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DEPARTMENT OF BALKAN SLAVIC & ORIENTAL STUDIES

SCHOOL OF ECONOMIC AND REGIONAL STUDIES

The dynamic relationship between Economic Freedom and Growth, Income Inequality and Happiness.

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ABSTRACT

This thesis aims to provide an analytical framework and offer insight regarding the macroeconomic effects of economic freedom on variables of interest, namely economic growth, happiness and income inequality. The analysis focuses on the case of Greece for several reasons. First, the lack of relevant literature on the subject and especially the investigations of the underlying macroeconomic relationships formed in Greece increase the interest to shed light on the examination of these variables. Second, due to the recent debt crisis in Greece, it is imperative alternative sources and roots of potential growth be investigated.

The thesis is structured in two main sections. The first involves a comprehensive presentation of the relevant literature (both theoretical and empirical) regarding the expected relationships formed among economic freedom, economic growth, happiness and income inequality. In addition, the theoretical premises of the variables under investigation are extensively discussed, as are the relevant measurement techniques that are employed in order to create the indexes of economic freedom, happiness and income inequality. Under this framework, a dataset is employed based on annual data for the period 1995-2015.

The second section involves an extended empirical analysis of the set of variables under consideration. Several econometric techniques are utilized in order to define the long-run as well as the short-run relationships formed among the variables. These techniques involve implementation of cointegration analysis and vector error correction models. In addition, the

propagation mechanisms of shocks among the system of variables is studied. This thesis also discusses the theoretical framework of the econometric procedures that are followed in order to enhance our analytical output and better define the techniques employed and the theoretical relationships studied.

The empirical findings of this thesis can be analyzed in several directions regarding the economic policy of the country. First of all, increased growth found to be associated with a positive impact on economic freedom and the happiness in the country both in the short-run and the long-run. This means that economic growth prepares the ground to promote economic policies that are related to the promotion of business and that enhance the outward outlook of the economy as an economic freedom suggests. Second, we empirically define that economic freedom policies in Greece are negatively associated with income inequality in the country. Thus, increased income equality will be arisen after the implementation of policies which are consistent with economic freedom. Furthermore, the empirical results suggest that, the implemented policies in Greece over recent years have had an effect and have managed to reduce income discrepancies in the country.

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1. INTRODUCTION

It is difficult for economic development to be predicted and controlled. It took a great deal of time for the economic theorists to understand the factors which foster economic growth and the reasons that some nations fail to adapt to development processes. Despite the efforts by the developed countries located in the West to ensure a socially flexible nation which aids the underprivileged, many countries are still struggling. Theorists like Solow and Romer can partially explain the economic growth in these countries.

Adam Smith, "the father of economics", argued in 1776 that free markets were necessary for economic growth, opposing the mercantile theory of high trade barriers. Since the days of Adam Smith, world opinion has been going back and forth between favoring trade openness and protectionism. The latter was a prominent strategy in the least developed countries (LDCs) in the post-World War II era, under the regime of import substitution industrialization (Edwards, 1993). It was claimed by Henry Bruton (1989) that protecting infant industries from international trade was the optimal approach for LDCs to catch up with richer nations. These ideas were in large implemented in Latin America under the 1recommendation of economist Raúl Prebisch during the 50's and 60's (Edwards, 1993) to combat government policies which interfered with productive economic activity, such as high transaction costs, violations of property rights, excessive regulations and policies creating uncertainty. Such policies reduce the economic freedom and, according to their critics, discourage productive economic activity. The idea of economic freedom, in terms of a small public sector and trade openness, has been adopted by the IMF as a pre-condition for loan recipients, despite the criticism that these policies harm the debtor (Kovachand Lansman, 2006).

It is therefore clear that a wide set of economic factors can affect and distort economic performance in a country or a region. A significant after-effect of the recent financial crisis and

the globalization of economic transactions is the fact that academic research has been widely focused on a variety of previously neglected factors that may foster economic activity. Of particular interest is the notion of economic freedom and its impact on economic growth and on other macroeconomic variables. Many developed and developing countries have adopted policies that promote, expand and nourish freedom of economic transactions. More specifically, this kind of economic policy focuses primarily on promoting competitiveness and attracting external investments and capital flows. Other aspects of economic freedom policies might also involve low taxation policies and an independent judicial system. Economic policies that focus on the promotion of freedom also emphasize enhancing the free market activities within the country, supporting an outward-oriented economy with increased trade flows with limited barriers and tariffs, and set the conditions for a complete legislative framework that protects individual assets and private property.

The idea that economic freedom is positively linked with increased economic growth is based on the fact that limited state intervention on economic affairs will enhance and promote economic activity. Thus, a bureaucratic framework that obstructs this idea is considered to have a negative impact on economic freedom. Under this scheme, promotion of economic freedom can be characterized as an economic growth policy that fosters individual economic activity and a country's global economic transactions with the rest of the world.

Thus, economic freedom policies achieve a broad-based economic dynamism with lasting growth and prosperity. The variable Economic Freedom comes from the Fraser Institute Index of Economic Freedom created by Gwartney, Lawson and Block (1996). Relevant academic research of the index has documented a positive relationship involving economic liberty and long-term development. Countries with high levels of economic freedom attain higher levels of income and their inhabitants attain better health. They safeguard the

environment and advance the frontier of human development in science and technology through creativity and innovation. Xu and Li (2008) point out that the decision making of governments is characterized by transparency and openness which exposes the loopholes where discrimination might flourish, thus promoting equal opportunity for everyone. In addition, Baum (1999) revealed that institutions and states which warrant economic liberty in most cases can also provide the growth, thus encouraging some development. Lawson and Holcombe (1999) studied the connection involving economic liberty, political free will, and growth and concluded that economic freedom is a key factor in promoting economic growth and expansion. They emphasize that this relationship is characterized by a mutual causality as economic growth is a significant driver for the expansion of economic freedom. This causal effect between economic growth and economic freedom is also present in the work of Doucouliagos and Ulubasoglu (2006).

Apart from economic growth, academic research has studied the bidirectional effects and the relationship between economic freedom, on the one hand, and income inequality and happiness, on the other. A variety of economists including Frey and Slutzer proved that people are happier when they live in democratic political institutions. Economic freedom has a direct impact on the happiness of a country's citizens due to the fact that it enlarges the choices attainable. This stems from the fact that a legislative framework that expands economic freedom leads to wealth and prosperity as people have autonomy in their decision-making. If there is no economic freedom, then people have to accept forceful decisions, which decrease their happiness in general. In particular, Jackson (2017) employed data from the U. S. and pointed out that there is a positive relationship between economic freedom and happiness at the state-level.

In addition, increases in economic freedom affect the growth of gross incomes positively and if low-income groups have a higher growth rate than others as a result of greater economic

freedom, income distribution may be made more equal. This means that economic freedom-oriented policies might foster income equality and dispersion among the public which means that the relationship between economic freedom and income inequality might be negative. This negative relationship is supported by the empirical works of Grubel (1998), Berggren (1999) and Scully (2002).

In this thesis, an attempt is made to provide a thorough framework of analysis which focuses on the empirical investigation of the relationships among the following four macroeconomic variables: economic growth, economic freedom, income inequality and happiness (happiness). More specifically, we employ a battery of widely-used econometric techniques, cointegration analysis, vector-error correction models, Granger causality tests, impulse response functions and forecast error variance decompositions, in order to reveal the relationship hidden among the variables for the case of Greece. Our dataset consists of annual data that span the period from 1995 to 2015 and were retrieved from various databases including the following: the Heritage Foundation database, Eurostat, the World Bank World Development Indicators and Erasmus University database. The aim of this thesis is to examine the empirical relationships among several macroeconomic variables namely economic freedom, economic growth, income inequality and happiness (happiness) focusing on the case of the Greek economy. There is a gap in the related literature regarding the empirical investigation of the underlying macroeconomic variables for Greece and this thesis attempts to fill that gap.

More specifically, this thesis offers a theoretical framework which involves an extended literature review in order to reveal the various relationships and causal effects that exist among the variables of interest and are supported by empirical studies. After establishing the expected outcomes and the corresponding expected relationships, several state of the art econometric techniques are employed in order to understand and estimate the connection among the

corresponding variables of the Greek economy. The empirical results are interpreted with caution and policy recommendations are extracted based both on the suggestions of the empirical literature and the econometric findings of this thesis.

Thus, an important aim of this thesis emphasizes policy recommendations for the Greek economy regarding the legislative framework of economic freedom and its impact on the remaining variables of our model. The recent financial crisis in Europe, and especially the debt crisis in Greece, has made it imperative to search for alternative sources of growth and to reveal possible policies that expand the economy, reduce inequality and enhance happiness in the region. In particular this thesis attempts to answer the following questions:

- Is there a long-run relationship between economic freedom, economic growth, income inequality and happiness in Greece?
- If so, what is the short-run relationship and how are the possible deviations from the long-run equilibrium corrected?
- What is the causal relationship among the variables in our model?
- How are positive shocks on the variables spread among the model and what is their impact on the other variables of the model?
- What factors affect variability of the variables under examination?
- What are the recommended policies for the Greek economy based on the results of the econometric analysis?

Through answering the above questions policy recommendations for the Greek economy may be extracted in an attempt to provide a set of suggested policies that can potentially offer alternative ways of overcoming the economic crisis and fostering economic growth in Greece. Thus, the main aim of the underlying thesis is through an extensive

application of econometric and statistical techniques to investigate the relationship among the variables of interest for the Greek case and propose statistical-backed economic policies that will enhance growth and promote happiness in Greece. The thesis is structured in 6 main Chapters which are categorized in relevant sections and subsections. In particular, Chapter 2 includes an extensive literature review of the empirical and theoretical relationships between economic freedom on the one hand, and growth, income inequality and happiness on the other. Additionally, it provides an extensive description of the term "economic freedom" and analyzes its measurement techniques. Chapter 3 extensively discusses and describes the theoretical background of the empirical models employed along with an extensive discussion of the relevant econometric techniques. This background and these techniques are necessary in order to understand the econometric procedures under consideration.

Chapter 4 provides the empirical results of our analysis and discusses the implications and the results suggested by the models employed. Chapter 4 is of particular interest as all the corresponding policy recommendations and implications for the Greek economy are based on the results presented in this Chapter. In Chapter 5, some policy recommendations for the Greek economy are provided which are based on a thorough analysis of the underlying econometric framework and the corresponding results. Finally, Chapter 6 concludes this thesis.

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2. LITERATURE REVIEW

2.1 Introduction

This section provides a detailed discussion regarding the properties and the structures behind the notion of the economic freedom index and the underlying relationships among the variables of interest in this thesis like economic freedom, growth, happiness and income inequality. More specifically, based on theoretical and empirical premises, a detailed description is offered of the mechanism by which the index of economic freedom is defined and created. In addition, the existing literature is presented in order to investigate the relationship between economic freedom and each of the remaining variables of interest.

2.2 Description of Economic Freedom

The variable "Economic Freedom" comes from the Fraser Institute Index of Economic Freedom created by Gwartney, Lawson and Block (1996). The authors have, together with internationally recognized economists, such as Milton Friedman, through various conferences, defined the concept of economic freedom. The authors declare that the core of economic freedom is "personal choice, protection of private property, and freedom of exchange" (Gwartney, Lawson and Block, 1996). The index is made up of five components of economic freedom, namely Size of Government, Legal System and Security of Property Rights, Sound Money, Freedom to Trade Internationally, and Regulation, which together have 24 sub-components. The figures in the index come from third-party sources and are not made up of any judgments of the authors. Each sub-component is rated on a scale from 0 to 10. The rating of each component is the average of its sub-components and the overall score of economic freedom is the average of the five components.

Lack of economic growth means the continued presence of hardship and poverty. Economic freedom gauges the scope of a free market formation with the central tenets of open competition, voluntary exchange and the safeguard of individuals and property (Williamson and Mathers, 2011). Economic freedom constitutes a descriptive aspect of economic growth and income distribution making it an independent variable, with the goal of characterizing the structure of institutions and the central themes of trade and industry policies. It also affects other variables making it a dependent variable that is shaped by different dynamics such as wealth, political liberty and democracy. A society with a free economy has each person controlling the fruits of their initiative and labor, where individuals are entitled to pursue their goals through free choice. The individuals succeed or fail based on their ability and effort, and the institutions of the free market do not discriminate either for or against class, gender, family, connections or any other factor.

In such an economy, governments decision-making is characterized by transparency and openness that exposes the loopholes where discrimination might flourish, thus promoting equal opportunity for everyone (Xu and Li, 2008). An economically free society has the power of economic decision-making dispersed widely, where the allocation of resources for consumption and production is by open competition, with every firm and person having an equal chance to succeed. These bring about the three main principles for economic freedom of free competition, non-discrimination, and empowerment. Therefore, every development policy and measurement presented in the Economic freedom index can be underpinned by something that is an essential element for human dignity, personal empowerment and autonomy.

Economic freedom, consequently, becomes an end in itself where it achieves broad-based economic dynamism with lasting growth and prosperity. Some editions of the index have documented a positive relationship involving economic liberty and long-term

development. Countries with high levels of economic freedom attain higher levels of income and better health. They safeguard the environment and advance the frontier of human development in science and technology through creativity and innovation. This concept is not new in economic theory as Adam Smith (1776) wrote about how an individual pursuing his interest promotes the growth of the economy. The idea is that when free market agents are allowed to retain the result of their hard work, the overall productive effort of the economy increases with the allocation of resources to the best use. The idea of economic freedom offers a foundation for arguing that the differences in financial performance are as a result of differences in institutions (Williamson and Mathers, 2011).

Several schools of thought, such as public choice and neo-institutional economics, study the association between economic performance and economic freedom. This entails examining black market activities, government regulations, enforcement of private property rights and rent-seeking behavior; elements which are significant as proxies in econometric studies of economic freedom. The importance of economic freedom has led to several attempts to quantify it through the three indices of the Freedom House index, the Fraser Institute index and the Heritage Foundation-Wall Street Journal index. These indices provide a basis for comparison between countries and act as the explanatory variables in regression models (Feldmann, 2007). The two leading indicators for economic freedom are the Economic Freedom of the World (EFW) that is generated by the Fraser Institute, and the Economic Freedom Index (EFI) from the Heritage Foundation.

The Fraser Institute is an autonomous, unbiased educational and research institute located in Canada. The Heritage Foundation was established in 1973 and is a prominent conservative think tank based in Washington D.C. Its main aim is to promote policies anchored on the principles of limited government interventions and market-based economy. The Heritage

Index not only attempts to measure macroeconomic outcome variables for each country, such as inflation, tariff rates, government expenditure, among others, but it also qualitatively analyzes the power of the institutions in every nation to encourage and maintain economic freedom. The Economic Freedom Index, created in 1995, is based on ten freedom categories that determine the overall economic freedom score for each country. The index analyzes the degree to which business, trade, money, investments and financial freedom are present in an economy. It also looks at government spending, monetary freedom, the corruption index and freedom of labor movement.

The Economic Freedom Index aims at measuring the scope of economic freedom in the world's nations with the critical assumption being that economic freedom is a positive societal and cultural influence. It offers knowledge about the degree of competition among countries, the extent of state intervention in an economy and the independence of a country's judiciary in enforcing laws and regulations about private property. The understanding of these indices is important due to the high interest in economic freedom in fields such as development economics. It is a significant factor that accounts for economic growth, perceived from a theoretical perspective only. The enticement that financial players like entrepreneurs, financiers, industrialists, innovators among others experience are primarily shaped by institutions present which can be either efficient or inefficient. These institutions come up with actions that stimulate the economy leading to the production of more valuable output that spur economic growth.

2.3 Economic Freedom and Growth

Economic freedom promotes greater returns on production efforts through an independent judicial system, low taxation, and protection of private property. Talent is therefore subsequently allocated to where it produces the highest returns. It also promotes an active, experimentally structured financial system where a vast number of business transactions are conducted through the probability of trial and error and where competition is stiff with government regulations and enterprises being few. Economic freedom aids in a low and steady inflation rate, coherent and predictable decision making and promotes free trade plus the flow of capital investments to areas with high returns and preference satisfaction rates. Even though, certain types of transformation of institutions are expected to bring positive change to growth effects through the introduction of the kind of incentives mentioned above, institutions alone are not capable of influencing both levels of growth and wealth with all things constant (Ayal and Karras, 1998).

Established institutions spur economic incentives at any given time and shape what financial players do. High levels of economic liberty is acceptable for a vibrant economy that functions and expands even though an increase in economic freedom from the initial low economic freedom levels exerts a unique effect on growth rates for a specific period. A continuous and elevated frequency of growth means that long-standing economic liberty will continue to augment the rate of economic growth, thus increasing the total accumulated wealth. It is the foundation of the theoretical logic that anticipates a positive association linking economic liberty and economic growth; but does evidence from empirical analysis confirm this hypothesis? Baum (1999) believes it does because institutions that warrant economic liberty in most cases can also provide the growth thus encouraging some development.

It is not very hard to prove that economic freedom has a favorable outcome on economic affluence. Global experience from the five decades confirms that whenever governments increase their use of markets and engage in liberalized free market policies that encourage trade and investments, as well as in diverse types of economic freedom, their countries prospered. In comparison, states that looked inwards and formulated all manner of extensive regulations on national decision making in production, innovation and investments are countries that have performed poorly. Gravel and Tarroux (2011) found out that at the initial stages of growth, the extent of the contribution of economic liberty has been insignificant in explaining this growth, but the positive changes that were undertaken to spur up economic freedom did. Other researchers have found that the initial stages of economic liberty are positively associated with an increase in growth.

The results, though, are generally weaker compared to those showing an overall positive effect due to the long-term presence of economic freedom. In others cases, when the change in economic liberty is taken as a variable, the extent of the impact was observed to be statistically significant. Carlsson and Lundström (2002) found that some aspects of the Economic Freedom Index better support economic growth compared to the rest and were statistically positive and significantly related. These were the use of the free market, freedom to use alternative currency, protected property rights, freedom of exchange, trade liberalization and freedom to trade in the capital markets. Two others were negatively associated with growth, i.e. government size and international trade, while one was not statistically significant to economic growth, i.e., price stability and monetary policy. The two negative interactions relate to the theoretical viewpoint, and when compared to their statistical results, economic freedom is inversely proportional to the size of government.

It also means that the more a country engages in international trade (imports), the slower the growth rate (Ayal and Karras, 1998). The challenge with this type of collective measurements of components is that some public activities will have a positive impact on the rate of economic growth while others will not. Therefore, individual components should be called for, as they make definite policy decisions possible especially those from institutions that have transformed since the time of these past studies (Gwartney, Lawson and Holcombe, 1999). Public undertakings above and below certain levels may hinder growth but may promote economic growth at a balanced middle level, making the relationship nonlinear. Other studies examined GDP per capita's rate of expansion as a function of economic liberty, and overall the outcomes were in line with previous research. Gravel and Tarroux (2011) studied the link connecting economic liberty and GDP per capita and found it to be definite and considerable. Easton and Walker (1997) state that the extent to which the political process intervenes in the economy and the structure under which the market economy operates is essential to a nation's wealth.

Xu and Li (2008) assert that the construction of the Economic Freedom Index (EFI) needs to be scrutinized as only some aspects of the weighting schemes (formulated) showed a link to economic growth. Gravel and Tarroux (2011) used EFI to show that the less developed nations that have better protection of economic rights have higher growth rates with an advanced degree of human well-being and national income. Gwartney, Lawson and Holcombe (1999) investigated the connection involving economic liberty, political free will and growth, and found that economic freedom is central to economic expansion as well as observing that elevated levels of income are a necessary consequence of political freedom.

De Soysa and Vadlammanati (2013) utilized a version of the Scully-Scuttle economic freedom index included in the Solovian, and the results indicated a positive correlation

connecting economic liberty to growth. The findings show that affirmative rights hamper growth and vice versa. The authors also indicate how numerous legal and constitutional issues together with economic liberty impact economic convergence where they defined the economic liberty variables with the most significant impact. It is essential for researchers to be careful when they interpret empirical results especially in cases where sensitivity analyses have not been used and where there is a lack of panel data. The underlying connection involving variables can be vague especially in instances where the link between economic liberty and growth is established and the question posed is: does economic freedom lead to economic growth?

Alternatively, the converse is the case, as Kolm (2010) suggested. Specifically, he argued that economic liberty cannot forecast potential increases in growth in a significant way. Gravel and Tarroux (2011) did make a similar conclusion using the Heritage Foundation freedom index and identified that the extent of economic liberty precedes growth. Kolm (2010) also observed common causation factors for economic freedom and growth but did not analyze the causal connecting economic growth and freedom. Dawson (2008) states that the present studies can easily determine the association involving economic growth and liberty but the causation cannot be established. By using the Granger-causality technique, the author finds that the extent of economic liberty influences growth, while a boost in economic liberty is associated with economic growth (Doucouliagos and Ulubasoglu, 2006). The difficulty of this connection is observed when some EFI elements do cause growth, especially the use of markets and protection of property rights; others lead to economic growth; while some features are jointly determined with economic expansion.

Gould (1982), states that results from past studies to find out the link between economic liberty and wealth were discordant. The author evidence indicates that a high degree of

economic freedom is concordant with a constructive economic environment, mainly where there are institutions that foster a high degree of income equality. Gravel and Tarroux (2011) found that the scope of economic liberty increases economic growth rates making the EFI index a significant determinant of macroeconomic growth. This would be achieved by raising the allocation of market proceeds that go directly to the poorer income quintile and lowering the percentage of income that goes to the wealthiest quintile. Carlsson and Lundström (2002) further argue that financial systems with more significant coverage of economic liberty account for more massive per capita income and elevated rates of economic development.

Other studies look at the association involving the impact of the scale of economic liberty on social and financial matters which range from the structure of government institutions to health issues and human migration. In general, the increase in coverage of economic liberty is connected with undesirable societal and economic outcomes. Several economists now agree that economic freedom is one of the pillars of a country's institutional constitution. Institutions are amongst the prominent factors in explaining cross-country differences in living standards (Doucouliagos and Ulubasoglu, 2006). According to the Economic Freedom of the world annual report (2016) the five main areas of economic freedom are:

1. Government size: when the government spends more relative to spending by businesses, household and individuals, the decision making by the government is substituted for individual choice and economic liberty decreases.

2. The structure of the legal system and protection of property rights: The rule of law and safeguarding of property rights is essential to economic liberty.

3. Access to money: Countries that formulate and enhance institutions that encourage single-digit inflation rates and expunge regulations that hinder the use of alternative currencies have high levels of economic freedom.

4. Autonomy to trade globally: For this to happen, a country must possess low tariffs, a competent custom administration as well as a limited control on the flow of capital, a large trade segment and a freely exchangeable legal tender.

5. Business and credit regulations: To achieve high levels of economic freedom, the market must be free to determine prices where there are limited regulatory interferences that increase the cost of production and lock entry to the economy.

A difference exists between political freedom and economic freedom. The former is about participation in the political process on equal terms through a free and fair election. Another difference relates to civil liberties which concern privacy protections, free and fair trials and freedom of speech and religion (Kuloglu, Lobont, and Topcu, 2010). Specific aspects like the extent of openness, corruption, economic structure distortions and size of government interventions are all quantified in both commercial and political freedom (Bengoa and Robles, 2003).

Several studies have suggested that economic liberty makes a positive contribution to the well-being of citizens as nations that possess increased levels of economic freedom tend to have high levels of economic growth (Azman-Saini et al., 2010; Berggren, 2003; Carlsson and Lundstrom, 2002; Cole, 2003; Dawson, 2003; De Haan and Sturm, 2000; Easton and Walker, 1997; Gordillo and Alvarez, 2003; Justesen, 2008; Scully, 2002).

People who live in environments with greater economic liberty are wealthier regarding overall well-being as measured through the GDP per capita (Farr et al., 1998; Hanke and Walters, 1997) in comparison to those in nations with less economic liberty. Economic freedom also positively affects other aspects of life such as reduced levels of joblessness (Grubel, 1998; Gwartney et al., 1997), more equal income distribution (Berggren, 2003; Scully, 2002), high life expectancy (Esposto and Zaleski, 1999), better environmental management (Norton, 1998), low

levels of poverty (Connors and Gwartney, 2010), and superior education and healthcare (Stroup, 2007). Economic freedom is, therefore, linked to many socio-economic benefits. Bergh and Karlsson (2005), point out that the Economic Freedom Index was developed primarily to make available worldwide comparisons of institutions between countries ranging from economies that are planned entirely and highly capitalist societies.

Individual freedom, according to Haan and Sturm (1999), relates to the right that someone can make economic activities free from arbitrary control and interference by the state and other individuals. Collective freedom is the scope to which an economy determines individual choice and it concerns itself with the preferences of the majority rather than the sentiments of the few. The neoclassical economic theory states that three factors, namely human resources, capital and technology are the prerequisites for economic growth. Recent research shows that policies which favor growth are associated with economic freedom and they also conform to the following three theories of economic growth.

Schiliro (2017) presents the neoclassical growth theory, which explains the constant increase in per capita income and is a characteristic of a great many market economies during the last two centuries. According to the neoclassical growth model, production occurs in conditions of competition and capital accumulation is the driving force behind output growth. The second theory is the geographic and location theory of economic growth (Diamond, 1997; Gallop, Sachs and Mellinger, 1998; Sachs 2001), which states that the environmental circumstances and access to significant markets are critical determinants of economic growth. The third theory is the institutional approach, which emphasizes the importance of an institutional guideline and policy framework for the smooth operations of markets in order for a country to gain from trade and entrepreneurial activities (Hayek, 1945; North,1990). Doucouliagos and Ulubasoglu (2006:68) proved through a meta-analysis of 52 past studies

relating to the impact of economic liberty on economic growth that "economic freedom has a robust positive effect on economic growth regardless of how it is measured". They concluded that countries with high levels of economic liberty enjoy high growth rates with greater factor efficiency, a relationship that is not only of great economic significance but is statistically significant.

Also, economic freedom has a more substantial effect on economic growth than political freedom does. Financial freedom is an essential aspect of financial performance and has received significant attention from many researchers. Although Carlsson and Lundstrom (2002) found that many economic freedom measures have an essential effect on the growth of GDP, this fact does not mean that increasing economic freedom increases economic growth because some categories of economic freedom relate negatively to it. Heckelman argues that not every type of economic freedom will increase growth as there is a possibility for growth to be prevented (2000). Through the Granger - causality tests, the author defines the economic freedom index as an essential element of economic growth which is positively and considerably interrelated (Heckelman, 2000). Some studies, Blomqvist (2004), Bergh (2005), Rothstein and Lindbom (2004), explain why some countries with higher taxes have experienced steep increases in economic freedom and globalization.

Whichever the relationship, if any, between government size and growth, analysis of a country's economic freedom and globalization is significant. If government size is unrelated to growth, the poor growth noted in previous studies of OECD countries with high levels of taxation prior to reforms of the 1990s could in part be due to levels of economic freedom and globalization in those countries. Alternatively, if government size and growth are negatively related, then considering the effects of economic freedom and globalization will enable a better estimate of the negative relationship between government size and growth. It is worth raising

the question of why countries with small government do not have as high levels of economic freedom and globalization as those countries with big government (Bergh and Karlsson, 2005). They also believe that monetary disturbances and unexpected inflation alter the value of money and threaten economic freedom. Nelson and Singh (1998) use economic liberty as a control variable as they analyze the link between economic development and political freedom. Their model refers to the period 1970 to 1989, and examined 67 developing countries. They used government size, price stability, trade restrictions and discriminatory taxation as measures of economic liberty and their study deduced that economic freedom has a positive impact on economic growth. Numerous studies have utilized economic growth as the dependent variable and economic freedom as an independent variable.

There are also studies where economic growth is used as the dependent variable with the change in economic freedom index taken as the independent variable. The result that arises is significantly positive (Adkins, 2002; Ayal and Karras, 1998; Pitlik, 2002; Weede and Kampf, 2002). There are also other studies such as those of Ali and Crain (2002), Carlsson and Lundstrom (2001), Dawson (2003), Goldsmith (1995), Hanson (2000), Mahmood et al. (2010), Pitlik (2002), Weede and Kampf (2002) which have utilized economic growth as the dependent variable and the extent of economic freedom index as the independent variable with the results showing a significant and positive relationship. Cebula (2011) investigated the effect of economic liberty on economic growth in OECD countries using both panel two-stage least squares estimations and panel least squares estimations. The results showed the natural log of purchasing-power- parity when adjusted for GDP per capita for the OECD nations had a positive impact measured through business freedom, monetary freedom, labor freedom, fiscal freedom, investment freedom, property rights freedom and freedom from corruption.

Farr (1998) has demonstrated that there is a link between economic freedom and the level of GDP through his study on causality between economic liberty and the level of GDP. Also, Heckelman (2000) found a causal connection between economic growth and freedom and proposed that the average degree of economic liberty precedes economic growth. De Haan and Sturm (2000) found that economic freedom leads countries to their steady-state level of economic development easily and fast, but that it is difficult to increase the rate of steady-state growth. Positive results have appeared through the study of Vega-Gordillo and Álvarez-Arce (2003), where they show that economic freedom seems to enhance economic growth. Additionally, however, Dawson (2003) indicates that economic liberty is the result of economic development rather than its cause.

Nobel Prize winner Amartya Sen (2006) believes freedom is both the goal and the means of development as he divides freedom into five components: "economic empowerment, political freedoms, social opportunities, protective security and transparency guarantees". He further claims that one form of freedom usually leads to another, making the study of political freedom interesting in connection with economic freedom. Likewise, Milton Friedman cited in Berggren and Nilsson (2012), believes that political freedom fosters economic freedom, which in turn stimulates economic growth. Another author who studied the concept of freedom from a theoretical point of view is Douglass North in his paper The Paradox of the West (1993), where he discusses the development of freedoms along with sustained economic growth. He believes that these concepts emerged simultaneously, as Western European countries, due to external circumstances as well as the bargaining power of their merchants, were forced, for their survival, to give power to parliaments and ensure property rights. Institutional change fundamentally transformed the structure of society, by granting citizens economic, political and religious freedoms, which ultimately enabled sustained economic growth. Furthermore, North argues that

technological progress and investments in human capital are not the fundamental source of economic growth, as argued by many other economists, but instead it is the role of an economy's institutions in promoting and protecting profitable economic activity that is the determinant of growth. Rule of law, through rightful courts, property rights and enforcements of contracts, as well as liberty to trade freely without excessive barriers and taxes are, according to North, the most important features of economic freedom as drivers of growth. De Haan and Sturm (2000) observed through their study that there are high percentages of growth in the framework of an environment that ensures economic freedom. Their paper has compared various indicators of economic freedom concluding that those indicators express similar rankings regarding the mentioned countries. However, there are some factors which are questionable in the framework of the relationship between freedom and growth and they concluded that while economic freedom fosters economic growth, the level of economic freedom is not related to general growth. Carlsson and Lundstrom (2002) conducted a research into the types of freedom required for economic growth as shown by many other studies related to this topic. Specifically, they found that there is a positive relationship between economic freedom and GDP of a state. Their findings have shown, however, that there is a problem regarding the choice of measures concerning economic freedom. There are some indicators of the economic growth index that have negative effects. Scully's (2002) research study refers to the role of economic freedom regarding market income and the role of government policies towards the promotion of income equality. It acknowledges that economic freedom promotes both economic growth and equity and also reveals that there is a positive relationship between growth and income inequality. Hafer (2013) claims that high levels of economic freedom are related to economic growth. According to his study, the question to be answered is whether the financial development growth nexus is correlated to economic freedom in the framework of a

specific financial statement. His paper concludes that countries with high levels of initial economic freedom demonstrate greater levels of financial development.

2.4 The Effect of Trade Openness on Economic Freedom and Economic Growth

In this section, the author aims to investigate how trade openness impacts economic freedom and growth. The latest rankings regarding trade freedom around the world, based on a research by the Heritage Foundation 2018 Index of Economic Freedom, demonstrate that citizens of countries that enjoy free trade are better off than those in countries that do not.

Trade freedom is a composite measure of the absence of tariff and non-tariff barriers that influence the import and export of goods and services. The trade freedom score is based on two inputs: the trade–weighted average tariff rate and non–tariff barriers. The sub-components are: tariffs (revenue from trade taxes (% of trade sector)), mean tariff rate, standard deviation of tariff rates, regulatory trade barriers (non-tariff trade barriers, and compliance costs of importing and exporting), black-market exchange rates, and controls of the movement of capital and people (foreign ownership / investment restrictions, capital controls, and freedom of foreigners to visit). Each sub-component is rated on a scale from 0 to 10. The rating of trade freedom is the average of its sub-components (Gwartney and Lawson, 2000). The data exhibit a strong correlation between trade freedom and a host of positive indicators such as economic prosperity, improved environmental conditions and generally cleaner environments, as well as gross national income per capita. In 1817 David Ricardo published that in a globalized world, all nations profit from international trade, even those with undeveloped industries. These countries still profit from trade as they can focus on their most competitive areas, and import other goods. This theory covers all restrictions to trade, such as tariffs, trade barriers and regulations.

Economic theory recommends that countries with decreased barriers to international trade and investment will succeed, in contrast to countries that restrict trade. The 2018 Index of Economic Freedom offers proofs that support this idea.

International trade greatly benefits the citizens and commerce of a country. Specifically, it contributes to an increase in both consumer and producer surplus, so that economic welfare is also achieved (Srinivasan, 1999). As Hall and Jones noted (1999), traditional (static) theories, such as those of Ricardian and Hecksher-Ohlin, state that trade liberalization leads to welfare improvements as specialization gains and exchange gains create higher output. The work of Razmi and Refai (2013) examined how economic freedom influences economic growth using data from 17 Middle East and Asian countries for the period 2000-2009. Their conclusions strongly suggest that openness and economic freedom to trade are great determining factors of economic growth, finding that the connection is both positive and significant. Depken and Sonora (2002) found a strong connection between the economic freedom of a country and the volume of exports of consumer goods and services from the U.S. to that country, stating the effect was positive and statistically significant.

Similarly, in Sonora's 2005 paper estimating the relationship between economic freedom and U.S. consumer exports and imports for the period 2000-2005 for 131 countries, utilizing the Frazer Institute's Economic Freedom of the World Index, it was concluded that an increase in economic freedom in the rest of the world would produce an increase in U.S. total trade volume.

2.5 Economic Freedom and Happiness

The scientific study of happiness is comparatively new. The field got its start as philosophers began to discover the importance of living a unique and meaningful life. In recent times, researchers in the sector of psychology have made a thriving subfield known as positive psychology. It is accepted that the level of happiness is affected by an individual's income. Primarily, a higher income causes a feeling of increased security and consumption. In addition, people with higher incomes usually contrast themselves with those who have less. After making this comparison and while noticing their relative success, or failure, individuals are more or less happy something that is based on how they compare to others. Income, as is already noted, is a significant factor for an individual's perceived happiness, so that total measures of income, like GDP per capita, should influence total measures of happiness.

Richard Easterlin is one of the first economists that tried to explain the field of happiness economics and became famous for what is now known as the Easterlin Paradox. This paradox presented the strong correlation that exists between individual income and happiness, but as the Easterlin paradox explains, there is no such positive connection between GDP per capita and national happiness (Easterlin, 1974). Although Easterlin managed to become famous with this empirical observation, his assertions are highly debated.

Frey and Slutzer (2004) demonstrate that people are happier when they live in democratic political institutions. Specifically, democratic authorities accomplish great political effects closer to the favored actions of their citizens. This fact drives happiness to record levels.

It is also shown that democracy, and more specifically the quality of democracy, is a very important factor for happiness (Inglehart, 2016). If political institutions and economic

development care about happiness, in consequence economic freedom, which is compatible with both democracy and economic growth, should also clearly influence happiness.

Economic freedom influences happiness as in a direct manner it expands the attainable choices, (Index of Economic Freedom, 2011).This occurs as institutions of economic freedom lead to huge wealth and prosperity and as people have autonomy in their decision-making. If there is no economic freedom, then people have to accept forceful decisions, which decrease their happiness in general. Jackson (2016), specifically using data from the U. S., pointed out that there is positive relationship between economic freedom and happiness at the state-level.

A number of studies suggest that economic freedom and life satisfaction are linked in two ways (Graafland and Lous, 2017). One way concerns happiness which is derived from living in an economically free country, and a second way which refers to the fact that economic freedom gives individuals a feeling of greater control over their own lives.

Several recent studies show that economic freedom is associated in a positive manner with happiness (Ovaska and Takashima, 2006; Veenhoven, 2000). Bjornskov, Dreher and Fischer (2010) claim that the linkage between measures of institutional quality (such as freedom) and happiness are not the same in rich and poor countries. Ott (2010a, 2010b) asserts that the connection between government size (a component of economic freedom) and happiness is dependent upon the quality of the governance. Verme (2009), gives a theoretical argument and empirical evidence that “freedom of choice” is an extremely effective and important factor in causing happiness.

Veenhoven (1984) defines happiness as the way someone evaluates the overall quality of his or her present life-as-a-whole positively. Another meaning that is given to this term is how much a person enjoys his or her life.

Due to the lack of proper empirical measures of happiness it was not possible for a long time to sufficiently approach issues involving happiness. However, during the last four decades the research on happiness has made tremendous progress. A number of studies by economists, psychologists, sociologists and others have shown that happiness, through subjective experience, can also be objectively measured. Consequently, since happiness is a conscious state of mind, it can be measured either by surveys, scales of positive and negative effects, mood analysis and frequency of positive emotional experience as well as analysis of facial expressions among other methods (Kalmijn, 2015; Vendegodt, 1996; Veenhoven, 2000).

Norton (1998a) and Grubel (1998) have each shown that many aspects of economic freedom are positively correlated with life expectancy, literacy rates and the predominance of extreme poverty. Holcombe's (2002) view implies that the expansion of democratic political rights in society could appease the beneficial impact that economic freedom can be expected to have on the happiness in society. There are many cross-country studies in which it is demonstrated that economic freedom is positively correlated with a great many measures of prosperity and human welfare in society. Friedman (2002) claimed that creating economic freedom in the world was an essential but not sufficient step for creating political freedom. He believed that these specific types of freedoms were very likely joined in their respective impact on the happiness in society and wanted a more in-depth analysis between them. There are also several studies which argue the great influence of economic freedom over the level of prosperity as well as over economic growth in society (see Nelson and Singh (1998) and Wu and Davis(1999)).

Additionally, Grubel et al. (1998) argue that there is a clear relationship between economic freedom and human development. Furthermore, Grubel's analysis also reveals a very strong and consistent relationship regarding the impact of economic freedom on infant mortality.

More specifically, the higher the level of economic freedom that exists in the society, the lower the infant mortality. Grubel (2014) has provided evidence that the 40 percent of countries with the least economic freedom have the highest levels of poverty, while the 40 percent with the highest economic freedom have the lowest poverty levels, by a large margin.

The Economic Freedom Index is used by many authors in order to prove that higher economic freedom is a crucial factor in the improvement of criteria which are vital for human well-being such as income levels, income growth, unemployment rates and human development.

Many authors strongly suggest that economic freedom coupled with political and civil freedoms, improve the economic prosperity and the happiness in the world and this fact tends to aid in the pursuit of social progress. In particular excluded groups such as women and the poor can be helped and a great number of citizens can acquire greater literacy and improved health. There are studies (Kešeljević, 2007; Steve and Stephen, 1997) which show that improvements in economic freedom usually cause increases in well-being and may play a vital role in promoting happiness via other aspects of well-being.

Nikolaev (2014), claims that a very important effect of economic freedom is strongly associated with some aspects of happiness like community, safety and life satisfaction, which are non-material. In this way, a higher level of economic freedom can assist in the strengthening of social networks, enhance the quality of the local environment, encourage more people to strive for higher education and discourage people from committing socially destructive behaviors. Nikolaev et al. (2014) demonstrates that economic freedom is favorably correlated with higher educational attainment and student skills, and with greater health outcomes, including self-reported health. Hall (2010), argues that via economic freedom, higher investment inhuman capital can be achieved, which can lead to better educational outcomes.

Similarly, Stroup (2007) concludes that when countries have more economic freedom, some benefits of great importance for a society can be achieved, such as a higher adult literacy rate, longer life expectancy, lower mortality rate and better disease prevention. According to Sen cited in Mahadea (2012), people who live in countries with a high degree of economic freedom also enjoy a better and higher material standard of living and better quality life with regard to sectors such as community, education, environment, governance, health, life satisfaction, safety and work-life balance. Furthermore, it is found that people who live in countries with institutions where the basic principles of economic freedom are firmly established are less likely to work long hours, more easily find a job and usually have better income and household wealth (Scully 2002; Stroup 2007). In addition, it becomes easier for those citizens to enjoy clean air and water, safer neighborhoods, stronger social networks and higher levels of life satisfaction. Additionally, those people are less likely to experience long-term unemployment. Hall and Lawson (2013) show that economic freedom is strongly correlated with many beneficial outcomes, concerning faster rates of economic growth, higher investment in physical capital, lower unemployment rates and rapid decrease in poverty.

Ott (2010) finds that the effect of economic freedom is coherent across both genders. Additionally, while women have a higher average life expectancy than men, both men and women are more likely to live longer in countries with more economic freedom. Similarly, while men are more likely to be employed than women, countries with a better degree of economic freedom also have much higher employment rates for both genders. Economic freedom has an impact of greater importance on the health, safety and general life satisfaction of women than it does for men. Economic freedom, however, has a perceptible impact on the health, education, safety, and living conditions of people no matter if they are rich or poor. Poorer people who live in countries with high economic freedom usually enjoy a less-polluted

environment and are more likely to enjoy better health. In addition, it is not very common for them to be assaulted but there is a greater likelihood they have a stronger social support network and present higher educational skills.

It is known that economic freedom creates economic growth and higher personal income, something that also influences several aspects of wellbeing, such as health and education. Also, higher economic freedom is also associated with an improved material standard of living and it is found that economic freedom may have still better effects in various areas of well-being, specifically those regarding non material outcomes such as the strength of social networks and life satisfaction. Also in the short run a higher level of economic freedom is connected with higher human development. Researchers have found that countries with a high level of economic freedom obtain better outcomes in many significant areas regarding the happiness such as better job opportunities, higher incomes, stronger social support networks and finally advanced life satisfaction. Moreover, the favorable effect of economic freedom tends to be consistent across genders and income classes.

Higher economic freedom, benefits the standard of living of the richest quintile much more than the material well-being of the poorest one. A high level of economic freedom is with stronger social support networks, better educational outcomes, and higher life satisfaction even among income earners in the bottom quintile. Summarizing, according to data from the Human Development Index, between 1972 and 2010, it can be concluded that economic freedom leads to an increase in human development in the short run (five years) as well as in the long run (ten years). Similarly, a large number of authors argue that economic freedom results in a favorable contribution to well-being.

Countries with high economic freedom tend to acquire higher rates of growth (Azman-Saini et al., 2010; Berggren, 2003; Carlsson and Lundstrom, 2002; Cole, 2003;

Dawson, 2003; De Haan and Sturm, 2000; Easton and Walker, 1997; Gordillo and Alvarez, 2003; Justesen, 2008; Scully, 2002). Also, countries with higher economic freedom are more successful regarding human well-being as measured by GDP per capita (Farr et al., 1998; Hanke and Walters, 1997) than those with lower economic freedom. Economic freedom also has a favorable effect on many aspects of human well-being such as lower unemployment (Gwartney et al., 1997; Grubel, 1998), higher life expectation (Esposto and Zaleski, 1999), more equitable income distribution among social groups (Berggren, 2003; Scully, 2002), lower poverty (Connors and Gwartney, 2010), more desirable quality of healthcare and education (Stroup, 2007) and more attractive ecological consequences (Norton, 1998). Overall, it can be said that economic freedom is associated with a great deal of socio-economic advantages.

Happiness according to (Oishi et al. , 2013; Veenhoven, 2001) is explained as the degree to which someone evaluates generally the quality of his present life as a whole positively. Happiness and life satisfaction seem to have a similar meaning but actually the former depends on the individual's respect for his life and the latter is related to the degree of the individual’s control over his life. According to Spruk and Keseljevic (2015), societies with higher economic freedom enjoy stronger rule of law, fairly protected property rights, great market openness and better regulatory environment relative to those with lower economic freedom. Gropper (2011), in a large cross-national study of more than 100 countries, finds that there is a positive association between economic freedom and national happiness. Also, personal and political freedom is strongly correlated with happiness in rich nations but not in poor nations.

The beneficial effects of economic freedom on happiness in rich nations can be interpreted in the light of the trade-off between economic freedom and social cohesion. People from Scandinavian countries feel very happy, while their governments are greatly concerned with income redistribution and cohesive social policies established on egalitarian norms. Sen

(1999) believes that the influence of freedom on happiness is affected indirectly via material endowments and grants and directly through subjective pleasures of life. There is a great amount of evidence which implies that happier societies can enjoy a better level of material well-being. Nevertheless, (Easterlin, 1974) has proved that after an increase in income, there is not a similar increase in the level of happiness. Spruk and Keseljevic et al. (2014), based on their analysis of 136 countries, recommend that after making allowances for potential confounding factors advocated by existing literature like unemployment rate, social capital, income health and life satisfaction, religion and crime, a higher level of economic freedom causes a much higher level of subjective well-being. Five cultural variables are considered to determine the level of economic freedom in order to address and capture possible omitted variable bias and reverse causality: Power distance index, individualism versus collectivism, uncertainty avoidance, long-term versus short-term orientation and indulgence versus restraint. Veenhoven (2000b) examined the effect of freedom on happiness in a comparative study of 46 nations in the early 1990s in an attempt to distinguish which variants of freedom contribute most to happiness and under what conditions. He found strong zero-order correlation and partial correlation between freedom and happiness, after controlling for possible effects of wealth.

According to Diener and Suh (2000), there is a positive relation between freedom and happiness, but only for rich countries and only when the opportunity and capability exist. They suggest that this is not the case with economic freedom, however, as their findings show that opportunity to trade freely has a positive impact on happiness only in poor countries, and most greatly where there is the least capability to choose.

The favorable effect of economic freedom on subjective well-being is robust according to many authors and especially after controlling for a broad array of established correlates and potential reasons for happiness such as unemployment rate, income inequality, public health,

civil, political and religious freedom, crime and violence, social capital and life satisfaction (Gehring, 2013). The results recommend that the basic impact of economic freedom on national happiness can be hypothesized independently of different indicators of institutional quality like the rule of law and control of corruption though both sets of measures are correlated with economic freedom. Verme (2009) claims that global freedom in which political freedom is included contributes to economic freedom and conversely economic freedom contributes to happiness.

2.6 Economic Freedom and Income Inequality

It is an open question how the disposable incomes of different individuals and groups are affected by an increase in economic freedom. On the one hand, economic freedom is negatively related to income equality in a static sense (that is, if one looks at the partial, immediate effect of a policy change) and if the income measure is disposable incomes (because the lower taxes and welfare expenditures generally associated with more economic freedom can be expected to reduce the relative position of low-income earners). On the other hand, increases in economic freedom affect the growth of gross incomes positively and if low-income groups have a higher growth rate than others as a result of greater economic freedom, income distribution may become more equal.

Three empirical studies suggest there is a statistically positive relationship between economic freedom and income equality under particular conditions. Berggren's 1999 study shows that between 1975 and 1985 an increase in economic freedom in a country is related to an increase in income equality around 1985. This result is valid for developing countries which experienced more liberalized trade and deregulation of the financial system. In this study Gini coefficients and the comparative income or consumption shares between low and high income

groups were used to measure equality. However, in 1985 there seems to be a negative relationship between economic freedom and economic equality, which may be due to reduced redistribution. Grubel (1998) regards the issue another way by examining in seventeen countries with a GDP per capita over $17000the relationship between income equality and GDP per capita, economic growth and economic freedom. His results suggest that greater income equality is associated with lower levels of GDP per capita, economic growth and economic freedom. According to Scully (2002), estimates of a structural model and reduced-form models show beneficial effects of economic freedom on economic growth and equality due to its significant negative impact on gain coefficients.

In fact, with respect to the end of the 2000s income distribution in Europe was more unequal than in other OECD countries, though notably less so than in the United States (BonesmoFredriksen, 2012). Examination of Eurostat (2014) figures shows how income inequality spread from the late 1970s to the late 2000s. At the beginning of this period income inequality began to grow in Anglophone nations, especially in the UK and the USA. The trend continued in the late 1980s across other OECD countries to the point where, by the late 2000s, income inequality had increased not only in countries historically associated with the phenomenon, such as the USA, but also in countries with a history of low income inequality, such as Denmark, Germany and Sweden, which experienced the greatest growth in income inequality. What is more, this rise in inequality appears to have strengthened since the onset of the Great Recession of the late 2000s, according to Eurostat (2014).

There are several empirical studies analyzing the relationship between economic freedom and income inequality. Their findings have yielded mixed results. The lack of consensus is partly due to the differences in the samples and the empirical methodology. Economic freedom promotes economic growth which in turn affects income distribution. In

addition, it is widely accepted that the amount of economic freedom improves and raises the rate of economic progress. In addition, economic freedom is a positive and important macroeconomic determinant of growth. It is acknowledged that greater liberties and economic freedom diminish income inequality.

The most popular single measure of income inequality is the Gini coefficient. The Gini coefficient measures the difference between the actual distribution of income among the population and an equal distribution of income. The Gini coefficient is bound between zero (a perfectly equal distribution of income) and 1 (a perfectly unequal distribution of income). If the Gini is equal to zero, everybody has exactly the same income. If the Gini is equal to 1, one person has all of the income and the rest of the population has none. Thus, the higher the value of the Gini coefficient, the less equal the income distribution.

Economic theory does not so far provide clear guidance on the anticipated relationship regarding economic freedom and income inequality. Berggren (1999) provides a theoretical framework on the way that economic freedom influences income inequality via different channels. He concludes that the net result of economic freedom both in levels of and impacts on income inequality is hypothetically ambiguous. Furthermore, he indicates that although the level of economic freedom is positively connected with inequality, changes that improve economic freedom over time cause lower inequality. Berggren et al. (1999) also supports the fact that a positive change in economic freedom requires lower taxes and fewer government regulations. He states that progressive increases in economic freedom positively affect both equality and income growth within the nation. A similar conclusion arises from De Soto (2000) who concluded that there is an ambiguity concerning the effects of economic freedom on income distribution.

Other studies indicate a negative relationship between changes in economic freedom and income inequality. The implementation of policies favoring economic freedom may increase income inequality in the short run because of the redistribution benefiting the rich. Nevertheless, in the long run economic freedom may benefit the poor due to economic growth.

Moreno and Guerrero (2000) investigate the relationship between economic freedom and income inequality in the EU countries using panel data and they conclude that not all categories of economic freedom influence income distribution correspondingly. While government size and regulation are positively related with income inequality, legal system and property rights, sound money, and freedom to trade internationally seem not to be remarkably associated with income distribution. Bennett and Cebula (2016) find that economic freedom leads to higher inequality.

Bergh and Nilsson (2010) observe high levels of inequality in nations with higher levels of international trade, with an apparent increase in inequality when moves are made towards greater economic freedom, most notably in rich nations. There appears to be some confusion regarding the actual relation between economic freedom and effective social and economic policies. De Haan and Strum (2000) further contribute to this uncertainty by pointing out how ambiguous the reported effects of economic freedom are, concluding that some measures seem to exhibit a pronounced impact, while other measures show no impact.

Berggren (1999) argues that trade openness and financial deregulation cause an important negative impact on income inequality. Scully (2002) demonstrated that the size of government is related to greater income equality, but that government intervention in the form of state-owned enterprises is associated with greater income inequality.

Both Berggren (1999) and Scully (2002) use a small sample of countries, whereas Carter (2006) estimates a linear fixed effects model implementing an unbalanced panel of 123 countries over six time periods during the years 1975 and 2004.

Carter (2006) concludes that the relationship between economic freedom and income inequality is positive, statistically significant and relatively inelastic. He discovers that while the short run effect of greater freedom is to enhance greater equality in income distribution, over the long run, this is not the case over a longer period of time. Greater freedom, he contends, will ultimately lead to greater measures of income inequality. Also it is argued that economic freedom eliminates legal barriers which defend politically favored groups and provides economic opportunities to less privileged and lower-income individuals. Economic freedom aids income inequality as it creates opportunities for the poor because equal access to property rights is created which are necessary for the generation of capital for everyone.

Also, economic freedom advances economic growth, which in turn influences income distribution. This result is mainly because of the anticipated differential result on inequality of various components including a measure of economic freedom**.** Bennett and Vedder (2013), describe the relationship between levels of economic freedom and inequality using panel analysis. Specifically, using this method they fail to find a statistically significant relationship between the level of economic freedom and income inequality in the USA.

In particular, they conclude that a rise in economic freedom causes a fall in income inequality. Many authors propose that government redistribution, which reduces economic freedom, can easily lead to an increase in equality. Clark and Lawson (2008) find that progressive taxation and redistribution policies increase equality. In addition, specific aspects of economic freedom such as property rights, sound money, trade openness and limited government correlate very strongly with increased income equality.

Scully (2002) provides an analysis which is based on a three-equation model of economic freedom, growth and inequality. He uses a sample of 26 nations (advanced countries and some newly industrialized Asian nations) with a sum of 86 observations for the years 1975, 1980, 1985 and 1990. He found that higher levels of economic freedom decrease income inequality (i.e. lowers the Gini coefficient) and concludes that economic freedom and income inequality are negatively correlated across countries. Furthermore, he argues that rises in economic freedom improve income equality through the increase in the share of market income earned by the two lowest income quintiles and a decrease in the share of the highest quintile.

In contrast, with Berggren (1999) and Scully (2002), who used Gini coefficients, Carter (2007) takes Gini coefficients from the UNU/WIDER World Income Inequality Database and indicates some methodological weaknesses of prior studies. Specifically, he implements panel-study methods and estimates for a fixed-effects model of country-level Gini coefficients as a function of economic freedom, containing a number of control variables like per capita income, political structure, education, demographics and industrial composition. Furthermore he takes into account that the potentially opposing effects of economic freedom on income inequality can create a nonlinear relationship.

Carter et.al. (2007) also points out that beginning from a low level of economic freedom, increases in economic freedom can have a negative result on income inequality, but that beyond a relatively low level of freedom, extra increases produce increased inequality. He concludes that the relationship between economic freedom and income inequality is positive, statistically significant and relatively inelastic. His study contrasts with Berggren's. Instead, using Berggren's results, Carter deduces that while the short run effect of greater freedom is to advance greater equality in income distribution, this is clearly not the case over a longer period of time. Greater freedom, he contends, will finally cause greater measures of income inequality.

He concludes that there is a tradeoff between economic freedom and income inequality adding to the ambiguity in the relationship between these two factors. Gwartney and Lawson (2002) conclude that economic freedom declines whereas taxes, government expenditures and regulations are substituted for personal preference, voluntary exchange and market coordination. A similar conclusion arises from the study of Li and Zhou (1998) who argue that greater income inequality could lead to higher economic growth on condition that government consumption enters the utility function.

Apergis *et al.* (2013) uses panel-country data to study the dynamic relationship between economic freedom and income inequality. He finds that a non-linear relationship exists between the Economic Freedom Index and income inequality in his country sample. Specifically, he studies the Granger-causal dynamics in both directions by using a panel error correction model framework. In addition, they find for U.S. during the period 1981-2004, that economic freedom has a negative impact on income inequality, though there is bidirectional causality among income inequality and economic freedom both in the short and the long run. They explain that high inequality may reduce economic freedom via the implementation of redistributive policies, and in turn lower economic freedom would increase income inequality to a greater extent.

Nations with higher economic freedom usually enjoy a more equal income distribution. As regards the advanced nations, an increase in economic freedom favorably affects the poorest income class and negatively affects the richest income class, but there is no change on the middle class (Scully, 2008).

As concerns the advanced countries, economic freedom improves equity by increasing the share of market income going to the lowest income quintile and decreasing the share going to the highest income quintile. The share of income that goes to the middle class seems to be unaffected given the existing level of economic freedom.

Bennett and Vedder (2013) use fixed effects models to assess the dynamic relationship between economic freedom and income inequality in different U. S. states during the period 1979-2004. They find robust evidence that increases in economic freedom are linked with lower income inequality.

Among studies which use economic freedom indices, there are results on particular aspects in the relationship between economic freedom and income inequality. Jaumotte (2013) analyses the effects of technological change and trade as well as financial globalization on income inequality in a panel of 51 developed and developing countries during the period 1981 and 2003. A new research by Young and Lawson (2014) finds that economic freedom is linked with a higher share of labor income. As is was mentioned above, regarding US Apergis et al (2014) there is a bidirectional relationship between inequality and economic freedom, with the likelihood that policies that are intended to reduce inequality will finally reduce economic freedom, which in turn will increase inequality over more.

Generally, it is agreed that although previous literature examining the relationship between economic freedom and income inequality has been inconclusive and both theoretical and empirical contributions are ambiguous, it is accepted that elevated levels of economic liberty are associated with desirable social and economic results. In addition, supplementary increases in economic freedom in a state lead to lower income inequality.

2.7 Conclusions

According to the findings presented in this chapter, it may be concluded that economic freedom and growth share a two-way relationship. Specifically, it was shown that aspects of economic freedom affect economic growth (Carlsson and Lundstrom, 2002). There is also strong evidence to suggest that conversely economic growth greatly impacts on economic

freedom (Justesen, 2006; Dawson, 2003). A number of economic freedom measures have a significant and sizeable effect on growth of GDP. If we consider the less strict sensitivity suggested by Barro and Martin (1997) all of the significant measures are robust to the model specification, although some are sensitive to the sample. Consequently, economic freedom does affect growth rate and the estimated relations are robust overall. There is general agreement that countries with improved economic freedom attract more investment and achieve greater productivity. Consequently, these countries exhibit higher growth and achieve higher income levels. In contrast, countries are weakened when their economic institutions do not launch productive activities.

According to the literature presented in this chapter, it is also considered that economic freedom motivates and stimulates life satisfaction and happiness (Ovaska and Takashima 2006; Veenhoven, 2000). In addition, it is thought that the more economic freedom people enjoy, the better off those people are, as regards social and individual indicators of human well-being such as health, education and happiness (Nikolaev and Bennett, 2017).

There is general agreement that economic freedom and development improve the subjective well-being of people. Inglehart (2006) shows that a society's level of freedom greatly reflected its happiness level. Economic freedom affects many socio-economic outcomes which are very significant determinants of subjective well-being, like higher income levels (Faria and Montesinos, 2009), lower unemployment (Feldman, 2007) and reduction of poverty (Slutzer, 2002).

Lastly, as concerns the relationship between economic freedom and income inequality, previous studies find that there is a positive association between them. Apergis (2004) demonstrates in his analysis of 58 countries between 1980 and 2010 that economic freedom decreases inequality both in the short and in the long run. Another important conclusion that

arises is that when economic freedom increases in a society, then poverty reduction is noticed, as well as greater equality in income distribution (Ashby and Sobel, 2008). Bennett and Vedder (2013) analyze the relationship between economic freedom and income inequality in the U.S. and they document evidence suggesting lower income inequality due to increased economic freedom.

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3. DATA & METHODOLOGY

3.1 Introduction

This chapter provides a thorough discussion of the empirical techniques and procedures employed in this thesis. In order to investigate the dynamic relationship among economic growth, freedom, happiness and inequality, it is imperative to consider several econometric methods which are in line with the relevant literature. Economic freedom and economic growth are closely related. To state the matter differently; they are jointly determined and difficult to distinguish from each other. Economic freedom is affected by economic growth, in such a way that more economic growth may then increase economic freedom.

We employ a three-step methodological procedure that is widely employed in the related empirical literature. The first step examines the stationarity of the series. If both economic freedom and growth are characterized by a unit root and are integrated in the same order, then the Johansen's cointegration test is performed in order to check whether a long run equilibrium relationship holds between the two series. If cointegration is confirmed, a Vector Error Correction Model is used to examine the recovery process regarding the long-run relationship. In particular, the following methodological procedures are considered, summarized in the following steps:

- Unit Root Tests
- Pairwise Cointegration Analysis (Engle and Granger Test)
- Error Correction Models
- Multivariate Cointegration Analysis (Johansen's Test)
- Vector Error Correction Models
- Granger Causality Tests

- Impulse Response Functions
- Forecast Error Variance Decompositions

The empirical analysis is structured as follows: As long as we ensure that all variables in our set are I(1), then we test for cointegration of the variables in pairs, using Engle and Granger test (first step).

When the unit root test is applied and the result shows stationarity, it means that the variable is I(0). However, if it is non stationary, then the unit root should be applied at the first difference taking the constant and constant plus trend. It depends where the variable becomes stationary. The first difference stationary with trend, with constant, without trend and constant means I(1) (Engle and Granger, 1987). Note that under this scheme we are primarily interested whether the dependent variable of the test is Economic Freedom although alternative relationships will also be tested for the robustness of the analysis. The second step involves estimation of the error correction model as suggested by the Engle and Granger analysis only when a pairwise cointegration relationship is present. The third step is to create a multivariate model that quantifies all the long-run and short-run relationships of the system. This is achieved by employing Johansen's cointegration test and the corresponding vector error corrections model analysis. Finally, the analysis is conducted using pairwise Granger causality test in order to establish causality relationships among the variables; impulse response functions to study the shock spillovers among the system; and forecast error variance decompositions. All empirical estimations where conducted through Eviews and Gretl econometric softwares.

3.2 The Dataset and Descriptive Statistics

3.2.1 Economic Freedom

This section outlines the dataset employed in our research. The Heritage Foundation's Index of Economic Freedom was chosen for this study as it is generally considered reliable and consistent. Based on the exact definition of Economic Freedom, retrieved from the Heritage Foundation web page, Economic Freedom can be defined as: *"the fundamental right of every human to control his or her own labor and property. In an economically free society, individuals are free to work, produce, consume and invest in any way they please. In economically free societies, governments allow labor, capital and goods to move freely, and refrain from coercion or constraint of liberty beyond the extent necessary to protect and maintain liberty itself.*[1] Therefore, by definition, a greater value of the index means greater prosperity in a country as it is directly associated with positive economic and social goals that a society wishes to achieve.

According to Heritage Foundation, the measurement of Economic Freedom is based on 12 quantitative and qualitative factors which can be grouped in 4 main categories:

- Rule of Law
- Government Size
- Regulatory Efficiency
- Open Markets

Based on these pillars, rule of law measures property rights, government integrity and effectiveness in the justice system of a country, while government size concerns fiscal issues. Moreover, business freedom, labor freedom, monetary freedom are quantified in the regulatory

[1]See https://www.heritage.org/index/about

efficiency, while trade freedom, investment freedom and financial freedom are quantified in the open markets category.

Under this framework, it is clear that inclusion of a measure of Economic Freedom in our analysis constitutes an important aspect in terms of its economic interpretation. Given the structure of the variable, valuable information can be inferred regarding the effects on economic growth and prosperity of the legal framework, the taxes and spending policies of the government, and the business and labor freedom.

3.2.2 Income Inequality

As concerns the data for income inequality, the Gini index is utilised, which measures the extent to which the distribution of income (or, in some cases, consumption expenditure) among individuals or households within an economy deviates from a perfectly equal distribution. A Lorenz curve plots the cumulative percentages of total income received against the cumulative number of recipients, starting with the poorest individual or household. The Gini index measures the area between the Lorenz curve and a hypothetical line of absolute equality, expressed as a percentage of the maximum area under the line. Thus, a Gini index of 0 represents perfect equality, while an index of 1 implies perfect inequality. The data are those used by the World Bank, Development Research Group and are based on primary household survey data obtained from government statistical agencies and World Bank country departments. In this analysis, all data concerning the Gini Index for Greece are retrieved from the Eurostat Database.

3.2.3 Real GDP

The growth index is defined as GDP at purchaser's prices and is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2010 U.S. dollars. Dollar figures for GDP are converted from domestic currencies using 2010 official exchange rates. The Greek real GDP was extracted from the World Bank's World Development Indicators.

3.2.4 Happiness

This study chooses Erasmus University data for happiness via the world database of happiness as it is widely accepted and most used by many researchers (Brouwer et al., 2008; Frey and Stutzer, 2002; Kahneman et al., 1997; Oswald, 1997)). Erasmus University presents distributional findings on happiness in almost all nations. Each separate finding is presented on a "page" that contains information about 1) the survey study, 2) the question on happiness used in that study, 3) the distribution of responses to that question and 4) the publication in which these results were reported. Means and standard-deviations are also reported in a separate 'overview' per nation, in which the findings are sorted by type of survey question on happiness and within these measurement types by year. This allows an easy view of changes in happiness over time. The dataset for the 4 variables of interest refers to annual data from 1995 to 2015 for Greece, resulting from a total of 21 observations. For analytical purposes we assess the log values of the levels of each series.

3.2.5 Statistical Properties of the Data

As a preliminary analysis of the chosen set of 4 macroeconomic variables for the Greek economy it is useful to investigate the statistical and the graphical properties of the series. Empirical literature focuses mainly on the moment statistics like mean, variance, skewness and kurtosis. Table 3.1 summarizes the descriptive statistics of the dataset. In addition, Figure 3.1 depicts the log levels of the variables.

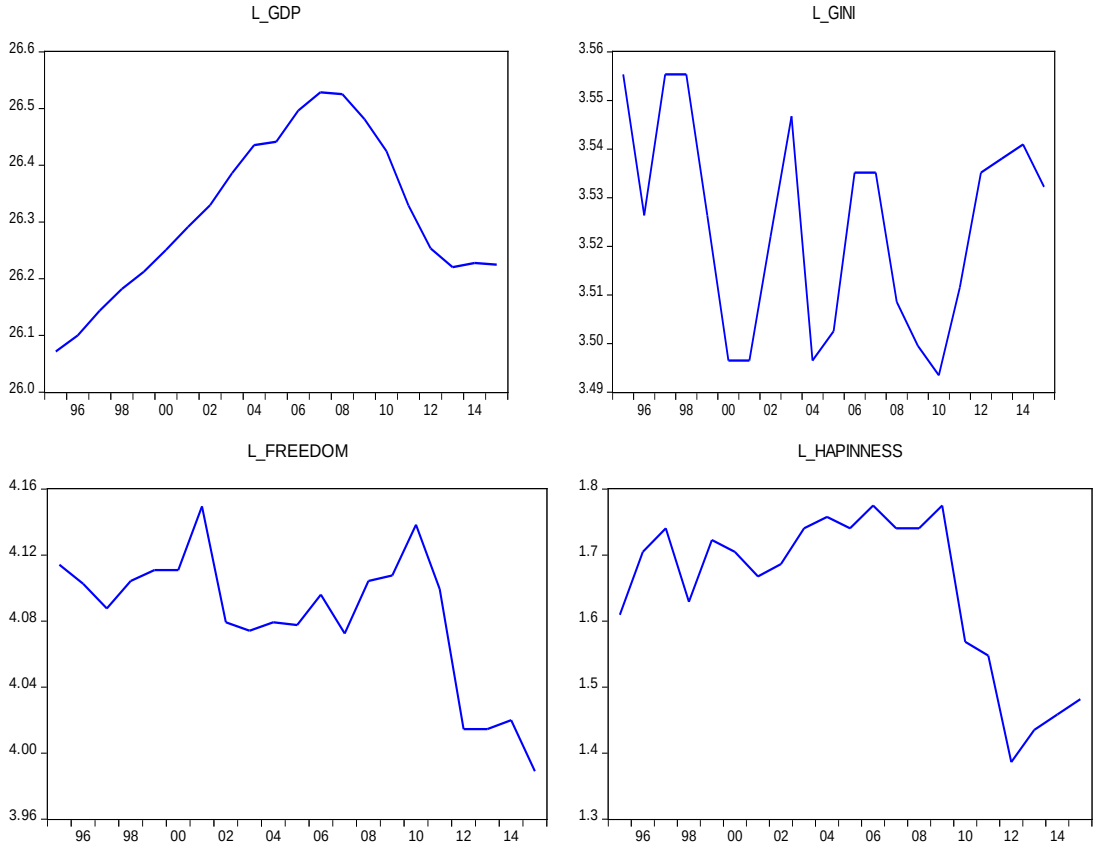
Table 3.1: Descriptive Statistics of the Data

	L_GDP	**L_Freedom**	**L_GINI**	**L_Happiness**
Mean	26.3122	4.083155	3.524252	1.648234
Median	26.29123	4.09601	3.526361	1.704748
Maximum	26.52858	4.149464	3.555348	1.774952
Minimum	26.07174	3.988984	3.493473	1.386294
Std. Dev.	0.140416	0.041703	0.02128	0.121768
Skewness	0.052168	-0.815876	-0.059657	-0.86671
Kurtosis	1.848655	2.960253	1.684275	2.401369
Jarque-Bera	1.169421	2.331172	1.527198	2.942716
Probability	0.557267	0.31174	0.465986	0.229613
Sum	552.5563	85.74624	74.0093	34.61292
Sum Sq. Dev.	0.394334	0.034782	0.009057	0.29655
Observations	21	21	21	21

The descriptive statistics of Table 3.1 indicate that the distributions of economic freedom and happiness are moderately left-tailed while those of GDP and Gini are fairly symmetrical. Kurtosis is in all cases positive and notably economic freedom and happiness approach the behavior of the normal distribution. In particular, the results from the Jarque-Bera (proposed by Jarque and Bera, 1987) statistic provide support that the data represent a normal distribution as the null hypothesis of the test cannot be rejected at the 5% level of significance in all cases. This means that the time series under consideration can be well described by linear models that rely on normal distributions like the OLS estimation.

The graphical representation of the data can also provide some inferences. More specifically, Figure 3.1 shows that the indexes of economic freedom and happiness in Greece decreased significantly during the period from 2009 onwards, when the economic crisis began. This is also the case of the Greek GDP which recorded a downturn. In other words, the Greek economy, during the crisis period downgraded not only in terms of domestic production but also in terms of social happiness and deterioration of the flexibility of economic transactions within the country. These common behaviors of the three variables create some questions regarding the dynamic and the long-run relationship among them which we try to explain. The Gini index fluctuated during the period of interest, but with a downward trend indicating that income inequality in Greece has been diverging slightly over the last twenty years.

Figure 3.1: Graphical Representation of the Data (1995 - 2015)



Source: Eurostat, Heritage Foundation, Erasmus University Database, World Bank and authors' calculations.

3.3 Unit Root Tests

The empirical investigation of the long-run relationships among the variables of interest, involves, first of all, the examination of the individual properties of each process. Any further inference regarding the time series analysis should imply stationarity of the underlying variables of the model. Gujarati (2004) defines as stationary a process with constant mean, constant variance, while the covariance between two time periods should depend only on the distance between these two periods and not on the time that the covariance is calculated. Thus, stationarity implies that:

Mean: $E(Y_t) = \mu$

Variance: $Var(Y_t) = E\left(Y_t - \mu\right)^2 = \sigma^2$

Covariance: $\gamma_\kappa = E\left[\left(Y_t - \mu\right)\left(Y_t + \kappa - \mu\right)\right]$

where γ_κ is the covariance of lag k among the values Y_t and Y_{t+k}.

On the other hand, a process that is defined as non-stationary has some undesirable properties. If a variable is non-stationary, then a shock to a structural variable of the model would have permanent effects on the system of variables. This means that a first approach on the empirical aspect of this study should focus on defining the order of integration of the variables under consideration. It is important to define the order of integration of the variables under consideration (i.e. I(0) or I(1)) as this could have possible implications on the implemented econometric techniques (e.g. the cointegration approach relies on variables that possess the same order of integration).

One flexible way to define the order of integration of time series is through its autocorrelation function. However, more advanced econometric techniques are available. In

particular, a battery of unit root tests is utilized such as the Augmented Dickey-Fuller unit root test (ADF hereafter), the Phillips-Perron (PP hereafter) unit root test and the Kwiatkowski, Phillips, Schmidt and Shin (KPSS hereafter) test for stationarity. By employing several tests to define the level of integration of our variables in the model, both the unit root and the stationarity null hypothesis, it is possible to extract valuable inferences regarding the cases where a series appears to have a unit root or appears to be stationary. In the case under analysis, especially, due to limitations in the dataset, it is imperative to utilize a variety of tests in order to define the order of integration of the variables in our dataset. In particular, the lack of a large enough dataset can potentially be less informative as regards the behavior of a variable. An attempt is made to overcome this issue by employing a set of various techniques in order to identify the level of integration of the variables in our dataset. For example, the KPSS test might appear to produce a high level of type 1 errors. A potential method to overcome this issue is to combine KPSS test with the ADF and the PP unit root tests. If the results from the three tests agree that a time series is stationary, then it probably is.

3.3.1 ADF Unit Root Test

The first stages of the work of the Dickey and Fuller unit root test[2] were to test for the presence of unit root in a AR(1) process defined as:

$$Y_t = \rho Y_{t-1} + u_t \ ,$$

where u_t is a white noise process. Under this framework Dickey and Fuller examined the hypothesis $H_0: \rho = 1$ against the one-sided alternative $H_0: \rho \neq 1$. In empirical analysis a transformation of the latter equation is employed such:

$$\Delta Y_t = \delta Y_{t-1} + u_t \ ,$$

so that $\Delta Y_t = Y_t - Y_{t-1}$ and $\delta = (\rho - 1)$. In this case, the null hypothesis of the test for the presence of a unit root is translated as:

$$H_0: \delta = 0, (\rho = 1) \rightarrow Presence\ of\ a\ unit\ root.$$

Against the alternative:

$$H_1: \delta < 0, (\rho < 1) \rightarrow series\ is\ stationary.$$

The test is conducted through the corresponding t-statistic of the coefficient and Dickey and Fuller have provided the appropriate test statistics. Note that the test can allow for an intercept, or an intercept and a deterministic trend, or neither of them in the regression.

In order to be valid the above test implies that the error term is described from a white noise process. This means that the values of the error term are uncorrelated. If the presence of autocorrelation cannot be eliminated then Dickey and Fuller suggested the Augmented Dickey Fuller test for unit root. In this case, the initial regression of the test is augmented by lags of the dependent variable in order to count for possible autocorrelation and increase the robustness of

[2]See Dickey and Fuller, 1979.

the test. Thus consider the equation:

$$\Delta Y_t = \gamma_0 + \gamma_1 t + \delta Y_{t-1} + \sum_{i=1}^{m} \alpha_i \, \Delta Y_{t-i} + \varepsilon_t \, ,$$

where the term ε_t is a white noise process, ΔY_{t-i} represent the lags of the dependent variable and $\gamma_1 t$ is the deterministic trend. Again, the ADF test is based on the t-statistic of the parameter δ while the null and the alternative hypotheses remain the same. For example, rejection of the null hypothesis means that the variable under consideration contains a unit root (and thus, is non-stationary) and, therefore, cannot be used in a regression analysis.

3.3.2 Phillips Perron Unit Root Test

As an alternative to the ADF test, Phillips and Perron (1988) provide a series of test procedures which offer an automatic correction to account for the presence of autocorrelation in the residuals. These tests have become increasingly popular in time series analysis. Phillips and Perron have developed a more comprehensive theory of unit root non stationarity. The tests are similar to ADF tests, but they incorporate an automatic correction to the DF procedure to allow for autocorrelated residuals. The PP unit root tests differ in how they deal with autocorrelation and heteroskedasticity in the errors. More specifically, while the ADF test operates through an ARMA representation to approximate the structure of the errors in the test regression, PP tests ignore any serial correlation in the test regression. Therefore, the regression for the PP unit root test is:

$$\Delta y_t = \beta' D_t + \pi y_{t-1} + u_t \ ,$$

where u_t is an integrated of zero order process and might be heteroscedastic. The PP test relies on the modified statistics, denoted by Z_t and Z_π, given by:

$$Z_t = \left(\frac{\hat{\sigma}^2}{\hat{\lambda}^2}\right)^{\frac{1}{2}} t - \frac{1}{2}\left(\frac{\hat{\lambda}^2 - \hat{\sigma}^2}{\hat{\lambda}^2}\right)\left(\frac{TSE(\hat{\pi})}{\hat{\sigma}^2}\right)$$

$$Z_\pi = T\hat{\pi} - \frac{1}{2}\left(\hat{\lambda}^2 - \hat{\sigma}^2\right)\left(\frac{T^2 SE(\hat{\pi})}{\hat{\sigma}^2}\right),$$

where the terms $\hat{\sigma}^2$ and $\hat{\lambda}^2$ are consistent estimates of the variance.

Under the null hypothesis, $H_0: \pi = 0$, the PP test statistics Z_t and Z_π have the same asymptotic properties of the ADF test statistic. In addition, Phillips and Perron's test statistics can be viewed as Dickey–Fuller statistics that have been made robust to serial correlation by using the Newey–West (1987) heteroskedasticity - and autocorrelation- consistent covariance

matrix estimator. A main advantage of the PP test is based on the fact that it is robust when heteroscedasticity in the error terms is present and does not specify a lag length for the test regression.

3.3.3. KPSS Stationarity Test

The ADF and PP tests check the null hypothesis of whether or not a unit root is present in the process under examination. In contrast, another family of tests examines the null hypothesis of stationarity, to wit, the series is I(0). It is worth noting that, by design, in the KPSS test the absence of unit root is not a proof of non-stationarity but of trend-stationarity.

These involve the so known as stationarity tests and the most commonly used is the test proposed by Kwiatkowski, Phillips, Schmidt and Shin (1992). First, they consider the equations:

$$y_t = \beta' D_t + \mu_t + u_t$$

$$\mu_t = \mu_{t-1} + \varepsilon_t, \varepsilon_t \sim WN(0, \sigma_\varepsilon^2)\,,$$

where D_t contains deterministic components such as a constant or a constant plus a time trend and u_t is a stationary process. The test also allows for heteroscedasticity to be present in the error term u_t. In addition, μ_t is a random walk process and σ_ε^2 is the variance of the innovations. Thus, the null hypothesis of the KPSS stationarity test can be formed as $H_0: \sigma_\varepsilon^2 = 0$, which implies that μ_t is constant and the series under consideration is I(0). The alternative is $H_1: \sigma_\varepsilon^2 > 0$ (unit root in the series). The test statistic can be derived from the known Langrage Multiplier (LM) statistic and is equal to:

$$KPSS = \frac{\left(T^{-2} \sum_{t=1}^{T} \hat{S}_t^2\right)}{\hat{\lambda}^2}\,,$$

where $\hat{S}_t^2 = \sum_{j=1}^{t} \hat{u}_j$, $\hat{u}_j$ is the residual of a regression of y_t on D_t. Moreover, $\hat{\lambda}^2$ is a consistent estimator of the long run variance of u_t. The stationary test is a one-sided right-tailed test so that one rejects the null of stationarity at the α% level if the KPSS test statistic is greater than the α% critical value from the appropriate asymptotic distribution. Critical values from the asymptotic distributions are obtained by simulation methods and presented in Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1).

3.3.4 Analysis of the Autocorrelation Functions

One way to decide whether the variables in this analysis are stationary or not, is to check the underlying autocorrelation functions. In this way, it is possible to check the dynamic properties of the series and extract valuable elements regarding its properties. The autocorrelation function is defined by the formula:

$$\rho_\kappa = \frac{\gamma_\kappa}{\gamma_0} = covariance\ in\ period.$$

In order for a series to be stationary, autocorrelations in the various lags should be around zero (like white noise). Conversely, variables that exhibit high correlations even in long latencies are probably non-stationary rows (such as random walks). The following figures summarize the autocorrelation functions (acfs) and the partial autocorrelation functions (pacfs)[3] of the log of the four variables in the current analysis (real gdp, gini index, happiness and economic freedom) both in levels and the first differences.

Figure 3.2 presents the correlograms of the variables in this model both in level and the first differences. The chosen number of lags is 4 because an annual frequency dataset is employed. For the case of happiness and economic freedom there is clear evidence suggesting that the series are I(1) as Q-stat is significant in levels and insignificant in first differences (for a 5 % level of significance).[4] In addition, for the case of the Gini index the behavior of the series in not clear although evidence suggest the presence of a unit root. Finally, the log value of GDP appears to be non-stationary both in levels and first differences. This behavior is not supported by literature and economic theory which precludes GDP from having explosive properties. To overcome any doubts regarding the results, a set of unit root and stationarity tests is employed in the following section.

[3]As partial autocorrelation function is defined the coefficient which determined the correlation between Y_t and Y_{t-k} provided that the correlation between Y_t and $Y_{t-1}Y_{t-2}$, ..., Y_{t-k-1}has been isolated.
[4]The statistic Q is defined as: $Q = n\sum_{i=1}^{m}\rho k2$ where n is the number of the sample and m the number of lags.

Figure 3.2: The Correlograms of the Variables in the Analysis

Log GDP

Sample: 1995 2015
Included observations: 21

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.866	0.866	18.092	0.000
		2	0.665	-0.336	29.334	0.000
		3	0.429	-0.220	34.280	0.000
		4	0.186	-0.162	35.262	0.000

DLog GDP

Sample: 1995 2015
Included observations: 20

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.813	0.813	15.322	0.000
		2	0.585	-0.226	23.690	0.000
		3	0.365	-0.108	27.138	0.000
		4	0.151	-0.150	27.761	0.000

Log Happiness

Sample: 1995 2015
Included observations: 21

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.760	0.760	13.947	0.000
		2	0.581	0.009	22.540	0.000
		3	0.336	-0.257	25.576	0.000
		4	0.043	-0.339	25.628	0.000

DLog Happiness

Sample: 1995 2015
Included observations: 20

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.178	-0.178	0.7340	0.392
		2	0.135	0.107	1.1790	0.555
		3	0.002	0.045	1.1791	0.758
		4	-0.115	-0.127	1.5410	0.819

Log Gini

Sample: 1995 2015
Included observations: 21

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.386	0.386	3.5910	0.058
		2	-0.133	-0.331	4.0425	0.132
		3	-0.166	0.040	4.7828	0.188
		4	0.009	0.045	4.7851	0.310

DLog Gini

Sample: 1995 2015
Included observations: 20

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.002	-0.002	7.E-05	0.993
		2	-0.527	-0.527	6.7775	0.034
		3	-0.187	-0.263	7.6866	0.053
		4	0.269	-0.053	9.6731	0.046

Log Freedom

Sample: 1995 2015
Included observations: 21

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.575	0.575	7.9915	0.005
		2	0.286	-0.068	10.066	0.007
		3	0.057	-0.120	10.152	0.017
		4	-0.198	-0.252	11.267	0.024

DLog Freedom

Sample: 1995 2015
Included observations: 20

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.105	-0.105	0.2540	0.614
		2	-0.142	-0.155	0.7459	0.689
		3	-0.016	-0.051	0.7524	0.861
		4	-0.155	-0.192	1.4113	0.842

3.3.5. Unit Root Test Results

A previous subsection extensively discussed the theoretical premises of the unit root tests used in the econometric analysis. The stationarity or not of a series can strongly influence its behavior and properties - e.g. persistence of shocks will be infinite for non stationary series. Thus, this step of the empirical analysis is of great importance. Given the fact that an attempt is made to unravel the long-run relationships and dynamics among the four variables of interest (namely real GDP, Gini index, Economic Freedom and Happiness), it is necessary to investigate the level of integration of each series. This can be based on the implementation of the aforementioned tests and the empirical examination of the results.

However, limitations regarding the dataset in question do exist. This problem can be alleviated after employing a variety of unit root and stationarity tests which increase the power of the underlying inferences. Therefore, Tables 3.2 to 3.4 summarize the unit root statistics of the ADF, PP and KPSS tests respectively. Note that all tests are applied both to the levels and the first differences of the log of the variables in order to define if a variable is I(1) or I(2).

The unit root test strategy employed is quite simple. Depending on the results of Tables 3.2 to 3.4, it is concluded that a variable is I(0) if the majority of tests conform to this and vice versa. Table 3.5 summarizes the results of all tests that employed in order to study the stationarity of the series in question.

In Table 3.2 the ADF test results are provided. Three cases are considered (with constant, with constant and trend and without constant and trend). The test statistics in the majority of the cases are greater than the 5% critical values and, therefore, there is evidence that all series under

consideration are non-stationary at the levels.[5] As regards first differences, the ADF test supports that the Gini index, economic freedom and happiness are stationary, which means that they are I(1) processes. For the case of the real GDP, there is evidence that the series is non-stationary in the first differences and thus, I(2). The PP unit root test (presented in Table 3.3) provides the same results.[6]

This misbehavior of the GDP in Greece can be explained mainly by the small sample of the analysis of this research, which weakens the power of the unit root tests. In addition, the recent economic crisis in the country can significantly affect the fluctuation of the GDP series, which might induce a structural break in the series.

The third test considered is the KPSS stationarity test presented in Table 3.4. The KPSS test implications can vary significantly with respect to the former analysis due to the different nature of the tests. In this case the log of the real GDP appears to be non-stationary at the level and stationary in first differences. Therefore, there is evidence to argue that the variable of the GDP is I(1) and can be included in the cointegration analysis that follows. The results of the unit root analysis are summarized in Table 3.5.

[5]The only exception is the equation of the Gini index with constant only, where it appears to be stationary.
[6]Nevertheless, some evidence that the GDP series is I(1) do exist, when we consider the ADF test with only 1 lag at the 10% level of significance.

Table 3.2: ADF Unit Root Test

At Level					
		Log_GDP	Log_FREEDOM	Log_GINI	Log_HAPINNESS
With Constant	t-Statistic	-2.5444	-1.0585	-3.1975	-1.0696
	Prob.	0.1214	0.7108	0.0362	0.7065
	Case	No	No	**	No
With Constant & Trend	t-Statistic	-2.1344	-1.8856	-3.1722	-2.1132
	Prob.	0.4958	0.6243	0.1192	0.5081
	Case	No	No	No	No
Without Constant & Trend	t-Statistic	-0.0312	-0.8961	-0.4228	-0.4458
	Prob.	0.6597	0.3157	0.5162	0.5086
	Case	No	No	No	No
At First Difference					
		d(Log_GDP)	d(Log_FREEDOM)	d(Log_GINI)	d(Log_HAPINNESS)
With Constant	t-Statistic	-1.3286	-4.5226	-5.2026	-5.1972
	Prob.	0.594	0.0024	0.0007	0.0006
	Case	No	***	***	***
With Constant & Trend	t-Statistic	-2.0576	-4.6012	-5.6819	-5.2027
	Prob.	0.5329	0.0088	0.0013	0.0028
	Case	No	***	***	***
Without Constant & Trend	t-Statistic	-1.393	-4.4801	-5.342	-5.2098
	Prob.	0.1469	0.0001	0	0
	Case	No	***	***	***

Notes: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1%. and (No) Not Significant. *MacKinnon (1996) one-sided p-values.

Table 3.3: Phillips Perron Unit Root Test

At Level					
		Log_GDP	Log_FREEDOM	Log_GINI	Log_HAPINNESS
With Constant	t-Statistic	-1.7441	-1.0585	-2.9254	-1.1261
	Prob.	0.3954	0.7108	0.0601	0.6841
	Case	No	No	*	No
With Constant & Trend	t-Statistic	-0.5941	-1.8856	-2.5743	-2.1301
	Prob.	0.9678	0.6243	0.2938	0.4995
	Case	No	No	No	No
Without Constant & Trend	t-Statistic	0.4254	-1.1574	-0.5545	-0.4718
	Prob.	0.7961	0.2166	0.4641	0.4982
	Case	No	No	No	No
At First Difference					
		d(Log_GDP)	d(Log_FREEDOM)	d(Log_GINI)	d(Log_HAPINNESS)
With Constant	t-Statistic	-1.4186	-4.5649	-7.5213	-5.1613
	Prob.	0.5513	0.0022	0	0.0006
	Case	No	***	***	***
With Constant & Trend	t-Statistic	-1.9134	-5.0391	-7.6242	-5.2215
	Prob.	0.6084	0.0038	0	0.0027
	Case	No	***	***	***
Without Constant & Trend	t-Statistic	-1.4756	-4.4876	-7.9273	-5.1534
	Prob.	0.1271	0.0001	0	0
	Case	No	***	***	***

Notes: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1%. and (No) Not Significant. *MacKinnon (1996) one-sided p-values.

Table 3.4: KPSS Stationarity Test

At Level					
		Log_GDP	Log_FREEDOM	Log_GINI	Log_HAPINNESS
With Constant	test-Statistic	0.250685	0.433613	0.243498	0.327806
	Case	No	*	No	No
With Constant & Trend	test-Statistic	0.161626	0.109301	0.174673	0.146867
	Case	**	No	**	**
At First Difference					
		d(Log_GDP)	d(Log_FREEDOM)	d(Log_GINI)	d(Log_HAPINNESS)
With Constant	test-Statistic	0.38025	0.2049	0.5	0.237034
	Case	***	No	**	No
With Constant & Trend	test-Statistic	0.090001	0.151448	0.415789	0.071055
	Case	No	**	***	No

Notes: (*)Rejection of the null hypothesis at the 10%; (**)Rejection of the null hypothesis at the 5%; (***) Rejection of the null hypothesis at the 1%. and (no) Not Significant. Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Table 3.5: Level of Integration of the Variables Based on Various Tests*

	*Test**	*Log_GDP*	*Log_FREEDOM*	*Log_GINI*	*Log_HAPINNESS*
With Constant	ADF	>I(1)	I(1)	I(0)	I(1)
	PP	>I(1)	I(1)	I(1)	I(1)
	KPSS	I(1)	>I(1)	I(1)	>I(1)
With Constant & Trend	ADF	>I(1)	I(1)	I(1)	I(1)
	PP	>I(1)	I(1)	I(1)	I(1)
	KPSS	I(0)	I(1)	I(0)	I(0)

Notes: (*) This Table summarizes and combines the unit root and stationarity tests results in order to define the level of integration of the variables. All tests have conducted at the 5% level of significance.

3.4 Analysis of the Long-Run Relationships

Previous sections contained a discussion of the importance of stationarity in the time series when it is used in econometrics modelling. The estimation of models when the data are not stationary can lead to serious problems in econometric analysis, i.e. spurious regression. Nevertheless, if two or more variables have the same order of integration and are non-stationary at their levels, then there is a possibility of the existence of a long-run relationship among them. In other words, if a linear combination of I(1) variables is stationary, then the variables are said to be cointegrated. Consider two I(1) variables where y_t is the dependent variable and x_t is the explanatory variable. A linear combination between the two can be written as:

$$y_t = \hat{a}x_t + \hat{u}_t$$

$$\hat{u}_t = y_t - \hat{a}x_t \ .$$

The combinations will normally still be I(1). However, if a long-run relationship is present between y_t and x_t then the bulk of the long run components of the two variables cancel out and thus, the combination $\hat{u}_t$ can be I(1). This means that the variables are cointegrated.

3.4.1 Engle and Granger Cointegration Test

The analysis of the long-run relationships along with the notion of cointegration was first introduced in the works of Granger (1981, 1986) and Engle and Granger (1987). The Engle and Granger (EG) test for cointegration, proposed by Engle and Granger (1987), allows testing for the presence of cointegration among two variables and establishing their long-run relationship and equilibrium. In the analysis presented in this thesis this test is employed in order to define if a long-run relationship among the variables of interest exists and to analyze their long-run properties. The steps involved in the test are simple. Suppose there are two

variables namely y_t and x_t which are I(1), and it needs to be determined whether there exists a long-run relationship between the two.

The first step of the EG test involves testing the variables for their level of integration. This is done by employing a unit root test (i.e. ADF test) in order to infer the number of unit roots in each variable. If the two variables are integrated of the same order, then the second step is reached. Note that stationarity of the series excludes the existence of long-run analysis as there are several time series techniques which can account for their properties.

The second step of the EG test is to estimate the so called long run or "equilibrium" relationship. This has the form:

$$y_t = \beta_0 + \beta_1 x_t + e_t. \qquad (1)$$

If the variables are cointegrated, then the parameters β_0 and β_1 can be estimated consistently with OLS. To determine if the two variables are cointegrated or not, the EG test performs a DF unit root test to the estimated residuals of the long-run relationship ($\hat{e}_t$ in order to define if a unit root is present or not. Note that the values of $\hat{e}_t$ represent the deviations of the long-run relationship. Considering the unit root test for the residuals gives:

$$\Delta\hat{e}_t = a_1\hat{e}_{t-1} + \varepsilon_t.$$

If the null hypothesis of $a_1 = 0$, cannot be rejected, then it is concluded that the series are not cointegrated as their linear combination is not stationary. On the other hand, rejection of the null hypothesis means that the residual sequence is stationary and cointegration exists. Alternatively, in order to account for autocorrelation an ADF approximation can be employed, formed as:

$$\Delta\hat{e}_t = a_1\hat{e}_{t-1} + \sum_{i=1}^{n} a_{i+1}\Delta\hat{e}_{t-i} + \varepsilon_t \ ,$$

where again rejection of the null hypothesis means cointegration among y_t and x_t. The critical values of the EG test are not the same with those of DF test as the $\hat{e}_t$ series is generated from a regression equation. Engle and Granger (1987) report the test's critical values which depend on the sample size and the number of variables used in the test.

The third step involves estimation of the error correction models. If cointegration is present, then equation (1) is the long run equation. In order to capture any short run dynamics, EG propose creating an error correction model. This model quantifies the short-run relationship between y_t and x_t and takes into account any deviation from the long-run equilibrium. The error correction model is simply a linear transformation of the autoregressive-distributed lag model. One may ask what its distinguishing feature is. The difference in the error correction modelling is that parameters that describe the extent of short-run adjustment to equilibrium are immediately provided by the regression (Benerjee et al., 1993:51). Therefore, in practice, the error correction term, which is nothing more than the lagged residuals from the levels regression, $\hat{e}_{t-1}$, and it is also preferable to other regression methods.

Using the residuals from equation (1) we can formulate:

$$\Delta y_t = \gamma_0 + \gamma_1 \Delta x_t + \gamma_2 \hat{e}_{t-1} + u_t \ , \qquad (2)$$

where $\hat{e}_t = y_{t-1} - \hat{\beta}_1 x_{t-1} - \hat{\beta}_0$. The stationary linear combination of the variables is also known as the cointegrating vector. In addition, parameter $\hat{\beta}_1$ is known as the cointegrating parameter, while the term $\gamma_2 \hat{e}_{t-1}$ is known as the error correction term. The parameter γ_2 is of major importance as it represents the speed of adjustment. In other words it shows how "fast" the short run deviations to the long run equilibrium are corrected. Empirically, parameter γ_2 should be negative and statistically significant in order for an intuitive meaning to exist. Following Niyimbanira (2013), the error correction model was initially used by Hendry *et al.*

(1984), Anderson and Hendry (1984) and Davidson *et al*. (1978) to make adjustments to a dependent variable which depends not on the level of some explanatory variable, but on the extent to which an explanatory variable deviates from an equilibrium relationship with the dependent variable. In other words, if there is cointegration between variables and there is a possibility that in the short run there may be disequilibrium, one uses this model.

Applications of the EG cointegration test are presented in subsequent sections. The multivariate case of the cointegration tests is presented in the next subsection.

3.4.2 Johansen Cointegration Test

The Johansen (1988) and Johansen and Juselius (1990) method of testing for the existence of cointegrating relationships has become a standard in the econometrics literature. The framework developed by Johansen and Juselius provides a multivariate maximum likelihood technique that leads to the determination of the number of cointegration vectors in an equation. However, in most cases this technique has been wrongly applied by most practitioners or econometricians. This wrong application can lead to significantly misleading results. Also, the associated error correction model estimates will be misleading and unrealistic in relation to forecast and policy implication.[7]

Johansen (1992) defines as stationarity: *"If X_t is a I(1) process then we call X_t cointegrated with cointegrating vector $\beta \neq 0$, if $\beta' X_t$ can be a stationary process by an appropriate selection of the initial distribution ($\beta' X_0$. The rank of cointegration is the number of linearly independent cointegrating relationships"*. From an empirical analysis perspective, the Johansen's test for cointegration has some advantages relative to the EG test described earlier. More specifically, the Johansen's test can trace more than one cointegrating relationship among

[7] For more details about the procedures involved at the Johansen's cointegration method, see Johansen (1995).

the variables. In addition, due to the fact that the test is based on a vector environment represented by a VAR(p) model, it is not imperative to define a dependent variable in the test. A further convenience stemming from employing the Johansen's test is the fact that it allows one to estimate for cointegration under a multivariate framework. This means that the long-run properties are tested after treating the variables of interest (GDP, income inequality, economic freedom and happiness) as a system of variables and allowing for cointegration among them. Thus, one is not limited to testing for cointegration only among two variables as in the EG test. The Johansen test and estimation strategy – maximum likelihood – makes it possible to estimate all cointegrating vectors when there are more than two variables. The EG test can potentially offer different results depending on the choice of dependent variable. Clements and Hendry (1995), argue that the Johansen test is more powerful compared to the EG test.

In order to test the long-run relationships of the variables in the dataset of this research we employ the Johansen test complementary to the EG test. The theoretical premises of this test depend on a reduced rank regression, a method of estimating multivariate models which has reduced rank in the coefficients' matrix. The first step in order to carry out the Johansen test is to consider a VAR(p) model:

$$y_t = c + B_1 y_{t-1} + B_2 y_{t-2} + \cdots + B_p y_{t-p} + \varepsilon_t,$$

where y_t is a $k \times 1$ vector of variables, which in this case is equal to a 4×1 vector of $y_t = (lgdp_t, lgini_t, lfreedom_t, lhappiness_t)$ and $B_i, i = 1, .., p$ are 4×4 vectors are 4×4 vectors of coefficients. Moreover, μ is a 4×1 vector of constant terms and ε_t is a 4×1 vector of white noise error terms. The above equation can be written in the form of a vector error correction model (VECM) which is equal to:

$$\Delta y_t = \mu + \Gamma_1 \Delta y_{t-1} + \cdots .. + \Gamma_{p-1} \Delta y_{t-p+1} + \Pi y_{t-p} + e_{t,} \qquad (3)$$

where $\Pi = \left(\sum_{i=1}^{p} B_i\right) - I_4$ and $\Gamma_i = \left(\sum_{j=1}^{i} B_j\right) - I_4$. This representation contains 4 first differenced variables on the left hand-side and 3 lags of dependent variables on the right hand side. It is very important to define optimally the lag length of the VECM model as Johansen's test can be affected significantly.[8] First, the test examines the matrix Π, which can be interpreted as the long-run coefficient matrix. It is worth noting that the matrix$\Pi = a\beta'$, where β is a $r \times 4$ matrix of cointegrating vectors and a is a $4 \times$r matrix gives the amount of each cointegrating vector that enters the VECM model. The test for cointegration among the variables inside vector y_t involves calculating the eigenvalues of matrix Π and then specifying its rank. The number of eigenvalues that are different from zero equals the rank of the matrix. Thus, the rank of matrix Π defines the number of cointegrating relationships among the variables.

Two test statistics can be formulated under the Johansen cointegration test namely:

$$\lambda_{trace}(r) = -T \sum_{j=r+1}^{k} \ln(1 - \hat{\lambda}_j),$$

and

$$\lambda_{max}(r, r+1) = -T ln\left(1 - \hat{\lambda}_{r+1}\right),$$

where r is the number of cointegrating vectors and $\hat{\lambda}_j$ is the *j-th* ordered estimated eigenvalue from the matrix Π.[9] A significantly non-zero eigenvalue indicates a significant cointegrating vector.

The critical values of the test are provided by Johansen and Juselius (1990). If the test statistic is larger than the corresponding critical value, the null hypothesis that there exist r

[8]We estimate the optimal lag length p of the VAR(p) model and as a result of the corresponding VECM model, based on the Akaike Information Criterion (AIC).

[9]Note that the Johansen's test prior to the estimation of λ_{trace} and λ_{max} test statistics, assumes an ordering of the estimated eigenvalues of matrix Π in ascending order.

cointegrating vectors is rejected and move to the next hypothesis that there are r+1 cointegrating vectors (λ_{max}) or more than r cointegrating vectors (λ_{trace}).

The testing procedure is as follows: If the initial null hypothesis that there are no cointegrating vectors is rejected, the next hypothesis is addressed: that there are r = 1 cointegrating vectors. If the hypothesis of r = 1 is also rejected, then the hypothesis that r = 2 is tested and so on. The test is continued until the null hypothesis is no longer rejected.

In the case of this research, if cointegration is present, the rank of of matrix Π can vary from 1 to 3, which means that 1 to 3 cointegrating vectors can be present. Subsequently, rank 0 or 4 in the of matrix Π can translated in that no long-run relationships exist among the set of 4 endogenous variables.

To identify the long-run equilibrium in the case where cointegration is present, $\Delta y_t = 0$ can be set. Thus, obtaining the relation $\Pi y^* = 0$, which can be written as: $\Pi y^* = a(\beta' y^*)$. In the case where 0 < rank (Π) = rank(a) = m < k the number of solutions of linear equations which are different from zero is m. The long-run relation does not hold perfectly in (t-1). There will be an "error" which is the deviation from the long-run relationship. This is quantified as:

$$\beta' y_{t-1} = \xi_{t-1} \neq 0.$$

The adjustment coefficients α multiplied by the "errors" " $\beta' y_{t-1}$ induce adjustment. They determine Δy_t so y's move in the correct direction in order to bring the system back into equilibrium.

3.5 Short - Run Dynamics in Johansen's Approach

The EG model and the corresponding ECMs, described earlier, suffer from specific weaknesses regarding the short-run analysis. These type of models are restricted to only a single equation with one variable as the dependent variable, and a set of fixed explanatory variables that are assumed to be weakly exogenous for the parameters of interest.

As noted in Killian and Lutkepohl (2017), cointegrating relationships can be imposed by reparameterizing the VAR model as a vector error correction model (VECM). In theory VECM is just a representation of cointegrated VAR.

More specifically, in the case where the Johansen test indicates the presence of cointegration in a multivariate level, then it is useful to examine the short-run properties and dynamics of the variables included in the initial VAR(p) model. In this way, it is possible to study how deviations of the long-run equilibrium are "corrected". The short-run dynamics in the case of the Johansen test are examined through a VECM representation with the form:

$$\Delta y_t = \mu + \Pi y_{t-p} + \sum_{i=1}^{p-1} \Gamma_i \, \Delta y_{t-i} + e_{t.} \qquad (4)$$

Under this representation, the short-run dynamics are ruled by Γ_i. The VEC Model is a restricted VAR, which has cointegration relations built into the specification, so that it restricts the long-run behavior of the endogenous variables to converge to their cointegrating relationships, while allowing for short-run adjustment dynamics. The cointegration term is known as the correction term since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments.

3.5.1 Impulse Response Functions

In the context of the VECM estimation, pairwise Granger Causality Tests (GC) and Impulse Response Functions (IRFs) analysis can be used for economic policy evaluation (see, e.g. Sims, 1980). The Impulse Response Function is the path followed by y_t as it returns to equilibrium when we shock the system by changing one of the innovations (e_t) for one period and then returning it to zero. Impulse response functions are used to describe how the economy reacts over time to exogenous impulses (shocks) within a VAR or a VECM framework.

Following the paper by Koop et al. (1996) concerning impulse response functions in nonlinear econometric models, Pesaran and Shin (1998) developed generalised impulse response functions because of the lack of unambiguity of the orthogonal shock analysis. Orthogonal impulse response functions depend on the sequence of the elements within the vector of jointly dependent variables. There are *n!* different sequences of *n* economic variables in the VAR model. There are no unambiguous criteria for the choice of an optimal sequence (Pesaran and Shin, 1998, p. 20). In contrast, the generalised impulse response functions for the individual variables are unambiguous, i.e. invariant towards the chosen order of variables within vector y_t. Also the response of the variables to unit shocks on innovations will be additionally considered.

3.5.2 Granger Causality Tests

Regarding the pairwise GC tests, Granger (1969) defined a concept of causality which, under suitable conditions, is fairly easy to deal with in the context of VAR or VECM models. Therefore, it has become quite popular in recent years. The idea is that a cause cannot come after the effect. If a variable *x* affects a variable *y*, the former should help improving the predictions of the latter variable.

A further definition of the methodology underlying the GC would be essential for the better understanding of the process. The set Ω_t *i*s defined as the information set containing all the relevant information available up to and including period t and $z_t(h|\Omega_t)$ is the optimal (minimum mean square error MSE) *h*-step predictor of the process z_t at origin *t*, based on the information in Ω_t. The corresponding forecast MSE is $\Sigma t(h|\Omega_t)$.The process x_t is said to cause z_t in Granger's sense if $\Sigma_t(h|\Omega_t) < \Sigma_t(h|\Omega t\ \{x_s : s \leq t\})$ for at least one h = 1, 2,…,Ω_t $\{x_s : s \leq t\}$ is the set containing all the relevant information in the universe except for the information in the past and present of the x_t process. If $z_t$can be predicted more efficiently if the information in the x_t process is taken into account in addition to all other information in the universe, , then x_t is Granger-causal for z_t.

Consider the model:

$$y_t = a_0 + a_1 y_{t-1} + \cdots + a_l y_{t-l} + \beta_1 x_{t-1} + \cdots + \beta_l x_{t-l} + e_t,$$

$$x_t = a_0 + \alpha_1 x_{t-1} + \cdots + \alpha_l x_{t-l} + \beta_1 y_{t-1} + \cdots + \beta_l y_{t-l} + e_t.$$

The formal representation of the test involves testing the joint hypothesis:

$$\beta_1 = \beta_2 = \cdots = \beta_l,$$

for each equation. The null hypothesis is that:

$$H_0: x\ does\ not\ granger\ cause\ y\ (for\ the\ first\ regression)\ ,$$

$$H_0: y\ does\ not\ granger\ cause\ x\ (for\ the\ second\ regression)\ .$$

The test is conducted using the F-test for testing the joint hypothesis. For example, an F statistic higher than its critical value leads to rejection of the null hypothesis and one concludes that there is no Granger causality among the variables of interest.

3.5.3 Forecast Error Variance Decompositions

Another useful tool in the analysis of the short time dynamics among the series in this research is the implementation of the Forecast Error Variance Decompositions (FEVDs). It determines how much of the forecast error variance of each of the variables can be explained by exogenous shocks to other variables. The variance decomposition indicates the amount of information each variable contributes to the other variables in the regression. In other words, it helps to determine the proportion of variation of the dependent variable explained by each of the independent variables. They also provide information about the relative importance of each structural shock in affecting the variables in the VAR.

Following this procedure, it will be possible to identify which of the independent variables is "stronger" in explaining the variability in the dependent variables over time. This is a very useful technique in order to establish an analytical framework and reveal any variation spillovers among economic growth, income inequality, happiness and economic freedom.

3.6 The Empirical Relationship between Economic Freedom and Growth

Economic freedom and economic growth are very relying on each other, so to state the manner in a different manner; they are jointly determined and difficult to distinguish from each other. Economic freedom is affected by economic growth in such a way that more economic growth may then increase economic freedom. Therefore it is interesting to examine the existence of any log-run properties among the set of two variables under examination. A three step methodological procedure is employed that is widely used in the related empirical literature.

The first step examines the stationarity of the series. If both economic freedom and growth are characterized by a unit root and are integrated in the same order the next step can be addressed. Therefore, if the two variables are I(1), then a cointegration analysis can be performed in order to establish any long-run relationship between the two variables.

In the next step, an EG cointegration test is performed in order to check whether a long run equilibrium relationship holds between the two series. Note that under the EG framework, as described in a previous section, it is possible to test for cointegration among a dependent variable and the corresponding explanatory variables. In this thesis an attempt is made to define whether or not economic growth in Greece has an explicable effect, in the long-run, on economic freedom. Thus, in this analysis, the dependent variable is the logarithm of economic freedom while the logarithm of the real GDP is the explanatory variable. For the purpose of robustness, the reverse case is also checked. This enables better understanding of the long-run relationship between economic freedom and growth in Greece.

Using this model, the long-run equation relating economic freedom and growth, for the case of Greece, can be formed as:

$$log(EconomicFreedom)_t = \beta_0 + \beta_1 log(rGDP)_t + e_t \ . \quad (5)$$

Equation 5 refers to the case where economic growth affects economic freedom in the long run, while β_1 is the long-run elasticity between the two variables. The long-run elasticity can be interpreted as the effect of a 1% increase in GDP on economic freedom, in the long-run. For example, if cointegration is present, a 1% increase in the real GDP in Greece will increase economic freedom by β_1 %.

Alternatively, in order to test whether or not economic freedom affects economic growth in Greece, the long-run equation is employed:

$$log(GDP)_t = b_0 + b_1 log(EconomicFreedom)_t + e_t \ . \quad (6)$$

In this case, b_1 is the long-run elasticity between the two variables. Similarly, parameter b_1 can capture the long-run effect of a 1% increase in economic freedom on real GDP.

If it is possible to establish a cointegration relationship between economic freedom and growth, the third step is to create an ECM as described in equation (2) in order to model the short-run behavior of the variables. The ECM representation between the two variables, when the dependent variable in the test is economic freedom, is:

$$\Delta log(EconomicFreedom) = \gamma_0 + \gamma_1 \Delta \log(GDP)_t + \gamma_2 \hat{e}_{t-1} + u_t, \quad (7)$$

where coefficient γ_1 captures the short-run relationship between economic freedom and growth. In addition, parameter $\gamma 2$ represents the speed of adjustment to the long-run equilibrium. More specifically, γ_2 measures how “quickly” any short-run deviations from the long-run equilibrium are corrected. There is interest in obtaining a negative and statistically significant speed of adjustment parameter in order to extract meaningful inferences from the EG cointegration

analysis. The purpose of this approach is to test whether economic freedom and economic growth in Greece are connected with a long-run relationship. The empirical literature supports the presence of such a relationship.

3.7 The Empirical Relationship between Economic Freedom and Happiness

In order to examine the relationship in Greece between Economic Freedom and happiness a three step methodological procedure is employed that is widely used in the related empirical literature. Again, the expectation is to establish a cointegrating framework between the two variables. There are two structural empirical questions to investigate for the case of Greece: (i) Is there a long-run relationship between economic freedom and the happiness in Greece? (ii) If so, what is their long-run relationship (positive or negative) and how do they behave in the short-run horizon?

The econometric procedure involves the same methodological steps as before. First of all, it is necessary to ensure that the variables under consideration are of the same order of integration (I(1)). If this is the case, then the next step can be addressed, which employs cointegration techniques.

The next step for examining the presence of a long-run relationship among the variables is the EG test. Again, two cases of the test can be distinguished: the first case, where the dependent variable is economic freedom, and another where the dependent variable is happiness. The former is the equation of interest while the latter is employed for a complementary analysis. Therefore, it is possible to represent the long-run equation between economic freedom and happiness in Greece as:

$$\log(EconomicFreedom)_t = \beta_0 + \beta_1 \log(happiness)_t + e_t \ , \qquad (8)$$

while the alternative case of the EG test will be:

$$\log(happiness)_t = b_0 + b_1 \log(EconomicFreedom)_t + e_t \ . \qquad (9)$$

Equation (8) refers to the case where happiness and happiness affect economic freedom in the long-run, where β_1 and b_1 represent the respective long-run elasticities between the two

variables. The long-run elasticity β_1 can be interpreted as the effect of a 1% increase in happiness on economic freedom, in the long-run. For example, if cointegration is present, a 1% increase in the happiness in Greece will increase economic freedom by β_1%.

If a cointegration relationship among economic freedom and happiness can be established, the third step is to create an ECM, as described in equation (2), in order to model the short-run behavior of the variables. The ECM representation between the two variables, when the dependent variable in the test is economic freedom, is:

$$\Delta log(EconomicFreedom) = \gamma_0 + \gamma_1 \Delta \log(happiness)_t + \gamma_2 \hat{e}_{t-1} + u_t \ , \qquad (10)$$

where coefficient γ_1 represents the short-run relationship between economic freedom and happiness in Greece. In addition, parameter γ_2 represents the speed of adjustment to the long-run equilibrium. Specifically, γ_2 measures how "quickly" any short-run deviations from the long-run equilibrium are corrected. It is in our interest to obtain a negative and statistically significant speed of adjustment parameter in order to extract meaningful inferences from the EG cointegration analysis.

3.8 The Empirical Relationship between Economic Freedom and Income Inequality

In order to examine the relationship between the Economic Freedom and income inequality a three step methodological procedure is employed that is widely used in the related empirical literature. It is worth noting that, income inequality is approached through the Gini Index, which is widely used in the literature to explain income differences within a country. Again, the expectation is to establish a cointegrating framework between the two variables. There are two structural empirical questions to investigate for the case of Greece: (i) Is there a long-run relationship between economic freedom and income inequality? (ii) If so, what is their long-run relationship (positive or negative) and how do they behave in the short run?

The econometric procedure involves the same methodological steps as previous. First of all, to ensure that the variables under consideration are of the same order of integration (I(1)). If this is the case, then the next step is addressed which employs cointegration techniques.

The next step is to test for the presence of a long-run relationship among the variables after utilizing the EG test. Again, two cases of the test are distinguished. One where the dependent variable is economic freedom, and one where the dependent variable is income inequality. The former is the equation of interest while the latter is employed for a complementary analysis. Therefore, the long-run equation among economic freedom and the Gini Index in Greece can be represented as:

$$log(EconomicFreedom)_t = \beta_0 + \beta_1 log(GiniIndex)_t + e_t \,, \qquad (11)$$

while the alternative case of the EG test will be:

$$log(GiniIndex)_t = b_0 + b_1 log(EconomicFreedom)_t + e_t \,. \qquad (12)$$

Equation (11) refers to the case where income inequality affects economic freedom in the long-run, where β_1 and b_1 are the respective long-run elasticities between the two variables.

The long-run elasticity β_1 can be interpreted as the effect of a 1% increase in income inequality on economic freedom, in the long-run. For example, if cointegration is present, a 1% increase in the happiness in Greece will increase economic freedom by β_1 %.

In order to establish a cointegration relationship between economic freedom and income inequality, the third step is to create an ECM as described in equation (2) in order to model the short-run behavior of the variables. The ECM representation between the two variables, when the dependent variable in the test is economic freedom, is:

$$\Delta log(EconomicFreedom) = \gamma_0 + \gamma_1 \Delta \log(GiniIndex)_t + \gamma_2 \hat{e}_{t-1} + u_t, \qquad (13)$$

where coefficient γ_1 represents the short-run relationship between economic freedom and the Gini index in Greece. In addition, parameter γ_2 represents the speed of adjustment to the long-run equilibrium. Specifically, γ_2 measures how "quickly" any short-run deviations from the long-run equilibrium are corrected. Once again, it is in our interest to obtain a negative and statistically significant speed of the adjustment parameter in order to extract meaningful inferences from the EG cointegration analysis.

3.9 The Multivariate Analysis of the Long Run

In the case of this analysis, the intention is to extract IRFs from a VECM model, which takes into account possible long-run relationships in the system. The related literature on macroeconomic modeling suggests that possible interconnections are present among the variables. Therefore, apart from the EG cointegration test, which implies the examination of the long-run properties of a couple of variables, it is imperative to investigate the long-run properties after treating the variables as a set of endogenous variables in a system.

Johansen's cointegration procedure is employed to fit and calibrate a VEC model, which accurately describes both the short run and long run dynamics of the variables. The equations describe a system in which each variable is a function of its own lag and the lag of the other variables in the system.

To start, a general VAR model is fitted to data, in line with existing economic theory and subsequently refined by selecting the appropriate lag order and testing for cointegration. If the original series are integrated I (1), i.e. the series have unit roots, and become I(0) by differencing, then the more appropriate VEC model is chosen. After being estimated, its "good" statistical properties are tested, such as residuals normality, non-autocorrelation and homoscedasticity and significance of VECM coefficients.

The VECM takes the form:

$$\Delta log(GDP)_t = +\Pi y_{t-p} + \sum_{i=1}^{p-1} \Gamma_{1i}\, \Delta\, log(GDP) + \sum_{i=1}^{p-1} \Gamma_{2i}\, \Delta\, log(EconomicFreedom) + \sum_{i=1}^{p-1} \Gamma_{3i}\, \Delta\, log(Gini) + \sum_{i=1}^{p-1} \Gamma_{4i}\, \Delta\, log(Happiness) + e_t\,, \qquad (14)$$

$$\Delta\, log(EconomicFreedom)_t =$$

$$\mu + \Pi y_{t-p} + \sum_{i=1}^{p-1} \Gamma_{5i}\, \Delta\, log(GDP) + \sum_{i=1}^{p-1} \Gamma_{6i}\, \Delta\, log(EconomicFreedom) +$$

$$\sum_{i=1}^{p-1} \Gamma_{7i}\, \Delta\, log(Gini) + \sum_{i=1}^{p-1} \Gamma_{8i}\, \Delta\, log(Happiness) + e_t\,, \qquad (15)$$

$$\Delta log(Gini)_t =$$

$$\mu + \Pi y_{t-p} + \sum_{i=1}^{p-1} \Gamma_{9i}\, \Delta\, log(GDP) + \sum_{i=1}^{p-1} \Gamma_{10i}\, \Delta\, log(EconomicFreedom) +$$

$$\sum_{i=1}^{p-1} \Gamma_{11i}\, \Delta\, log(Gini) + \sum_{i=1}^{p-1} \Gamma_{12i}\, \Delta\, log(Happiness) + e_t\,, \qquad (16)$$

$$\Delta log(Happiness)_t = \mu + \Pi y_{t-p} + \sum_{i=1}^{p-1} \Gamma_{13i}\, \Delta\, log(GDP) + \sum_{i=1}^{p-1} \Gamma_{14i}\, \Delta\, log(Gini) +$$

$$\sum_{i=1}^{p-1} \Gamma_{15i}\, \Delta\, log(EconomicFreedom) + e_t\,. \qquad (17)$$

In this case $y_{t-p} = \begin{pmatrix} \log(GDP) \\ \log(EconomicFreedom) \\ \log(Gini) \\ \log(happiness) \end{pmatrix}$ and $\Pi = a\beta'$,

as described in a previous section.

In this model, the main attempt is to define the rank of matrix Π , which defines the number of cointegrating relationships among the variables. Based on the (λ_{max}) and (λ_{trace}) statistics, the Johansen test is employed in order to test for cointegration under a multivariate framework.

This model also allows quantifying any long-run convergence to steady state "equilibrium" along with the analysis of the short-run behavior of the variables. The second step is to employ such a specification in order to examine the short-run behavior of the variables. The focus of the short-run analysis is on three widely used techniques: Granger Causality, IRFs and FEVDs.

In particular a four dimension pairwise GC hypothesis is tested such:

Dependent Variable: log(GDP)

$(a) H_0: Economic\ Freedom\ does\ not\ Granger\ Cause\ GDP$

$(b) H_0: Gini\ Index\ does\ not\ Granger\ Cause\ GDP$

$(c) H_0: Hapinness\ does\ not\ Granger\ Cause\ GDP$

Dependent Variable: log(Economic Freedom)

$(a) H_0: GDP\ does\ not\ Granger\ Cause\ Economic\ Freedom$

$(b) H_0: Gini\ Index\ does\ not\ Granger\ Cause\ Economic\ Freedom$

$(c) H_0: Hapinness\ does\ not\ Granger\ Cause\ Economic\ Freedom$

Dependent Variable: log(Gini)

$(a) H_0: GDP\ does\ not\ Granger\ Cause\ Gini$

$(b) H_0: Economic\ Freedom\ Index\ does\ not\ Granger\ Cause\ Gini$

$(c) H_0: Hapinness\ does\ not\ Granger\ Cause\ Gini$

Dependent Variable:log(Happiness)

$(a) H_0: GDP\ does\ not\ Granger\ Cause\ Happiness$

$(b) H_0: Gini\ Index\ does\ not\ Granger\ Cause\ Happiness$

$(c) H_0: Economic\ Freedom\ \ does\ not\ Granger\ Cause\ Happiness$

In addition, based on the results from the dynamic analysis of the VECM model (GIRFs, IRFs and FEVDs) it is possible to extract useful inferences regarding the short-run relationship and behavior among the variables in our system. This means that it is possible to study how a shock to a specific variable spills over onto the remaining variables of the system. When

analyzing the response of a particular variable, focus is placed on the magnitude, the sign and the statistical significance that a certain shock has. This enables the establishment of any dynamic patterns among the variables and draw conclusions for the short run relationships among growth, economic freedom, income inequality and happiness in Greece.

3.10 Conclusions

In this chapter the empirical techniques and procedures employed in this thesis were presented. Several econometric methods were used in order that the dynamic relationship between economic growth, freedom, happiness and inequality be investigated. Specifically, the procedure was analysed through which the stationarity of the series was proved. Thus, through ADF, PP and KPSS tests, the level of integration of the variables in our dataset was shown. Subsequently, Engle and Granger cointegration tests were analyzed where the variables of our model will be examined in pairs separately. Afterwards, Johansen's cointegration procedure was presented and how it will be used in order to check whether a long run equilibrium relationship holds between the two series. Providing cointegration is confirmed, a Vector Error Correction Model will be used to examine the recovery process regarding the long-run relationship. The Granger causality test is employed in order to examine the causality relationships among the variables. Lastly, impulse response functions are conducted to study the shock spillovers between the system; and forecast error variance decompositions. The results of the long-run analysis along with the corresponding ECMs and VECMs are presented in the next Chapter of this thesis. The results of the dynamic analysis are also included in the next section.

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4. EMPIRICAL RESULTS

4.1 Introduction

This chapter provides the empirical results regarding the analysis of the relationship among the macroeconomic variables of economic growth, economic freedom, happiness and income inequality for the case of Greece. The framework of the current analysis, involves several steps and procedures regarding the econometric approaches employed and the corresponding analysis of results. An analytical viewpoint is offered which takes into account both short-run and long-run relationships of our variables in order to establish a better understanding of the dynamics involved in the Greek economy.

In particular, this chapter is structured as follows: First an examination the long-run properties and relationships of the variables under consideration in “couples”. More specifically, the first aspect of the empirical analysis employs the EG cointegration test, where the variables in the model are examined in separate pairs. In this approach, the relationship of interest is that between economic freedom and each of the variables in the set. The second step involves multivariate analysis of the long-run and the short-run relationship among the vector of the variables. While the previous approach examines the variables in “pairs”, this approach treats the variables as a vector and assesses their mutual behavior. This step involves the examination of cointegration through the Johansen test procedure and the utilization of an ECM in order to investigate short-run dynamics. The third step in our empirical analysis involves implementation of Granger causality, impulse response functions and variance decomposition techniques, which can offer useful inferences regarding the relationships and the dynamics among the variables. It is important to note that it has been ensured that all variables in this analysis are I(1).

4.2 The Empirical Engle-Granger Model between Economic Freedom and Growth

In this section, the EG methodology for cointegration is applied between economic freedom and growth for the case of the Greek economy. Primarily interest lies in the case where economic freedom is the dependent variable but consideration is also given to the case where economic growth is the dependent variable. Under the EG approach, the models of long-run equations are estimated, namely equation (5) and equation (6) both for the case where a constant and a constant and a deterministic trend exists. The EG test is considered with only one lag. The decision to use this fixed lag specification is due to limitations in the dataset (21 observations).[10] Table 4.1 demonstrates the EG cointegration test results along with the z-statistics and p-values.

Table 4.1: Engle-Granger Cointegration Test between Economic Freedom and Growth in Greece

With Constant		
Dependent	**z-statistic**	**Prob.***
log(Economic Freedom)	-5.286822	0.669
log(GDP)	-7.930236	0.4153
With Constant and Trend		
Dependent	**z-statistic**	**Prob.***
log(Economic Freedom)	-17.08395	0.0929
log(GDP)	-6.156323	0.8582
Notes:*MacKinnon (1996) p-values.		

For the case of the EG test with constant, the results indicate that the null hypothesis of the test of no cointegration cannot be rejected at a 5% level of significance, as the values of z-statistic are lower than the corresponding critical values of the test (p-values are also higher than 0,05). This means that there is no evidence for the presence of cointegration both when economic freedom is the dependent variable and when economic growth is the dependent

[10] A scheme could have been chosen where the optimal lag length was selected based on AIC or SBIC information criteria.

variable. Therefore, considering the EG test with a deterministic trend, there is some weak evidence for the presence of cointegration only when the dependent variable is economic freedom. In this case the null hypothesis of the test, although it is not rejected at a 5% level of significance, is rejected for the 10% level of significance. Thus, it can be inferred that there is a long-run relationship between economic freedom and economic growth in Greece over the last twenty years. During the examination of the reverse case, where economic growth is the dependent variable, the results show that there is no evidence for the presence of cointegration. In order to quantify this relationship, an estimation is made of the long-run model as represented by equation (5). Table 4.2 represents the long-run equation between economic freedom and growth in Greece.

Table 4.2: The Long-Run Relationship between Economic Freedom and Growth in Greece

Dependent Variable: log(Economic Freedom)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**p-value**
log(GDP)	0.14***	0.05	2.89	0.01
constant	0.49	1.25	0.39	0.70
trend	-0.01***	0.00	-5.19	0.00
Observations	21			
R-squared	0.57			
F-statistic	11.87			
Prob(F-statistic)	0.00			

Note: *** indicates significance at the 1% level. HAC standard errors are employed.

In addition, the empirical representation of equation (5) would have the form of:

$$log(Economic\ Freedom) = 0.49 - 0.01t + 0.14log(GDP)\ .$$

The results from Table 4.2 indicate that the long-run relationship among economic freedom and economic growth in Greece is positive. More specifically the long-run elasticity

between the two variables is equal to 0.14 and is statistically significant at the 1% level. Therefore, higher economic growth in Greece leads to a higher level of economic freedom in the country, at a long-run horizon. For example, if the real GDP in Greece increases by 1% it will have a long-run positive impact of 0.14% on economic freedom. Thus, under the EG analysis it is possible to establish the presence of a positive long-run relationship between economic freedom and growth in Greece. This finding is in alignment with the existing empirical literature which defines a positive relationship between economic freedom and GDP.

4.3 The Empirical Short-Run Relationship between Economic Freedom and Growth

After this discussion of the long-run properties and implications between the long-run relationship of economic freedom and growth in Greece, interest turns to investigating the short-run dynamics and behavior of these two variables. Also, there is interest in investigating the short-run deviations from the long-run equilibrium established in the previous section.

In this section an error correction model is employed as suggested by the cointegration procedure of Engle and Granger in order to define the short-run dynamics between economic freedom and growth in Greece. The current analysis is based on the estimation of equation (7) as explained in Chapter 3. Based on the residuals from the long-run relationship among the two variables as described in equation (5) an estimate is made of the ECM for economic freedom and growth. The estimated ECM of equation (7) is presented in Table 4.3.

Table 4.3:The Error Correction Model between Economic Freedom and Growth in Greece

Dependent Variable Δlog(Economic Freedom)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
Δlog(GDP)	-0.05	0.17	-0.28	0.78
	-0.76***	0.17	-4.57	0.00
constant	0.00	0.01	-0.74	0.47
R-squared	0.39			
F-statistic	5.44			
Prob(F-statistic)	0.01			
Note: *** indicates significance at the 1% level. HAC standard errors are employed.				

In addition, the empirical representation of equation (7) is formed as:

$$\Delta log(Economic\ Freedom) = 0 - 0.05\Delta \log(GDP)_t - 0.76\hat{e}_{t-1}.$$

Under this analysis, results from table 4.3 suggest that the short-run relationship between economic freedom and growth in Greece (which is represented by γ_1) is negative and statistical insignificant. Therefore, no meaningful inferences can be extracted regarding their short-run relationship. On the other hand, parameter γ_2 is estimated to be negative (-0.76) and statistically significant at the 5% level of significance. This parameter describes the speed of adjustment back to equilibrium, and by strict definition is that it measures the proportion of the last period's equilibrium error that is corrected for. Thus, in this model, it can be ensured that the speed of the adjustment parameter has the desired properties. A negative speed of adjustment parameter means that any short-run deviations of economic freedom and growth in Greece from their long-run equilibrium will be corrected at a 76% rate per year. The negative and relatively high value of γ_2 ensures that the two variables would converge to their long-run relationship. Note the exclusion of the term of deterministic trend as it is not meaningful to use it, under a short-run modeling framework.

4.4 The Empirical EG Model between Economic Freedom and Happiness

In this section, results are provided regarding the empirical analysis of the long-run relationship between economic freedom and happiness for Greece over the last twenty years. Again, the main interest is to establish a long-run relationship when economic freedom is the dependent variable in the model, but consideration is also given to the case where the happiness is the dependent variable too. Under this framework, the long-run equations are estimated as implied by equations (8) and (9) and the EG cointegration test is employed. The EG cointegration test is presented in Table 4.4.

Table 4.4: Engle-Granger Cointegration Test between Economic Freedom and Happiness in Greece

With Constant		
Dependent	**z-statistic**	**Prob.***
log(Economic Freedom)	-14.0142	0.0802
log(Happiness)	-7.523238	0.4516
With Constant and Trend		
Dependent	**z-statistic**	**Prob.***
log(Economic Freedom)	-15.64145	0.1462
log(Happiness)	-6.979994	0.7992
Notes:*MacKinnon (1996) p-values.		

The results from Table 4.4 indicate that the null hypothesis in all cases can not be rejected at the 5% level of significance. This is justified from the high values of the z-statistic which are translated in p-values higher than 0.05. Nevertheless, when the dependent variables is only the economic freedom and the model contains only a constant term (as in equation (8)), it can be inferred that there is evidence for the presence of cointegration at the 10% level of significance. This means that it is possible to establish a long-run relationship between economic freedom and happiness in Greece. Therefore, the next step in the analysis is to

estimate the long-run relationship between the two variables as represented in equation (8). Table 4.5 demonstrates the long-run relationship between economic freedom and happiness in Greece.

Table 4.5: The Long-Run Relationship between Economic Freedom and Happiness in Greece

Dependent Variable: log(Economic Freedom)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**p-value**
log(Happiness)	0.21***	0.07	2.90	0.01
constant	3.73***	0.12	30.12	0.00
Observations	21			
R-squared	0.38			
F-statistic	11.77			
Prob(F-statistic)	0.00			

Notes: *** indicates significance at the 1% level. HAC standard errors are employed.

In addition the empirical representation of equation (8) is:

$$log(Economic\ Freedom) = 3.73 + 0.21log(Happiness).$$

Based on the results of Table 4.5 useful inferences can be extracted. First of all, it is possible to establish a positive long-run relationship between economic freedom and happiness in Greece. In particular, the long-run elasticity between the two variables is 0.21 and statistically significant at the 1% level of significance. This means that if happiness in Greece increases by 1%, then economic freedom should also increase by 0.21% in the long-run. This represents a positive long-run relationship between the two variables, something that is in alignment with the existing empirical literature on the subject. Consequently, it is possible to define the following mechanism: greater happiness in a country in the form of higher living standards and a better happiness for its inhabitants are more likely to adopt and implement legislative instruments that promote economic freedom. Better happiness for the public makes it easier to establish laws and

economic procedures that enhance economic freedom in a country. Greece is not exception and it is possible to trace a long-run relationship between the two variables.

4.5 The Empirical Short-Run Relationship between Economic Freedom and Happiness

The previous section established a long-run relationship between economic freedom and happiness in Greece. After a discussion of the long-run properties and implications between the variables of interest, we are interested in investigating the short-run dynamics and behavior of these two variables. Also, interest lies in investigating the short-run deviations from the long-run equilibrium of the system studied in the previous section.

The next step under the Engle and Granger framework of the long-run analysis is to quantify their short-run relationship and their short-run deviations from their long-run equilibrium. Therefore, in this section an error correction model is utilized in order to examine the short-run dynamics between economic freedom and happiness in Greece. In particular, a model is introduced as represented in equation (10). The residuals are extracted from the long-run equation (8) and used in order to create an ECM representation. This approach enables investigation of how the set of variables behaves in the short run and can offer useful inferences regarding their relationship in general. Table 4.6 summarizes the estimated error correction model between economic freedom and happiness in Greece.

In addition, the empirical representation of equation (10) is formed as:

$$\Delta log(Economic\ Freedom) = 0 + 0.02\Delta \log(Happiness)_t - 0.60\hat{e}_{t-1}\ .$$

The results from Table 4.6 suggest that the short-run relationship between economic freedom and happiness in Greece is positive but insignificant. Moreover, the speed of adjustment parameter is negative (-0.60) and statistically significant at the 1% level of significance. This means that the short-run deviations of economic freedom and happiness from their long-run equilibrium are corrected by 60% per year. Thus, it can be inferred that the

long-run relationship between economic freedom and happiness in Greece is characterized by minor short-run deviations that are corrected rapidly.

Table 4.6: The Error Correction Model between Economic Freedom and Happiness in Greece

Dependent Variable Δlog(Economic Freedom)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
Δlog(Happiness)	0.02	0.09	0.19	0.85
	-0.60***	0.15	-3.92	0.00
constant	0.00	0.01	-0.76	0.46
R-squared	0.34			
F-statistic	4.33			
Prob(F-statistic)	0.03			

Notes: *** indicates significance at the 1% level. HAC standard errors are employed.

4.6 The Empirical EG Model between Economic Freedom and Income Inequality

The next relationship under investigation is that between economic freedom and income inequality in Greece. The analytical framework is based on the long-run relationships represented by equations (11) and (12). In order to investigate whether or not economic freedom and the Gini index (which proxies income inequality) are related in the long run, the EG test is implemented for the set of variables. If cointegration does exist, then it is possible to estimate the long-run relationship between the two variables and extract inferences regarding the long-run properties regarding the two variables as in the previous cases. Table 4.7 summarizes the EG test between economic freedom and Gini index.

Table 4.7:Engle Granger Cointegration Test between Economic Freedom and Income Inequality in Greece

With Constant		
Dependent	**z-statistic**	**Prob.***
log(Economic Freedom)	-2.25	0.92
log(Gini)	-17.47	0.02
With Constant and Trend		
Dependent	**z-statistic**	**Prob.***
log(Economic Freedom)	-15.53	0.15
log(Gini)	-32.62	0.00
Notes:*MacKinnon (1996) p-values.		

The results from Table 4.7 suggest that in the case where the dependent variable is economic freedom, there is no evidence for cointegration between the variables of interest. This is due to the fact that the z-statistic in relatively small and the p-value of the test is high which indicates that the null hypothesis of no cointegration cannot be rejected. On the other hand, when the case is considered where income inequality (Gini index) is the dependent variable in the test equation (as suggested in equation (12)) it is obvious that there is evidence that supports

the notion of cointegration. More specifically, the EG test statistic in both cases (with constant and with constant and trend) is larger than the corresponding critical value at a 5% level of significance which suggests that the null hypothesis of the test can be rejected. Therefore, it is possible to trace a long-run relationship between the Gini index and economic freedom when the former is the dependent variable and the latter the independent variable.

The next step is to estimate the long-run equation which in this case is equal to equation (12). Two versions of equation (12) are considered: one with a constant only and one with a constant and a deterministic trend. Table 4.8 summarizes the results.

Table 4.8: The Long-Run Relationship between Economic Freedom and Income Inequality in Greece

Dependent Variable: log(Gini)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**p-value**
log(Economic Freedom)	-0.20**	0.08	-2.39	0.03
constant	4.35***	0.34	12.76	0.00
Observations	21			
R-squared	0.16			
F-statistic	3.53			
Prob(F-statistic)	0.07			

Notes: *** indicates significance at the 1% level. ** indicates significance at the 5% level. HAC standard errors are employed.

Dependent Variable: log(Gini)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**p-value**
log(Economic Freedom)	-0.43***	0.06	-7.30	0.00
constant	5.29***	0.24	21.84	0.00
trend	-0.01***	0.01	-4.35	0.00
Observations	21			
R-squared	0.46			
F-statistic	7.80			
Prob(F-statistic)	0.00			

Notes: *** indicates significance at the 1% level. HAC standard errors are employed.

In addition the empirical representation of equation (12) is:

$$log(Gini) = 4.35 - 0.20log(Economic\ Freedom)$$

and

$$log(Gini) = 5.29 - 0.01t - 0.43log(Economic\ Freedom)\ .$$

The results from table 4.8 suggest that the long-run relationship between the Gini index and economic freedom is negative and statistically significant. In both cases, the long-run elasticity of income inequality with respect to economic freedom is negative and statistically significant at a 5% level of significance. More specifically, a 1% increase in the level of economic freedom in Greece is associated with a 0.20% decrease (or 0.43% decrease in the case with constant and deterministic trend) in the level of income inequality. This means that a higher level of economic freedom has positive long-run effects on the level of income equality in the Greek economy.

4.7 The Empirical Short-Run Relationship between Economic Freedom and Income Inequality

This section contains an analysis of the short-run relationship between economic freedom and income inequality in Greece. In order to model the short-run dynamics, an error correction model is estimated as presented in equation (13) which is based on the residuals of the long-run equation as presented in equation (12). Under this framework it is possible to examine how the short-run dynamics are formed and measure the speed of adjustment of the short-run deviations from the long-run equilibrium. Table 4.9 demonstrates the estimated error correction model between economic freedom and the Gini index in Greece.

Table 4.9:The Error Correction Model between the Gini Index and Economic Freedom in Greece

Dependent Variable Δlog(Gini)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
Δlog(Economic Freedom)	-0.38***	0.05	-8.20	0.00
	-0.94***	0.14	-6.52	0.00
constant	0.00	0.00	-0.93	0.37
R-squared	0.56			
F-statistic	11.02			
Prob(F-statistic)	0.00			

Notes: *** indicates significant at the 1% level. HAC standard errors are employed.

In addition, the empirical representation of equation (13) is formed as:

$$\Delta log(Gini) = 0 - 0.38\Delta \log(Economic\ Freedom)_t - 0.94\hat{e}_{t-1}\ .$$

Table 4.9 provides useful inferences regarding the short-run behavior of the relationship between economic freedom and income inequality in Greece. First of all, based on equation (13) parameter γ_1 (which represents the short-run relationship between the two variables) is negative (as anticipated) and statistically significant. This means that a 1% increase in the level of

economic freedom in Greece, in the short-run is associated with a 0.38% decrease in the level of income inequality, so that income equality will arise. The speed of adjustment parameter in the ECM model is negative (-0.94) and statistically significant which means that any short-run deviations from the long-run equilibrium are corrected approximately within a year (94% rate of correction per annum).

4.8 The Empirical Results of the Multivariate Analysis of the Long-Run

In this section, the analysis is appended by employing multivariate econometric techniques in order to examine the long-run and short-run relationships among economic freedom, growth, happiness and income inequality in Greece. This analytical framework involves several steps. First, Johansen's cointegration test is conducted to define the existence of cointegrating relationships among the variables. If cointegration is present (based on the Johansen test statistics), then the second step is to estimate a VECM for the set of four variables. The third step involves the implementation of econometric techniques that uncover the short-run dynamics of the variables such as Granger causality, impulse responses and variance decompositions.

4.8.1 The Johansen Cointegration Test Empirical Results

In this section the multivariate cointegration test is employed as proposed by Johansen (1992). The first step in the Johansen methodology is to estimate the optimal lag-length of the corresponding VAR model.[11] The optimal lag-length of the VAR model in the empirical literature (and the corresponding VECM model) is based on several information criteria such as AIC and SBIC. In this thesis, due to data limitations it has been decided to estimate the Johansen cointegration test with only one lag in the underlying VECM model. Note that annual data is utilized, as this approach is preferable to this frequency of data. Table 4.10 summarizes the Johansen cointegration test statistics for the VECM which includes economic freedom, growth, happiness and income inequality.

[11] Note that the Johansen's procedure is based on a VECM representation in order to test for the presence of cointegrating vectors among the variables of interest.

Table 4.10: Johansen's Cointegration Test Results

Trace Statistic				
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.860617	69.17889	47.85613	0.0002
At most 1 *	0.654236	31.73889	29.79707	0.0295
At most 2	0.347153	11.56093	15.49471	0.1792
At most 3	0.166447	3.459101	3.841466	0.0629
Trace test indicates 2 cointegratingeqn(s) at the 0.05 level				

Maximum Eigenvalue Statistic				
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.860617	37.44	27.58434	0.002
At most 1	0.654236	20.17796	21.13162	0.0675
At most 2	0.347153	8.101833	14.2646	0.3685
At most 3	0.166447	3.459101	3.841466	0.0629
Max-eigenvalue test indicates 1 cointegratingeqn(s) at the 0.05 level				

Notes: * denotes rejection of the hypothesis at the 0.05 level. **MacKinnon-Haug-Michelis (1999) p-values.

Based on the results from Table 4.10, which demonstrates the rack test statistics (both trace statistic and max eigenvalue statistic), it can be concluded that cointegrations do exist among the set of the four variables under investigation. In particular, the trace test statistic indicates that the null hypothesis of the Johansen test is rejected for the case of at most 1 cointegrating relationship and cannot be rejected when the null hypothesis is at most 2 cointegrating vectors. Thus, it can be concluded that the trace test statistic indicates the presence of two cointegrating vectors among the variables at the 5% level of significance. In addition, the max-eigenvalue test statistic also indicates the presence of cointegration. Specifically, the max-eigenvalue test statistic indicates that there is one cointegrating vector among the variables

at the 5% level of significance.

Therefore, when studying the Greek economic, it is imperative to take into account any possible interconnections among the variables under consideration. The results imply that a long-run relationship among all the four variables of interest is present. The findings suggest that there is a long-run relationship among economic freedom, economic growth, happiness and income inequality in Greece. Thus, any implications regarding the behavior and the interconnections among this set of variables should be based on a cointegrating framework of analysis.

In order to define the long-run relationships among the variables of interest, the long-run coefficients of the variables are estimated. This approach enables quantification of the long-run relationship of the variables and extraction of useful inferences regarding the connections hidden among them. Table 4.11 demonstrates the long-run relationship as suggested by Johansen's cointegration test among economic freedom, growth, happiness and income inequality in Greece. It is important to emphasize that theoretical framework employed concerns only the case where economic freedom is the dependent variable; thus, consideration is only given to this case regarding the long-run relationship among the variables.

Table 4.11:The Long-Run Relationship between Economic Freedom, Growth, Happiness and Income Inequality in Greece

Cointegrating Equation	
Dependent Variable: log(Economic Freedom)	
log(GDP)	-0.40***
std. error	-0.04
t-statistic	[9.85]
log(Happiness)	0.48***
std. error	-0.06
t-statistic	[-7.88]
log(Gini)	-2.61***
std. error	-0.30
t-statistic	[8.81]
constant	-23.18
Included Observations	19 after adjustments
Note: *** Indicates significance at the 1% level.	

Based on the results of Table 4.11 the cointegrating coefficient β is statistically significant for all the independent variables (namely: GDP, Happiness and Gini index). The long-run relationship between economic freedom and real GDP in Greece is found to be negative, which means that if GDP increases by 1%, the level of economic freedom will decline by approximately 0.4%. This is in contrast to the positive long-run relationship found between the two variables based on the Engle and Granger approach, highlighting the importance of taking into account a multivariate perspective when investigating the long-run relationships among variables.

On the other hand, the long-run elasticity between the level of the happiness and

economic freedom is found to be positive. A 1% increase in the level of happiness in Greece is associated with a 0.48% increase in the level of economic freedom in the long-run. This finding is in alignment with the long-run elasticity suggested by the Engle and Granger approach, which also found a positive and statistically significant relationship. Thus, it is possible to trace a strong positive connection between economic freedom and the happiness in Greece. This finding means that as the living standards in Greek society rise, there is a positive impact on the legislative framework of Greece, which promotes economic activity and economic freedom.

Finally, the Johansen test suggests that the long-run relationship between economic freedom and income inequality is negative. Under this framework a 1% increase in the level of the Gini coefficient (and consequently in inequality) is associated with a 2.61% decrease in the level of economic freedom. As income inequality in Greek society rises, the level of economic freedom in the country worsens significantly. The discussion regarding the long-run relationship among the set of four variables leads to the conclusion that the impact of income inequality on economic freedom exceeds by far the effect of the other two variables in terms of absolute values. Therefore, it can be concluded that income inequality has the strongest long-run (negative) impact on economic freedom, followed by the effects of happiness and economic growth.

4.9 The Vector Error Correction Model

The next step under Johansen's cointegration analysis is to model the variables in the analysis into a VECM context in order to examine the short-run adjustment process of the variables. In other words, under the VECM representation and model estimation it is possible to quantify any short-run deviations of the variables from their equilibrium state in the long-run, under a multivariate perspective.

A VECM is introduced which includes the endogenous variables, economic freedom, GDP, happiness and income inequality. Under this framework it is possible to study the short-run dynamics of the system of variables by employing Granger Causality tests, Impulse Response Functions and Variance Decompositions. The Johansen test relies on two types of tests: (i) trace test and (ii) maximum eigenvalue test (Johansen, 1991). It has been decided to include one cointegrating vector in the VECM estimation for convenience in estimation and interpretation of the results. This is a common practice regarding error-correction modeling where there are indications of more than one cointegrating vectors. In addition, one lag for the model estimation is included as one lag has been used in order to implement the Johansen test for cointegration. The VECM in this analysis refers to equations (14) to (17) as presented in Chapter 3. Table 4.12 demonstrates the estimated VECM model.

The results from Table 4.12 are not particularly significant in regards to their economic interpretation. Due to the nature of the VECM models (and the VAR models in general) it is not possible to infer any meaningful conclusions from the VECM estimation. In contrast, several techniques are implemented as described above that quantify the short-run relationships and dynamics of the model.

Based on the results from Table 4.12, it can be observed that the previous period's deviation from long run equilibrium is corrected in the current period at an adjustment speed of 1.7%. A 1% increase in GDP is associated with a 0.27% increase in economic freedom. In addition, a 1% increase in income inequality is associated with a 0.42% decrease in economic freedom. Lastly, a 1% increase in happiness does not substantially affect economic freedom.

In the context of the VECM estimation, Pairwise Granger Causality Tests and Impulse Response Function analysis will be employed in order to estimate the short-run properties of the variables in model used.

Table 4.12: The VECM Estimation

Error Correction:	log(Economic Freedom)$_t$	log(GDP)$_t$	log(Happiness)$_t$	log(Gini)$_t$
CointEq1	0.017675	-0.287081	0.611247	-0.40049
S.E.	-0.22121	-0.14913	-0.4472	-0.12212
t-stat	[0.07990]	[-1.92510]	[1.36683]	[-3.27932]
log(Economic Freedom)$_{t-1}$	-0.355917	-0.20857	-0.774761	0.120928
S.E.	-0.30698	-0.20694	-0.62057	-0.16947
t-stat	[-1.15943]	[-1.00788]	[-1.24846]	[0.71356]
log(GDP)$_{t-1}$	0.274433	0.749193	1.133066	-0.23631
S.E.	-0.20894	-0.14085	-0.42238	-0.11535
t-stat	[1.31346]	[5.31906]	[2.68254]	[-2.04869]
log(Happiness)$_{t-1}$	-0.00702	0.037269	-0.315672	-0.0932
S.E.	-0.12553	-0.08462	-0.25377	-0.0693
t-stat	[-0.05592]	[0.44041]	[-1.24391]	[-1.34488]
log(Gini)$_{t-1}$	-0.423883	0.617005	-1.292937	0.493855
S.E.	-0.49185	-0.33157	-0.99432	-0.27154
t-stat	[-0.86181]	[1.86086]	[-1.30032]	[1.81875]
constant	-0.010376	0.00015	-0.028374	0.002483
	-0.0084	-0.00566	-0.01697	-0.00463
	[-1.23593]	[0.02656]	[-1.67176]	[0.53565]
R-squared	0.209715	0.82576	0.397816	0.507999
F-statistic	0.689954	12.32197	1.71762	2.68454
Log likelihood	40.94646	48.43893	27.57281	52.23412

Notes: S.E denotes standard error values.

4.10 Granger Causality Tests

In this section, the Granger Causality tests are conducted based on the VECM estimation described in equations (14) to (17) and demonstrated in Table 4.12. Under this procedure it is possible to define any short-run causality among the variables of the model. Causality is an important notion regarding the economic intuition of the relationship among the variables. In particular, the presence of causality means that a variable in the system analysed has "predictive power" to other variables of the system.

Under this framework the results of the Granger Causality tests are calculated, based on the null hypotheses as demonstrated in Section 3.8. Note that this test is based on the estimated parameters of the VECM representation. Rejection of the null hypothesis of the test means that there is a causal relationship between the underlying variables. Tables 4.13 to 4.16 represent the Granger Causality test results for the VECM model comprised of economic freedom, growth, happiness and income inequality in Greece.

Based on the results of Table 4.13, there is no evidence of causality of any of the dependent variables (namely GDP, happiness and the Gini index) to economic freedom in Greece as the null hypothesis of the test cannot be rejected at any of the significance levels. For the VECM model, when the dependent variable is the GDP (see Table 4.14) a causal effect can be traced from the Gini index to GDP at the 10% level of significance. This means that, in the short-run, income inequality in Greece has predictive power on the real GDP variation. This means that there is a link between the level of income inequality and the future values of economic growth for the case of Greece.

On the other hand, a causal link can be established between economic growth in Greece (real GDP) and the variables of happiness and the Gini index. Based on the results of Tables

4.15 and 4.16 it is observed that the null hypothesis of the Granger causality test can be rejected at the 5% both for the case of GDP in the equations of happiness and Gini. Thus, economic growth in Greece has predictive power and "causes" variation in the short-run both to the happiness and the income dispersion and inequality. In addition, it is possible to trace the presence of bidirectional causality or a "feedback" effect between real GDP in Greece and income inequality.

The results regarding the Granger Causality analysis provide evidence that economic growth in Greece is the main driver and the best predictor of the short-run variations in the other variables of the system (economic freedom, happiness and income inequality). Moreover, economic freedom and happiness do not impact the other variables in the system in a significant manner. Finally, there is confirmation of the strong relationship between income inequality and the level of GDP as the two variables are closely interconnected and related in the short-run. See Table 4.17 which summarizes the Granger Causality test results.

Table 4.13: Granger Causality Test for the Case of Economic Freedom

Dependent variable: log(Economic Freedom)			
Excluded	**Chi-sq**	**df**	**Prob.**
log(GDP)	1.725186	1	0.189
log(Happiness)	0.003127	1	0.9554
log(Gini)	0.742713	1	0.3888
All	2.125386	3	0.5468

Table 4.14: Granger Causality Test for the Case of Economic Growth

Dependent variable: Δlog(GDP)			
Excluded	**Chi-sq**	**df**	**Prob.**
Δlog(Economic Freedom)	1.015817	1	0.3135
Δlog(Happiness)	0.193957	1	0.6596
Δlog(Gini)	3.462783	1	0.0628
All	9.471617	3	0.0236

Table 4.15: Granger Causality Test for the Case of Happiness

Dependent variable: Δlog(Happiness)			
Excluded	**Chi-sq**	**df**	**Prob.**
Δlog(Economic Freedom)	1.558648	1	0.2119
Δlog(GDP)	7.196038	1	0.0073
Δlog(Gini)	1.690845	1	0.1935
All	7.729086	3	0.052

Table 4.16: Granger Causality Test for the Case of Income Inequality

Dependent variable: Δlog(Gini)			
Excluded	**Chi-sq**	**df**	**Prob.**
Δlog(Economic Freedom)	0.509171	1	0.4755
Δlog(GDP)	4.197148	1	0.0405
Δlog(Happiness)	1.8087	1	0.1787
All	8.57086	3	0.0356

Table 4.17: Granger Causality Test Results

Hypothesis	Result
Economic Freedom causes Growth	No
Economic Freedom causes Happiness	No
Economic Freedom causes Income Inequality	No
Economic Growth causes Economic Freedom	No
Economic Growth causes Happiness	Yes
Economic Growth causes Income Inequality	Yes
Happiness causes Economic Growth	No
Happiness causes Economic Freedom	No
Happiness causes Income Inequality	No
Income Inequality causes Economic Freedom	No
Income Inequality causes Economic Growth	Yes
Income Inequality causes Happiness	No

4.11 Impulse Response Functions Analysis

One of the advantages of the application of the VAR model is the ability to analyze the response of a variable toward a shock or a change in the other variable to the variable itself. Thus, the next step in the analysis is to estimate the propagation mechanism of a shock on one variable, to the other variables in the system. This is achieved through the implementation of the Impulse Response Analysis techniques. More specifically, based on the estimated VECM model (see Table 4.12) an estimate is made of GIRFs as proposed by Pesaran and Shin (1998) and Orthogonalized Impulse Response Functions (OIRFs).

Analysis of IRFs is conducted by providing a plot from impulse response functions to visualize the change of response of economic freedom values toward the shock experienced due to the change of economic growth, happiness and income inequality in Greece. The main area of interest is the mechanism in which a positive shock on the other variables of the system affects economic freedom. Consideration is also given to the diffusion mechanism of shocks to the whole system of variables under analysis, which offers a wider framework and supports examination of further relationships. It should be noted that this kind of techniques imply the examination of the short-run relationships among the variables (it stems from a VECM representation). In addition, the adjustment to the corresponding long-run relationship is also taken into account.

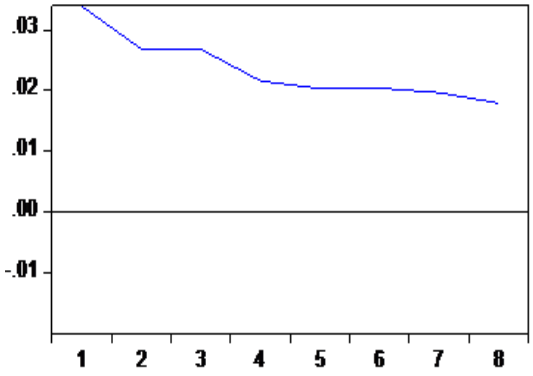
4.11.1 Generalized Impulse Response Functions

This section contains a simulation and discussion of the results regarding the GIRF analysis of the VECM model. Under this framework, Pesaran and Shin (1998) showed that this technique is order invariant, in contrast with the typical Cholesky representations of the impulse responses whose results are extremely sensitive to the ordering of the variables. Figures 4.1 to

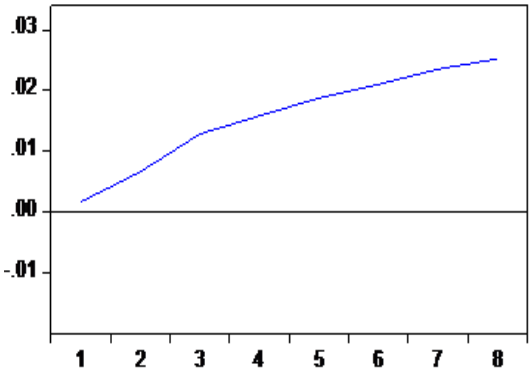
4.4 demonstrate the results of the one standard deviation positive shock on economic freedom, economic growth, happiness and income inequality along with the corresponding responses of the other variables in the system. Note that under this specification and due to the fact that the underlying impulse response functions stem from a VECM representation, it is not possible to estimate the corresponding confidence intervals of the responses.

Figure 4.1: GIRF Responses of Economic Freedom to a one-standard-deviation shock

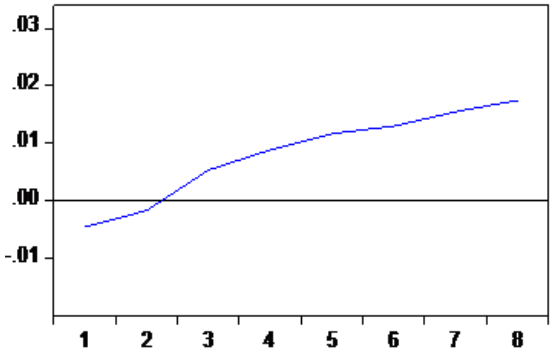
Response of Economic Freedom to a one s.d. shock on Economic Freedom



Response of Economic Freedom to a one s.d. shock on Economic Growth



Response of Economic Freedom to a one s.d. shock on Happiness



Response of Economic Freedom to a one s.d. shock on Income Inequality

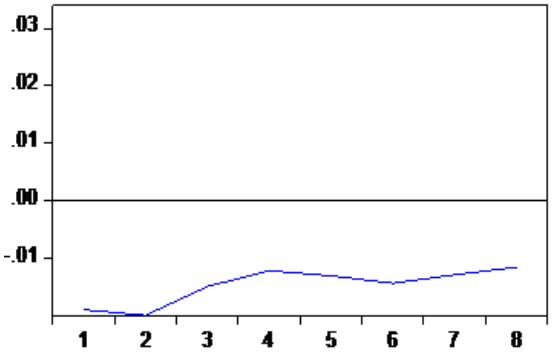
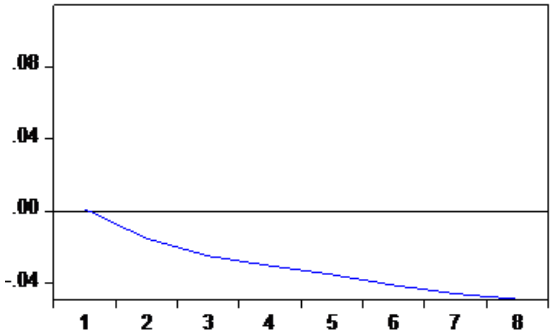
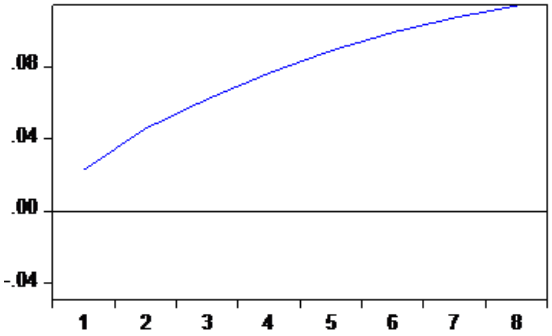


Figure 4.2: GIRF Responses of Economic Growth to a one-standard-deviation shock

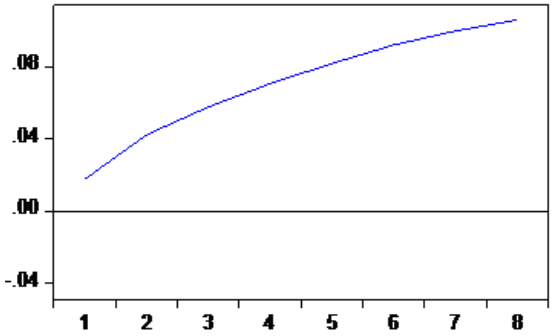
Response of Economic Growth to a one s.d. shock on Economic Freedom



Response of Economic Growth to a one s.d. shock on Economic Growth



Response of Economic Growth to a one s.d. shock on Happiness



Response of Economic Growth to a one s.d. shock on Income Inequality

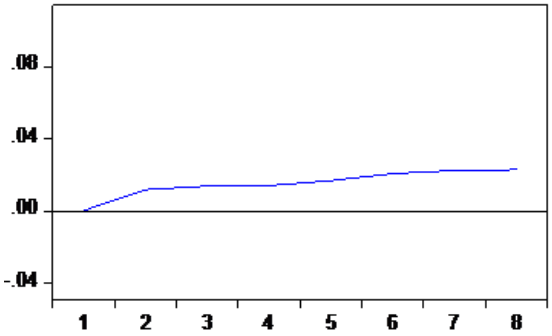
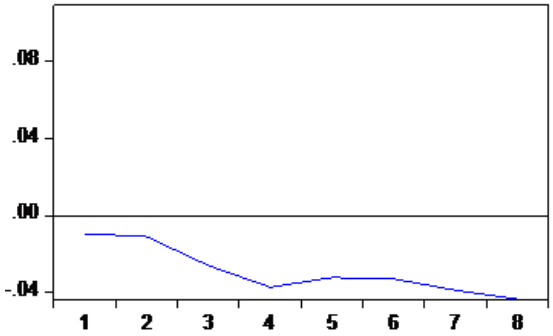
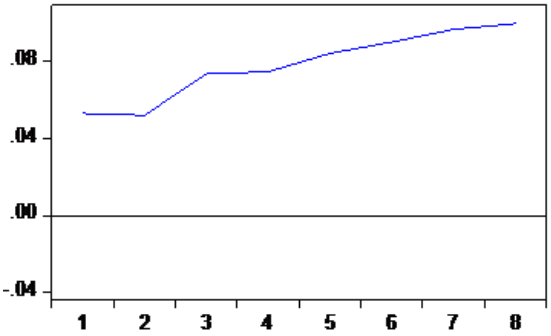


Figure 4.3: GIRF Responses of Happiness to a one-standard-deviation shock

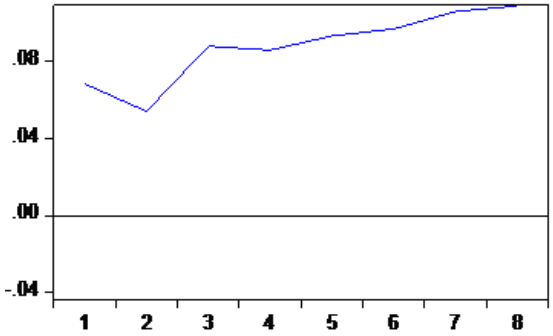
Response of Happiness to a one s.d. shock on Economic Freedom



Response of Happiness to a one s.d. shock on Economic Growth



Response of Happiness to a one s.d. shock on Happiness



Response of Happiness to a one s.d. shock on Income Inequality

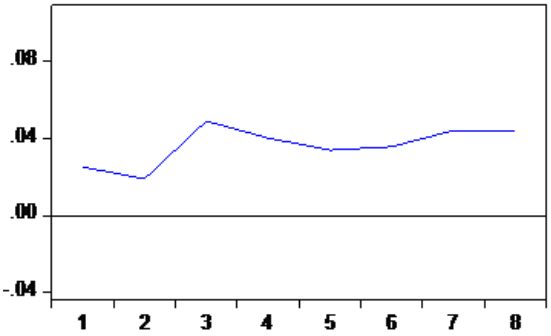
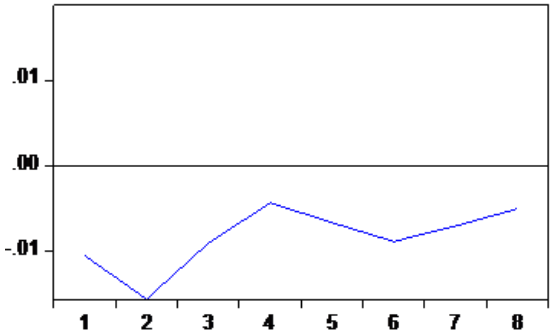
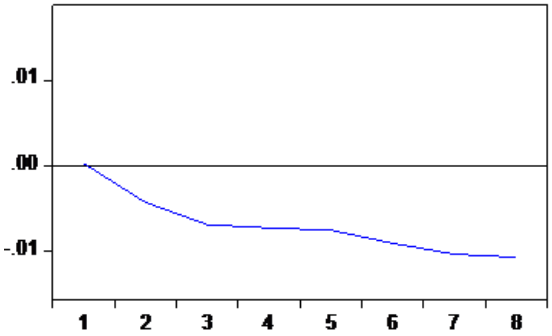


Figure 4.4: GIRF Responses of Income Inequality to a one-standard-deviation shock

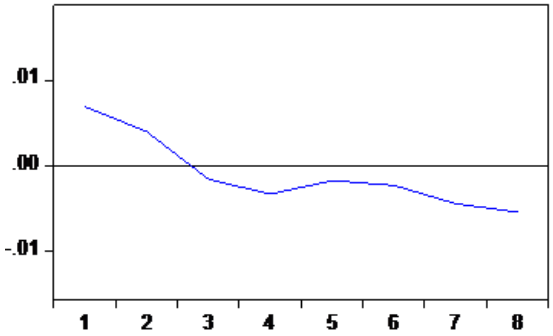
Response of Income Inequality to a one s.d. shock on Economic Freedom



Response of Income Inequality to a one s.d. shock on Economic Growth



Response of Income Inequality to a one s.d. shock on Happiness



Response of Income Inequality to a one s.d. shock on Income Inequality

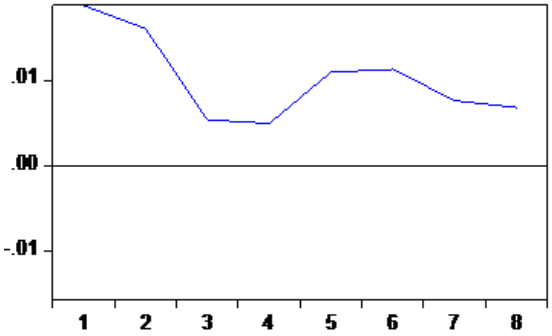


Figure 4.1 demonstrates the response of economic freedom to one-standard deviation shocks on economic growth, happiness and income inequality. Based on the GIRF analysis it is possible to trace that a shock on economic freedom has a positive impact on the variable itself which remains in the long-run (8 quarters). In addition, a positive shock on economic growth increases economic freedom. As regards a positive shock on happiness its impact on economic freedom becomes relatively important only during the long-run. In contrast, it is possible to establish a negative relationship between income inequality and economic freedom as a positive shock on the former causes a negative response on the latter both in the short-run and the long-run.

Regarding the results from Figure 4.2, it is possible to highlight the positive impact between happiness and economic growth in Greece. A positive one-standard deviation shock on happiness has a strong positive impact on economic growth, which is qualitatively the same as a shock on the economic growth variables itself. The relationship between economic growth and income inequality is positive, while there is a negative link between economic freedom and economic growth in Greece. The GIRFs suggest that a positive shock on economic freedom in Greece is associated with a negative response of the GDP which can be attributed to harmful selection of economic policies in Greece.

Results from Figure 4.3 suggest that happiness in Greece is greatly affected by economic growth both in the short-run and the long-run. A positive shock on economic growth in Greece has a great positive impact on the response of happiness. This is also the case regarding the relationship between happiness and income inequality. This is a rather unusual finding due to the fact that it was expected that the higher the income inequality, the lower the happiness in Greece would be. Furthermore, the link between economic freedom in Greece and happiness is found to be negative. A positive shock on economic freedom tends to reduce happiness in

Greece over the following 2 years of the shock. This can be attributed, again, to the inefficiency of the implemented economic policies in Greece over the last twenty years which negatively affect the happiness of the public and, as a result, happiness in Greece.

Finally, Figure 4.4 depicts the responses of income inequality to a one-standard deviation shocks. One particularly interesting inference that can be highlighted is the negative relationship between income inequality and economic growth in Greece. More specifically, a positive shock on economic growth has a negative impact on income inequality mostly in the long-run. Moreover, a shock on economic freedom also has a negative impact on income inequality. This means that higher economic freedom in Greece tends to reduce income inequality in the country. A positive shock on happiness has a positive effect on income inequality for the first years of the shock (short-run) but in the long-run period the response of income inequality gradually declines and becomes negative.

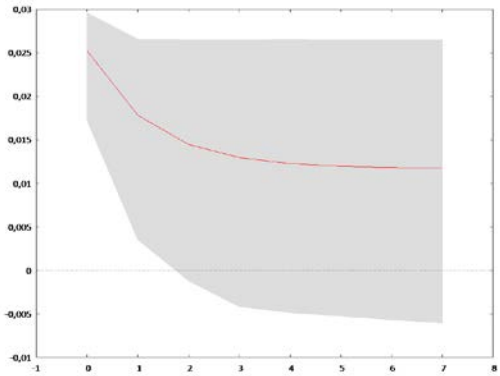
4.11.2 Orthogonalized Impulse Response Functions Analysis

In this section, an identification scheme is provided for the impulse response analysis of the VECM model. This is made by employing a Cholesky set of shock identification as suggested by the orthogonalized impulse response function analysis. Unlike the GIRFs, this technique enables a framework to identify the shock origin in the VECM model and thus enhances the economic interpretation of the impulse response functions. This is achieved through the ordering of the variables. On the other hand, the GIRFs technique was order invariant.

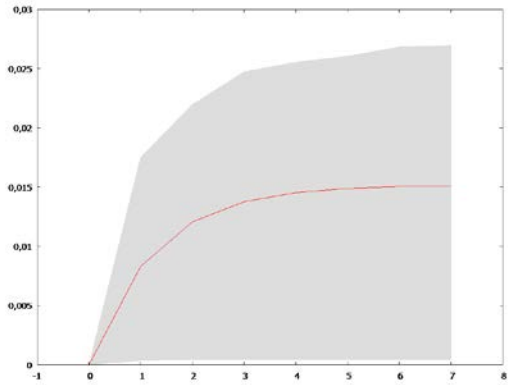
Under this framework the following ordering scheme is employed for the variables in the model: the logarithm of economic freedom comes first, followed by economic growth, happiness and income inequality. This ordering scheme enables to study how a shock induced on economic freedom spreads throughout the full system of variables. Thus, it is possible to identify and trace shocks stemming from economic freedom in Greece and the mechanism through which they affect the rest of the economy and society. Figures 4.5 - 4.8 demonstrate the orthogonalized impulse response functions of the variables under analysis, based on the corresponding estimated VECM model. The shaded areas represent the 90% bootstrapped confidence interval.

Figure 4.5: OIRF Responses of Economic Freedom to a one-standard-deviation shock

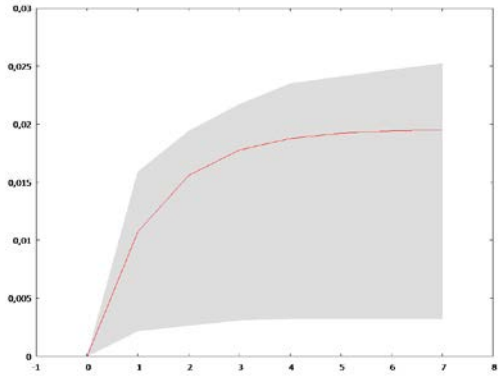
Response of Economic Freedom to a one s.d. shock on Economic Freedom



Response of Economic Freedom to a one s.d. shock on Economic Growth



Response of Economic Freedom to a one s.d. shock on Happiness



Response of Economic Freedom to a one s.d. shock on Income Inequality

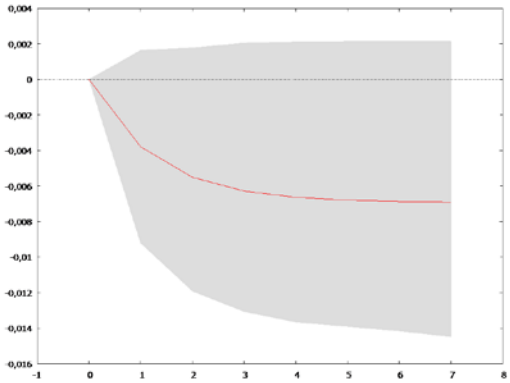
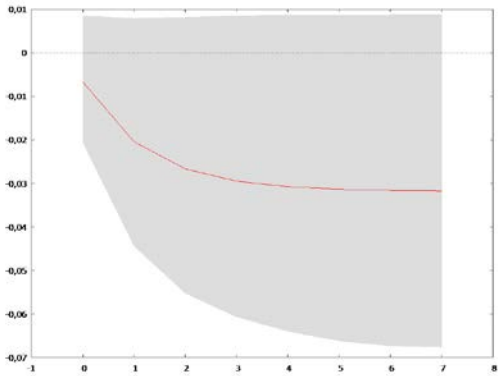
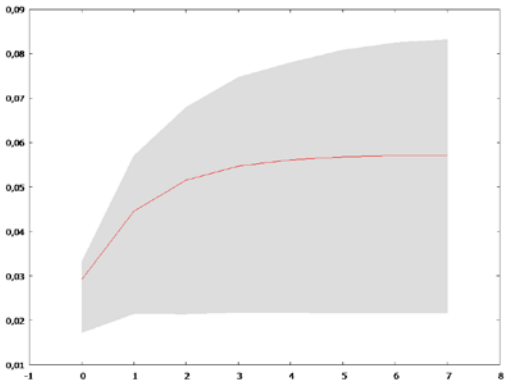


Figure 4.6: OIRF Responses of Economic Growth to a one-standard-deviation shock

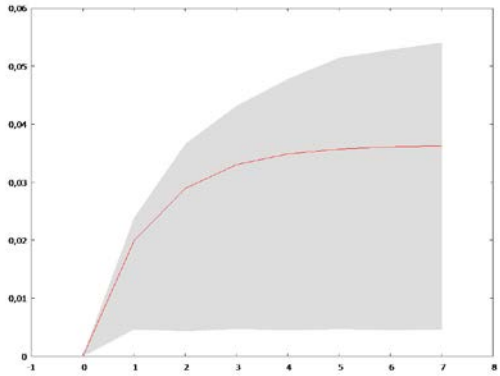
Response of Economic Growth to a one s.d. shock on Economic Freedom



Response of Economic Growth to a one s.d. shock on Economic Growth



Response of Economic Growth to a one s.d. shock on Happiness



Response of Economic Growth to a one s.d. shock on Income Inequality

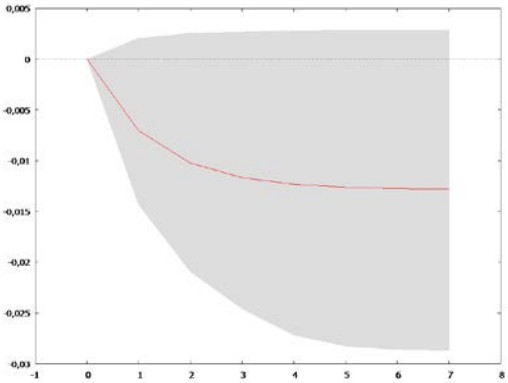
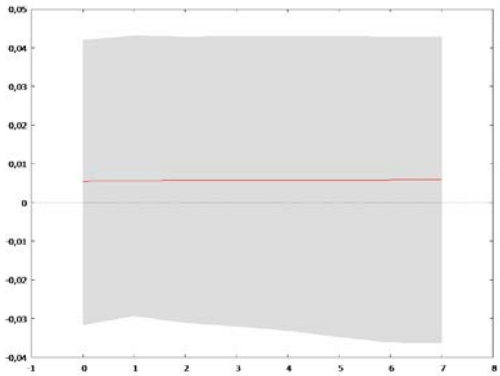
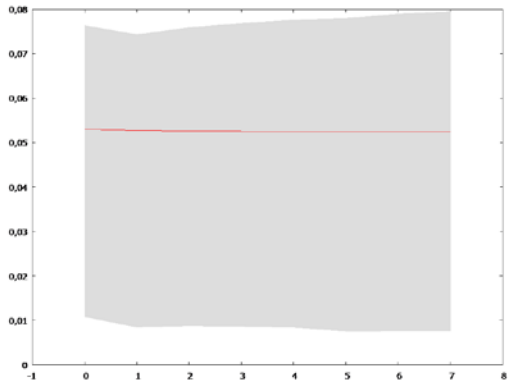


Figure 4.7: OIRF Responses of Happiness to a one-standard-deviation shock

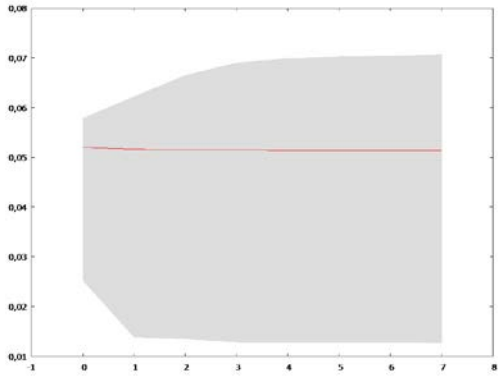
Response of Happiness to a one s.d. shock on Economic Freedom



Response of Happiness to a one s.d. shock on Economic Growth



Response of Happiness to a one s.d. shock on Happiness



Response of Happiness to a one s.d. shock on Income Inequality

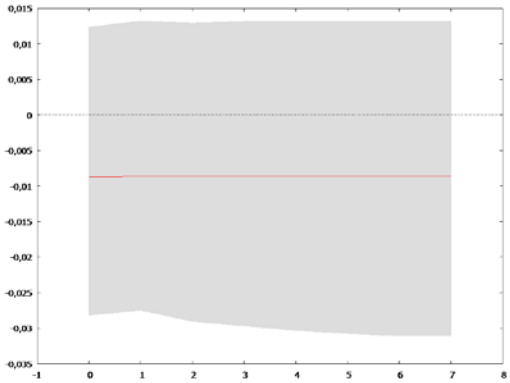
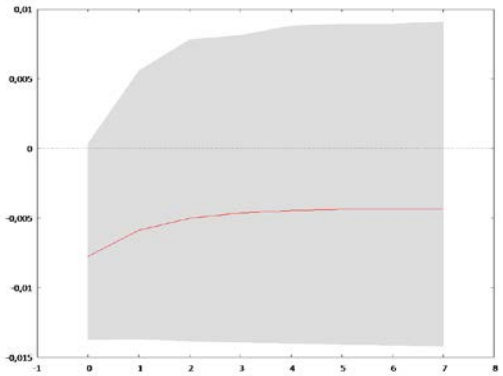
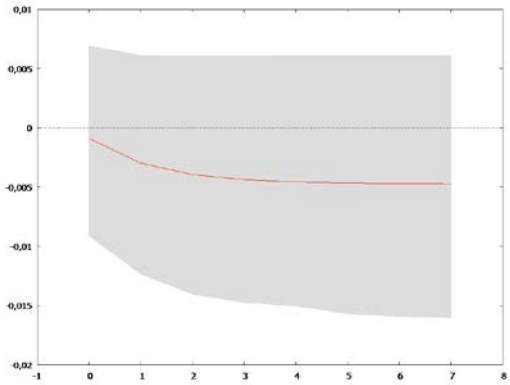


Figure 4.8: OIRF Responses of Income Inequality to a one-standard-deviation shock

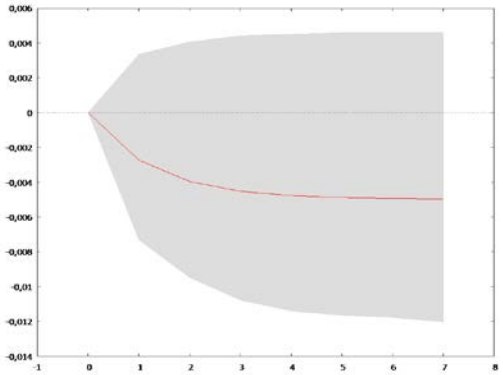
Response of Income Inequality to a one s.d. shock on Economic Freedom



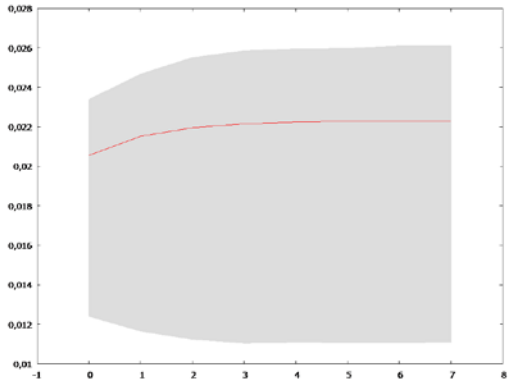
Response of Income Inequality to a one s.d. shock on Economic Growth



Response of Income Inequality to a one s.d. shock on Happiness



Response of Income Inequality to a one s.d. shock on Income Inequality



The results from Figure 4.5 suggest that positive one-standard deviation shocks on economic growth and happiness have a positive impact on economic freedom in Greece over the short-run and the long-run period. This means that a positive relationship can be established between economic growth in Greece and promotion of economic freedom in the economy. In addition, another factor that could impact positively on economic freedom is the increased happiness in Greece. On the other hand, when a shock is given on income inequality, economic freedom reacts negatively.

Happiness in Greece is a significant factor that affects economic growth. A shock on happiness positively affects economic growth in Greece (Figure 4.6). In addition, shocks on economic freedom and on income inequality will have a negative impact on the Greek GDP. Also the OIRFs analysis shows that happiness is affected positively by economic freedom and growth in Greece (Figure 4.7). Furthermore, shocks on income inequality will have a negative impact on happiness. Income inequality is sensitive to shocks stemming from the variable itself (Figure 4.8). According to the results from Figure 4.8 it could be said that shocks on happiness, economic freedom and economic growth will have a negative impact on income inequality.

To summarize the OIRFs results, a positive relationship is established among economic freedom, economic growth and happiness in Greece. Specifically, from an economic policy perspective, increased income and happiness in the economy leads to a better economic framework, that increases both the economic freedom index and the income equality in the country. Also, a positive link is traced between an increase in happiness and increase in economic freedom.

4.12 Forecast Error Variance Decomposition

The implementation of the FEVDs is useful in order to investigate the connection among the variables in the analysis. This section provides the FEVDs which are estimated from the VECM model which includes economic freedom, economic growth, happiness and income inequality in Greece. The variance decomposition of the variables is based, again, on a Cholesky scheme under which the variables are ordered under the following sequence: economic freedom, economic growth, income inequality and happiness. The results of the FEVDs are presented in Tables 4.18 to 4.21.

Table 4.18: Variance Decomposition of Economic Freedom

Variance Decomposition of log(Economic Freedom):					
Period	**S.E.**	**log(Economic Freedom):**	**log(Economic Growth)**	**log(Happiness)**	**log(Income Inequality)**
1	0.033902	100	0	0	0
2	0.044014	96.56496	1.445318	0.015617	1.974109
3	0.052806	92.8153	5.792386	0.011202	1.381109
4	0.058943	87.89929	10.93223	0.035681	1.132803
5	0.064963	82.15348	16.49007	0.213568	1.142882
6	0.071197	76.62735	21.65936	0.340397	1.372896
7	0.077378	71.32972	26.87084	0.438519	1.360921
8	0.083211	66.31078	31.81982	0.551121	1.318278

Table 4.19: Variance Decomposition of Economic Growth

Variance Decomposition of log(Economic Growth):					
Period	**S.E.**	**log(Economic Freedom):**	**log(Economic Growth)**	**log(Happiness)**	**log(Income Inequality)**
1	0.022854	0.250298	99.7497	0	0
2	0.054382	7.813689	90.78665	1.301236	0.098421
3	0.087911	10.9837	86.75071	2.076905	0.188684
4	0.122561	11.72662	85.31478	2.494957	0.463647
5	0.157563	12.08366	84.75699	2.612881	0.54647
6	0.192808	12.60507	84.16633	2.696712	0.531887
7	0.227592	13.10163	83.54718	2.794151	0.557036
8	0.261442	13.39651	83.11805	2.87595	0.609498

Table 4.20: Variance Decomposition of Happiness

Variance Decomposition of log(Happiness):					
Period	**S.E.**	**log(Economic Freedom):**	**log(Economic Growth)**	**log(Happiness)**	**log(Income Inequality)**
1	0.068536	1.817942	61.33182	26.94576	9.904483
2	0.08929	2.52518	71.14708	18.31984	8.007896
3	0.128222	5.258886	68.89137	13.13112	12.71863
4	0.157795	8.983041	69.18309	11.87878	9.955084
5	0.186061	9.406984	71.18477	11.58389	7.824359
6	0.212855	9.556257	73.08325	10.78746	6.573029
7	0.240998	10.01792	73.87361	10.12557	5.982905
8	0.268041	10.69235	74.23032	9.753717	5.323616

Table 4.21: Variance Decomposition of Income Inequality

Variance Decomposition of log(Income Inequality):					
Period	**S.E.**	**log(Economic Freedom):**	**log(Economic Growth)**	**log(Happiness)**	**log(Income Inequality)**
1	0.018716	31.3264	0.188191	0	68.48541
2	0.026417	50.30137	1.827538	1.74392	46.12718
3	0.028912	51.67206	6.449733	3.300958	38.57725

4	0.03028	49.11639	11.26124	3.124552	36.49782
5	0.0331	45.0916	14.11052	2.620391	38.17749
6	0.036267	43.47493	17.37522	2.327486	36.82236
7	0.038618	41.61216	21.97639	2.244994	34.16645
8	0.040682	39.00722	26.37397	2.05935	32.55947

The discussion of the variance decompositions provides very useful inferences regarding the connections among the variables under study. More specifically the results show that, in the long-run, approximately 30% of the variability in economic freedom of Greece is solely explained by economic growth (see Table 4.18). Thus, there is a strong connection between these two variables (which is confirmed from the impulse response analysis too) as the GDP is an important factor which determines the variation in the formation of economic freedom in Greece. Happiness and income inequality have a minor impact. Regarding the determinants of variation in economic growth (see Table 4.19), economic freedom affects 14% of the variation in the long-run and happiness only 3%.

An important conclusion stemming from Table 4.20 is that economic growth in Greece is the main driver of the variation regarding the index of happiness. This means that happiness in Greece is primarily determined from the level of income which accounts for more than two thirds (approximately 75%) of the variability. In addition, economic freedom accounts for 10% of the variation in happiness. Finally, based on the results of Table 4.21 it can be concluded that the two main factors in the variation of Greek income inequality are economic freedom and economic growth. More specifically, economic freedom accounts for 50% of the variation in income inequality in the short-run and 40% in the long-run. Moreover, except for itself, variation in income inequality is affected by approximately 25% from economic growth in Greece in the long-run. The impulse response function analysis and the variance decomposition analysis offer an intuitive framework for analyzing the properties and the formation of relationships among the set of variables under discussion.

4.13 Conclusions

In this chapter the empirical results regarding the analysis of the relationship among the macroeconomic variables of economic growth, economic freedom, happiness and income inequality for the case of Greece were provided. Several steps and econometric procedures that were employed were presented in detail. In addition, the corresponding analysis of the results is also part of this chapter. An analytical viewpoint was offered in which both short-run and long-run relationships of our variables were considered in order to establish a better understanding of the dynamics involved in the Greek economy. Firstly, an examination of the long-run properties and relationships of the variables under consideration in pairs took place through the EG cointegration test. The relationship of interest, as is already noted, is that between economic freedom and each of the variables in the set. Afterwards, a multivariate analysis of the long-run and the short-run relationship among the vector of the variables was conducted, where the mutual behavior of the variables was assessed. This is employed via the Johansen test procedure and the utilization of an ECM in order to investigate short-run dynamics. Afterwards, an implementation of Granger causality, impulse response functions and variance decomposition techniques are presented through which useful inferences regarding the relationships and the dynamics among the variables are offered.

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5. CONCLUSIONS, POLICY RECOMMENDATIONS AND PROPOSALS FOR FURTHER RESEARH

In this Chapter, a comprehensive summary of the main conclusions of this paper will be presented, discussing the thesis's main findings regarding the variables of interest for Greece, their relationships and their implications. Some relevant, research-driven, policy recommendations for the Greek economy will be provided to promote both Greece's economic freedom and development in the country as well. We base our inferences on well-established statistical and econometric facts from the analysis presented in previous chapters.

In the beginning, a theoretical approach regarding Economic Freedom was presented and it was emphasized why it is an engine that drives success and prosperity worldwide. A detailed description was offered of the mechanism by which the index of economic freedom is defined and created. More specifically, based on theoretical and empirical premises, it was shown how greater economic freedom creates dynamic benefits for both citizens and societies. Through many studies the relationship between economic freedom and growth was shown, and specifically whether economic freedom leads or lags economic growth. Afterwards, the relationship between economic freedom and income inequality was investigated. Lastly, an extensive presentation in the field of happiness was made. The link between economic freedom and happiness was investigated by providing a great many studies relating to these variables. Thus, this thesis investigates the relationships between economic freedom and growth, economic freedom and inequality, and economic freedom and happiness for the case of Greece between 1995 and 2015.

An extended empirical analysis of the set of variables under consideration was employed in order to investigate the above relationships. In the beginning of our analysis the stationarity of the series was examined since the empirical investigation of the long-run

relationships among the variables of our interest involves, first of all, the examination of the individual properties of each process. Provided the variables were characterized by a unit root and were integrated in the same order, then the Engle and Granger cointegration test was employed where the presence of cointegration among two variables each time is examined and their long run relationship and equilibrium established. Afterwards, the Johansen cointegration method was used in order to investigate the existence of cointegrating relationships. After confirmation of cointegration, a Vector Error Correction Model was used to examine the recovery process to the long-run relationship. Furthermore, pairwise Granger causality tests were conducted in order to establish the causality relationships among the variables. Lastly, the impulse response functions analysis was employed to examine the shock spillovers in the system; and the forecast error variance decompositions technique was employed to investigate the connection among the variables.

The first set of variables in our analysis was economic freedom and economic growth. They are very dependent on each other and difficult to distinguish from each other. The methodological procedure described above was employed. In this thesis an attempt was made to define whether or not economic growth in Greece has an explicable effect, in the long-run, on economic freedom. Thus, the dependent variable was economic freedom while real GDP was the explanatory variable. For the purpose of robustness and for a better understanding of the long-run relationship between economic freedom and growth in Greece, the reverse case where economic growth is the dependent variable was also checked. However, the results show that in this case there is no evidence for the presence of cointegration. Therefore, after considering the EG test there is some weak evidence for the presence of cointegration only when the dependent variable is economic freedom. The results that arose from our analysis indicate that the long-run relationship between economic freedom and economic growth in Greece is positive. Thus, it can

be inferred that there is a long-run relationship between economic freedom and economic growth in Greece over the last twenty years. Therefore, there is strong evidence to suggest that higher economic growth in Greece leads to a higher level of economic freedom in the country in the long run, so a basic priority of policy makers should be the implementation of policies that promote growth and consequently economic progress and economic freedom.

Regarding the investigation of the short-run dynamics and behavior of these two variables, an error correction model was employed as suggested by the cointegration procedure of Engle and Granger. The results suggest that the short-run relationship between economic freedom and growth in Greece is negative and statistically insignificant. Therefore, no meaningful inferences can be drawn regarding their short-run relationship. In addition, it can be concluded that the speed of the adjustment parameter has the desired properties. A negative speed of adjustment parameter means that any short-run deviations in economic freedom and growth in Greece from their long-run equilibrium will be corrected at a 76% rate per annum. This fact ensures that the two variables would converge to their long-run relationship. Through the implementation of the Johansen cointegration test the long-run relationship between economic freedom and real GDP in Greece is negative, which is in contrast to the positive long-run relationship found between the two variables based on the Engle and Granger approach, highlighting the importance of taking into account a multivariate perspective when investigating the long-run relationships among variables.

Afterwards an attempt was made to examine the short-run adjustment process of the variables via the Granger Causality tests, through which it is possible to define any short-run causality among the variables of the model. In particular, the presence of causality means that a variable in the system analyzed has “predictive power” to other variables in the system. Under this framework the results of the Granger Causality tests provide no causality when the

dependent variable is GDP to economic freedom and the same result arises when economic freedom is the dependent variable.

The next step was to implement the Impulse Response Analysis techniques in order to estimate the propagation mechanism of a shock on economic growth to economic freedom and vice versa. Considering the results from generalized impulse response functions analysis, it may be concluded that a positive shock on economic growth has a positive effect on economic freedom, but after a shock on economic freedom there is a negative effect on economic growth. As concerns the results from orthogonalized impulse response functions analysis, there is strong evidence to suggest that positive one-standard deviation shocks on economic growth have a positive and statistically significant impact on economic freedom in Greece over the short-run and the long-run period.

Lastly, forecast error variance decompositions were employed and very useful inferences regarding the connections among the variables under study arose. More specifically the results show that, in the long-run, approximately 30% of the variability in economic freedom in Greece is solely explained by economic growth. Thus, there is a strong connection between these two variables (which is confirmed by the impulse response analysis too) as the GDP is an important factor which determines the variation in the formation of economic freedom in Greece.

As concerns the relationship between economic freedom and happiness, it can be inferred that there is evidence for the presence of cointegration between them so that it is possible to establish a long-run relationship between economic freedom and happiness in Greece. For the purpose of robustness and for a better understanding of the long-run relationship between economic freedom and happiness in Greece, the reverse case where happiness is the dependent variable was also checked. However, the results show that in this case there is no

evidence for the presence of cointegration. Therefore, considering the EG test it can be concluded that there is a positive long-run relationship between economic freedom and happiness in Greece. This represents a positive long-run relationship between the two variables, something that is consistent with the existing empirical literature on the subject. Consequently, it is possible to define the following mechanism: greater happiness in a country, in the form of higher living standards, is more likely to lead to the adoption and implementation of legislative instruments that promote economic freedom. Thus, increasing happiness may increase the economic freedom in a country.

Regarding the investigation of the short-run dynamics and behavior of these two variables, an error correction model was employed as suggested by the cointegration procedure of Engle and Granger. The results suggest that the short-run relationship between economic freedom and happiness in Greece is positive but insignificant. Moreover, the speed of adjustment parameter is negative (-0.60) and statistically significant at the 1% level of significance. This means that the short-run deviations in economic freedom and happiness from their long-run equilibrium are corrected by 60% per year. Thus, it can be inferred that the long-run relationship between economic freedom and happiness in Greece is characterized by minor short-run deviations that are corrected rapidly. Through the implementation of the Johansen cointegration test the long-run relationship between economic freedom and happiness in Greece is positive. This finding is consistent with the long-run elasticity suggested by the Engle and Granger approach, which also found a positive and statistically significant relationship.

Afterwards an attempt was made to examine the short-run adjustment process of the variables via the Granger Causality tests that have already been described. From the results of the Granger Causality tests it is not possible to establish a causal link between economic

freedom and happiness. Consequently, the Impulse Response Analysis techniques were used in order to estimate the propagation mechanism of a shock on happiness to economic freedom and vice versa. Considering the results from generalized impulse response functions analysis, it may be concluded that a positive shock on economic freedom has a negative effect on happiness, but after a shock on happiness the impact on economic freedom becomes relatively significant only during the long-run. As concerns the results from orthogonalized impulse response functions analysis, there is strong evidence to suggest that positive one-standard deviation shocks on happiness have a positive and statistically significant impact on economic freedom in Greece over the short-run and the long-run period. Finally, happiness is affected positively after a shock on economic freedom.

Forecast error variance decompositions are employed and very useful inferences arise regarding the connections between economic freedom and happiness. More specifically the results show that, in the long-run, happiness has a minor impact, approximately 0.5%, on the variability in economic freedom in Greece. Similarly, economic freedom has a minor impact, approximately 10% on the variability of happiness in Greece.

As regards the relationship between economic freedom and income inequality, it should be stressed that a negative relationship should exist. It can be inferred that there is evidence for the presence of cointegration between them, and so it is possible to establish a long-run relationship between those variables in Greece. For the purpose of robustness and for a better understanding of the long-run relationship between economic freedom and income inequality in Greece, the reverse case where income inequality is the dependent variable was also checked. According to our results, the only case in which a long-run relationship between income inequality and economic freedom can be traced is when the former is the dependent variable and the latter the independent variable. Specifically, it may be concluded that the long-run

relationship between income inequality and economic freedom is negative and statistically significant. This means that a higher level of economic freedom has positive long-run effects on the level of income equality in the Greek economy.

As regards the investigation of the short-run dynamics and behavior of these two variables, an error correction model was employed as suggested by the cointegration procedure of Engle and Granger. The results suggest that the short-run relationship between economic freedom and income inequality in Greece is negative and statistically significant. Moreover, the speed of adjustment parameter in the ECM model is negative (-0.94) and statistically significant, which means that any short-run deviations from the long-run equilibrium are corrected approximately within a year (94% rate of correction per annum).

Through the implementation of the Johansen cointegration test the long-run relationship between economic freedom and income inequality in Greece is negative. This finding is in line with the result that arose from the Engle and Granger approach. Afterwards, Granger Causality tests were employed, but there is no causal relationship between the underlying variables. Consequently, the Impulse Response Analysis techniques were used in order to estimate the propagation mechanism of a shock on income inequality to economic freedom and vice versa. Considering the results from generalized impulse response functions analysis, it may be concluded that a negative relationship between income inequality and economic freedom arises as a positive shock on the income inequality causes a negative response on economic freedom. Thus, an increase on income equality will have a positive impact on economic freedom. Moreover, a shock on economic freedom also has a negative impact on income inequality. As concerns the results from orthogonalized impulse response functions analysis, there is strong evidence to suggest that the impact of a positive shock on income inequality has no statistically significant impact on economic freedom.

Forecast error variance decompositions were employed and very useful inferences arose regarding the connections between economic freedom and income inequality. More specifically the results show that, in the long-run, income inequality has a minor impact, approximately 1.3 %, on the variability in economic freedom of Greece. In addition, it may be concluded that economic freedom accounts for 50% of the variation in income inequality in the short-run and 40% in the long-run.

Therefore, some other empirical results regarding our variables of interest may be concluded. A very close relationship is revealed between economic growth and happiness in Greece. In addition, increased growth is one of the most important drivers of happiness in Greece. Between economic growth and income inequality there is bidirectional causality. Also meaningful inferences can be extracted regarding the short-term behavior of the variables from the impulse response analysis (OIRFs in particular). It may be concluded that increased economic growth in Greece positively affects the happiness of the public, a relationship which is bidirectional (a positive shock on the happiness of the Greeks also has a positive impact on economic growth).

Greece has been at the forefront of public policy debates for almost eight years. The country has changed government six times and lost almost 30 percent of its real GDP since 2008, and has been in continuous debt negotiations with the European Union, the International Monetary Fund, and the European Central Bank. According to a study implemented by the Heritage Foundation Institute, Greece's economic freedom score is 57.7, making its economy the 106th freest in the 2019 Index. Thus, revising, modifying and improving economic freedom in Greece is no easy process. However, there is still room for improvement on some components of economic freedom that will restore economic dynamism in Greece and enhance economic freedom.

According to the results of the thesis, it may be concluded that increased economic growth in Greece will enhance the promotion of a more “open” legislative economic framework which, in turn, is also promoted when the happiness of Greeks is increased. In addition, the results suggest that the promotion of policies that increase economic freedom in Greece can reduce income inequality. Therefore, policy makers should focus on establishing a legal framework that would expand economic activity in Greece and reduce poverty and income inequality.

A crucial sector with a great deal of room for improvement concerning economic freedom and growth is the legal system. The first category of economic freedom is “Rule of law”, which measures the degree to which Greek laws protect private property rights and the degree to which Greece enforces those laws. “Property rights” with a score of 52.4 and “Judicial effectiveness”, with a score of 49.5 are included in this category. Based on these scores, it could be said that the judiciary is inefficient, slow and understaffed. It is crucial for the country to promote some radical changes and improvements in this sector as property rights are a vital factor in the accumulation of capital for production and investment. Secure titling is key to unlocking the wealth embodied in real estate, making natural resources available for economic use, and providing collateral for investment financing. In addition, a national land registry should be completed, including the highly specific demarcation of sites and zones of archeological interest.

A major area where significant further research could be conducted is the investigation of the relationship between a specific aspect of economic freedom which Greece lacks i.e property rights and growth, happiness and income inequality. Consequently, it could be examined whether this specific aspect of economic freedom will induce faster growth, higher

incomes, and other positive economic outcomes or whether economic freedom will prevent such outcomes from occurring.

The second category of Economic Freedom is “Government size”, where tax burden, government spending, and fiscal health are included and the level of government expenditures as a percentage of GDP is measured. On analysis of this category, it is noteworthy that the public debt in Greece is equivalent to 181.9 percent of GDP. There is general agreement that during recent years Greece has had to implement very onerous measures imposed by the IMF and so only extremely high taxation recession policies were implemented. This over taxation has undermined recovery and growth and has aggravated deeply felt social problems. Thus, happiness in Greece was dramatically declined. There is a need to bring the GDP onto a positive course and improve the economic growth prospects of the country. The promotion of these policies will enhance economic freedom in Greece.

As regards the third category of Economic Freedom, which is “Regulatory Efficiency”, Based on the scores that Greece achieves, it could be argued that the Greek economy lacks labor mobility and that labor regulations are still restrictive although Greek governments have agreed to a very long list of structural reforms. A few of these have been implemented but unfortunately most have been relegated to the future. The future has arrived in Greece, however, and the sooner these reforms happen, like the privatization of heavily subsidized and loss-making state-owned enterprises that cover everything from ports to oil-production companies and electricity-generation utilities, the sooner economic progress and success will be achieved.

Exploring the relationship between the specific aspect of this category named “labor freedom”, which is extremely low for Greece, and growth, happiness and income inequality will be very productive. In the light of such research is conducted, policy makers should be encouraged to develop reforms that may help improve the index of economic freedom, enabling

households to enjoy an improved quality of life, with greater income, consumption and employment opportunities. This could cause increased business investment, which may aid the creation of new enterprises and new job vacancies, and increase domestic production and trade.

Lastly, as concerns the fourth category of Economic Freedom, which is “Open Markets”, Trade freedom (81), Investment Freedom (55) and Financial Freedom (50) are included. The current framework is suffocating for the market and for the economy is general. There is also widespread recognition that a completely new framework for business start up and operation should be created. There is a need to increase the production value of the primary sector of the economy. Domestic industrial production should be also strengthened.

There are two requirements to achieve this: the creation of an environment conducive to business investment, and the participation in joint ventures with foreign industry. It is also necessary to restore the trade balance with a view to making that balance positive. The implementation of these policies can strengthen the country’s economy and prosperity and put the country on the path to enhance its economic freedom.

The reliability of this index and the irrefutable relationship between economic freedom and prosperity impel Greek policy makers to implement reforms that improve economic freedom and social outcomes.