FINANCIAL DEVELOPMENT, TRADE OPENNESS AND ECONOMIC GROWTH NEXUS: TIME SERIES EVIDENCE FOR GREECE

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ABSTRACT

This study examines the linkage among financial development, trade openness and Economic Growth in Greece, within the vector autoregressive framework. Under this study, the Johansen cointegration test is employed to check if there is long run equilibrium among the selected economic variables, taking time-series data for Greece over the period 1960 to 2009. Subsequently, an error correction equation was estimated to show the correcting mechanism for short run relationship to make long run equilibrium. Also, granger causality test was used to analyse the causality between trade, financial development and economic growth.

Based on the empirical findings, we identify that there is long run integration among domestic credit, private credit, trade and economic output. The vector error correction formulation also shows there is significant interaction among the variables under the restricted model. Result from VECM reveals that the disequilibrium between the short run and long run relationship clears by 20 percent every year, with trade having positive elastic impact on the economy of Greece. Granger Causality test indicates that the long run relationship existing between real output and trade openness is caused by the changing economic output of Greece, whereas financial development and economic growth show feedback causality. The causality test also shows the nexus between trade and financial development in Greece is a unidirectional flow from trade to financial sector.

Keywords: Cointegration, economic growth, financial development, granger causality, Greece

ÖZ

Bu çalışma Yunanistan'da finansal büyüme, dış ticaret, ve ekonomik büyüme arasındaki ilişkiyi araştırmaktadır; bu vesile ile Johansen yöntemi çerçevesinde eş bütünleme, hata düzeltme modelleri, ve Granger nedensellik testleri 1960-2009 dönemini kapsayan veri seti için uygulanmıştır. Sonuçlar, yurtiçi krediler, özel sektör kredileri, dış ticaret, ve reel gelir arasında bir eş bütünleme (uzun dönemli denge ilişkisi) olduğunu ortaya koymaktadır. Hata düzeltme modellerine göre, reel gelirin bağımlı değişken olduğu durumda, reel gelirin kısa ve uzun dönem denge değerleri arasındaki fark, finansal büyüme ve dış ticaretten dolayı her dönem (yıl) 20% oranında kapanmaktadır. Finansal büyüme ile dış ticaretin reel gelir üzerindeki etkisi pozitif ve istatistiki olarak anlamlı bulunmuştur. Son olarak, Granger nedensellik testi sonuçlarına göre, reel gelirden dış ticarete doğru bir nedensellik, finansal büyüme ile reel gelir arasında ise çift yönlü bir nedensellik tespit edilmiştir. Son olarak, dış ticaretten finansal büyümeye doğru bir nedensellik olduğu, Yunanistan örneğinde tespit edilmiştir.

Anahtar Kelimeler: Eş bütünleme, ekonomik büyüme, finansal büyüme, Granger nedensellik, Yunanistan.

To My Best Teachers

My parents;

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&

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INTRODUCTION

1.1 Background of the Study

Revisiting the work of Adam Smith (1776) "the wealth of Nations" a perspective of economic growth theory was propounded. A center point he emphasized on was the economics of international trade, where he suggested the strategy of absolute advantage. Similarly, authors like David Ricardo in 1817, developed the comparative cost advantage theory which was targeted to make up for the relics of the Adam Smith's failure[1]. Beck (2002) emphasized on factor endowments, technology and scale of economies as sources of comparative advantage and therefore determinants of trade flows between countries. Whereas, in 1960s there was wide acceptance of import-substitution by concerned economies; in 1980s, it turned to be a paradigm shift towards export promotion and trade liberalization. A standing point for this shift is identified to be the weak effect of import substitution on growth, and the growing empirical evidence showing a causal relationship between trade openness and economic growth.[2]

What seems to be a major concern of development economics is factors that determine growth in economies nation. Some authors have suggested a finance-led

[1] ...the **law of comparative advantage** says that two countries (or other kinds of parties, such as individuals or firms) can both gain from trade if, in the absence of trade, they have *different* relative costs for producing the same goods. Even if one country is more efficient in the production of all goods (absolute advantage), it can still gain by trading with a less-efficient country, as long as they have different *relative* efficiencies.

[2] Krueger, Anne O. (1997). Trade policy and economic development: How we learn

growth, others suggests a trade-led strategy. In most cases, both hypothesis move together. For a trade-led hypothesis to be progressive, the financial sector must be active. An example is the Bretton Wood System, where countries agreed to control exchange rate by pegging currencies to the US dollar in enhancing international trade for economic stability (Bordo and Eichengreen, 1993). Financial development can take two forms of which both are tailored towards economic development. In practice, most economies have repressed rather than liberalize their financial sector to achieve development. According to Keynes (1936) in his "General Theory", the free market system cannot guarantee long run equilibrium condition for growth; he further identified efficiency of capital as precarious to economic growth and this he explains can only be achieved through a restrained financial sector. The degree of interaction among the financial intermediaries indicates the level of financial development of a country.

Regarding the trade-led growth hypothesis, many scholars have re-visited the ideas of Adam Smith, David Ricardo, and the likes; restating the need for a more efficient interaction among markets (see Yanikkaya 2002, Rodriguez and Rodrik 2001, and Rodrik 1999). Whereas theoretical perspectives have paved more studies on trade policies and its impact on economic growth, empirical digestions have focused on trade volumes relationship with economic growth.

The constraints on economic growth may not be as bad as we see them; the structural pattern and institutions employed in implementing public policies may be a relinquishing factor for system failure when they do not match the traditional edifice of the economy. Therefore, problem of economic growth may not be necessarily linked to inadequate capital, but rather the growth pattern employed in a particular setup. Besides, the Solow's growth model explains that capital itself has diminishing returns in the long

run (see Solow 1956). Bifurcating views on a finance-led growth, the Keynesian school of thought has strongly argued for a financial restrained economy to achieve meaningful growth.

In a study by Katircioglu *et al* (2007), in a case study for India, empirical evidence profound long run equilibrium among financial development, trade and economic growth. In their study both the finance-led and output-oriented hypothesis were upheld. Theoretically, natural factor endowment is not a sole panacea for economic growth, the economic value of these natural resources can only be established when they are well harnessed for production. The paradigm shift from import-substitution to export promotion is one that requires certain international standards to be ensued. Export promotion itself has been identified by Mckinnon (1973) as dependent on an effective capital formation process and technology transfer. If a country exports mainly primary goods, it may not require much capital to sustain its trade pattern; but it earns substantially below its national output value (see Myint 1958). This argument has been instituted as a policy driver of the World Bank in developing countries.

World Bank in recent times are not just sponsoring the production activities in the third world countries, they are beginning to identify the key sectors for investment, that can hold and better utilize capital to attain higher growth stance (WDR 1989). In a report by USAID (2006) the vitality of an agrarian economy was said to be precarious because of its weak financial substance. A strong technological subvention has been advocated through the provision of funds for innovation in agric technology for better transformation of the traditional agric sector to a modernized one that can penetrate international market. Giving an example of paprika production in Zambia, USAID identified that the price of the product as given by the typical farmers is one-tenth of its

price in the world market. This would create an avenue for foreign exchange earnings and increase foreign reserve of the country, leading to economic growth. This conjures a perception that weak financial structure impedes trade activities and growth.

Financial development is a phenomenon that reflects the provision of a financial superstructure that that enhances both productive activities and smooth running of the economy. It supplies the necessary capital, valuates the economic cost of resources being traded and substantiates the vitality of public policy process. Provision of funds in form of credit, repressing the market interest rate, shock therapy, etc; are all reflection of a country's financial development tailored towards economic growth (see Levine et al 2000). The financing of the industrialization process which is one driving a deficit financial sector in Greece has shown the bad side of financial freedom. For any program on industrialization and trade promotion to be successful, the economy needs a viable financial sector that would merge its traditional economy with development goals. Apart from increasing the per capita output and expenditure, it enhances regional economic balances through industrial dispersal and promotes effective allocation of resources.

On Greece, at the inception of a new government in 2009, a review of government budget revealed a deficit of 12.7 percent as against initial estimate of 6.7 percent of GDP (Nelson et al 2010). Eurostat (2010) records a 13.6 percent of gross domestic output as Greek government budget deficit for the same period. This caused investors panic, sovereign credit rating was downgraded by all credit rating agencies, and cost of financing government activities increased. For example, interest rate on government bond increased from 1.78 percent low July 2009 to 26.65 percent high in July 2011.[3] As a result of the Greece's financial liberalization- a general syndrome for the member

[3] http://www.bloomberg.com/apps/quote?ticker=GGGB2YR:IND

states of the European Union, the financial crisis became contagious to the EU states as euro currency became affected and cross-border activities including trade were also badly affected. Trade from the eurozone became expensive in the world market, with trade volume dropping from annual growth of 5 percent in 2007 to -12 percent in 2010, while Greece trade volume dropped from annual growth of 6 percent to -19 percent (World Bank, 2011). The Greek government recently announced tight monetary policies aimed at restraining the financial sector to cushion a stable economy.

1.2 Statement of the Problem

Financial sector and international market for economic output are important factors in economic growth process. While the financial sector serves the demand-side of the economy, the international market stands as a platform for exchange of economic output. Although, economic output may serve domestic purposes, the real economic value of such outputs are usually derived from the international market. Hence, there is a question of how much an economy should engage in cross-border trading in order to benefit from net gain in movement of tradables in and out of the country. In some cases, import-led hypothesis has worked better. For example, Murinde and Eng (1994) in a case study on Singapore hypothesized that import trading impacts positively on economic growth; while in some studies export-led hypothesis has been adjudicated (see Titus 2008).

In spite of the role of financial sector in the economy, the fundamentals of financing for growth have not been unified for all economies. For instance, Ejike and Darwin (2002) presented time series evidence to show that financial freedom is close to obstructing economic growth as evident in the case of Russia. Similar finding by

Soukhakian (2007) in the case of Iran shows no long-run linkage between financial sector development and economic growth. This kind of scenario is more common among developing nations, where financial development enhances corruption and self-actualization among the socialist rather than increasing economic aggregates.

In addition, the financial sector, especially the formal financial intermediaries have not been efficient in credit service delivery. The ongoing financial crisis in Greece can be seen as illustration of a failed financial system; but then we ask, is financial liberalization really the cause of the crisis? If yes, has this affected trans-border trading of Greece? What causality exists between financial freedom and growth; trade openness and growth; and also financial development and trade openness?

1.3 Objective of the Study

As the argument on the nature and actual effect of financial development on economic growth persist, world economists are seeking and fine tuning policy options that will sustain a vibrant productive economy and speed up the development process of its sovereign entity. Implementing public policies requires a responsive financial sector whether liberalized or repressed.

This study focused on Greece, juxtaposing the vital economic structure for growth, and the missing link which might have led to the systemic breakdown of the Greek economy. Based on empirical evidence, this study will identify what growth hypothesis is peculiar to Greek economy. Subsequently, we plow a co-integration and causality test to establish possible long run triangular nexus between financial development, trade openness and growth.

Greece is one country that has attracted attention in recent times, especially after its entrapment in bad debt position. Since its 2010 debt crisis, Greece has witnessed negative economic growth, dropping from a high 5.2 percent in 2006, to -4.5 percent in 2010 (eurostat, 2011). In the past few years, activities engineered towards a sustainable economic growth have been anchored on a financial sector which is restrained by the European Union policies. Also, fiscal policies have turned towards promotion of cross border trading with increasing share of export from the region. Then the question is, have these policies propagate growth for Greece? Is there any causal relationship between the selected variables? If yes, does it transform to a long-run equilibrium? What is the direction of causality?

1.4 Organizational Structure

This study is made up of six chapters, with the following structure:

The first chapter is the introduction which has four subsections. The chapter one gives a background of the study; statement of problems, identifies objectives of the study; and it also shows the significance of the study.

Chapter two reviews related studies on financial development, trade and economic growth. It provides broad definition of the concept. It also gives an overview of financial repression, financial liberalization, cross-border trade advantage; its pros and cons.

Chapter three provides an overview of the financial sector, international trade operations, and the Greek economy in general as an EU state, focusing on its fiscal and monetary retribution for sustainable growth. In addition, this chapter provides a perspective of the Greek debt crisis of 2009 which has resulted in a negative growth

rate. It gives a theoretical insight into the nature of Greek economy; whether it is finance-led or output-oriented.

Chapter four provides the methodology for analyzing this topic. Time series econometric techniques will be integrated into this study. Specifically, the unit root test, co-integration test and Granger causality would be applied to show empirical evidence of the study. Hence, this chapter provides notes on the relevance and appropriateness of these methods for our research.

Chapter five analyzes results and findings. Considering a specified regression model, we will generate output based on the model, and this chapter shall critically analyze the results.

Finally, chapter six gives a summary of our findings, policy recommendation and concludes the study.

Chapter 2

LITERATURE REVIEW

This chapter aims at reviewing previous studies related to financial development, trade openness, and economic growth. To vehemently investigate a suitable growth model for Greece, in the context of finance-led or output-oriented hypothesis, it is imperative to look back at similar studies that have been carried out by other authors in order to get a basic understanding of what kind of statistical model and variables can apply to our case study.

2.1 Previous Studies

A review of previous literatures provide an insight into the technical relationship between trade openness and economic growth suggesting that, there is no generalized form of relationship between these two concepts. What seem identical is explained by Kim and Lin (2009) in terms of stages of economic development. Developing countries tend to perform better when it engages more in export trading. For instance, Awojobi et al (2011) in supporting the trade-led hypothesis identified that export trading fosters economic growth in Nigeria. However, an efficient export strategy may require technology import. Hence, import trade has a value in the growth process of a country; it provides access to the advances of technological knowledge of its trade partners. Also, trade liberalization provides an avenue for innovation and efficiency in resource use.

Understanding the significance of trade as an agent of growth is dynamic. There are time series results that claim the effect of trade on growth is not as significant as they have been preached (see Taylor, 1991; Hirschman, 1968). But evidences have shown that export trading is the desired form of trade as it generates foreign exchange for economies which in turn promotes growth (Titus, 2008). This perspective is in line with Kim and Lin (2009) exposition on trade impact as a function of development stage. Further studies have investigated causality between trade openness and economic growth. For instance, Jenkins and Katircioglu (2009) using the ARDL modeling approach for the case of Cyprus adjudicates a linkage between real growth and international trade. In their study, it was observed that economic growth stimulates trade (see supporting examples in Gurley and Shaw 1967, Goldsmith 1969). This contradicts the common view of the classical theorists which regards trade as a factor for growth.

The classical theory on international trade has also suggests that the level of financial openness impacts significantly on trade (Vernon 1966). This assertion may not be true for all economies as some researchers have empirically proved that financial development rather than influence trade has posed in an opposite direction (Foster, 2008). What seems to be a major concern of development economists have been the actual factors that determine the growth of a nation. Some authors have suggested a finance-led growth, others suggests a trade-led strategy. Greenwood and Jovanovic (1990) re-asserts that increased involvement in financial markets has been motivated by the process of economic growth which in turn has expanded financial operations. Huybens and Smith (1999) empirically profound a negative effect of inflation on financial development and economic growth; concluding that a less repressed financial sector is a mechanism for growth since the hypothesis has shown a negative impact on

financial development. Taghipour (2009) also revealed a negative effect of financial restrains[4] on financial development.

Considering the possibility of finance as an important element of economic growth, there has been a bifurcated view on the actual direction of relationship. Several studies have justified the need for a vibrant money sector as it holds positive relationship with economic growth. Mackinnon (1973) and Shaw (1973) posit that government restraints on financial system through interest rate ceilings and domestic control of money supply, in addition to credit preference for selected sectors, among other policy control measures, regulates financial development which they say is primal for economic growth (also see, Schumpeter, 1911; Hicks, 1969; and Anyanwu, 2006). On the other hand, studies by influential economists have exposited an inverse nexus between financial depth and economic growth (see Kuznets, 1955; and Friedman & Schwartz, 1963).

Murende and Eng (1994) made a time series empirical test on their work using the unit root and co-integration techniques within a Bayesian Auto-regressive (BVAR) model. They applied time series econometrics to the case of Singapore collating quarterly series for periods between 1979 and 1990, evidence proved a unidirectional causality springing from financial development to growth substantiating a finance-led hypothesis for growth. Calderon and Liu (2003) in a cross-country study identified causality between financial development and economic growth, with financial depth having more impact on developing countries than industrialized economies.

[4] Financial restraint has been described as policy framework where regulations, taxes, interest rate policies, and other qualitative and quantitative restrictions are imposed by governments on financial intermediaries (McKinnon, 1973).

Soukhakian (2007a) and Soukhakian (2007b) empirically subjected the economy of Iran and Japan respectively to a time series check for possible long run convergence and causality between financial development and growth, under a VAR construction. The outcome of their studies suggests long run equilibrium exists between financial development and economic growth in both economies. Whereas, study on Iran refutes the supply leading hypothesis, results for Japanese economy shows that openness of money sector is a causal factor for output growth, upholding supply-led growth hypothesis.

Furthermore, various studies have applied cross-sectional analysis to link indicators of financial development to long-run economic growth (see Calderon and Liu 2003). Emerging evidence from panel studies on growth model showed estimates of financial development impact on growth, disregarding the country specific factors.[5]

However, the debate on trade openness or financial development for economic growth remains part of a larger debate of what indicators to use for measuring trade openness and financial development. Rodrik (1997) argues that in most studies on trade openness and growth, inappropriate indicators have been used to reflect trade regime. A popularly used proxy for trade openness is total trade, including exports and imports, taken as a proportion of GDP.

2.2 Overview and Measurement of Key Concepts

There has been ongoing debate on the right way to investigate the relationship between trade openness, financial development and economic growth. To establish a purposeful yardstick for measuring these variables, it is essential we consider some

[5] *See also World bank (1989), Roubin and Sala-i-Martin(1992)*

notes on the concepts and probably relate them theoretically to each other. Financial development is the development plan that expands the money sector of an economy. It may be through money supply, interest rates repression or through domestic lending. Some studies include net foreign direct investment and foreign borrowing in measuring financial development. In a research by the International Monetary Fund (IMF), Creane *et al* (2003) assessed financial sector development by constructing an index which captures six elements; monetary policy, growth in bank liability, regulation and supervision, non-bank financial sector, financial depth and institutional quality[6].

International trade has been necessitated by the rising need to integrate world economies and redistribute wealth of nations according to needs and comparative advantage. The extent of international trading has been the major concern of governments, differing from size economy to level of development. Shang-Jin (2002) identifies that developing economies are perturbed about the effect of openness of the economy to international trade. In his view, Trade openness may make the poor poorer and the rich richer (Shang-Jin, 2002). On a contrary, Butcher and Agama (2003) posits that trade openness has promoted political and economic reforms in the developing countries especially when supported with strong economic policies and institutional framework. Trade openness relays the extent of integration of a domestic economy to the world market for tradable. It is an avenue to generate foreign exchange and increase nation's foreign reserves. Although trade openness has been adjudged to have more benefits than cost, the direction of trade is a key determinant of its impact. Studies have revealed than small economies and third world economies tend to be prone to mishaps in the global market as they trade more on imports (Kuznet, 1957).

[6] See Creane et al. (2003) Financial Development in the Middle-East and North Africa.

Although some researchers like Carbaugh (1988) have suggested that countries should maximize exports and minimize imports. They further propose that imports be restricted through tariff regimes and restrictive policies, exports they say should be promoted through subsidies. Of course, most welfare economists fall to this view because it generates exchange and strengthens the local currency in the dollar market. Economic growth basically connotes increase in output (GDP or GNP) of a nation.

Common variables used to measure financial development include: broad money (M2) as a ratio of GDP, ratio of domestic credit to GDP, ratio of bank credit (private sector) to GDP, or liquid liabilities (M3) over GDP[7]. For trade openness, Pritchett (1996), Rodrik and Rodriguez (2000) and Garrett (2001) have asserted that measuring trade openness poses a major challenge for analyzing trade policy impacts. Some studies have made use of export growth rate, imports growth rate; rate of change in sum of imports and exports[8]. Rodrik (1998) measured trade openness as ratio of total export and import weighed over GDP. Growth is usually measured either as real GDP, GNI or real GDP per capita. For this study, we adopt the measurement proposed by Rodrik (1998) for trade; i.e. sum of the value of import and export, divided by real GDP. Financial development in most studies have been measured as proportion of total money supply to GDP, and ratio of domestic credit, either from banking sector or to private sector, over GDP.

[7]See example in Murinde, V. and Eng, F.S (1994); Berthelemy, J. and Varoudakis, A. (1995); and Agung, F. (1998)

[8] See Liu *et al*. (1997)

Chapter 3

AN OVERVIEW OF GREEK ECONOMY

3.1 Brief Overview of Greek Financial Economy

Greece is a capitalist country, located at the southeastern part of Europe. It consists of several islands and surrounded with many mountains. Because of its geographical location, nature and historical antecedents, Greece has high tourist attractions which make tourism a significant contributor to GDP of the country. According to the World Bank report in 2010, tourism provides about 15 percent of its GDP; Immigrants form about 20 percent of the total work force, most of them engaged in agricultural and downstream sector. Greece is a founding member of the European Union and European Economic Commission. Averagely it benefits from EU aid about 3.3 percent of its annual GDP. Between the period 2003 and 2007, a steady growth rate of 4 percent was achieved due to increased infrastructural spending.

With a population of 11million (World Bank, 2009), there is enormous human resource capacity, holding a labour size of above 5million. Most of Greek prefer to live in capital, Athens and this has made the capital the center of economic activities. In spite of the abundance human resource and high level of capital formation in the country, unemployment is high; estimated at 12.5 percent in the CIA world factsheet for 2010. This implies there is no problem of labour shortage to contain the economic needs and production services.

The Greek economic ideology can be traced to combine opinion of two famous philosophers: Plato and his student Aristotle. Plato's economic idea is a fountain based on ethics. He conjures to the balancing of money and high level of ethics as logic of household management. This brings forward the mythology and logic that coined the word 'oiknomik', a Greek word meaning 'economics', management of household. Greece has a rich base of natural resources such as bauxite, coal, petroleum, vegetables, olives, etc.

By the late 1960, Because of foreign investments in large scale production, country met the higher rates of economic growth. Though the absence of guided fiscal policies by government caused a decline on GDP after1965 and this decline had a strong affect on oil price and labor cost; Greece had a high level of hope to recover the tracks and cut the budget deficit by joining the European commission in 1981. This could not bring immediate tranquility to the economic downturn as the influx of credit to the economy resulted in high inflation during that period. The import credit policy persisted till 1992 and the government debt went beyond 100 percent of its GDP. At this stage, Greek economy became uncontrollable to debt financing with debt mainly sourced from foreign market (see figure 1).

Towards late 1990s, the Greek economy started adjusting its internal monetary framework to maintain a low inflation rate in order to adopt the Euro regional currency which finally replaced the Greek drachma on the 19th of June 2000. The inability of the Greek authorities to match its spending with revenue generated resulted in deficit spending. This was more pronounced after the adoption of the euro currency as a legal tender in 2000 and from 2001, it could no longer meet the EU's Growth and Stability Pact budget deficit criterion of no more than 3 percent of GDP. In 2009, it became an

economic problem with the deficit reaching all time high 15.4 percent of GDP and other European countries were affected. Even after intervention from the EU, the structural problems of the economy remains unsolved.

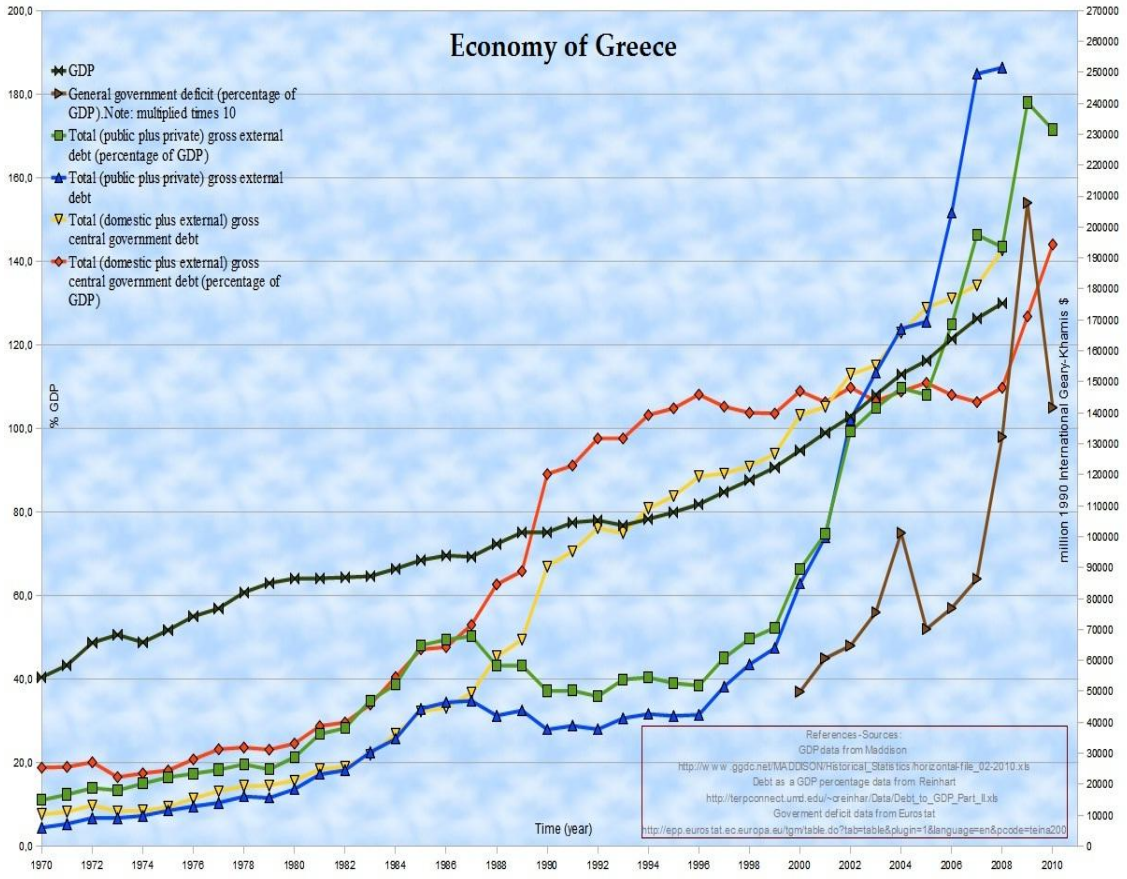

Figure 1: Trend of Economic Growth and Deficit Budgeting

The remarkable factors which cause debt crisis in Greek economy:

- High level of government expenses. Counting: expenditures and transportation is almost 46 % of GDP.
- Ignoring the credit crunch by new government after election, 2009.
- Deregulation and self-fulfilling expectation

- Weaknesses in banking sector and generally private sector

3.2 An Overview of Greek Trade Sector

Traditionally, Greek economy has been more of an import trader than export and until now, the trade pattern has not changed significantly. However, ever since Greece joined the EU and gave up restrictive trading measures, things have started to look up, albeit with still a negative balance. The US remains the largest trade partner of the nation outside of EU members. Greece trade imbalance has been managed with loans from the EU, remittances from expatriates, shipping and tourism. Tourism has, in fact, helped the nation collect foreign exchange and contributes to the GDP on an increasing trend.

Greece has been a traditional exporter of food, beverages and textiles. It has most of its trading partners located in the EU with the only notable external trade partner being USA. In 2009, the economy suffered due to dip in exports, as the figures dropped from $29.14 billion (2008) to $18.64 billion in 2009. The country, in terms of export volume, ranked 65th in the world and thus was far below the EU rankings.

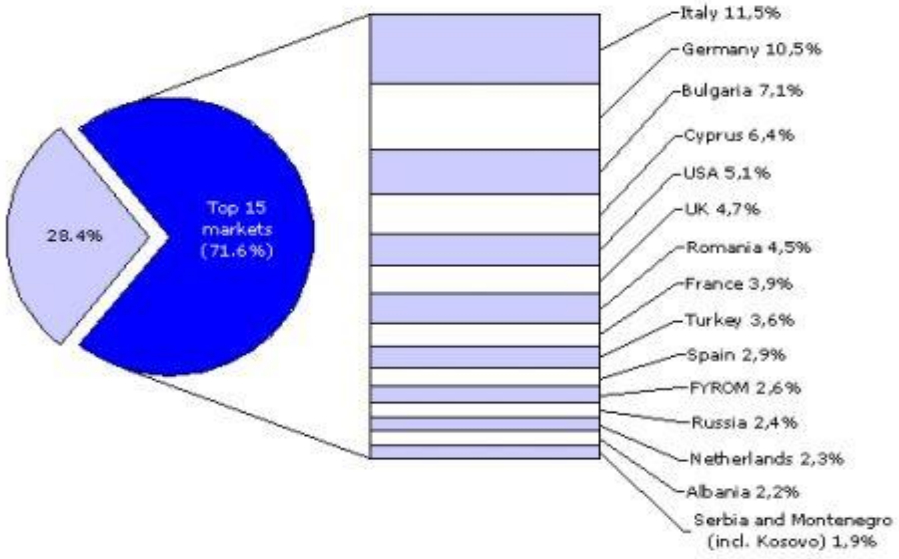

Figure 2: Trade Partners According to Level of Activities

Table 1: Macroeconomic indicators in Greece (World Bank Statistics, 2009)

Indicators	**1990**	**2000**	**2009**
DC/GDP (%)	32	47	92
Exports of goods and services (%of GDP)	18	25	19
GDP per Capita (current US$)	9,271	11,501	28,935
Gross Capital Formation (% of GDP)	23	23	16
Imports of goods and services (%of GDP)	30	38	29
Inflation GDP deflator (annual%)	21	3	1
Trade (%of GDP)	47	63	48
Unemployment, total (%of total labor force)	7	11	13
Tourism receipt (% of export)	37	31	25

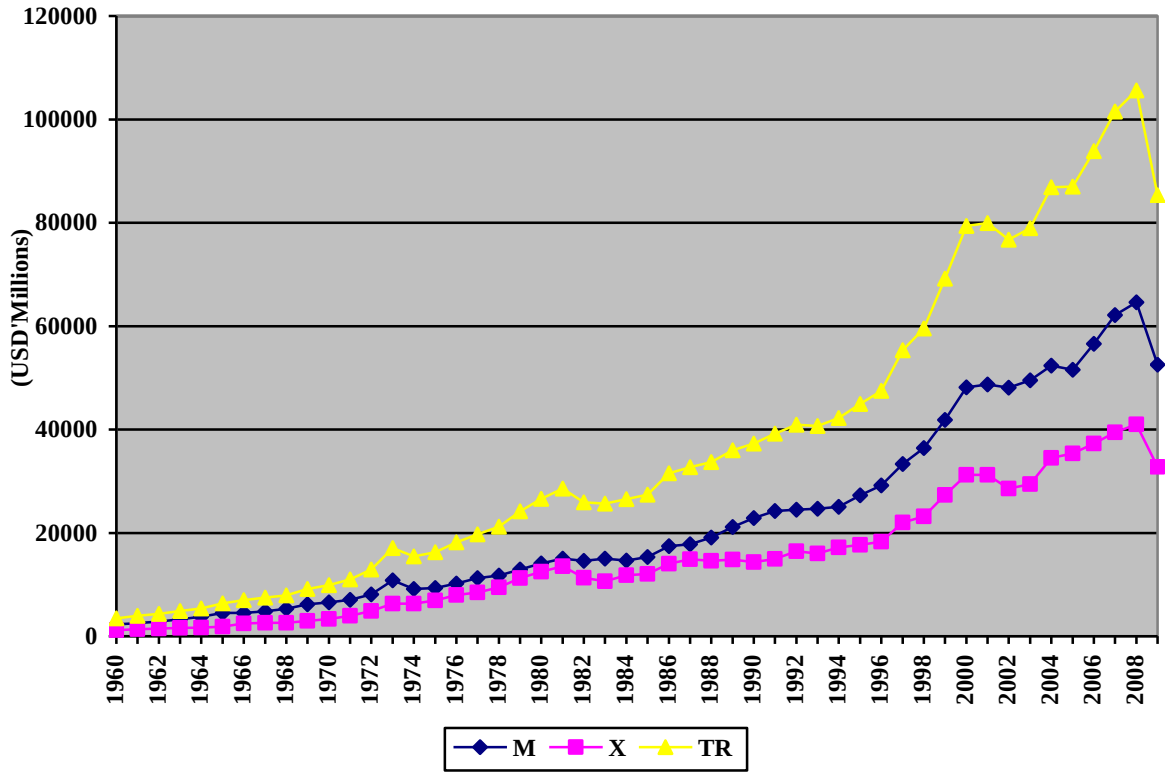

Figure 3: Trend of Import and Export Trade in Greece

Chapter 4

DATA AND METHODOLOGY

4.1 Variables and Data Source

This research employs annual time series data for Greece, covering period from 1960 to 2009. Data have been sourced from World Bank statistical database and Euromonitor statistical yearbook (2011). For scientific evidence, we apply sophisticated econometric techniques of cointegration and granger causality for a multivariate model to our study. A model is designed to show a time series regression equation, taking economic growth as a dependent variable, regressed on financial development and trade indicators. For our study, financial development is proxied with two variables, DCP and DC. "DCP" in this instance is used to notify for ratio of private credit to real GDP, and it is the summation of credit from within the country and from external sources, going to private sector. "DC" is taken as the ratio of domestic credit provided by banking sector to GDP and it shows the depth of bank lending to private sector. The DCP and DC are both included in this study because, Greek economy is a market economy and Banking sector is well dominated by private investors. GDP per capita (constant 2000$) as we know is the national aggregate of domestic output from a country. Todaro (2000) defined economic growth as increasing domestic output. Under the proposed model, trade is proxy with three different variables, X, M, and TR. "X" is used to signify for total real exports of goods and services; "M" is total real imports for goods and services. Finally,

"TR" represents level of trade openness of the country, measured as the sum of X and M.

4.2 Unit Root Test

Econometric time series should be stationary by assumption (Gujarati, 2009). Hence, before specifying a model, it is necessary we consider stationarity test for each variable to determine the consistency of the series, and to substantiate the auto regressive lag level of the variable. This will help us identify whether the variables, both explanatory and regressand within the model are integrated at the same order. For instance, a model with dependent variable that fails to reject hypothesis stating a presence of unit root at level order, but conforms no unit root at 1st difference, may be problematic if the regressors are stationary at level order. In this case, the variables are distorted and may not be identical of the same order. To achieve the stationarity, we conduct a unit root test using the Augmented Dickey-Fuller and Phillips and Perron (1988) test.

Augmented Dickey Fuller: the ADF is an extended form of Dickey-Fuller test for stationarity which has been developed by Dickey and Fuller (1981) to correct for the unit root test in situation where $\in_t$ is not white noise. It accommodates for incidence of serial correlation Termed as the "white noise innovation", the Augmented Dickey-Fuller involves estimating the following equation:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta^* Y_{t-1} + \sum_{i=1}^{m-1} \alpha_i \Delta Y_{t-i} + \in_t \qquad (1)$$

with,

$$\alpha_i = -\sum_{k=i+1}^{m} \delta k \qquad \text{and} \qquad \delta^* = \left(\sum_{i=1}^{m} \delta_i \right) - 1$$

Where $\in_t$ is used to denote Gaussian white noise, *Y* is the series for regressand; *t* = time; β = intercept; and *m* = the lag level. "m" is number of time lags of regressand, defined with the Akaike Information Criteria (AIC) form to ensure that the errors are white noise. An advantage of the ADF equation is that it accommodates higher-order autoregressive process (Greene 2003). The unit root formulation expressed above is a general form which includes intercept and trend. The test may also be carried out with only intercept, or none of intercept and trend.

Phillips-Perron test: this test has been suggested by Philip (1987), and Phillips and Perron (1988) as an alternative to the Augmented Dickey-Fuller test for unit root. It is a non-parametric technique of eliminating high order serial correlation in a series, and ensures that the generating process is a simple first order autoregressive[9], i.e. AR(1). It estimates residual variance employing the widely used Newey-West method for correcting for autocorrelation and heteroscedasticity. The Newey-West (Barlett) estimate for Phillip Perron unit root coefficient is of the form:

$$\omega_k = \frac{1}{T}\sum_{s=k+1}^{T} \ell_t \ell_{t-s} \qquad k = 0,\ldots, p = k^{\text{th}} \text{ autocovariance of residuals}$$

$$\omega_0 = \left[(T-K)/T\right]s^2 \qquad \textit{where} \qquad s^2 = \frac{\sum_{t=1}^{T} \ell_t^2}{T-K}$$

$$\gamma = \omega_0 + 2\sum_{k=i+1}^{n}\left(1-\frac{k}{n+1}\right)\omega_k \qquad (2)$$

n as appear in the equation above indicates the restricted lag form for estimating the PP test statistic. ω_k is the correlation coefficient of changes in residuals.

[9] See Phillips and Perron (1988).

Both ADF and PP tests are tailored towards the establishment of possible presence of unit roots; i.e. non stationary variable. Basically, two hypotheses are stated for the unit root test under the ADF and PP test: the null hypothesis (H_0) and the alternative hypothesis (H_1). The null hypothesis signifies there is unit root, i.e., the series is non-stationary; while the alternative hypothesis takes the form of no unit root, implying the series are stationary. The hypothesis is further tested and validated with the MacKinnon (1991) table for critical values of unit root coefficient. If the test statistic is greater than the MacKinnon critical values at level order, then the null hypothesis can be rejected but the value must be negative. In this instance, we accept the alternative hypothesis and adopt the series at level form as having no unit root, a pure condition for stationarity and long run model.

Conversely, if the null hypothesis is accepted at level order (i.e. δ*=0), then we proceed and take first difference of series to produce stationary process which makes our formulation an ARIMA(m-1, 1, 0) model for Y_t. If the null is rejected at the first difference, we accept the alternative hypothesis, implying that series has stationarity at first difference I(1). Differencing of our series no longer define a long run model. The regression model will then be a short run supplication with additional test to show long run convergence of the model.

Kwiatkowski Phillips Schmidt and Shin's test: to further strengthen the unit root results obtained from the ADF and PP tests, *KPSS* test is administered to get rid of possible low power against stationary near unit root processes which might have occurs in the *ADF* and *PP* tests (Kwiatkowski *et al*, 1992). However, hypothesis for KPSS test is the reverse of ADF and PP. Null hypothesis in this case is *no unit root*, a condition for stationary process. Rejection of the null hypothesis will then mean no stationarity for

the series. For KPSS, the LM statistic can be used to evaluate the stationarity hypothesis by disintegrating the features of the series into a unique sum of deterministic trend, the random walk, and error component which should have zero variance; say≈

$$Y_t = \rho t + r_t + \eta_t;$$

where t = 1, 2,….,T for observed series of Y_t, r_t is a random walk estimated by "$r_{t-1} + v_t$"[10]. For the null hypothesis to be accepted, variance of the disturbance from random walk σ_v^2 should be zero (Kwiatkowski *et al* 1992). Thus the LM statistic is derived from:

$$LM = \sum_{t=1}^{T} S_t^2 \Big/ \sigma_\varepsilon^2 \qquad (3)$$

S is the partial sum process of residual of the form;

$$S_t = \sum_{i=1}^{t} e_t$$

The *KPSS* test can be defined with trend and intercept, or only trend, in a form similar to the Augmented Dickey Fuller and Phillips Perron tests as;

$$Y_t = \alpha_0 + \mu t + k\sum_{i=1}^{t} \xi_i + \eta_t \qquad (4)$$

Unit root result from application of KPSS test is subject to lag formation which in this study would be restricted with the Newey-West bandwidth.

After carrying out the unit root test using the 3 statistical tests, we try to identify the form of integration among tested variables. If the series are all stationary at level form I(0), then a condition for long run model can be substantiated since they are naturally cointegrated. Otherwise, if the variables all have stationary process at first difference

[10] See detail of theoretical explanation of the unit root process for KPSS in *Kwiatkowski et al*(1992)

I(1), then a cointegration test can be used to check if there is possibility of long run convergence, that is we look at the prospect of the disequilibrium disappearing with time.

4.3 Cointegration Test

As previously explained, there is possibility that variables will not be stationary at their level form, which is most common with time series data like GDP, trade, national savings, etc. In the next step, a cointegration test would be used to explore possible cointegration and long run equilibrium among chosen economic variables. As pointed out by Granger (1981), a regression of a non stationary time series on another non stationary time series may produce a spurious regression. Also, regressing a time series with different integrating order may produce a problematic result from model. To this end, Granger (1986), Engel and Granger (1987), and Cheung and Lai (1993), have all suggested a cointegration test for long run stability of relationship between series.

A unique test of cointegration is the Johansen and Juselius (1990) trace statistics which tries to calibrate the presence of cointegrating vectors among multiple variables. Another test of cointegration is an older technique propounded by Engle-Granger (1987). However, the trace test supersedes the Maximum Eigen test when more variables are involved, even though we run both as a single test. The J&J statistic is also used to solve problems arising from endogeneity of predictors by conceding to VAR or error correction model with lag restrictions. The VAR construction for cointegrating vectors is commonly used for short run interaction where some variables are not integrated in same order. The VAR model is expressed below with *k* lags:

$$Y_t = \tau_1 Y_{t-1} + \tau_2 Y_{t-2} + ... + \tau_k Y_{t-k} + \mu_t \qquad (5)$$

This could also be expressed as a first differenced, transforming to a short run model;

$$\Delta Y_t = \phi_1 \Delta Y_{t-1} + \phi_2 \Delta Y_{t-2} + ... + \phi_{k-1} \Delta Y_{t-k+1} + \phi_k Y_{t-k} + \mu_t \quad (6)$$

Where $\phi_i = -I + \tau_1 + \tau_2 + ... + \tau_i; i = 1,2,...k.$ I is to denote identity matrix (specified long run target) and τ is the rank of matrix coefficient which signals the count of long run equilibrium between variables in the cointegrating system. If Y_t is I(1), then the first differencing ΔY_t would be I(0). Congruently, if the variables cointegrate in any form, then the condition for full rank should not hold for matrix ϕ (Maddala, 2005:563).

Johansen and Juselius (1990) explain 3 instance of relationship between time variants which can be established with the rank of matrix coefficient (τ):

i. If the rank is *P, i.e* $r(\tau) = P$, it implies that τ has full rank, then any linear combination of *I(1)* series is stationary.
ii. If the rank is zero, i.e $r(\tau) = 0$, τ becomes a null matrix which means there is no cointegration.
iii. If the rank is between zero and *P, i.e* $0 < r(\tau) < P$), it means there are matrices *A* and *B* with *P* by *r* dimension, making it possible to represent $\tau = AB'$. Matrix *B* is termed as 'cointegrating matrix' and matrix *A* is the 'adjustment matrix'. Matrix *B* has a tactical feature of generating a stationary process for $B'X_t$ even as X_t is not in the equilibrium relationship.

The number of cointegrating equation can be known with the eigenvalue coefficient (λ_i), by testing if λ_i is statistically different from zero. Johansen and Juselius (1990) profound the trace statistics (λ_{trace}) computation for eigenvalue of rank of matrix coefficient, ordered from highest to lowest;

$$\lambda_{trace} = -T\sum Ln(1-\lambda_i) \quad (7)$$

$i = r + 1, \ldots, n - 1$

The result of the Johansen trace statistics is then tested against a null hypothesis for cointegration stating that Y_t and X_t are not cointegrated. Null hypothesis is tested by comparing the trace statistic values with their corresponding asymptotic critical values as generated by Osterwald-Lenum (1992). If the trace statistic value is less than its asymptotic critical value, we accept the null hypothesis that the variables are not cointegrated; otherwise an alternative hypothesis is formed. The alternative hypothesis is tested sequentially, starting from $r \geq 1$. If null r = 0 is rejected, it means there is atleast one cointegrating vector (i.e $r \geq 1$) so we test for r = 1 as null hypothesis. If null hypothesis r = 1 rejected, then $r \geq 2$ is statistically significant, we proceed to r = 2, and continue the process till r = $n - 1$.

4.4 Level Coefficients and Error Correction Model

The explanation above is for vector autoregressive (VAR) model. The formulation under the error correction model (ECM) is slightly different with the inclusion of an error correction term ECT mathematically defined as "$Y_t - \theta X_{t-1}$" (Greene 2003). When variables cointegrate at level form, they are described as having long run relationship. If they cointegrated at first difference, it shows short run equilibrium. The short run equilibrium may likely converge in the long run by adjusting with time. This adjustment process can be examined using the ECM. Assume $X_t \sim I(1)$, $Y_t \sim I(1)$ is established, then ΔY_t, ΔX_t and $(Y_t - \theta X_{t-1})$ are I(0). The error correction model can then be expressed as:

$$\Delta Y_t = \delta(\Delta X_t) + \tau(Y_{t-1} - \theta X_{t-1}) + \varepsilon_t \quad (8)$$

This equation defines the variation of Y_t close to its long run trend as caused by, or related to variation in X_t around its long run trend, and the ECT≈ (Y_t - θX_{t-1}).

4.5 Granger Causality Test

Katircioglu (2009) points out that if no stationarity exist in time series, regression result could be spurious therefore may deter a conclusion that is based on such causality model. In time series methods, when series are stationary at first difference and they are cointegrated at I(1), Toda and Phillips (1993) have developed a technique for dealing with granger causality: the Block Exogeneity Wald approach under the VECM (vector error correction mechanism).

$$\Delta \ln Y_t = C_o + \sum_{i=1}^{m} \beta_i \Delta \ln Y_{t-i} + \sum_{i=1}^{n} \alpha_i \Delta \ln X_{t-i} + p_i ECT_{t-1} + \varepsilon_t \qquad (X \rightarrow Y)$$

$$\Delta \ln X_t = C_o + \sum_{i=1}^{m} \omega_i \Delta \ln X_{t-i} + \sum_{i=1}^{n} \theta_i \Delta \ln Y_{t-i} + \eta_i ECT_{t-1} + u_t \qquad (Y \rightarrow X) \qquad (9)$$

u_t and ε_t are included to represent random errors which fundamentally should have zero mean and unit variance according to the classical regression model assumptions. The essence of granger causality test is to intuitively evaluate the statistical significance of the parameters α*'s* and θ*'s*, subject to optimal lag lengths *m* and *n*. In this case, we want to establish the causal relationship that exist between the variables *Y* and *X*; that is, we try testing if *Y* granger causes *X* by using a multiple rank F-test and t-test~VEC framework, under a null hypothesis (H_0): *Y* does not granger cause *X*. If null is rejected, then we accept an alternative hypothesis (H_1): *Y* granger cause *X*. After testing for causality from *Y* to *X*, we also want to know if *X* granger causes *Y*. Under these scenarios, one out of four outcomes will hold: either unidirectional causality from *X* to

Y, unidirectional causality from *Y* to *X*, bidirectional causality (feedback relationship) between *X* and *Y*; or no causality between both variables.

However, if the unit roots test is I(1) for all variables, testing causality with F-statistic will be giving short run causality test. Under economic analysis, short run equilibrium are not common, therefore, applying the *F*-statistic may not be sufficient. The block exogeneity test (for error correction or VAR models) under this circumstance may be helpful for establishing the long run equilibrium needed for a more dynamic analysis. If the variables are all I(1) and they cointegrate, the VEC framework defined in equation # & # is appropriate. On the other hand, if the variables do not cointegrated, meaning there is no long run relationship, then VAR framework will be suitable for testing the direction of causality. Causality with VAR is of the form:

$$\Delta \ln Y_t = C_o + \sum_{i=1}^{m} \beta_i \Delta \ln Y_{t-i} + \sum_{i=1}^{n} \alpha_i \Delta \ln X_{t-i} + \varepsilon_t \qquad (X \rightarrow Y)$$

$$\Delta \ln X_t = C_o + \sum_{i=1}^{m} \omega_i \Delta \ln X_{t-i} + \sum_{i=1}^{n} \theta_i \Delta \ln Y_{t-i} + u_t \qquad (Y \rightarrow X) \qquad (10)$$

In our study, both short run and long run equilibrium will be considered. For short run equilibrium, the *F*-statistic is applied to the first difference of the series (for instance, causality between Δln*GDP* and Δln*TRADE*). The mathematical computation of F-statistic can be derived from the equation below:

$$F = \frac{(\mathrm{RSS}_r - RSS_u) df_u}{RSS_u (df_{r-} df_u)} \qquad (11)$$

RSS_r denotes sum of squared residuals for restricted equation, while RSS_u is the sum of squared residuals in unrestricted model; df_r and df_u are the degrees of freedom in restricted and unrestricted models.

In time series analysis, a first condition for estimating a long run model is to check if the series are stationary and are cointegrated. This is the importance of the ADF and PP unit root test, further supported with the KPSS test in case of mixed result. The KPSS eliminate possible low power against stationary near unit root processes which might have occurs in the *ADF* and *PP* tests (Kwiatkowski *et al*, 1992). If the series are I(0) for all variables, it means all variables are naturally cointegrated and can be used to estimate a long run equilibrium, no need for cointegration test. If series are I(1), then we need to perform a cointegration test to see how the model can adjust to a long run equilibrium since differencing the series no longer makes it ideal for long run estimation and short run models are not ideal under economic analysis. However, if the series are cointegrated, then there is possibility that the disequilibrium will gradually disappear with time. This gradual adjustment to long run equilibrium can be evaluated with an error correction model (VECM). Where there is no cointegration, then we can estimate our model based on the vector autoregressive formulation as explained previously. Subsequently we perform the causality test.

Chapter 5

RESULTS AND DISCUSSION

5.1 Results

Existence of consistency in variable feature is primer to universal application of time series econometrics in order to ensure a model is unbiased. Under this study, as earlier mentioned in the methodology chapter, a unit root test is performed to test for stationarity of variables. Initially, the Augmented Dickey Fuller and Phillips Perron (1988) approach were employed. Results for ADF and PP tests are depicted on table # as two sections; the top section shows the unit root test for stationarity at level order, the other section gives result of the test after taking first difference. Table # shows a mixed response of our data to the stationarity test, with domestic output, export and trade indicating stationary process at level form; that is, they are integrated at their level form~I(0), while private credit is not stationary. Test for unit root at first difference reveals that all variables are stationary at I(1).

To eliminate possible low rank against stationarity near unit root, the KPSS unit root test was performed. KPSS result as shown in table # rejects null hypothesis for unit root at level order for all variables, implying no stationarity at I(0). However, the null hypothesis were unanimously upheld for the variables at I(1), supporting a stationary process in our time series variant after first difference. The KPSS tests substantiate the stationarity feature of GDP, export and trade as I(1), against the I(0) claim under the

ADF and PP output. Therefore, based on results KPSS tests, we conclude that all of the series are non-stationary at their level form but stationary after taking the first difference, which means variables of the present study are integrated of order one~I(1) and can be used to explain short run functions (see Enders 1995).

Following the unit root test under the KPSS (1992) approach, a stationary process could not be established for the variables at level order. This means that the variables are not naturally cointegrated and cannot be used to estimate a long run model in their level form. Therefore, it is essential to see if the variables converge in the long run since they all integrate at first difference. The Johansen and Juselius (1990) methodology is adopted to test for cointegration. Table # relays the outcome of the trace statistic test carried out for different possible interactions with GDP. Table # gives cointegration results indicating the number of cointegrating vector within the all inclusive model; where lngdp = f(lnx, lnm, lndc, lndcp).

Results in table # reveals there is at least one cointegrating vector in the specified model. This is because the null hypothesis of r =0 can be rejected at $\alpha = 0.05$ level. Therefore, lngdp = f(lnx, lnm, lndc, lndcp) is a cointegration model. The normalized cointegrating equation indicates that the responsiveness of GDP to growth in export trade is positively elastic and statistically significant with 1.57 percent stimulus for every 1 percent change in export trade. This is not the case for import as the coefficient shows there is a negative impact of real import on GDP, with 1.12 percentage change in GDP for every 1 percent shift in real import for Greece; the variable is also significant. Private sector credit has a similar trend with real import, except that it has an inelastic impact on GDP. However, domestic credit under the normalized cointegration equation has a positive but insignificant impact on GDP.

Table 2: ADF and PP unit root test

Statistics (Level)	**ln y**	**lag**	**lnx**	**lag**	**lnm**	**lag**	**lntr**	**lag**	**lndc**	**lag**	**lndcp**	**lag**
τ_T (ADF)	-2.983***	(1)	-1.126	(0)	-2.189	(3)	-1.514	(1)	-1.257	(0)	-1.346	(1)
τ_μ (ADF)	-2.655	(1)	-2.797***	(0)	-2.639	(0)	-3.018**	(0)	-1.358	(0)	-0.257	(1)
τ (ADF)	3.018	(1)	4.729	(0)	5.503	(0)	5.727	(0)	-2.933**	(3)	-2.652	(1)
τ_T (PP)	-2.724	(2)	-1.150	(2)	-1.844	(0)	-1.431	(3)	-1.301	(1)	-1.757	(2)
τ_μ (PP)	-3.314**	(0)	-2.780***	(1)	-3.223**	(1)	-3.208**	(2)	-1.355	(0)	-0.428	(0)
τ (PP)	4.274	(0)	4.214	(1)	5.306	(3)	5.210	(2)	-2.873*	(0)	-2.212	(0)
Statistics (1st Difference)	**Δln y**	**Lag**	**Δlnx**	**lag**	**Δlnm**	**lag**	**Δlntr**	**lag**	**Δlndc**	**lag**	**Δlndcp**	**lag**
τ_T (ADF)	-5.283*	(0)	-5.254*	(0)	-5.995*	(0)	-5.431*	(0)	-6.639*	(12)	-5.705*	(0)
τ_μ (ADF)	-4.771*	(0)	--4.710*	(0)	-5.455*	(0)	-4.740*	(0)	-6.641*	(6)	-5.773*	(0)
τ (ADF)	-1.796***	(0)	-3.711*	(0)	-3.817*	(0)	-3.392*	(0)	-5.761*	(6)	-5.129*	(0)
τ_T (PP)	-5.457*	(1)	-5.009*	(1)	-5.729*	(3)	-5.212*	(1)	-6.635*	(2)	-5.757*	(1)
τ_μ (PP)	-4.927*	(1)	-4.710*	(1)	-5.336*	(3)	-4.748*	(1)	-6.541*	(0)	-5.824*	(1)
τ (PP)	-3.302*	(2)	-3.655*	(1)	-3.817*	(2)	-3.261*	(2)	-5.798*	(1)	-5.205*	(2)

Note:

y represents real gross domestic product; M2 is broad money or money supply; DC is domestic credit provided by banking sector; X is total real exports; M is total real imports; and finally, TR is total real trade (import *plus* export). All of the series are at their natural logarithms. τ_T represents the most general model with a drift and trend; τ_μ is the model with a drift and without trend; τ is the most restricted model without a drift and trend. Numbers in brackets are lag lengths used in ADF test (as determined by AIC set to maximum 3) to remove serial correlation in the residuals. When using PP test, numbers in brackets represent Newey-West Bandwith (as determined by Bartlett-Kernel). Both in ADF and PP tests, unit root tests were performed from the most general to the least specific model by eliminating trend and intercept across the models (See Enders, 1995: 254-255). *, ** and *** denote rejection of the null hypothesis at the 1%, 5% and 10% levels respectively. Tests for unit roots have been carried out in E-VIEWS 6.0.

Table 3: KPSS test for unit roots

Statistics (Level)	**ln y**	**lag**	**lnx**	**lag**	**lnm**	**lag**	**lntr**	**lag**	**lndc**	**lag**	**lndcp**	**lag**
τ_T	0.176**	(1)	0.202**	(0)	0.164**	(3)	0.194**	(0)	0.196**	(0)	0.091	(1)
τ_μ	0.875*	(1)	0.891*	(0)	0.929*	(0)	0.917*	(0)	0.856*	(0)	0.799*	(1)
Statistics (1^{st} Difference)	**Δln y**	**Lag**	**Δlnx**	**lag**	**Δlnm**	**lag**	**Δlntr**	**lag**	**Δlndc**	**lag**	**Δlndcp**	**lag**
τ_T	0.104	(0)	0.061	(0)	0.107	(4)	0.073	(0)	0.073	(1)	0.095	(0)
τ_μ	0.145	(0)	0.356***	(0)	0.149	(4)	0.058	(0)	0.098	(5)	0.102	(0)

Note:

y represents real gross domestic product; DCP is private credit; DC is domestic credit provided by banking sector; X is total real exports; M is total real imports; and finally, TR is total real trade (import *plus* export). All of the series are at their natural logarithms. τ_T represents the most general model with a intercept and trend; τ_μ is the model with a intercept and without trend. *, ** and *** denote rejection of the null hypothesis at the 1%, 5% and 10% levels respectively. Tests for unit roots have been carried out in E-VIEWS 6.0.

Table 4: Cointegration results for overall model

Null hypothesis	Eigen-value	Max-Eigen Statistic	Trace Statistic	5 %/1 % Critical Value (Trace)	5%/1 % Critical Value (Max-eigen)
r = 0	0.586	42.420*	102.35	68.52/76.07	33.46/38.77
r = 1	0.425	26.582	59.93	47.21/54.46	27.07/32.24
r = 2	0.260	14.505	33.35	29.68/35.65	20.97/25.52
r = 3	0.207	11.157	18.84	15.41/20.04	14.07/18.63
r = 4	0.148	3.690	7.69	3.76/6.65	3.76/6.65

Table 5: Unrestricted long run equation

Normalized cointegrating coefficients:				
LNGDP	**LNX**	**LNM**	**LNDC**	**LNDCP**
-1.000000	1.571418	-1.124830	0.088871	-0.394400
	(0.20274)	(0.18357)	(0.14212)	(0.11040)
	[7.851]*	[-6.142]*	[0.619]	[-3.572]**

The existence of cointegrating vector within our specified long run model signifies there is an adjustment mechanism from short run to long run equilibrium. Because the variables are all non stationary at level form, our series are restricted to short run estimates. This necessitates the need to estimate a short run model which would include the adjustment component for long run equilibrium. Since there is cointegration among the variables, the short run model is estimated using the Error Correction Model. Based on the VECM, a short run model is formulated:

$$lngdp = \text{f}(lnx, lnm, lndc, lndcp)$$

The error correction model was estimated using lag restrictions. Table # reports an error correcting term of -0.20 at lag 4. The negative sign explains the gradual disappearance of disequilibrium between the short run and the long run values of dependent variable. This means that short run values of GDP converge into a long run equilibrium level by 20% speed of adjustment every year. The declining rate of

disequilibrium gives an impression that financial development and trade openness are long run catalyst for economic growth in Greece.

Table 6: Error Correction Model (Short run equation with ECT for long run equilibrium)

Cointeg Eq:	**LNGDP**	**C**	**LNX**	**LNM**	**LNDC**	**LNDCP**	**ECT**
CointEq1	-1.000	16.562	1.1438 (0.2316) [4.9387]**	-0.5143 (0.2009) [-2.5591]**	1.0163 (0.1260) [8.0637]*	0.1113 (0.1020) [1.0907]	-0.200 (0.067) [-2.960]**

Furthermore, the VEC model shows that real GDP responds at a slower rate to changes in real imports, but export trading has an elastic impact on growth with the former having a negative impact, and the latter having positive impact in the short term period. Result for DCP explains a positively inelastic impact of private credit on growth; with no evidence of its statistical relevance under the short run equation estimated for Greece. Theoretically, the long run unrestricted model has negated our apriori expectation, showing negative impact on growth, the short run restricted model failed to show any significant impact of financial development on growth in Greece. This may be a situation of bad money (deficit spending with accumulating cost) financing growth process. Tracing the origin of the Greece financial dilemma that erupted a retrogressive growth trend since 2009, analysts have been vary of factors that led to the crisis-reckless government spending, weak revenue collection, and structural rigidities in Greece's economy (see Nelson et al 2010).

Based on empirical findings, we identify that the Greek's financing activities have not been effectively channeled to productive investments that could have returned benefits sufficient to cover cost of finance with residue for advancing the economy. Although the short run model shows there is positive impact of financial development on growth, private credit was insignificant under the short run hypothesis. Also, we

identified that trade indicators under the short run model followed their theoretical apriori as estimated for the normalized cointegrating equation; with export having positive impact and import showing negative.

Looking at the long run dynamics, and enveloping an adjustment mechanism (ECT) for short run equation to take a desired long run equilibrium, financial development and trade openness can be said to be a long run catalyst for economic growth with an adjustment speed of 20 percent to its long run equilibrium. But because domestic credit is insignificant under the long run model, it is not moving directly to pluck equilibrium with growth. However, its significance under the short run model may imply that there is internal transmission within the model, for instance domestic credit may be impacting on growth through trade to trade.

To justify explicit transmission lines among economic variables proxied for openness and growth, the granger causality test was performed. Since the cointegration test profound existing cointegration among lngdp, lnx, lnm, lndc, and lndcp; the block exogeneity test for I(1) condition was carried out under the VEC framework. Table # shows the outcome of the causality test. The *F*-statistic is included to define short run causality between different pairs of variables. A glimpse at the causality table shows there is long run bidirectional causality between real exports and economic growth of Greece. Also, there is bidirectional causality between real imports and economic growth.

Empirical evidence from this study has reiterated a broken link between financial development and economic growth of Greece. Result indicates domestic credit and growth have no existing long run relationship under the VEC framework, but the *F*-statistic shows there is causality from growth to domestic credit. Considering financial

development under specification of private credit, a one-way causality is detected, moving from private credit to growth in the real sector.

Furthermore, a linkage was identified between the trade proxies as real import granger causes export trade under the block exogeneity test. An economic interpretation for the unidirectional causality from import to real export can be explained by the technological dependence of Greece on other countries, especially from Euro region. The Greek government as we recall enacted the innovation and technology transfer act in 1987 which was later amended in 1997. This was necessitated to avert a failure of the seemingly redundant ancient Greek technology to compete efficiently with other economies during the time the EU alliance was formed. (see Greece Patent Law No. 1733/87, article 1- OBI part 1). A rationale behind this is the need to match the EEC market standards aimed towards trade liberalization within the Euro zone. As noted by Nelson *et al* (2010), this was the beginning of the debt story for Greece as a substantial portion of government spending was on technology import (Nelson *et al* 2010).

Results for the block exogeneity test under the error correction formulation propel unidirectional causality from private credit to export and no causality between domestic credit and export. Private credit also has unidirectional causality on import, in addition to the one way causality from domestic credit.

Table 7: Granger Causality for lngdp = f(lnx, lnm, lndc, lndcp)

Null hypothesis	lag 1		lag 2		lag 3		lag 4		Remark
	F-stat	t-stat (ECT)	F-stat	t-stat (ECT)	F-stat	t-stat (ECT)	F-stat	t-stat (ECT)	
lnx does not granger cause lngdp	0.61	0.64	1.57	0.95	1.54	6.65**	1.46	3.64	X↔GDP
lngdp does not granger cause lnx	5.20**	0.06	3.22**	0.04	1.63	4.21***	1.15	3.57	
lnm does not granger cause lngdp	2.25***	4.43**	6.38*	2.08	7.11*	8.19*	4.95*	5.28***	M↔GDP
lngdp does not granger cause lnm	0.24	3.44***	1.62	4.13***	1.13	4.81***	1.2	4.03	
lndc does not granger cause lngdp	1.98	0.24	1.6	1.02	0.62	3.04	0.89	4.26	DC…GDP
lngdp does not granger cause lndc	5.33**	0.42	3.15**	2.62	2.24***	1.34	1.71	1.69	
lndcp does not granger cause lngdp	0.12	0.04	3.04**	0.75	1.76	5.54	0.78	13.40*	DCP→GDP
lngdp does not granger cause lndcp	1.79	0.86	1.17	0.52	2.22***	0.67	2.23***	1.3	
lnm does not granger cause lnx	1.36	0.36	0.71	1.52	0.55	7.69**	0.52	4.47***	M→X
lnx does not granger cause lnm	0	0.13	0.01	0.5	0.34	1.25	0.48	1.18	
lndc does not granger cause lnx	1.11	1.8	0.2	1.66	0.51	1.05	0.37	1.84	DC…X
lnx does not granger cause lndc	8.65*	0	3.81**	0.74	2.40***	1.19	1.9	0.98	
lndcp does not granger cause lnx	1.24	0.31	1.04	1.89	1.26	9.17**	2.24***	4.6***	DCP→X
lnx does not granger cause lndcp	2.24	0.02	1.06	1.02	0.63	1.62	0.94	2.4	
lndcp does not granger cause lnm	0.34	0.44	2.56***	0.9	2.28***	4.66***	2.16***	2.15	DCP→M
lnm does not granger cause lndcp	2.38***	0	1.52	0.31	1.45	3.66	1.63	3.31	
lndc does not granger cause lnm	0.24	0.01	0.26	0.39	0.18	5.44***	0.31	4.13***	DC→M
lnm does not granger cause lndc	2.26***	0.34	1.06	0.87	0.63	2.11	0.94	3.36	

Table 8: Granger causality test for trade openness, financial development and economic growth

Null hypothesis	lag 1		lag 2		lag 3		lag 4		Remark
	F-stat	t-stat (ECT)	F-stat	t-stat (ECT)	F-stat	t-stat (ECT)	F-stat	t-stat (ECT)	
lngdp does not granger cause lntr	0.08	0.48	1.97	9.42*	1.11	18.13*	0.90	20.80*	GDP→TR
lntr does not granger cause lngdp	0.56	0.27	4.86*	3.48	5.87*	1.58	4.41*	1.11	
lngdp does not granger cause lndcp	1.79	0.05	1.17	5.94**	2.22***	6.33**	2.23***	6.48**	DCP↔GDP
lndcp does not granger cause lngdp	0.12	0.02	3.04**	5.13***	1.76	1.35	0.78	2.67***	
lntr does not granger cause lndcp	2.38***	1.17	1.58	0.09	1.85	5.85**	1.73	8.60*	TR→DCP
lndcp does not granger cause lntr	0.99	0.57	2.84***	0.83	2.71**	0.44	3.13**	1.10	

The outcome of causality test from the general model shows individual causality of variables chosen for the model. In other to test for general causality between trade openness, financial development and growth, we specify a model lngdp = f(lntr, lndcp). Lndc is omitted here because it was tested to be statistically insignificant. Hence, trade openness is represented as summation of real imports and exports, while private credit is used as financial development. The Johansen test for this function shows there is no cointegration among the variables in the long run. Therefore, granger causality under the VAR framework is applied to establish a triangular nexus.

Table 8 is used to clearly exposit a triangular nexus among the key components of study- openness, financial development and economic growth. Here, GDP is a transmitting mechanism for trade openness in a long run; private credit and economic growth have shown a reciprocating dimension of causality. Finally, the causality test shows there is unidirectional causality transmitting from trade sector to financial development. This causal relationship is represented in the diagram below;

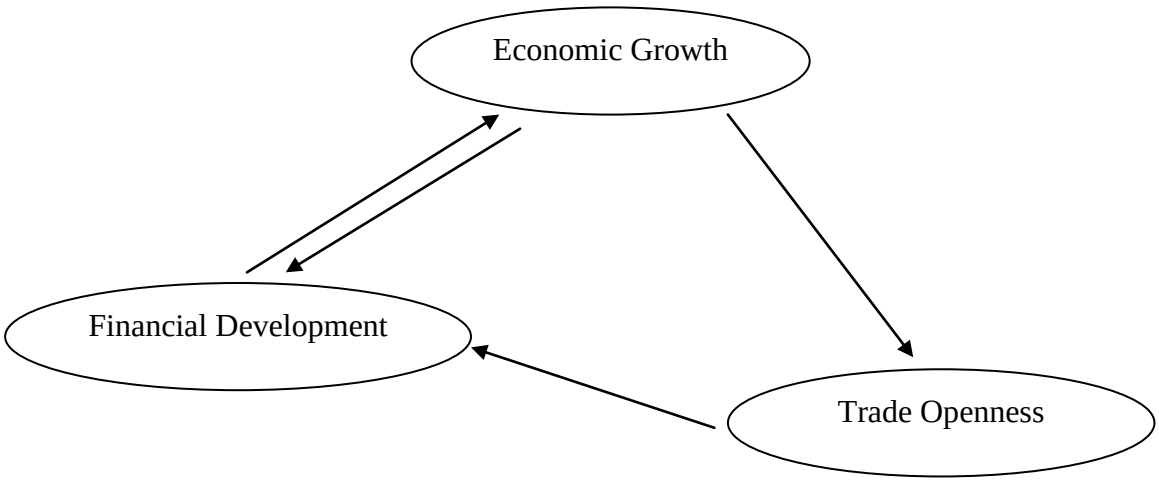

Figure 4: Triangular Nexus among Trade Openness, Financial Development and Growth in the Case of Greece

Chapter 6

CONCLUSSION AND POLICY RECOMMENDATION

6.1 Conclusion

In recent times, the financial integration of the European countries has generated many unresolved issues as the aim of setting up a liberalized economy has been counter-productive in some member states. For about two decades, Greece has shown strong economic position among other European countries and its growth rate steadily above the EU average growth rate. Its economic policies have been guided by those of the European Union, with trade serving as bedrock of economic integration. Suddenly, the Greek economy started witnessing a backdrop of economic productivity triggered by the debt crisis of 2009. This crisis became a contagion to other sectors including trade; cost of financing economic activities increased as country risk became high.

The aim of this study is to investigate the economic structure and long run growth model for Greece. We try to hypothetically identify the missing link which might have caused the systemic breakdown of the Greek economy since 2009. Theoretical views from scholars like Schumpeter have suggested the need for a vibrant financial sector to achieve meaningful economic growth. Of course, the Greek financial system has been a very active one until recent times, yet it experienced an economic dilemma due to excessive debt financing of its growth process. This study tries to identify a growth hypothesis peculiar to Greece by testing 2 common growth hypotheses: trade-led and

finance-led growth. Historical time series data is used to show the past trend of and real contributors to economic growth in Greece.

Based on empirical investigation, we have been able to establish a long run relationship between trade openness, financial development and economic growth for Greece. Although the stationarity feature of our data makes it improper to estimate a natural long run regression, result from Johansen cointegration tests suggest there is possible long run interaction among domestic credit, private credit, real export, import and domestic output. From the cointegration tests, we also estimated the normalized level coefficients to show our long run expectations under the unrestricted model. Result from the unrestricted long run equation shows that domestic output is positively responsive to export trade and domestic credit but the later was found to be statistically insignificant, making it dormant in the model. The level coefficients also reveal that imports and private credit have negative impact on economic growth.

Since there is cointegration among variables in the model, a short run equation is estimated under the error correction condition to show the adjustment process of the model from short run to long run. The error correction estimates proves the model converge into a long run equilibrium level at 20 percent speed of adjustment speed every year. This substantiates our claims that financial development and trade openness are long run determinants of growth in Greece. Subsequently, we investigate the direction of causality among the individual variables under VEC framework, and then triangular nexus trade openness, financial development and economic growth is described under VAR because there was no cointegration among the three.

Empirical evidence shows there is a feedback relationship between growth and financial development. This implies that monetary policies that foster financial

development has long run impact on economic growth and when her economy is growing the financial sector of Greece is bound to expand as well. On the nexus between trade and growth, granger causality test indicates economic growth is a catalyst for trade openness and not the other way as profound by Adam Smith and David Ricardo under the trade theory; in other words, cross border trade is enhanced by growth in domestic output in Greece. But trade openness has a strong causal impact on financial development. Hence we infer that financial development remains the link between trade and growth. When the financial sector is progressive, domestic output increases, and this increase creates a residue which can be exported.

6.2 Implications

We proffer policy options based on our empirical findings. In Greece, the service industry contribution is above 78.5 percent of the GDP, followed by industry. The composition of the GDP shows that the financial impact is more felt in the service sector than in industry and this is a barrier to trade. If the industry sector is promoted by ensuring it gets needed financial resources, economic output can increase and this will prosper trade operations.

Conclusively, this study support policies engendered towards financial development. Sound financial system will directly enhance economic growth and indirectly improve the trade operations of Greece. Since financial development does not have direct causality on trade openness but economic growth has, financing the productive sectors of the Greek economy is expected to prosper trade and in the long run creates a symbiotic benefit for the financial sector itself. A finance-led is therefore advocated but

sectoral preferences should also be considered if economic growth is to be sustained in Greece.

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