International Economic Integration and Fiscal Policy Effectiveness

Master thesis

Finance & Strategic Management

Copenhagen Business School

Councelor: Lisbeth la Cour, PhD

Dep. of Economics, Copenhagen Business School

10th October 2011

78 standard pages (177.515 STUs)

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Abstract

The present thesis is devoted to the study of international economic integration and fiscal policy effectiveness, topics which are increasingly relevant, especially due to the observed propagation of events such as the US subprime mortgage crisis and the European sovereign debt crises. In order to provide a strong contribution to diminish and fight such propagations, it is necessary to clearly understand the dimensions of the above two concepts. For that purpose, the analysis is carried out based on the examination of the coefficients of 12 time-series multivariate models that arise from the investigation in Østrup (2003). The econometric cointegration techniques applied to these models, allow for accurate interpretations and conclusions on the key topics of this thesis. The findings suggest no significant evidence of international economic integration, pointing out at the same time towards a significantly effective fiscal policy when applied by the authorities. Moreover, the obtained results imply no tendencies, neither on international economic integration, nor on the fiscal policy effectiveness.

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1. Introduction

Globalization is a widely discussed topic throughout time by many researchers, governments and companies. It is defined by the Organization for Economic Cooperation and Development (OECD) as an increasing internationalization of markets for goods and services, by means of production, financial systems, competition, corporations, technology and industries (stats.oecd.org.1). In fact, globalization started very early, in the XV century, with the known Age of Discovery, when some European countries explored the world, and it continued increasing afterwards. By looking back in time, it is now possible to understand that the First and Second World Wars were decisive for the globalization process, as they contributed to gather countries in organizations/regions that allowed them to cooperate in many aspects. Organizations such as the United Nations (UN) or the European Coal and Steal Community (ECSC), that later became the European Union (EU), were established, and followed by others throughout the time. These involved, among other things, trade and mobilization agreements, which increased both trade and migration. The innovation on communication technologies boomed the development of globalization as it started to be visible in each person's daily routine. Actually, nowadays activities like video chatting with a person that is in the other corner of the world, are common in anyone's life and changed, among other things, businesses, governments and people´s relations.

Globalization is undeniably changing the world by both its benefits and disadvantages. Currently, one can instantaneously access the breaking news of another country, discuss business contracts by video conference, migrate to another country, and buy another country's product in the nearest local supermarket. However, as an example, it is with the same easiness, that also the crises move from one side of the world to another. The recent subprime mortgage crisis in the US spread into the world quickly and left its presence in many countries. This latest happening fostered even more the research on globalization and its consequences. In fact, not only the researchers are deepen into this study, as also governments and companies are, recently, investigating it more and more, in order to understand the dimensions of this concept, and thus to deal with it effectively. In fact, stronger studies on the globalization could have at some degree diminished the recent crisis contagion, as it would have been more effective, if the countries exposed to this US subprime crisis knew their degree of exposure beforehand. Another example comes from the recent situation in Europe, where peripheral countries are sequentially dealing with sovereign debt crises. In order to decrease this propagation in a successful manner, it is important to firstly understand the links existent between these countries and also the effectiveness the government policies that are used fight against these types of events.

To sum up, globalization and the recent crises (the subprime mortgage crisis and the European sovereign debt crises) are the main motivations that lead this thesis, in which international economic integration and the government's fiscal policy effectiveness, often used to fight economic crises, are the main topics. Thus, this thesis aims to provide an essential contribution to combat happenings such as the ones mentioned.

1.1. Problem Statement

As it was mentioned in the previous section, it is crucial for governments and companies to clearly understand the concept of globalization. In fact, it may change the way government policies affect the domestic economy and the way crises spread, depending on the degree of each country's exposure to globalization, i.e. whether these are integrated. This thesis will concentrate on these specific aspects, and will analyze the degree of integration of some countries, while offering at the same time some conclusions on the fiscal policy effectiveness applied by each country's authorities. To accomplish this analysis, this project will be developed with the goal of answering the following research questions:

- *Are the countries really internationally integrated?*
- *Is there any trend, throughout time, in the integration process of the countries?*
- *Is the fiscal policy effectively applied by the authorities?*
- *Is the fiscal policy effectiveness changing throughout the time, more specifically, is it becoming less effective due to globalization?*

1.2. Delimitations

The models that will be developed in this thesis will be tested in the OECD countries. However, since for some countries, the data needed were not available for a significantly long time period of analysis, only 20 of the 36 OECD members will be considered. The time period chosen for the analysis is from 1972 until the third quarter of 2010, also due to data availability. According to Sachs & Warner (1995), "integration means, not only increased market-based trade and financial flows, but also institutional harmonization with regard to trade policy, legal codes, tax systems, ownership patterns and other regulatory arrangements". In this thesis, the analysis will focus on the economic perspective of integration and globalization, leaving behind other perspectives inherent to these global and general concepts.

Consequently, along this thesis, economic integration will be referred as simply integration. Apart from these delimitations, the conclusions from the analysis will be mainly centered in the obtained results and due to time and space constraints, the economic reasons for them will not be analyzed in detail.

1.3. Structure

The remainder of the report is organized as follows. In Chapter 2, the existent literature, especially on globalization/integration and also on fiscal policy effectiveness, is described, together with the methods commonly used for these analyses.

Chapter 3 presents the models that are used in this thesis, in order to answer the four research questions, and explains its contributions to the existent literature.

Chapter 4 comprehends the analysis made, where firstly, in section 4.1., the econometric methods used to obtain coherent final models, based in the ones mentioned in chapter 3, are explained. Then, in section 4.2., the data used in the analysis are presented and finally, the obtained results are reported and commented in brief discussions in section 4.3 and 4.4, where the first serves to answer the first and third research questions whereas the second one concerns the results of sub-periods analyses, with the aim of answering to the second and fourth research questions above presented.

Finally, in Chapter 5, the main conclusions of the thesis are summarized and the problem statements are clarified. Moreover, a brief statement of future research is proposed.

2. Literature Review

Integration among the countries has been extensively investigated throughout the time, however the conclusions reached on this topic are not always consensual. It is a fact that in the past decades, especially from the mid 80's, in general, the world has been witnessing a rise in trade, capital flows and migration, as well as an expansion in the development of technology and telecommunications, which allow people and companies to easily communicate with the rest of world. The mentioned rises are justified by the increased removal of barriers to trade, to invest or to circulate, through agreements or even unions among countries, by the increased deregulation, and by the technological innovations, such as the ones that revolutionized the transportation sector by reducing its costs and also its travel duration. Nevertheless, many researchers argue that these facts are not sufficient to conclude for a trend regarding the international economic integration of the countries.

Before starting reviewing the previous literature on the different analyses and conclusions on international integration, it is essential to clarify the main concepts that will be used, i.e. globalization and integration. These two concepts are very similar and usually considered as synonyms along the literature. Nevertheless, the first one has been differently defined according to each author's perspective. For instance, Giddens (1990) portrays globalization as an intensification of social relations, which links different locations in a way that local actions are influenced by world-wide events. Hirst & Thompson (1999) illustrate this concept as the situation in which the national economies and domestic strategies of national economic management are more and more irrelevant. Conversely, Weistein (2005) argued that the most common and agreed aspects found in all of the definitions, show this phenomenon as a global process or evolution of the economic integration through trade, capital flows, migration and technology spillovers, whereas, Vujakovic (2010) stated that a complete definition of this concept should include the multidimensionality inherent to it, namely by considering the economic, political and cultural perspectives, and thus he defines this term as a "process of growing interaction and interdependence between economies, societies and nations across large distances". The term integration offers higher consensus along the literature, as it is usually not considered as a global and multidimensional concept such as globalization, where each author interprets it on his way, but on the contrary, it is usually used within a specific field of research, and thus, easier to define. Based on the previous, Rodrik (2000) argues that the usage of the term integration is preferred against globalization, and this thesis will, in general, follow that indication. This author refers to the economic perspective of integration, which is the one to be considered in this thesis, as the situation where barriers to trade are removed, and it can exist in different degrees. Moreover, he states that the market for goods and services is interrelated with the before mentioned concept, as the presence of international economic integration induces a parallel integration in this market. By this, it is meant that, economic integration presupposes that the prices of similar products in different locations, corrected by exchange rates, should be the same (law of one price), or at least, follow the same pattern, in the long-term. Consequently, when the markets are fully integrated, the absolute or the relative Power Purchasing Parity (PPP) is verified, respectively meaning that, the ratio $REER^i = \frac{P^i}{P^w} * e^i$, i.e. the Real Effective Exchange Rate (REER), where e^i is the real exchange rate between the two countries, P^i the domestic price level, and P^w a weighted average of other countries' price levels, should be one or constant (Rødseth, 2000). After a clarification of the concepts that will be used in this thesis through a revision of its definitions in the literature, the main analyses and conclusions involving them, will be further presented.

Along the existent literature, it is possible to perceive the common argument that integration has been increasing together with the volume of the world trade. Irwin, in Weinstein (2005) evaluates the ratio of world exports and imports against the world production, i.e. the degree of openness, when arguing for globalization. Agbetsiafa (2010) within the field of regional integration analyzed whether trade openness caused economic growth in eight members of the West African Monetary Union (UEMOA). As measures for the trade openness he used the exports ratio to production, the imports ratio to production and the sum of imports and exports ratio to production, which he considered to be indicators of regional integration. Marelli & Signorelli (2011) have also recurred to the degree of openness indicator, as a measure of international integration, in order to analyze the economic growth of both India and China, since 1980. The foreign direct investment flows were also considered as an indicator of global integration in this study, which through a standard economic growth model, aims to analyze the growth rate of output. In this paper, the authors mention the remarkable growth of the value of net exports and the increasing percentage of the foreign direct investment against GDP, especially in China, meaning that also their international integration has been characterized by an upwards trend. Sachs & Warner (1995) documented the global integration and also analyzed its effects on the economic growth. As to do so, within their vast investigations, they also used as an explanatory variable for the income growth, the trade openness indicator, which according to them, represented a measure of each country's integration into the world economy, with the argument that the progress of trade liberalization is a condition for the government's reform towards global integration. Along with these authors, Down (2007), when analyzing the relationship among trade openness, country size and domestic economic volatility, has also assumed that the increase of the trade volume implicates more economic integration. As a matter of example, apart from these mentioned authors, also Alesina & Wcziarg (1998), Avelino, Brown & Hunter (2005), Klein, Schuh & Triest (2003), Feenstra (1998), among many others, share the same conclusions of a more international integrated world, based on the world trade volume. Interesting to notice, is the fact that the mentioned studies are reported in different periods of the time, indicating that the same beliefs on integration are not time dependent. Opposed to these researchers, Vujakovic (2010) argues that traditional measures of integration such as the above referred do not consider various other factors that enhance the conclusion for international integration, such as the distance of the countries that trade or its intensity, which would allow for the distinction of global integration or regionalization, and thus that the above conclusions may be biased. Accordingly, this author develops a new index, with 21 variables related to economic, political, and social fields included, to measure globalization with the goal of capturing the multidimensionality that characterizes this concept. In his results, he found out that the most integrated countries were the small European ones, which raised the question, aligned with the above mentioned, regarding the traditional integration measures, of whether these countries were in fact global integrated or regionalized. In addition, in this study, countries like the US, Japan, or the BRICS[1], which are known for their expanded economic growth and hence many times associated with globalization, did not even appear in the 30 top globalized countries. Reyes, Schiavo & Fagiolo (2010) shared the same opinion as the previous mentioned author, when it comes to measuring integration by using solely trade volume measures, such as the degree of openness. They argued that it is important to go further, and also to analyze the structure of the trade relationships among the countries. Therefore, they developed a study based on network analysis, which showed that, the trade growth observed in the Latin American countries was not followed by an increasing international integration. Poncet (2003) resorted to the border effects method to analyze the trade flows within Chinese domestic market and international markets, during the 80s and 90s. In fact, she concluded that both international and domestic border effects were high, when compared with other regions and thus, that Chinese barriers to trade were still high, contrarily to Marelli & Signorelli (2011) who, as above documented, concluded for the

[1] Brasil, Russia, India, China and South-Africa

Chinese integration in the world economy, based on the degree of openness, even though for a slightly different period. Moreover, Irwin, in Weinstein (2005), has also referred to this effect, arguing that despite the removal of barriers to trade through agreements among countries or regions, there are still effects inherent to the borders that have impact on the trade flows. According to him, the border effect may be accentuated if the countries in question do not share a common language, currency, legal system or culture. In the same line, he claims that trust is increasingly considered of extreme importance among producers, since specific and differentiated products are more and more demanded by consumers, and thus producers may have to commit with specific machinery that might be able to accomplish such specific requirements. In this manner, it is considered that the above mentioned common factors that countries may share might give rise to trust. Another factor that is behind the border effect, concerns the difficulties of acquiring information, especially, when the countries do not share common characteristics. Regarding this aspect, it is argued that the recent innovations and developments in technology and telecommunications have been increasingly contributing to shorten information asymmetries, nonetheless, perfect information, particularly among distant countries with different characteristics, will be hard to reach, hindering arbitrage and thus integration. In other words, what this author means is that even though the political barriers are increasingly removed giving rise to more trade flows, there are still some barriers to trade, inherent to the borders, which consist of limitations to the trade flows and thus to global integration. Related to the previous, McCallum (1995), analyzed the border effect by means of a gravity model, between two very similar countries, the U.S. and Canada, which share a common language, culture and trade agreements. He concluded that despite these similarities, the two countries still share a strong border effect that hinders their trade flows.

In conclusion, along the literature, and throughout time it is possible to perceive two trends of opinion regarding international economic integration based on the trade volumes: on the one hand those who argue for a more integrated world along with larger trade flows, and on the other hand those who claim that the measures used by the firsts are not enough to reach any conclusion, and that it is possible that the world is not so internationally integrated, according to methods such as network analysis and border effects, supporting the existence of other kind of phenomena, e.g. regionalization.

A trend towards international economic integration is also usually defended by many researchers who analyze the price convergence among the countries. Along the literature, it is possible to perceive the preference of the authors to analyze price convergences within the European market, perhaps because it consists of an economic and monetary union which has been constantly making efforts towards integration. In this sense, Goldberg & Verboven (2005) investigated the price convergence within the European automobile market, with the goal of concluding on international economic integration and found that there is a process towards convergence in the prices of European cars, confirming both the relative and absolute versions of the law of one price. Susanto, Rosson III & Adcock (2008) have also studied the relationship between price convergence within North America and its integration. For this purpose, these authors based their analysis on the onion market and concluded for a process toward price convergence in this market within North America, and consequently for higher integration within the NAFTA countries. Faber & Stokman (2009) have also examined the relationship existent between price convergence and international integration. In this sense, he analyzed the price levels convergence within 15 EU-members throughout the development of a price dispersion measure. Their findings were very significant and pointed out in the direction of a convergence of the price levels among these countries, and thus a process towards integration. Resorting to panel data unit root tests, also Sosvilla-Rivero & Gil-Pareja (2004) found strong evidence of price convergence, especially on traded goods, among the European countries within the period from 1975-1995. Many other authors, such as Uebele (2011), Parsley & Wei (2002), and Rogers (2002) found the same evidences. Still related to price convergence, Bilgin, Lau & Tvaronavičienė (2010) also investigated international economic integration, by developing a new model based on a new panel unit root test, which allows for testing individual series for a unit root while considering cross-sectional dependence and also structural breaks. In order to do so, they analyzed the degree of both financial and economic integration of China, Japan, UK, European Union and the US, by investigating the empirical validity of the real interest parity (RIP), the uncovered interest parity (UIP) and purchasing power parity (PPP), based on economic theories and on Frankel indications in 1991 that if both real (PPP) and financial (UIP) parity exist simultaneously, the RIP has to hold:

$$r_{t,j}^{d} - r_{t,j}^{f} = \left(i_{t,j}^{d} - i_{t,j}^{f} - \Delta s_{t,j}\right) - (\pi_{t,j}^{d} - \pi_{t,j}^{f} - \Delta s_{t,j})$$

where parity conditions exist when the differentials of RIP are stationary. This study found evidence of both financial and economic integration between China and the other countries.

Apart from the previously mentioned studies, many other investigations on international integration based on the price convergence concluded the opposite from the above authors, i.e. a price dispersion which contradicts the integration beliefs. Bergin & Glick (2004) analyzed the global price convergence from 1992 until 2007, and concluded for a Ushaped behavior of price dispersion, which according to the authors coincides with the oil price fluctuations, and thus with transportation costs. In what concerns the measure of integration, these authors clearly state the benefits of using the price convergence, that mirrors arbitrage, against measures of openness which can be affected by many other factors rather than integration, such as government national policies. Engle & Rogers (2004) found similar patterns as before mentioned, in a study of the price convergence in the Eurozone from 1990 until 2003, contradicting a possible expectation of integration from the time that the common currency was implemented. In addition, it is worth mentioning the work from Cheung, Chinn & Fujii (2006), based on Frankel indications in 1991 cited in this article, as they not only analyzed the degree of integration of some countries, as they went further and also investigated the determinants for the parities deviations found. In this matter, these authors resorted to a regression where the absolute deviation from a given parity (ADEV) is the dependent variable and the explanatory variables were the trade intensity, FDI, a capital control index compiled by Chan-Lee in 2002 cited in this article, and macroeconomic policies: centered moving averages variances of both inflation and exchange rates. The findings obtained from this paper conclude that the effects of the explanatory variables on the parity deviations are not unanimous. Proxies for capital controls, trade intensity, FDI and exchange rate volatility are found to be significant factors, despite the trade intensity having the wrong sign, which might indicate that a bad proxy was used. Moreover, it was confirmed that the exchange rate regime has implications on the results of integration.

Still concerning the study about international economic integration through price convergence, many authors analyzed the border effects with respect to the products price. For instance, Serres, Hoeller & Maisonneuve (2001) argued that the border effects on prices are generally smaller than on trade flows. However he still found significant effects of the European countries' borders on price differentials.

As it might be easy to perceive, agreements on the direction of international integration have been difficult to reach throughout time. Actually, many other aspects, linked to what was above described, have also generate some divergence among the researchers' opinions. As a matter of example, the trade on services has been considered to have increased in the recent decades due to the developments and innovations within the technology field, as the Internet allows for an easier way to trade what before considered as non-tradable. Irwin, in Weinstein (2005) based on the previous, argued that the trade on services has, indeed, been rising in the recent time, but also that this growth is not enough to conclude for an increase in international integration, as there are still many barriers imposed by the authorities inherent to the trade of this kind of products. Moreover, as it was mentioned before, many authors claim that also due to the enhancement of the transportation sector, its costs have been decreasing, e.g. the reduction in shipping costs, along with an increased containerization have contributed to facilitating trade and thus integration (Berg, 2008). Nonetheless, on the contrary, as it was before mentioned, it is has also been argued that these costs have been in fact increasing due to oil prices, hindering integration.

Apart from the trade volume and price convergence measures of international economic integration, which are the most relevant along the literature, it is also important to note that authors like, Hallett & Piscitelli (2002), Choe (2001), and Abbott, Easaw & Xing (2008) have pursued their analyses on integration mainly through business cycle synchronization models, where controversy conclusions were also observed.

After having described the main literature existent on international economic integration, the literature about the fiscal policy effectiveness will be further reviewed. As in integration, the effectiveness of the fiscal policy has also been controversial. Frenkel & Razin (1986) have soon raised the question of fiscal policy effectiveness together with international economic interdependence. They state that “the impact of policies depends on the relations among spending patterns of domestic and foreign private sectors, of domestic and foreign governments as well as of domestic and foreign saving propensities”, and based on that, developed a model to analyze the international transmissions of the fiscal policy, with the assumption of perfect integration of the world markets. These authors concluded for the effectiveness of this measure, i.e. that a rise in government spending, which is financed by taxes and debts issues, originates a fall in the domestic private consumption. Arestis & Sawyer (2004) investigated the effectiveness of the fiscal policy by analyzing its effects on the income. They determined that this policy remains a powerful macroeconomic policy that is able to offset changes in the level of the aggregate demand, especially if it is coordinated with a monetary policy. However, it is worth mentioning that these results are linked to a model that assumes a closed economy, and thus not very relevant for this thesis. In addition, also Genschel (2004) defended that the fiscal policy effectiveness was not affected by international integration. However, in his study, he mentioned other authors, namely those that he called the “globalists”, who defend the opposite, i.e. that macroeconomic controls are affected by globalization, and makes fiscal policy less and less effective. Marinas (2010), supports the idea that the fiscal policy do not generate the same effect than previously, due to the recent economic crises period, and resorted to the theory to find the reasons for this fact.

He concluded that there are some factors inherent to crises periods, such as pessimism, that influence the fiscal policy effects on consumption, hindering the effectiveness of this policy.

To sum up, the above examples from the existent literature show the controversy conclusions on this topic, especially in the recent times.

3. Own contributions

In the previous section, the most common tools used to analyze international integration and fiscal policy effectiveness, were described. As it is possible to note, each method results in controversial conclusions by the researchers. In this sense, this thesis is based in Østrup (2003) work, where a new model to test both integration and the fiscal policy effectiveness was introduced, and in which some of the controversial aspects above discussed are corrected. This thesis goes beyond an analysis on integration, as most of the previous work on this topic, and allows for a discussion on the fiscal policy effectiveness with the goal of providing strong contributions to combat economic crises. The main novelty introduced in this thesis concerns the choice of a larger time period of analysis including the recent crises, and the development of econometric techniques that will allow transforming Østrup's model into more accurate ones. Moreover, as it is possible to understand from the literature review presented before, the preference among investigations on specific countries, regions or economic unions can be seen. The analysis that will be further carried out, concerns some selected countries from the OECD. As it was previously explained, not all of this organization's members were examined due to data unavailability, especially in the less developed countries; however, the sample included in the investigation surely contains small and great economies from different regions of the world, thus enriching the conclusions. Further contributions to the previous literature will be further mentioned.

3.1. The model

The model developed by Østrup (2003) arises from the Gross Domestic Product (GDP) identity:

$$Y = C + I + G + X - M$$

where Y corresponds to the GDP, C to private consumption, I to the gross investment, G to the government consumption, X to the exports and M to the imports. From this identity, he added the first two variables, representing the domestic private demand, and the last two, net exports, were substituted by one measure of competitiveness, the REER. It is important to highlight that in this author's model, the government consumption was not considered due to reasons that will be further discussed. The decision of substituting the net exports by a competitiveness measure comes from the controversial aspect of considering the trade flows as a measure of integration, as it was previously mentioned in the literature review, and also supported by this author. In this sense, to analyze international integration and fiscal policy effectiveness, Østrup (2003) used the following regression based on the referred variables:

$$GDP_{\,t} = \alpha + \beta_1\, Demand_{\,t} + \beta_2\, Competitiveness_{\,t} + \varepsilon_t$$

<u>Measures of competitiveness</u>

In this thesis, two measures of competitiveness, the REER and the relative Unit Labor Costs (ULC) will be considered in the model, since these are the most commonly used along the literature (Turner & Van't dack, 1993). The REER consists of a measure of competitiveness as it compares the currency of one country with other countries currencies "weighted by their share in either the country's international trade or payments", adjusted by the respective price levels (stats.oecd.org.2). The ULC will be also used as a measure of competitiveness, as it represents the ratio of the domestic cost of labor per unit of output against the average of the labor costs per unit of output in other countries. While the first measure represents an indication of a country's competitiveness based on the prices, the second one is based on the costs competitiveness. Turner & Van't dack (1993) mentioned that controversy concerning the correct use of these measures as indicators of competitiveness has been discussed along the literature. In fact, it has been argued that measures based on price levels, as the REER, may raise ambiguities when analyzing integration, as they may have behind an adjustment made through government policies, such as exchange rate, which directly impacts this measure, and/or the fiscal policy, through an indirect impact on the demand (Østrup, 2003). In this manner, not only arbitrage but also authorities are able to affect the REER. Other aspects that give raise to ambiguities concerning this measure according to Turner & Van't dack (1993), concern the choice of the price indices and respective weights, i.e. the way the REER is calculated. These mentioned ambiguities inherent to this measure are the reason for the choice of using a second competitiveness measure in the model, the ULC. However, according to the same author, also this measure raises some ambiguities, especially concerning the manner it is calculated, as it is claimed that it fails in considering productivity differences.

In summary, in order to contribute with stronger conclusions on integration and on fiscal policy effectiveness, not only the REER will be considered as also the ULC, giving rise to three different models: one with the REER as a competitiveness measure, a second one with the ULC, and a last one considering both measures. The consideration of three models will raise the level of the discussion, and represents a new contribution to the previous literature on these topics.

Government Consumption

Government consumption is possible mainly by means of taxes, fiscal policy, and debt issues by the government. Based on this statement, it can easily be understood that in order to analyze the effects of the fiscal policy, one should consider the net disposable income, i.e. the GDP with the government consumption deducted, rather than on the aggregate income. In fact, the private consumption depends on the private wealth, i.e. net of taxes and thus, to analyze the impact of the fiscal policy, it is important to take into consideration the net disposable income (Frenkel & Razin, 1984). These are the reasons for the deduction of government consumption in both the demand and production in Østrup's model. Nevertheless, in the present thesis, not only these types of models will be developed, but also models with the government consumption included in its variables. This fact arises from the consideration that while, on the one hand models without the government consumption will allow for better conclusions on the fiscal policy effectiveness, on the other hand there is no reason to deduct this variable when solely investigating international integration. The consideration of these two types of models in what concerns the government consumption presents a new contribution to the existent literature.

Ratios

Both of the competitiveness measures are presented in relative terms, as the concept itself suggests. For this reason and for consistency purposes, the other variables, i.e. both the demand and GDP variables, will also be considered in relative terms, i.e. against the total values for all of the considered OECD countries, like in the model developed in Østrup (2003). In fact international integration, the main topic of this thesis, is also by definition a relative concept. Therefore, economically, it makes more sense to also consider these other variables taken in ratios. However, since the referred variables will not properly behave in order to fit some of the further econometric tests, models with variables free of ratios will be also analyzed in order to check if these will bring any benefits to the econometric method's conclusions. In this sense, 6 new models will be considered for the main analysis.

Summing up, there are 12 models that will be analyzed in this thesis based on the above equation, in order to enhance the conclusions on both integration and fiscal policy effectiveness. The table below only presents the 6 models considered in relative terms, since the remainder 6, in which the dependent and the first explanatory variables are not measured in relative terms, are similar but simply without the consideration of ratios.

Model_REER: $NGDP_{\ t} = \alpha + \beta_1\ CIG_{\ t} + \beta_2\ REER_{\ t} +\ \varepsilon_t$

Model_REER_G: $NGDP\_G_{\ t} = \alpha + \beta_1\ CI_{\ t} + \beta_2\ REER_{\ t} +\ \varepsilon_t$

Model_ULC: $RGDP_{\ t} = \alpha + \beta_1\ CIG_{\ t} + \beta_2\ ULC_{\ t} +\ \varepsilon_t$

Model_ULC_G: $RGDP\_G_{\ t} = \alpha + \beta_1\ CI_{\ t} + \beta_2\ ULC_{\ t} +\ \varepsilon_t$

Model_REER_ULC: $NGDP_{\ t} = \alpha + \beta_1\ CIG_{\ t} + \beta_2\ REER_{\ t} + \beta_3\ ULC_{\ t}\ \varepsilon_t$

Model_REER_ULC_G: $NGDP\_G_{\ t} = \alpha + \beta_1\ CI_{\ t} + \beta_2\ REER_{\ t} + \beta_3\ ULC_{\ t}\ \varepsilon_t$

The models REER_G, ULC_G and REER_ULC_G correspond to the ones where the government consumption was disregarded and will be used for conclusions on fiscal policy effectiveness. The variables NGDP_G and RGDP_G respect to the nominal and real GPD without the government consumption, respectively. Attention must be paid to the fact that the models using merely the ULC as a measure of competitiveness, are presented in real terms, i.e. without considering inflation. This is so, in order to remove the mentioned drawbacks inherent to the use of price levels to investigate integration. Models that include the REER use instead of the RGDP (Real GDP) the NGDP (Nominal GDP) as the dependent variable, so as to validate the identity. These models are further assumed to be correctly specified.

To conclude, the 12 models should allow for conclusions on both international economic integration and fiscal policy as follows:

✓ Model_REER, Model_ULC and Model_REER_ULC, both in ratios and free of ratios: If the impact of the national demand (CIG) on production is low or inexistent, while at the same time the impact of the competitive measures is significantly high, then international economic integration is concluded. On the contrary, if the impact of the national demand (CIG) on the production is high and the impacts of the competitiveness measures on the same variable are either low or inexistent, no international integration is concluded.

✓ Model_REER_G, Model_ULC_G and Model_REER_ULC_G, both in ratios and free of ratios: If the impact of the national private demand (CI) on production with the government deducted is low or inexistent, a not effective fiscal policy is concluded for the country in analysis. On the contrary, if the impact of the national private demand (CI) on the production, without government consumption is high, arguments for an effective fiscal policy will be made. In these cases, also the impacts of the competitiveness measure on production may be analyzed, as indicated above, but just with the goal of confirming the conclusions made from the models above, i.e. with government consumption included.

Summing up, conclusions on international economic integration will be based on the joint results for coefficients β_1, β_2, and β_3 of Model_REER, Model_ULC and Model_REER_ULC, whereas the conclusions for fiscal policy effectiveness will be based in the coefficient β_1 for Model_REER_G, Model_ULC_G and Model_REER_ULC_G. In order to achieve these conclusions, the coefficients of the variables will therefore be tested against 0, and both its significance and magnitude will be interpreted. Furthermore, the fact that the fiscal policy affects the demand was assumed, as in Østrup (2003).

4. Analysis

4.1. Methodology[2]

In order to proceed with the analyses on the explained models, some econometric techniques will be applied with the goal of transforming them. These transformations will allow for an accurate analysis of the coefficients, which is the main goal of this project.

4.1.1. The Phenomenon of Spurious regression

The phenomenon of spurious consists of the main reason for the models that will be analyzed to suffer from some transformations. In fact, when it comes to analyzing time-series multivariate models, as it is the case, it is crucial to investigate the properties of the variables inherent to these models, i.e. whether they represent stationary or non-stationary processes. These two concepts will be further explained. At this point, it is only of interest to keep in mind that stationarity in a time-series is a condition to make coherent statistical inferences on models they are included in, as otherwise, both the estimations and its t-statistics and R^2 are biased. This is known as the phenomenon of spurious, in which no interpretations on a linear regression can be made after an Ordinary Least Square (OLS) procedure, and it was introduced by Yule (1926). Therefore, a regression model which includes non-stationary variables is considered as a spurious regression, which cannot be accurately analyzed. Accordingly, after running stationarity tests on the variables, if the presence of integrated or non-stationary processes is confirmed, some transformations are required in order to turn these variables into stationary ones, and thus possible to be examined. A common tool to transform non-stationary series into stationary ones is known as differencing, i.e. the subtraction of the value of a variable in the preceding period by its current value (ΔX_t=$X_t - X_{t-1}$). It is very common that the first differences of the variables are stationary, and usually these are the ones used in the models, so that statistical inferences can be accurately done. Variables that are non-stationary in their levels, but after taking their first differences become stationary are said to follow an integrated processes of order 1, i.e. I (1), or to have a stochastic trend, which differs from a deterministic trend in the sense that the first cannot be predicted. Another possible procedure to convert a non-stationary process into a stationary one is called detrending, which might be used when in the presence of a process with a deterministic trend, i.e. a predictable trend. It is often difficult to conclude which type of trend

[2] This section will be based in Koop (2008), Alexander (2008a), Alexander (2008b), Gujarati (2003) and Juselius (2006).

is inherent to a process, and graphical inspection for this purpose is not enough. In this project it is assumed that the observed trends are stochastic ones, and thus only the differencing method will be used to transform the variables into stationary ones.

For the reasons already mentioned, it is necessary to understand the properties of a variable, namely if this consists of a non-stationary or stationary process, so that a time-series linear regression model can be accurately evaluated. Another aspect that is crucial for the accuracy of the model is the order of non-stationary of the variables. In fact, it is important that all of those included in the model have the same properties, meaning that they should all be either stationarity or integrated of the same order, i.e. they all need to be differenced the same number of times until they become stationary.

An exception to the spurious phenomenon exists and is worth to be mentioned. Actually, if two series are integrated processes but cointegrate, the interpretation of the estimated coefficients resultant from a linear regression may be coherently analyzed however, due to reasons that will be further explained, hypothesis tests can still not be carried out. Concepts like stationary, non-stationary or integrated processes and cointegration, will be explained in the following section. The importance of this introductory section lies in understanding the motivations for the use of econometric techniques that will transform the models that will be analyzed in the present thesis.

In many empirical analyses, the time series are assumed to be stationary, and usually, analyses on a linear regression estimated coefficients are wrongly carried out. However since this thesis consists of a detailed analysis on the coefficients of the models described in the previous section, it is important that these are accurately estimated.

4.1.2. Unit root tests

To understand in what the unit root tests consists, it is firstly necessary to comprehend two concepts: stationary and non-stationary or integrated processes in discrete time series. The first one is characterized by a mean-reverting behavior, which therefore has to accomplish three conditions:

- ✓ $E(x_t)$ is a finite constant;
- ✓ $V(x_t)$ is a finite constant;
- ✓ Cov (x_t, x_{t-s}) is independent of time.

where x_t is a stochastic process, i.e. a sequence of identically distributed random variables indexed by time, t. The first two conditions are easy to understand as they imply no trends in the process, i.e. the process should revolve around its mean value (mean-reversion behavior) and that the expected values should be close to the observations. The third and last condition usually concerns the joint distribution of the variable to be independent of time. However, in this thesis, this condition is weakened, as it is usually done in empirical works, and will only require the covariance to be independent of the time, but dependent on the distance between the periods it is measured, i.e., $t - s$. Accordingly, with these three conditions one is before a weakly stationary process. For a matter of simplicity we will refer to these types of series as simply, stationary. As it can be understood from the previously explained, stationary processes and no trend behavior are very similar. In this sense, one could consider to analyze a variable through a graphical inspection of its behavior over the time, in order to conclude for stationarity. This procedure can help in the decision of whether a series is stationary or not, however, it is still important to understand the origin of the referred trend, i.e., whether this is stochastic or deterministic, since this will be important for the transformation process of turning the variables into a stationary processes. From the three conditions of stationary, others that will lead to them arise. In fact, a stationary process should be independent and identically distributed (i.i.d.), implying no autocorrelation in the process and also that the distribution parameters are the same along it, more precisely, that it accomplishes homoscedastic, i.e. variance is the same in any point in time. The i.i.d. assumption is usually verified in the error term of the regression model, i.e.:

$$\varepsilon_t \sim IIDN(O, \sigma^2)$$

The unit root tests are tests for stationarity and lie in the assumptions and concepts before explained. They are based on an Autoregressive Model of order p, AR (p), of the time series in analysis:

$$X_t = \propto + \theta X_{t-1} + \varepsilon_t$$

The function above presented is a mere example of a first order autoregression, AR(1), as it includes only the first lagged value of the dependent variable. It was chosen as an example to explain this section for simplicity reasons, as more complex models, such as AR processes of order p or ARMA models, i.e. AR processes involving moving averages, could have also been used. The order of the autoregression will depend on the variable to study, e.g. its sample.

From the above AR (1) process it results that:

- $E(x_t) = \frac{\propto}{1-\theta}$
- $V(x_t) = \frac{\sigma^2}{1-\theta^2}$
- $\theta = \frac{COV(X_t\,, X_{t-1})}{V(X_t)}$

Therefore, in order to meet the above explained requirements for stationary, it can be seen that |θ| must be <1. Otherwise, if θ=1 both the mean and the variance are undefined and the process is non-stationary. A process such as this, reveals a unit root, and if substituting this value in the AR (1) linear regression, it resembles a pure random walk, which is a particular type of an integrated process. In addition, when θ=0 one is before the most stationary process of all, and when |θ|>1, which is not very common in economics, it represents a process growing quickly and further away from its mean value (e.g. hyperinflation). These aspects are in the origin of the name of the tests for stationarity, the unit root tests. At this point, it was already understood that stationary and non-stationary or integrated processes are opposite concepts, and the last one should resemble a process with a trending behavior, characterized by an infinitive expected value and variance. Three types of non-stationary series, a pure random walk, a random walk with drift (represented in the AR (1) function above when substituting θ per 1) and random walk with drift and deterministic trend, will be used in the unit root tests that will be following carried out. Below, a brief description of these processes can be found.

Pure Random Walk:

$$X_t \;=\; X_{t-1} + \varepsilon_t$$

In this case, the best prediction for tomorrow’s price is the one for today plus an unpredictable value. According to the financial theory, stock prices follow this type of pure random walk. The expected value of this model is X_0 and its variance tσ^2, confirming the non-stationary condition as variance is not finite, it depends on *t*.

Random Walk with drift

$$X_t \;= \propto + X_{t-1} + \varepsilon_t$$

This is the model used above to explain stationarity and non-stationarity concepts, when θ=1, and it differs from the previous one by the addition of an intercept. Macroeconomic variables are usually examples of this model, as they tend to have a trend.

The expected value is $X_0 + t\alpha$ and its variance $t\sigma^2$, being that both depend on *t*, it is confirmed that one is before a non-stationary process.

<u>Random Walk with drift and deterministic trend</u>

$$X_t = \propto + \theta X_{t-1} + \beta t + \varepsilon_t$$

This case resembles the model used above, AR (1) plus a deterministic trend. In this case, it is argued that even if $|\theta|<1$, one is before a non-stationary process due to the inclusion of a deterministic trend, which inherently brings a dependence on time.

Previously, the difference between stochastic and deterministic trends was mentioned. In these examples, it can be understood where this difference comes from. In fact, the two first cases possess stochastic trends, i.e. a non predictable trend which comes from the non-predictable part of the function, i.e. the error term, whereas the third case includes not only a stochastic but also a deterministic trend which depends on time, *t*. In this sense, due the phenomenon of spurious, in order to convert these series in stationary processes it will be necessary to resort to the first differences method in the first two cases, and to both the first differences method and the detrending procedure in the third and last case.

After a detailed explanation of stationarity and non-stationarity concepts, as well as of the need to understand whether a process is one or another, the methods used in this thesis for this purpose, will be further described. The specific unit root test that will be used in this thesis is the Augmented Dickey-Fuller (ADF) test, that arises from the simple Dickey-Fuller test, which is based on an autoregression function such as the above, subtracted on both sides by X_{t-1}, in order to enable statistical tests on the autoregressive coefficient against 0.

$$\Delta X_t = \propto + \beta X_{t-1} + \varepsilon_t ,$$

where $\beta = \theta - 1$.

This regression is now able to be tested for a random walk with drift, where the null hypothesis is whether β is 0, or equivalently, whether one is in the presence of an integrated process. Unit root tests for random walk without drift and also with drift and deterministic trend are done in the same manner. The reason to test the three previously explained cases is due to the fact that it is not possible to accurately attribute a case to each of the time-series, especially due to the difficulty to distinguish a stochastic trend from a deterministic one. The ADF test in SAS, the statistical program that will be used, automatically reports the results for the three different cases, and also for three different options of the number of lagged variables included in the model (0, 1, and 2). Since, this thesis mainly deals with macroeconomic series, which usually have a trending behavior, the first case will be disregarded, and only the last two will be considered for the conclusions. In fact, the attribution of a wrong case to a series would lead to misspecifications and biased results. Thus, due the mentioned difficulty on deciding especially between the last two cases, both will be considered, and hopefully the stationarity results inherent to them will be same.

The Dickey-Fuller method, tests β against 0, equivalently to testing θ=1 or whether a process is integrated. The t-statistics of this test are done in the traditional manner, but compared with critical values that derive from a tau (τ) statistic distribution, known as the Dickey-Fuller distribution. As mentioned above, it was the Augmented Dickey-Fuller test (ADF) that was chosen to check for stationary processes. This was because with the simple Dickey-Fuller test, in the presence of autocorrelation in the residuals, the critical values are biased and interpretations may be misleading. In this sense, the ADF is a result of the Dickey-Fuller test where lagged dependent variables are included so as to remove any autocorrelation in residuals and thus to obtain unbiased critical values to compare the tau statistics with.

$$\Delta X_t = \propto\ + \beta_{\ 1} X_{t-1} + \beta_{\ 2} \Delta X_{t-1} + \cdots + \beta_{\ p-1} \Delta X_{t-p+1} + \varepsilon_t$$

Likewise in the Dickey-Fuller regression, the example above shows an ADF regression, only for one of the three cases to be considered. Usually, the optimal number of lags to include in this regression to remove any autocorrelation observed in the residuals, can be discovered by resorting to selection criteria models, which compare different models and present values with regards to the goodness of fit based on the fact that by adding one lagged variable the autocorrelation among residuals may decrease but on the other hand the number of free parameters on the models will also decrease, being that the most negative value corresponds to the best model. Examples of selection criteria measures are the Akaike Information Criteria (AIC) or the Schwartz Bayesian Criterion (SBC). Another method that will help the decision on the optimal number of lagged variables is the F test for AR disturbances which tests the presence of autocorrelation in the residuals. Both of these methods will be used further in the present thesis in other methods that, contrarily to the ADF, do not automatically present results for 3 different options of the number of lagged variables.

The augmented model implies other critical values, rather than those used in the simple DF test, that will also depend on the number of lagged variables and on the case in analysis. Other unit root tests, such as the Philips-Perron test could have been done. However, the ADF test was chosen as it is the most commonly referred in the econometrics literature.

At last, it is worth mentioning that this test has a disadvantage that will many times represent a problem for the analyses of the variables to be investigated in this thesis, and it relates to the fact that when in the presence of structural breaks or jumps in the series, the results of this test might be biased. To overcome this problem, as it will be further seen, some time-series will have to be divided in sub-periods.

Due to the fact that two possible cases will still be considered for the conclusions of stationarity from the ADF test, it will not always be possible to obtain the same results for all of them. Moreover, as before mentioned, SAS, when executing this test, does not compute the optimal order of lagged variables to include in the model, but rather, returns the results for three possibilities, namely, 0, 1 and 2 lagged variables. These aspects hinder the decision for stationarity, when the results obtained are different for each of the cases. To overcome this aspect, the interpretations of the results given by this test, will be compared with graphs obtained through the Autocorrelation function (ACF), and it will be the analyses of both that will allow for conclusions for stationarity. The ACF consists of the following function:

$$\rho_k = \frac{covariance\ at\ lag\ k}{variance}$$

The ACF graph is the representation of the ACF against the different lags. In this way, when an ACF graph represent bars that along the lags die out very slowly, it means that the variable in question depends on the past observations, and therefore it is very dependent on time. As it was shown, this kind of graph represents an integrated process. The lags to include in these analyses are automatically selected by the statistical program in use.

4.1.3. Cointegration

Cointegration consists of an exception to the problem of spurious regression and it is a measure of long-term association among two or more series levels. If two series cointegrate, they are said to have a linear combination that is stationary, even though individually they follow integrated processes. Therefore, these series have a common trend, which cancels with each other giving rise to the stationary linear combination, e.g. their spread. In other words, when two integrated series cointegrate, one may not predict their tendency for the future, but it is certain that wherever one series will be, the other will have followed.

The analysis of cointegration is two folded, i.e. it not only consists of the long-term investigation of the levels' spreads in a first step, but also includes a dynamic version by studying the short-term deviations of the changes. This second part of the cointegration analysis is known as the Error Correction Model, and it will be explained further in this section.

To clarify, two integrated series cointegrate if they have a linear combination between them such as: $Z = X - \alpha Y$, where Z represents the disequilibrium term from the long-run equilibrium, which is required to be stationary. From this regression, one can extract the cointegration vector, which are the constant coefficients of the disequilibrium regression, in this case (1, -α). The number of cointegration vectors can be up to the number of integrated processes minus one (n-1), otherwise, if equal to n, the processes are stationary. It is argued that, cointegration is verified if at least one of these vectors, i.e. one linear combination, exists.

The two most common methodologies to test cointegration are the Engle-Granger and the Johansen method, where the first one is based on an OLS linear regression and the last on an eigenvalue analysis of a certain matrix. The concept of cointegration will be further developed in the eyes of these two methods, in the next two sub-sections.

4.1.3.1. Engle-Granger Method

The Engle-Granger method is considered as the simplest method to test for cointegration. It consists of two steps: first regressing one integrated variable on another, and then of applying a unit root test on the residuals to check for its stationarity. In the previous section, cointegration was defined as the situation in which two integrated series have a stationary spread or disequilibrium term, Z. From this definition, it becomes clear the necessity of testing whether the residuals, i.e. the estimation of this disequilibrium term, resultant from the first step regression is stationarity, in order to conclude for cointegration. This method is based on an OLS procedure, and if it is proved that the unit root series cointegrate, one can analyze the results obtained in the first step regression, although not testing them as it does not imply a standard normal distribution.

This method has some important drawbacks that must be taken into account, especially if the number of integrated variables, n, to be analyzed, is more than 2. In this case, the choice of the dependent variable will affect the residual term and thus the cointegration results. This negative aspect of the Engle-Granger test will not have a big impact in the models to be investigated, as it is very straightforward which variable to consider as the dependent one. On the other hand, this method only reports one cointegration vector, which is not a problem when n=2, since only one cointegration vector is possible to be obtained (maximum cointegration vectors = n-1), but when the number of included variables is higher it might be a relevant drawback. Once again, this aspect will also not have a big impact on the analysis part of this thesis, since as it will be argued, the goal of it is mainly to discover whether cointegration among the variables included in the models pretended to examine exists or not. At last, another drawback comes from the fact that this method involves a unit root test on the residuals, and thus it might have the same drawbacks as those previously explained for the Augmented Dickey-Fuller test, i.e. the fact that many different cases are considered in these analyses. In this case, since this test will be carried out on the residuals, it is possible to disregard the second and the third cases above presented, and only to consider the pure random walk case for the conclusions. Still, visual inspection of the ACF graphs will also be done and considered on the cointegration conclusions.

The mentioned drawbacks of this test will definitely impact many of the cointegration results of this thesis. Thus, the Johansen methodology will also be computed, with the aim of confirming and clarifying the cointegration results obtained for this test.

4.1.3.2. Johansen Methodology

The Johansen methodology is based on an eigenvalue analysis of a matrix and it consists of looking for the most stationary linear combination, opposed to the Engle-Granger method which seeks the one with minimum variance.

This methodology is, like the ADF tests, based on an autoregressive model. The difference is that it is based on a multivariate vector autoregressive model (VAR model), in which all the variables to be included in the cointegration analysis are considered as dependent variables.

A VAR (1) can be expressed by:

$$\boldsymbol{X_t} = \propto + \boldsymbol{\theta X_{t-1}} + \boldsymbol{\varepsilon_t},$$

where $\boldsymbol{X_t}$ is a vector of all the variables included in the models, $\boldsymbol{X_{t-1}}$ is a vector of the same variables but lagged in one period, and $\boldsymbol{\theta}$ is the matrix which gives the cointegration relationships among the variables. As in the ADF test, in order to test for unit roots, this model has to be subtracted by $\boldsymbol{X_{t-1}}$:

$$\Delta \boldsymbol{X_t} = \propto + \boldsymbol{B X_{t-1}} + \boldsymbol{\varepsilon_t}$$

Both functions are in bold to express the fact that matrices are involved. $\boldsymbol{B}$ is $\boldsymbol{\theta}$-$\boldsymbol{I}$, the identity matrix, and is therefore tested against 0. The general VAR model may imply more lagged variables, in order to remove any autocorrelation in residuals, similarly to the ADF test:

$$\Delta \boldsymbol{X_t} = \propto_{\boldsymbol{0}} + \boldsymbol{B}\boldsymbol{X_{t-1}} + \Gamma_{\boldsymbol{1}}\Delta\boldsymbol{X_{t-1}} + \cdots + \Gamma_{\boldsymbol{q}}\Delta\boldsymbol{X_{t-q}} + \boldsymbol{\varepsilon_t}$$

The test involved in this methodology consists of analyzing the rank, *r*, of the matrix ***B***, where *r* is the number of linear combinations existent among the variables. Therefore, if *r*>0 the variables cointegrate. Thus, this method, as opposite from the Engle-Granger, allows one to access the number of cointegrating vectors, and thus the number of common trends among the variables (*n*-*r*). The test inherent to this method, which allows for knowing the number of cointegrated vectors, is known as the trace test, since it tests the number of non-zero eigenvalues, *r*, of matrix ***B***.

From the obtained results, one can read the number of cointegrating relations by sequentially evaluating the null hypothesis (H0) that the number of cointegrating vectors is equal to r against being higher, until it cannot be rejected. This analysis will be further clarified in the presentation of the results.

The above referred equations correspond to simply one of the cases to which the models might apply. As it happened when testing for stationarity with ADF test, in this method there will be five possible cases to choose the one which is the most similar with the behavior of the variables to be analyzed. Once again, an incorrect choice of the model might lead to misspecifications in the cointegration results. Nevertheless, in this case, contrary to what happened in the ADF tests, a choice is required.

<u>Case 1</u>: In this case there is no intercept.

$$\Delta \boldsymbol{X_t} = \boldsymbol{B}\boldsymbol{X_{t-1}} + \Gamma_{\boldsymbol{1}}\Delta\boldsymbol{X_{t-1}} + \cdots + \Gamma_{\boldsymbol{q}}\Delta\boldsymbol{X_{t-q}} + \boldsymbol{\varepsilon_t}$$

<u>Case 2</u>: This case implies a constant only inherent to the long-run relations.

$$\Delta \boldsymbol{X_t} = \alpha(\beta, \beta_0)(\boldsymbol{X_{t-1}}, \boldsymbol{1}) + \Gamma_{\boldsymbol{1}}\Delta\boldsymbol{X_{t-1}} + \cdots + \Gamma_{\boldsymbol{q}}\Delta\boldsymbol{X_{t-q}} + \boldsymbol{\varepsilon_t}$$

<u>Case 3</u>: This case includes an intercept in the long-run relations and a linear trend in the levels of series.

$$\Delta \boldsymbol{X_t} = \propto_{\boldsymbol{0}} + \boldsymbol{B}\boldsymbol{X_{t-1}} + \Gamma_{\boldsymbol{1}}\Delta\boldsymbol{X_{t-1}} + \cdots + \Gamma_{\boldsymbol{q}}\Delta\boldsymbol{X_{t-q}} + \boldsymbol{\varepsilon_t}$$

<u>Case 4</u>: In this case, there is trend in the long-run relations and a linear trend in the levels of series.

$$\Delta \boldsymbol{X_t} = \propto_{\boldsymbol{0}} + \alpha(\beta, \beta_0)(\boldsymbol{X_{t-1}}, \boldsymbol{t}) + \Gamma_{\boldsymbol{1}}\Delta\boldsymbol{X_{t-1}} + \cdots + \Gamma_{\boldsymbol{q}}\Delta\boldsymbol{X_{t-q}} + \boldsymbol{\varepsilon_t}$$

Case 5: In this case, there are no restrictions in the trend meaning that a trend is observed in the long-term relations, and linear trend is observed in the variables levels and differences, implying a quadratic trend.

$$\Delta \boldsymbol{X_t} = \propto_{\boldsymbol{0}} + \boldsymbol{B}\boldsymbol{X_{t-1}} + \Gamma_{\boldsymbol{1}} \Delta \boldsymbol{X_{t-1}} + \cdots + \Gamma_{\boldsymbol{q}} \Delta \boldsymbol{X_{t-q}} + \boldsymbol{\delta_t} + \boldsymbol{\varepsilon_t}$$

The case used in the examples is case 3, and this is the one chosen to perform the Johansen cointegration test. In fact, the first case was ignored because it seems not probable that the cointegrating relations will have no intercept, i.e. that they will start from zero. Following, case 2 will also be disregarded, as it implies no trend in the data. Since it is not expect any trends in the cointegration relations, as it would be somehow contrary to the theory, case 4 will also be disregarded. Case 5, includes a deterministic trend in the model and it will be disregarded as it will be assumed that any trend should be a stochastic one. To conclude, case 3 will be the most accurate to perform the Johansen test given our data. The selection of the optimal number of lagged variables will be done mainly based on the F-test for AR disturbances and on the information criteria indicators above referred.

4.1.3.3. The Error Correction Model (ECM)

This section introduces the second stage of the cointegration analysis. It arises from the Granger Representation theorem introduced by Granger (1986), which claims that when integrated variables cointegrate, a model on its differences is still misspecified since the disequilibrium terms are still missing. Therefore, this section explains how to include the referred disequilibrium terms in the model in order to obtain a final accurate model from which statistical inferences may be done. The model that includes these transformations is called the Error Correction Model (ECM), as it accounts for the disequilibrium term, and it allows for the correction of any short-term deviation from the long-term equilibrium. The disequilibrium term used at this stage corresponds to the estimated residuals in the first stage of the cointegration analyses, namely from the Engle-Granger regression.

In order to understand how this model works, we will use as an example two series, X and Y:

$$\Delta \mathrm{X_t} = \propto_1 + \sum_{i=1}^{m} \beta_{11}^{i} \Delta \mathrm{X_{t-i}} + \sum_{i=1}^{m} \beta_{12}^{i} \Delta \mathrm{Y_{t-i}} + \gamma_1 \mathrm{Z_{t-i}} + \varepsilon_t$$

where Z is the disequilibrium term above mentioned, i.e. $Z = X - \alpha Y$. Accordingly, if $\alpha > 0$, this model has an error correction property if $\gamma_1 < 0$, assuming that Z is positive, X will decrease, reducing Z and thus correcting the errors. If Z is negative, $\gamma_1 < 0$ will increase X and in this manner the error will also be corrected. Similarly, if $\alpha < 0$, then γ_1 must also be negative, in order to correct the model for short-term deviations. In this manner, by looking at γ_1, it is possible to confirm whether the ECM actually corrects the short-term deviations. At last, it is important to mention how interpretations should be done. The short-term impact on the dependent variable is interpreted as usual, through the marginal effects of this dynamic model, whereas to interpret the long-term impact, one has to look into these effects from coefficients in the Engle-Granger regression. The decision of the number of optimal lagged values will be done through a similar test to the F-test above explained, known as the Godfrey test, which also tests for no autocorrelation in the residuals. The results for this test will be given by SAS when regressing this final model as a linear regression with autoregressive errors.

To conclude, the ECM applies when cointegration among the variables is found. If on the contrary cointegration is not observed, the Engle-Granger regression will be misspecified and conclusions on the coefficients may only be taken from a model similar to the ECM but without the error correction term. To sum up, in these cases, the long-term effects cannot be interpreted, only the short-term ones.

4.2. Data

In this section the data that will be used in the analyses of the models will be presented.

Originally, the idea was to consider all the OECD countries which include different sized economies in order to obtain significant conclusions on international economic integration and fiscal policy effectiveness. However, since the econometric techniques that will be used require a sufficiently long period of analysis, due to data unavailability only 20 of the 34 OECD countries will be analyzed from the first quarter of 1972 until the third quarter of 2010, corresponding to 155 quarterly observations. Both quarterly and annual data for the required variables of the model were available, however, the first type of data was the one chosen, as it allows for more observations and therefore for more powerful statistical results. Consequently, the countries to be analyzed over the referred period of time are the following: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Korea, Luxembourg, the Netherlands, Norway, Spain, Sweden, the UK and the US. Furthermore, the variables that will be used for each of these countries are the following: NGDP, NGDP_G, RGDP, RGDP_G, CIG, CI, REER, and the ULC.

The whole data, with the exception of the REER, were obtained through the OECD iLibrary web-site, being that all of these, but the ULC, were found under the national accounts, whereas the ULC was retrieved from the labor costs option (stats.oecd.org.3). The variable REER was obtained through Datastream. These variables are measured as follows:

RGDP:	Gross Domestic Product - expenditure approach, measured in millions of US dollars, volumes estimates, fixed PPPs, OECD reference year, annual levels, seasonally adjusted.
RGDP_G:	The same as the above less General government final consumption which is measured in millions of US dollars, volumes estimates, fixed PPPs, OECD reference year, annual levels, seasonally adjusted.
NGDP:	Gross Domestic Product-expenditure approach measured in millions of US dollars, current prices, current PPPs, annual levels, seasonally adjusted.
NGDP_G:	The same as the above less General government final consumption measured in millions of US dollars, current prices, current PPPs, annual levels, seasonally adjusted.
CIG:	The sum of "Private final consumption expenditure" with "Gross fixed capita formation" and "General government final consumption" - All of these measured in millions of US dollars, volumes estimates, fixed PPPs, OECD reference year, annual levels, seasonally adjusted.
CI:	The sum of "Private final consumption expenditure" with "Gross fixed capita formation" - All of these measured in millions of US dollars, volumes estimates, fixed PPPs, OECD reference year, annual levels, seasonally adjusted.
REER:	Real Effective Exchange rate index based in the consumer prices.
ULC:	Unit labor costs for the total economy, index OECD base year (2005=100), trend cycle.

Summing up, the variables above described were used as input in the models previously detailed. The ULC was however, the only measure that suffered some transformations, since as a measure of competitiveness it is more adequate to consider it in relative terms. Thus, the relative Unit Labor Costs were obtained by dividing the ULC of a country by the average of the ULC for the rest of the 19 countries. In addition, concerning the models transformed in ratios, the variables to include in these also suffer transformations as they are computed to be presented in relative terms. Another aspect that is important to note is that all data are transformed in logarithms, so as to soften the trending behavior usually observed in economic variables. Finally, it is worth mentioning that all the selected countries are considered to be open economies for the period of analysis (Sachs & Warner, 1995). In Appendix A, a summary statistics for all of the variables can be found.

4.3. Empirical results for the level of integration and fiscal policy effectiveness

4.3.1. Unit root tests

In this section, the variables included in the 12 models will be tested for stationarity. A quick visual inspection on their graphs indicates that they are non-stationary on their levels, since a trending behavior can be observed in all of them. As before mentioned, due to this reason the first of the three considered cases by the ADF unit root test will be disregarded. Still, by having two possible cases to which a variable may apply, with three different options for the optimal number of lagged variables to include in the autoregression, it may happen that sometimes the results will not be the same for all of these. Thus, to overcome this drawback and so that clear conclusions on stationarity can be made, these will not only be based on the ADF unit root tests, but also on a visual inspection of the series against time and on the ACF against the number of lags. This analysis will be firstly done in the variables levels and then in its differences.

<u>Levels</u>

As an example of the stationarity analyses made for all of the variables, selected output for the ADF test on the variable CI, i.e. demand without consideration of government consumption, measured in ratios, regarding Australia will be shown below.

Table 1: ADF Test for variable CI_Australia, in levels, measured in ratios.

Augmented Dickey-Fuller Unit Root Tests			
Type	Lags	Tau-statistics	p-value
Zero Mean	0	-2.96	0.0033
	1	-2.21	0.0265
	2	-2.08	0.0362
Single Mean	0	2.23	0.9999
	1	1.32	0.9987
	2	1.18	0.9980
Trend	0	0.26	0.9983
	1	-0.36	0.9881
	2	-0.43	0.9856

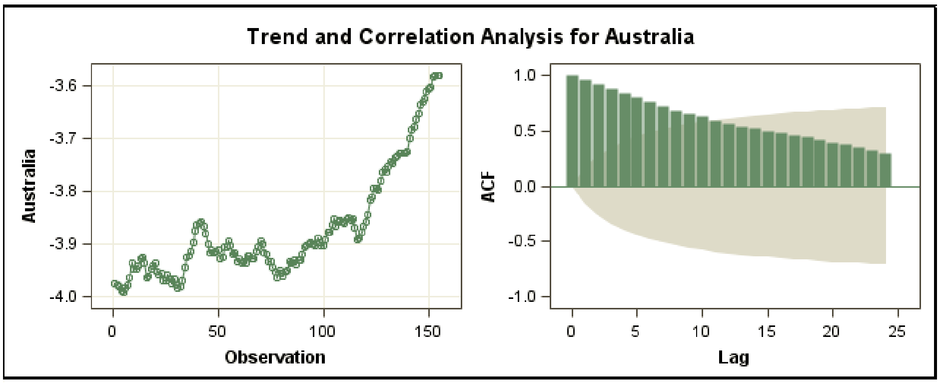


Figure 1: Trend and ACF graphs for variable CI_Australia, in levels, measured in ratios.

Table 1 concerns the ADF unit root test results for this variable. The output presents the results for the three cases: zero mean, concerning the first case of a pure random walk; single mean, equivalent to the random walk with drift case and trend, referring to the deterministic trend case above mentioned. The last two cases, which will be considered for the conclusions, strongly indicate that this variable follows a non-stationary process, as they cannot reject at a 5% significance level the H0 of non-stationarity, since p-value is higher than 0.05 in all the considered options. Figure 1 refers to the graphic representations of the variable in question against the time and the ACF graph. From the first of them on the left, it is possible to perceive an upwards trend indicating the non-stationarity property of this variable, while the second helps to confirm it, as it is possible to see that the ACF dies out very slowly along with the addition of lags, pointing out that this process has a very long memory. From all of the above, it can be concluded that the variable CI, measured in ratios, for Australia is non-stationarity in its levels.

The same analysis was made for the rest of the variables, whose graphs can be found in Appendix B divided in two parts: the first of them refers to the variables used in models considering ratios, whereas the second one to the same variables but free of ratios.

It is important to mention that for some variables the conclusions were not as straightforward as in the above example. Below, these cases will be enumerated and it will be explained how the conclusions were reached. Firstly, this analysis will be done for the variables measured ratios, and secondly for the variables without considering ratios.

The variables below presented implied some difficulties in the conclusions for stationarity, especially due to the different results obtained for each of the cases and lag options. These variables are: CI_Austria; NGDP_France; NDGP_Korea; NGDP_G_Belgium; REER_Austria; ULC_UK; REER_France; REER_Korea; REER_Norway; REER_Sweden;

ULC_Canada; RGDP_Korea; ULC_Denmark; ULC_Finland; ULC_Germany; ULC_Greece; ULC_Ireland; RGDP_G_Denmark; ULC_Italy; ULC_Japan; ULC_Korea; ULC_Netherlands; ULC_Spain, and RGDP_Korea. Nevertheless, conclusions for non-stationarity on these time-series variables were decided mainly based on both the trend and the ACF graph visual inspections. In some of these variables, the ACF dies out quicker than in the others, however its values for the first lags are close to 1, implying heavy autocorrelation in the residuals of the autoregressions and thus, entailing a non-stationary process. The only variable that presented different results was the ULC for the US (ULC_US), in which both the unit root tests and the ACF graph indicated for a stationary process. Apart from this mentioned variable, the ADF tests on the others strictly concluded for a non-stationarity behavior.

Conclusions for the variables free of ratios, turned out to be more difficult to decide than with the previous variables. It might be worth to remember that only the variables CIG, CI, NGDP, NGDP_G, RGDP and RGDP_G, were considered in the no ratios form, since the REER and the ULC (as measures of competitiveness) are only good indicators in relative terms. In this manner, apart from the existence of different results for the two cases regarding many of the variables, where non-stationarity was easy to conclude with the help of a visual inspection of the trend and the ACF graphs, there are two variables, namely NGDP and NGDP_G, which for most of the countries present stationary results in the pure Random Walk model with drift case, while very strong results for non-stationarity in the deterministic trend case. In these cases, both the ACF and the trend graph clearly point out towards a non-stationary process of these variables. Consequently, non-stationarity was concluded and it was also perceived that perhaps these variables belong to the third of the presented cases in the ADF test. To sum up, despite the difficulties, it was considered that all these variables free of ratios were non-stationary processes.

To conclude, all the variables analyzed follow non-stationary processes in their levels, with the exception of the variable ULC_US measured in ratios. Models including this variable will be disregarded from now, since otherwise they would include a variable with different properties from the others.

First differences

Due to the problem of spuriousness previously explained, it is necessary to transform the above non-stationary variables into stationary ones, so that statistical inferences on the models can be made. For this purpose, the first differences of the series will be taken, and

ADF unit root test will be applied on them, in order to check for their stationarity behavior. If still these variables are non-stationarity, second differences should be taken and so on, until obtaining stationarity results. The analysis of the variable CI in ratios for Australia will be shown as an example of the analyses made for all of the variables.

Table 2: ADF test for variable CI_Australia, in first differences, measured in ratios.

Augmented Dickey-Fuller Unit Root Tests			
Type	Lags	Tau	p-value
Zero Mean	0	-8.96	<.0001
	1	-6.66	<.0001
	2	-5.37	<.0001
Single Mean	0	-9.35	<.0001
	1	-7.06	<.0001
	2	-5.81	<.0001
Trend	0	-9.62	<.0001
	1	-7.33	<.0001
	2	-6.03	<.0001

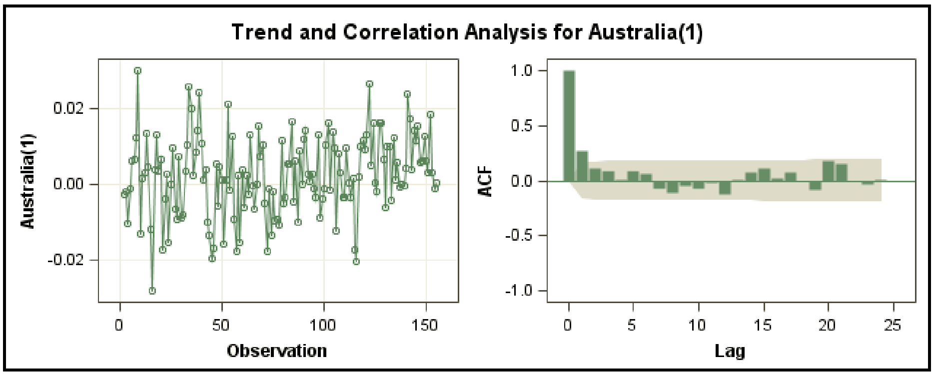


Figure 2: Trend and ACF graphs for variable CI_Australia, in first differences, measured in ratios.

From the ADF unit root test results, it is possible to conclude that this series has now become stationary. In fact, the p-values strongly reject non-stationarity at 5% significance level since their values are much lower than 0.05. Through visual inspection of the trend graph, it is not possible to perceive a trending behavior of this series anymore. Moreover, the ACF in the graph dies out very quickly. According to this, it can be concluded that this series is stationary in their first differences and thus that they follow an integrated process of order 1, I (1).

This analysis was also carried out for the rest of the variables. Similarly to what happened in the unit root tests analysis for the variables in levels, some of them do not involve straightforward conclusions. Below, these variables are presented, as well as brief comments on the conclusions and how these were reached. The same structure of above will be applied.

The following variables presented different results for each of the cases and lag options: CIG_Ireland; ULC_Denmark; ULC_Finland; ULC_Ireland; ULC_Japan; ULC_Netherlands; ULC_Luxembourg, and ULC_Sweden. For all of them, except ULC_Netherlands, the ACF graph inspection was crucial for the decisions of stationary processes as in these cases the ACF dies out pretty quickly. In what concerns the variable ULC_Netherlands, despite having an ACF graph which does not die out so quickly, it will be concluded to be a stationary process in their first differences, based on a visual inspection of the trend graph.

The below mentioned variables did not manage to become stationary processes with this method and perhaps, in order to turn them stationarity, they should be differenced once again. Nevertheless, since the goal is to have the same properties in all the variables this will not be done. Therefore, models including the following variables will be disregarded from now on: ULC_France; ULC_Germany; ULC_Greece; ULC_Italy; ULC_Korea, and ULC_Spain.

When it comes to the variables free of ratios, all of them seem to have become stationary after this method, even the ones above suggested to have a deterministic trend, contrarily to what it would be expected. Accordingly, all these variables are concluded to follow an I(1) process.

It should be remembered that the idea of analyzing models where the GDP and the demand variables are considered free of ratios, comes from the weird behavior that some variables measured in ratios reveal, i.e. structural breaks and trend shifts. However, since this mainly happens for the variables REER and ULC, which are also included in the models free of ratios, the referred models would not bring any additional benefit to the analysis. Therefore, from now on, it was decided to disregard the consideration of the models free of ratios in this report, since economically it makes more sense to carry out the entire analysis in relative terms. Furthermore, it is worth mentioning that the results and conclusions achieved from the analysis of models free of ratios are very similar to the ones that will be further presented for the models that consider ratios, fact that would also not enhance the level of discussion in this thesis.

Lastly, to conclude this section, all the variables, with exception of the mentioned ones that will be disregarded, are considered to be integrated processes of order one, I (1). This fact allows for proceeding with the analysis of cointegration in the 6 models considered in relative terms. From now on, all the presented variables in this report will be measured in ratios, however for simplicity purposes, this fact will not be mentioned every time a variable is referred.

4.3.2. Cointegration tests

4.3.2.1. Engle-Granger Cointegration test

After having checked the stationarity properties for all the variables, cointegration tests will be carried out, in order to check for common long-term trends among the variables, for each of the models. In this section, the results from the Engle-Granger test are presented recurring to the example of Model_REER to Australia.

The first step of this method implies the Engle-Granger regression as follows:

$$NGDP\_Australia_t = \alpha_0 + \beta_1 CIG\_Australia_t + \beta_2 \, REER\_Australia_t + \beta_3 D_2 + \beta_4 D_3 + \beta_5 D_4 + \varepsilon_t,$$

where centered seasonal dummies, i.e. D_2, D_3, D_4 were included to adjust any possible seasonality behavior of the variables. The results for the referred linear regression can be found in the table below:

Table 3: Engle-Granger regression results for Model_REER_Australia.

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	p-value
Intercept	1	-1.43609	0.06932	-20.72	<.0001
Australia_CIG	1	0.62387	0.01528	40.84	<.0001
Australia_REER1	1	-0.00754	0.01018	-0.74	0.4599
D2	1	-0.00098549	0.00439	-0.22	0.8225
D3	1	-0.00046602	0.00439	-0.11	0.9155
D4	1	-0.00110	0.00441	-0.25	0.8040

From the results, it is possible to understand that only the intercept and the variable CIG have significant influence on the dependent variable – the NGDP. But, are these results reliable? The answer is: it is still not known! In fact, as previously explained, the only exception for the phenomenon of spuriousness, requires the presence of cointegration, which would make the estimated coefficients to be reliable. Thus, after saving the residuals given by the above Engle-Granger regression, ADF tests will be applied to them in the second stage of this method, and conclusions for cointegration will be obtained.

Table 4: Engle-Granger cointegration test results for Model_REER_Australia

Augmented Dickey-Fuller Unit Root Tests		
Type	Lags	Tau
Zero Mean	0	-3.67
	1	-3.64
	2	-2.99

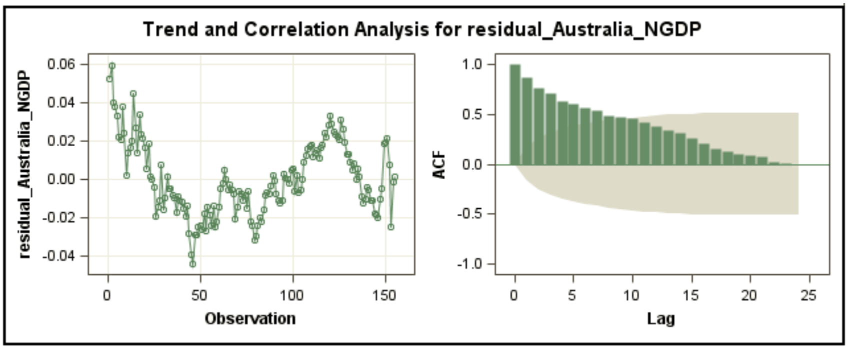


Figure 3: Trend and ACF graphs for the residuals of Model_REER_Australia

Table 4 presents the results for the first of the ADF cases, which is the one of interest, since the analysis concerns cointegration and therefore is applied on the residuals. In spite of being carried out in the same manner, the Engle-Granger test is interpreted slightly differently from the ADF unit root tests. Actually, its p-values are calculated based on specific critical values for this test. Thus, the tau-statistics for this test should be compared with the critical values presented in Appendix C, for 155 observations.

In this manner, as the linear regression in the example includes 3 variables, the correspondent critical value at a 5% significance level should be in the range from -3.828 to -3.785. Since the tau-statistics are lower than these values, it is not possible to reject the H0 of no cointegration, and thus it is possible to conclude that there are no common trends among these variables, which is also confirmed with visual inspection from both the trend graph and the ACF graph, which slowly dies out. After having reached a conclusion, it is now possible to answer the above question. Since no cointegration is observed, the Engle-Granger regression above is spurious and its results are therefore not reliable.

This analysis was performed in the rest of the models for all the countries. In what concerns the Model_REER_ULC and Model_REER_ULC_G, as these include 4 variables, the tau statistics are compared with the respective critical value, i.e. between -4.210 and -4.154. Moreover, as in the above example, centered seasonal dummies were also included in the other models with the aim of correcting any seasonal behavior. The following table summarizes the obtained the results.

Table 5: Summary results for the Engle-Granger cointegration test for all the models.

	Model: REER	Model: REER_G	Model: ULC	Model: ULC_G	Model: REER_ULC	Model: REER_ULC_G
Australia	No coint.	No coint.*	No coint.	No coint.	No coint.	No coint.*
Austria	No coint.	No coint.*	No coint.	No coint.	No coint.	No coint.
Belgium	No coint.	Bdline	No coint.	No coint.	No coint.	Coint.*
Canada	No coint.	No coint.	No coint.	No coint.	No coint.	No coint.
Denmark	Coint.	Coint.*	No coint.	No coint.	Bdline	Bdline
Finland	No coint.	Coint.*	No coint.	No coint.	No coint.	Bdline
France	No coint.	Coint.*				
Germany	No coint.	No coint.*				
Greece	Bdline	Coint.*				
Ireland	No coint.	No coint.	No coint.	No coint.	No coint.	No coint.
Italy	No coint.	Coint.				
Japan	No coint.	No coint.*	No coint.	No coint.	No coint.	Coint.*
Korea	No coint.	No coint.				
Luxembourg	No coint.	No coint.	Coint.	Coint.	No coint.	No coint.*
Netherlands	No coint.	No coint.	No coint.	No coint.	No coint.	No coint.
Norway	No coint.	No coint.	No coint.	No coint.	No coint.	No coint.
Spain	No coint.	No coint.				
Sweden	Coint.	Coint.	No coint.	No coint.	Coint.	Coint.
UK	No coint.	No coint.	Coint.	Coint.	No coint.	No coint.
US	Coint.	Coint.				

From the above results there are some aspects worth to be commented. The results marked with *, concern decisions mainly based on visual inspections of the trend and ACF graphs. The border line results highlighted in grey, despite representing results and graphs difficult to interpret, can be decided by a visual inspection of the above table. In fact, the Model_REER and Model_REER_G are very similar to the models Model_REER_ULC and Model_REER_ULC_G, respectively, since the only difference consists in the introduction of the variable ULC. In this sense, if cointegration is observed in one of the two first referred models, it has also to be observed in one of the last two mentioned models. To sum up, the border line results observed for Denmark and Finland can be assumed to be "cointegration", whereas other borderline results cannot be demystified. The blank cells refers to models which were disregarded in the above section.

Some of the variables included in the models do not behave as required in order to obtain unbiased results in this type of cointegration test. In fact, some of them include structural breaks or trend shifts, due to some specific event occurred at that time. In the present thesis, it will be expected that for instance economic crises may affect, during their corresponding period, some of the variables leading to some structural break in their data. Events originating a trend shift in the variables are expected to concern, for instance, changes in government policies or price levels, especially if this happens in the competitiveness variables, or an economic bubble that at some point collapsed. Nevertheless, it should be mentioned that since the variables are measured in relative terms, it is more difficult to find economic reasons for some of these behaviors. In order to overcome this disadvantage, some changes in the models are necessary, as to enrich the conclusions and interpretations on cointegration. These changes will be explained by country.

- Australia: From visual inspection on its trend graph, it is possible to perceive a trend shift at around observation 125th, i.e. 2002 in the variable REER, being that from that point it reveals an upwards trend. The intuition is that this shift is due the rise in the oil prices that increased the Australian consumer price indices from around 2002 (treasurer.gov.au). Accordingly, this trend shift was included in the models that contain this variable. An example of this transformation for Model_REER can be seen below:

$$
\begin{aligned}
NGDP\_Australia_t &\\
&= \alpha_0 + \gamma_1 t + \gamma_2 D + \gamma_3 tD + \beta_1 CIG\_Australia_t + \beta_2\, REER\_Australia_t + \beta_3 D_2 \\
&+ \beta_4 D_3 + \beta_5 D_4 + \varepsilon_t
\end{aligned}
$$

where *t*, concerns the introduction of the trend, and *D*, the dummy associated to the shift.
The results of these models are as follows:

- Model_REER: No coint.
- Model_REER_G: No coint.
- Model REER_ULC: No coint.
- Model_REER_ULC_G: No coint.

- Belgium: Due to a jump in the data for variable REER at around observations 30-50, it was decided to consider for this country, models from January 1984, i.e. the 50th observation. The economic reasons behind this behavior might arise from 1979 oil crisis that impacted this country (Mommen, 1994). Stationary tests were carried out for this new period and conclusions for I(1) processes to all of them were reached. The cointegration results for models including the variable above mentioned, are as follows:

- Model_REER: No coint.
- Model_REER_ULC: No coint.
- Model_REER_G: No coint.
- Model_REER_ULC_G: No coint.

- Canada: A structural break is perceived at around observation 70-85 for almost all the 8 variables, possibly due to the recession that hit this country in 1990 (nytimes.com). Thus, the original period will be divided into two sub-periods: one before the referred break and another after it in order not to take this break into account. Moreover, for models including the variables REER and ULC, a trend shift will be considered in the second sub-period at around observation 125th, which might be related to the rise of the oil prices at this time (treasurer.gov.au). The models for the first sub-period will be similar to the original one but for another period, while the model for the second period will be similar to the above transformed model for Australia, i.e. with the inclusion of the trend shift behavior. Firstly, ADF unit root tests were applied to the time-series for both the two sub-periods, where an I(1) behavior for all them was concluded, and only then the Engle-Granger test was carried out. The results are as follows:

<u>Jan. 1972 – Oct. 1988:</u>

- Model_REER: Coint.
- Model_REER_G: Coint.
- Model_ULC: No coint.
- Model_ULC_G: No coint.
- Model_REER_ULC: Coint.
- Model_REER_ULC_G: Coint.

<u>Jan. 1993 – Jul. 2010:</u>

- Model_REER: No coint.
- Model_REER_G: No coint.
- Model_ULC: No coint.
- Model_ULC_G: No coint.
- Model_REER_ULC: No coint.
- Model_REER_ULC_G: No coint.

- <u>Denmark</u>: From a visual inspection of the trend graph for variable ULC, it is possible to see a jump in observations 70-90, which may be related to the Danish deep downturn at 1990 (oecd.org). Therefore, the original model was divided into two sub-periods. Before running the cointegration test, the variables were checked for stationarity and it was concluded that all of them followed an I(1) process. The cointegration conclusions are as follows:

<u>Jan.1972- Oct. 1988:</u>

- Model_ULC: No coint.
- Model_ULC_G: No coint
- Model_REER_ULC: No coint.
- Model_REER_ULC_G: No coint.

<u>Jan.1995 – Jul. 2010:</u>

- Model_ULC: Coint.
- Model_ULC_G: Coint
- Model_REER_ULC: No coint.
- Model_REER_ULC_G: No coint.

- <u>Finland:</u> The variables concerning this country present a structural break at around the 75th observation, possibly due to the deep depression that hit Finland in the early 90s (Honkapohja & Koskela, 1999). Thus, the model was divided into two sub-periods. Unit root tests were performed and an I(1) behavior for all of the variables was confirmed. The cointegration conclusions on the models are as follows:

Jan.1972 – Oct.1990:

- Model_REER: No coint.
- Model_REER_G: Coint.
- Model_ULC: No coint.
- Model_ULC_G: No coint.
- Model_REER_ULC: Bdline
- Model_REER_ULC_G: Coint.

Jan.1994 – Jul.2010:

- Model_REER: No coint.
- Model_REER_G: No coint.
- Model_ULC: Coint.
- Model_ULC_G: Bdline
- Model_REER_ULC: No coint
- Model_REER_ULC_G: No coint.

- Greece: A non regular behavior is perceived until observation 50, for some of the variables that might be related with the 1979 oil crisis that affected many countries (Barsky & Kilian, 2004). Moreover a trend shift is perceived at around observation 100 for most of the variables. The new model will include observations starting from Jan. 1985 and will also include the trend shift behavior. Strong economic events that justify this last behavior were not found. Firstly, unit root tests were applied to the variables in the new period, and I(1) processes were confirmed for all of the variables. Then, cointegration tests were performed presenting the following results:

- Model_REER: Coint.
- Model_REER_G: Coint.

- Italy: Two structural breaks are found from the beginning of the observations until the 20th and at around 80-90 observations. Due to this fact, the models for Italy (two, since the variable ULC, and thus models including it were disregarded in the previous section), will be divided into two sub-periods, in order not to include the mentioned breaks. These are: 1st sub-period: Jan. 1977 – Oct. 1991 and 2nd sub-period: Jan. 1994 – Jul. 2010. The mentioned structural breaks found in the variables may concern, respectively the 1974-75 Italian crisis derived from an oil price shock (federalreserve.gov), and the Italian deep recession in 1992 (imf.org). Unit root tests were carried out for the variables in both of these two sub-periods and it was concluded that all of them follow an I (1) process. The cointegration results are as follows:

Jan. 1977 – Oct. 1991:

- Model_REER: Coint.
- Model_REER_G: Coint.

Jan. 1994 – Jul.2010:

- Model_REER: Coint.
- Model_REER_G: Coint.

- Japan: For all of the variables, except for the ULC, a very significant trend shift is observed in the trend graphs at around observation 75th, which may represent the Japanese economic bubble until the early 90s, and its collapse afterwards (Shiratsuka, 2003). This trend shift was included in the model in order to account for this behavior. The cointegration results for the new model are as follows:

  - Model_REER: Coint.
  - Model_REER_G: Coint.
  - Model_ULC: Coint.*
  - Model_ULC_G: Coint.*
  - Model_REER_ULC: Coint.
  - Model_REER_ULC_G: Coint.

The results marked with *, represent borderline results, where the decision was based in ACF graph.

- Luxembourg: Due to the observation of a break in variable REER and a trend shift in the demand variables, at around observation 40, models from observation 50, i.e. Jan. 1984 will be considered below. This behavior might be due to the 1979 oil crises that affected many countries (Barsky & Kilian, 2004). Unit root tests were applied to this new period and with the help of the ACF graph it was possible to conclude for I (1) processes of the variables. The Engle-Granger cointegration tests are as follows:

  - Model_REER: Coint.
  - Model_REER_G: Coint.
  - Model_ULC: Coint.
  - Model_ULC_G: Coint.
  - Model_REER_ULC: Coint.
  - Model_REER_ULC_G: Coint.

- Netherlands: A trend shift is observed in the 4 variables concerning the GDP at the 70th observation. No evidences for the growth of GDP from this point, i.e. 1989 were found. Thus, this trend shift is introduced in the models, in order to obtain more reliable results. The cointegration results are as follows:

  - Model_REER: Coint.
  - Model_REER_G: Coint.
  - Model_ULC: Coint.
  - Model_ULC_G: Coint.
  - Model_REER_ULC: Coint.
  - Model_REER_ULC_G: Coint.

- Norway: At around observations 45-70, a structural break is perceived for some of the variables. Consequently, the original model will be divided into two sub-periods that will not include the mentioned one. Moreover, in the second sub-period, it a trend shift was observed for the variable ULC at around the 100th observation. The second sub-period model will therefore include this behavior. No specific economic events for this country were found to justify neither the structural break nor the trend shift. Unit root tests indicate that the variables are considered as I(1) in both of the sub-periods. The cointegration results are as follows:

Jan. 1972 – Oct. 1984:

- Model_REER: No coint.
- Model_REER_G: No coint.
- Model_ULC: Coint.
- Model_ULC_G: Coint.
- Model_REER_ULC: No ciont.
- Model_REER_ULC_G: No coint.

Jan. 1990 – Jul. 2010:

- Model_REER: No coint.
- Model_REER_G: No coint.
- Model_ULC: Coint.
- Model_ULC_G: Coint.
- Model_REER_ULC: No ciont.
- Model_REER_ULC_G: No coint.

- Spain: A trend shift is observed at observation 50 for all of the variables except for the REER. The main intuition for this aspect is related to the entrance of this country in the European Union at this time (europa.eu). This behavior will be included in the only two models of Spain that are in consideration (models including ULC were disregarded in the unit root tests section). The cointegration results are as follows:

- Model_REER: No coint.
- Model_REER_G: No coint.

- UK: Some of the variables for this country exhibit a trend shift at around observation 80. No specific economic events for this country that would generate a trend shift in the respective variables were found. This behavior will be included in the model so as to obtain more reliable cointegration results. These are as follows:

- Model_REER: No coint.
- Model_REER_G: No coint.
- Model_ULC: Coint.
- Model_ULC_G: Coint.
- Model_REER_ULC: No ciont.
- Model_REER_ULC_G: No coint.

4.3.2.2. Johansen Cointegration test

Due to the already mentioned drawbacks inherent to the Engle-Granger method, that make difficult to interpret the results, it was decided to resort to the Johansen VAR model, in order to confirm or clarify the above conclusions on cointegration. In this section, the example of Model_REER_G for Sweden will be used to explain how the analysis of the Johansen cointegration test is done. The code introduced in the SAS program to execute this test can be found in Appendix D, in which, as above, seasonal centered dummies are also included.

Table 6: Johansen cointegration test results for Model_REER_G_Sweden (*p*=2)

Cointegration Rank Test Using Trace				
H0: Rank=r	H1: Rank>r	Eigenvalue	Trace	5% Critical Value
0	0	0.1533	44.625	29.38
1	1	0.0971	19.1732	15.34
2	2	0.023	35.526	3.84

Information Criteria	
AIC	-24.408
SBC	-23.814

Univariate Model AR Diagnostics								
	AR1		AR2		AR3		AR4	
Variable	F Value	p-value	F Value	p-value	F Value	p-value	F Value	p-value
Sweden_NGDP_G	0.32	**0.5749**	1.49	**0.2293**	1.2	**0.3107**	0.97	**0.4272**

The first part of the above table refers to the cointegration results, in which the analysis has to be made sequentially, as it was already mentioned. The first line refers to the H0 of r=0 (no cointegration) as opposed to the fact that $r > 0$ (cointegration of rank $r > 0$). Since the trace test statistics is higher than the 5% significance level critical value, the H0 was rejected. Thus, one should proceed to the second line of this table where H0 is r=1 (cointegration of rank 1) as opposed to r >1 (cointegration of more than 1 common trends). Once again, this H0 hypothesis is rejected, which turns the analysis into the third line of the table where H0 of r=2 against $r > 2$ is tested. In this case, the trace test statistic is lower than the critical value at a 5% significance level, which allows one to stop the investigations and conclude for cointegration with two vectors. The second part of the table is composed of selected information criteria automatically generated by SAS and also of Univariate Model AR diagnostics, which are the tools that allow for the decision of the optimal p. In order to better understand the analysis and decision made in this particular case, the results from table 6 will be compared with the ones for table 7, below, which respectd the consideration of p=1 as opposed to before where p=2 was considered.

Table 7: Johansen cointegration test results for Model_REER_G_Sweden (*p*=1)

Information Criteria	
AIC	-23.9816
SBC	-23.4803

Univariate Model AR Diagnostics								
Variable	AR1		AR2		AR3		AR4	
	F Value	p-value	F Value	p-value	F Value	p-value	F Value	p-value
Sweden_NGDP_G	11.96	**0.0008**	6.60	**0.0020**	4.60	**0.0045**	3.76	**0.0067**

By comparing the information criteria of the two models, it is possible to perceive that these values are more negative for the VAR (2) model than for the VAR (1) one, suggesting that the first represents a better fit for the Model_REER_G_Sweden. Moreover, the p-values for the univariate model AR diagnosis are less than 0.05 for the VAR (1) model, meaning that at a 5% significance level, the H0 of no autocorrelated residuals for AR(1) up to AR(4) is rejected. Thus, *p*=2 should be considered in order to correct this fact, and from the AR diagnostics table for this model, it is possible to see that it actually does, as at a 5% significance level, the H0 of non autocorrelation in the residuals cannot be rejected, i.e. the p-values of this test are higher than 0.05. Accordingly, the VAR(2) is selected as the most appropriate one for the model in the example, and it can be concluded that its variables cointegrate with 2 cointegrating vectors.

The analysis carried out in this example was similar for the rest of the models. Since in this thesis, it is only of interest to check whether cointegration is verified or not, and the number of cointegrating vectors is not relevant, the cointigration results, without mentioning the ranks, are summarized in the table below. Furthermore, it is worth mentioning that the selection of the optimal number of lagged variables to include in the model was mainly based in the AR diagnostics test, since the goal is to add the minimum possible number of it so that any autocorrelation in the residuals is removed, without losing many degrees of freedom. In this manner, the information criteria indicators were mainly used when the referred test was not enough to make coherent conclusions.

Table 8: Summary results for the Johansen cointegration test for all the models.

	Model: REER	Model: REER_G	Model: ULC	Model: ULC_G	Model: REER_ULC	Model: REER_ULC_G
Australia	p=1; Coint.	p=1; Coint.	p=1; No coint.	p=1; No coint.	p=1; Coint.	p=1; Coint.
Austria	p=1; No coint.	p=1; Coint.	p=1; No coint.	p=1; No coint.	p=1; No coint.	p=1; Coint.
Belgium	p=2; No coint.	p=1; Coint.	p=2; Coint.	p=2; Coint.	p=2; Coint.	p=1; Coint.
Canada	p=2; No coint.	p=2; No coint.	p=1; Coint.	p=1; Coint.	p=1; Coint.	p=1; Coint.
Denmark	p=1; Coint	p=1; Coint.	p=2; No coint.	p=2; No coint.	p=1; No coint.	p=1; Coint.
Finland	p=1; starionary	p=3; stationary	p=2; Coint.*	p=1: Coint.	p=1; stationary	p=3; Coint.
France	p=3; Coint	p=3; Coint.				
Germany	p=1; No coint.	p=1; No coint.				
Greece	p=3; No Coint.	p=3; No Coint.				
Ireland	p=3; No coint.	p=3; No coint.	p=3; No coint.	p=3; No coint.	P=4; Coint.	p=4; No coint.
Italy	p=2; No coint.	p=2; Coint.				
Japan	p=2; No coint.	p=4; No coint.	p=1; Coint.	p=1; Coint.	p=1; Coint.	p=3; No coint.
Korea	p=2; Coint.*	P=1; Coint.				
Luxembourg	p=1; Coint.	p=1; Coint.	p=2; Coint.	p=2; Coint.	P=1; Coint.	P=1; Coint.
Netherlands	p=2; No coint.	p=2; No coint.	p=2; Coint	p=2; Coint	p=2; Coint	p=2; Coint.
Norway	p=2; No coint.	p=1; No coint.	p=2; No coint.	p=1; Coint.	p=2; No coint.	p=1; Coint.
Spain	p=3; No coint.	p=3; No coint.				
Sweden	p=1; Coint.	p=2; Coint.	p=2; Coint.	p=2; Coint.	p=1; Coint.	p=1; Coint.
UK	p=1; Coint.	p=1; No coint.	p=1; Coint.	p=1; Coint.	p=1; Coint.	p=1; Coint.
US	p=2; Coint.	p=1; Coint.				

Firstly, from table 8 it is possible to see that the results obtained by means of this test for some models are different to the ones obtained above with the Engle-Granger test. The cells marked with * refer to conclusions which were based in the AIC for the decision of the number of lagged variables to include in the model. On the other hand, the results highlighted in grey concern clear biased results, as they indicate the same number of cointegration relations than the number of variables in the models implying these to be stationary, in contrast with the previously concluded. At last, the conclusion marked in red regards another probably biased result, as since Model_REER_G_Denmark contains one cointegrating vector, also Model REER_ULC_G should have at least one. These biased results may come from the fact that also this test does not hold in the presence of structural breaks. Accordingly, Johansen cointegration tests were applied to the same sub-periods as in the above section and for the same reasons, where it will be possible to see that the biased results were corrected. It is important to note that trend shifts were not included in these models, as it was not possible to do so in the above referred code for the Johansen cointegration test in SAS. Below, the results for the new models, that will enhance the cointegration conclusions, will be presented.

Table 9: Summary results for the Johansen cointegration test for the transformed models.

	Model: REER	Model:REER_G	Model:ULC	Model:ULC_G	Model:REER_ULC	Model: REER_ULC_G
Belgium	p=2; No coint.	p=2; No coint.			p=2; Coint.	p=2; Coint.
Canada (1972-1988)	p=1; NoCoint.	p=1; Coint.	p=1; Coint.	p=1; Coint.	p=1; Coint.	p=1; Coint.
Denmark (1972-1988)			p=1; No coint.	p=1; No coint	p=1; Coint	p=1; Coint
Denmark (1995-2010)			p=1; Coint.	p=1; No coint.	p=1; No Coint.	p=1; No coint.
Finland (1972-1990)	p=1; Coint.	p=1; Coint.	p=1; Coint.	p=1; Coint.	p=1; Coint.	p=1; Coint.
Finland (1994-2010)	p=1; No coint.	p=2; Coint.	p=1; Coint.	p=1; Coint.	p=2; No coint.	p=3; Coint.
Italy (1977-1991)	p=1; No coint.	p=1; No coint.				
Italy (1994-2010)	p=2; No coint.	p=1; No coint.				
Luxembourg	p=1; No coint.	p=1; No coint.	p=2; Coint.	p=2; Coint.	p=1; Coint.	p=1; Coint.
Norway (1972-1984)	p=1; No coint.	p=1; No coint.	p=1; Coint.	p=1; No coint.	p=1; Coint.	p=1; No coint.

To sum up this section, some comments should be made concerning the results on both methods to test cointegration. In fact these results are sometimes different, and due to the mentioned drawbacks inherent to the Engle-Granger test, it was decided to proceed with the analysis and construction of the final models based on the results obtained from the Johansen cointegration tests whenever possible, as they are assumed to be the most correct ones. The only exception, concerns models which variables include a tend shift, since their final models will be based in the Engle-Granger test cointegration conclusions.

4.3.3. Final models based on the ECM

After testing for cointegration, it is now possible to finally construct the final models that will allow for an accurate analysis of international economic integration and fiscal policy effectiveness. Using as example Model_REER_G_Sweden, since it was concluded above that it reveals cointegration, the final model will be as follows:

$$\Delta NGDP\_G\_Sweden_t = \alpha_0 + \beta_1 \Delta CIG\_Australia_t + \beta_2 \Delta REER\_Australia_t + \beta_3 D_2 + \beta_4 D_3 + \beta_5 D_4 + \varepsilon_{t-1}$$

where δ_1 should be negative so as to reflect the error correction properties of this model.. The number of lagged variables included in this model is one, and this was decided through the Godfrey test for *p*=1 below:

Table 10: Godfrey test for Model_REER_G_Sweden (p=1)

Godfrey's Serial Correlation Test		
Alternative	LM	p-value
AR(1)	3.1106	0.0778
AR(2)	3.9946	0.1357
AR(3)	5.187	0.1586
AR(4)	5.7018	0.2226

According to table 10, it is possible to see that the test p-values are higher than 0.05, thus, the H0 of no autocorrelation in the residuals for AR (1) to AR (4) cannot be rejected at a 5% significance level, meaning that *p*=1 should be the optimal number of lagged variables to include in the model. If it would happen that the p-values were lower than 0.05, the H0 would be rejected, and the Godfrey test would have to be applied to a model with *p*=2 and so on, until H0 could not be rejected (p-value >0.05).

Having decided the correct number of lagged variables to include, it is now possible to report the results obtained from the regression:

Table 11: ECM results for Model_REER_G_Sweden.

Dependent Variable	D_NGDP_G				
Variable	DF	Estimate	Standard Error	t Value	Approx Pr > |t|
Intercept	1	-0.00119	0.001205	-0.99	0.3257
D_CI	1	0.3069	0.094	3.26	0.0014
D_REER	1	0.018	0.0453	0.4	0.6919
D2	1	-0.0038	0.003356	-1.13	0.2593
D3	1	0.001423	0.003364	0.42	0.673
D4	1	-0.00427	0.003372	-1.27	0.2073
Residual_t_1	1	-0.2445	0.0533	-4.59	<.0001

In the above table, D_CI and D_REER represent the variables in changes, D2, D3 and D4 the seasonal centered dummies for the second, third and fourth quarter, respectively and Residual_t_1 represents the lagged residuals, which were included in the model as the error correction term. From the results, it is possible to see that both the intercept, D_REER and the dummies, are not significantly different from 0, since their p-values are higher than 0.05. D_CI on the other hand seems to influence D_NGDP_Sweden, as well as the Residual_t_1, which coefficient is negative, confirming the error correction properties of this model. The R^2 result for this linear regression is not relevant for this thesis, since the goal of this project is not to explain the dependent variables but rather the effects of the specific explanatory variables on them. Consequently, this result will be reported but not deeply analyzed. The R^2 for this model is 0.1831, meaning that in the short-term the explanatory variables do not strongly explain the dependent one. Moreover, since cointegration was concluded for this model, it will be possible to analyze, although not to test, the estimations of the coefficients in the long-term, i.e. from the Engle-Granger regression:

Table 12: Engle-Granger regression results for Model_REER_G_Sweden

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	-1.38746	0.2019	-6.87	<.0001
Sweden_CI	1	0.71174	0.02208	32.24	<.0001
Sweden_REER1	1	0.01318	0.02298	0.57	0.5671
D2	1	-0.00327	0.00517	-0.63	0.5279
D3	1	0.00070805	0.00517	0.14	0.8913
D4	1	-0.00185	0.0052	-0.36	0.7226

The same tests were applied to the rest of the models, and their final models might only differ in what concerns the inclusion or not of the error correction term as explanatory variable, and the selected number of lagged variables. In the tables below, the main results will be presented for each of the six models. P-values were chosen to be present instead of t-statistic since the interest in the present thesis is mainly to analyze whether the impacts on the dependent variable are significant or not, i.e. testing against 0, and also the magnitude of this impact. Below each table, comments on the results and conclusions on international economic integration and fiscal policy effectiveness can be found, giving more importance to the results obtained for the long-term, since these are more related with the main concepts of this thesis.

Table 13: Summary results for both the ECM and the Engle-Granger regressions for Models_REER.

Results for the ECM (short-term)						Long-term results		
	p	D_CIG	D_REER	Residual_t_1	R^2		CIG	REER
Australia	3	0.6789 (<.0001)	-0.007013 (0.6669)	-	0.4154	Australia	-	-
Austria	2*	0.5829 (<.0001)	-0.0455 (0.3962)	-	0.5777	Austria	-	-
Belgium (from 1984)	1	0.331 (0.0051)	-0.1123 (0.0324)	-	0.1299	Belgium (from 1984)	-	-
Canada (1972-1988)	2	0.4848 (<.0001)	-0.0264 (0.5757)	-	0.4843	Canada (1972-1988)	-	-
Canada (1993-2010)	2	0.2454 (0.0682)	-0.0276 (0.1858)	-	0.3672	Canada (1993-2010)	-	-
Denmark	1	0.3241 (<.0001)	-0.009703 (0.8444)	-0.3149 (<0.0001)	0.3616	Denmark	0.51309	-0.22041
Finland (1972-1990)	1	0.7761 (<.0001)	0.055 (0.3236)	-0.1894 (0.0086)	0.6397	Finland (1972-1990)	0.74784	-0.02001
Finland (1994-2010)	2	0.4146 (0.0098)	-0.0557 (0.4672)	-	0.2159	Finland (1994-2010)	-	-
France	3	0.5188 (<.0001)	-0.0197 (0.3991)	-0.1135 (0.0007)	0.4637	France	0.87527	-0.19472
Germany	1	0.6414 (<.0001)	0.0292 (0.2574)	-	0.5166	Germany	-	-
Greece (from 1985)	1	0.7766 (<.0001)	-0.2287 (0.0154)	-0.7059 (<0.0001)	0.465	Greece (from 1985)	0.86653	-0.14938
Ireland	5	0.4776 (<.0001)	-0.001039 (0.9812)	-	0.5025	Ireland	-	-
Italy (1977-1991)	1	0.7 (<.0001)	-0.0329 (0.603)	-	0.3391	Italy (1977-1991)	-	-
Italy (1994-2010)	2	0.3236 (0.0589)	-0.0248 (0.5773)	-	0.4169	Italy (1994-2010)	-	-
Japan	1	0.7618 (<.0001)	-0.0185 (0.081)	-0.3 (<.0001)	0.6193	Japan	0.67968	-0.04809
Korea	1	0.5607 (<.0001)	0.0118 (0.5776)	-0.0515 (0.0113)	0.4785	Korea	1.13471	-0.18784
Luxembourg	1	0.1583 (0.0484)	-0.0424 (0.8266)	-	0.0419	Luxembourg	-	-
Netherlands	2	0.6834 (<.0001)	-0.0793 (0.1103)	-0.1707 (0.0037)	0.4959	Netherlands	0.65483	-0.03602
Norway (1972-1984)	1	-0.1427 (0.2655)	-0.0517 (0.604)	-	0.0927	Norway (1972-1984)	-	-
Norway (1990-2010)	5	0.2131 (0.1594)	0.085 (0.3097)	-	0.4658	Norway (1990-2010)	-	-
Spain	1	0.6225 (<.0001)	-0.0299 (0.3079)	-	0.4105	Spain	-	-
Sweden	1	0.4712 (<.0001)	0.0297 (0.3476)	-0.2568 (<0.0001)	0.2518	Sweden	0.81122	-0.08350
UK	1	0.4848 (<.0001)	-0.0234 (0.1772)	-	0.253	UK	-	-
US	1	0.7258 (<.0001)	-0.008198 (0.4768)	-0.1961 (<0.0001)	0.5042	US	0.59044	-0.01823

Model_REER: The left part of the above table reports the short-term results on model_REER. In what concerns the impact of the demand on the production, it is shown that it is high in most of the cases, especially for Finland (1972-1990), Greece, Italy (1977-1991), Japan and the US, where a 1% increase in the changes in demand results in a 0.7% positive effect in the changes of NGDP. On the contrary, it is observed that for Canada (1993-2010), Italy (1994-2010), Luxembourg and Norway (for both the two periods), there is no significant impact of the changes in the demand on the changes of production, since the p-values for these cases are higher than 0.05. Concerning the REER impact on production, the opposite is verified, i.e. for most of the cases there is no evidence that changes in REER affect the changes in the dependent variable, with exception for Belgium and Greece, which present very low impacts (-0.11% and -0.22% respectively).

From these results, it is possible to conclude that there is no strong evidence of integration in the short-term for the analyzed countries. Actually, in what concerns Canada (1993-2010), Italy (1994-2010), Luxembourg and Norway (for both the two periods), where, in the short-term, no impact from the demand (CIG) in the production was verified, it can be argued that these are probably the most integrated countries. However, it can also be noted that, despite this fact, for these countries, the REER competitiveness variable shows no significant impact in the production, contradicting the integration signs given by the first variable. Overall, it is possible to conclude that there are no strong integration evidences given by this model in short-term, with the exception of the above mentioned countries, which might reveal some moderate degree of integration.

Not less important than the economic interpretations of these findings, it is the interpretation of the lagged residual included in the model, which for all the cases shows a negative impact in the dependent variable, confirming the error correction property of the model. The rapidness of this adjustment is perceived from the magnitude of the coefficients of this variable. As an example, for Greece it is possible to see that the short-term deviations from the long-term equilibrium are quickly corrected, as the absolute value of the coefficient of the lagged residual is relatively high (0.70%).

The long-term results presented in the right part of the above table will allow more significant conclusions regarding international integration, since all the key concepts of the present thesis revolve around a long-term perspective.

Since cointegration was only verified for half of the countries in analysis, long-term results can be only examined in these cases due to the problem of spurious. For the 9 countries analyzed, it is possible to conclude, without exception, for strong impacts of the demand on production and small effects of REER on the same variable, strongly confirming that the above suggestions of no strong evidence of integration in the short-term are also applicable to the long-term

Table 14: Summary results for both the ECM and the Engle-Granger regressions for Models_REER_G.

Results for the ECM (short-term)					
	P	D_CI	D_REER	Residual_t_1	R^2
Australia	1	0.0513 (0.6011)	0.003178 (0.8968)	-	0.0101
Austria	1	0.1216 (0.0514)	0.009912 (0.914)	-0.1289 (0.0008)	0.0903
Belgium (from 1984)	1	0.328 (0.0261)	0.0266 (0.7784)	-	0.0569
Canada (1972-1988)	1	0.112 (0.2822)	0.0354 (0.5642)	-0.4935 (<0.0001)	0.4063
Canada (1993-2010)	2	-0.3259 (0.0278)	0.0232 (0.3937)	-	0.2793
Denmark	1	0.0952 (0.0838)	0.1562 (0.0266)	-0.2319 (<0.0001)	0.2346
Finland (1972-1990)	1	0.2625 (0.0073)	0.0762 (0.4189)	-0.4043 (<0.0001)	0.3106
Finland (1994-2010)	2	-0.0187 (0.9074)	0.0954 (0.3131)	-0.1791 (0.0014)	0.294
France	4	0.0259 (0.7021)	0.001895 (0.9376)	-0.1397 (<0.0001)	0.5384
Germany	1	-0.006607 (0.9321)	-0.009681 (0.8362)	-	0.0044
Greece (from 1985)	1	-0.1136 (0.5199)	0.3687 (0.0024)	-0.6777 (<0.0001)	0.4155
Ireland	5	0.0921 (0.1784)	0.0474 (0.3748)	-	0.4714
Italy (1977-1991)	1	0.154 (0.287)	0.2827 (0.0046)	-	0.1919
Italy (1994-2010)	1	-0.2118 (0.309)	0.0477 (0.5054)	-	0.0497
Japan	4	0.0625 (0.2934)	0.005383 (0.6895)	-0.2528 (<0.0001)	0.6157
Korea	1	0.1376 (0.0396)	0.008407 (0.7862)	-0.1205 (<0.0001)	0.176
Luxembourg	1	0.0611 (0.4287)	-0.1742 (0.4483)	-	0.0144
Netherlands	4	0.1628 (0.0112)	0.1061 (0.0865)	-0.2177 (0.0048)	0.5751
Norway (1972-1984)	1	0.1783 (0.1571)	-0.1411 (0.2699)	-	0.0704
Norway (1990-2010)	3	-0.2949 (0.0683)	-0.2334 (0.0482)	-	0.2544
Spain	1	0.2861 (0.0005)	0.0165 (0.6026)	-	0.0875
Sweden	1	0.3069 (0.0014)	0.018 (0.6919)	-0.2445 (<0.0001)	0.1831
UK	1	0.1262 (0.1406)	-0.000531 (0.9829)	-	0.0206
US	1	0.1447 (0.092)	0.00386 (0.8256)	-0.296 (<0.0001)	0.2474

Long-term results		
	CI	REER
Australia	-	-
Austria	0.7138	-0.50046
Belgium (from 1984)	-	-
Canada (1972-1988)	0.4488	-0.04815
Canada (1993-2010)	-	-
Denmark	0.565	0.00673
Finland (1972-1990)	0.6205	-0.0179
Finland (1994-2010)	0.8228	-0.2147
France	0.6977	-0.1692
Germany	-	-
Greece (from 1985)	0.3598	0.1785
Ireland	-	-
Italy (1977-1991)	-	-
Italy (1994-2010)	-	-
Japan	0.6199	-0.0455
Korea	1.098	-0.2222
Luxembourg	-	-
Netherlands	0.44	-0.0863
Norway (1972-1984)	-	-
Norway (1990-2010)	-	-
Spain	-	-
Sweden	0.7117	0.01318
UK	-	-
US	0.596	-0.03661

Model_REER_G: From a quick visual inspection of the left part of the table, it is possible to observe that contrarily to the previously analyzed model, the impact of the changes in demand (CI) on the changes in production (NGDP_G) are considerably lower and even non significant for most of the cases in the short-term. In fact, the highest impact found concerns Belgium with a value of 0.328%, which is very similar to the lowest effect observed in table 13. Therefore, from the effects of demand on the net disposable income, which in this case is represented by NGDP_G, it is possible to conclude that in the short-term the fiscal policy adopted by these countries does not effectively affect the production. In what concerns the short-term impacts of the REER, similar conclusions as in the previous model can be obtained, i.e. in general it is not rejected that there is no impact of REER in the production. Exceptions for Denmark, Greece and Italy (1977-1991) are observed, but still the impacts verified are fairly low. It is important to mention that these results present a different sign from what economic theories predict, as they point out towards a positive impact on the change in production from the REER. Besides, also the coefficient for the change in the demand for Canada (1993-2010) presents a different sign, showing a decrease in the changes in production accompanied by a relative increase in the national domestic demand changes. Further analyses on these aspects would involve deep country-specific analyses and thus will not be done due to time and space constraints.

To sum up, based on the demand, there is evidence of weak effective fiscal policy applied by the authorities of these countries in the short-term.

The right part of the table shows the long-term results for the cases presenting cointegration. These results are easier to interpret as most of the analyzed countries indicate a strong impact of the national demand in production, meaning that in the long-term the fiscal policy applied by authorities becomes effective, with the exception of Greece. It is interesting to highlight that Greece is not considered as integrated from the conclusions of table 13. Actually, it was shown that this country was one of the least integrated ones.

At the same time it is possible to see a very low impact of REER on production, confirming the extracted conclusions from the previous model.

To sum up, while in the short-term, any fiscal policy will not clearly exercise strong effects, in the long-term it will most certainly do.

Table 15: Summary results for both the ECM and the Engle-Granger regressions for Models_ULC.

Results for the ECM (short-term)					
	p	D_CIG	D_ULC	Residual_t_1	R^2
Australia	2	0.6136 (<.0001)	-0.2077 (0.169)	-	0.356
Austria	1	0.5461 (<.0001)	-0.3534 (<0.0001)	-	0.656
Belgium	1	0.5953 (<.0001)	-0.1925 (0.0166)	-0.1002 (0.0055)	0.401
Canada (1972-1988)	1	0.5046 (<.0001)	0.1143 (0.3589)	-0.2538 (0.0056)	0.475
Canada (1993-2010)	2	0.0815 (0.4882)	0.0517 (0.651)	-	0.265
Denmark (1972-1988)	1	0.2057 (0.0042)	-0.2065 (0.5036)	-	0.152
Denmark (1995-2010)	1	0.4575 (<.0001)	-0.493 (0.2397)	-0.4401 (0.0006)	0.512

Long-term results		
	CIG	ULC
Australia	-	-
Austria	-	-
Belgium	0.6956	0.10353
Canada (1972-1988)	0.5849	0.12487
Canada (1993-2010)	-	-
Denmark (1972-1988)	-	-
Denmark (1995-2010)	0.2583	-0.7535

Finland (1972-1990)	2	0.76 (<.0001)	-0.2891 (0.2092)	-0.0635 (0.3086)	0.786
Finland (1994-2010)	1	0.2617 (0.0142)	-0.5892 (0.0082)	-0.465 (<0.0001)	0.465
France	-	-	-	-	-
Germany	-	-	-	-	-
Greece	-	-	-	-	-
Ireland	2	0.4221 (<.0001)	-0.1633 (0.4099)	-	0.333
Italy	-	-	-	-	-
Japan	2	0.7068 (<.0001)	-0.2467 (0.051)	-0.1792 (0.0015)	0.63
Korea	-	-	-	-	-
Luxembourg	2	0.1538 (0.0321)	-0.00758 (0.9859)	-0.0315 (0.5236)	0.282
Netherlands	2	0.6593 (<.0001)	0.0717 (0.8002)	-0.4314 (<0.0001)	0.583
Norway (1972-1984)	1	-0.0802 (0.4159)	-0.22 (0.0771)	-0.5391 (<.0001)	0.505
Norway (1990-2010)	3	0.2192 (0.007)	-0.3824 (0.1842)	-0.3954 (0.0012)	0.577
Spain	-	-	-	-	-
Sweden	3	0.4964 (<.0001)	-0.0592 (0.8013)	-0.1493 (0.0014)	0.384
UK	1	0.5172 (<.0001)	-0.1349 (0.0048)	-0.312 (<0.0001)	0.434
US	-	-	-	-	-

Finland (1972-1990)	0.7693	0.01238
Finland (1994-2010)	0.3797	-1.2523
France	-	-
Germany	-	-
Greece	-	-
Ireland	-	-
Italy	-	-
Japan	0.7312	-0.1245
Korea	-	-
Luxembourg	1.4335	0.0521
Netherlands	0.6504	-0.0621
Norway (1972-1984)	0.4071	-0.3126
Norway (1990-2010)	0.2408	-0.085
Spain	-	-
Sweden	0.4048	-0.3362
UK	0.5227	-0.125
US	-	-

Model_ULC: The above table concerns the 3rd model of analysis in which the competitiveness measure is given by the ULC. In this case, it is observed that the short-term impact of CIG (demand) on the production is significant and high for most of the cases with the exception of Canada (1993-2010) and Norway (1972-1984), where no significant evidence of an impact on the dependent variable is observed. In addition, a low impact of the demand in production in the short-term, is observed for Denmark (1972-1988), Finland (1994-2010), Luxembourg and Norway (1990-2010). In what concerns the impacts of the changes in ULC in the changes in production, it can be noted that for most of the countries these are non significant, and that for Austria, Belgium and the UK are very low. An exception is found only for Finland (1994-2010), in where a 1% increase in the change of ULC results in an approximately 0.60% negative effect on the production changes. Accordingly, Finland (1994-2010) can be considered as the only exception to the overall conclusion for no evidence of integration for the evaluated countries, as its results clearly suggest integration based on the two variables. Finally, it is important to mention, the slow adjustment of short-term deviations for Finland (1972-1990) and Luxembourg, given by their fairly low coefficients of the error correction term.

Long-term results are available for more than half of the countries in the right part of the above table. In fact, these results suggest strong evidence of no integration for most of the countries where a strong impact of the demand on production, and low impact of the ULC in this same variable were estimated. Exceptions to this conclusion concern the following countries: Denmark, Finland (1994-2010), Norway (1972-1984) and Sweden. Even though these results are not common to a same period of analysis, they are particularly interesting as they concern the European Nordic countries, suggesting perhaps not a global integration of these countries, but rather a regional one. Further comments on these aspects were left behind due to time constraints.

Table 16: Summary results for both the ECM and the Engle-Granger regressions for Models_ULC_G.

	Results for the ECM (short-term)					Long-term results	
	p	D_CI	D_ULC	Residual_t_1	R^2	CI	ULC
Australia	2	0.675 (<.0001)	-0.245 (0.1916)	-	0.3445	-	-
Austria	1	0.5388 (<.0001)	-0.4128 (<0.0001)	-	0.6287	-	-
Belgium	1	0.6133 (<.0001)	-0.2404 (0.0258)	-0.1047 (0.0065)	0.3997	0.63552	0.12911
Canada (1972-1988)	1	0.5765 (<.0001)	0.1973 (0.2644)	-0.222 (0.0116)	0.4753	0.55452	0.22706
Canada (1993-2010)	2	0.0781 (0.4963)	-0.4482 (0.0958)	-	0.2863	-	-
Denmark (1972-1988)	1	0.1959 (0.0075)	-0.3359 (0.4237)	-	0.1425	-	-
Denmark (1995-2010)	3	0.4337 (<.0001)	0.4141 (0.7918)	-	0.5395	-	-
Finland (1972-1990)	2	0.7642 (<.0001)	-0.3474 (0.2484)	-0.0772 (0.2625)	0.7825	0.74537	-0.0195
Finland (1994-2010)	1	0.3292 (0.0047)	-0.7501 (0.0124)	-0.3857 (<.0001)	0.432	0.42690	-1.60385
France	-	-	-	-	-	-	-
Germany	-	-	-	-	-	-	-
Greece	-	-	-	-	-	-	-
Ireland	2	0.3713 (<.0001)	-0.2812 (0.2271)	-	0.2912	-	-
Italy	-	-	-	-	-	-	-
Japan	2	0.7098 (<.0001)	-0.336 (0.0265)	-0.1752 (0.0014)	0.5959	0.78405	-0.15386
Korea	-	-	-	-	-	-	-
Luxembourg	2	0.1111 (0.1034)	-0.1036 (0.8361)	-0.014 (0.7383)	0.2609	1.57453	0.05516
Netherlands	2	0.6673 (<.0001)	0.1304 (0.7315)	-0.4399 (<0.0001)		0.66333	-0.04948
Norway (1972-1984)	1	-0.04 (0.7345)	-0.613 (0.001)	-	0.2595	-	-
Norway (1990-2010)	3	0.2177 (0.0068)	-0.3963 (0.2922)	-0.4201 (0.0016)	0.5417	0.21556	-0.14864
Spain	-	-	-	-	-	-	-
Sweden	3	0.4962 (<.0001)	-0.1172 (0.7238)	-0.0906 (0.0047)	0.3851	0.31435	-0.43408
UK	1	0.5130 (<.0001)	-0.1937 (0.0021)	-0.3098 (<0.0001)	0.4104	0.52856	-0.19143
US	-	-	-	-	-	-	-

<u>Model_ULC_G:</u> The left part of the table above presents the short-term results of Model_ULC_G, while the right part of it presents its long-term results. The results for this model show strong impacts of the national demand on the production in the short-term for most of the countries, but with the exception of Denmark (1972-1988), Finland (1994-210),

Ireland and Norway (1990-2010), in which low impacts are verified, and Canada (1993-2010), Luxembourg and Norway (1972-1984), in which no significant impacts are verified. Consequently, it is possible to conclude that in the short-term, apart from the mentioned countries, the fiscal policy is effectively applied. Furthermore it is interesting to notice that, with the exception of Luxembourg, the above mentioned countries are concluded to be the most integrated ones according to Model_ULC.

Regarding the impacts of the change in ULC in the changes in production, these are relatively small in this model and in many cases not even significant. Exceptions to the previously mentioned fact are observed for Austria, Finland (1994-2010) and Norway (1972-1984). Overall, the results regarding this variable confirm the conclusions reached on integration in the previous model.

The results from the long-term regressions were obtained for half of the countries, and suggest an effective fiscal policy when applied by the authorities for most of the cases. The European Nordic countries contradict this overall conclusion. In fact for Finland (1994-2010), Norway (1990-2010), and Sweden, the presented results reveal a small impact of the demand in production, implying a low effective fiscal policy for these countries. These countries are concluded to be the most integrated ones based on the long-term results of Model_ULC. The fact that these conclusions concern the Nordic European countries is curious but as it was already stated further analyses on this were not carried out. Finally, it should also be mentioned that the estimation of the coefficient for variable ULC for Canada (1972-1988) presents a different sign that what economic theories predicts. This aspect will also not be further examined, due to time and space constraints.

Table 17: Summary results for both the ECM and the Engle-Granger regressions for Models_REER_ULC.

Results for the ECM (short-term)						
	p	D_CIG	D_REER	D_ULC	Residual_t_1	R^2
Australia	3	0.6672 (<.0001)	-0.003459 (0.8405)	-0.1459 (0.4068)	-	0.4218
Austria	2	0.5571 (<.0001)	-0.0392 (0.4473)	-0.5505 (0.0006)	-	0.6139
Belgium (from 1984)	3	0.3638 (0.0015)	-0.0761 (0.14)	-0.0536 (0.8182)	-0.1078 (0.0168)	0.3605
Canada (1972-1988)	1	0.5172 (<.0001)	-0.0467 (0.277)	0.152 (0.2214)	-0.4947 (<.0001)	0.5404
Canada (1993-2010)	2	0.2309 (0.0951)	-0.0296 (0.1632)	-0.357 (0.1528)	-	0.3912
Denmark (1972-1988)	1	0.2711 (0.0001)	0.0556 (0.4184)	0.0834 (0.7804)	-0.3012 (0.0003)	0.3318
Denmark (1995-2010)	1	0.641 (<.0001)	-0.1466 (0.1936)	-0.1286 (0.808)	-	0.3926

Long-term results			
	CIG	REER	ULC
Australia	-	-	-
Austria	-	-	-
Belgium (from 1984)	0.74335	-0.14744	0.27486*
Canada (1972-1988)	0.49877	-0.05936	0.05257
Canada (1993-2010)	-	-	-
Denmark (1972-1988)	0.51877	-0.05911	-0.00352
Denmark (1995-2010)	-	-	-

Finland (1972-1990)	1	0.7992 (<.0001)	0.0876 (0.1332)	-0.3364 (0.0076)	-0.2404 (0.0036)	0.6997
Finland (1994-2010)	2	0.3609 (0.0238)	-0.0354 (0.6536)	-0.978 (0.1266)	-	0.2759
France	-	-	-	-	-	-
Germany	-	-	-	-	-	-
Greece	-	-	-	-	-	-
Ireland	3	0.4425 (<.0001)	0.006453 (0.8872)	-0.1948 (0.4912)	-0.009687 (0.513)	0.4368
Italy	-	-	-	-	-	-
Japan	4	0.6286 (<.0001)	-0.0111 (0.3178)	-0.0741 (0.6707)	-0.4162 (<.0001)	0.7033
Korea	-	-	-	-	-	-
Luxembourg	1	0.1558 (0.0653)	-0.0459 (0.8158)	-0.6312 (0.0197)	-0.0518 (0.2462)	0.1246
Netherlands	2	0.6986 (<.0001)	-0.0814 (0.0973)	-0.0705 (0.8328)	-0.2415 (0.0003)	0.5207
Norway (1972-1984)	1	-0.2747* (0.0202)	-0.0291 (0.7503)	-0.2428 (0.0653)	-0.1965 (0.0012)	0.3544
Norway (1990-2010)	5	0.2356 (0.1308)	0.0995 (0.2448)	-0.6005 (0.2814)	-	0.508
Spain	-	-	-	-	-	-
Sweden	1	0.4177 (<.0001)	0.0488 (0.1196)	-0.1129 (0.2411)	-0.3029 (<0.0001)	0.286
UK	1	0.4971 (<.0001)	-0.00776 (0.6544)	-0.1871 (0.0009)	-	0.3069
US	-	-	-	-	-	-

Finland (1972-1990)	0.8698	-0.29964	0.19056*
Finland (1994-2010)	-	-	-
France	-	-	-
Germany	-	-	-
Greece	-	-	-
Ireland	1.21706	0.55601*	0.24691*
Italy	-	-	-
Japan	0.62477	-0.03353	-0.09575
Korea	-	-	-
Luxembourg	1.53742	1.16852*	0.40711*
Netherlands	0.58054	-0.09163	0.21943*
Norway (1972-1984)	0.20224	0.12986	-0.77616
Norway (1990-2010)	-	-	-
Spain	-	-	-
Sweden	0.6802	-0.02961	-0.10909
UK	-	-	-
US	-	-	-

Model_REER_ULC: The results summarized in the above table refer to the model with the two measures of competitiveness, the REER and the ULC. From the left part, it can be observed that in general and in the short-term, the variable CIG, representing the relative national demands, strongly impacts the NGDP. As a result, the highest impact is observed for Finland (1972-1990), where a 1 % increase in the changes in demand generate around 0.7% of positive effect in the changes in production. Exceptions are found for Canada (1993-2010), Luxembourg and Norway (1990-2010), which show a non significant impact of CIG on production in the short-term, and for Denmark (1972-1988), which reveals a low impact (0.27%). In what concerns the impact of the changes in the REER, this table shows that for all the analyzed countries, the effects on production are non significant in the short-term. Regarding the second variable of competitiveness, the ULC, it shows the same results for most of the countries, i.e. no significant or low impact on production, with the exception of Finland (1972-1990), Austria and Luxembourg, which present high impacts of this variable on the changes in the NGDP.

To sum up, in the short-term, for Austria, Canada (1993-2010), Finland (1972-1990), Ireland, Norway (1990-2010), and the UK there is no clear conclusion to be taken from a joint analysis of the three variables, suggesting a possible small degree of integration. The conclusions for Luxembourg are the same when analyzing the impact of both the demand and the ULC in production, suggesting this country might be the one with higher, but still not significantly high, degree of integration.

In the long-term, clearer results are obtained as: strong impacts of the CIG are presented for all the 10 countries, with the exception of Norway (1972-1984); low impacts of the REER in the NGDP are observed for all the variables, with the only exception of Luxembourg and at last the ULC reveals low impacts on the production for all the countries but Luxembourg and Norway. From these results, it can be concluded that Luxembourg and Norway are the only with some moderate degree of integration in the long-term.

Finally, it is important to note that also in this model there are results which present a different sign to the one that would be predicted. These are marked with * in table 17.

Table 18: Summary results for both the ECM and the Engle-Granger regressions for Models_REER_ULC_G.

Results for the ECM (short-term)							Long-term results			
	P	D_CI	D_REER	D_ULC	Residual_t_1	R^2		CI	REER	ULC
Australia	1	0.0515 (0.6038)	0.003110 (0.9008)	0.002608 (0.9872)	-	0.01	Australia	-	-	-
Austria	1	0.1072 (0.0948)	0.005149 (0.9563)	0.1697 (0.2877)	-0.0553 (0.0169)	0.059	Austria	0.4039	-0.30398	0.17591*
Belgium (from 1984)	1	0.36 (0.0081)	0.0834 (0.2834)	-0.171 (0.3534)	-0.1823 (0.0003)	0.18	Belgium (from 1984)	0.7663	-0.1221	0.30893*
Canada (1972-1988)	1	0.2675 (0.0071)	-0.0892 (0.1403)	0.6384* (0.0005)	-0.543 (<.0001)	0.494	Canada (1972-1988)	0.484	-0.0329	0.25711*
Canada (1993-2010)	2	-0.2494 (0.0802)	0.0356 (0.1768)	0.4765 (0.1389)	-	0.37	Canada (1993-2010)	-	-	-
Denmark (1972-1988)	1	0.1296 (0.0484)	0.2539* (0.0036)	0.3685 (0.3416)	-0.2157 (0.0006)	0.297	Denmark (1972-1988)	0.6405	-0.0594	0.392*
Denmark (1995-2010)	1	-0.041 (0.7531)	-0.071 (0.6919)	-0.216 (0.7987)	-	0.014	Denmark (1995-2010)	-	-	-
Finland (1972-1990)	1	0.2024 (0.0442)	-0.0551 (0.6078)	0.6883* (0.0068)	-0.3121 (0.0005)	0.273	Finland (1972-1990)	0.6426	-0.0708	0.0384
Finland (1994-2010)	2	-0.0882 (0.593)	0.0662 (0.504)	-0.00864 (0.9915)	-0.202 (0.0026)	0.338	Finland (1994-2010)	0.2678	-0.075	-1.01446
France	-	-	-	-	-	-	France	-	-	-
Germany	-	-	-	-	-	-	Germany	-	-	-
Greece	-	-	-	-	-	-	Greece	-	-	-
Ireland	2	0.2704 (0.0002)	0.0714 (0.2465)	0.707* (0.0074)	-	0.165	Ireland	-	-	-
Italy	-	-	-	-	-	-	Italy	-	-	-
Japan	1	0.2017 (0.0211)	0.009647 (0.6103)	0.00573 (0.9524)	-0.0303 (0.0181)	0.068	Japan	0.5411	-0.0278	-0.12468
Korea	-	-	-	-	-	-	Korea	-	-	-
Luxembourg	1	0.1626 (0.0463)	0.0546 (0.8141)	0.5342 (0.0986)	-0.1215 (0.002)	0.109	Luxembourg	1.7198	1.51171*	0.55117*
Netherlands	4	0.2329 (0.0024)	0.0692 (0.3718)	0.1648 (0.3652)	-0.4207 (<0.0001)	0.242	Netherlands	0.3645	-0.146	0.23496*
Norway (1972-1984)	1	0.206 (0.1108)	-0.1835 (0.1717)	0.1677 (0.3716)	-	0.088	Norway (1972-1984)	-	-	-
Norway (1990-2010)	2	-0.2421 (0.1336)	-0.2368 (0.0524)	0.6791 (0.2309)	-	0.215	Norway (1990-2010)	-	-	-
Spain	-	-	-	-	-	-	Spain	-	-	-
Sweden	1	0.2974 (0.0018)	0.0206 (0.6503)	0.1204 (0.3893)	-0.2598 (<0.0001)	0.198	Sweden	0.64626	0.03632	-0.06831
UK	1	0.1267 (0.1403)	0.002171 (0.9326)	-0.0329 (0.6893)	-	0.022	UK	-	-	-
US	-	-	-	-	-	-	US	-	-	-

Model_REER_ULC_G: Similarly to Model_REER_G, the above table reveals very low impacts of the demand in the production in the short-term, especially when compared with Model_REER_ULC. In fact, the highest impact observed concerns Belgium, where a 1% increase in the changes in demand origins a positive effect of 0.36% in the changes in NGDP_G. For half of the countries, the impacts observed are not even significant (p-values > 0.05). Accordingly, it is possible to conclude, that for these countries the fiscal policy applied by the authorities is not effective in the short-term.

In what concerns the impact of the REER on production in the short-term, it might be observed that this is either insignificant or low, confirming the above conclusions of no integration. The same is observed for variable ULC with exceptions for Canada (1972-1988), Finland (1972-1990), and Ireland.

In the long-term, for most of the countries, with the exception of Finland (1994-2010), Luxembourg and the Netherlands, the demand has high impacts on production, implying an effective fiscal policy. Concerning Luxembourg, it is interesting to note that the previous model, i.e. Model_REER_ULC, concludes for some degree of integration in this country.

In conclusion, while in the short-term, fiscal policy, is in general, not effectively applied by the countries in study, in the long-term they will most certainly be effectively applied with the few exceptions that were mentioned before.

The results marked with * in table 18, present a different sign that what would be expected from economic theories. Further explanations on this were not developed due to time and space constraints.

To conclude this section, according to the analyses made along the 6 models, it can be concluded that international economic integration is still far from being achieved. However, it is curious to note that based on Model_ULC, the European Nordic countries are the most integrated ones. Overall, from a joint analysis of the models, Canada, Luxembourg and Norway can be considered as the most integrated countries.

In what concerns the fiscal policy effectiveness, Model_ULC_G presented interesting findings, as it allows for concluding that the European Nordic countries are the only ones where the fiscal policy is less effectively applied. A final conclusion on this matter is that overall, in the long-term the fiscal policy is effectively applied by the authorities, while in the short-term, in general, the opposite happens. This fact is in accordance with the economic theories that predict that the effects of government policies are mostly noticed in the long-term (Frenkel & Razin, 1986).

4.4. Empirical results for the development of integration and fiscal policy effectiveness

In order to check the tendencies on both the international economic integration and fiscal policy effectiveness throughout the time, the analysis above detailed will also be applied to different sub-periods: 1972-1990 and 1972-2000. These periods were randomly selected, with the only requirement of being long enough to handle with the cointegration techniques. In this sense, and for a better comparison among the countries, the six models presented in this thesis, will be examined and compared for the two above referred periods and also for the one above analyzed in section 4.3., i.e. 1972-2010.

Another important consideration is the fact that, this analysis in sub-periods was not applied to Canada, Denmark (models with ULC included), Finland, Italy (models including the REER), and Norway since these models were already divided in sub-periods above, due to a structural break. However, for a completeness purpose, they will also be reported in the final tables and analyzed.

4.4.1. Unit root tests

As in section 4.3., the first step of this analysis will be based on testing the variables for unit roots. Since this method was already explained, only the results will be presented. Furthermore, it is important to note that the variables disregarded in the unit root test section 4.3.1, will not be included in these analyses as only a weak comparison based in two sub-periods would be done at the most.

<u>Levels:</u>

<u>1972-1990:</u>

ADF tests were carried for all the variables and non-stationarity was concluded for all of them by means of both the results of this test and the visual inspection from the trend and ACF graph. The variables subsequently presented, reported different results for each of the three cases considered in the ADF test, and thus non stationarity conclusions were mainly based in the graphs´ visual inspections. These are variables as follows: CIG_Denmark; NGDP_Australia, NGDP_Sweden; NGDP_G_Australia; NGDP_G_Greece; NGDP_G_Netherlands; RGDP_Austrlralia; ULC_Austria; ULC_Canada; ULC_Denmark; ULC_Finland; ULC_Japan; ULC_Luxembourg; ULC_Norway; ULC_Sweden; RGDP_G_Australia

1972-2000:

ADF tests were applied to all the variables determining non-stationarity for all. The following variables report non-stationary conclusions that were mainly based in the ACF and trend graphs: CI_Austria; CI_Canada; CIG_Canada; NGDP_Belgium; NGDP_Greece; NGDP_G_Belgium; NGDP_G_Greece; REER_Korea; ULC_Austria; ULC_Denmark; ULC_Finland; ULC_Ireland; ULC_Japan; ULC_Netherlands; ULC_Norway; ULC_UK

First differences:

Since all the variables for both the sub-periods are concluded to be non-stationary in levels, the first differences method will be used in order to transform these into stationary processes.

1972-1990:

ADF tests were applied to the first differences of all of the variables and it was concluded that these were stationarity. The following variables concern decisions that were mainly based on visual inspection from the trend and the ACF graph. The referred variables are as follows: CI_Finland; CI_Greece; CI_Ireland; CI_Luxembourg; CI_Spain; CIG_Canada; CIG_Greece; CIG_Ireland; CIG_Luxembourg; CIG_Spain; CIG_US; NGDP_Spain; NGDP_G_Spain; REER_Spain; ULC_Austria; ULC_Belgium; ULC_Canada; ULC_Denmark; ULC_Finland; ULC_Ireland; ULC_Japan; ULC_Luxembourg; ULC_Netherlands; ULC_Norway; ULC_Sweden; ULC_UK.

1972-2000:

ADF tests were carried out for the first differences of the variables in this period, and stationarity was concluded for all of them. As the examples above, the following variables concern decisions mainly based on the trend and ACF graphs visual inspections. These variables are: CIG_Ireland; ULC_Austria; ULC_Belgium; ULC_Denmark; ULC_Finland; ULC_Ireland; ULC_Japan; ULC_Luxembourg; ULC_Netherlands; ULC_Norway; ULC_Sweden; ULC_UK.

4.4.2. Cointegration tests

4.4.2.1. Engle-Granger

After testing the variables for stationarity and having concluded that all of them follow an I (1) process, it is now possible to proceed with the cointegration tests. The following table will show these results for the Engle-Granger cointegration tests for the period of 1972-1990.

Table 19: Summary of the conclusions for the Engle-Granger cointegration test for period 1972-1990.

	Model: REER	Model: REER_G	Model: ULC	Model: ULC_G	Model: REER_ULC	Model: REER_ULC_G
Australia	Bdline	No coint.	No coint.	No coint.	No coint.	Bdline
Austria	Coint.	Coint	Coint.	Coint.	Coint.	Coint.
Belgium	-	-	No coint.	No coint.	-	-
Canada	-	-	-	-	-	-
Denmark	Coint.	No coint.	-	-	-	-
Finland	-	-	-	-	-	-
France	Bdline	No coint.	-	-	-	-
Germany	No coint.	Bdline	-	-	-	-
Greece	-	-	-	-	-	-
Ireland	No coint.	No coint.	No coint.	No coint.	No Coint.	No coint.
Italy	-	-	-	-	-	-
Japan	No coint.	No coint.	Bdline	Bdline	Bdline	Coint.
Korea	Bdline	Coint	-	-	-	-
Luxembourg	-	-	-	-	-	-
Netherlands	Coint.	Coint.	Bdline	Coint.	Coint.	Coint.
Norway	-	-	-	-	-	-
Spain	No coint.	No coint.	-	-	-	-
Sweden	Coint.	No coint.	Coint.	Bdline	Coint.	No coint.
UK	No coint.	No coint.	Coint.	Coint.	Coint.	Coint.
US	Coint.	Coint.	-	-	-	-

Models for Luxembourg, Belgium (models with the REER included) and Greece were not considered in this period as for most of it, especially until 1984, the variables have a bad behavior which would not allow for an accurate cointegration analysis, as an analysis starting after that weird period would imply few observations.

Some of the variables included in the above analysis contain a trend shift at some point in time. In this manner, since the Engle-Granger test does not accurately test models with variables with this behavior, it was necessary to include in the models this shift in order to consider it. It is also important to mention that economic events for these behaviors were not found, possibly because the number of observations in this case is not significantly high. The results for these models are as follows:

- Ireland: A trend shift in the demand variables was observed at around observation 40. The results of the new model that account for this behavior are as follows:

- Model_REER: Coint.
- Model_REER_G: Coint.
- Model_ULC: Coint.
- Model_ULC_G: Coint.
- Model_REER_ULC: Coint.
- Model_REER_ULC: Coint.

- Netherlands: A trend shift was observed in variable REER at around the 20th observation. The results for the model considering this behavior are as follows:

- Model_REER: Coint.
- Model_REER_G: Coint.
- Model_REER_ULC: Coint.
- Model_REER_ULC: Coint.

In summary, an important detail to be mentioned concerns the fact the above results originated many border line conclusions. This fact can be justified by the shorter time period of cointegration analysis, which actually implies that finding common long trends is more difficult.

The table below presents the Engle-Granger cointegration results obtained for the period of 1972-2000:

Table 20: Summary of the conclusions for the Engle-Granger cointegration test for period 1972-2000.

	Model: REER	Model: REER_G	Model: ULC	Model: ULC_G	Model: REER_ULC	Model: REER_ULC_G
Australia	No coint.	No coint.	No coint.	No coint.	No coint.	No coint.
Austria	No coint.	Coint.	No coint.	No coint.	No coint.	Coint.
Belgium	Bdline	Bdline	No coint.	No coint.	Bdline	Bdline
Canada						
Denmark	Coint.	Coint.				
Finland						
France	No coint.	No Coint.				
Germany	No coint.	Coint.				
Greece	Coint	Coint.				
Ireland	No coint.	No coint.	No coint.	No coint.	No coint.	No coint.
Italy						
Japan	No coint.	Bdline	Bdline	No coint.	No coint.	Coint.
Korea	No coint.	Bdline				
Luxembourg	No coint.	No coint.	No coint.	No coint.	No coint.	No coint.
Netherlands	No coint.	Coint.	Bdline	Bdline	Coint.	Coint.
Norway						
Spain	No coint.	No coint.				
Sweden	Coint.	Coint.	Coint.	No coint.	Coint.	Coint.
UK	No coint.	No coint.	Coint.	Coint.	No coint.	No coint.
US	Bdline	Coint.				

Models for Belgium (with the REER included), Greece and Luxembourg, which contain variables with weird behaviors until the 50th observation, i.e. 1984, were included in the analysis of this period ,as it was assumed that the number of observations is sufficient to detect any long-term common trends. For these countries the analyses were made from 1984. At last, it is possible to perceive from the table that there are still some borderline cases, but less than before.

Also for this period there are variables which contain a trend shift. Thus, these behaviors were taken into account in new models in order to accurately analyze cointegration. The economic reasons for these behaviors are respectively the same as the ones explained in section 4.3.. The results for models including these variables are as follows:

- Australia: A trend shift was observed in variables NGDP_G and RGDP_G at around the 80th observation. Thus, models with this behavior included, presented the following results:

  - Model_REER_G: Coint.
  - Model_REER_ULC_G: Coint.
  - Model_ULC_G: Coint.

- Japan: A trend shift was observed for most of the variables related to this country at around the 75th observation. This behavior was included in models and presented the following results:

  - Model_REER: Coint.
  - Model_REER_G: Coint.
  - Model_ULC: Coint.
  - Model_ULC_G: Coint.
  - Model_REER_ULC: Coint.
  - Model_REER_ULC: Coint.

- Netherlands: A trend shift was observed for most of the variables at around observation 70. Thus, this behavior was included in the models giving the following results:

  - Model_REER: Coint.
  - Model_REER_G: Coint.
  - Model_ULC: Coint.
  - Model_ULC_G: Coint.
  - Model_REER_ULC: Coint.
  - Model_REER_ULC: Coint

4.4.2.2. The Johansen Cointegration test

The Johansen cointegration test will be further applied with the goal of clarifying and/or confirming the cointegration conclusions obtained above with the Engle-Granger test, since as argued before, this is a more trustful test considering that it avoids the drawbacks of the Engle-Granger test.

The table below presents the results obtained for the period 1972-1990:

Table 21: Summary of the Johansen cointegration test results for period 1972-1990.

	Model: REER	Model: REER_G	Model: ULC	Model: ULC_G	Model: REER_ULC	Model: REER_ULC_G
Australia	p=1; No Coint.	p=1; Coint.	p=1; No coint.	p=1; No coint.	p=1: No Coint.	p=1; Coint.
Austria	p=1; Coint.	p=3; No coint.	p=1; Coint.	p=1; Coint.	p=1; Coint.	p=1; No coint.
Belgium			p=2; Coint.	p=2; Coint.		
Canada						
Denmark	p=1; Coint	p=1; No Coint.				
Finland						
France	p=3; No Coint	p=1; Coint.				
Germany	p=1; No coint.	p=3; No coint.				
Greece						
Ireland	p=2; No coint.	p=2; No coint.	p=2; Coint.	p=2; Coint.	P=2; Coint.	p=2; Coint.
Italy						
Japan	p=1; No coint.	p=1; Coint.	p=1; Coint.	p=1; Coint.	p=1; Coint.	p=1; Coint.
Korea	p=1; No coint.	p=1; No coint.				
Luxembourg						
Netherlands	p=1; No coint.	p=3; No coint.	p=2; Coint	p=2; Coint	p=2; Coint	p=2; Coint.
Norway						
Spain	p=2; No coint.	p=1; Coint.				
Sweden	p=2; No coint.	p=2; No coint.	p=2; Coint.	p=2; No coint.	p=1; Coint.	p=2; Coint.
UK	p=1; No coint.	p=1; No coint.	p=1; Coint.	p=1; Coint.	p=1; Coint.	p=1; Coint.
US	p=1; Coint.	p=1; Coint.				

In the following table, the same Johansen cointegration tests are shown, but in this case for the period 1972-2000.

Table 22: Summary of the Johansen cointegration test results for period 1972-2000.

	Model: REER	Model: REER_G	Model: ULC	Model: ULC_G	Model: REER_ULC	Model: REER_ULC_G
Australia	p=1; No Coint.	p=1; Coint.	p=1; No coint.	p=1; No coint.	p=1; No coint.	p=1; No coint.
Austria	p=1; No coint.	p=3; No coint.	p=1; No coint.	p=1; No coint.	p=1; No coint.	p=3; No coint.
Belgium	p=1; No coint.	p=2; Coint.	p=2; Coint.	p=2; Coint.	p=1; Coint.	p=1; Coint.
Canada						
Denmark	p=1; Coint	p=1; Coint.				
Finland						
France	p=2; No Coint	p=3; Coint.				
Germany	p=1; No coint.	p=1; Coint.				
Greece	p=1; stationary.	p=1; Coint.				
Ireland	p=3; No coint.	p=4; No coint.	p=3; No coint.	p=3; No coint.	P=4; Coint.	p=4; No coint.
Italy						
Japan	p=2; No coint.	p=3; No coint.	p=4; No coint.	p=4; No coint.	p=1; Coint.	p=3; Coint.
Korea	p=1; Coint.	P=1; Coint.				
Luxembourg	p=1; No coint.	p=1; No coint.	p=1; Coint.	p=1; Coint.	P=1; Coint.	P=1; Coint.
Netherlands	p=2; No coint.	p=2; No coint.	p=2; Coint	p=2; Coint	p=2; Coint	p=3; Coint.
Norway						
Spain	p=2; No coint.	p=1; Coint.				
Sweden	p=2; Coint.	p=2; Coint.	p=1; Coint.	p=2; Coint.	p=2; Coint.	p=2; Coint.
UK	p=1; Coint.	p=1; No coint.	p=1; Coint.	p=1; Coint.	p=1; Coint.	p=1; Coint.
US	p=2; No coint.	p=1; Coint.				

From the above table, there are some aspects necessary to consider. Firstly, the result in red corresponds to a clearly biased result, as this is expected to be “cointegration”, according to reasons explained before. Furthermore, the result for Model_REER for Greece does also seem biased, as the variables that compose it are non stationary processes. In order to overcome this problem, due to the necessity of extracting a clear conclusion in order to proceed with the following analysis, it will be concluded that the result for this case should be "cointegration" based on the strong Engle-Granger cointegration test conclusions.

4.4.3. Final models based on the ECM

In this section, the results obtained in the three sub-periods are presented in the tables below. These values will be analyzed so as to conclude for the existence of the development of international economic integration and fiscal policy effectiveness.

Table 23: Summary results for the ECM and the Engle-Granger regressions in the 3 periods for Models_REER.

Results for the ECM (short-term)						Long-term results		
	p	D_CIG	D_REER	Residual_t_1	R^2		CIG	REER
Australia (1972-1990)	2	0.7958 (<.0001)	0.005217 (0.853)	-	0.427	Australia (1972-1990)	-	-
Australia (1972-2000)	2	0.7004 (<.0001)	0.00723 (0.7292)	-	0.4005	Australia (1972-2000)	-	-
Australia (1972-2010)	3	0.6789 (<.0001)	-0.007013 (0.6669)	-	0.4154	Australia (1972-2010)	-	-
Austria (1972-1990)	1	0.6226 (<.0001)	-0.018 (0.8026)	-0.3189 (0.0004)	0.7448	Austria (1972-1990)	0.93371	-0.11164
Austria (1972-2000)	1	0.5744 (<.0001)	-0.0164 (0.7679)	-	0.6474	Austria (1972-2000)	-	-
Austria (1972-2010)	2	0.5829 (<.0001)	-0.0455 (0.3962)	-	0.5777	Austria (1972-2010)	-	-
Belgium (1984-1990)	-	-	-	-	-	Belgium (1984-1990)	-	-
Belgium (1984-2000)	1	0.2776 (0.0512)	-0.1141 (0.0816)	-	0.1281	Belgium (1984-2000)	-	-
Belgium (1984-2010)	1	0.331 (0.0051)	-0.1123 (0.0324)	-	0.1299	Belgium (1984-2010)	-	-
Canada (1972-1988)	2	0.4848 (<.0001)	-0.0264 (0.5757)	-	0.4843	Canada (1972-1988)	-	-
Canada (1993-2010)	2	0.2454 (0.0682)	-0.0276 (0.1858)	-	0.3672	Canada (1993-2010)	-	-
Denmark (1972-1990)	1	0.2448 (0.0002)	0.012 (0.8491)	-0.3671 (<.0001)	0.3643	Denmark (1972-1990)	0.51958	-0.14792
Denmark (1972-2000)	1	0.2883 (<.0001)	0.009686 (0.8518)	-0.4125 (<.0001)	0.3744	Denmark (1972-2000)	0.51574	-0.14317
Denmark (1972-2010)	1	0.3241 (<.0001)	-0.009703 (0.8444)	-0.3149 (<0.0001)	0.3616	Denmark (1972-2010)	0.51309	-0.22041
Finland (1972-1990)	1	0.7761 (<.0001)	0.055 (0.3236)	-0.1894 (0.0086)	0.6397	Finland (1972-1990)	0.74784	-0.02001
Finland (1994-2010)	2	0.4146 (0.0098)	-0.0557 (0.4672)	-	0.2159	Finland (1994-2010)	-	-
France (1972-1990)	1	0.4884 (0.0002)	-0.0132 (0.6999)	-	0.247	France (1972-1990)	-	-
France (1972-2000)	1	0.5084 (<.0001)	-0.0266 (0.3354)	-	0.2504	France (1972-2000)	-	-
France (1972-2010)	3	0.5188 (<.0001)	-0.0197 (0.3991)	-0.1135 (0.0007)	0.4637	France (1972-2010)	0.87527	-0.19472
Germany (1972-1990)	1	0.6876 (<.0001)	0.0198 (0.5508)	-	0.5971	Germany (1972-1990)	-	-
Germany (1972-2000)	3	0.691 (<.0001)	0.0238 (0.4305)	-	0.5811	Germany (1972-2000)	-	-
Germany (1972-2010)	1	0.6414 (<.0001)	0.0292 (0.2574)	-	0.5166	Germany (1972-2010)	-	-
Greece (1985-1990)	-	-	-	-	-	Greece (1985-1990)	-	-
Greece (1985-2000)	1	0.6942 (0.0419)	-0.3888 (0.002)	-0.6999 (<.0001)	0.4708	Greece (1985-2000)	0.96383	-0.38343

Greece (1985-2010)	1	0.7766 (<.0001)	-0.2287 (0.0154)	-0.7059 (<0.0001)	0.465
Ireland (1972-1990)	2	0.6528 (<.0001)	0.0312 (0.2441)	-0.2145 (<.0001)	0.773
Ireland (1972-2000)	5	0.4559 (<.0001)	0.005533 (0.8905)	-	0.606
Ireland (1972-2010)	5	0.4776 (<.0001)	-0.001039 (0.9812)	-	0.5025
Italy (1977-1991)	1	0.7 (<.0001)	-0.0329 (0.603)	-	0.3391
Italy (1994-2010)	2	0.3236 (0.0589)	-0.0248 (0.5773)	-	0.4169
Japan (1972-1990)	1	0.6556 (<.0001)	-0.021 (0.2079)	-	0.5649
Japan (1972-2000)	1	0.7266 (<.0001)	-0.00613 (0.5867)	-0.3263 (<.0001)	0.683
Japan (1972-2010)	1	0.7618 (<.0001)	-0.0185 (0.081)	-0.3 (<.0001)	0.6193
Korea (1972-1990)	1	0.4776 (<.0001)	0.008996 (0.8413)	-	0.2451
Korea (1972-2000)	1	0.5543 (<.0001)	0.0104 (0.6887)	-0.0654 (0.0265)	0.4725
Korea (1972-2010)	1	0.5607 (<.0001)	0.0118 (0.5776)	-0.0515 (0.0113)	0.4785
Luxembourg (1984-1990)	-	-	-	-	-
Luxembourg (1984-2000)	1	0.2893 (0.0024)	-0.112 (0.631)	-	0.1529
Luxembourg (1984-2010)	1	0.1583 (0.0484)	-0.0424 (0.8266)	-	0.0419
Netherlands (1972-1990)	1	0.8425 (<.0001)	-0.0757 (0.3458)	-0.6042 (<.0001)	0.6241
Netherlands (1972-2000)	1	0.6998 (<.0001)	-0.0931 (0.1216)	-0.3946 (<.0001)	0.5195
Netherlands (1972-2010)	2	0.6834 (<.0001)	-0.0793 (0.1103)	-0.1707 (0.0037)	0.4959
Norway (1972-1984)	1	-0.1427 (0.2655)	-0.0517 (0.604)	-	0.0927
Norway (1990-2010)	5	0.2131 (0.1594)	0.085 (0.3097)	-	0.4658
Spain (1972-1990)	1	0.6989 (<.0001)	-0.0119 (0.6729)	-	0.4811
Spain (1972-2000)	2	0.5505 (<.0001)	-0.0277 (0.2199)	-	0.5259
Spain (1972-2010)	1	0.6225 (<.0001)	-0.0299 (0.3079)	-	0.4105
Sweden (1972-1990)	2	0.2734 (0.0513)	0.0248 (0.6905)	-	0.2728
Sweden (1972-2000)	2	0.3994 (0.0002)	0.001665 (0.9636)	-0.2593 (0.0009)	0.3033
Sweden (1972-2020)	1	0.4712 (<.0001)	0.0297 (0.3476)	-0.2568 (<0.0001)	0.2518
UK (1972-1990)	1	0.5554 (<.0001)	-0.0187 (0.4973)	-	0.322
UK (1972-2000)	1	0.5707 (<.0001)	-0.00838 (0.6815)	-0.0863 (0.0486)	0.3177
UK (1972-2010)	1	0.4848 (<.0001)	-0.0234 (0.1772)	-	0.253
US (1972-1990)	1	0.6781 (<.0001)	-0.0123 (0.5119)	-0.2655 (0.0034)	0.5132
US (1972-2000)	2	0.7085 (<.0001)	-0.0184 (0.2164)	-	0.5128
US (1972-2010)	1	0.7258 (<.0001)	-0.008198 (0.4768)	-0.1961 (<0.0001)	0.5042

Greece (1985-2010)	0.86653	-0.14938
Ireland (1972-1990)	0.53207	-0.11271
Ireland (1972-2000)	-	-
Ireland (1972-2010)	-	-
Italy (1977-1991)	-	-
Italy (1994-2010)	-	-
Japan (1972-1990)	-	-
Japan (1972-2000)	0.65050	-0.3440
Japan (1972-2010)	0.67968	-0.04809
Korea (1972-1990)	-	-
Korea (1972-2000)	1.06780	-0.30121
Korea (1972-2010)	1.13471	-0.18784
Luxembourg (1984-1990)	-	-
Luxembourg (1984-2000)	-	-
Luxembourg (1984-2010)	-	-
Netherlands (1972-1990)	0.894	-0.05209
Netherlands (1972-2000)	0.83339	-0.10778
Netherlands (1972-2010)	0.65483	-0.03602
Norway (1972-1984)	-	-
Norway (1990-2010)	-	-
Spain (1972-1990)	-	-
Spain (1972-2000)	-	-
Spain (1972-2010)	-	-
Sweden (1972-1990)	-	-
Sweden (1972-2000)	0.85353	-0.14215
Sweden (1972-2020)	0.81122	-0.08350
UK (1972-1990)	-	-
UK (1972-2000)	1.08776	-0.03687
UK (1972-2010)	-	-
US (1972-1990)	0.57841	-0.02902
US (1972-2000)	-	-
US (1972-2010)	0.59044	-0.01823

Model_REER: From the table above, it is possible to conclude that in general there has been no significant trend towards international economic integration. However, countries like Australia, Ireland, Luxembourg, the Netherlands and the UK, show moderate evidence towards integration based on the variable CIG, since their estimated coefficients slowly decrease over the three periods. Still, these values correspond to a situation of no international economic integration, suggesting that these countries are still very far from being integrated. It is worth mentioning that for Canada, Finland and Italy, there are more significant decreases in the coefficients of the variable CIG. However, it is not possible to strongly conclude for a trend towards integration in these cases, as the division of sub-periods was done in a different manner. Accordingly, the decrease observed might be due to specific events inherent to one of the periods of analysis. Furthermore, it is curious to mention that for Japan, Korea and the US, the impact of the demand in production in the short-term, increases along the period, suggesting therefore less international integration. In what concerns the impacts of the REER in production in the short-term, the results show no significant changes over the three periods for all of the countries.

Regarding the analysis in the long-term, this was only based in 7 countries, from which the Netherlands showed some evidence of a trend towards integration based on the demand impacts on production, but still the results indicate that this country is far from being integrated.

Finally, it is possible to conclude that there are no strong evidences toward more integration along the three periods for the countries under evaluation.

Table 24: Summary results for the ECM and the Engle-Granger regressions in the 3 periods for Models_REER_G.

Results for the ECM (short-term)					
	p	D_CI	D_REER	Residual_t_1	R^2
Australia (1972-1990)	1	-0.3012* (0.0403)	0.0397 (0.3118)	-0.2583 (0.0002)	0.2075
Australia (1972-2000)	1	-0.1348 (0.2158)	0.0162 (0.5865)	0.2809 (<.0001)	0.1842
Australia (1972-2010)	1	0.0513 (0.6011)	0.003178 (0.8968)	-	0.0101
Austria (1972-1990)	1	0.0739 (0.3784)	0.0481 (0.7709)	-	0.0417
Austria (1972-2000)	1	0.0722 (0.3013)	0.0247 (0.8255)	-	0.0251
Austria (1972-2010)	1	0.1216 (0.0514)	0.009912 (0.914)	-0.1289 (0.0008)	0.0903
Belgium (1984-1990)	-	-	-	-	-
Belgium (1984-2000)	1	0.5147 (0.0027)	0.0737 (0.4504)	-0.2911 (0.0009)	0.2607
Belgium (1984-2010)	1	0.328 (0.0261)	0.0266 (0.7784)	-	0.0569

Long-term results		
	CI	REER
Australia (1972-1990)	-0.0177	0.0609
Australia (1972-2000)	0.13623	0.0014
Australia (1972-2010)	-	-
Austria (1972-1990)	-	-
Austria (1972-2000)	-	-
Austria (1972-2010)	0.71375	-0.50046
Belgium (1984-1990)	-	-
Belgium (1984-2000)	1.1457	-0.06485
Belgium (1984-2010)	-	-

Canada (1972-1988)	1	0.112 (0.2822)	0.0354 (0.5642)	-0.4935 (<0.0001)	0.4063
Canada (1993-2010)	2	-0.3259 (0.0278)	0.0232 (0.3937)	-	0.2793
Denmark (1972-1990)	1	0.1056 (0.1385)	0.2311 (0.0164)	-	0.1172
Denmark (1972-2000)	1	0.1237 (0.0305)	0.1882 (0.01)	-0.2497 (<0.0001)	0.2547
Denmark (1972-2010)	1	0.0952 (0.0838)	0.1562 (0.0266)	-0.2319 (<0.0001)	0.2346
Finland (1972-1990)	1	0.2625 (0.0073)	0.0762 (0.4189)	-0.4043 (<0.0001)	0.3106
Finland (1994-2010)	2	-0.0187 (0.9074)	0.0954 (0.3131)	-0.1791 (0.0014)	0.294
France (1972-1990)	4	-0.0737 (0.5584)	-0.0152 (0.6754)	-0.1299 (0.0189)	0.5331
France (1972-2000)	4	-0.00946 (0.9044)	0.003722 (0.8905)	-0.1316 (0.0031)	0.5202
France (1972-2010)	4	0.0259 (0.7021)	0.001895 (0.9376)	-0.1397 (<0.0001)	0.5384
Germany (1972-1990)	4	-0.00575 (0.9478)	0.0419 (0.3516)	-	0.6473
Germany (1972-2000)	1	0.089 (0.3192)	0.047 (0.3717)	-0.2949 (<0.0001)	0.1608
Germany (1972-2010)	1	-0.006607 (0.9321)	-0.009681 (0.8362)	-	0.0044
Greece (1985-1990)	-	-	-	-	-
Greece (1985-2000)	1	-0.5052 (0.15)	0.1734 (0.1954)	-0.6192 (<0.0001)	0.5477
Greece (1985-2010)	1	-0.1136 (0.5199)	0.3687* (0.0024)	-0.6777 (<0.0001)	0.4155
Ireland (1972-1990)	2	0.1774 (0.1359)	-0.0131 (0.7387)	-0.2009 (<0.0001)	0.563
Ireland (1972-2000)	5	0.122 (0.0799)	0.001597 (0.9717)	-	0.608
Ireland (1972-2010)	5	0.0921 (0.1784)	0.0474 (0.3748)	-	0.4714
Italy (1977-1991)	1	0.154 (0.287)	0.2827 (0.0046)	-	0.1919
Italy (1994-2010)	1	-0.2118 (0.309)	0.0477 (0.5054)	-	0.0497
Japan (1972-1990)	1	0.0396 (0.7086)	0.0425 (0.1133)	-0.1921 (0.0008)	0.177
Japan (1972-2000)	4	0.0279 (0.6321)	0.0105 (0.4671)	-0.2434 (<0.0001)	0.6732
Japan (1972-2010)	4	0.0625 (0.2934)	0.005383 (0.6895)	-0.2528 (<0.0001)	0.6157
Korea (1972-1990)	1	0.2072 (0.0754)	0.1458 (0.0148)	-	0.1362
Korea (1972-2000)	1	0.1614 (0.0301)	0.009563 (0.7981)	-0.1706 (<.0001)	0.1897
Korea (1972-2010)	1	0.1376 (0.0396)	0.008407 (0.7862)	-0.1205 (<0.0001)	0.176
Luxembourg (1984-1990)	-	-	-	-	-
Luxembourg (1984-2000)	1	0.0218 (0.8246)	-0.3429 (0.253)	-	0.0293
Luxembourg (1984-2010)	1	0.0611 (0.4287)	-0.1742 (0.4483)	-	0.0144
Netherlands (1972-1990)	1	0.2662 (0.0133)	0.0913 (0.4907)	-0.7769 (<0.0001)	0.4142
Netherlands (1972-2000)	1	0.2569 (0.0024)	0.006728 (0.9431)	-0.5898 (<0.0001)	0.3099
Netherlands (1972-2010)	4	0.1628 (0.0112)	0.1061 (0.0865)	-0.2177	0.5751

Canada (1972-1988)	0.44876	-0.04815
Canada (1993-2010)	-	-
Denmark (1972-1990)	-	-
Denmark (1972-2000)	0.54404	0.01301
Denmark (1972-2010)	0.56495	0.00673
Finland (1972-1990)	0.62052	-0.0179
Finland (1994-2010)	0.82284	-0.2147
France (1972-1990)	0.6771	-0.1803
France (1972-2000)	0.69772	-0.1241
France (1972-2010)	0.69773	-0.1692
Germany (1972-1990)	-	-
Germany (1972-2000)	0.84055	0.02368
Germany (1972-2010)	-	-
Greece (1985-1990)	-	-
Greece (1985-2000)	0.84228	-0.4765
Greece (1985-2010)	0.35981	0.1785
Ireland (1972-1990)	0.40727	-0.1448
Ireland (1972-2000)	-	-
Ireland (1972-2010)	-	-
Italy (1977-1991)	-	-
Italy (1994-2010)	-	-
Japan (1972-1990)	1.09968	0.05666
Japan (1972-2000)	0.49114	-0.0294
Japan (1972-2010)	0.61985	-0.0455
Korea (1972-1990)	-	-
Korea (1972-2000)	1.01774	-0.3576
Korea (1972-2010)	1.098	-0.2222
Luxembourg (1984-1990)	-	-
Luxembourg (1984-2000)	-	-
Luxembourg (1984-2010)	-	-
Netherlands (1972-1990)	0.27871	0.03306
Netherlands (1972-2000)	0.41312	-0.1078
Netherlands (1972-2010)	0.44004	-0.0863

Norway (1972-1984)	1	0.1783 (0.1571)	-0.1411 (0.2699)	-	0.0704
Norway (1990-2010)	3	-0.2949 (0.0683)	-0.2334 (0.0482)	-	0.2544
Spain (1972-1990)	1	0.0155 (0.8751)	-0.0264 (0.4023)	-0.2944 (<0.0001)	0.4141
Spain (1972-2000)	1	0.1727 (0.0417)	0.001376 (0.9638)	-0.1994 (<0.0001)	0.299
Spain (1972-2010)	1	0.2861 (0.0005)	0.0165 (0.6026)	-	0.0875
Sweden (1972-1990)	2	0.1774 (0.1941)	-0.066 (0.4554)	-	0.2579
Sweden (1972-2000)	2	0.3162 (0.003)	0.0309 (0.5612)	-0.2375 (0.0005)	0.2687
Sweden (1972-2020)	1	0.3069 (0.0014)	0.018 (0.6919)	-0.2445 (<0.0001)	0.1831
UK (1972-1990)	1	0.0618 (0.6382)	-0.0221 (0.5911)	-	0.0291
UK (1972-2000)	1	0.1367 (0.1713)	0.002151 (0.9426)	-	0.0264
UK (1972-2010)	1	0.1262 (0.1406)	-0.000531 (0.9829)	-	0.0206
US (1972-1990)	1	-0.034 (0.7787)	0.009735 (0.914)	-0.4246 (<0.0001)	0.3117
US (1972-2000)	1	0.0794 (0.4015)	0.0129 (0.5352)	-0.3399 (<0.0001)	0.2947
US (1972-2010)	1	0.1447 (0.092)	0.00386 (0.8256)	-0.296 (<0.0001)	0.2474

Norway (1972-1984)	-	-
Norway (1990-2010)	-	-
Spain (1972-1990)	0.81586	-0.1883
Spain (1972-2000)	0.90648	-0.2166
Spain (1972-2010)	-	-
Sweden (1972-1990)	-	-
Sweden (1972-2000)	0.7377	-0.0347
Sweden (1972-2020)	0.71174	0.01318
UK (1972-1990)	-	-
UK (1972-2000)	-	-
UK (1972-2010)	-	-
US (1972-1990)	0.47042	-0.0521
US (1972-2000)	0.63544	-0.0463
US (1972-2010)	0.596	-0.03661

Model_REER_G: From table 24 it is possible to observe that there are more significant decreases in the estimations of the CI coefficients than in the previous model, namely for Australia, Belgium, Greece, Ireland, Korea and the Netherlands, being that in the last three, the decrease is relatively low. Finland also presents a significant decrease in these coefficients, but as before, it is important to take into account that the division of period for this country was done according to a structural break in the original period, and that this decrease, may be related to some specific event occurred either during the first or the second periods. In this manner, it can be concluded that for the above referred countries, there is some evidence that the fiscal policy is becoming less effective. Some of these countries were concluded as to be more integrated over time from Model_REER, however, for instance Korea, reveals exactly the opposite. Consequently, the existence of links between more integration and less fiscal policy effectiveness could not be concluded.

Despite the above results, the conclusions that can be extracted from this model, is that there is no evidence of a significant trend towards a less effective fiscal policy over the time. This conclusion derives from the long-term results which are considered to be more accurate for the analysis. In fact, the only exception to this conclusion concerns Greece.

In addition, the impacts of the REER on NGDP_G both in the short and in the long-term do not imply different conclusions on integration from Model_REER. Furthermore, it is important to state that some of the results in table 24, the ones marked with * present a different sign from what it should be expected. Further economic analyses on this matter were not carried out due to time constraints.

Table 25: Summary results for the ECM and the Engle-Granger regressions in the 3 periods for Models_ULC.

Results for the ECM (short-term)					
	p	D_CIG	D_ULC	Residual_t_1	R^2
Australia (1972-1990)	2	0.761 (<.0001)	-0.0486 (0.8203)	-	0.415
Australia (1972-2000)	2	0.6702 (<.0001)	-0.111 (0.5142)	-	0.385
Australia (1972-2010)	2	0.6136 (<.0001)	-0.2077 (0.169)	-	0.356
Austria (1972-1990)	1	0.5889 (<.0001)	-0.3635 (0.0006)	-0.3201 (0.0001)	0.785
Austria (1972-2000)	1	0.5458 (<.0001)	-0.3337 (0.0002)	-	0.695
Austria (1972-2010)	1	0.5461 (<.0001)	-0.3534 (<0.0001)	-	0.656
Belgium (1972-1990)	1	0.7286 (<.0001)	-0.252 (0.0463)	-0.0739 (0.1939)	0.557
Belgium (1972-2000)	1	0.6336 (<.0001)	-0.2003 (0.037)	-0.1175 (0.0097)	0.427
Belgium (1972-2010)	1	0.5953 (<.0001)	-0.1925 (0.0166)	-0.1002 (0.0055)	0.401
Canada (1972-1988)	1	0.5046 (<.0001)	0.1143 (0.3589)	-0.2538 (0.0056)	0.475
Canada (1993-2010)	2	0.0815 (0.4882)	0.0517 (0.651)	-	0.265
Denmark (1972-1988)	1	0.2057 (0.0042)	-0.2065 (0.5036)	-	0.152
Denmark (1995-2010)	1	0.4575 (<.0001)	-0.493 (0.2397)	-0.4401 (0.0006)	0.512
Finland (1972-1990)	2	0.76 (<.0001)	-0.2891 (0.2092)	-0.0635 (0.3086)	0.786
Finland (1994-2010)	1	0.2617 (0.0142)	-0.5892 (0.0082)	-0.465 (<0.0001)	0.465
France	-	-	-	-	-
Germany	-	-	-	-	-
Greece	-	-	-	-	-
Ireland (1972-1990)	2	0.5744 (<.0001)	-0.3188 (0.0012)	-0.2155 (<0.0001)	0.772
Ireland (1972-2000)	3	0.2457 (0.0081)	-0.3649 (0.1655)	-	0.423
Ireland (1972-2010)	2	0.4221 (<.0001)	-0.1633 (0.4099)	-	0.333
Italy	-	-	-	-	-
Japan (1972-1990)	1	0.5878 (<.0001)	-0.1965 (0.0015)	-0.245 (0.0017)	0.64
Japan (1972-2000)	4	0.5931 (<.0001)	-0.1512 (0.4247)	-0.3127 (0.0006)	0.73
Japan (1972-2010)	2	0.7068 (<.0001)	-0.2467 (0.051)	-0.1792 (0.0015)	0.63
Korea	-	-	-	-	-
Luxembourg (1984-1990)	-	-	-	-	-
Luxembourg (1984-2000)	2	0.234 (0.0088)	-0.0708 (0.8777)	-0.0596 (0.3898)	0.383
Luxembourg (1984-2010)	2	0.1538 (0.0321)	-0.00758 (0.9859)	-0.0315 (0.5236)	0.282
Netherlands (1972-1990)	2	0.7805 (<.0001)	0.0853 (0.8609)	-0.2654 (0.0205)	0.59

Long-term results		
	CIG	ULC
Australia (1972-1990)	-	-
Australia (1972-2000)	-	-
Australia (1972-2010)	-	-
Austria (1972-1990)	0.8871	-0.0059
Austria (1972-2000)	-	-
Austria (1972-2010)	-	-
Belgium (1972-1990)	0.7846	0.02543
Belgium (1972-2000)	0.8192	0.02736
Belgium (1972-2010)	0.6956	0.10353
Canada (1972-1988)	0.5849	0.12487
Canada (1993-2010)	-	-
Denmark (1972-1988)	-	-
Denmark (1995-2010)	0.2583	-0.7535
Finland (1972-1990)	0.7693	0.01238
Finland (1994-2010)	0.3797	-1.2523
France	-	-
Germany	-	-
Greece	-	-
Ireland (1972-1990)	0.3547	-0.2584
Ireland (1972-2000)	-	-
Ireland (1972-2010)	-	-
Italy	-	-
Japan (1972-1990)	0.7361	-0.133
Japan (1972-2000)	0.6431	-0.09
Japan (1972-2010)	0.7312	-0.1245
Korea	-	-
Luxembourg (1984-1990)	-	-
Luxembourg (1984-2000)	1.245	-0.1643
Luxembourg (1984-2010)	1.4335	0.0521
Netherlands (1972-1990)	0.7142	0.04626

Netherlands (1972-2000)	1	0.6734 (<.0001)	-0.2142 (0.0674)	-0.4882 (<.0001)	0.56
Netherlands (1972-2010)	2	0.6593 (<.0001)	0.0717 (0.8002)	-0.4314 (<0.0001)	0.583
Norway (1972-1984)	1	-0.0802 (0.4159)	-0.22 (0.0771)	-0.5391 (<.0001)	0.505
Norway (1990-2010)	3	0.2192 (0.007)	-0.3824 (0.1842)	-0.3954 (0.0012)	0.577
Spain	-	-	-	-	-
Sweden (1972-1990)	1	0.4865 (0.0002)	-0.1416 (0.3472)	-0.4904 (<0.0001)	0.366
Sweden (1972-2000)	1	0.5281 (<.0001)	-0.0465 (0.6854)	-0.3626 (<0.0001)	0.312
Sweden (1972-2020)	3	0.4964 (<.0001)	-0.0592 (0.8013)	-0.1493 (0.0014)	0.384
UK (1972-1990)	1	0.5484 (<.0001)	-0.1081 (0.1274)	-0.3828 (0.0003)	0.494
UK (1972-2000)	1	0.5325 (<.0001)	-0.1153 (0.0383)	-0.2881 (<0.0001)	0.457
UK (1972-2010)	1	0.5172 (<.0001)	-0.1349 (0.0048)	-0.312 (<0.0001)	0.434
US	-	-	-	-	-

Netherlands (1972-2000)	0.7123	-0.1
Netherlands (1972-2010)	0.6504	-0.0621
Norway (1972-1984)	0.4071	-0.3126
Norway (1990-2010)	0.2408	-0.085
Spain	-	-
Sweden (1972-1990)	0.5324	-0.2279
Sweden (1972-2000)	0.5805	-0.2223
Sweden (1972-2020)	0.4048	-0.3362
UK (1972-1990)	0.4759	-0.1559
UK (1972-2000)	0.5185	-0.1652
UK (1972-2010)	0.5227	-0.125
US	-	-

Model_ULC: From the above table, it is possible to conclude that in the short-term, the generality of the results points out towards no significant evidence of a trend towards international economic integration. Countries like Belgium, Luxembourg and the Netherlands, presented small decreases on the coefficient of the demand, indicating some moderate degree of a trend towards integration. Australia also presents a decrease in the coefficients of the demand and an increase in the coefficients of the ULC, suggesting a stronger trend towards integration than the countries before, despite these results still suggesting no integration for the three periods individually. Finland and Canada presented a significant decrease in the coefficients of the demand, and the first of these countries also presented a significant increase in the coefficients of the ULC over the three periods. This result can be a sign of an increasing integration of these countries, but it is not possible to definitely conclude for that, since the division of sub-periods for these two countries was done due to a structural break in the data. In this sense, the results obtained may be due to some specific event that occurred in a specific period. Finally, it is interesting to mention the fact that for Japan, there is an increase in the demand's impact on production in the short-term, implying less integration throughout time.

From the results of the 8 countries analyzed in the long-term, it is not possible to conclude for any significant trend towards more integration in these countries. Actually, Finland, Norway and the Netherlands are the only countries for which some trend can be claimed. However, as it was before mentioned, conclusions derived from the first two countries should be carefully made. Concerning the Netherlands, only a very small decrease in demand's coefficients is observed, but still these remain fairly high.

Table 26: Summary results for the ECM and the Engle-Granger regressions in the 3 periods for Models_ULC_G.

Results for the ECM (short-term)					
	p	D_CI	D_ULC	Residual_t_1	R^2
Australia (1972-1990)	2	0.9054 (<.0001)	-0.00349 (0.9892)	-	0.4327
Australia (1972-2000)	1	0.6657 (<.0001)	-0.1025 (0.4614)	-0.4071 (<0.0001)	0.456
Australia (1972-2010)	2	0.675 (<.0001)	-0.245 (0.1916)	-	0.3445
Austria (1972-1990)	1	0.5748 (<.0001)	-0.4197 (0.0014)	-0.3221 (0.0001)	0.7656
Austria (1972-2000)	1	0.5365 (<.0001)	-0.3949 (0.0004)	-	0.6713
Austria (1972-2010)	1	0.5388 (<.0001)	-0.4128 (<0.0001)	-	0.6287
Belgium (1972-1990)	1	0.7414 (<.0001)	-0.3337 (0.0519)	-0.0719 (0.2097)	0.5608
Belgium (1972-2000)	1	0.6554 (<.0001)	-0.2554 (0.0479)	-0.1171 (0.0126)	0.4283
Belgium (1972-2010)	1	0.6133 (<.0001)	-0.2404 (0.0258)	-0.1047 (0.0065)	0.3997
Canada (1972-1988)	1	0.5765 (<.0001)	0.1973 (0.2644)	-0.222 (0.0116)	0.4753
Canada (1993-2010)	2	0.0781 (0.4963)	-0.4482 (0.0958)	-	0.2863
Denmark (1972-1988)	1	0.1959 (0.0075)	-0.3359 (0.4237)	-	0.1425
Denmark (1995-2010)	3	0.4337 (<.0001)	0.4141 (0.7918)	-	0.5395
Finland (1972-1990)	2	0.7642 (<.0001)	-0.3474 (0.2484)	-0.0772 (0.2625)	0.7825
Finland (1994-2010)	1	0.3292 (0.0047)	-0.7501 (0.0124)	-0.3857 (<.0001)	0.432
France	-	-	-	-	-
Germany	-	-	-	-	-
Greece	-	-	-	-	-
Ireland (1972-1990)	2	0.5545 (<.0001)	-0.4258 (0.0004)	-0.2091 (<0.0001)	0.767
Ireland (1972-2000)	3	0.1999 (0.0244)	-0.5601 (0.0705)	-	0.4055
Ireland (1972-2010)	2	0.3713 (<.0001)	-0.2812 (0.2271)	-	0.2912
Italy	-	-	-	-	-
Japan (1972-1990)	1	0.5533 (<.0001)	-0.2118 (0.003)	-0.2899 (0.0007)	0.5916
Japan (1972-2000)	3	0.6525 (<.0001)	-0.4398 (0.0471)	-0.2732 (0.0025)	0.6613
Japan (1972-2010)	2	0.7098 (<.0001)	-0.336 (0.0265)	-0.1752 (0.0014)	0.5959
Korea	-	-	-	-	-
Luxembourg (1984-1990)	-	-	-	-	-
Luxembourg (1984-2000)	2	0.1928 (0.0283)	-0.2718 (0.6216)	-0.0496 (0.4454)	0.3679
Luxembourg (1984-2010)	2	0.1111 (0.1034)	-0.1036 (0.8361)	-0.014 (0.7383)	0.2609
Netherlands (1972-1990)	2	0.7789 (<.0001)	0.2021 (0.7551)	-0.2987 (0.0146)	0.6359
Netherlands (1972-2000)	2	0.686 (<.0001)	0.2553 (0.5693)	-0.4423 (<.0001)	0.6286

Long-term results		
	CI	ULC
Australia (1972-1990)	-	-
Australia (1972-2000)	0.50185	0.30224
Australia (1972-2010)	-	-
Austria (1972-1990)	0.84459	0.00138
Austria (1972-2000)	-	-
Austria (1972-2010)	-	-
Belgium (1972-1990)	0.76598	0.0159
Belgium (1972-2000)	0.76924	0.04057
Belgium (1972-2010)	0.63552	0.12911
Canada (1972-1988)	0.55452	0.22706
Canada (1993-2010)	-	-
Denmark (1972-1988)	-	-
Denmark (1995-2010)	-	-
Finland (1972-1990)	0.74537	-0.0195
Finland (1994-2010)	0.42690	-1.60385
France	-	-
Germany	-	-
Greece	-	-
Ireland (1972-1990)	0.38327	-0.32484
Ireland (1972-2000)	-	-
Ireland (1972-2010)	-	-
Italy	-	-
Japan (1972-1990)	0.61338	-0.16071
Japan (1972-2000)	0.63148	-0.11493
Japan (1972-2010)	0.78405	-0.15386
Korea	-	-
Luxembourg (1984-1990)	-	-
Luxembourg (1984-2000)	1.1571	-0.38716
Luxembourg (1984-2010)	1.57453	0.05516
Netherlands (1972-1990)	0.69761	0.06015
Netherlands (1972-2000)	0.72174	-0.11045

Netherlands (1972-2010)	2	0.6673 (<.0001)	0.1304 (0.7315)	-0.4399 (<0.0001)	
Norway (1972-1984)	1	-0.04 (0.7345)	-0.613 (0.001)	-	0.2595
Norway (1990-2010)	3	0.2177 (0.0068)	-0.3963 (0.2922)	-0.4201 (0.0016)	0.5417
Spain	-	-	-	-	-
Sweden (1972-1990)	2	0.3237 (0.0196)	0.7039 (0.2984)	-	0.3447
Sweden (1972-2000)	2	0.4913 (<.0001)	0.3254 (0.3831)	-0.1753 (0.0178)	0.3419
Sweden (1972-2020)	3	0.4962 (<.0001)	-0.1172 (0.7238)	-0.0906 (0.0047)	0.3851
UK (1972-1990)	1	0.5941 (<.0001)	-0.1909 (0.0423)	-0.3451 (0.0007)	0.4565
UK (1972-2000)	1	0.5642 (<.0001)	-0.1834 (0.013)	-0.2844 (<0.0001)	0.4251
UK (1972-2010)	1	0.5130 (<.0001)	-0.1937 (0.0021)	-0.3098 (<0.0001)	0.4104
US	-	-	-	-	-

Netherlands (1972-2010)	0.66333	-0.04948
Norway (1972-1984)	-	-
Norway (1990-2010)	0.21556	-0.14864
Spain	-	-
Sweden (1972-1990)	-	-
Sweden (1972-2000)	0.53835	-0.28442
Sweden (1972-2020)	0.31435	-0.43408
UK (1972-1990)	0.56232	-0.12693
UK (1972-2000)	0.57008	-0.13809
UK (1972-2010)	0.52856	-0.19143
US	-	-

<u>Model_ULC_G</u>: From the results presented in table 26, it is possible to conclude that in general there is no significant trend towards a less effective fiscal policy. Belgium and the Netherlands are two small exceptions to this conclusion as their coefficients for the variable CI are slowly decreasing throughout time. Australia is another exception as in the short-term it shows a more significant decrease in the coefficients of CI, implying a trend towards a less effective fiscal policy in this country. However, it is possible to notice from the values observed, that in spite of this trend, the introduction of a fiscal policy is still effective for all the three periods. At last, Canada and Finland also show evidence of a less effective fiscal policy along the periods, (more Finland than Canada), but for the reasons already discussed, conclusions cannot be clearly extracted from the countries for which sub-divisions were made due to structural breaks. To sum up, it can be concluded that in the short-term the fiscal policy is not becoming less effective and that exception to this can only be found for Australia still with at a moderate degree. It is important to note that this country is concluded to be more integrated throughout the time, based on Model_ULC. Other curious fact concerns Japan, since from the results it is possible to conclude that the fiscal policy applied in this country is becoming more effective. In this case it can also be pointed out that Model_ULC concludes for lower integration of this country throughout time. Finally, in the short-term, the coefficients observed for variables ULC do not change the conclusions on integration extracted from the previous model.

Long-term results show, in general, no evidence of a less effective fiscal policy throughout the time. Belgium and Sweden present small evidence of the contrary since a small decrease in the coefficients for CI can be observed. Still, no strong conclusions on these two countries can be made as the former only presents a small decrease, whereas the latter does not present results for the first period in analysis, weakening the comparison. Finland also presents results showing a less effective fiscal policy in the second period than that in the first, but as it was already mentioned, due to the different division of the sub-periods, no conclusions on tendencies can be reached. In other words, the only conclusion that can be derived for Finland is that the fiscal policy was less effective in the period 1994-2010 than in 1972-1990. Furthermore, the case of Japan should also be highlighted from the long-term results, as it presents an increase in the impact of demand in production along the periods, implying a more effective fiscal policy when applied in this country's authorities. To sum up, it can be concluded that there is no evidence of less effective fiscal policy throughout time for the countries under evaluation. The results observed for variables ULC do not change the above conclusions on integration.

Table 27: Summary results for the ECM and the Engle-Granger regressions in the 3 periods for Models_REER_ULC.

Results for the ECM (short-term)						
	P	D_CIG	D_REER	D_ULC	Residual_t_1	R^2
Australia (1972-1990)	2	0.7928 (<.0001)	0.006361 (0.8317)	-0.0553 (0.8066)	-	0.4338
Australia (1972-2000)	2	0.6967 (<.0001)	0.0102 (0.6441)	-0.0996 (0.579)	-	0.406
Australia (1972-2010)	3	0.6672 (<.0001)	-0.003459 (0.8405)	-0.1459 (0.4068)	-	0.4218
Austria (1972-1990)	1	0.5752 (<.0001)	-0.018 (0.7831)	-0.3857 (0.0002)	-0.351 (<0.0001)	0.7929
Austria (1972-2000)	1	0.5369 (<.0001)	-0.0175 (0.7403)	-0.3061 (0.0007)	-	0.6834
Austria (1972-2010)	2	0.5571 (<.0001)	-0.0392 (0.4473)	-0.5505 (0.0006)	-	0.6139
Belgium (1984-1990)	-	-	-	-	-	-
Belgium (1984-2000)	3	0.3858 (0.0262)	-0.1045 (0.1385)	-0.1626 (0.6086)	-0.1165 (0.2615)	0.3583
Belgium (1984-2010)	3	0.3638 (0.0015)	-0.0761 (0.14)	-0.0536 (0.8182)	-0.1078 (0.0168)	0.3605
Canada (1972-1988)	1	0.5172 (<.0001)	-0.0467 (0.277)	0.152 (0.2214)	-0.4947 (<.0001)	0.5404
Canada (1993-2010)	2	0.2309 (0.0951)	-0.0296 (0.1632)	-0.357 (0.1528)	-	0.3912
Denmark (1972-1988)	1	0.2711 (0.0001)	0.0556 (0.4184)	0.0834 (0.7804)	-0.3012 (0.0003)	0.3318
Denmark (1995-2010)	1	0.641 (<.0001)	-0.1466 (0.1936)	-0.1286 (0.808)	-	0.3926
Finland (1972-1990)	1	0.7992 (<.0001)	0.0876 (0.1332)	-0.3364 (0.0076)	-0.2404 (0.0036)	0.6997
Finland (1994-2010)	2	0.3609 (0.0238)	-0.0354 (0.6536)	-0.978 (0.1266)	-	0.2759
France	-	-	-	-	-	-
Germany	-	-	-	-	-	-
Greece	-	-	-	-	-	-
Ireland (1972-1990)	2	0.5862 (<.0001)	0.0526 (0.0482)	-0.337 (0.0005)	-0.2043 (<.0001)	0.7895
Ireland (1972-2000)	5	0.4027 (<.0001)	0.00329 (0.9355)	-0.135 (0.5702)	0.004833 (0.7693)	0.6378
Ireland (1972-2010)	3	0.4425 (<.0001)	0.006453 (0.8872)	-0.1948 (0.4912)	-0.009687 (0.513)	0.4368

Long-term results			
	CIG	REER	ULC
Australia (1972-1990)	-	-	-
Australia (1972-2000)	-	-	-
Australia (1972-2010)	-	-	-
Austria (1972-1990)	0.93105	0.00199	-0.10924
Austria (1972-2000)	-	-	-
Austria (1972-2010)	-	-	-
Belgium (1984-1990)	-	-	-
Belgium (1984-2000)	1.05713	0.17684	-0.0987
Belgium (1984-2010)	0.74335	-0.14744	0.27486
Canada (1972-1988)	0.49877	-0.05936	0.05257
Canada (1993-2010)	-	-	-
Denmark (1972-1988)	0.51877	-0.05911	-0.00352
Denmark (1995-2010)	-	-	-
Finland (1972-1990)	0.8698	-0.29964	0.19056
Finland (1994-2010)	-	-	-
France	-	-	-
Germany	-	-	-
Greece	-	-	-
Ireland (1972-1990)	0.35083	-0.02288	-0.25701
Ireland (1972-2000)	1.3828	0.17554	1.06837*
Ireland (1972-2010)	1.21706	0.55601*	0.24691

Italy	-	-	-	-	-	-
Japan (1972-1990)	1	0.5927 (<.0001)	0.005626 (0.7379)	-0.2219 (0.0009)	-0.2588 (0.0028)	0.6435
Japan (1972-2000)	3	0.6791 (<.0001)	-0.00401 (0.7386)	-0.328 (0.0825)	-0.3723 (<0.0001)	0.722
Japan (1972-2010)	4	0.6286 (<.0001)	-0.0111 (0.3178)	-0.0741 (0.6707)	-0.4162 (<.0001)	0.7033
Korea	-	-	-	-	-	-
Luxembourg (1984-1990)	-	-	-	-	-	-
Luxembourg (1984-2000)	1	0.3427 (0.0006)	0.0373 (0.8745)	-0.0108 (0.9727)	-0.1795 (0.008)	0.2774
Luxembourg (1984-2010)	1	0.1558 (0.0653)	-0.0459 (0.8158)	-0.6312 (0.0197)	-0.0518 (0.2462)	0.1246
Netherlands (1972-1990)	1	0.8596 (<.0001)	0.0118 (0.891)	-0.4833 (0.0193)	-0.6817 (<.0001)	0.6486
Netherlands (1972-2000)	1	0.6943 (<.0001)	-0.086 (0.1589)	-0.0459 (0.7267)	-0.4133 (<.0001)	0.5276
Netherlands (1972-2010)	2	0.6986 (<.0001)	-0.0814 (0.0973)	-0.0705 (0.8328)	-0.2415 (0.0003)	0.5207
Norway (1972-1984)	1	-0.274* (0.0202)	-0.0291 (0.7503)	-0.2428 (0.0653)	-0.1965 (0.0012)	0.3544
Norway (1990-2010)	5	0.2356 (0.1308)	0.0995 (0.2448)	-0.6005 (0.2814)	-	0.508
Spain	-	-	-	-	-	-
Sweden (1972-1990)	1	0.2094 (0.101)	0.052 (0.382)	-0.327 (0.0435)	-0.577 (<0.0001)	0.3594
Sweden (1972-2000)	1	0.3587 (0.0005)	0.027 (0.4696)	-0.0486 (0.8551)	-0.3306 (0.0001)	0.3376
Sweden (1972-2020)	1	0.4177 (<.0001)	0.0488 (0.1196)	-0.1129 (0.2411)	-0.3029 (<0.0001)	0.286
UK (1972-1990)	1	0.5662 (<.0001)	0.0192 (0.4464)	-0.1263 (0.0753)	-0.4521 (<0.0001)	0.5191
UK (1972-2000)	1	0.575 (<.0001)	0.0136 (0.5095)	-0.171 (0.005)	-0.1278 (0.0204)	0.3836
UK (1972-2010)	1	0.4971 (<.0001)	-0.00776 (0.6544)	-0.1871 (0.0009)	-	0.3069
US	-	-	-	-	-	-

Italy	-	-	-
Japan (1972-1990)	0.7331	-0.13317	-0.00297
Japan (1972-2000)	0.60327	-0.02672	-0.08092
Japan (1972-2010)	0.62477	-0.03353	-0.09575
Korea	-	-	-
Luxembourg (1984-1990)	-	-	-
Luxembourg (1984-2000)	1.22486	0.18042	-0.11454
Luxembourg (1984-2010)	1.53742	1.16852*	0.40711*
Netherlands (1972-1990)	0.90786	-0.033	-0.06981
Netherlands (1972-2000)	0.7713	-0.12144	0.0951
Netherlands (1972-2010)	0.58054	-0.09163	0.21943
Norway (1972-1984)	0.20224	0.12986	-0.77616
Norway (1990-2010)	-	-	-
Spain	-	-	-
Sweden (1972-1990)	0.37803	-0.21753	0.02742
Sweden (1972-2000)	0.73249	-0.09371	-0.09197
Sweden (1972-2020)	0.6802	-0.02961	-0.10909
UK (1972-1990)	0.47951	-0.14817	-0.03502
UK (1972-2000)	0.63889	-0.12217	0.00496
UK (1972-2010)	-	-	-
US	-	-	-

Model_REER_ULC: From table 27 it is possible to observe that in general, in the short-term, there is no evidence of a more international economic integration by these countries. Australia, Ireland and the Netherlands, report small decreases in the variable CIG coefficients, whereas there are no significant changes in the other variables' coefficients over the three periods. This fact may induce evidence for higher integration however, no strong conclusions can be made as only one of the variables of the model weakly point towards a higher integration. Moreover, high impacts of the changes in demand in the changes of production are observed for the three periods, meaning that individually there is no evidence for integration. Luxembourg seems to be the country in this model which presents results indicating for more integration however, since there are no results for the first period of analysis, the comparison is weakened. Finland and Canada, as in the previous models, also present strong results for more integration in the second period of analysis. Nevertheless, as it was mentioned, this may be due to some specific event that happened in one of the two periods.

A long-term analysis of this model is possible for 7 countries, 5 of which, namely, Belgium, Ireland, Japan, Luxembourg and the Netherlands show either decreases (if in the CIG's coefficients) or increases (in either the REER or the ULC coefficients), in one or two of the variables included in the models, which do not allow for a strong conclusion on higher integration, but rather some degree of it. In conclusion, it is not possible to argue for higher integration, but only that some degree of it may exist, in spite of the countries being far from being internationally integrated. Curious results concern Sweden and Ireland as their impacts of the demand on production are higher throughout time, suggesting some moderate degree of less integration. Finally the results marked with * correspond to coefficients that present a different sign from what it should be predicted. Further analyses on this matter were not carried out as they would involve deep country specific studies.

Table 28: Summary results for the ECM and the Engle-Granger regressions in the 3 periods for Models_REER_ULC_G

Results for the ECM (short-term)							Long-term results			
	p	D_CI	D_REER	D_ULC	Residual_t_1	R^2		CI	REER	ULC
Australia (1972-1990)	1	-0.297 (0.0489)	0.0358 (0.3822)	0.1623 (0.4761)	-0.2589 (0.0003)	0.214	Australia (1972-1990)	-	-	-
Australia (1972-2000)	1	-0.1584 (0.1283)	0.00102 (0.7217)	0.2155 (0.1863)	-0.4212 (<0.0001)	0.277	Australia (1972-2000)	0.25681	-0.03423	0.50347*
Australia (1972-2010)	1	0.0515 (0.6038)	0.003110 (0.9008)	0.002608 (0.9872)	-	0.01	Australia (1972-2010)	-	-	-
Austria (1972-1990)	1	0.072 (0.4154)	0.0482 (0.7721)	-0.0181 (0.9416)	-	0.042	Austria (1972-1990)	-	-	-
Austria (1972-2000)	1	0.0784 (0.2784)	0.0249 (0.825)	0.0652 (0.7254)	-	0.026	Austria (1972-2000)	-	-	-
Austria (1972-2010)	1	0.1072 (0.0948)	0.005149 (0.9563)	0.1697 (0.2877)	-0.0553 (0.0169)	0.059	Austria (1972-2010)	0.40391	-0.30398	0.17591
Belgium (1984-1990)	-	-	-	-	-	-	Belgium (1984-1990)	-	-	-
Belgium (1984-2000)	1	0.5454 (0.0018)	0.0432 (0.6541)	-0.3156 (0.183)	-0.3737 (0.0003)	0.29	Belgium (1984-2000)	1.09193	0.27177	-0.04083
Belgium (1984-2010)	1	0.36 (0.0081)	0.0834 (0.2834)	-0.171 (0.3534)	-0.1823 (0.0003)	0.18	Belgium (1984-2010)	0.76625	-0.12209	0.30893*
Canada (1972-1988)	1	0.2675 (0.0071)	-0.0892 (0.1403)	0.6384* (0.0005)	-0.543 (<.0001)	0.494	Canada (1972-1988)	0.48398	-0.03294	0.25711
Canada (1993-2010)	2	-0.2494 (0.0802)	0.0356 (0.1768)	0.4765 (0.1389)	-	0.37	Canada (1993-2010)	-	-	-
Denmark (1972-1988)	1	0.1296 (0.0484)	0.2539 (0.0036)	0.3685 (0.3416)	-0.2157 (0.0006)	0.297	Denmark (1972-1988)	0.64051	-0.0594	0.392*
Denmark (1995-2010)	1	-0.041 (0.7531)	-0.071 (0.6919)	-0.216 (0.7987)	-	0.014	Denmark (1995-2010)	-	-	-
Finland (1972-1990)	1	0.2024 (0.0442)	-0.0551 (0.6078)	0.6883* (0.0068)	-0.3121 (0.0005)	0.273	Finland (1972-1990)	0.64259	-0.07084	0.0384
Finland (1994-2010)	2	-0.0882 (0.593)	0.0662 (0.504)	-0.00864 (0.9915)	-0.202 (0.0026)	0.338	Finland (1994-2010)	0.26779	-0.075	-1.01446
France	-	-	-	-	-	-	France	-	-	-
Germany	-	-	-	-	-	-	Germany	-	-	-
Greece	-	-	-	-	-	-	Greece	-	-	-
Ireland (1972-1990)	2	0.1939 (0.0877)	-0.0214 (0.5702)	0.1716 (0.2505)	-0.2213 (<0.0001)	0.622	Ireland (1972-1990)	0.32564	-0.09761	-0.16044
Ireland (1972-2000)	5	0.1284 (0.0652)	-0.00865 (0.8442)	-0.114 (0.6439)	-	0.656	Ireland (1972-2000)	-	-	-
Ireland (1972-2010)	2	0.2704 (0.0002)	0.0714 (0.2465)	0.707* (0.0074)	-	0.165	Ireland (1972-2010)	-	-	-

Italy	-	-	-	-	-	-
Japan (1972-1990)	1	-0.0874 (0.3682)	0.0362 (0.1252)	-0.0722 (0.418)	-0.4006 (<0.0001)	0.338
Japan (1972-2000)	4	0.011 (0.8679)	0.00595 (0.6864)	0.0198 (0.9303)	-0.2544 (0.0005)	0.691
Japan (1972-2010)	1	0.2017 (0.0211)	0.009647 (0.6103)	0.00573 (0.9524)	-0.0303 (0.0181)	0.068
Korea	-	-	-	-	-	-
Luxembourg (1984-1990)	-	-	-	-	-	-
Luxembourg (1984-2000)	1	0.1445 (0.124)	0.006858 (0.9801)	0.9768* (0.0117)	-0.22 (<0.0001)	0.286
Luxembourg (1984-2010)	1	0.1626 (0.0463)	0.0546 (0.8141)	0.5342* (0.0986)	-0.1215 (0.002)	0.109
Netherlands (1972-1990)	4	0.1731 (0.0438)	0.3058 (0.0068)	-0.1525 (0.8351)	-0.9121 (<.0001)	0.793
Netherlands (1972-2000)	4	0.1417 (0.0533)	0.0504 (0.5413)	0.774* (0.2486)	-0.4257 (0.0009)	0.636
Netherlands (1972-2010)	4	0.2329 (0.0024)	0.0692 (0.3718)	0.1648 (0.3652)	-0.4207 (<0.0001)	0.242
Norway (1972-1984)	1	0.206 (0.1108)	-0.1835 (0.1717)	0.1677 (0.3716)	-	0.088
Norway (1990-2010)	2	-0.2421 (0.1336)	-0.2368 (0.0524)	0.6791 (0.2309)	-	0.215
Spain	-	-	-	-	-	-
Sweden (1972-1990)	2	0.204 (0.1295)	-0.0259 (0.7671)	0.8185* (0.223)	-0.2078 (0.0151)	0.355
Sweden (1972-2000)	2	0.2943 (0.0051)	0.0485 (0.3781)	0.5424* (0.1588)	-0.2359 (0.0008)	0.292
Sweden (1972-2020)	1	0.2974 (0.0018)	0.0206 (0.6503)	0.1204 (0.3893)	-0.2598 (<0.0001)	0.198
UK (1972-1990)	1	0.0597 (0.6116)	-0.00195 (0.9585)	0.1296 (0.2229)	-0.4194 (<0.0001)	0.3
UK (1972-2000)	1	0.1642 (0.0832)	0.0329 (0.2761)	0.0335 (0.7091)	-0.2273 (0.0001)	0.151
UK (1972-2010)	1	0.1267 (0.1403)	0.002171 (0.9326)	-0.0329 (0.6893)	-	0.022
US	-	-	-	-	-	-

Italy	-	-	-
Japan (1972-1990)	0.35918	-0.20553	0.01503
Japan (1972-2000)	0.41967	-0.01927	-0.11267
Japan (1972-2010)	0.54109	-0.02784	-0.12468
Korea	-	-	-
Luxembourg (1984-1990)	-	-	-
Luxembourg (1984-2000)	1.10893	0.3164*	-0.29149
Luxembourg (1984-2010)	1.71978	1.51171*	0.55117*
Netherlands (1972-1990)	0.34271	0.12735	-0.3565
Netherlands (1972-2000)	0.42478	-0.10418	-0.02489
Netherlands (1972-2010)	0.3645	-0.14602	0.23496
Norway (1972-1984)	-	-	-
Norway (1990-2010)	-	-	-
Spain	-	-	-
Sweden (1972-1990)	0.68279	-0.01602	-0.05273
Sweden (1972-2000)	0.66378	0.00234	-0.06909
Sweden (1972-2020)	0.64626	0.03632	-0.06831
UK (1972-1990)	0.45797	-0.00973	-0.19144
UK (1972-2000)	0.60278	0.05177	-0.18171
UK (1972-2010)	-	-	-
US	-	-	-

Model_REER_ULC_G: From the short-term results of this model presented in the table 28, it is possible to conclude that fiscal policy is not becoming less effective. Australia and Belgium are the only countries that suggest, in a small degree, the opposite. However, the fact that Belgium does not present results for the first period in analysis weakens the conclusions regarding this country. The same does not apply to Australia for which a moderate decrease in the CI coefficients over the three periods is observed. In addition, Australia is, based on Model_REER_ULC, considered as being more and more integrated in the short-term.

The long-term results for this model are available for 7 countries and in general it is possible to conclude that fiscal policy is not becoming less effective throughout time. Results that might suggest otherwise, concern countries like Belgium, where it is possible to observe a small decrease in the demand coefficients, despite the magnitude of the results still pointing out towards an effective fiscal policy in this country, and Finland, where a decrease in the impact of the demand in production may be seen. Regarding this last country, it can be argued that no strong conclusions can be made, since as mentioned in the last models, this country was analyzed in two specific sub-periods due to a break in the data, hindering the conclusions of possible tendencies. Finally, Japan presents higher impacts of demand on production suggesting a more effective fiscal policy when applied by the authorities throughout time. In what respects this country, it is interesting to note that from Model_REER_ULC, conclusions for a higher integration throughout time were extracted for this country, suggesting no links between higher integration and less effective fiscal policy. It is still important to mention that the results marked with * concern different coefficient signs from what it would be expected.

The analyses of the six different models along this section allowed for reaching the conclusion that in general there is no evidence of a significant increase of the international economic integration. Australia, Ireland, Luxembourg, the Netherlands and Belgium are exceptions to this main conclusion, as they reveal a moderate degree of higher integration throughout. In what concerns the effectiveness of fiscal policy, this is concluded not to become lower throughout the years. Finally, it is worth mentioning that there was not found any clear relation between the development of integration and of the effectiveness of fiscal policy, probably due to the results on international integration which do not reveal many changes along the three periods.

5. Summary and Conclusions

This research aims to provide contributions to combat crises such as the recent ones, i.e. the subprime mortgage crisis that started in the US and the European sovereign debt crisis, especially in what concerns their propagation effects, i.e. the contagion to other countries. As to do so, the analysis pursued has the goal of finding whether the countries are internationally and economically integrated and whether the fiscal policy applied by the authorities, used many times as tools to fighting situations as the above, are still effective both in the level and development, since the conclusions on both these two topics are not unanimous along the existent literature.

In order to proceed with the above mentioned goals, the analysis is based on the development of some models originally introduced by Østrup (2003). The mentioned models were transformed by means of econometric cointegration techniques, so that accurate interpretations on the main topics of this research could be taken. The data chosen to develop this analysis respects to some of the OECD members, implying different sized economies. The considered period of analysis was from 1972 until the third quarter of 2010 due to data availability purposes.

The findings resultant from the analysis point out towards no strong evidence of international economic integration, neither in its levels nor in its development, and towards an effective application of the fiscal policy, both in levels and development. Moreover, no strong links between these two topics were perceived from the obtained results, which may be due to the fact that no trends in integration were deducted. To sum up, the findings allow for clearly answering the proposed research questions in the introductory section of the present thesis, since with few and weak exceptions, mentioned when reporting the results:

- *There is no strong evidence that the countries are internationally and economically integrated.*
- *There is no strong evidence for higher international economic integration.*
- *There is strong evidence that in the long-term the fiscal policy applied by the authorities is effective.*
- *There is no strong evidence that the fiscal policy effectiveness is decreasing (neither increasing), and no links between the development of international economic integration and of the effectiveness of fiscal policy were found.*

Finally, it is important to note that the findings obtained from this research are in line with the ones obtained in Østrup (2003).

Lastly, the presented findings suggest that the happenings described in the introductory part linked to globalization, are rather possibly linked to other phenomena such as regionalization. In fact, some specific findings concerning the European Nordic countries also suggested for some regional integration. Accordingly, as a future research, a similar investigation to the one in the present thesis, but concentrated in specific regions, is proposed.

References

Abbott, A., Easaw, J. & Xing, T. 2008, "Trade Integration and Business Cycle Convergence: Is the Relation Robust across Time and Space?", *Scand. J. of Economics*, vol.110, no.2, pp. 403–417.

Agbetsiafa, D. 2010, "Regional Integration, trade openness, and economic growth: causality evidence from the UEMOA countries.", *International Business and Economics Research Journal*, vol.9 no.10.

Alesina, A. & Wcziarg, R. 1998, "Openness, country size and government.", *Journal of public economics*, vol.69, no.3, pp. 305-321.

Alexander, C. 2008a, *Market Risk Analysis, volume II: Practical Financial Econometrics*, John Wiley & Sons Ltd

Alexander, C. 2008b, *Market Risk Analysis, Volume I: Quantitative Methods in Finance*, John Wiley & Sons Ltd

Arestis, P. & Sawyer, M. 2004, "On the Effectiveness of Monetary Policy and of Fiscal Policy", *Review of social economy*, vol. LXII, no.4.

Australian Government – the treasury web-page: http://www.treasurer.gov.au/DisplayDocs.aspx?doc=pressreleases/2002/019.htm&pageID=&min=phc&Year=2002&DocType=0 Viewed in September 2011.

Avelino, G., Brown, D., S, & Hunter, W. 2005, "The effects of capital mobility, trade openness and democracy on social spending in Latin America 1980-1999.", *American Journal of Political Science*, vol.49, no.3, pp. 625-641.

Barsky, R. B. & Kilian, L. 2004, "Oil and the Macroeconomy since the 1970s," *Journal of Economic Perspectives, American Economic Association*, vol. 18, no.4, pp. 115-134.

Berg, C. 2008, "20 years reveals gigantic strides in international trade". *Institute of Public Affairs Review*, vol. 60 no.1.

Bergin, P. R. & Glick, R. 2004, "Global Price Dispersion: Are prices converging or diverging?", *Journal of International Money and Finance*, vol. 26, pp.703-729.

Bilgin, M. H., Lau, C.K.M & Tvaronavičienė, M. 2010, "Is China integrated with her major trading partners: evidence on financial and real integration", *Baltic Journal on Sustainability*, vol.16, no.2, pp. 173-187.

Cheung, Y. & Chinn, M.D. & Fujii, E. 2006, "The Chinese Economies in Global Context: The Integration Process and Its Determinants", *Journal of the Japanese International Economies*, vol.20, pp. 128–153.

Choe, J. 2001, "An impact of economic integration through trade: on business cycles for 10 East Asian countries", *Journal of Asian Economics*, vol.12, pp. 569–586.

Down, I. (2007) "Trade Openness, Country Size and Economic Volatility: The Compensation Hypothesis Revisited.", *Business and Politics*, vol. 9, no. 2, Article 3.

Enders W. (2004), *Applied Econometric Time Series*, Wiley, 2nd.ed.

Engel, C. & Rogers, J. H. 2004, "European product market integration after the euro", *Economic Policy*, vol.19, no.39, pp. 347-384.

European Union web-page: http://europa.eu Viewed in October 2011.

Faber, R. P . & Stokman, Ad C. J . 2009, "A short history of price level convergence in Europe", *Journal of Money, Credit and Banking*, vol.41, no. 2-3.

Federal Reserve web-page: http://www.federalreserve.gov/pubs/ifdp/2009/966/ifdp966.htm Viewed in October 2011.

Feenstra, R. C. 1998, "Integration of trade and disintegration of production in the global economy.", *Journal of Economic Perspectives*, vol 12, no.4, pp. 31-50.

Frenkel , J. A. & Razin, A. 1984, "Fiscal policies, debt and international economic interdependence.", *National Bureau of Economic Research, WP nº1266.*

Frenkel, J. A. & Razin, A. 1986, "Fiscal Policies, Debt, and International Economic Interdependence*", NBER Working Papers 1266, National Bureau of Economic Research, Inc.*

Genschel, P. 2004, "Globalization and the welfare state: a retrospective", *Journal of European Public Policy*, vol.11, no.4, pp. 613–636.

Giddens, A. 1990, *The consequences of modernity*. Cambridge: Polity Press.

Goldberg, P. K. & Verboven, F. 2005, "Market integration and convergence to the law of one price: evidence from the European car market", *Journal of international economics*, vol. 65, pp.49-73.

Granger, C. W. J. 1986, "Developments in the study of cointegrated economic variables", *Oxford Bulletin of Economic and Statistics*, vol. 48, no. 3.

Gujarati, D. 2003, *Basic Econometrics*, 4th edition Mc Graw Hill.

Hallet, A. H. & Piscitelli, L. 2002, "Does trade integration cause convergence?", *Economics Letters*, vol.75, pp.165–170.

Hirst, P., & Thompson, G. 1999, *Globalization in Question*. Cambridge: Polity Press.

Honkapohja, S. & Koskela, E. 1999, "The economic crisis of the 1990s in Finland," *Economic Policy, CEPR, CES, MSH*, vol.14, no.29, pp. 399-436.

Juselius, K. 2006, *The cointegrated VAR model*. Oxford University Press.

Klein, M.W., Schuh, S., & Triest, R. K. 2003, "Job creation, job destruction and the real exchange rate.", *Journal of international economics*, vol. 59, no.2, pp. 239-265.

Koop, G. 2008, *Introduction to Econometrics*, John Wiley & Sons Ltd.

Marelli, E. & Signorelli, M., 2011, “China and India: Openness, trade and effects on economic growth.”, *The European journal of comparative economics*, vol. 8, no.1, pp. 129-154.

Marinas, M.C. 2010, “The effectiveness of fiscal policy in combating economic crisis. An analysis based on the economic literature”, *Theoretical and Applied Economics*, Vol.17, no. 11(552), pp.63-78.

McCallum, J. (1995), “National borders matter: Canada- US Regional trade patterns”, *The American Economic Review*, vol. 85, no.3, pp. 615-623.

Mommen, P. 1994, *The Belgium economy in the twentieth century*. Routledge

New York Times web-page: http://www.nytimes.com/1990/12/03/business/canada-now-in-recession.htm Viewed in October 2011.

OECD web-page:

1. http://stats.oecd.org.esc-web.lib.cbs.dk/index.aspx?r=706215
2. http://stats.oecd.org/glossary/detail.asp?ID=1121
3. http://stats.oecd.org/glossary/detail.asp?ID=1792
4. http://www.oecd.org/document/23/0,3746,en_2649_34569_43964951_1_1_1_1,00.html#how_to

Viewed in May 2011.

Østrup, F. 2003, “The level and development of economic integration”, *mimeo*, Copenhagen Business School.

Parsley, D. C. & Wei, S. J. 2002. “Currency arrangements and goods market integration: a price based approach”, *International Finance*, EconWPA.

Poncet, S. 2003, “Measuring Chinese domestic and international integration”, *China Economic Review*, vol.14, no.1, pp. 1-21.

Reyes, J. , Schiavo, S. & Fagiolo,G. 2010 “Using complex network analysis to assess the evolution of international economic integration: the cases of East Asian and Latin American.”, *The Journal of International Trade & Economic Development*, vol 19, no.2, pp. 215-239.

Rodrik, D. 2000, “How far will economic integration go?”, The Journal of Economic Perspectives, vol.14, no.1, pp. 177-186.

Rødseth, A. ,2000, *Open economy macroeconomics*. Cambridge University Press

Rogers, J. H. 2002, “Monetary union, price level convergence, and inflation: how close is Europe to the United States?”, *International Finance Discussion Papers 740, Board of Governors of the Federal Reserve System (U.S.).*

Sachs, J. & Warner, A. 1995 “Economic reform and the process of global integration.”, *Brookings papers on economic activity*, vol 1995, no.1, pp. 1-118.

Serres, A. & Hoeller, P. & Maisonneuve, C. 2001,"The Width of the Intra-European Economic Borders", *OECD Economics Department Working Papers 304, OECD Publishing.*

Shiratsuka, S. 2003, “Asset Price Bubble in Japan in the 1980s: Lessons for Financial and Macroeconomic Stability”. *Discussion Paper No. 2003-E-15. Institute for monetary and economic studies – Bank of Japan.*

Sosvilla-Rivero, S. & Gil-Pareja, S. 2004, “Price convergence in the Eropean Union”, *Applied Economic Letters*, vol.11 pp.39-47.

Susanto, D., Rosson III, C. P. & Adcock F.J. 2008, “Market integration and convergence to the Law of one price in the North American Onion Market”, *Agribusiness*, vol 24, no.2, pp.177-191.

The IMF web-page: http://www.imf.org/external/pubs/ft/survey/so/2009/res041609b.htm Viewed in October 2011.

Turner, P. & Van’t dack, J. 1993 “Measuring international price and cost competitiveness”. *BIS economic papers*, no.39.

Uebele, M. 2011, "National and international market integration in the 19th century: Evidence from comovement.", *Explorations in Economic History, Elsevier*, vol. 48, no.2, pp. 226-242.

Vujakovic, P. 2010, "How to Measure Globalization? A New Globalization Index (NGI).", *Atlantic Economic Journal, International Atlantic Economic Society*, vol. 38, no.2, pp. 237-237.

Weinstein, M. 2005, *Globalization - What’s new?*. New Columbia University Press.

Yule, G. U. 1926, “Why do we sometimes get nonsense-correlations between time-series?- a study in sampling and the nature of time-series”, *Journal of the Royal Statistical Society*, vol.89, pp. 1-63.

Appendix – A: Summary statistics of the variables

<u>Variables transformed in ratios:</u>

Variable: CI

Variable	Mean	Std Dev	Minimum	Maximum	N
Australia	-3.8717839	0.1023264	-3.9902142	-3.5813738	155
Austria	-4.6672164	0.0859192	-4.8157983	-4.4836511	155
Belgium	-4.5049907	0.0968204	-4.6474226	-4.3286878	155
Canada	-3.4181913	0.0507193	-3.5044249	-3.2765426	155
Denmark	-5.1672946	0.1461257	-5.3520058	-4.8536765	155
Finland	-5.2975670	0.1124870	-5.4965104	-5.0698241	155
France	-2.7941399	0.0930889	-2.9106445	-2.6439040	155
Germany	-2.4325498	0.1098754	-2.6335766	-2.2452804	155
Greece	-4.6074643	0.0794861	-4.7200703	-4.4336040	155
Ireland	-5.7420890	0.1694525	-5.9525986	-5.3614590	155
Italy	-2.7991695	0.0991440	-2.9817785	-2.6574039	155
Japan	-1.9900227	0.1022264	-2.1875364	-1.8261914	155
Korea	-3.7389151	0.4244485	-4.6091842	-3.2303138	155
Luxembourg	-7.3287118	0.0906733	-7.5254428	-7.1063429	155
Netherlands	-4.1062259	0.0882631	-4.2358924	-3.9257085	155
Norway	-5.2101129	0.0954151	-5.3521756	-5.0258302	155
Spain	-3.3234829	0.0685144	-3.4440165	-3.1846335	155
Sweden	-4.6949366	0.1383543	-4.8642982	-4.4122139	155
United Kingdom	-2.7927956	0.0406397	-2.8571664	-2.6973407	155
United States	-0.9225064	0.0587235	-1.0085096	-0.8240741	155

Variable: CIG

Variable	Mean	Std Dev	Minimum	Maximum	N
Australia	-3.8837974	0.1035247	-4.0217139	-3.6066689	155
Austria	-4.6530508	0.0740007	-4.7808521	-4.4939982	155
Belgium	-4.4447172	0.0902768	-4.5760139	-4.2897830	155
Canada	-3.3739884	0.0436705	-3.4516770	-3.2573422	155
Denmark	-5.0601698	0.1195090	-5.2113940	-4.8205700	155
Finland	-5.2435589	0.0912302	-5.4009279	-5.0793026	155
France	-2.7319185	0.0729049	-2.8312043	-2.6236605	155
Germany	-2.4111409	0.1027662	-2.5994813	-2.2578169	155
Greece	-4.6406816	0.0733175	-4.7489229	-4.4820593	155
Ireland	-5.7330308	0.1616323	-5.9343207	-5.3701904	155
Italy	-2.7753646	0.0927255	-2.9496254	-2.6501995	155
Japan	-2.0218372	0.0804123	-2.1658470	-1.8817445	155
Korea	-3.7916358	0.4160372	-4.6146113	-3.2762763	155
Luxembourg	-7.3214929	0.1118917	-7.5298287	-7.0823557	155
Netherlands	-4.0228330	0.0643683	-4.1099120	-3.8888528	155
Norway	-5.1660107	0.0652104	-5.2772263	-5.0542261	155
Spain	-3.3553362	0.0704899	-3.4890786	-3.2026682	155
Sweden	-4.5620564	0.1241915	-4.7100582	-4.3335858	155
United Kingdom	-2.7522460	0.0426383	-2.8121812	-2.6368329	155
United States	-0.9425105	0.0460973	-1.0030231	-0.8619989	155

Variable: NGDP

Variable	Mean	Std Dev	Minimum	Maximum	N
Australia	-3.8935964	0.0675277	-3.9814625	-3.7142330	155
Austria	-4.6242561	0.0719366	-4.7362345	-4.4962681	155
Belgium	-4.4150182	0.0821178	-4.5380692	-4.2671879	155
Canada	-3.3400572	0.0258359	-3.3967725	-3.2877836	155
Denmark	-5.0492586	0.0726024	-5.1630282	-4.8802405	155
Finland	-5.2174034	0.0583135	-5.3364049	-5.1074998	155
France	-2.7372705	0.0607568	-2.8221556	-2.6326283	155
Germany	-2.3671812	0.0811956	-2.4935364	-2.2356282	155
Greece	-4.6939244	0.1030589	-4.8533058	-4.4968659	155
Ireland	-5.6784234	0.2609276	-5.9946588	-5.1646133	155
Italy	-2.7760207	0.0846258	-2.9412545	-2.6570943	155
Japan	-2.0129190	0.0791416	-2.1703675	-1.8659525	155
Korea	-3.8629822	0.4904741	-4.8616611	-3.2462356	155
Luxembourg	-7.1370867	0.2086582	-7.3902996	-6.6705063	155
Netherlands	-4.0153230	0.0444455	-4.0909774	-3.9335928	155
Norway	-5.1877320	0.1529994	-5.4157297	-4.8200677	155
Spain	-3.3479062	0.0774837	-3.4433475	-3.1586421	155
Sweden	-4.5371515	0.0928141	-4.6639818	-4.3584434	155
United Kingdom	-2.7685259	0.0500084	-2.8542830	-2.6304809	155
United States	-0.9539857	0.0276285	-1.0003287	-0.9012410	155

Variable: NGDP_G

Variable	Mean	Std Dev	Minimum	Maximum	N
Australia	-3.9063262	0.0677062	-3.9947975	-3.7106413	155
Austria	-4.6489364	0.0816362	-4.7644965	-4.4959244	155
Belgium	-4.4810250	0.0870406	-4.6101858	-4.3056967	155
Canada	-3.3963572	0.0354342	-3.4912305	-3.3352421	155
Denmark	-5.1611049	0.0875992	-5.3016373	-4.9467943	155
Finland	-5.2713498	0.0834355	-5.4299819	-5.1059558	155
France	-2.5734504	0.0630932	-2.6597686	-2.4643330	155
Germany	-2.4041247	0.0755364	-2.5173751	-2.2471536	155
Greece	-4.6760960	0.1188087	-4.8580259	-4.4517418	155
Ireland	-5.6947161	0.2739083	-6.0066089	-5.1528139	155
Italy	-2.7999749	0.0944121	-2.9933786	-2.6561970	155
Japan	-1.9974051	0.0908554	-2.1939465	-1.8273422	155
Korea	-3.8326209	0.4883880	-4.8058033	-3.2305859	155
Luxembourg	-7.1353047	0.2038817	-7.4038555	-6.6786373	155
Netherlands	-4.1092627	0.0431516	-4.1841943	-4.0362778	155
Norway	-5.2426332	0.1517552	-5.4491442	-4.8455014	155
Spain	-3.3436470	0.0807387	-3.4580931	-3.1925388	155
Sweden	-4.6663437	0.1023718	-4.7980586	-4.4358193	155
United Kingdom	-2.8158524	0.0519433	-2.9115435	-2.6652260	155
United States	-0.9533345	0.0357988	-1.0070398	-0.8893622	155

Variable: REER

Variable	Mean	Std Dev	Minimum	Maximum	N
Australia	4.5808347	0.1553881	4.3062249	4.9074945	155
Austria	4.5761754	0.0495861	4.4178763	4.6668296	155
Belgium	4.5955002	0.0603553	4.4824374	4.7541073	155
Canada	4.6230599	0.1230206	4.3715974	4.8376302	155
Denmark	4.5359460	0.0605201	4.3727336	4.6552928	155
Finland	4.7149026	0.1152416	4.5524021	4.9609547	155
France	4.6186690	0.0412922	4.5202657	4.7279187	155
Germany	4.6294869	0.0544892	4.5217886	4.7909856	155
Greece	4.5096063	0.0826398	4.3040651	4.6805559	155
Ireland	4.4934513	0.0930935	4.3308649	4.7420584	155
Italy	4.5725162	0.0779850	4.3921007	4.7376886	155
Japan	4.5013861	0.2292631	4.0020465	4.9723794	155
Korea	4.5742840	0.1357300	4.1090690	4.8178593	155
Luxembourg	4.6065783	0.0484163	4.5323844	4.7213519	155
Netherlands	4.5657638	0.0466864	4.4515527	4.6640993	155
Norway	4.5852738	0.0438168	4.4973622	4.6711452	155
Spain	4.5245331	0.0907619	4.3008166	4.6892356	155
Sweden	4.7541723	0.1329006	4.4555094	4.9816183	155
United Kingdom	4.5531531	0.0956942	4.3194861	4.7829816	155
United States	4.6014002	0.0929810	4.4548123	4.8757315	155

Variable: RGDP

Variable	Mean	Std Dev	Minimum	Maximum	N
Australia	-3.8908990	0.0697680	-3.9796456	-3.7046534	155
Austria	-4.6397387	0.0550202	-4.7157620	-4.5364460	155
Belgium	-4.4186154	0.0709915	-4.5093638	-4.2826785	155
Canada	-3.3549222	0.0283751	-3.4173715	-3.3087701	155
Denmark	-5.0283999	0.0894990	-5.1744580	-4.8480757	155
Finland	-5.2024591	0.0578003	-5.3275430	-5.0967876	155
France	-2.7242011	0.0717620	-2.8267470	-2.6083776	155
Germany	-2.4038116	0.0775561	-2.5374212	-2.2793564	155
Greece	-4.6990434	0.1021902	-4.8573376	-4.5029300	155
Ireland	-5.7070845	0.2745144	-6.0374048	-5.2013047	155
Italy	-2.7684950	0.0906399	-2.9647696	-2.6465669	155
Japan	-2.0076915	0.0755576	-2.1423938	-1.8633565	155
Korea	-3.8565270	0.5055060	-4.8732903	-3.1699769	155
Luxembourg	-7.1483866	0.1887016	-7.3931672	-6.8111020	155
Netherlands	-3.9754384	0.0455039	-4.0393483	-3.8642259	155
Norway	-5.0305950	0.0357510	-5.1266010	-4.9595108	155
Spain	-3.3523968	0.0465642	-3.4242988	-3.2596849	155
Sweden	-4.5305455	0.0863780	-4.6443810	-4.3294402	155
United Kingdom	-2.7467711	0.0536822	-2.8183984	-2.5980669	155
United States	-0.9573966	0.0331982	-1.0073060	-0.9003795	155

Variable: ULC

Variable	Mean	Std Dev	Minimum	Maximum	N
Australia	-0.0800569	0.0825948	-0.2298436	0.0502484	155
Austria	0.2290085	0.1952790	-0.0523285	0.6157617	155
Belgium	0.0706234	0.0773201	-0.0073105	0.2348815	155
Canada	0.0250637	0.0296856	-0.0245372	0.0859986	155
Denmark	-0.0147406	0.0361623	-0.0762955	0.0643442	155
Finland	0.0295024	0.0950867	-0.2174259	0.2339351	155
France	0.0402353	0.0738152	-0.0874474	0.1968127	155
Germany	0.2296817	0.2307296	-0.0990394	0.7980331	155
Greece	-0.9878780	0.9805946	-2.7053917	0.1119648	155
Ireland	-0.1389000	0.1792480	-0.5929675	0.0534626	155
Italy	-0.2694183	0.3532147	-1.0650586	0.0176354	155
Japan	0.4840044	0.3708116	-0.1486801	1.0956657	155
Korea	-0.3466881	0.3712478	-1.2579517	0.0457421	155
Luxembourg	0.0581895	0.1091897	-0.0777606	0.2850796	155
Netherlands	0.1269309	0.2020847	-0.0596541	0.5407794	155
Norway	-0.0438210	0.0881495	-0.1706980	0.1961384	155
Spain	-0.3568454	0.3736628	-1.1992380	0.0283951	155
Sweden	-0.0448900	0.1128782	-0.3105421	0.1255863	155
United Kingdom	-0.2047991	0.2167733	-0.7393681	0.0367876	155
United States	-0.0052503	0.0352234	-0.0490157	0.1490682	155

Variable: RGDP_G

Variable	Mean	Std Dev	Minimum	Maximum	N
Australia	-3.8801309	0.0635597	-3.9685488	-3.6935860	155
Austria	-4.6508013	0.0628996	-4.7339279	-4.5363101	155
Belgium	-4.4716930	0.0721171	-4.5632276	-4.3188044	155
Canada	-3.3943105	0.0367771	-3.4844825	-3.3373871	155
Denmark	-5.1242967	0.1054790	-5.3133534	-4.8860534	155
Finland	-5.2452650	0.0733803	-5.4073819	-5.0915218	155
France	-2.7844446	0.0918008	-2.9045647	-2.6230892	155
Germany	-2.4238244	0.0792740	-2.5612239	-2.2739157	155
Greece	-4.6770389	0.1183438	-4.8600406	-4.4531318	155
Ireland	-5.7170818	0.3129573	-6.0974154	-5.1632959	155
Italy	-2.7907822	0.0970934	-3.0008702	-2.6496355	155
Japan	-1.9725961	0.0910491	-2.1582868	-1.8034473	155
Korea	-3.8182013	0.5341332	-4.9448090	-3.1076966	155
Luxembourg	-7.1180623	0.1812746	-7.3627558	-6.7877023	155
Netherlands	-4.0436574	0.0602759	-4.1242739	-3.9016494	155
Norway	-5.0383717	0.0371885	-5.1313851	-4.9725111	155
Spain	-3.3206397	0.0682890	-3.4131757	-3.1485660	155
Sweden	-4.6532759	0.0963093	-4.8266356	-4.4129079	155
United Kingdom	-2.7851781	0.0433018	-2.8590622	-2.6477247	155
United States	-0.9400210	0.0440715	-1.0091071	-0.8630990	155

Variables transformed in ratios:

Variable: CI

Variable	Mean	Std Dev	Minimum	Maximum	N
Australia	12.6756768	0.4042716	12.0072142	13.4052613	155
Austria	11.8802444	0.2390424	11.4137339	12.2169736	155
Belgium	12.0424700	0.2280835	11.5844685	12.3960723	155
Canada	13.1292694	0.3326332	12.4906546	13.7105547	155
Denmark	11.3801661	0.1941205	11.0870172	11.7564565	155
Finland	11.2498938	0.2428596	10.8159995	11.6965873	155
france	13.7533208	0.2305183	13.3224001	14.1278828	155
Germany	14.1149110	0.2192122	13.7364060	14.3996275	155
Greece	11.9399964	0.2935918	11.3937374	12.4633571	155
Ireland	10.8053718	0.4526313	10.1153116	11.6451211	155
Italy	13.7482912	0.2296264	13.2870388	14.0529283	155
Japan	14.5574381	0.2811426	13.9581064	14.8507907	155
Korea	12.8085456	0.7358893	11.3872940	13.7567835	155
Luxembourg	9.2187489	0.3917334	8.6118174	9.8998797	155
Netherlands	12.4412348	0.2465929	12.0334240	12.8319712	155
Norway	11.3373478	0.2715011	10.8040266	11.8648544	155
Spain	13.2239778	0.3230956	12.6838565	13.8048106	155
Sweden	11.8525242	0.2035251	11.5586026	12.2569982	155
United Kingdom	13.7546651	0.3245096	13.2737098	14.2749224	155
United States	15.6249543	0.3729995	14.9981032	16.1810348	155

Variable: CIG

Variable	Mean	Std Dev	Minimum	Maximum	N
Australia	12.8697378	0.3972098	12.1998499	13.5773523	155
Austria	12.1004845	0.2362172	11.6360700	12.4395052	155
Belgium	12.3088181	0.2189803	11.8536626	12.6482337	155
Canada	13.3795468	0.3090295	12.7692589	13.9266789	155
Denmark	11.6933654	0.1979620	11.3750203	12.0530230	155
Finland	11.5099763	0.2418470	11.0367451	11.9253422	155
France	14.0216167	0.2348618	13.5718026	14.3819327	155
Germany	14.3423943	0.2106181	13.9500157	14.6179027	155
Greece	12.1128536	0.2880455	11.5798117	12.6224867	155
Ireland	11.0205044	0.4302324	10.3363697	11.8179827	155
Italy	13.9781706	0.2227547	13.5199707	14.2702397	155
Japan	14.7316980	0.2935852	14.1103920	15.0527124	155
Korea	12.9618994	0.7151283	11.6063119	13.9077448	155
Luxembourg	9.4320423	0.4039714	8.8082635	10.1110792	155
Netherlands	12.7307022	0.2529020	12.3137147	13.1354292	155
Norway	11.5875245	0.2881708	11.0038862	12.1000659	155
Spain	13.3981990	0.3451518	12.8051722	13.9989857	155
Sweden	12.1914788	0.1900013	11.8687030	12.5378534	155
United Kingdom	14.0012892	0.2868224	13.5610274	14.4696980	155
United States	15.8110248	0.3456533	15.2385054	16.3260987	155

Variable: NGDP

Variable	Mean	Std Dev	Minimum	Maximum	N
Australia	12.5565265	0.7616399	11.0349843	13.7021395	155
Austria	11.8258668	0.6413212	10.4340640	12.7280707	155
Belgium	12.0351047	0.6302205	10.6568290	12.9173123	155
Canada	13.1100657	0.7054114	11.5825518	14.1033307	155
Denmark	11.4008643	0.6402918	10.0739635	12.3028397	155
Finland	11.2327195	0.6782915	9.7849104	12.2289867	155
France	13.7128524	0.6536060	12.2786331	14.6150421	155
Germany	14.0829417	0.6337662	12.7107989	14.9559533	155
Greece	11.7561984	0.6378233	10.3848502	12.7513412	155
Ireland	10.7716995	0.9448212	8.9779942	12.2159059	155
Italy	13.6741022	0.6389105	12.2449511	14.5154657	155
Japan	14.4372039	0.7132550	12.8568023	15.2871540	155
Korea	12.5871406	1.1970057	10.0925429	14.1747962	155
Luxembourg	9.3130362	0.8906831	7.6756358	10.7519513	155
Netherlands	12.4347999	0.7116441	10.9854571	13.4806598	155
Norway	11.2623909	0.8404757	9.5635137	12.5941849	155
Spain	13.1022167	0.7346848	11.5982804	14.2381768	155
Sweden	11.9129714	0.6219908	10.5913231	12.8274373	155
United Kingdom	13.6815970	0.6776137	12.2976483	14.6422806	155
United States	15.4961372	0.7303630	13.9895479	16.5064214	155

Variable: NGDP_G

Variable	Mean	Std Dev	Minimum	Maximum	N
Australia	12.3657070	0.7567180	10.8789662	13.5027287	155
Austria	11.6186413	0.6312543	10.2682465	12.5184105	155
Belgium	11.7859013	0.6242570	10.4468168	12.6390803	155
Canada	12.8744367	0.7124577	11.3525288	13.8702785	155
Denmark	11.1047358	0.6277576	9.8332826	11.9938722	155
Finland	10.9972873	0.6540816	9.6127484	11.9744285	155
France	13.6951289	0.6514914	12.2654829	14.5930993	155
Germany	13.8629712	0.6397607	12.5110851	14.7420337	155
Greece	11.5913709	0.6170924	10.2723259	12.5573442	155
Ireland	10.5838041	0.9570045	8.8046882	12.0378659	155
Italy	13.4672668	0.6253033	12.0507144	14.2898468	155
Japan	14.2714333	0.6946067	12.7336437	15.0868390	155
Korea	12.4579282	1.1852829	9.9787332	14.0086646	155
Luxembourg	9.1423105	0.8854696	7.5471204	10.5755034	155
Netherlands	12.1603863	0.7072079	10.7314790	13.1851084	155
Norway	11.0333746	0.8315189	9.3648426	12.3781404	155
Spain	12.9273924	0.7040523	11.4915998	14.0196434	155
Sweden	11.6001677	0.6185711	10.3347445	12.5241953	155
United Kingdom	13.4517550	0.6786720	12.0831485	14.3976584	155
United States	15.3179642	0.7380900	13.7879338	16.3203996	155

Variable: RGDP

Variable	Mean	Std Dev	Minimum	Maximum	N
Australia	12.8567980	0.3660757	12.2580658	13.4745409	155
Austria	12.1079583	0.2566712	11.6242015	12.5282406	155
Belgium	12.3290816	0.2389123	11.8673029	12.7036990	155
Canada	13.3927748	0.3122478	12.7840739	13.8681703	155
Denmark	11.7192971	0.2213947	11.3339512	12.0650855	155
Finland	11.5452379	0.2865559	11.0266043	12.0410472	155
France	14.0234958	0.2370047	13.5648410	14.3778342	155
Germany	14.3438853	0.2344413	13.8935091	14.6831610	155
Greece	12.0486536	0.2476554	11.5842404	12.5160337	155
Ireland	11.0406124	0.5690702	10.1623112	11.9922549	155
Italy	13.9792020	0.2273415	13.4852507	14.2734020	155
Japan	14.7400055	0.3125887	14.0824170	15.1117523	155
Korea	12.8911700	0.8104582	11.3087366	14.0137931	155
Luxembourg	9.5993104	0.4854477	8.8937266	10.3881379	155
Netherlands	12.7722586	0.2783638	12.3019933	13.2186553	155
Norway	11.7171020	0.3219553	11.0883083	12.1696620	155
Spain	13.3953002	0.3096112	12.8406657	13.9136025	155
Sweden	12.2171515	0.2367870	11.8156304	12.6427384	155
United Kingdom	14.0009258	0.2667132	13.5607859	14.4326169	155
United States	15.7903003	0.3360092	15.2047954	16.2875282	155

Variable: RGDP_G

Variable	Mean	Std Dev	Minimum	Maximum	N
Australia	12.6601154	0.3668552	12.0773728	13.2819064	155
Austria	11.8894450	0.2642666	11.3988883	12.3272592	155
Belgium	12.0685532	0.2535694	11.6022851	12.4668936	155
Canada	13.1459358	0.3371357	12.5101833	13.6555651	155
Denmark	11.4159495	0.2232022	11.0631714	11.7726498	155
Finland	11.2949812	0.2993432	10.7998700	11.8372027	155
France	13.7558016	0.2332382	13.3134576	14.1223312	155
Germany	14.1164219	0.2491375	13.6659588	14.4841983	155
Greece	11.8632073	0.2461435	11.3990694	12.3350405	155
Ireland	10.8231645	0.6247462	9.8930748	11.8456721	155
Italy	13.7494641	0.2357167	13.2396148	14.0568566	155
Japan	14.5676502	0.3035075	13.9254538	14.9221177	155
Korea	12.7220450	0.8527842	11.0044159	13.8790948	155
Luxembourg	9.4221840	0.4913330	8.7149051	10.2260961	155
Netherlands	12.4965888	0.2799081	12.0147965	12.9444062	155
Norway	11.5018745	0.3136341	10.9075730	11.9534714	155
Spain	13.2196066	0.2797998	12.7238376	13.6972624	155
Sweden	11.8869704	0.2667014	11.4891109	12.3929513	155
United Kingdom	13.7550682	0.2989427	13.2733878	14.2315549	155
United States	15.6002252	0.3622650	14.9550323	16.1363064	155

Appendix – B: Engle-Granger critical values

	two variables			three variables		
T	1%	5%	10%	1%	5%	10%
50	-4.123	-3.461	-3.13	-4.592	-3.915	-3.578
100	-4.008	-3.398	-3.087	-4.441	-3.828	-3.514
200	-3.954	-3.368	-3.067	-4.368	-3.785	-3.483
500	-3.921	-3.35	-3.054	-4.326	-3.76	-3.464
	four variables			five variables		
50	-5.017	-4.324	-3.979	-5.416	-4.7	-4.348
100	-4.827	-4.21	-3.895	-5.184	-4.557	-4.24
200	-4.737	-4.154	-3.853	-5.07	-4.487	-4.186
500	-4.684	-4.122	-3.828	-5.003	-4.446	-4.154

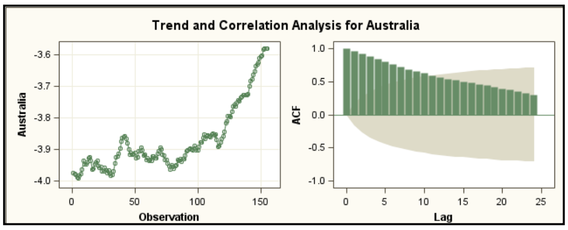
Critical values the Engle-Granger cointegration test (with a constant in the cointegration vector)

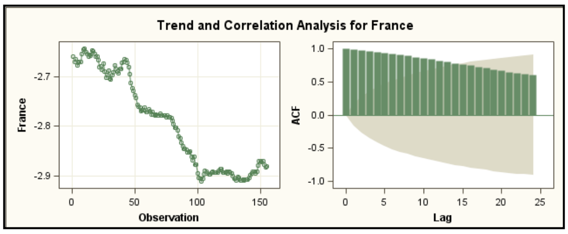
Source: Enders W. (2004), *Applied Econometric Time Series*, Wiley, 2nd.ed.

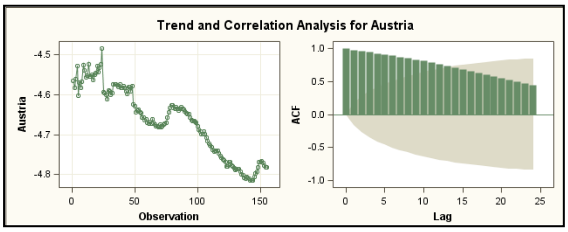
Appendix – C: Trend and ACF graphs for the variables in their levels

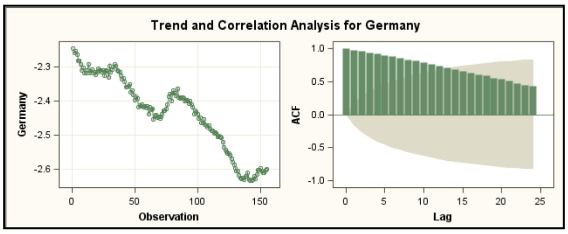
Variables with ratios

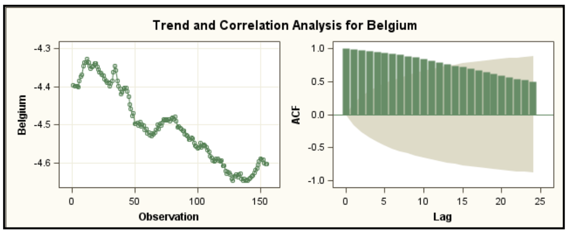
Variable: CI

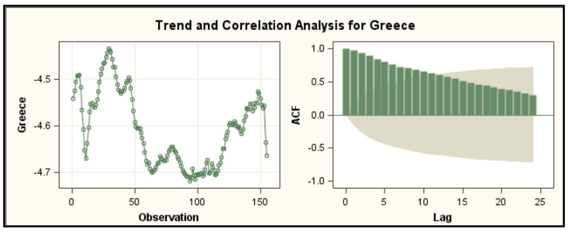


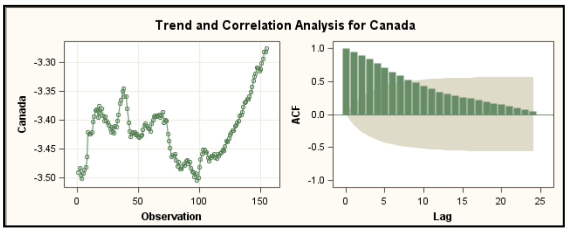


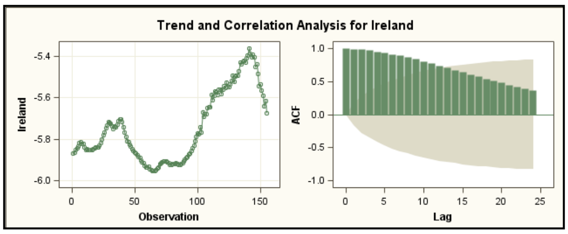


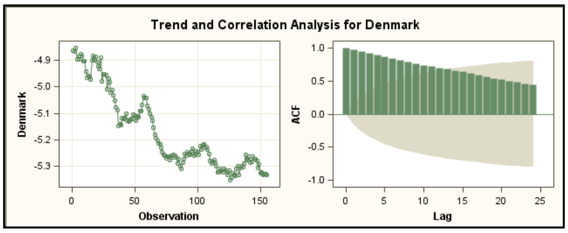


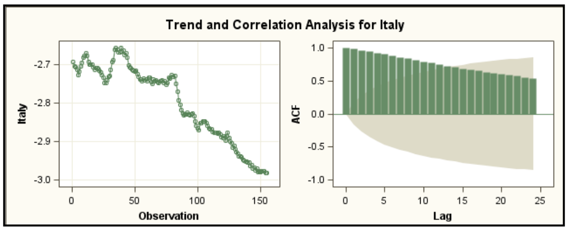


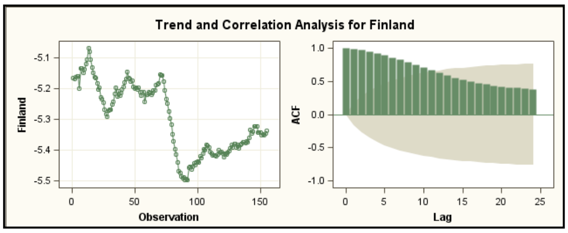


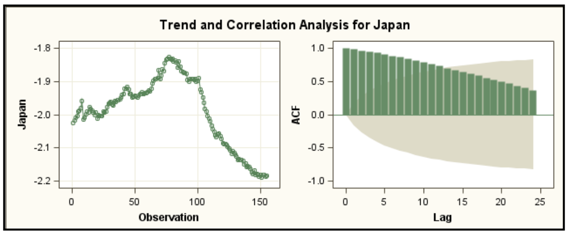


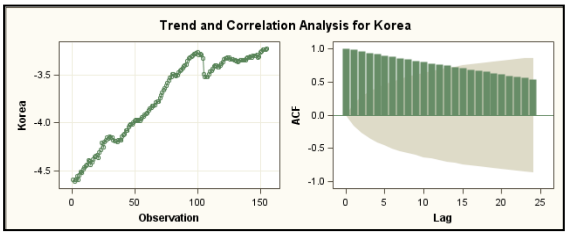


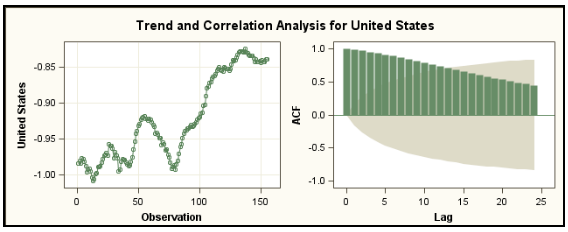


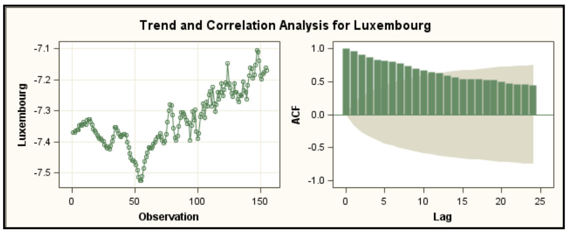


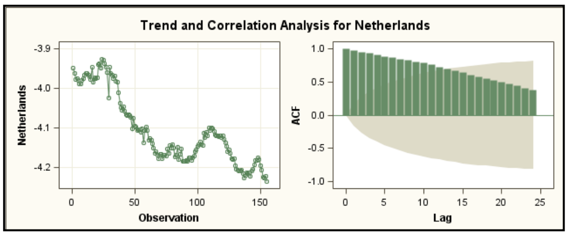


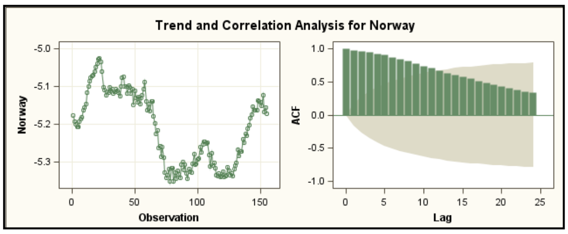


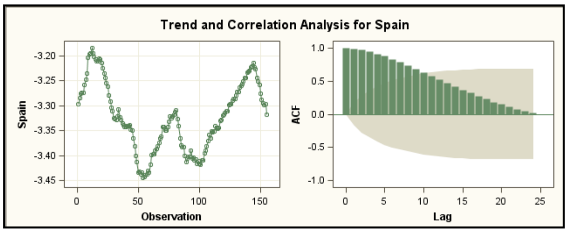

Trend and Correlation Analysis for Korea
Korea
Observation
ACF
Lag

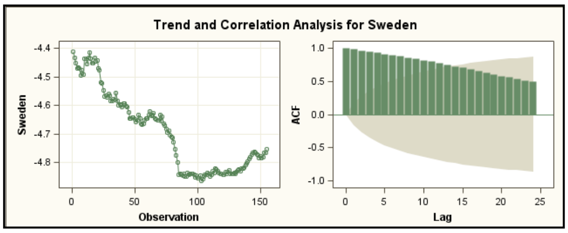

Trend and Correlation Analysis for United States
United States
Observation
ACF
Lag

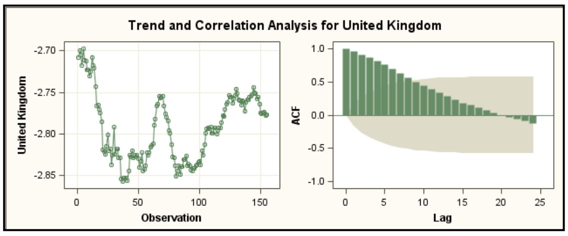

Trend and Correlation Analysis for Luxembourg
Luxembourg
Observation
ACF
Lag


Trend and Correlation Analysis for Netherlands
Netherlands
Observation
ACF
Lag

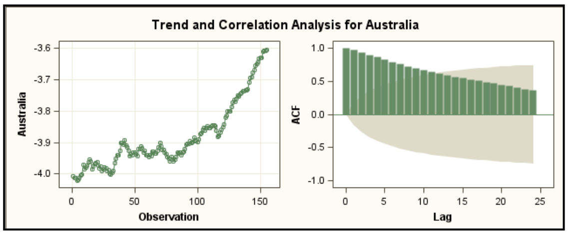

Trend and Correlation Analysis for Norway
Norway
Observation
ACF
Lag

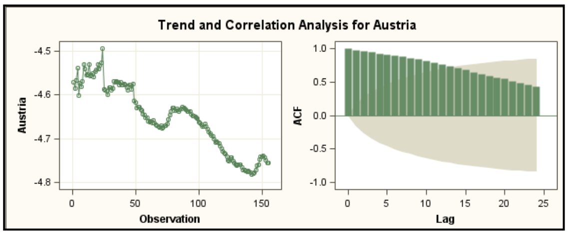

Trend and Correlation Analysis for Spain
Spain
Observation
ACF
Lag

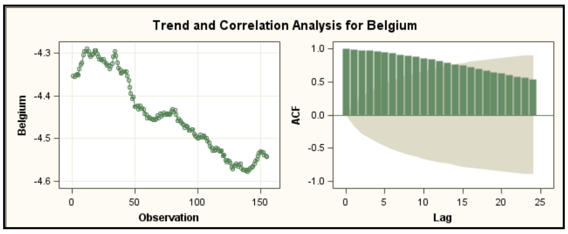

Trend and Correlation Analysis for Sweden
Sweden
Observation
ACF
Lag

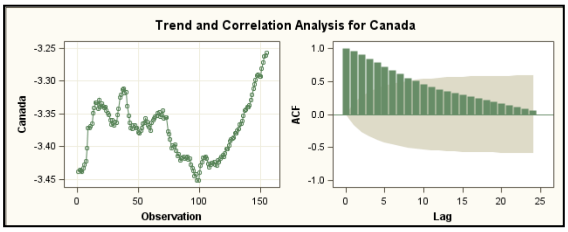

Trend and Correlation Analysis for United Kingdom
United Kingdom
Observation
ACF
Lag

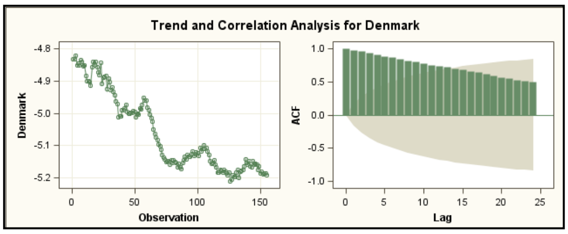
Variable: CIG

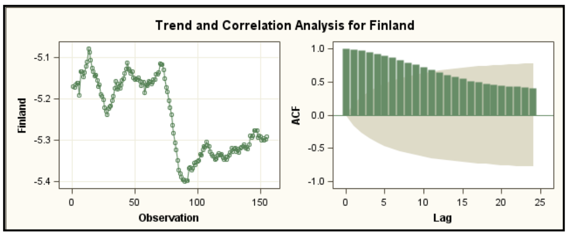


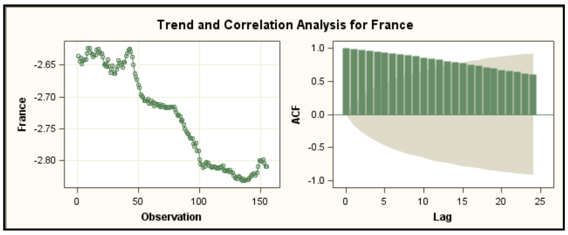


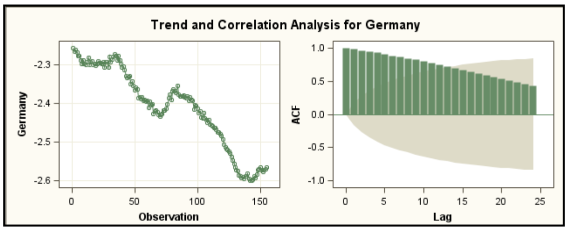


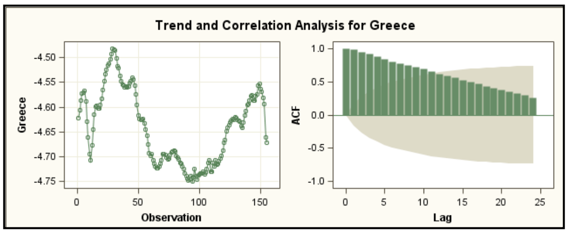


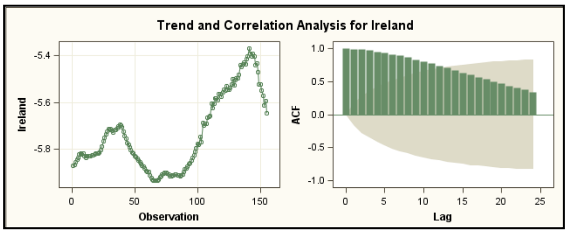


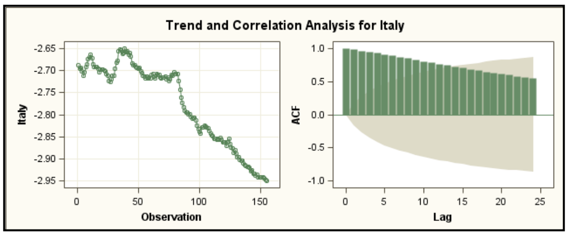


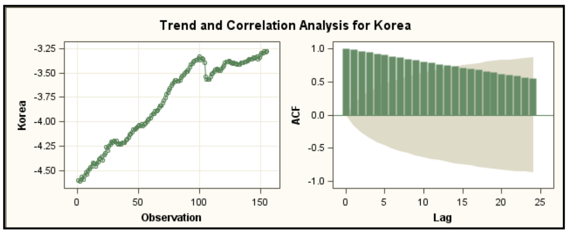


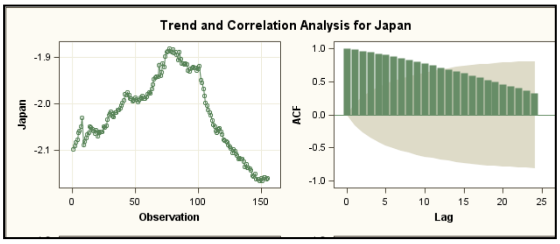


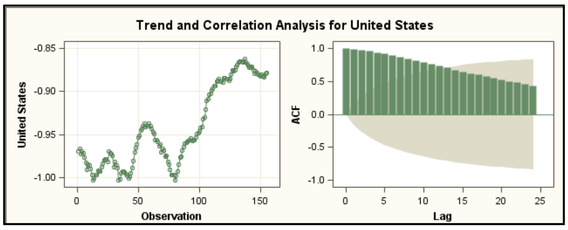


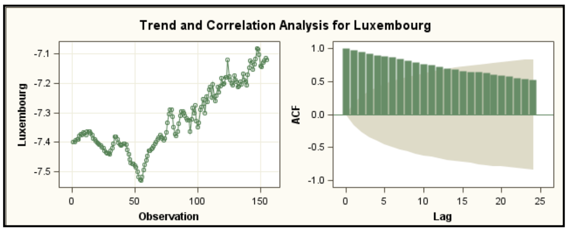







Trend and Correlation Analysis for Japan
Japan
ACF
Observation
Lag


Trend and Correlation Analysis for United States
United States
ACF
Observation
Lag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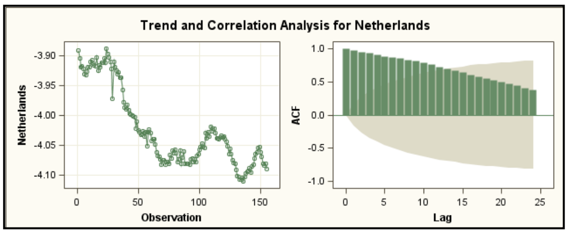
Observation
Lag


Trend and Correlation Analysis for Netherlands
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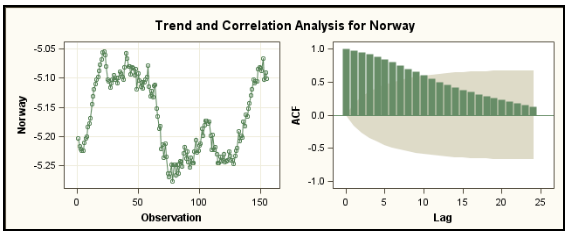
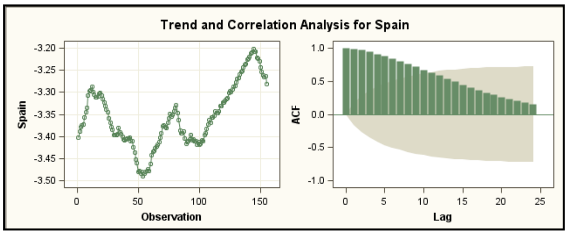
ACF
Observation
Lag


Trend and Correlation Analysis for Norway
Norway
ACF
Observation
Lag


Trend and Correlation Analysis for Spain
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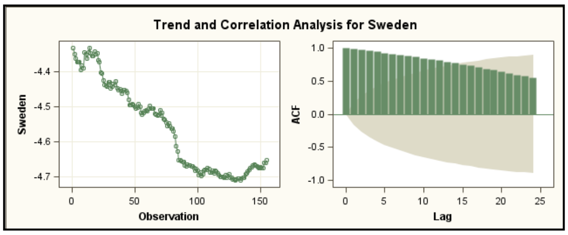
Observation
Lag


Trend and Correlation Analysis for Sweden
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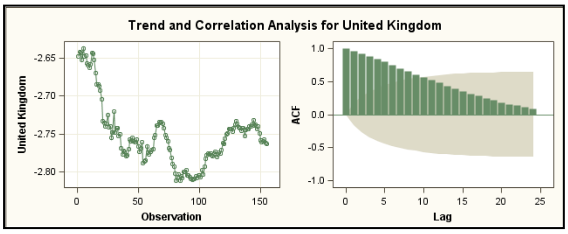
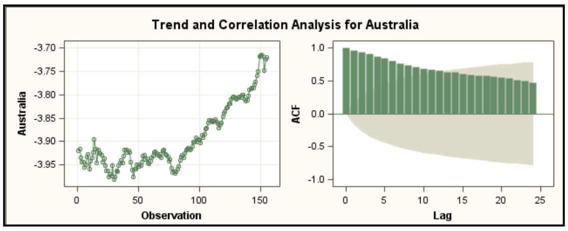
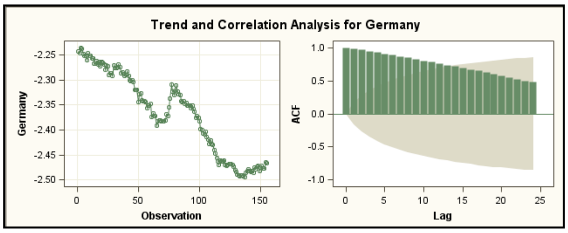
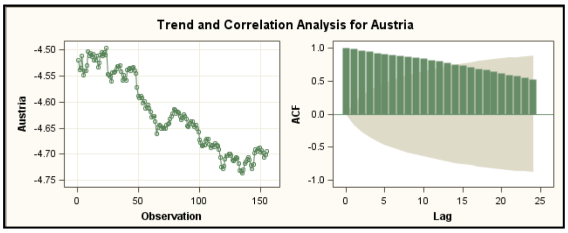
ACF
Observation
Lag

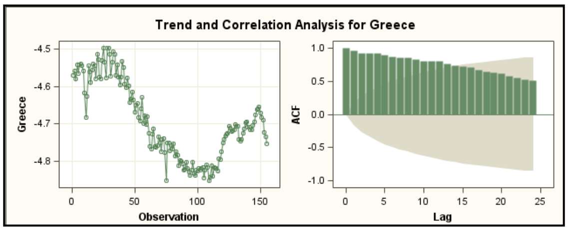

Trend and Correlation Analysis for United Kingdom
United Kingdom
ACF
Observation
Lag

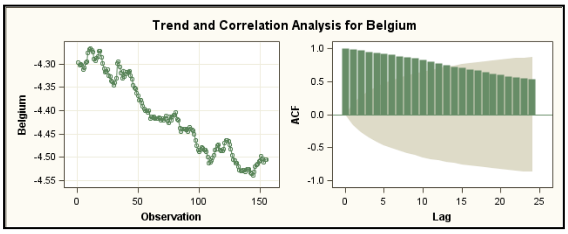
Variable: NGDP

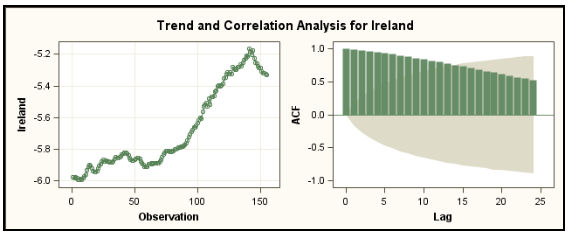


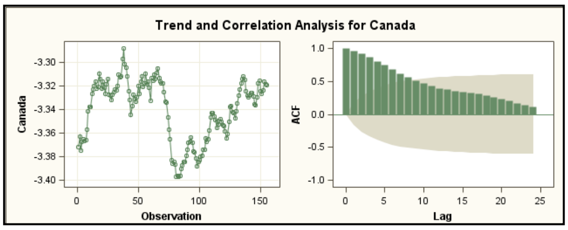


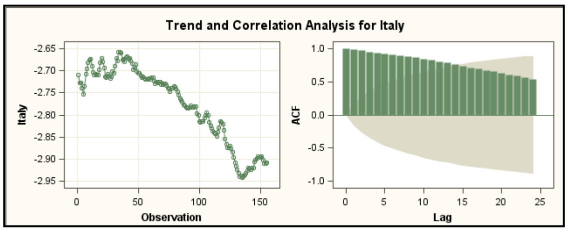


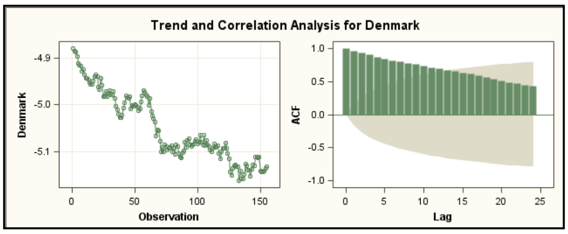


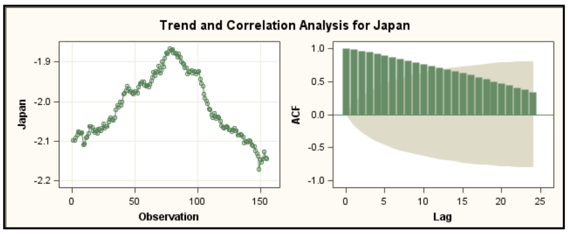


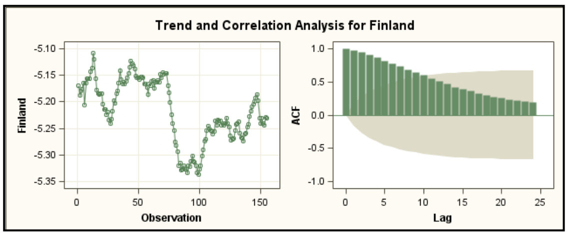


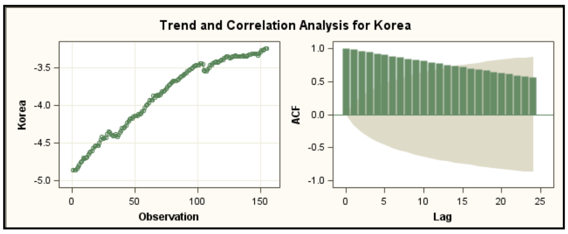


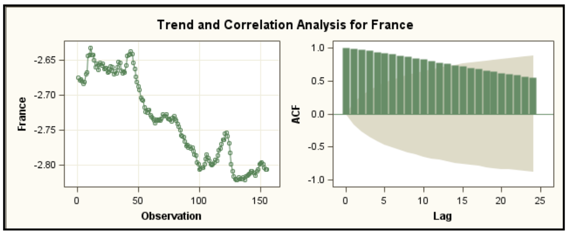


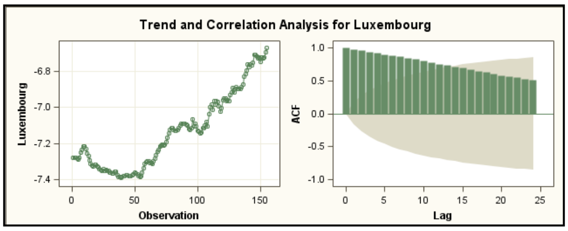


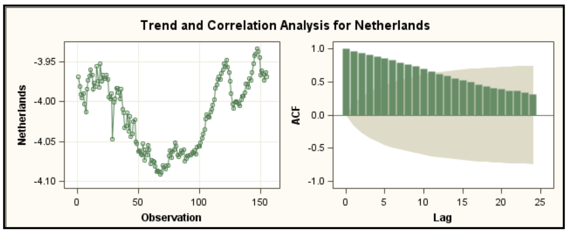


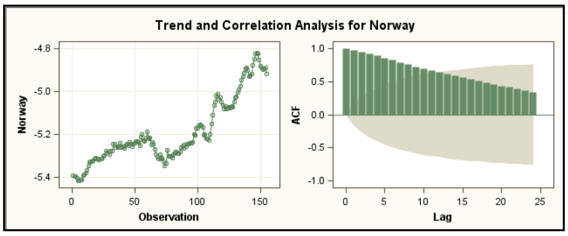


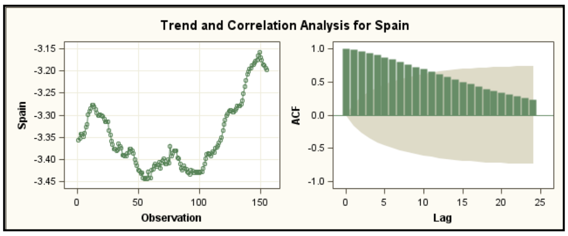


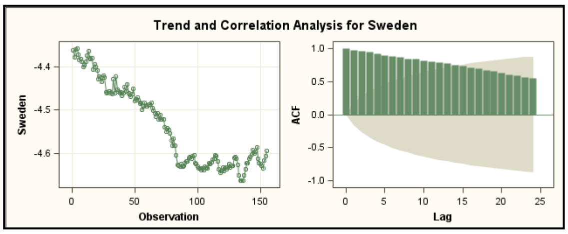


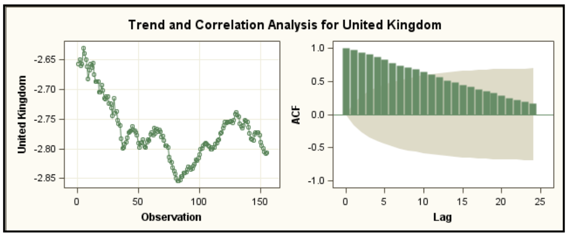


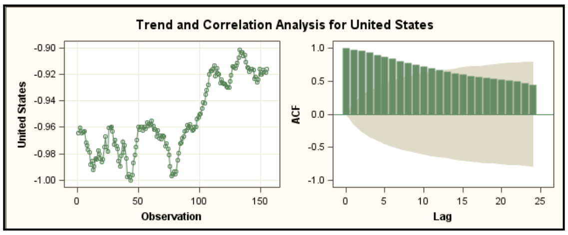

Trend and Correlation Analysis for Netherlands
Netherlands
Observation
ACF
Lag


Trend and Correlation Analysis for Norway
Norway
Observation
ACF
Lag

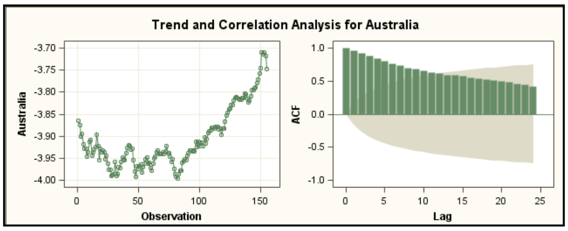

Trend and Correlation Analysis for Spain
Spain
Observation
ACF
Lag

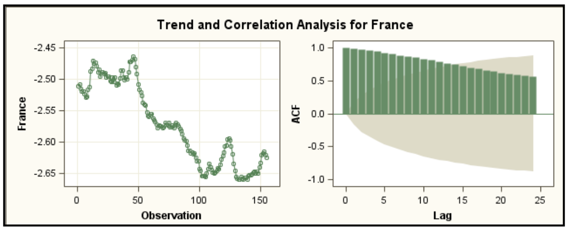

Trend and Correlation Analysis for Sweden
Sweden
Observation
ACF
Lag

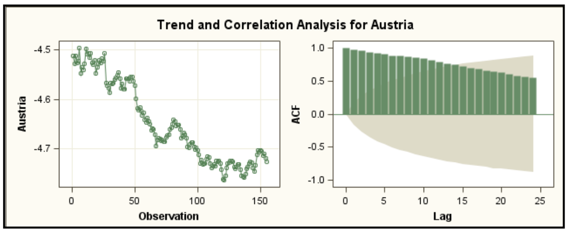

Trend and Correlation Analysis for United Kingdom
United Kingdom
Observation
ACF
Lag

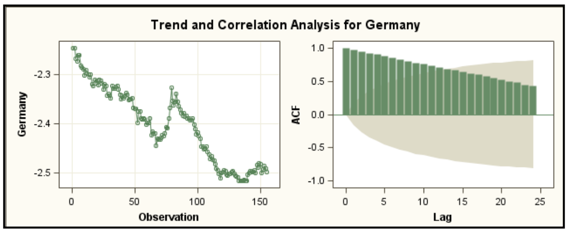

Trend and Correlation Analysis for United States
United States
Observation
ACF
Lag

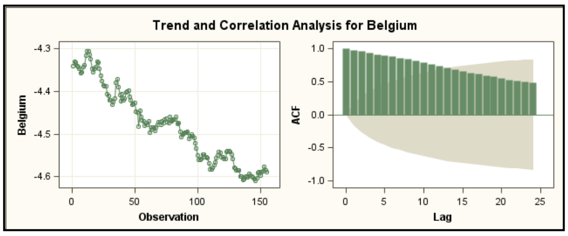
Variable: NGDP_G

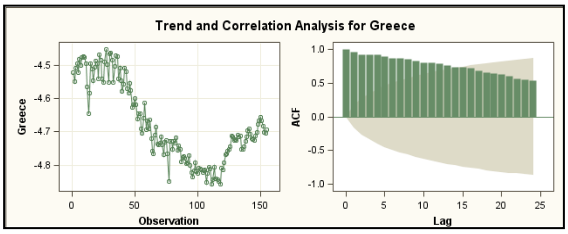


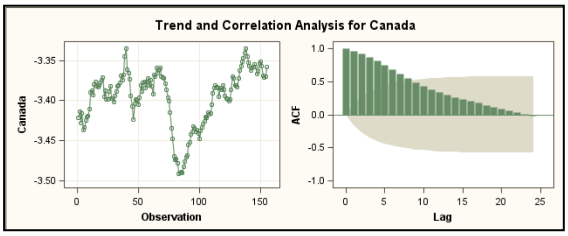


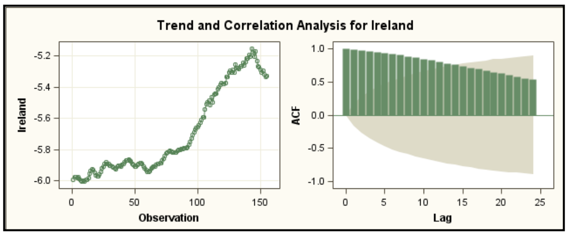


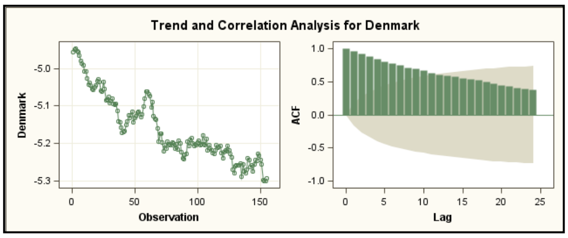


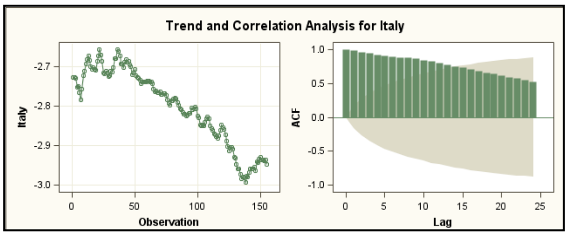


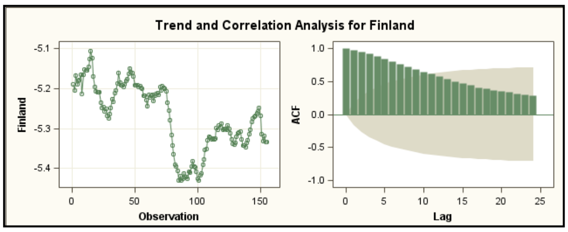


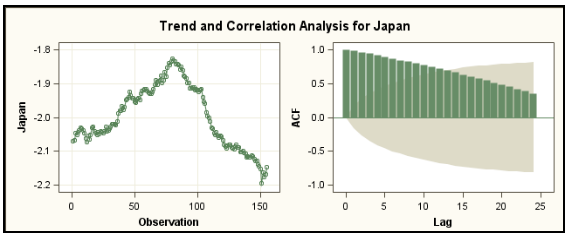


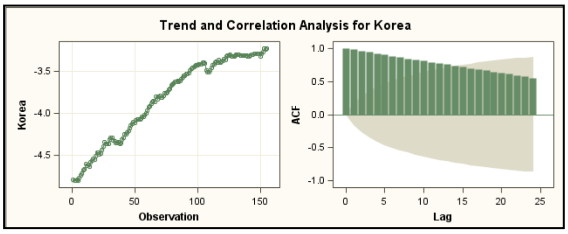


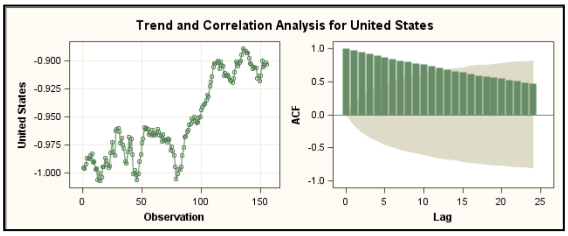


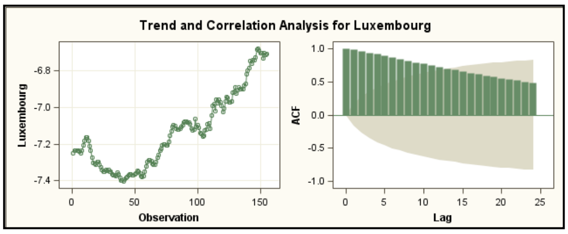


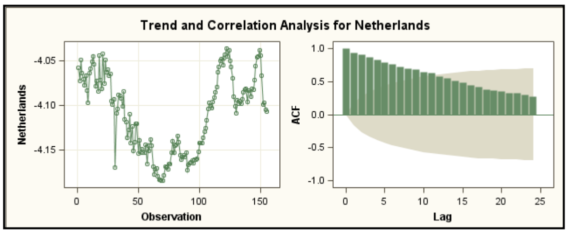


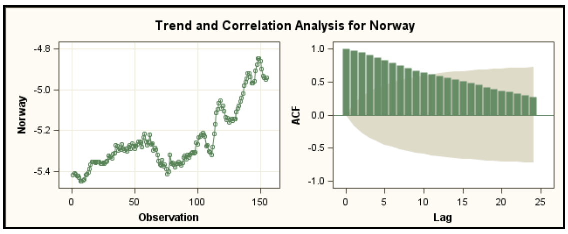


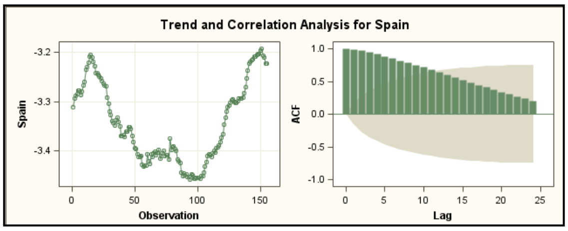

Trend and Correlation Analysis for Korea
Korea
Observation
ACF
Lag

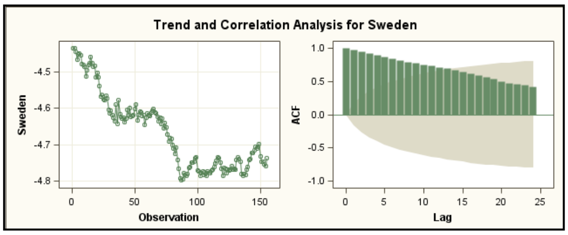

Trend and Correlation Analysis for United States
United States
Observation
ACF
Lag

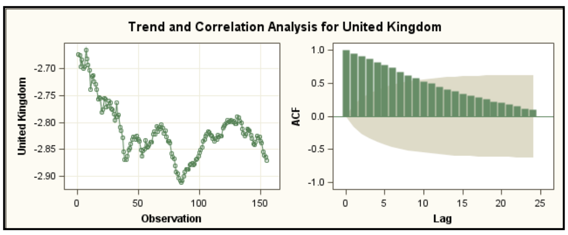

Trend and Correlation Analysis for Luxembourg
Luxembourg
Observation
ACF
Lag


Trend and Correlation Analysis for Netherlands
Netherlands
Observation
ACF
Lag

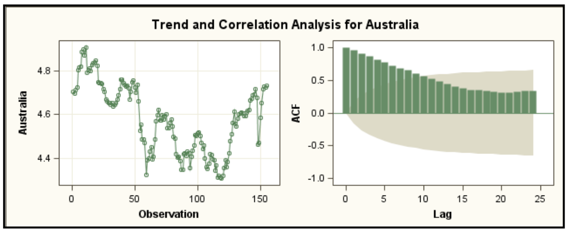

Trend and Correlation Analysis for Norway
Norway
Observation
ACF
Lag

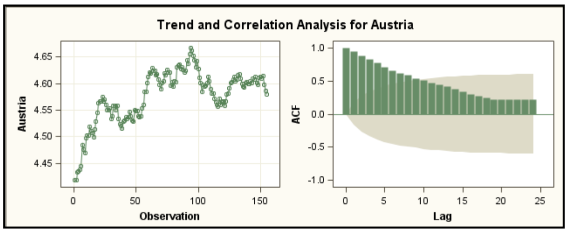

Trend and Correlation Analysis for Spain
Spain
Observation
ACF
Lag

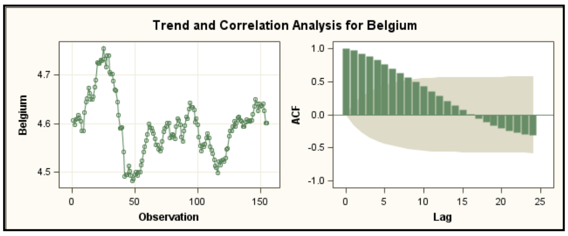

Trend and Correlation Analysis for Sweden
Sweden
Observation
ACF
Lag

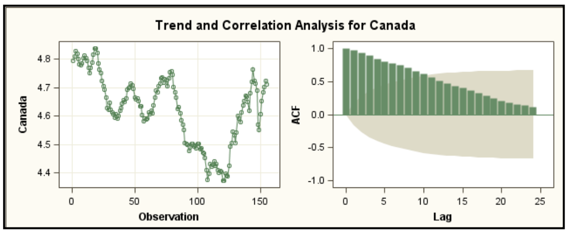

Trend and Correlation Analysis for United Kingdom
United Kingdom
Observation
ACF
Lag

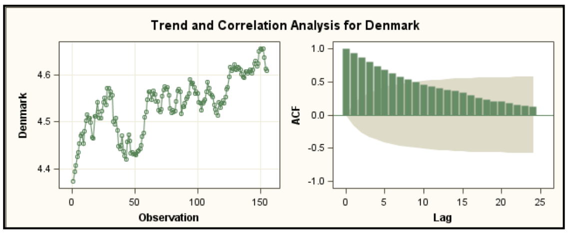
Variable: REER

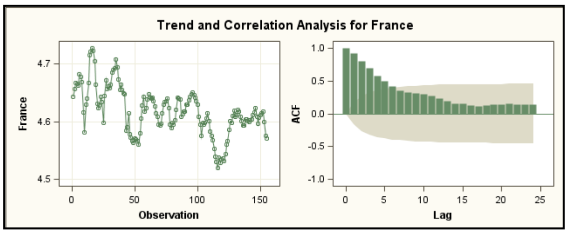


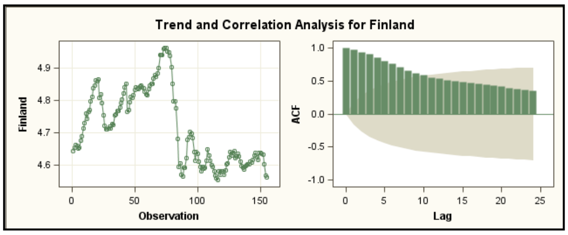


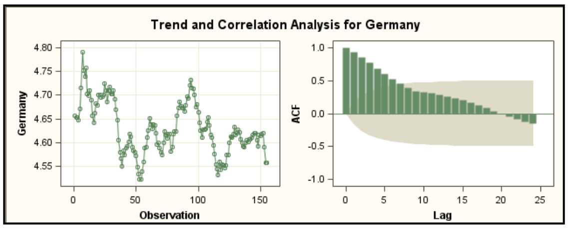


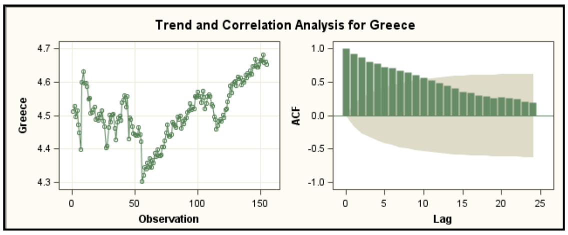


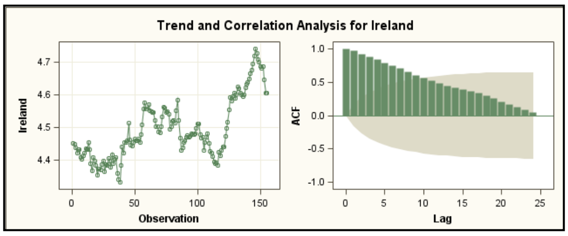


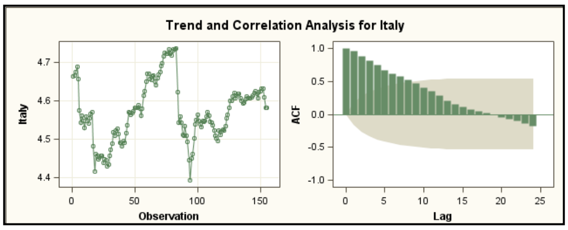


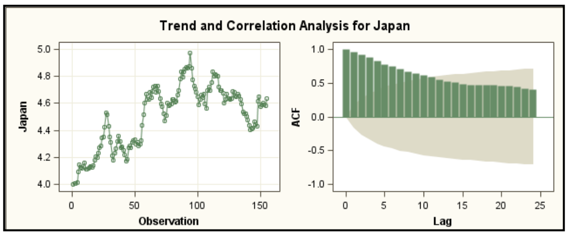


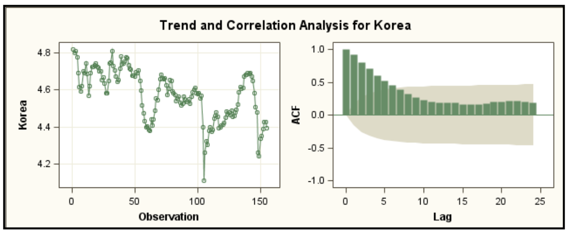


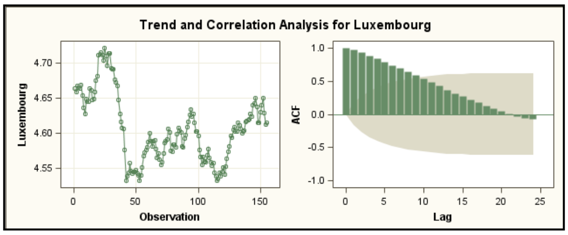


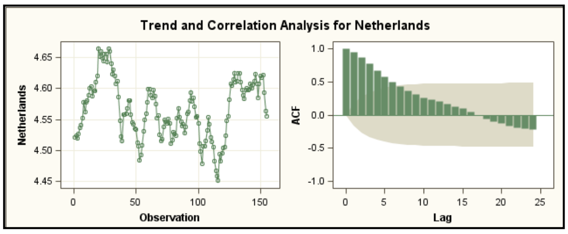


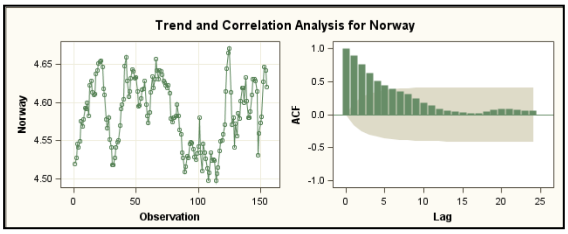


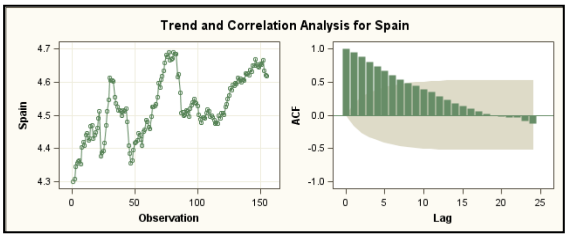


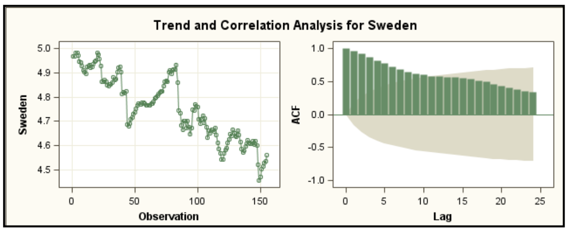


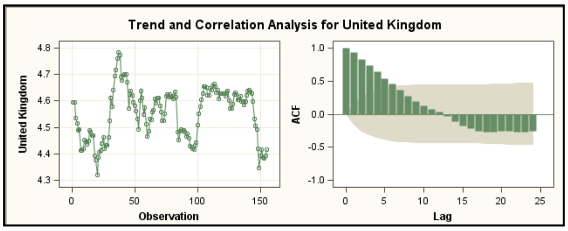


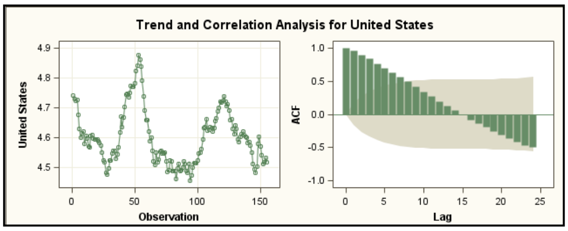

Trend and Correlation Analysis for Netherlands
Netherlands
Observation
ACF
Lag


Trend and Correlation Analysis for Norway
Norway
Observation
ACF
Lag

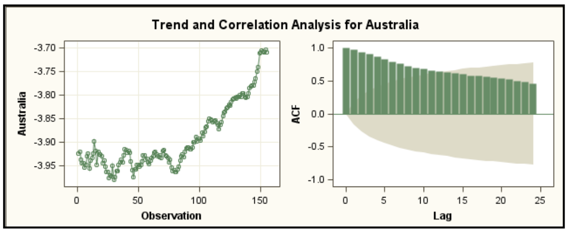

Trend and Correlation Analysis for Spain
Spain
Observation
ACF
Lag

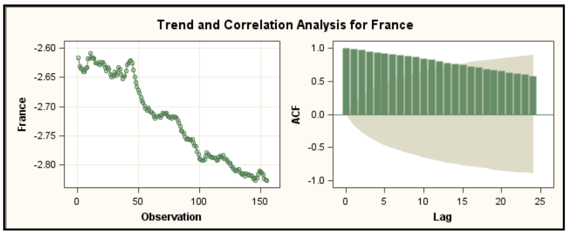

Trend and Correlation Analysis for Sweden
Sweden
Observation
ACF
Lag

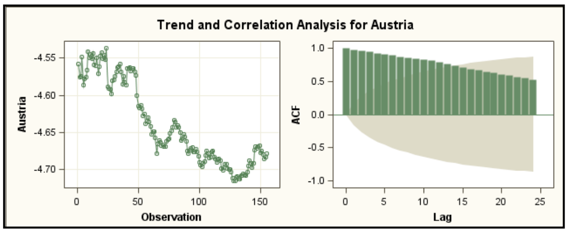

Trend and Correlation Analysis for United Kingdom
United Kingdom
Observation
ACF
Lag

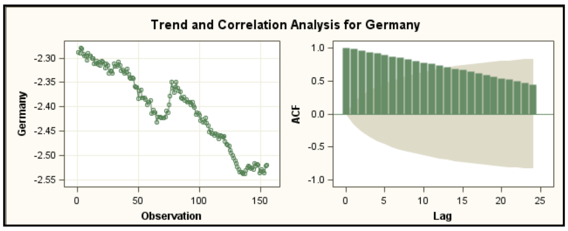

Trend and Correlation Analysis for United States
United States
Observation
ACF
Lag

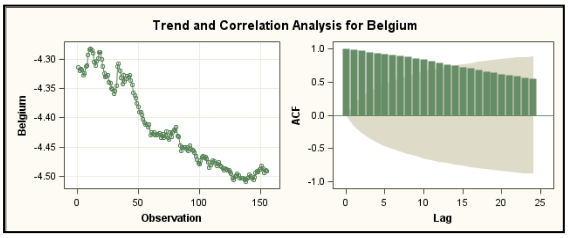
Variable: RGDP

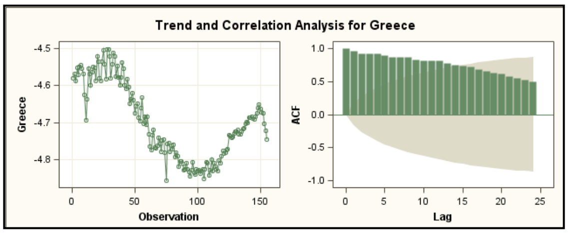


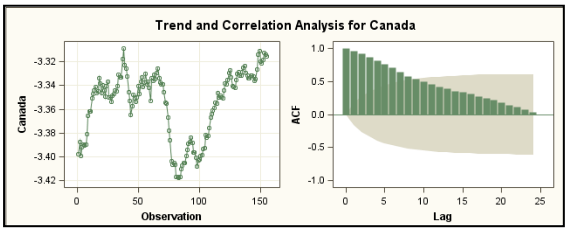


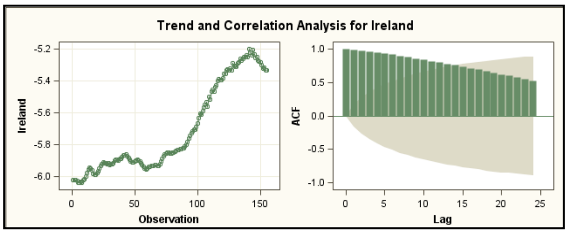


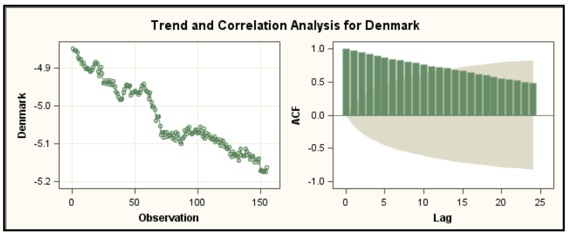


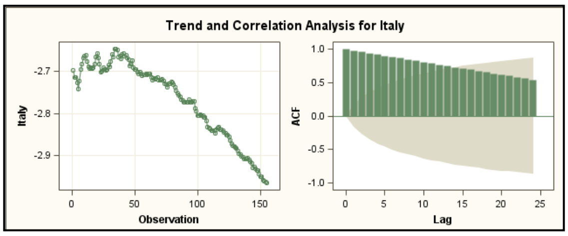


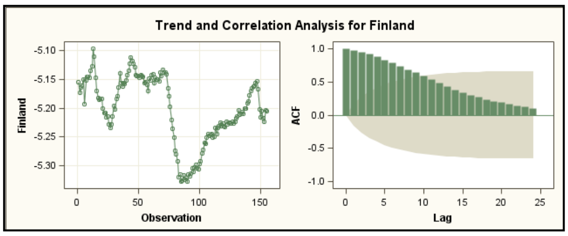


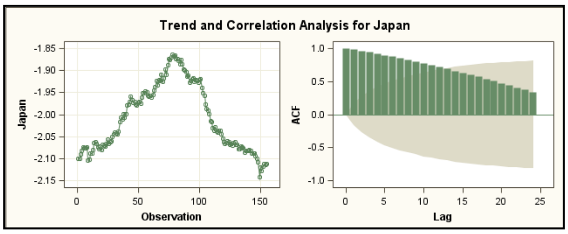


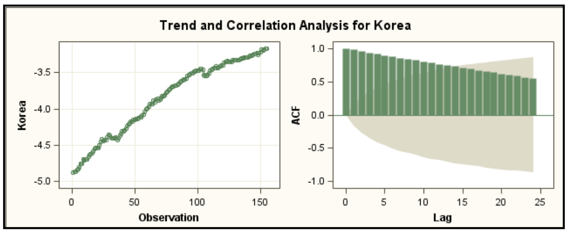


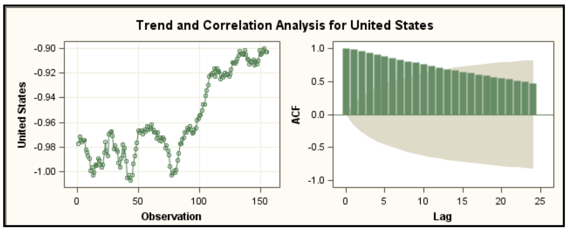









Trend and Correlation Analysis for Korea
Korea
Observation
ACF
Lag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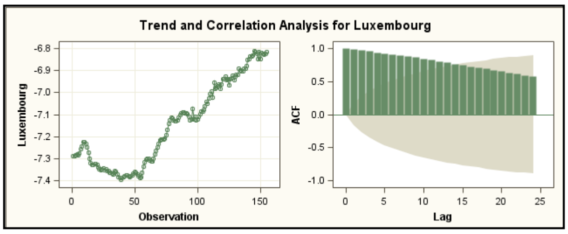
Observation
ACF
Lag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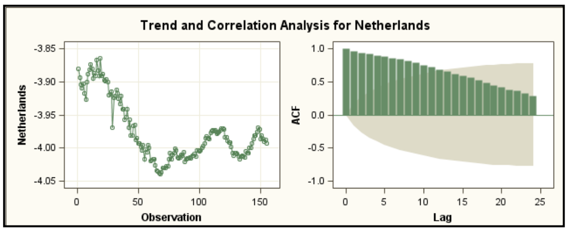
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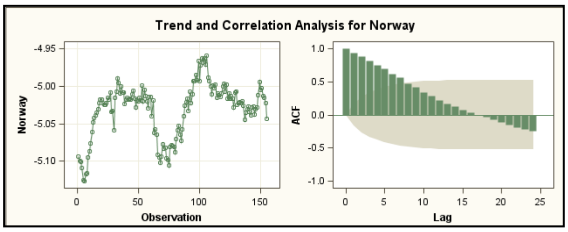
Lag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Observation
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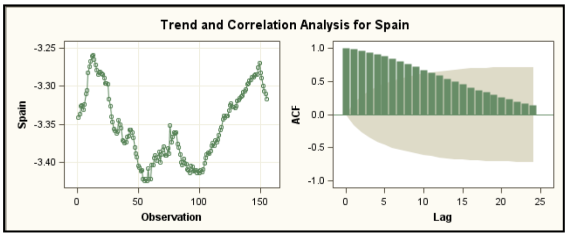
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Observation
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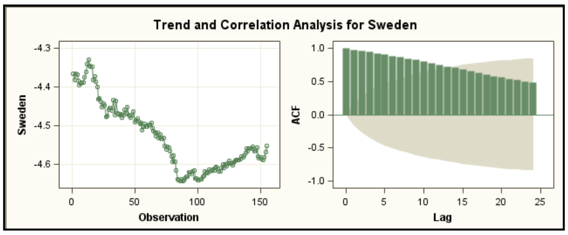
Lag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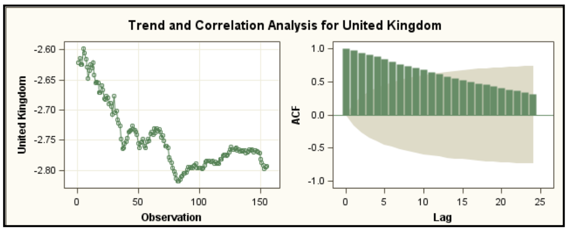
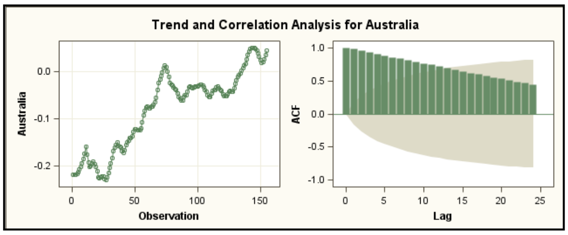
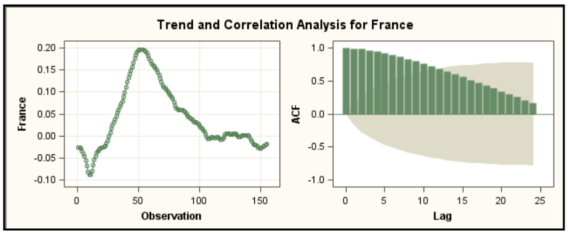
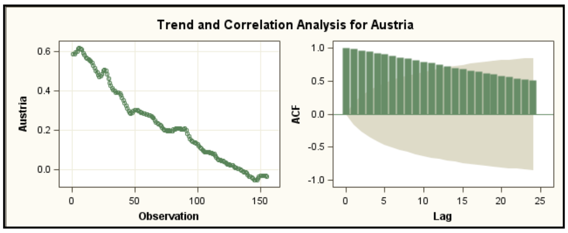
Observation
ACF
Lag

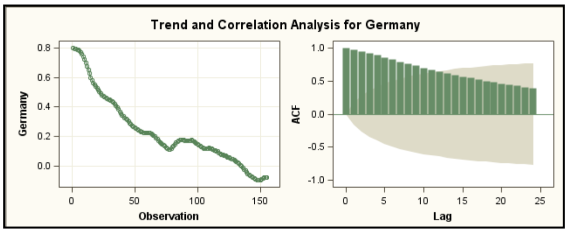

Trend and Correlation Analysis for United Kingdom
United Kingdom
Observation
ACF
Lag

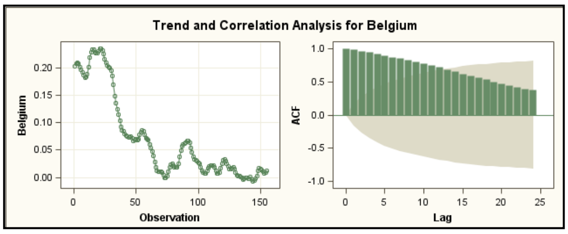
Variable: ULC

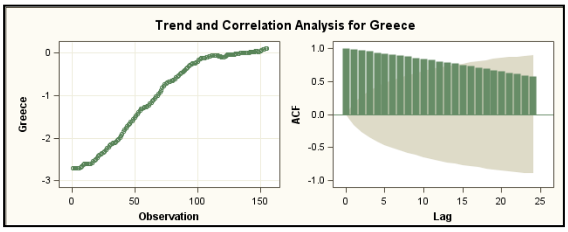


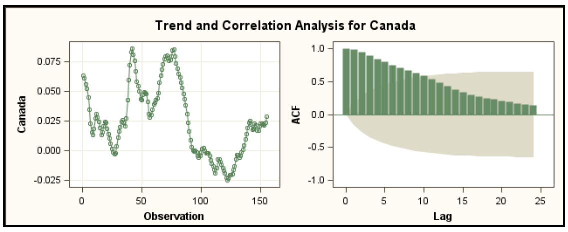


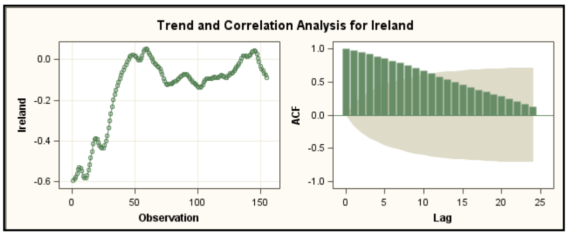


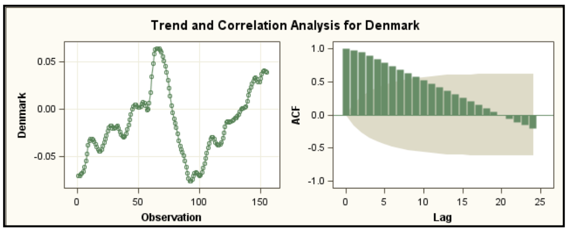


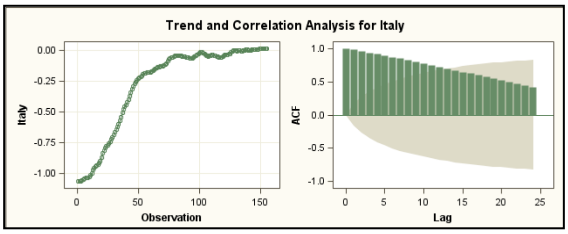


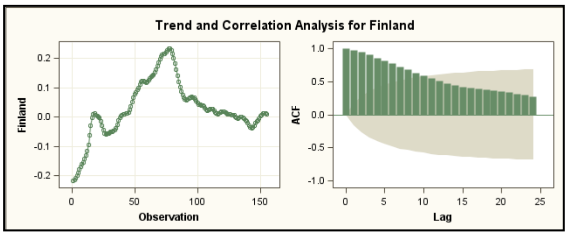


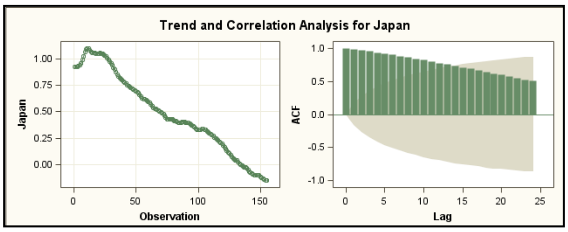


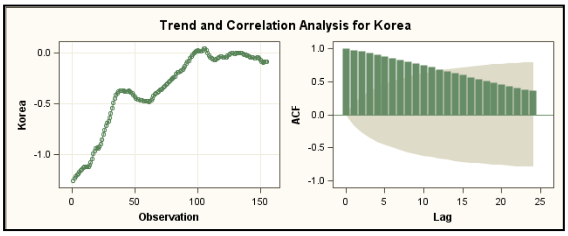


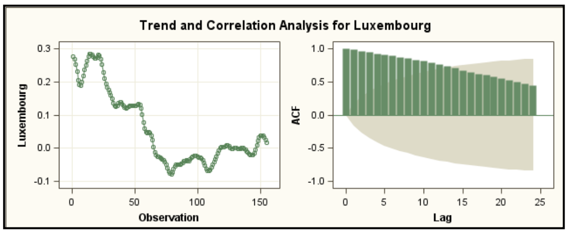


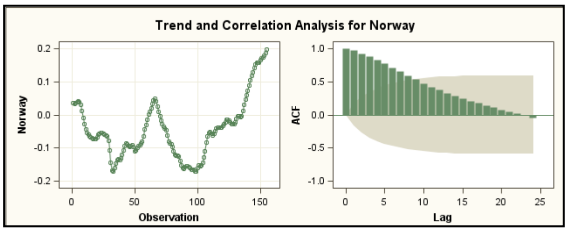







Trend and Correlation Analysis for Korea
Korea
Observation
ACF
Lag


Trend and Correlation Analysis for Luxembourg
Luxembourg
Observation
ACF
Lag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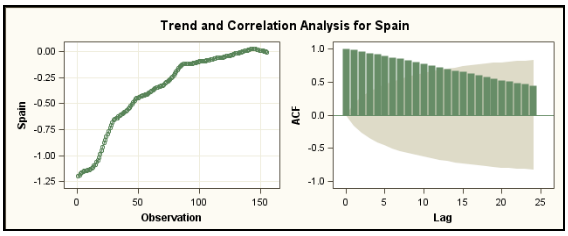
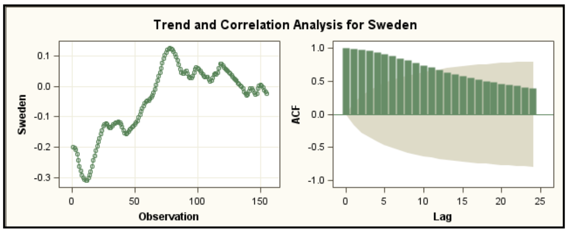
Norway
Observation
ACF
Lag


Trend and Correlation Analysis for Spain
Spain
Observation
ACF
Lag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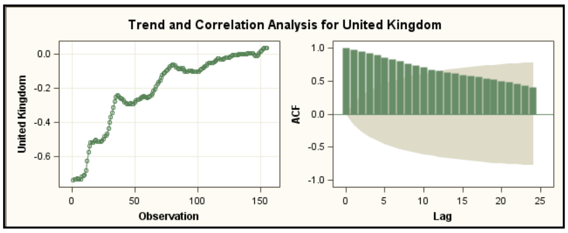
Observation
ACF
Lag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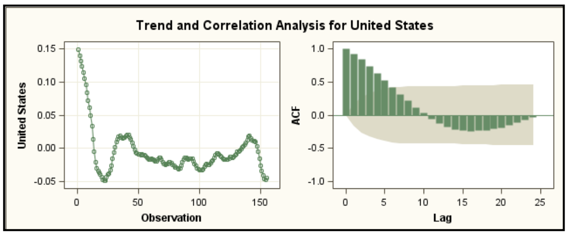
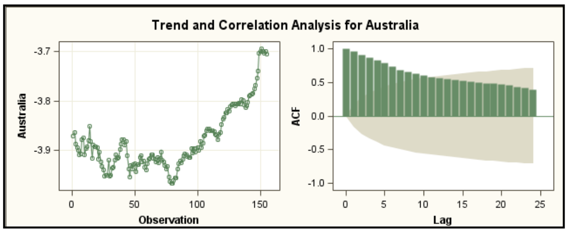
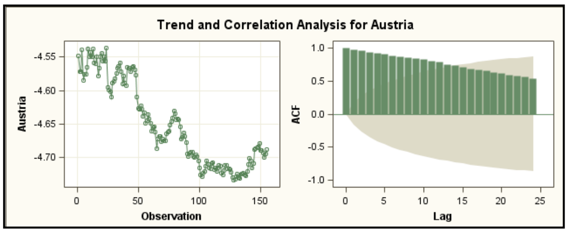
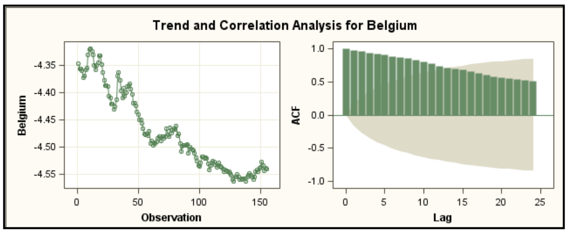
Observation
ACF
Lag

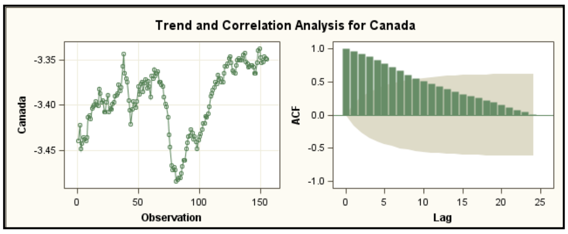

Trend and Correlation Analysis for United States
United States
Observation
ACF
Lag

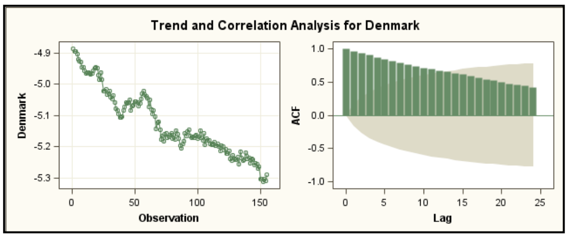
Variable: RGDP_G

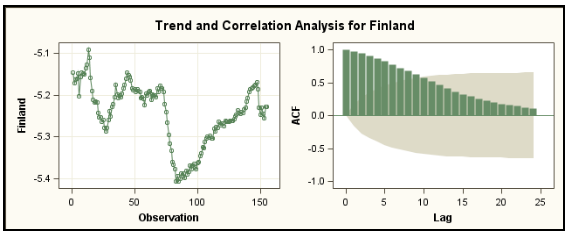


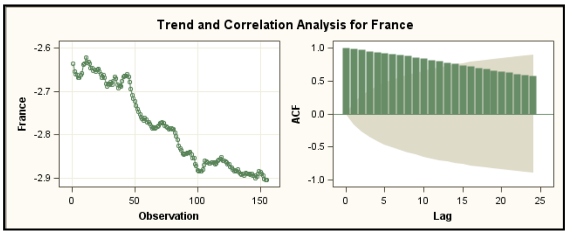


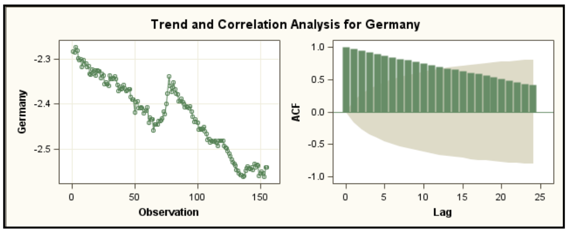


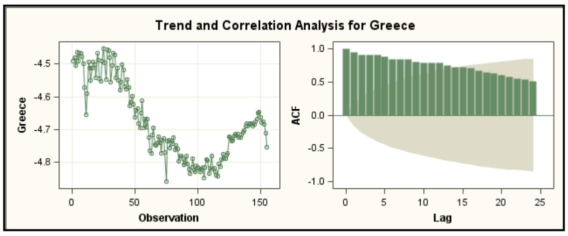


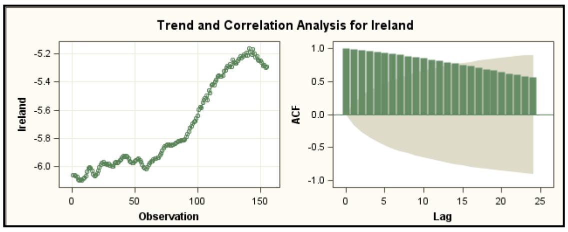


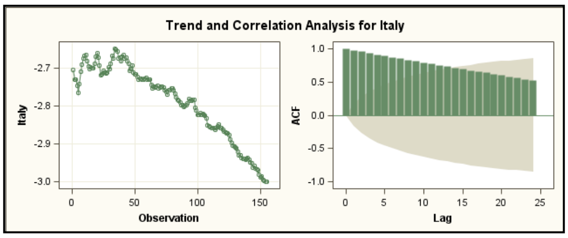


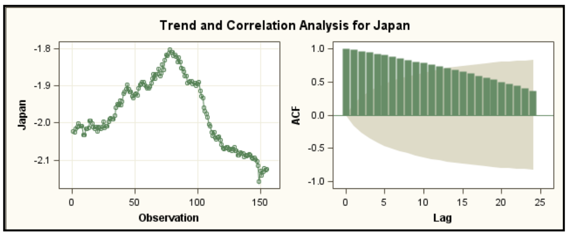


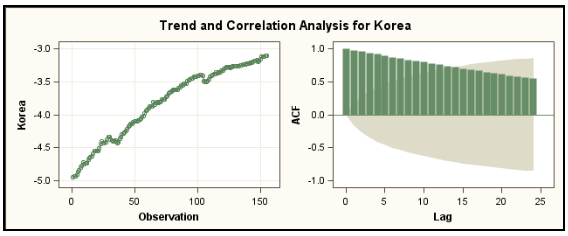


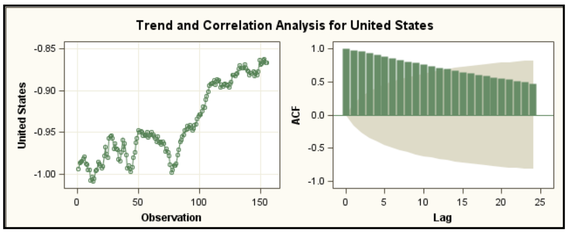









Trend and Correlation Analysis for Korea
Korea
Observation
ACF
Lag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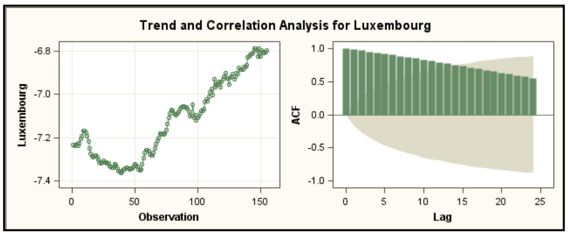
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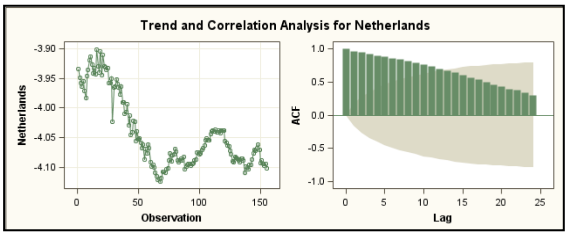
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ACF
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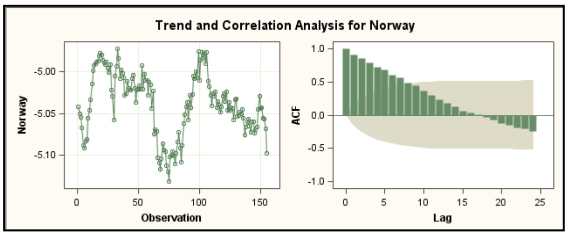
Trend and Correlation Analysis for Norway
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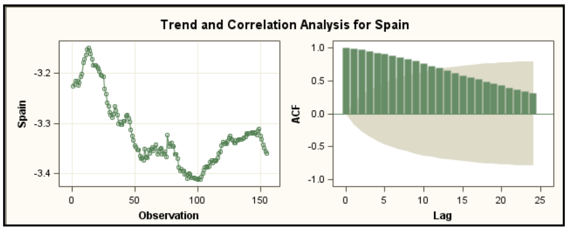
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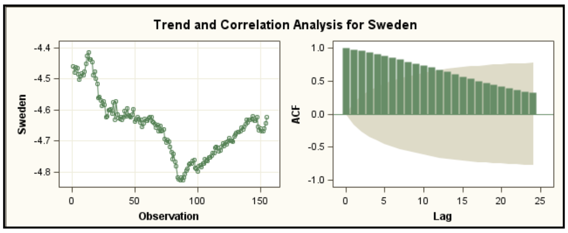
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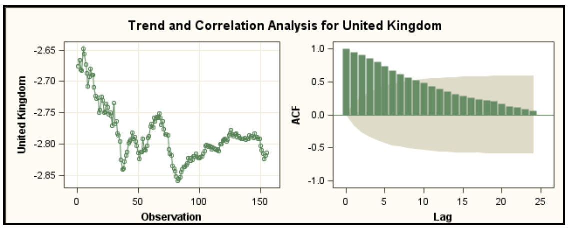
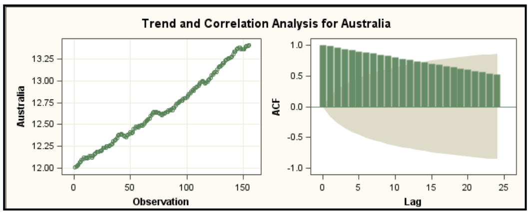
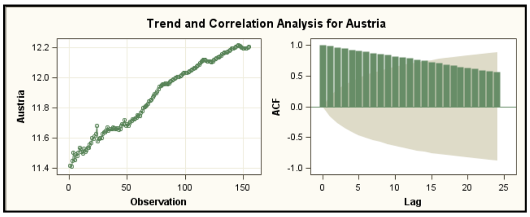
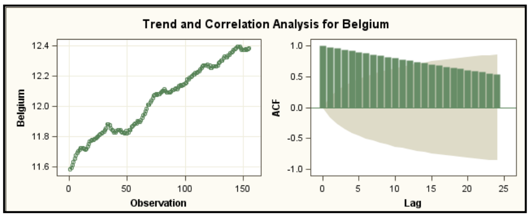

Trend and Correlation Analysis for United Kingdom
United Kingdom
Observation
ACF
Lag

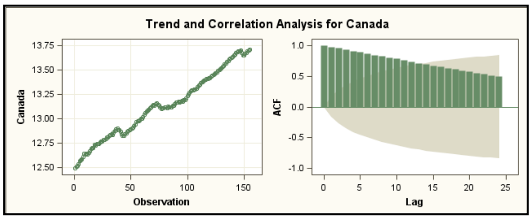
<u>Variables free of ratios:</u>

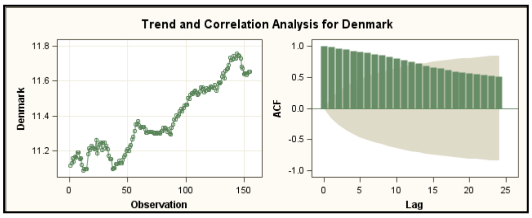
Variable: CI

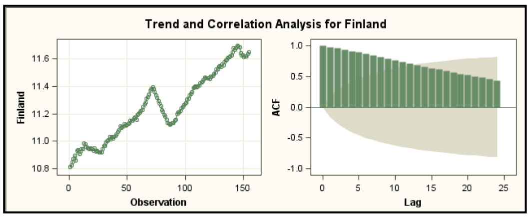


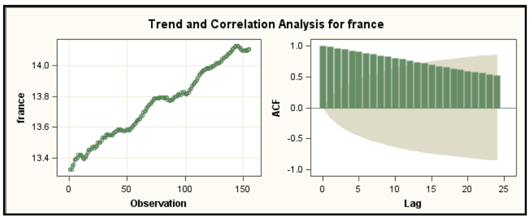


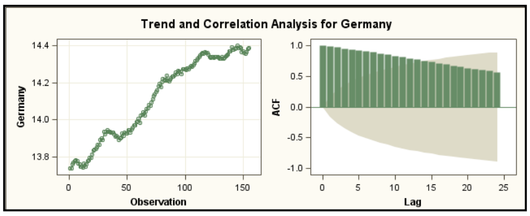


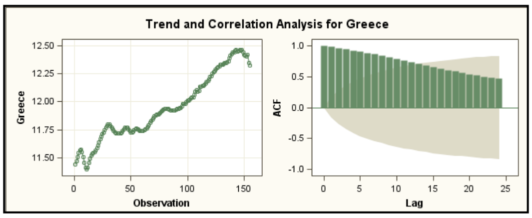


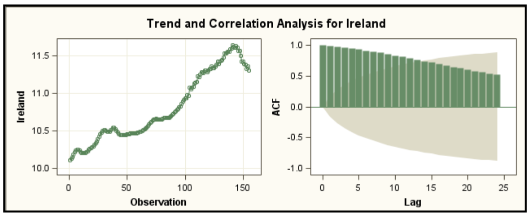


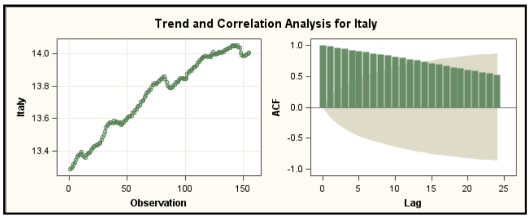


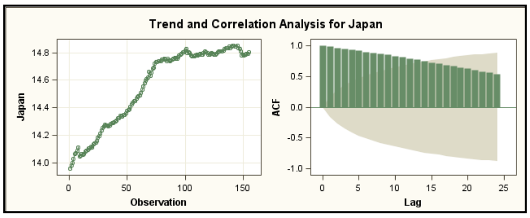


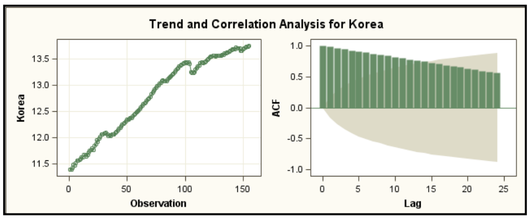


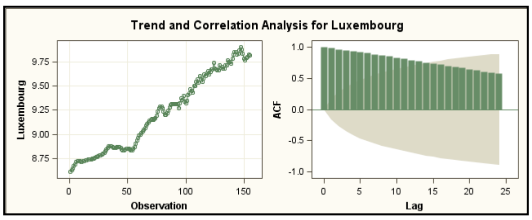


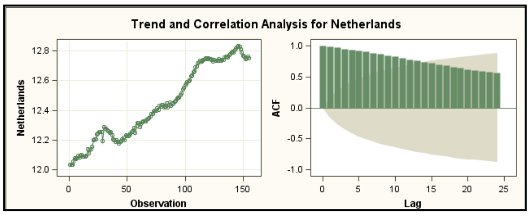


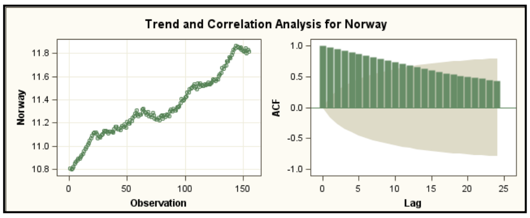









Trend and Correlation Analysis for Netherlands
Netherlands
Observation
ACF
Lag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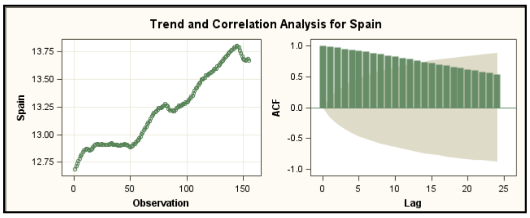
Norway
Observation
ACF
Lag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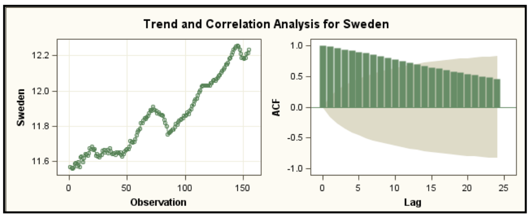
Spain
Observation
ACF
Lag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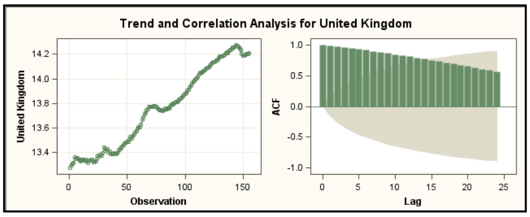
Observation
ACF
Lag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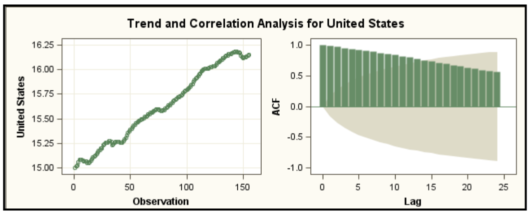
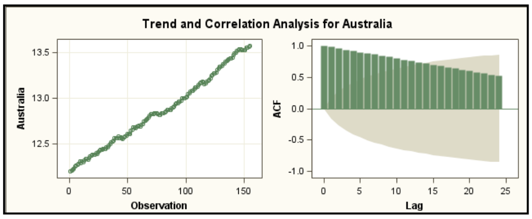
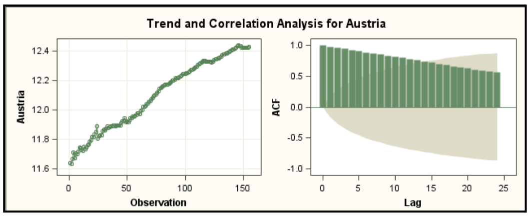
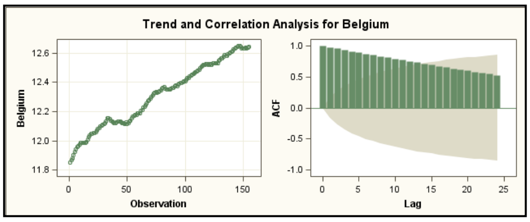
United Kingdom
Observation
ACF
Lag

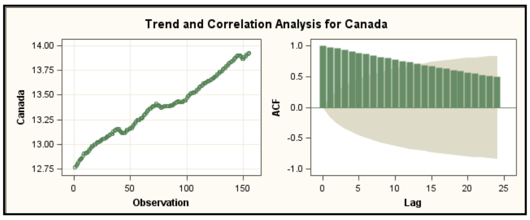

Trend and Correlation Analysis for United States
United States
Observation
ACF
Lag

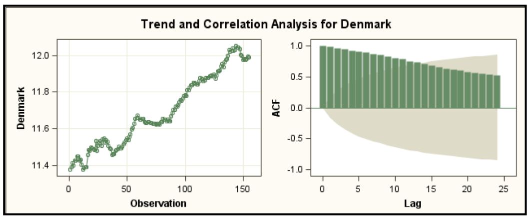
Variable: CIG

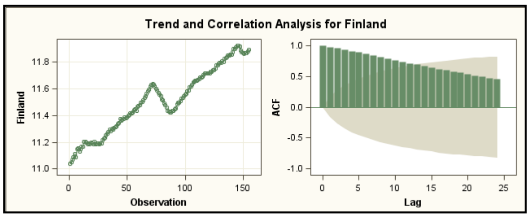


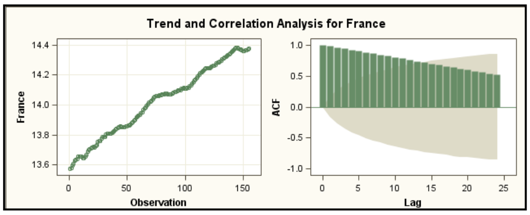


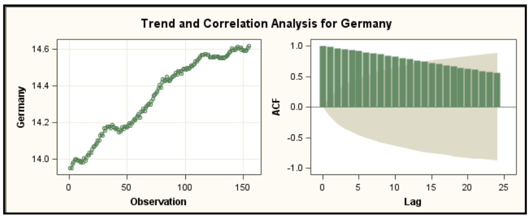


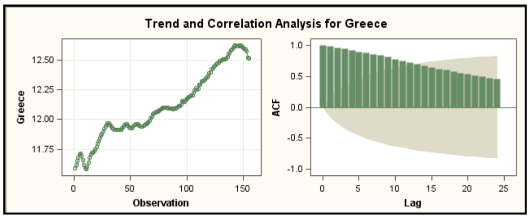


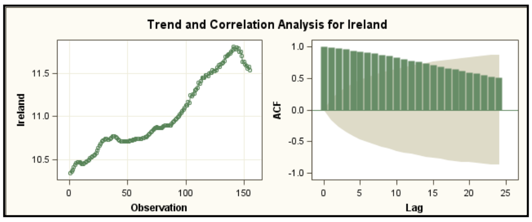


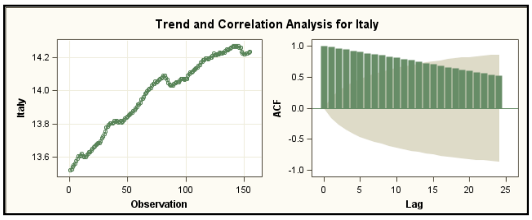


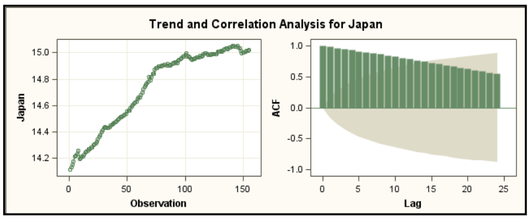


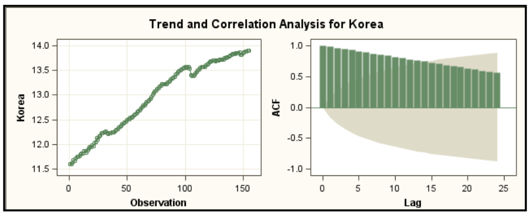


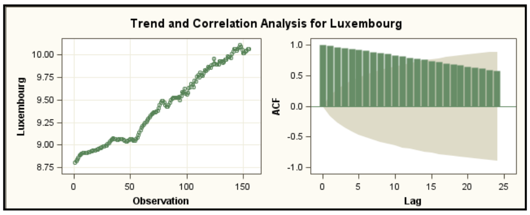


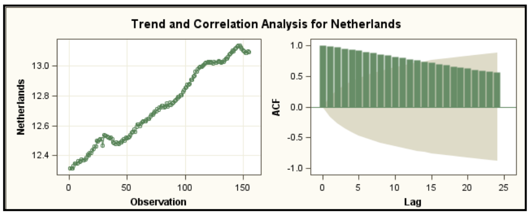


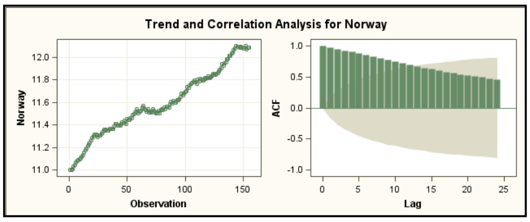


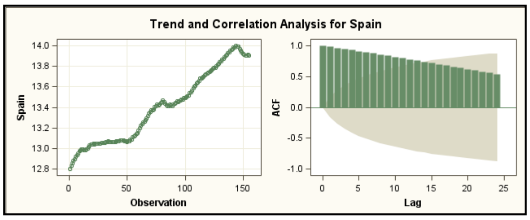


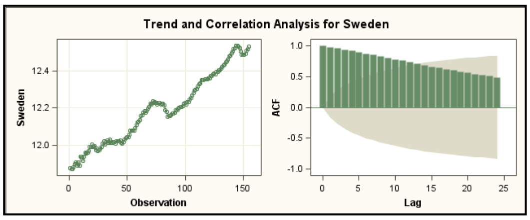


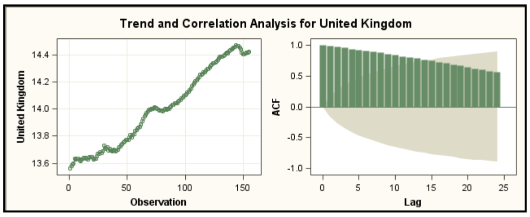


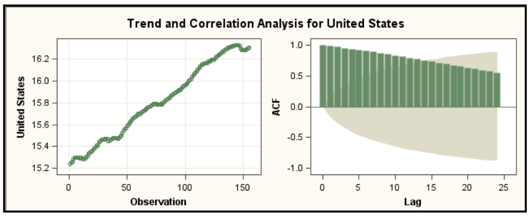

Trend and Correlation Analysis for Netherlands
Netherlands
Observation
ACF
Lag


Trend and Correlation Analysis for Norway
Norway
Observation
ACF
Lag

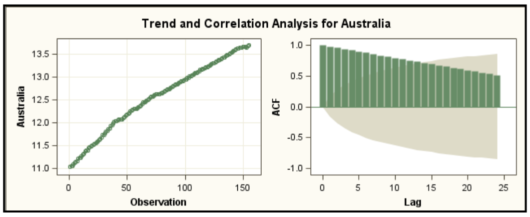

Trend and Correlation Analysis for Spain
Spain
Observation
ACF
Lag

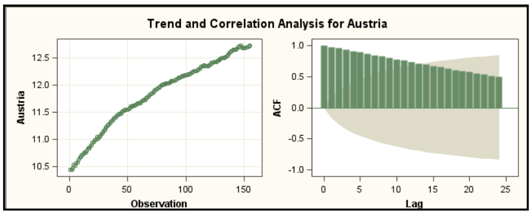

Trend and Correlation Analysis for Sweden
Sweden
Observation
ACF
Lag

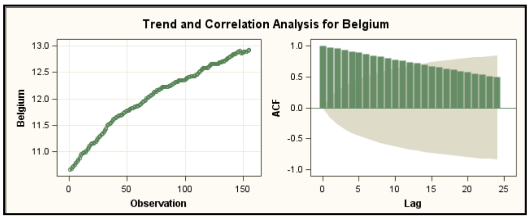

Trend and Correlation Analysis for United Kingdom
United Kingdom
Observation
ACF
Lag

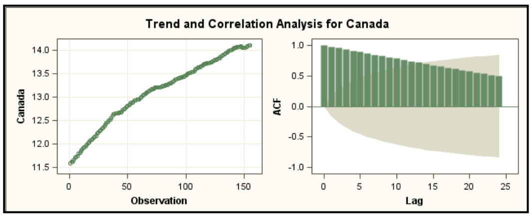

Trend and Correlation Analysis for United States
United States
Observation
ACF
Lag

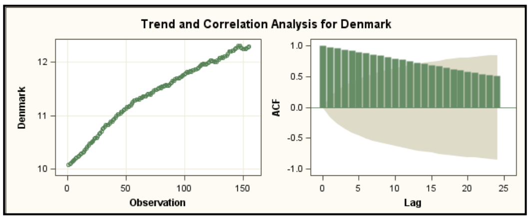
Variable: NGDP

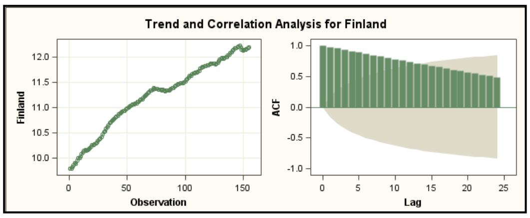


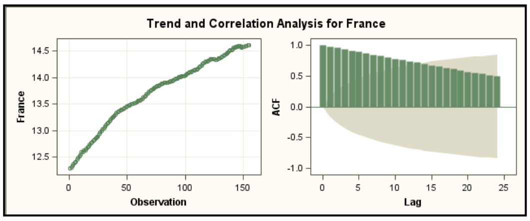


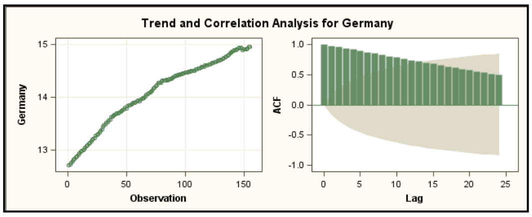


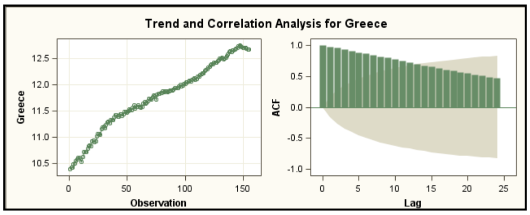


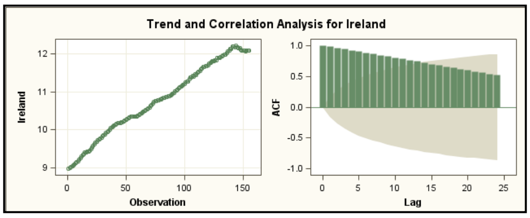


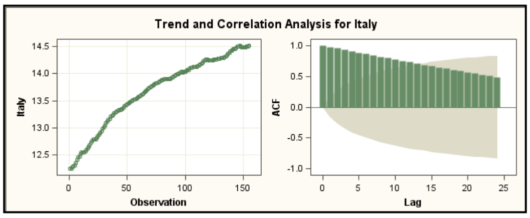


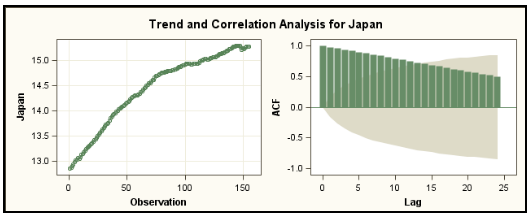


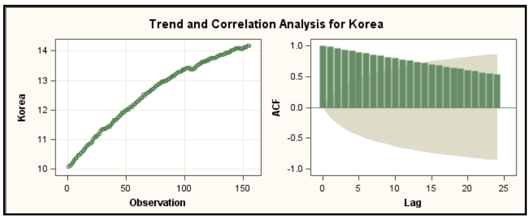


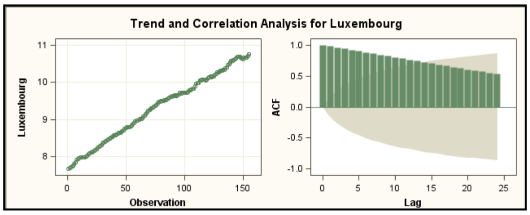


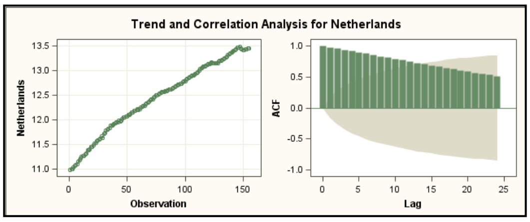


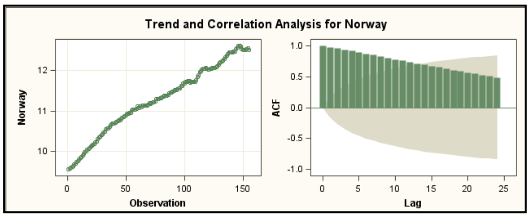


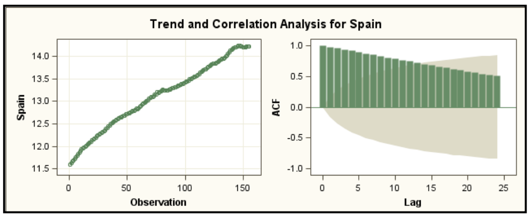


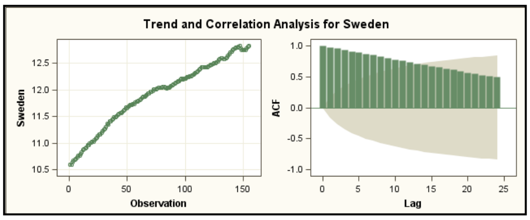


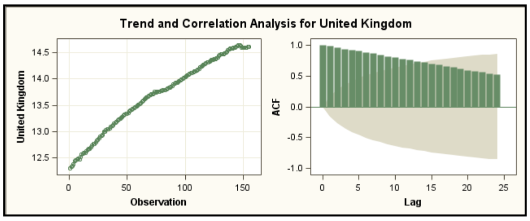



Trend and Correlation Analysis for Netherlands
Netherlands
Observation
ACF
Lag


Trend and Correlation Analysis for Norway
Norway
Observation
ACF
Lag


Trend and Correlation Analysis for Spain
Spain
Observation
ACF
Lag


Trend and Correlation Analysis for Sweden
Sweden
Observation
ACF
Lag


Trend and Correlation Analysis for United Kingdom
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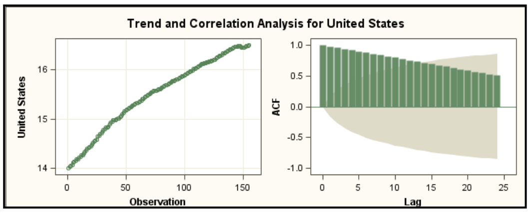
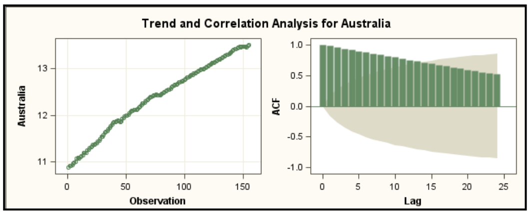
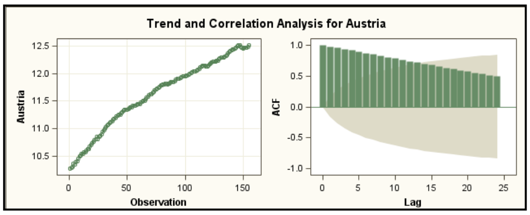
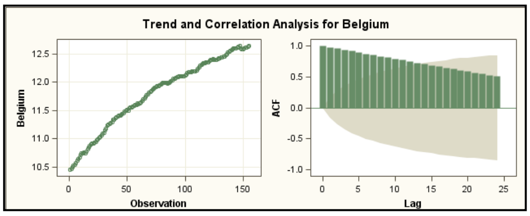
Observation
ACF
Lag

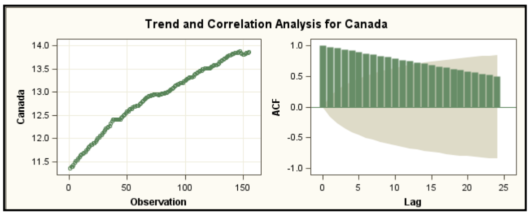

Trend and Correlation Analysis for United States
United States
Observation
ACF
Lag

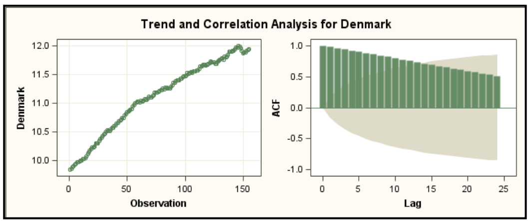
Variable: NGDP_G

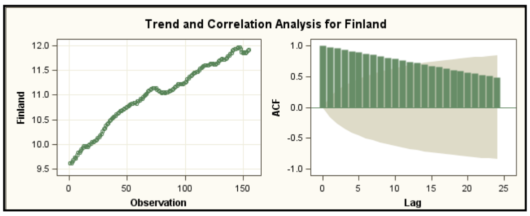


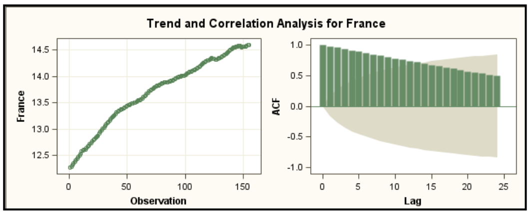


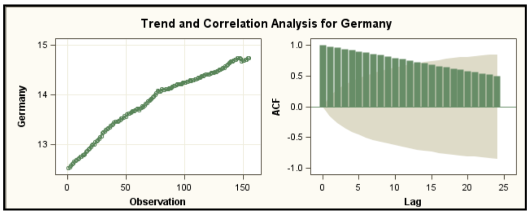


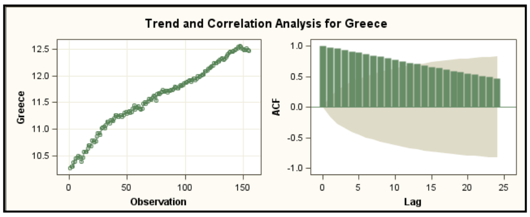


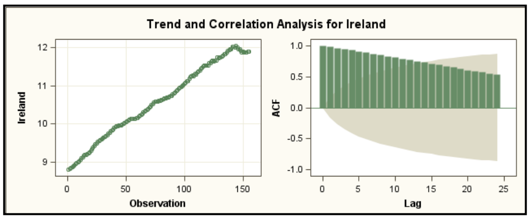


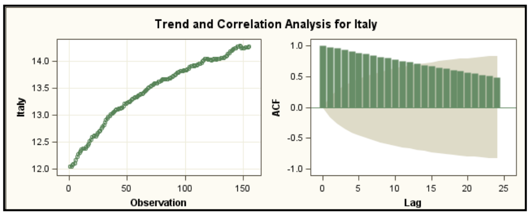


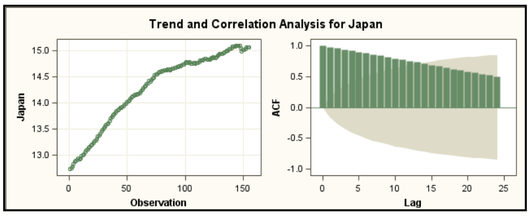


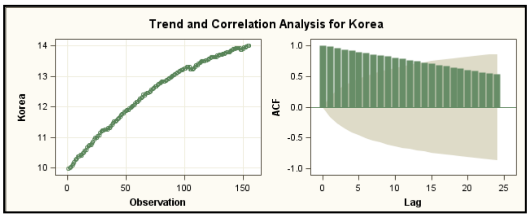


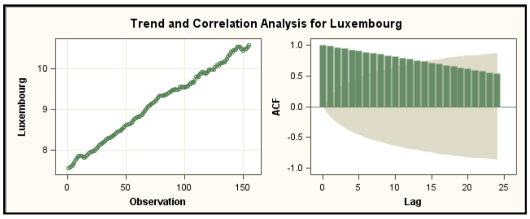


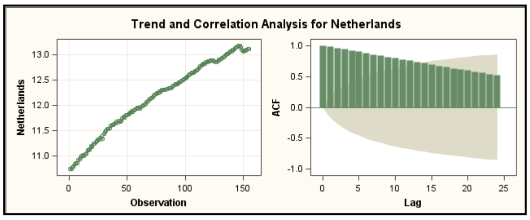


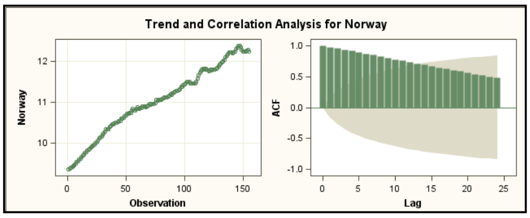


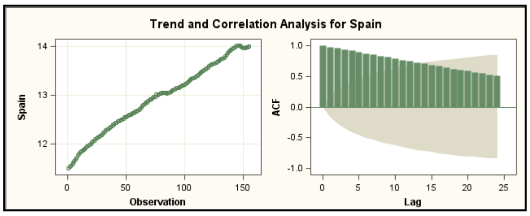


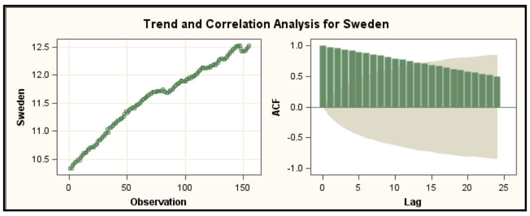


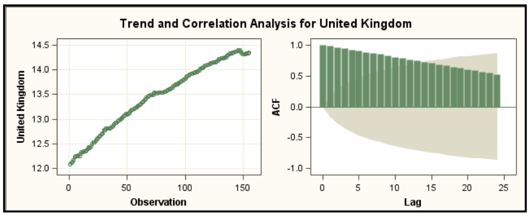


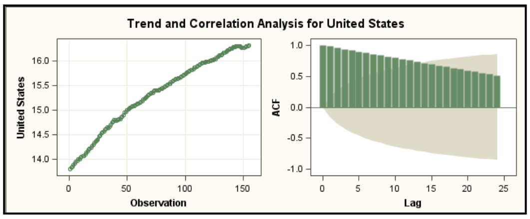

Trend and Correlation Analysis for Netherlands
Netherlands
Observation
ACF
Lag


Trend and Correlation Analysis for Norway
Norway
Observation
ACF
Lag

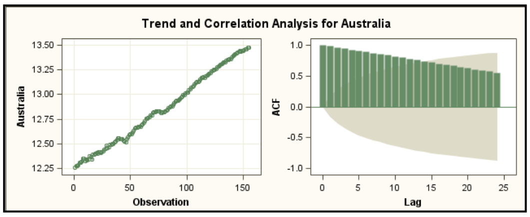

Trend and Correlation Analysis for Spain
Spain
Observation
ACF
Lag

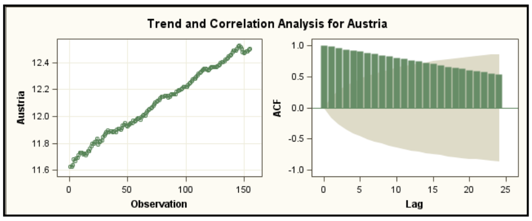

Trend and Correlation Analysis for Sweden
Sweden
Observation
ACF
Lag

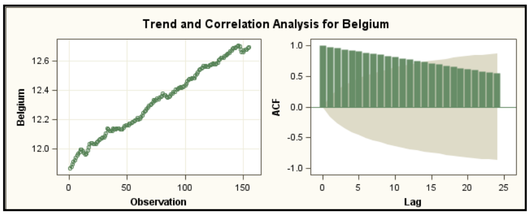

Trend and Correlation Analysis for United Kingdom
United Kingdom
Observation
ACF
Lag

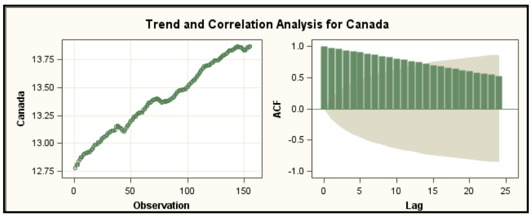

Trend and Correlation Analysis for United States
United States
Observation
ACF
Lag

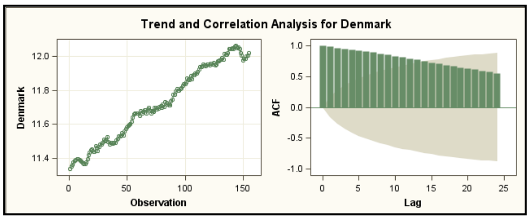
Variable: RGDP

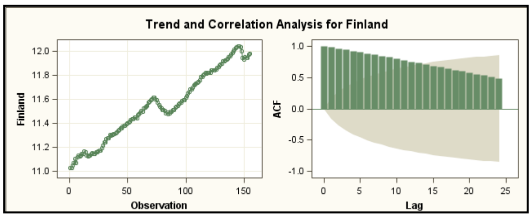


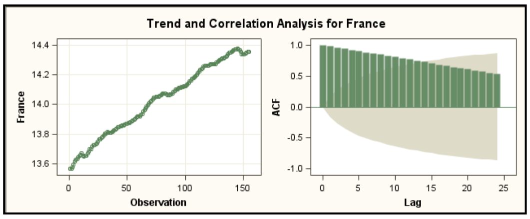


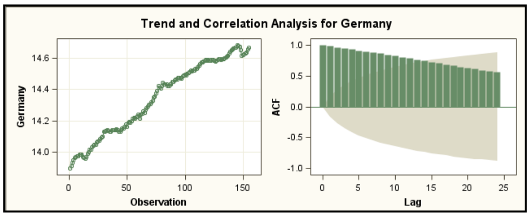


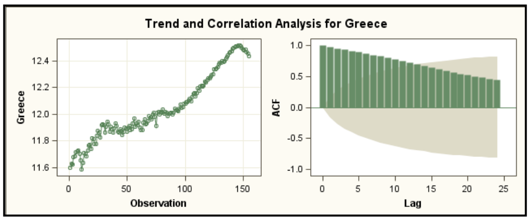


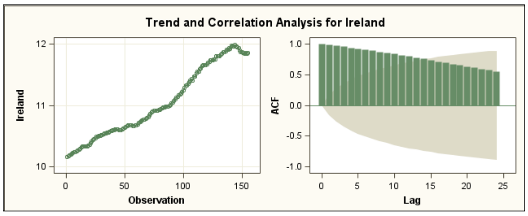


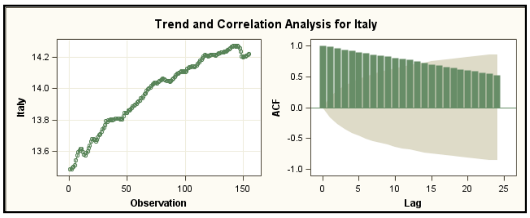


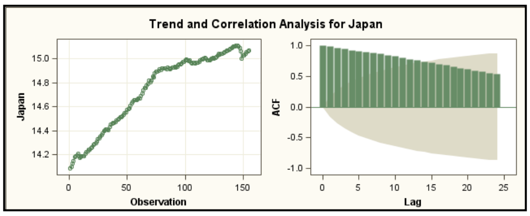


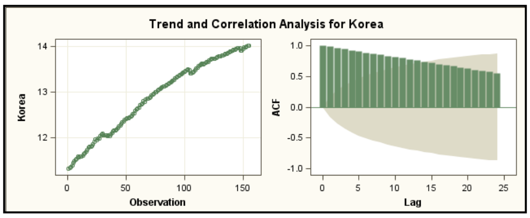


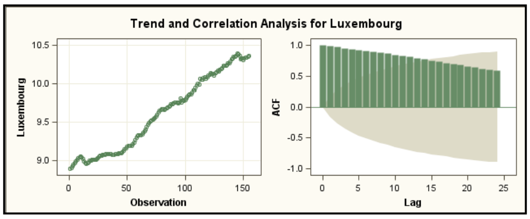


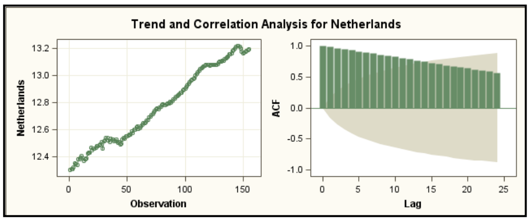


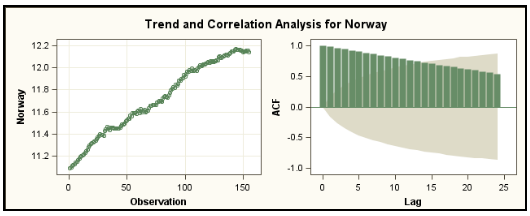


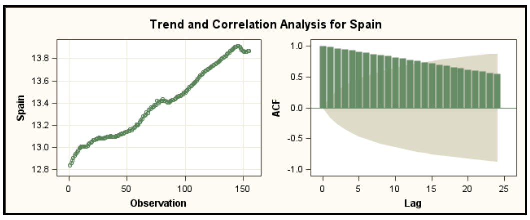


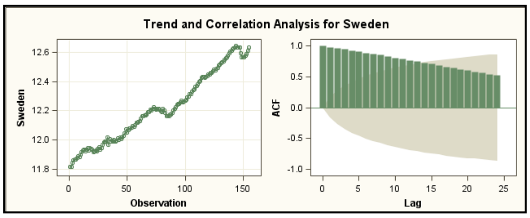




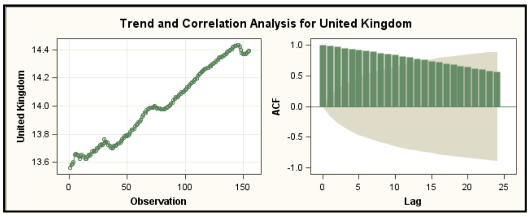

Trend and Correlation Analysis for Netherlands
Netherlands
Observation
ACF
Lag

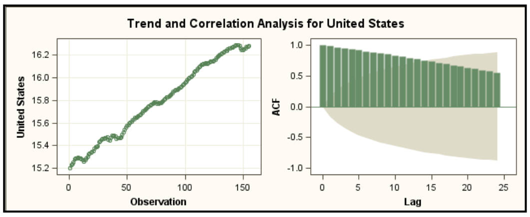

Trend and Correlation Analysis for Norway
Norway
Observation
ACF
Lag

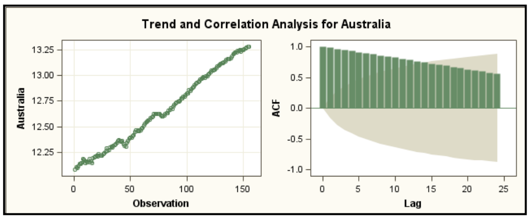

Trend and Correlation Analysis for Spain
Spain
Observation
ACF
Lag

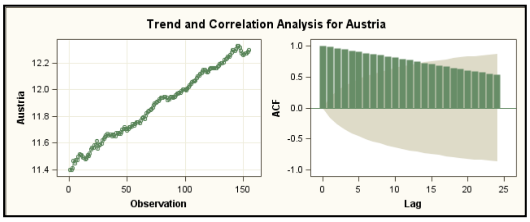

Trend and Correlation Analysis for Sweden
Sweden
Observation
ACF
Lag

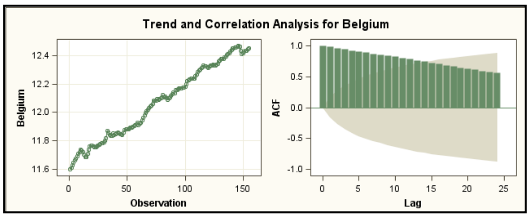
Variable: RGDP_G

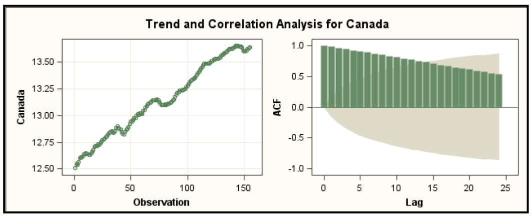


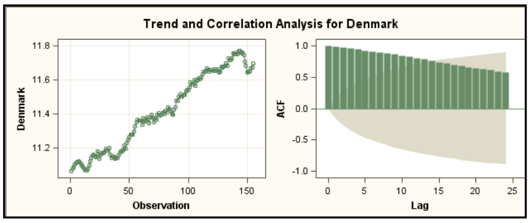


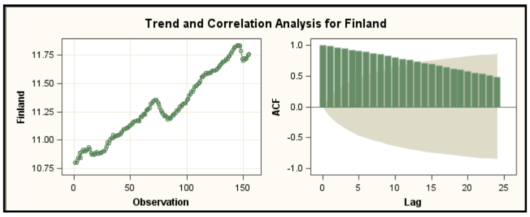


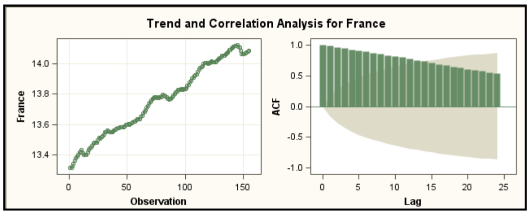


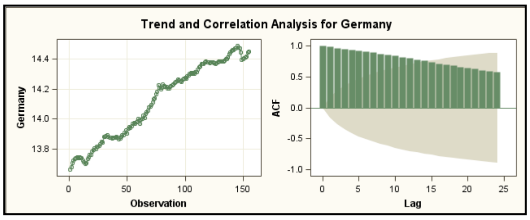


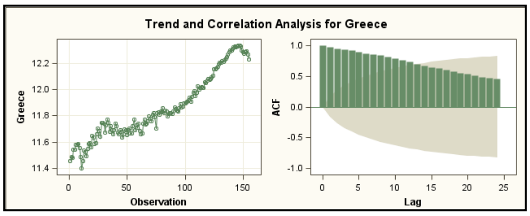


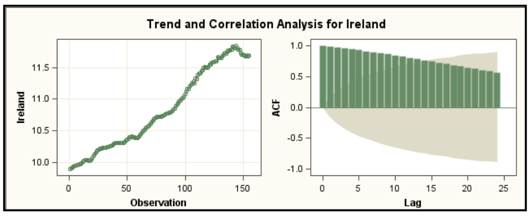


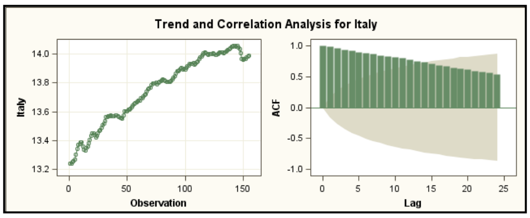


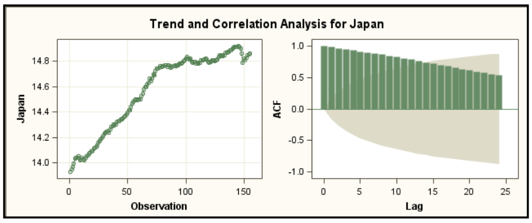


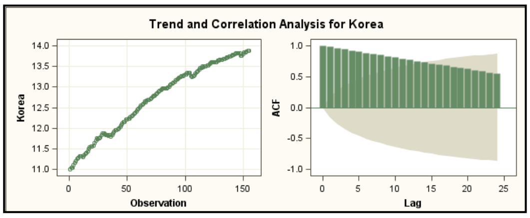


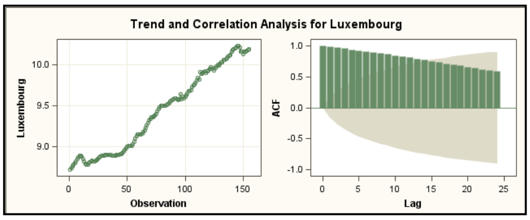


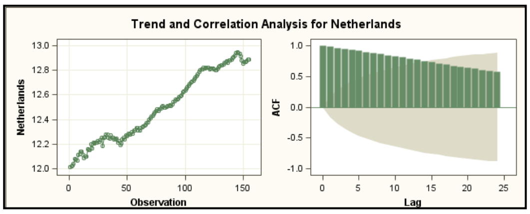


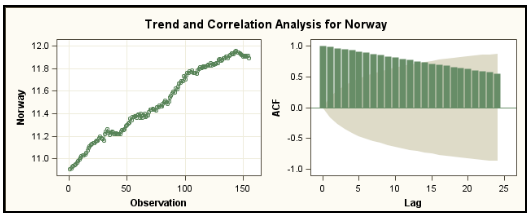


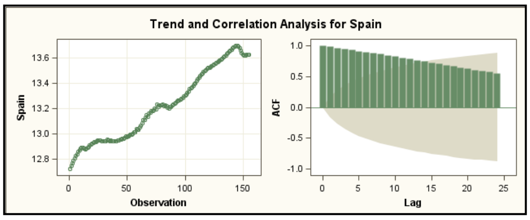


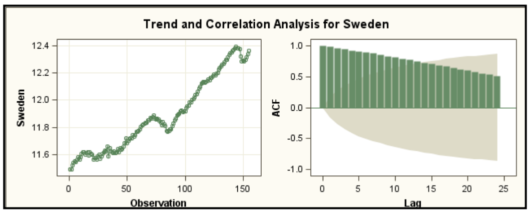

Trend and Correlation Analysis for Korea
Korea
Observation
ACF
Lag

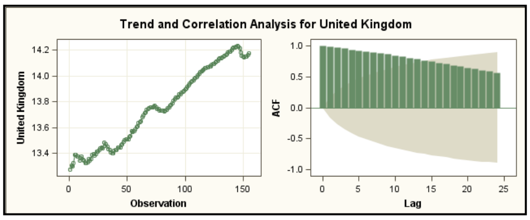

Trend and Correlation Analysis for Luxembourg
Luxembourg
Observation
ACF
Lag

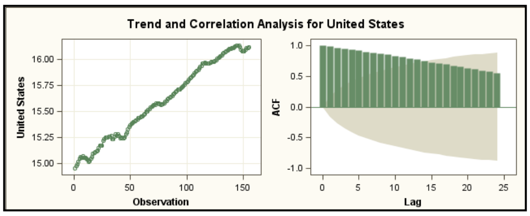

Trend and Correlation Analysis for Netherlands
Netherlands
Observation
ACF
Lag


Trend and Correlation Analysis for Norway
Norway
Observation
ACF
Lag


Trend and Correlation Analysis for Spain
Spain
Observation
ACF
Lag


Trend and Correlation Analysis for Sweden
Sweden
Observation
ACF
Lag


Trend and Correlation Analysis for United Kingdom
United Kingdom
Observation
ACF
Lag


Trend and Correlation Analysis for United States
United States
Observation
ACF
Lag

Appendix – D: Johansen cointegration test code for SAS

```
Proc varmax DATA=SASUSER.PREDLINREGPREDICTIONSIMPORT_0095;
model    Sweden_NGDP_G    Sweden_CI    Sweden_REER/p=2    nseason=4    scenter
print=(estimates diagnose) cointtest=(johansen);
      run;
```