenler olarak ise toplam M1, M2 ve M3 para arzı ölçütleri kullanılmaktadır. Durağanlık, birimler arası korelasyon ve homojenlik testlerinin sonuçları doğrultusunda, ekonometrik analiz Gengenbach, Urbain & Westerlund EC Eşbütünleşme ve Dumitrescu & Hurlin Panel Granger Nedensellik Testleri ile yapılmıştır. Analiz sonuçlarına göre, gelişmekte olan ülkelerde para arzından ekonomik büyümeye doğru kısa dönemli bir nedensellik bulunurken, uzun dönemde bu değişkenler arasında herhangi bir ilişki yoktur.

Anahtar Kelimeler: Para Arzı, Ekonomik Büyüme, Panel Granger Nedensellik Testi.

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INTRODUCTION

The impact of money supply, which is controlled within monetary policy practices, increased with expansionary policies or reduced with contractionary policies, on economic growth has been one of the main areas of interest in macroeconomic approaches. As a result of different assumptions on the economic theory, there are different opinions about how the consequences of interventions on the macroeconomic functions of a country through monetary policy practices would be shaped. These distinctions in theory could be exemplified by opinions such as money supply has no effect on economic growth, money supply affects economic growth positively or negatively, and these effects differ in short and long terms. In order to test the validity of such theoretical approaches, applied studies have been conducted to investigate the relationship between money supply and economic growth. This study aims to investigate the effects of money supply on economic growth with the help of the data from developing countries. For this purpose, Panel Cointegration and Panel Causality Analyses are carried out using monthly data of developing countries for the period of 1997-2017. This study consists of introduction, theoretical framework, literature review, methodology and dataset, findings, and conclusion sections.

Theoretical Framework

Theoretical discussions on the relationship between money supply and economic growth are based on the difference in approaches to the effectiveness of monetary policy. The classical approach, which predicts that the economy would automatically maintain full employment equilibrium thanks to its flexible price mechanism, claims that monetary policy would be ineffective in accordance with the principle of Classical Dichotomy. According to the principle of Classical Dichotomy, it is not possible to create an effect on real variables with a policy that affects nominal variables; therefore no relationship could be established between money supply and economic growth. In an economy that reaches full employment equilibrium with the flexibility of prices, wages and interest rates, increasing the money supply through expansionary monetary policy practices would not have a real increasing effect on the overall output of the economy; it would rather have an inflationary effect on the general level of prices. In contrast, the Keynesian approach is of the opinion that prices in the economy are not flexible enough, and the economy is not able to achieve full employment equilibrium due to price stickiness. Expansionary economic policies could be effective in order to move from the underemployment situation resulting from the total demand shortage towards the full employment equilibrium. In line with the Liquidity Preference Theory, it is possible to decrease interest rates, increase consumption and investments, and thus activate a mechanism that would expand the supply side of the economy with an expansionary monetary policy to increase total demand. Hence, it can be argued that money supply has a positive effect on economic growth (Bocutoğlu, 2012).

Different perspectives of Classical and Keynesian approaches towards the relationship between money supply and economic growth are shared by the followers of these approaches. The differences of

Monetarist, New Classical, and New Keynesian approaches regarding the effectiveness of monetary policies are based on the different assumptions and implications of these approaches regarding the Aggregate Demand-Aggregate Supply Analysis. Based on the assumption that adaptive expectations are valid in the economy, the Monetarist approach claims that the implementation of an expansionary monetary policy would increase the general level of prices, thus real wages would decrease in the short term. Thanks to the real wages falling within the framework of the Worker Misperception Model, an increase in production and short-term total supply occurs. In this case, it is observed that money supply affects economic growth positively in the short term. However, in line with the adaptive expectations, real wages will return to the baseline with an increase in nominal wages in the long term, and the temporary increase in production disappears. In this case, money supply has no effect on economic growth in the long run. The New Classical approach argues that rational expectations are valid in the economy; and therefore, an expansionary monetary policy practice could only be effective in case it has not been previously announced and predicted. It is possible to increase the total output in the short term by increasing the money supply in an unexpected and unpredictable manner within the frame of Imperfect Information Model. While a positive relationship could be established between money supply and economic growth as a result of unforeseen policies, it is argued that there is no relationship between these variables in the long term. Although the new Keynesian approach agrees with the idea that rational expectations are valid in the economy, it is argued that an expansionary monetary policy would have short-term effects on total output, since wages are not particularly flexible enough, even if it is an expected and anticipated policy. Within the Sticky Wage Model, money supply is expected to affect economic growth positively in the short term, and there is no relationship between these variables in the long run (Bilgili, 2016).

Literature Review

The literature investigating the relationship between money supply and economic growth consists of applied studies using data from different countries and various econometric methods. The short and long-term results obtained in these studies show differences in support of various approaches in economic theory about the effects of money supply on economic growth. In a way, different conclusions have been reached in these applied studies that support different theoretical approaches claiming there are positive and negative causations in short and/or long term between money supply and economic growth, or there is no relationship between these variables. Some of the applied studies investigating the relationship between money supply and economic growth are presented in Table 1, including the results obtained with the dataset and methodology used in these studies.

Table 1. Literature Review

Authors	Dataset	Methodology	Results
Chang et al. (2009)	1993-2008 period - China	ARMA Model	While reductions in money supply affect economic growth negatively, increase in money supply has no effect on economic growth.
Ogunmuyiwa & Ekone (2010)	1980-2006 period - Nigeria	OLS Regression Analysis and Vector Error Correction Model	There is no causality from money supply to economic growth in both the short and long terms.
Düzgün (2010)	1987-2007 period - Turkey	ARDL Bound Test	The effect of money supply on economic growth is statistically insignificant.
Nouri & Samimi (2011)	1974-2008 period - Iran	OLS Regression Analysis	There is a positive relationship between money supply and economic growth.
Yan-liang (2012)	1998-2007 period - China	Johansen Cointegration Analysis and Granger Causality Test	While there is no relationship between money supply and economic growth in the long run, there is bidirectional causality in the short run.
Ihsan & Anjum (2013)	2000-2011 period - Pakistan	Correlation and Regression Analyses	There is no significant impact of money supply on economic growth.
Abdalla (2014)	1990-2012 period - Sudan	Johansen Cointegration Analysis and Granger Causality Test	While there is bidirectional causality between money supply and economic growth in the long term, there is no causality in the short term.
Inam (2014)	1985-2012 period - Nigeria	Johansen Cointegration Analysis and Granger Causality Test	Money supply affects economic growth negatively in the short term.
Chaitip et al. (2015)	1995-2013 period - ASEAN	Pooled Mean Group Estimation and Panel ARDL Test	Money supply affects economic growth positively in the long term.
Sancar (2015)	1990-2014 period - Turkey	ARDL Bound Test	While money supply affects economic growth negatively in the short run, there is no relationship between these two variables in the long term.
Chude & Chude (2016)	1987-2010 period - Nigeria	ARDL Cointegration Analysis and Granger Causality Test	There is a positive relationship between money supply and economic growth both in the short and long terms.
Denbel et al. (2016)	1970-2011 period - Ethiopia	Johansen Cointegration Analysis and Vector Error Correction Model	There is no causality from money supply to economic growth both in the short and long terms.
Aslam (2016)	1959-2013 period - Sri Lanka	CUSUM Test for Structural Break and McCallum Regression Model	Money supply affects economic growth positively.
Dingela & Khobai (2017)	1980-2016 period - South Africa	CUSUM Test for Structural Break and ARDL Bound Test	There is a positive relationship between money supply and economic growth both in the short and long terms.
Hussain & Haque (2017)	1972-2014 period - Bangladesh	Vector Error Correction Model	Money supply affects economic growth positively in the long run.

Methodology and Dataset

In this study, which aims to investigate the relationship between money supply and economic growth, using the monthly data of developing countries for 1997-2017, econometric estimates are carried out with Panel Cointegration and Panel Causality Analyses. In these analyzes, the real gross domestic product of the country is used as the dependent variable, and the M1, M2 and M3 data are used as independent variables to represent the money supplies of the countries. All variables included in the Panel Cointegration and Panel Causality Analyses are obtained from the Federal Reserve Bank of St. Louis, and are used in the model by taking their natural logarithms.

Findings

In this study, stationarity, cross sectional dependence, homogeneity, cointegration and causality tests are performed respectively in order to analyze the relationship between money supply and economic growth econometrically. The results obtained from the stationarity, cross sectional dependence and homogeneity tests are determinants regarding the methods to be used in performing cointegration and causality analyses. For this purpose, the results of the Im-Pesaran-Shin Unit Root Test for stationarity are shown in Table 2; and, the Pesaran CD Test for the cross sectional dependence and Swamy S Test results for homogeneity are shown in Table 3.

Table 2. Stationarity

	Level		First Difference	
Variable	**Statistic**	**P-Value**	**Statistic**	**P-Value**
GDP	2.1131	0.9827	-31.2961	0.0000
M1	1.5893	0.9440	-19.7898	0.0000
M2	1.5700	0.9418	-17.4958	0.0000
M3	2.4669	0.9932	-18.5937	0.0000

Table 3. Cross Sectional Dependence and Homogeneity

Test	**Statistic**	**P-Value**
Pesaran CD Test	44.29	0.0000
Swamy S Test	3205	0.0000

According to the results of the Im-Pesaran-Shin Unit Root Test in Table 2, while all the series used in the model contain unit root at level, they become stationary when the first differences are taken. According to the Pesaran CD Test results shown in Table 3, the H0 hypothesis claiming there is cross sectional independence in the model is rejected. Accordingly, there is a correlation between units in the

model (Pesaran, 2015). According to Swamy S Test results seen in Table 3, the H0 hypothesis that predicts homogeneity for the parameters is rejected. Accordingly, there is heterogeneity for parameters in the model (Ando & Bai, 2015). In line with these results, under the assumption of cross sectional dependence and heterogeneity, Panel Cointegration Analysis should be performed with the Gengenbach, Urbain & Westerlund EC Cointegration Test, which is compatible with these assumptions. The Gengenbach, Urbain & Westerlund EC Cointegration Test results are shown in Table 4.

Table 4. Cointegration

d.y	Coef.	T-bar	P-Value
y(t-1)	-0.143	-2.750	>0.1

The results of Gengenbach, Urbain & Westerlund EC Cointegration Test in Table 4 show that the coefficient calculated for y(t-1) is statistically insignificant at the level of 5%. Accordingly, there is no cointegration relationship between the variables in the model. In this way, it is determined that there is no long-term relationship between money supply and economic growth in developing countries. This result demonstrates that short-term causality between variables should be determined with the help of Panel VAR Analysis. Since the model contains assumptions of correlation and heterogeneity between the units, Panel VAR Analysis should be performed with Dumitrescu-Hurlin Panel Causality Test, which is compatible with these assumptions (Dumitrescu and Hurlin, 2012). Dumitrescu-Hurlin Panel Granger Causality Test results are shown in Table 5.

Table 5. Dumitrescu & Hurlin Panel Granger Causality Test

Variable	Z-bar	P-Value
M1	32.2032	0.0000
M2	18.4780	0.0000
M3	14.8567	0.0000

The results of Dumitrescu-Hurlin Panel Granger Causality Test in Table 5 show that the H0 hypothesis, which argues that there is no causality between variables, was rejected for all three of the M1, M2 and M3 money supply measures. According to these results, there is a short-term causality from money supply to economic growth in developing countries.

Conclusion

The effects of money supply on economic growth within the framework of monetary policies have been analyzed in many studies both theoretically and practically. This applied study also aims to investigate the relationship between money supply and economic growth for developing countries. For

this reason, cointegration and causality analyses were conducted by using the monthly data for the period of 1997-2017. According to the results of Gengenbach, Urbain & Westerlund EC Cointegration Test, there is no cointegration relationship between the variables in the model. This result demonstrates that there is no long-term relationship between money supply and economic growth in developing countries. According to the results of the Dumitrescu-Hurlin Panel Granger Causality Test, there is a short-term causality from money supply to economic growth in developing countries.

The fact that money supply positively affects economic growth in the short term in developing countries shows that monetary policy could be used effectively against short-term economic fluctuations and underemployment conditions stemming from the insufficiency of aggregate demand. Therefore, it is possible for developing countries to improve their real variables such as total product/output and employment thanks to the expansionary monetary policies aimed at increasing aggregate demand in times of economic recession, and the increase in money supply and monetary transmission mechanisms. Moreover, this short-term result shows that there is a deficit-to-GDP ratio sufficient to meet the increasing aggregate demand in developing countries with the expansion of money supply. For the developing countries, this gap between the current output and the potential output has the opportunity to be closed in the short term with the interaction from aggregate demand increase to total product, hence increasing total supply, as predicted by the Keynesian approach. The long-term result obtained in the study supports the principle of Classical Dichotomy, pointing out that long-term economic growth in developing countries could be achieved not by an increase in nominal values such as money supply, but by advancements due to productivity and technology. In this manner, solutions could be developed against short-term issues of developing countries with the help of monetary policies, and it could be argued that it is necessary to focus on structural transformations against long-term problems.

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