**THE RELATIONSHIP BETWEEN MONEY SUPPLY, INFLATION, AND ECONOMIC GROWTH IN MEDITERRANEAN COUNTRIES**

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**Abstract**

In this study of nine selected Mediterranean countries during 2008–2014, money supply and its relationship with inflation and economic growth is investigated by using a panel causality approach. The presented results show a unidirectional causal relationship between money supply and inflation but no causal relationship between money supply and economic growth. The obtained results correspond with the increased emphasis on price stability since the 1990s. The selected countries have strong economic ties with the European economy. Consequently, the recent negative progress in the European economy might affect the economies of these countries. This study recommends the application of policies that recognize the relationship between monetary policy and economic growth in Mediterranean countries that have recently shown poor economic performance.

**JEL classification numbers**: C23, E31, E50, F43

**Keywords**: Money Supply, Inflation, Economic Growth, Panel Causality

**1 Introduction**

Among the objectives of monetary policy, price stability and economic growth are important. Price stability states that economic units do not (i) need to consider a low inflation rate when making decisions about investment, consumption, and saving and (ii) expect a rise in this rate (Central Bank Republic of Turkey 2008). Inflationary and deflationary processes in the economy are undesirable because they damage the stability of financial markets and the real economic system. Accordingly, central banks aim to achieve price increases as close to zero as possible. Economic growth, which refers to a continuous increase in the production performance of a country over time (Haller 2012), is thus among the main objectives of economic policies because it improves the well-being of individuals.

Theoretical debates on the impact of monetary policy on macroeconomic variables date back to David Hume, who first introduced the quantity theory of money. In later periods, classical economists emphasized monetary neutrality by stating that monetary policy does not affect real factors in the long-term (e.g., real variables such as employment and production). Raising money supply increases the overall price level at a certain rate.

The Keynesian monetary policy view is the same as that of classical economists when the economy has full employment. However, when the economy is suffering unemployment, Keynesian monetary policy argues that a change in money supply affects real variables. Following the finding by Friedman and Schwartz (1963) that monetary developments have had an empirical impact on volatility, it has been argued that emphasizing the rigidity of wages and money in the short-term might change money supply, which could then affect real variables. Indeed, in the long-term, monetary policy might only affect nominal variables, and monetarist economic thought suggests rule-based monetary policy based on these points. During the same period, New Keynesian economists also accepted the monetarist economic view’s vision about money with the contribution of Tobin (1969).

Monetarists’ viewpoint of the effectiveness of monetary policy is based on the theory of augmented expectation. This theory makes an important contribution with the assumption that economic units cannot react to changes in money supply in the short-term. The neoclassical economic view suggests rational expectations theory when analyzing the extent to which monetary policy influences economies. According to this view, the effects of monetary shocks on real variables are associated with the policy implemented and not expected to have an impact in the short-term. This situation only occurs if the policy of the central bank is not foreseen by economic units (Gali 2008). Real business cycle theory, which is the foundation of the work by Kydland and Prescott (1982), forms the basis of neoclassical economic views about the effectiveness of monetary policy. According to this, a change in real macroeconomic variables is only possible because of changes in non-monetary indicators. Changes in monetary indicators have no effect on predicted fluctuations.

In terms of empirical results, monetarist and neoclassical views of monetary policy have shown significant discrepancies, shaped within the framework of the augmented and rational expectations theories of the 1970s and 1980s. New Keynesians evaluated monetary policy based on micro-foundations during the same period. Those who accepted the existence of rational expectations theory, such as Akerlof and Yellen (1985), Mankiw (1985), and Ball and Romer (1990), created a number of assumptions such as New Keynesian studies of monopolistic competition, market structure, menu costs, nominal prices, and wage rigidities. These economists asserted that real economic variables might be affected when these assumptions are evaluated from the perspective of the effectiveness of monetary policy, which forms the basis of the New Keynesian economic view.

After the 1970s, financial practices based on inflation targeting were successful. The inflation rate fell to zero in developed countries and monetary authorities faced with a major economic crisis were seen to be ineffective. Under these circumstances, the New Keynesian view brought forward-looking expectations theory into the forefront. Accordingly, monetary indicators affect short-term real macroeconomic variables only if economic units are able to manage their future monetary expectations (Krugman et al. 1998; Eggertsson and Woodford 2003).

**2 Literature Review**

When considering theoretical discussions of the effects of money supply on economic growth and inflation, such an effect only occurs in the long-term. In the short-term, there might be a trade-off between inflation and economic growth. In this context, the relationship that emerges between the two variables is closely associated with the economic structure of the country and the practice of its monetary authorities (Solow 1999).

Empirical studies of the effects of money supply on inflation and economic growth increased following Sims’s (1972) work, which investigated the relationship between national income and money supply in the US economy and found unidirectional causality from money supply to the national income. Lee and Li (1985) found a bidirectional relationship between money supply and income in the Singaporean economy. Herwartz and Reimers (2004) investigated the dynamic relationship between money supply, real income, and prices for the economies of 110 countries, concluding that those with high inflation show a relationship between money supply and prices.

Expansionary monetary policy emerged in 2008 with the financial crisis period, which increased studies of the monetary indicators of prices and impact on income. Such studies generally investigated the relationship between monetary indicators, income, and inflation in developing countries. Ahmed and Suliman (2011), Mehrara and Musai (2011), and Al-Fawwaz and Al-Sawai’e (2012) concluded that monetary changes affect inflation but not growth. Masnan et al. (2013), who investigated the economies of Malaysia, Indonesia and Singapore, revealed that money supply affected inflation in these three countries, but growth was affected only in Singapore. Heidari et al. (2012) and Bozkurt (2014) found evidence that inflation is a monetary phenomenon. While Shams (2012) found causality from money supply to both prices and income, Motamedi and Mohammadian (2012) concluded that monetary developments do not affect income or inflation. Babatunde and Shuaibu (2011) concluded that money supply affects growth. Mishra et al. (2010) found that money supply affects income in the short-term, but only prices in the long-term. Mirbagherijam (2014) showed that money supply does not affect prices during low inflation periods, but it does affect prices during high inflation periods, while also showing that it affects growth in the short-term.

Besides studies analyzing these three variables, research has investigated the effects of money supply on growth and inflation. Of studies that have analyzed the relationship between money supply and growth, Ogunmuyiwa and Ekone (2010) found no effect of money supply on growth, although Sturgill (2014) and Zapodeanu and Cociuba (2010) found a relationship between money supply and growth. In the United States, Caraiani (2012) found that during the Great Moderation (1985–2005) period when volatility reduced, monetary developments had less effect on growth, although there was a strong relationship in the other periods analyzed.

On the relationship between money supply and inflation, studies analyzing developing countries, such as Tang (2010), Simwaka et al. (2012), Chuba (2015), and Vladova and Yanchev (2015), have confirmed that money supply affects inflation. El-Shagi and Giesen (2013) analyzed the US economy between 1959 and 2007, showing that money supply had a substantial effect on inflation. The analyses of Oktar and Dalyanci (2011), Mandler and Scharnagl (2014), and Jiang et al. (2015) showed an important relationship between money supply and inflation in the long-term, although this relationship decreased or disappeared in the short- and mid-term. Berger and Osterholm (2011) and Rua (2012) analyzed the Eurozone after 1970 and found that the relationship between money supply and inflation decreased compared with the 1970s and 1980s. Assenmacher-Wesche and Gerlach (2008) and Assenmacher-Wesche et al. (2008) revealed that monetary changes affect the economies of Switzerland and Japan in the short-term. Bhaduri and Durai (2013) and Sahin and Karanfil (2015) determined that money supply does not affect inflation.

Mediterranean countries were selected for this study for several reasons. Firstly, they have a close relationship with the European economy, which has recently seen important economic developments. Secondly, determining the extent to which the rate of monetary development, which was above 10% during 2008–2014, affects inflation and economic growth is crucial for the design of future policy. Thirdly, every country may design their own monetary policy practices rather than adopting the decisions made by a central unit such as the European Central Bank.

**3 Variables and Data Set**

This study tested the relationships between money supply in the economy (M2) and the consumer price index (CPI) and M2 and economic growth (GDP) among nine selected Mediterranean countries (Albania, Algeria, Bosnia and Herzegovina, Morocco, Croatia, Israel, Turkey, Tunisia, and Egypt). Countries where monetary policy was determined by the European Central Bank were excluded from the analyses. The data set covered the seven years from 2008 to 2014. The average annual growth rates in money and quasi money were used as money supply. The CPI shows the annual percentage change in the average cost of a basket of goods and services. For GDP, the annual percentage growth rate was taken. All variables were derived from the World Bank’s electronic database, except CPI for Bosnia and Herzegovina, which was taken from Trend Economy (2015), since it is not provided by the World Bank.

**3.1 Panel Unit Root Tests**

Before the analysis, we must conduct a unit root test to avoid spurious regression and gather meaningful results. Various panel unit root tests have been developed (Baltagi and Kao 2000), such as Levin and Lin (1992), Quah (1994), Im et al. (1997) (IPS test hereafter), Maddala and Wu (1999), Choi (1999, 2001), Kao (1999), Harris and Tzavalis (1999), Hadri (1999), Levin et al. (2002) (LLC test hereafter), Breitung (2000), and Harris and Sollis (2003).

Levin and Lin (1992) limited the normal distribution in panel test statistics on univariate time series data against the standard distribution of a unit root test. They accepted that N→∞ and T→∞ values tend toward infinity in every situation. However, the convergence rates are faster for T→∞ than for N→∞ (Maddala and Wu 1999). According to Im et al. (2003), under a standard normal distribution, the time dimension tends to T→∞, while the diagonal section also follows it and goes to N→∞ as well. Under N/T→k, the k value is finite and hypothetically below a non-negative constant, which results after diagonal convergence as T and N→∞ (Im et al. 2003).

In our study, the stability of the constants was examined by using first generation stability tests such as the LLC, IPS, ADF, and PP tests. In all tests, for the M2, CPI, and GDP series at first difference, the 5% significance level was constant and fixed. The M2, CPI, and GDP series unit root test results are shown in Table 1.

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| --- | --- | --- | --- | --- | --- | --- |
| Table 1. Panel Unit Root Test Results | |  |  |  |  |  |
|  |  | Level | |  | First difference | |
| Variables | Method | Statistic | Prob\* |  | Statistic | Prob\* |
| M2 | LLC | -7.727 | 0.000\* |  | -8.877 | 0.000\* |
|  | IPS W-stat | -0.198 | 0.421 |  | -2.514 | 0.006\* |
|  | ADF-Fisher Chi-square | 24.707 | 0.133 |  | 41.352 | 0.001\* |
|  | PP-Fisher Chi-square | 55.225 | 0.000\* |  | 61.319 | 0.000\* |
| CPI | LLC | -12.150 | 0.000\* |  | -16.181 | 0.000\* |
|  | IPS W-stat | -0.950 | 0.171 |  | -4.963 | 0.000\* |
|  | ADF-Fisher Chi-square | 32.267 | 0.020\* |  | 56.320 | 0.000\* |
|  | PP-Fisher Chi-square | 59.893 | 0.000\* |  | 73.198 | 0.000\* |
| GDP | LLC | -14.489 | 0.000\* |  | -15.591 | 0.000\* |
|  | IPS W-stat | -1.257 | 0.104 |  | -5.481 | 0.000\* |
|  | ADF-Fisher Chi-square | 37.299 | 0.004\* |  | 64.988 | 0.000\* |
|  | PP-Fisher Chi-square | 63.213 | 0.000\* |  | 87.382 | 0.000\* |
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\*IPS, ADF-Fisher, and PP-Fisher – Null Hypothesis: Unit root (Individual unit root process); LLC – Null Hypothesis: Unit root (Common unit root process)

Automatic lag length selection based on the modified Schwarz criteria and Bartlett’s kernel

**3.2 Panel Cointegration Test**

A panel cointegration test was then conducted to determine the existence of a long-term relationship between the variables. In the literature, one of the most commonly used cointegration tests is that provided by Pedroni (2004). This test allows the cointegration vector to be heterogeneous as well as different between sections under the alternative hypothesis. The Pedroni cointegration test, which is based on the Engle–Granger (1987) method, is presented below:

(1)

t=1,…, T ; i=1,…, N ; m=1,2,…, M

where T is the number of observations, N is the number the individual units in the panel, and M is the number of the variables in the regression. Equation (1) shows that Xi is a specific intersection element and δit is the determinative time trend, all of which properly pertain to individual panel membership. The existence of a cointegration relation between the variables is tested by the stability of the error terms above. The null hypothesis suggests no cointegration, which accepts that the Yit and Xit variables are also cointegrated in the first degree I(1) with the eit error term.

The equation for the non-parametric statistical estimation is (Pedroni 1999)

(2)

and that for the parametric test estimation is (Pedroni 1999)

(3)

The H0 hypothesis shows that cointegration does not exist for all units, whereas the H1 hypothesis shows that cointegration exists for all units. The alternative hypothesis does not presume a mutual first-order autoregressive factor for all units, and the test statistics have a normal distribution:

(4)

where XN,T is the test statistic. The μ and v values refer to the mean and variance, respectively (Pedroni 1999).

Table 2. Pedroni Cointegration Test Results (only with constant)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Model 1: | | | | | | | | | | |
|  | |  | |  | |  | | Weighted | |  |
|  | |  | | Statistics | | Prob. | | Statistics | | Prob. |
| Panel v-Statistic | | | | -0.047 | | 0.518 | | 0.126 | | 0.449 |
| Panel rho-Statistic | | | | -1.031 | | 0.151 | | 0.033 | | 0.513 |
| Panel PP-Statistic | | | | -7.327 | | 0.000 | | -3.940 | | 0.000 |
| Panel ADF-Statistic | | | | -3.533 | | 0.000 | | -4.339 | | 0.000 |
|  | |  | |  | |  | |  | |  |
| Alternative hypothesis: individual AR coefs. (between-dimension) | | | | | | | | | | |
|  | |  | |  | |  | |  | |  |
|  | |  | | Statistics | | Prob. | |  | |  |
| Group rho-Statistic | | | | 1.511 | | 0.934 | |  | |  |
| Group PP-Statistic | | | | -4.731 | | 0.000 | |  | |  |
| Group ADF-Statistic | | | | -8.399 | | 0.000 | |  | |  |
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| Model 2: | | | | | | | | | | |
|  | |  | |  | |  | | Weighted | |  |
|  | |  | | Statistics | | Prob. | | Statistics | | Prob. |
| Panel v-Statistic | | | | -0.011 | | 0.504 | | -0.293 | | 0.615 |
| Panel rho-Statistic | | | | -1.859 | | 0.031 | | -0.435 | | 0.331 |
| Panel PP-Statistic | | | | -11.972 | | 0.000 | | -5.706 | | 0.000 |
| Panel ADF-Statistic | | | | -3.916 | | 0.000 | | -4.183 | | 0.000 |
|  | |  | |  | |  | |  | |  |
| Alternative hypothesis: individual AR coefs. (between-dimension) | | | | | | | | | | |
|  | |  | |  | |  | |  | |  |
|  | |  | | Statistics | | Prob. | |  | |  |
| Group rho-Statistic | | | | 1.183 | | 0.881 | |  | |  |
| Group PP-Statistic | | | | -6.886 | | 0.000 | |  | |  |
| Group ADF-Statistic | | | | -4.927 | | 0.000 | |  | |  |
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|  | |  | |  | |  | |  | |  |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Model 3: | | | | | | |  |  |  |  | Weighted |  | |  |  | Statistics | Prob. | Statistics | Prob. | | Panel v-Statistic | | -1.344 | 0.911 | -1.063 | 0.856 | | Panel rho-Statistic | | -0.451 | 0.326 | -0.783 | 0.216 | | Panel PP-Statistic | | -6.944 | 0.000 | -8.546 | 0.000 | | Panel ADF-Statistic | | -5.392 | 0.000 | -3.701 | 0.000 | |  |  |  |  |  |  | | Alternative hypothesis: individual AR coefs. (between-dimension) | | | | | | |  |  |  |  |  |  | |  |  | Statistics | Prob. |  |  | | Group rho-Statistic | | 0.599 | 0.725 |  |  | | Group PP-Statistic | | -14.336 | 0.000 |  |  | | Group ADF-Statistic | | -5.934 | 0.000 |  |  | | | | | | | | | | | |
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H0= Cointegration does not exist

H1= Cointegration exist

The test statistics in Table 2 have a value above Z0.05=1.96, thereby rejecting the null hypothesis of no cointegration between M2 and GDP (Model 1), M2 and CPI (Model 2), and GDP and CPI (Model 3) at the 5% significance level. These results suggest that M2 and GDP, M2 and CPI, and GDP and CPI have long-term stable relations.

**4 Granger Causality Test**

In our analysis, by keeping the variable constant, we used the Granger causality test to examine the direction of the relations among these variables (Granger 1969):

(5)

(6)

(7)

Table 3. Granger Causality Test Results

|  |  |  |  |
| --- | --- | --- | --- |
| Null Hypothesis: | Obs. | F-Statistics | Prob. |
|  |  |  |  |
|  |  |  |  |
| ∆M2 does not Granger cause ∆CPI | 36 | 4.800 | 0.015\* |
| ∆CPI does not Granger cause ∆M2 | | 2.177 | 0.130 |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| ∆M2 does not Granger cause ∆GDP | 36 | 0.978 | 0.387 |
| ∆GDP does not Granger cause ∆M2 | | 0.347 | 0.709 |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| ∆GDP does not Granger cause ∆CPI | 36 | 0.595 | 0.557 |
| ∆CPI does not Granger cause ∆GDP | | 0.276 | 0.760 |
|  |  |  |  |
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|  |  |  |  |

For the M2–CPI relation, Table 3 shows that the probability result is lower than 5%, rejecting H0 (M2 does not cause CPI), thus suggesting unidirectional causality from M2 to CPI. This table also shows for the M2–GDP relation that the probability value is larger than 5%, accepting H0 (M2 does not cause GDP). Hence, there is no causality relation between M2 and GDP.

**5 Summary and Conclusions**

The degree to which monetary policy affects economic growth and inflation has long been discussed theoretically. While there is a common opinion that monetary policy only affects inflation in the long run, the discussion on the short-term effects is ongoing. On this basis, this empirical study investigated the relation between money supply and the CPI/economic growth in nine Mediterranean countries during 2008–2014. According to the analysis results, there is a direct unidirectional relation from money supply to inflation, although no relation was found between money supply and economic growth. These results concur with those from studies such as Ahmed and Suliman (2011), Mehrara and Musai (2011), and Al-Fawwaz and Al-Sawai’e (2012), but differ from those of Babatunde and Shuaibu (2011) and Shams (2012).

Countries are concerned about the positive effect of price stability on economic growth, leading to rising political understanding about the importance of price stability. Our results confirm this situation. The countries included in the analysis have close relations with the European economy. Hence, the recent negative events in the European economy could affect these countries’ economies significantly. Since the 2008 financial crisis, there has been a need to question the monetary policies of these countries, especially those that have shown poor economic performance (e.g., Albania, Bosnia-Herzegovina, Croatia).

Poor performance is driven by EU help funds and structural problems in their banking sectors. Structural reforms in these countries will thus have important effects. In addition, countries that have close to zero or negative increases in prices must adopt monetary policy that simultaneously aims for price stability and economic growth. In this direction, the Albanian and Croatian central banks, using monetary policies such as liquidity management and diversified deposit tender tools, have required more active reserve policies to refresh domestic demand. The target exchange rate of the central bank of Bosnia-Herzegovina might fall to devaluation, which will affect domestic and foreign demand. Therefore, countries such as Albania, Croatia, Turkey, and Egypt must use an exchange rate policy that depends on foreign capital flows. Policy tools that can be applied include dollar-repo activities, capital inflow-and-outflow regulatory practices, cost-ratio methods for currency activities, foreign money and currency reserves, and interest payment practices.

Among the studied countries, Turkey and Egypt have higher inflation rates compared with the others and thus monetary policy should be applied more sensitively because of the possibility of price instability. With the decreasing prices of raw material and petrol, the growth of the economies of export-led countries such as Algeria, Morocco, Egypt, and Israel might be affected. The economies of these countries can continue their currency activities by using depreciated currency value policies for non-financial exporting companies. Finally, the central bank of Israel has established price stability and is currently using a zero-interest policy. At this point, its recent economic growth can be increased by repeating previous monetary expansion policies.

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