AN ANALYSIS OF KEY SECTORS OF ECONOMIC GROWTH IN GREECE: A VAR TESTING APPROACH

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Abstract

The purpose of the study is to examine the relationship that exists between tourism, money supply and construction, on the one hand, and the economic growth in Greece, using a multivariate autoregressive model VAR. The long-term relation based on the Cointegration test results has shown the existence of a long run relation despite the prolonged economic recession. The analysis was carried out for the period from 1965 to 2015. The empirical results show that the economy of Greece can recover and return to long run equilibrium with a speed of adjustment reaching 3,60 % per year. The global economic crisis has undoubtedly affected the Greek economy. Long before the onset of the economic crisis, Greece applied a model of economic growth that relied on the growth of the manufacturing sector. In particular, the development of the construction sector was the engine of the Greek economy. However, through our analysis, it turns out that the engine for the development of the Greek economy is tourism rather than construction. The relationship between construction and the supply of money in Greece's GDP is positive. However, the dynamics of the tourism industry stand out in comparison to the other areas examined.

Keywords: Economic Growth, VAR, GDP, Tourism, Constructions, Accounting Variables

1. INTRODUCTION

Variables such as tourism, money supply and construction constitute key factors that contribute towards economic development. The course of the Gross Domestic Product is affected positively or negatively over the course of time. It would be interesting to investigate the relation between the accounting variables mentioned using the VAR testing approach. The positive effect of the economic growth on the other variables and vice versa is generally accepted. Schumpeter (1911) was one of the first researchers who tried to explain scientifically the relation between accounting variables in order to investigate the relations between key economic indicators. The main object of his research was the financial services which are supplied by the intermediaries and he claimed that a necessary condition for the economic development is the promotion of innovations (Ghali, 1999; Floros, 2004).

Mckinnon (1991, 1973) and Shaw (1973) believe that there is a parallel bad effect on the development of the tertiary sector and on the economic growth because of the bank system limitations that were imposed. Focusing on Greece, Delivani and Nikas (2013) argued that the "engine of growth" for Greece was the tourism sector instead of the manufacturing sector. Brida and Pulina (2010) agreed that tourism is one of the factors contributing to economic growth in the short as well as in the long term, which is the so-called tourism-led growth hypothesis.

According to Solow (1957), technological progression is also a driving force that can result in economic development. Several researchers supported the majority of the Cointegration technique based on Engle and Granger (1987), Johansen (1988) who further developed the maximum likelihood test and Johansen and Juselius (1990) in order to investigate the relationship created in the long run between variables. In any case, these techniques have the main disadvantage, namely that it is not suitable for small samples (Narayan, 2005; Odhiambo, 2009). There are many people around the world exploring the relationship between tourism and economic growth. This relationship is explored both in the short and long term. According to Brida and Pulina (2010), the role of tourism in economic growth is important. Especially in emerging countries, such as Greece, the effect the tourism industry has on the country's development is important as it provides a positive sign to the country's GDP by increasing the tourist exchange rate and boosting employment.

Worldwide, the growth rate of tourism is rising and this results in related activities being positively affected. Today, tourism is considered one of the largest industries and for countries that are traditional tourist destinations is a top tool of economic growth. Belloumi (2010) supported the view that tourism and the tourism sector, in general, are leading to an increase in the inflow of exchange rate income, creating the right conditions for a positive overall balance of payments. In any case, the role of tourism in the manufacturing sector has been examined by several economists. Views differ when it comes to determining which sector holds a supremacy over the other and whose role is more important in the economic development of a country. However, Rowthorn and Wells (1987) argue about the role of the manufacturing sector when the economy reaches the stage of economic maturity. As a result of the deindustrialization process, it is the strengthening of another sector of the economy, the tertiary sector of production that prevails. In developing economies, such as Greece, the positive effect that tourism has on economic development has been strongly supported by many researchers (Spinthiropoulos et al., 2018; Garefalakis et al., 2011; Garefalakis & Dimitras, 2016).

In the next section, a literature review on the efficiency of tourism-GDP, money supply and construction is provided. In the third section, an analysis of the methodology is presented. Finally, the conclusion of our research is evaluated in the last section of our paper.

2. LITERATURE REVIEW

According to Delivani and Nikas (2013), the Greek economy was in the process of economic maturity and had to implement a different economic policy. The choice of industrialization of the country had to be abandoned. The choice of Greek governments was the further development of the tourism industry. Tourism provides solutions for potential economic growth in economies in the midst of a prolonged economic downturn. Delivani (1991) argued that the most rapidly growing sectors of the Greek economy are tourism and agriculture. In particular, the added value of tourism (GDP) and agriculture (GDP of the agricultural sector) was such that these sectors of the Greek economy were rightly identified as a lever for the country of Greece. According to the report of the World Tourism Organization (World Tourism Organization, Annual Report, 2016), tourism is one of the most prosperous sectors despite the economic downturn of the last decade. The importance of the tourism sector to the economic development of Greece was such that it now has a dominant position among traditional sectors such as construction and agriculture. Indeed, Greece, since the 1970s, has managed to turn from a purely rural economy into an economy with a remarkable service sector.

Different approaches have been used by researchers in order to investigate economic growth. It would be interesting to study the role of construction, money supply and the gross domestic product generated by tourism (tourism- GDP) over a period of time that the country is trying to return to regularity (Garefalakis et al., 2015). The construction sector used to hold a dominant position in the Greek economy. The importance of the construction sector in the economic development of Greece up to the decade of 2000 was undeniable. With the emergence of the global financial crisis, the Greek economy proved to be unprepared to cope with a prolonged economic downturn.

The construction sector was the one most negatively affected in comparison to all the other sectors during the financial crisis in Greece. The country has embarked on a process of fiscal adjustment programs in order to avoid total bankruptcy. Construction and the construction sector, in general, has ceased to be one of the driving forces of the Greek economy (Garefalakis et al., 2016a). The money supply index was totally controlled by the European institutions and the speed of money circulation was extremely limited. Taxation reached the highest levels among the countries of Economic and Monetary Union (Garefalakis et al., 2016b). However, despite the high taxation, the tourism industry continued to grow and increase its contribution to the country's GDP.

The construction industry has been the "engine of growth" for Greece for over three decades. In Katrakilidis et al. (2013) a motive for a further research is provided in order to point out the importance of construction instead of other sectors of the Greek economy by investigating the validity of the Kaldorian theory. What remains to be determined is what will happen when a sector reaches the point of "economic maturity". Rowthorn and Wells (1987) argue that the deindustrialization process begins when the key sector of construction reaches its peak and that a decline follows and also that other sectors, the tertiary, in particular, continue to grow. The service sector and especially Tourism is very important for a country like Greece, especially during a period of prolonged economic recession. Dritsakis (2004) and Zortuk (2009) argued that the tourism industry plays a key role in the development of the Greek and Turkish economy respectively. The booming of the tourist industry in Greece in the last decades and the transformation of the economy to a productive one, through the development of the primary sector with the increase of the agricultural production and the provision of tourism services, inevitably led to the development of the tertiary sector Delivani (1991).

Galani (1993) argues that, since the 1970s, Greece managed to transform from a purely agricultural economy to a country that possesses a remarkable service sector. As a consequence, the development of the service sector has led to the expansion of the banking system, through the money supply, and the total GDP has risen.

On the one hand, the growth of the construction sector looks like an endless process since the introduction of new production methods, technology and innovation, high specialization, expanding markets and strong forward and backward linkages, all considered as industry's exclusive privileges. On the other hand, the ongoing economic crisis in Greece did not prevent the tourism sector from expanding (WTTC Economic Impact, 2016).

It would be interesting to study the relationship that exists among economic development, construction, money supply and tourism in a country like Greece due to its particular characteristics. The country has implemented three fiscal adjustment programs since 2010 and has been restricted by capital controls on the Banking system since 2015. The construction sector has been unable to react under these circumstances, but the tourism industry has shown that it is developing despite the economic downturn in Greece.

3. METHODOLOGY

In order to reach a safe conclusion, the time period selected for investigation was between 1965 and 2015 for particular reasons. The construction sector, during the study period, was evidently flourishing and held a dominant position among the political leadership choices. The supply of money to an economy like Greece is of particular interest because the country changed its constitution at that time, entered the European Economic Community, transformed from a purely agricultural to a service economy and entered the Eurozone. Finally, the country's tourism industry began to develop in the late 1960s and since then, it continued to grow in relation to the other sectors of the economy. For the reasons mentioned above, the specific time period and also the variables of our model were chosen. In this study we are trying to investigate the relationship among GDP in Greece, net value added generated by the tourism- receipts, money supply and construction sector. The data was produced by the World Bank for the time period between 1965-2015. Additionally, the time series projecting constructions, the receipts by tourism and money supply used as a proxy for GDP generated by tourism are derived by the Organization for Economic Co-operation and Development (OECD). The following triplex-variable VAR model is used in order to analyze the causal relationships among them:

$$GDP = f(Tour, M3, Constr) \qquad (1)$$

Where:
– *GDP* is the Gross Domestic Product,
– *Tour* is the net value added generated by the tourism-receipts,
– *M3* is the Construction of buildings, houses in general.

– *M3* (broad money) indicator includes *M2* and marketable securities issued by monetary financial institutions.

The model to be estimated is the following:

$$\ln(GDP) = a_1\ln(GDP_{tour}) + a_2\ln(GDP_{m3}) \\ + a_3\ln(GDP_{constr}) \qquad (2)$$

Sims (1980) proposed a vector autoregressive VAR model with the vector U defined in Equation 3. Engle and Granger (1987) and Granger (1988) have pointed out that a VAR model in levels with non-stationary variables may lead to spurious results and a VAR model in first differences with co-integrated variables is misspecified.

A Vector Error Correction Model can be written as:

$$\Delta U_t = A_0 + A(L)\Delta U_{t-1} + \delta EC_{t-1} + \mu_t \qquad (3)$$

Where the *EC* is the error correction term, μ is a 3x1 vector of white noise errors.

In order to continue the analysis of the VAR, the stationarity existence of the given accounting variables must be examined. A unit root test, namely the Augmented Dickey-Fuller (ADF) test, was used for this purpose. According to the VAR model theory, if the variables are established as stationary at the first difference through the ADF, a Cointegration test and vector error-correction model (VECM) should be used. If variables are found to be cointegrated, the Granger causality tests can then be used. About the analysis of the multivariate time series that include stochastic trends, the Augmented Dickey-Fuller (1979) (ADF), Phillips-Perron (1988) unit root tests were used to estimate individual time series, with the intention of providing evidence of instances when the variables are integrated. Our variables are expressed in logarithms in order to include the proliferating effect of time series and are indicated by the 'ln' preceding each variable name.

4. RESULTS AND DISCUSSION

In order to examine the stationarity of our variables, the methodology used was proposed by Dickey-Fuller (ADF) test and Phillips and Perron (PP) test. Nelson and Plosser (1982) had pointed out that time series contain unit roots dominated by stochastic trends. The existence of a stochastic trend is determined by testing the presence of unit roots in time series data. The augmented ADF test refers to the t-statistics of δ_2 coefficient and the regression is the following:

$$\Delta X_t = \delta_0 + \delta_1 t + \delta_2 X_{t-1} + \sum_{i=1}^{k} a_i \Delta X_{t-1} + u_t \qquad (4)$$

Dritsakis and Adamopoulos (2004) argued that we can rely on the index's results of the Akaike (Akaike, 1973) information criterion (AIC) in conjunction with what was proposed by Engle and Yoo (1987), to define the optimal specification of Equation 4. Additionally, the distribution of the augmented Dickey-Fuller is non-regular and the critical values are suggested by Mackinnon (1991).

The Phillips and Perron (PP) technique is an alternative (nonparametric) methodology. According to this methodology, the serial correlation can be

controlled when testing for a unit root. The PP method estimates the non-augmented DF test equation and modifies the t-ratio of the coefficient so that serial correlation does not affect the asymptotic distribution of the test statistic. The combined results from both tests (ADF and PP) suggest that all the series under consideration are integrated to the order of 1, I (1).

Table 1. Variables and root tests

Variable	ADF Unit Root Test				Phillips Perron Root Test		
	Dt-stat 1	Dt-stat 2	Dt-stat 3	k	Pt-stat 1	Pt-stat 2	Pt-stat 3
LGDP	1.902	-12.91***	1.384	1	-12.75***	-12.875***	-13.222***
LTOUR	-2.737*	-2.276***	-2.267***	1	-2.73*	-2.27**	-2.26
LCONSTR	-16.87***	-17.045***	-16.65***	0	-64.11***	-36.23***	-46.28***
LM3	-4.422***	-4.335***	-4.589***	0	-4.392***	-4.334***	-4.521***

Notes: Dt-stat[1,2,3], Pt-stat[1,2,3] are the t-statistic for testing the level of significance with intercept, no trend and with trend and intercept respectively. All the calculation made according to Dickey-Fuller (1981) and Phillips-Perron (1988). The calculated statistics are those reported in Dickey-Fuller (1981). The critical values at 1%, 5% and 10% are -3.588, -2.929 and -2.603 for Dt-stat[1], --2.618, -1.948 and -1.612 for Dt-stat[2], -2,61, -1,94 and -1,61 for Dt-stat[3] respectively. The critical values at 1%, 5% and 10% are −3.584, -2.928 and −2.602 for Pt-stat[1], -2.618, -1.948 and -1.612 for Pt-stat[2], -4.18, -3.513 and -3.188 for Pt-stat[3] respectively. The lag selection is determined using the AIC Criterion.

***, **, * indicate significance at the 1%, 5% and 10% respectively.

Since the variables were found to be stationary at the first difference, we were able to proceed with the Cointegration test. The Cointegration test was proposed by Johansen (1988; 1991; 1992) and Johansen and Juselius (1990). According to the econometric theory, if the selected variables are established as stationary at the first difference through the ADF, a Cointegration test and vector error-correction model (VECM) should be used. The Johansen (1988, 1991, 1992) and the Johansen and Juselius (1990) technique was used following the maximum likelihood procedure in order to test the existence of Cointegration. VAR model is used to analyse the long-run relationship that might exist between the accounting variables. They proposed the trace test and the maximum eigenvalue test in order to calculate the number of co-integrating vectors in the VAR model.

Table 2. Co-integration test based on Johansen maximum likelihood procedure

	Eigenvalue	Trace Statistic	Critical Value 0.05	Prob.
None	0.606823	6.078.859	4.785.613	0.0019
At most 1	0.300914	1.971.483	2.979.707	0.4423
At most 2	0.080945	3.963.628	1.549.471	0.9065
At most 3	0.005658	0.249638	3.841.466	0.6173
	Eigenvalue	Max-Eigen Statistic	Critical Value 0.05	Prob.
None	0.606823	4.107.376	2.758.434	0.0005
At most 1	0.300914	1.575.120	2.113.162	0.2397
At most 2	0.080945	3.713.991	1.426.460	0.8882
At most 3	0.005658	0.249638	3.841.466	0.6173

The results of Table 2 allow us to support that the null hypothesis of no Cointegration is rejected by the Max-Eigen statistics and the trace test for the entire period. We cannot reject the long-run homogeneity and, thus, we can support that our variables are cointegrated. When the variables are cointegrated, it means that these variables move together in the macro environment. In other words, this means that the GDP as a function of Tourism, Construction and money supply is homogeneous to one degree.

To continue our analysis, the lag length criterion it must be found and the next table shows the results of the precise analysis.

Table 3. Results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2.129.617	NA	1.57e+39	1.016.008	1.017.663	1.016.615
1	-2.023.936	1.861.993	2.20e+37	9.733.029	9.815.775	9.763.359
2	-1.991.683	50.68398*	1.04e+37	**9.655.631**	98.04575*	97.10225*
3	-1.972.643	2.629.277	9.50e+36*	96.41157*	9.856.297	9.720.015
4	-1.965.079	9.005.315	1.59e+37	9.681.326	9.962.663	9.784.448
LR: sequential modified LR test statistic (each test at 5% level)				FPE: Final prediction error		
AIC: Akaike information criterion		SC: Schwarz information criterion		HQ: Hannan-Quinn information criterion		

Notes: * indicates lag order selected by the criterion.

Having validated the existence of Cointegration, we estimate the Unrestricted Error Correction Model (UECM) and if we take into account the Equation 3, we can strongly support that if we use Gross Domestic Product as an endogenous variable then we can conclude that the δ coefficient is statistically significant since the VAR system results in one Error correction term.

According to the econometric theory, if the speed of adjustment is negative and statistically significant, then the long run relationship with the endogenous variable is acceptable. In the next table, we can observe the endogeneity of GDP along with other variables of our VAR model.

Table 4. Long run relation

Dependent Variable $\Delta LGDP_{tGR}$				
Greece	Regressor	Coefficient	St. error	Prob
	$Ecm_{GRE(t-1)}$	-0.036	0.016	0.031
	$Ect_{GRE(t-1)} = \Delta LGDP_{tGRE} - (-0.0009*\Delta LConstr_{tGRE} - 0.2352* \Delta LM3_{tGRE} - 0.46340*\Delta LTOUR\text{-}_{tGRE})$			
	$R^2 = 0.630$			

According to Table 4, the speed of adjustment has the expected sign, meaning negative and statistically significant, which indicates that any deviation from the long run equilibrium between variables is corrected with an annual rate of about 3.6 %. There is no short run causality among the variables of our system because the null hypothesis of the Wald test had been accepted.

Null: H_0: $C_X = C_{X1} = C_{X2} = C_{X2} = 0$.
Alt: H_1: $C_X \neq C_{X1} \neq C_{X2} \neq C_{X2} \neq 0$.

5. CONCLUSION

The Greek economy seemed unprepared to manage an economic crisis. The reaction of the Greek economy was not immediate. The main cause is the organization of the country's production sectors as well as the growth model that had been applied in previous years. The prolonged economic downturn, the lack of capital resources and rigorous banking controlled to a dramatic decline in the country's GDP. At the same time, the disposable income of citizens and businesses declined dramatically through the increase in taxation. Traditional sectors of the Greek economy lost their momentum and reduced their contribution to the country's GDP. Negative GDP growth continued for more than nine years. The implementation of fiscal policies had a short-term horizon, and the results were a 40% shrinking of the Greek economy in about eight years.

The upturn of the Greek economy was a matter of concern and the role of certain sectors of the economy in this direction had to be analyzed. With this work, we demonstrated that tourism was essential both in the period before the start of the economic crisis and in the period during the economic crisis. GDP growth was positively influenced by a high correlation rate with the tourism sector.

The tourism industry plays an essential role in the economic development of the Greek economy. In particular, the sector of tourist services, construction and money supply appear to have a positive relationship with the GDP of Greece. In this paper, we studied the potential role of tourism receipts, construction (buildings and homes in general) and the M3 (broad money) index that includes the M2 index and marketable securities issued by monetary financial institutions. The relationship between GDP and the factors used in the econometric model is positive. However, this relationship is stronger with the tourism sector and less positive with the other variables.

In other words, tourism's contribution to the economic development of the country appears to play an essential role even in times when the country's economy is in a prolonged economic recession. The construction sector contributes positively to economic growth but with less intensity when compared to the tourism industry.

The long-term relationship was studied with the help of the VAR model process. In order to come to a safe conclusion with the VAR technique, we followed the VAR method. According to the results of the Vector Authentication Estimate, the existence of the Fusion was confirmed. The long-term relationship between the variables exists because the ECT has the right mark and is statically important. In economies such as Greece, there is a long-term relationship and at the same time absence of a short-term relationship between the variables examined by this study.

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