# The Interrelationship between Money Supply, Prices and Government Expenditures and Economic Growth: A Causality Analysis for the Case of Cyprus

**Andreas G. Georgantopoulos[1] and Anastasios D. Tsamis[2]**


## Abstract

*This paper investigates the short run as well the long run relationships between money supply, inflation, government expenditure and economic growth by employing the Error Correction Mechanism (ECM) and Johansen co-integration test respectively for the case of Cyprus using annual data from 1980 to 2009. Collectively, empirical results imply that public spending promotes economic development in Cyprus. However, deficit financing by the government causes more liquidity effects but also inflationary pressure in the economy. Results show that inflation negatively effects economic growth probably due to adverse supply shock. Money supply should be allowed to grow according to the real output of the economy but excess growth of money causes inflationary pressure in case of Cyprus. Therefore, this paper suggests that the government should control its current expenditure that stimulates aggregate demand and to focus more on development expenditure which stimulates aggregate supply and increases real output level.*


**Keywords:** Economic development, Co-integration, Granger causality, Deficit financing

**JEL Classification:** C32, E60, O11

## 1. Introduction

### 1.1 Theoretical Background

During the last decades, the macroeconomic literature has provided a vast number of instruments of fiscal and monetary policies regarding almost every country in order to achieve macroeconomic goals such as development, growth, redistribution of income, financial stabilization, job opportunities etc. However, economists still argue on the basic dilemma, whether more government expenditure can finally boost economic growth, or appropriate contractionary policy measures are the key for long-term economic development

[1] PhD, Department of Public Administration, Panteion University of Political and Social Sciences, 136, Sygrou Ave. 176 71,Athens, Greece, e-mail: ageorgantos@yahoo.com

[2] Professor, Department of Public Administration, Panteion University of Political and Social Sciences, 136, Sygrou Ave. 176 71, Athens, Greece, e-mail: atsamis@panteion.gr

and financial stability. In this aspect, policy makers are usually interested in demanding management policy and supplying side policies. Change in money supply will affect the liquidity position in financial institutes and private spending of the economy, while the public expenditures affect public spending of the economy.

The theory of Money is based on two core elements for policy purpose; the quantity theory of money and the natural rate of unemployment. Monetarism derives from the quantity theory of money and states that variation in the money supply has major influences on national output in the short run and the price level over longer periods and that objectives of monetary policy are best met by targeting the growth rate of the money supply. Assuming that the velocity of money is constant and the output is not influenced by money supply, increases in the money supply proportionally raise inflation level. The long run evidence behind monetarism is compelling but the short run support is weak.

According to the monetarism, money supply is changed by monetary authority. As money supply increases, prices also rise proportionally (with all other things remain constant). So, inflation rises as monetary authority increases money supply. On the other hand, the hypothesis of natural rate of unemployment suggests that this rate is determined by the central institution of the national economy. Any increase in money supply that causes output level above natural level in the short run will cause a proportionally increase in prices (i.e. inflation) in the long run. It is also suggested that instead of following up full employment objective, macroeconomic policy should be concentrated on achieving the constant rate of monetary growth. However, monetarists ruled out the possibility that demand management can impact either on real economic growth or employment in the long run. It was argued that the above analyzed policies did not generate employment; on the contrary, they created only inflation in the economy. This methodology of demand management critically spoiled the free market mechanism where price stability is a necessary base.

A second feature of the monetarists' approach to the monetary policy was to focus on supply side economy. They ruled out any discussion for demand management policies but they agreed upon that government can take a severe initiative to enhance economic efficiency by macroeconomics instruments and policies in order to influence households and industries from the supply side. One example of this approach is the policy of reducing marginal tax rates for those who have high incomes. This was initiated under the assumption that entrepreneurs will lead the way to long term economic growth. On the other hand, for those who have low incomes, the corresponding incentives were to be obtained by the reduction of unemployment and earnings-related payments (i.e. wages).

Nevertheless, during the last decade central banks did not predict the increasingly important role of investment banks and hedge funds in the global financial system, which was extended with participation of funds outside the regulatory framework of traditional commercial banks. The global financial crisis that followed the shortness of liquidity in the banking system of the United States necessitated government intervention to direct provision of funds, bringing the monetarist model in second place, and fears of destabilization of the economy and inflation emerged. Fears judged to be minor compared to the effort of

governments, central banks and other policy makers to address the prolonged downturn in the global economy that began in 2008 and continues until present.

Taking into consideration the above analysis, this paper investigates the behavior of money supply, inflation, government expenditures and economic growth for a developed European Union member country, Cyprus.

### 1.2 A Brief Review of the Economic Outlook of Cyprus

Cyprus was included by the International Monetary Fund in its list of advanced economies in 2001. Erratic growth rates in the 1990s reflected the economy's vulnerability to swings in tourist arrivals, caused by political instability on the island and fluctuations in economic conditions in Western Europe. On 1 January 2008, the country entered the Eurozone replacing the Cypriot pound with the euro. Since gaining independence from the United Kingdom in 1960, Cyprus has had a record of successful economic performance, reflected in strong growth, full employment conditions and relative stability. The underdeveloped economy inherited from colonial rule has been transformed into a modern economy, with dynamic services, industrial and agricultural sectors and an advanced physical and social infrastructure.

According to World Economic Outlook Database (2011), Cyprus is one of the most prosperous countries in the Mediterranean region, with GDP per capita reaching $30,000. Their standard of living is reflected in the country's high Human Development Index and Cyprus is ranked 23$^{rd}$ in the world in terms of the quality-of-life index, as data from the Economist Intelligence Units (2005) rankings imply.

In the past 30 years, the economy has shifted from agriculture to light manufacturing and services. The services sector, including tourism, contributes almost 80 percent to GDP and employs more than 70 percent of the labor force. Industry and construction account for approximately one-fifth of GDP and labor, while agriculture is responsible for 2.1 percent of GDP and 8.5 percent of the labor force.

After robust growth rates in the 1980s (i.e. average annual growth was 6.1%), economic performance in the 1990s was mixed with real GDP growth ranging from 1.7% to 9.7%. This pattern underlined the economy's vulnerability to swings in tourist arrivals and the need to diversify the economy. Declining competitiveness in tourism and especially in manufacturing is expected to act as a drag on growth until structural changes are effected. Overvaluation of the Cypriot pound prior to the adoption of the euro in 2008 had kept inflation in check.

Trade is vital to the Cypriot economy (the island is not self-sufficient in food and has few natural resources) and the trade deficit continues to grow. Cyprus must import fuels, most raw materials, heavy machinery, and transportation equipment. More than 50 percent of its trade is with the rest of the European Union, especially Greece and the United Kingdom, while the Middle East receives 20 percent of exports. In 1991, Cyprus introduced a Value Added Tax (VAT), which is currently 15% in line with the EU minimum. Cyprus ratified the new world trade agreement (General Agreement on Tariffs and Trade, GATT) in

1995 and began implementing it fully on 1 January 1996. Cyprus also has the fourth-largest ship registry in the world, with 2,758 ships and 25.5 million gross registered tons (GRTs). It is an open registry and includes ships from more than 43 countries, including Greece, Germany, and Russia.

EU accession negotiations started on 31 March 1998, and concluded when Cyprus joined the organization as a full member in 2004. However, after more than three decades of unbroken growth, the economy of Cyprus entered recession in 2009. This reflected the exposure of Cyprus to the European sovereign debt crisis. In recent times, concerns have been raised about the state of public finances and spiraling borrowing costs.

In the above spirit, this paper attempts to estimate the behavior of money supply, government expenditure, growth and prices and their simultaneous impacts on inflationary expectations. This work has a particular research interest, taking into consideration that Cyprus recently entered the global financial crisis and experienced since then difficulties in various macroeconomic aspects.

This study is motivated by a number of factors. First, there is a lack of published studies that investigate the presence of interdependence between money supply, government expenditures, prices and growth in one study for Cyprus. Second, it enriches the very few existing literature on the links between these macroeconomic variables. The above kind of nexus has been studied separately using methods of correlation, regression, or Granger's bivariate causality tests. Third, it covers a period which includes some of the most important macroeconomic and political transformations leading to a more open and therefore more globalized and developed economy for Cyprus.

Therefore, there are three central objectives of this research; First, to investigate the causal links between money supply (i.e. monetary policy), public expenditure (i.e. fiscal policy) and real GDP. Second, to find out the association between current governments spending and consumer price index. Third, to examine the impact of government expenditures on monetary base in case of budget deficit (deficit financing).

The rest of the paper is organized as follows. Section 2 briefly reviews the literature. Section 3, presents the data and methodology employed. Section 4 presents the empirical results, while concluding remarks with some policy implications are presented in Section 5.

## 2. Review of Recent Literature

In the recent literature there are several studies dealing with monetary and fiscal policy issues producing contradictory evidence regarding the behavior of the selected macroeconomic variables in each case.

Karpetis (2006) developed a simple dynamic New Keynesian type model using the multiplier – accelerator principle in order to examine the quantitative impact of changes in the level of government expenditures and the growth rate of nominal money supply on the level of several macroeconomic magnitudes. He concluded that long run value of inflation (expected and actual) is affected by size of government expenditure and nominal money supply.

Demeri, Duck and Musgrave (2004) used a data set from 1964 to 1981 in the case of West Germany. They found that for this country unanticipated money growth affects output and employment.

Choi and Devereux (2005) explored how fiscal policy (represented by increases in government spending) has asymmetric effects on economic activity across different levels of real interest rates. They suggested that the effect of fiscal policy depends on the level of real rates. Using threshold vector autoregression models on U.S. data, the paper provides evidence that expansionary government spending is more conducive to short-term growth when real rates are low.

Han and Mulligan (2008) argued that inflation is significantly positively related to the size of government, mainly when periods of war and peace are compared. They found a weak positive peacetime time series correlation between inflation and the size of government and a negative cross-country correlation of inflation with non-defense spending.

Jiranyakul (2007) used Thai-data from 1993 to 2004 in order to find out causal relationships between economic development and size of government. Empirical evidence showed that there was no bilateral link between government expenditures and economic growth. However, a unidirectional causality running from government expenditures to economic growth existed. Furthermore, estimation results from the ordinary least square (OLS) regression confirmed the strong positive impact of government spending on economic growth during the period of investigation.

Koeda and Kramarenko (2008) evaluated a fiscal scenario based on the assumption of a rapid scaling-up of expenditure to be followed by a rapid scaling-down in the context of Azerbaijan's current temporary oil production boom. They suggested that the evaluated fiscal scenario poses significant risks to growth sustainability.

Albatel (2000) used data from 1973 to 2004 in the case of Saudi Arabia, and employed granger causality test to examine the association between money supply, government expenditure and economic growth and his findings showed bilateral causality between the variables.

Nurudeen and Usman (2010) investigated the effect of government expenditure on economic growth, by employing a disaggregated analysis for Nigeria during the period 1970-2008. The results reveal that government total capital expenditure (TCAP), total recurrent expenditures (TREC) and government expenditure on education (EDU) have negative effect on economic growth. On the contrary, rising government expenditure on transport and communication (TRACO) and health (HEA) resulted to an increase in economic growth.

Hsieh and Lai (1994) conducted a multivariate time series analysis based on data for the Group-of-Seven (G-7) countries with particular attention paid to the causal pattern and the shape of the impulse-response function in the context of vector autoregressions. The empirical results suggest that the relationship between government spending and growth can vary significantly across time, as well as across the major industrialized countries that presumably belong to the same level of economic development.

Mehmood and Sadiq (2010) examined both the long run and the short run relationship

between the fiscal deficits, which is the outcome of high government expenditure over the level of tax revenue collection and poverty. Their results reveal a negative relationship between government expenditure and poverty, based on time series data from 1976 to 2010 for Pakistan.

Lucas and Stokey (1983), Judd (1989) and others have argued that an optimal tax policy involves the use of 'state-contingent debt'. Citizens buy contingent claims on the government, which pay off extraordinarily well when government revenues (spending) are above (below) expectations and poorly when government revenues (spending) are below (above) expectations.

Judd (1989) argues that nominal government liabilities and nominal provisions in the tax code serve this state-contingent debt function, with monetary policy adjusting the price level appropriately to achieve the right pattern of payoffs\ for the state-contingent debt. Thus, inflation is above normal upon the receipt of 'bad news' about the government's fiscal situation and below normal upon receipt of 'good news'. One empirical counterpart to good and bad news is the beginning and end of wars - inflation should be high during the war and prices should jump down at the conclusion of the war.

## 3. Data and Methodology

This study investigates the relationship between money supply (M2), prices as measured by Consumer Price index (CPI) for the end of the year, total government expenditures (GE) and growth as measured by the rate of change of real GDP for Cyprus during the period 1980-2009. All selected data are in annual base and gathered from reliable sources; GDP, CPI and GE data are derived from the World Economic Outlook (WEO, i.e. International Monetary Fund database), while M2 annual observations are drawn from the World Development Indicators (WDI, i.e. World Bank database). Authors' calculations are conducted using the E-views 7.1 software (2010). All data sets are transformed into logarithmic returns in order to achieve mean-reverting relationships and to make econometric testing procedures valid.

To check the stationarity properties of the univariate time series, Augmented Dickey-Fuller (ADF) test is employed in order to test for the unit roots of the concerned time series variables (Dickey and Fuller, 1979). It consists of running a regression of the first difference of the series against the series lagged once, lagged difference terms, and optionally, by employing a constant and a time trend. This can be expressed as:

$$\Delta y_t = a_1 y_{it-1} + \sum_{j=1}^{p_i} \beta_{ij} \Delta y_{it-j} + x'_{it}\delta + \varepsilon_t \qquad (1)$$

The test for a unit root is conducted on the coefficient of ($y_{t-1}$) in the regression. If the coefficient is significantly different from zero then the hypothesis that (y) contains a unit root is rejected. Rejection of the null hypothesis implies stationarity.

Furthermore, the time series has to be examined for co-integration. Cointegration analysis helps to identify long-run economic relationships between two or several variables

and to avoid the risk of spurious regression. Co-integration analysis is important because if two non-stationary variables are cointegrated, a Vector Autoregression (VAR) model in the first difference is misspecified due to the effect of a common tend. If a cointegration relationship is identified, the model should include residuals from the vectors (lagged one period) in the dynamic Vector Error Correcting Mechanism (VECM) system. In this stage, the Johansen (1988) cointegration test is used to identify a cointegrating relationship among the variables. Within the Johansen multivariate cointegrating framework, the following system is estimated:

$$\Delta z_t = \Gamma \Delta z_{t-1} + \Gamma_{k-1} \Delta z_{t-k-1} \Pi z_{t-1} + \mu + \varepsilon_t : t=1,..,T \quad (2)$$

where, $\Delta$ is the first difference operator, z´ denotes a vector of variables, $\varepsilon_t \sim n\ iid\ (0,\sigma^2)$, $\mu$ is a drift parameter, and $\Pi$ is a (p x p) matrix of the form $\Pi = \alpha\beta'$, where $\alpha$ and $\beta$ are both (p x r) matrices of full rank, with $\beta$ containing the r cointegrating relationships and $\alpha$ carrying the corresponding adjustment coefficients in each of the r vectors. The Johansen approach can be used to carry out Granger causality tests as well. In the Johansen framework, the first step is the estimation of an unrestricted, closed p-th order VAR in k variables. Johansen (1988) suggested two tests statistics to determine the cointegration rank. The first of these is known as the trace statistic:

$$N\{trace(r_0 / k) = -T \sum_{i=r_0+1}^{k} \ln(1 - \hat{\lambda}_i) \quad (3)$$

where, $\hat{\lambda}_i$ are the estimated eigenvalues $\lambda_1 > \lambda_2 > \lambda_3 > \ldots > \lambda_\kappa$ and $r_0$ ranges from zero to k-1 depending upon the stage in the sequence. This is the relevant test statistics for the null hypothesis $r \leq r_0$ against the alternative $r \geq r_o+1$. The second test statistic is the maximum eigenvalue test known as $\lambda_{max}$; we denote it as $\lambda_{max}$ $(r_0)$. This is closely related to the trace statistic, but arises from changing the alternative hypothesis from $r \geq r_o+1$ to $r = r_o+1$, thus improving the power of the test by limiting the alternative to a cointegration rank, which is just by one more than the null hypothesis. The λmax test statistic is:

$$\lambda_{max}(r_0) = -T \text{ in } (1 - \lambda_i) \text{ for } i = r_0 + 1 \quad (4)$$

The null hypothesis is that there are r cointegrating vectors, against the alternative of (r+1) cointegrating vectors. Johansen and Juselius (1990) indicated that the trace test might lack power relative to the maximum eigenvalue test. Based on the power of the test, the maximum eigenvalue test statistic is often preferred when the sample size is smaller (n<40) because it produces more sophisticated results.

In order to examine the short term relationships between the tested variables, the Error Correction Mechanism (ECM) is employed and works in the following manner; Firstly, the relevant equation is run. After noting the produced residuals from the regression a second regression is run in first differences including the residuals observations. The so called speed of adjustment (i.e. residual coefficient) produced from the regression if negative and statistically significant indicates the level of the short term predictability of the model. Otherwise, the model is unpredictable in the short run.

On the other hand, according to Granger (1969), Y is said to 'Granger-cause' X if and only if X is better predicted by using the past values of Y than by not doing so with the past values of X being used in either case. In short, if a scalar Y can help to forecast another scalar X, then we say that Y Granger-causes X. If Y causes X and X does not cause Y, it is said that unidirectional causality exists from Y to X. If Y does not cause X and X does not cause Y, then X and Y are statistically independent. If Y causes X and X causes Y, it is said that feedback exists between X and Y. Essentially, Granger's definition of causality is framed in terms of predictability. To implement the Granger test, a particular autoregressive lag length k (or p) is assumed and Models (5) and (6) are estimated by OLS:

$$X_t = \lambda_1 + \sum_{i=1}^{k} a_{1i} X_{t-i} + \sum_{j=1}^{k} b_{1j} Y_{t-j} + \mu_{1t} \tag{5}$$

$$Y_t = \lambda_2 + \sum_{i=1}^{k} a_{2i} X_{t-i} + \sum_{j=1}^{k} b_{2j} Y_{t-j} + \mu_{2t} \tag{6}$$

Furthermore, an F-test is carried out for the null hypothesis of no Granger causality; $H_0 : b_{i1} = b_{i2} = \ldots = b_{ik} = 0, i = 1,2$. where, the F statistic is the Wald statistic of the null hypothesis. If the F statistic is greater than a certain critical value for an F distribution, then we reject the null hypothesis that Y does not Granger-cause X, which means Y Granger-causes X.

A time series with a stable mean value and standard deviation is called a stationary series. If d differences have to be made to produce a stationary process, then it can be defined as integrated of order d. Engle and Granger (1987) state that if several variables are all I(d) series, their linear combination may be cointegrated, that is, their linear combination may be stationary. Although the variables may drift away from equilibrium for a while, economic forces are expected to restore equilibrium. Thus, they tend to move together in the long run irrespective of short run dynamics. The definition of Granger causality is based on the hypothesis that X and Y are stationary or I(0) time series. Therefore, the fundamental Granger method for variables of I(1) cannot be applied. In the absence of a cointegration vector, with I(1) series, valid results in Granger causality testing are obtained by simply first differentiating the VAR model. With cointegration variables, Granger causality will require further inclusion of an error term in the stationary model in order to capture the short term deviations of series from their long-term equilibrium path. Hassapis et al. (1999) show that in the absence of cointegration, the direction of causality can be decided upon via standard F-tests in the first differenced VAR. The VAR in the first difference can be written as:

$$N\{\Delta X_t = \lambda_1 + \sum_{i=1}^{k} a_{1i} \Delta X_{t-i} + \sum_{j=1}^{k} b_{1j} \Delta Y_{t-j} + \mu_{1t} \tag{7}$$

$$N\{\Delta Y_t = \lambda_2 + \sum_{i=1}^{p} a_{2i} \Delta X_{t-1} + \sum_{j=1}^{p} b_{2j} \Delta Y_{t-j} + \mu_{2t} \tag{8}$$

## 4. Empirical Results

Table 1 reports the descriptive statistics for the data sample. Overall, calculations indicate that all variables are not normally distributed and are characterized as leptokurtic and skewed.

**Table 1: Descriptive Statistics**

| Statistics | GDP | M2 | GE | CPI |
|---|---|---|---|---|
| Mean | 3.863742 | 9.846529 | 9.786292 | 4.851277 |
| Median | 3.893692 | 9.938806 | 9.825702 | 4.879286 |
| Maximum | 4.118728 | 10.67719 | 10.28321 | 5.038306 |
| Minimum | 3.539578 | 8.900302 | 9.184803 | 4.578490 |
| Std. Dev. | 0.182419 | 0.532776 | 0.324815 | 0.135105 |
| Skewness | -0.305028 | -0.275481 | -0.232383 | -0.342003 |
| Kurtosis | 1.837073 | 1.886127 | 1.946685 | 1.937453 |
| Jarque-Bera | 2.155711 | 1.930339 | 1.656848 | 1.996088 |
| Probability | 0.340325 | 0.380919 | 0.436737 | 0.368600 |

Table 2 displays the estimates of the Augmented Dickey – Fuller (ADF) test in levels and in first differences of the data with an intercept, with an intercept and trend and with no intercept or trend. The tests have been performed on the basis of 5 percent significance level, using the MacKinnon Critical Values (MacKinnon, 1996). The lag length was determined using Schwarz Information Criterion (Schwartz, 1978). Initially, ADF test with an intercept implies that all variables are not stationary at levels even at 10 percent level of significance. However, at 1st differences GDP, M2, GE and CPI are all stationary at 1 percent significance level. Similar results presents the unit root test with an intercept and trend, since all variables show no significance at levels but at 1st differences all variables are integrated of order one. Finally, ADF test with no intercept or trend reports that at levels none of the examined variables have a unit root. However, at 1st differences all variables are stationary at an accepted significance level (i.e. 5 percent). Collectively, all test results imply that all variables are not stationary at levels at any accepted level of significance (i.e. 5 percent significance level or higher). These are stationary at 1st differences. So, robust results indicate that all three variables are integrated of order one i.e. I(1).

**Table 2: Augmented Dickey – Fuller Unit Root Test Results**

| Variables | Test with Intercept | | Test with Intercept and Trend | | Test with no Intercept or Trend | |
|---|---|---|---|---|---|---|
| | Levels | 1st Differences | Levels | 1st Differences | Levels | 1st Differences |
| GDP | -2.5878 | -4.8488*** | -0.3948 | -6.2849*** | 0.5984 | -2.9635** |
| M2 | -1.1677 | -4.7938*** | -1.5933 | -4.8252*** | 3.5968 | -2.2698** |
| GE | 1.9529 | -5.1994*** | -2.2693 | -5.6902*** | 5.6984 | -2.3967** |
| CPI | -2.4296 | -3.7753*** | -2.7029 | -4.5547*** | 7.9657 | -2.0624** |

**Note:** *, **, *** denote significance at 10%, 5% and 1% respectively. This note also applies to the subsequent tables.

Table 3 provides the results from the application of Johansen cointegration test among the data sets. Empirical findings show that both the maximum eigenvalue and the trace tests reject the null hypothesis of no cointegration at the 5 percent significance level according to critical value estimates. Thus, empirical results imply that there are long run relationships among the tested variables at accepted significance levels.

**Table 3: Johansen Co-integration Test Results**

| Null Hypothesis | Trace Statistic | 5% Critical Value | Maximum Eigenvalue Statistic | 5% Critical Value |
|---|---|---|---|---|
| $r^* = 0$ | 52.3480** | 47.8561 | 28.5753** | 27.5843 |
| $r \leq 1$ | 30.7677** | 29.7970 | 21.2703** | 21.1316 |
| $r \leq 2$ | 16.4983** | 15.4947 | 15.3940** | 14.2646 |
| $r \leq 3$ | 2.6588 | 3.8415 | 2.6495 | 3.4896 |

**Note:** * r is the number of co-integrating vectors under the null hypothesis.

Table 4 presents the results from the application of the Error Correction Model in order to test the existence of short run equilibrium among the variables. Regression results show that adjustment coefficient is negative and significant (-0.3782). These findings suggest that 37.82 percent of the disequilibrium will be corrected immediately, i.e. in the next period.

**Table 4: Error Correction Model Estimates (Dependent Variable ΔGDP)**

| Variable | Coefficient | Std. Error | T-Statistic |
|---|---|---|---|
| Δ M2 | 0.0187 | 0.0330 | 3.7687** |
| Δ CPI | 0.2274 | 0.2058 | 3.8947** |
| Δ GE | 0.4501 | 0.1016 | 4.4316*** |
| $U_1$(-1) | -0.3782 | 0.1685 | -3.7710** |
| C | 0.0050 | 0.0041 | 1.2123 |

Moreover, the Granger causality test is employed for investigating the bilateral or unidirectional causal links between the variables. Calculations are tabulated in Table 5. Overall calculations indicate that there are no bilateral causal links between the tested macroeconomic variables for Cyprus. On the other hand, empirical results show that unidirectional causality exists between growth, inflation and money supply running from GDP to CPI and M2. Furthermore, public spending emerges as a key variable for the economy of Cyprus; the results imply that GE granger-causes economic growth, M2 and CPI. Finally, the relationship between CPI and M2 is also unidirectional running from money supply to inflation.

**Table 5: Granger Causality Test Results**

| | F - Statistics | | | |
|---|---|---|---|---|
| **Null Hypothesis** | **Lag 1** | **Lag 2** | **Lag 3** | **Lag 4** |
| CPI does not Granger-cause GDP | 2.1411 | 1.5695 | 1.2454 | 0.5590 |
| GDP does not Granger-cause CPI | 12.2253*** | 4.9542** | 3.4174** | 3.5421** |
| GE do not Granger-cause GDP | 4.8185** | 3.8478** | 3.7508** | 2.6104* |
| GDP does not Granger-cause GE | 0.8092 | 0.6533 | 0.5208 | 0.4636 |
| M2 do not Granger-cause GDP | 0.0782 | 0.0137 | 0.7424 | 1.2958 |
| GDP does not Granger-cause M2 | 4.6223** | 3.4381** | 2.7663* | 1.7606 |
| GE does not Granger-cause CPI | 5.6122*** | 3.6609** | 1.9476 | 1.5064 |
| CPI does not Granger-cause GE | 0.1533 | 0.2835 | 0.8847 | 0.7265 |
| M2 do not Granger-cause CPI | 11.1312*** | 5.6812*** | 5.5982*** | 5.2208*** |
| CPI does not Granger-cause M2 | 0.2393 | 0.9292 | 1.5429 | 1.2375 |
| M2 do not Granger-cause GE | 1.4246 | 0.7879 | 0.7111 | 0.4623 |
| GE does not Granger-cause M2 | 3.9914** | 3.6842** | 3.4084** | 3.3330** |

## 5. Concluding Remarks and Policy Implications

The central objective of this study is to investigate the relationship between four key macroeconomic variables (i.e. money supply, inflation, government expenditures and economic growth) for a developed economy, Cyprus.

The survey is of particular interest considering the impact of the global financial crisis on the economy of Cyprus. After more than two decades of rapid economic growth and significant improvements in its citizens' standard of living, Cyprus entered recession mostly due to the country's exposure to the European sovereign debt crisis. The economic achievements of Cyprus during the preceding decades have been impressive, bearing in mind the severe economic and social dislocation created by the Turkish invasion of 1974 and the continuing occupation of the northern part of the island by Turkey. The success of Cyprus in the economic sphere has been attributed to the adoption of a market-oriented economic system, the pursuance of sound macroeconomic policies by the government as well as the existence of a dynamic and flexible entrepreneurship and a highly educated labor force. Moreover, the economy benefited from the close cooperation between the public and private sectors. However, in recent times, concerns have been raised about the state of public finances and spiraling borrowing costs demanding radical economic transformations in order for Cyprus to maintain economic prosperity.

In this spirit, this study supports that investigating empirically the interdependence of dominant macroeconomic variables, such as inflation, liquidity, public spending and economic growth can provide useful information with important economic implications. As presented in Section 3, this paper employs the Error Correction Mechanism (ECM) to determine the short run relationship between the variables while Johansen co-integration test is used to find out long run associations. Moreover, Granger causality test indicates the direction of causality. The empirical results presented and analyzed econometrically in Section 4 robustly indicate that co-integration relationships exist between the tested variables.

In conclusion, the impact of monetary and fiscal policies is significant in Cyprus. Increase in public spending by deficit financing effects positively the real output. These results show that during the tested period, the government of Cyprus has succeeded in promoting economic growth through government expenditures. However, deficit financing in the case of Cyprus could cause liquidity effects and inflationary pressure in the economy. Government should closely monitor inflation rates. Moreover, the economy can benefit greatly in terms of real output as money supply grows, since M2 positively affects real GDP. However, excess money supply could also lead to inflationary pressure. Government should control its current expenditure which stimulates aggregate demand and focus more on development expenditure which stimulates aggregate supply and increase real output level.

Finally, it is important to highlight that our results may be sensitive to the choice of sample period, selection of variables and methodology adopted. This also indicates the sensitivity of Granger causality and that is why results based on Granger causality

should be interpreted with care. Results may also suffer from the omission of other relevant variables. Hence, future research may include more relevant variables, such as government expenditure components (i.e. military expenditures, health expenditures, expenditures for education etc.), employment/unemployment data, real interest rates, tax revenues or poverty (e.g. Gini index), in order to further improve this survey's findings.

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