ECONOMIC RESEARCH FORUM

منتدى البحوث الاقتصادية

2013

working paper series

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Working Paper No. 772

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September 2013

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First published in 2013 by
The Economic Research Forum (ERF)
21 Al-Sad Al-Aaly Street
Dokki, Giza
Egypt
www.erf.org.eg

Abstract

In this paper, we use an Extreme Bound Analysis (EBA) and Wavelet Transformation (WT) to provide a detailed characterization of the business cycle synchronization among the countries under study, namely Euro Area and Gulf Cooperation Countries (GCC) countries. In addition, we introduce a Genetic Algorithm combined with wavelets transform to search for the best combinations of synchronization factors which offer an optimal solution for changing business cycles in order to achieve high levels of economic integration beween two groups of countries. The analyses are conducted by introducing the main determinants of business cycles existing in the literature in order to understand how they could elvolve both in time and in scale, depending on the different phases of the system construction. Globally, and unlike the Euro Area, the results show not only a considerable delay in creating an economic and financial integration in the GCC, but more importantly, a growing divergence in business cycles among the countries.

JEL Classification: E32, F15, F41, F42.

Keywords: Business Cycles -Synchronization -Wavelets Analysis- Genetic Algorithm - Extreme Bounds Analysis -Trade - Economic and Monetary Union.

ملخص

في هذه الورقة، نستخدم تحليل ملزمة المتطرفة (EBA Extreme Bound Analysis) وتحول المويجات (Wavelet Transformation WT) لتوفير توصيف مفصل لتزامن دورة الأعمال بين البلدان قيد الدراسة، وهما منطقة اليورو ودول مجلس التعاون الخليجي (GCC). وبالإضافة إلى ذلك، ونحن نقدم الخوارزمية الجينية (Genetic Algorithm) جنبا إلى جنب مع WT للبحث عن أفضل مزيج من عوامل التزامن التي تقدم الحل الأمثل لتغيير دورات الأعمال التجارية من أجل تحقيق مستويات عالية من التكامل الاقتصادي بين مجموعتين من البلدان. ويتم إجراء التحاليل عن طريق إدخال المحددات الرئيسية للدورات التجارية القائمة في الأدب من أجل فهم الكيفية التي يمكن أن تنمو بها سواء في الوقت أو من حيث النطاق، اعتمادا على المراحل المختلفة لبناء نظام. وعلى الصعيد العالمي، وعلى عكس منطقة اليورو، أظهرت النتائج إلى تأخير كبير في خلق التكامل الاقتصادي والمالي في دول مجلس التعاون الخليجي، ولكن الأهم من ذلك، التباين المتزايد في الدورات التجارية بين الدول.

1. Introduction

For many years, there was a very thorough debate on issues in relation with the establishment of secure economic zones, or even single currency areas. As the business cycle synchronization is widely related to the literature on optimal currency areas and on economic unions, and despite the existence of many divergent points of view in both academic and political spheres, there was still a large consensus about the importance of business cycle synchronization as a necessary condition of successful economic integration.

In this paper, we will try to investigate the underlying factors of business cycle synchronization in the Euro area and GCC countries by considering a large number of business cycle synchronization determinants inspired from the previous theoretical and empirical works in this research field. In addition, the most important contribution in this work is the use of a combination of relevant econometric and heuristic tools, to be specific, the use of an efficient type of regression: Extreme Bound Analysis (EBA), Stationary Wavelets Transformation (SWT), Wavelets crossing and coherence, and finally a Wavelets-Genetic Algorithmoptimization (W-GA).

The present paper has many important objectives embodied in three fundamental axes. First, our objective is to demonstrate to what degree business cycles are correllated across Euro area and GCC countries. In addition, the analysis is extended to understand the gap between the economic integration in the EU and the integration in the GCC. We propose the use of a denoised signal of the cyclical component of GDP in order to assess the different degrees of synchronization in the business cycles. Therefore, the analyses are not based only on the cyclical component in the GDP but on a much smoothed variable leading to a stronger framework determining the factors driving business cycle differentials among Euro area and GCC countries and how these factors can evolve through time.

Second, we will try to answer two questions: first, why within a group of economic interest may the business cycles of different countries be synchronous or asynchronous. And second, why they may converge or diverge. To do this, we will include in the analysis a set of factors, which are common in the literature, and for which data are within our reach. They are supposed to have an impact on the synchronization of business cycles.

Third, as we introduce a hybrid model based on wavelets analysis and genetic algorithm to measure business cycles synchronization among countries in the Euro area and GCC countries, we have to justify its relevance in relation with the used variables. Moreover, we try to overcome some problems with the popular approach in business cycle synchronization related to the robustness of tests. Thereby, we will present the difference in the results with a simple denoised signal of wavelets as a dependent variable, and the results with an optimized-denoised signal with the Genetic Algorithm.

The remainder of this paper is structured as follows. Section 2 provides a recent literature review in relation with the potential determinants of business cycle synchronization. Section 3 outlines the empirical analysis, namely the used data, the statistical approach and artificial intelligence techniques and finally the obtained results. Section 4 discusses the economic interpretation of the results in the context of Euro area and GCC countries.

2. Literature Review

The literature on business cycles synchronization is evolving both theoretically and empirically. Because of its diversity, it can be subdivided in several categories (for example, the variables used in the study, the technical packages considered in the analysis, the research context, etc.). Since theory is indeterminate upon which factors are behind synchronization, identifying the determinants of synchronization is thus a subjective matter left to the initiative of the researcher (Baxter and Kouparitsas, 2005).

By considering the research context, the most important part of works on business cycles synchronization is concentrated (in a descending order) on the Euro area, United States and South Asia. Because of a huge number of constraints, the works on GCC countries or the MENA region are still insufficient and need more developments.

Among the various works about the business cycles synchronization, we can cite the following ones:

Frankel and Rose's (1998) work mainly focused on the effects of international trade, Rose and Engel (2002) confirm this statement of fact argued by the intensified trade flows between currency union members. As a result, business cycles are more synchronized across currency union countries. Artise et al. (2004) have presented a Markov Switching VAR models to assess the synchronization process in the European Union and to identify a common unobserved component that determines the European business cycle dynamics.

Camacho et al. (2006) and Harding and Pagan (2006) have discussed how the degree of synchronization between business cycles of different countries can be measured and tested. They conclude that there is no common business cycle across Europe.

Clark and Wincoop (2001) have argued that business cycles of U.S. Census regions are substantially more synchronized than those of European countries.

Baxter and Kouparitsas (2005), Imbs (2004) and Inklaar et al. (2008) have analyzed a set of key variables like international trade flows, specialization, and financial integration and their relation with the synchronization process in both developing and industrialized countries. Imbs concludes that economic regions with strong financial links are significantly more synchronized. Baxter and Kouparitsas argue that currency unions are not important determinants of business cycle synchronization. And Inklaar et al. conclude that convergence in monetary and fiscal policies have a significant impact on business cycle synchronization.

Stockmann (1988) has focused his work on the importance of sectorial shocks for the business cycle and concludes that the degree of differences in sectorial specialization is negatively related to cycle synchronization, i.e. the more dissimilar the economies, the less correlated the cycles.

Kalemli-Ozcan et al. (2003) have argued that countries with a high degree of financial integration tend to have more specialized industrial patterns and less synchronized business cycles. They corroborate their conclusions with the contagion effect of the financial crises and put forward a direct and positive effect of capital flows on business cycle synchronization.

From another point of view, Selover and Jensen (1999) have adopted a mathematical modeling approach to conclude that the world business cycle may result from a mode-locking phenomenon (a nonlinear process by which weak coupling between oscillating systems tends to synchronize oscillations in the systems).

Overall, all the works are concentrated on the two main blocks of variables: *trade or economic specialization* and *financial integration*. Therefore, the literature is ambiguous on the real effect of these blocks of variables on the business cycles synchronization. This is quite understandable since different researchers relay on various research ways. Their results are, however, not unequivocal and seem to depend on the economic structure of the country, the chosen period of time and samples, etc.

3. Empirical Analyses

3.1. Data and variables description

In this paper, we follow fundamentally the work of Baxter and Kouparitsas (2005), and Imbs (2004) with some small modifications to analyze the relationship between business cycle synchronization and the following variables: bilateral trade, trade openness, trade specialization, economic specialization, deposit interest rate differentials, official exchange rate fluctuations, fiscal deficit differential, financial openness, monetary policy, current account balance, Gross national savings as % of GDP, oil imports (only for EU) and oil exports (only for GCC). We also consider introducing two gravity variables to the regression equation, namely geographical distance and population density. As a dependent variable, we use, as usual, the GDP data.

We construct 55 pairs among the 11Euro area countries[1] and 15 pairs among the 6 GCC countries[2] over the period 1980-2011. In order to extract the specifications and most important events in the considered period, the latter is split into three sub-periods: 1980-1989, 1990-1999 and 2000-2011.

The terminology used in the following equations corresponds to the country indices *i* and *j* as well as the time index *t*. In what follow, we give a description of each variable used in the regression. We classify the considered variables into two sets; the first one concerns the most important determinants of business cycle synchronization proposed by Baxter and Kouparitsas (2005), Imbs (2004) and Inklaar (2005). The second set of variables consists of policy and structural indicators, which appear particularly relevant in the context of an economic and monetary union.

Business cycles synchronization measurement

The dependent variable in our study is the degree of business cycle synchronization between countries *i* and *j* at time *t*. To measure this variable, we follow Inklaar et al. (2005) methodology to conduct regressions with Fisher's z-transformations of the correlation coefficients as dependent variable. The transformed correlation coefficients are calculated as:

$$Syn_{ij} = Corr_{tran,ij} = \frac{1}{2}\ln\left[\frac{1 + Corr_{ij}}{1 - Corr_{ij}}\right]$$

where $Corr_{ij}$ is the pair-wise correlation coefficient of the cyclical components[3] of GDP of country i and country j. Since a Pearson's correlation coefficient is bounded at -1 and 1, the error terms in a regression model of the determinants of business cycle synchronization are unlikely to be normally distributed if the untransformed correlation coefficients are used (Inklaar et al, 2005). This complicates reliable inference. The transformed correlations do not suffer from this problem, since the transformation ensures that they are normally distributed (David, 1949).

Business cycle synchronization: fundamental determinants

There is no doubt that the foremost among the determinants of business cycles is the trade intensification. To understand the effect of trade on business cycle synchronization (BCS), we must invoke the Ricardo comparative advantage theory and trade specialization. Increased trade must result in increased sectorial specialization leading to increased business cycle correlation. In addition, trade may act as a conduit for the transmission of shocks that affect all industries (Baxter and Kouparitsas, 2005). In this case, increased trade would lead to increased business cycle correlation, which means a positive relationship between trade and

[1] Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal and Spain.

[2] Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates.

[3] The cyclical component of the GDP date is extracted by the Hodrick-Prescott filter.

BCS. In relation with trade, we consider four variables, namely bilateral trade, trade openness, trade specialization and economic specialization.

We use two essential ***bilateral trade*** measurements: the first one (*BLTRt*) is defined as the average of the sum of bilateral exports and imports in a pair of countries, divided over the sum of total exports and imports:

$$BLTRt_{ij} = \frac{1}{T}\sum_{t=1}^{T}\left[\frac{\left(X_{ijt} + M_{ijt}\right) + \left(X_{jit} + M_{jit}\right)}{\left(X_{it} + M_{it}\right) + \left(X_{jt} + M_{jt}\right)}\right]$$

The second one (*BLTRy*), expresses bilateral trade as a fraction of aggregate GDP in the two countries:

$$BLTRy_{ij} = \frac{1}{T}\sum_{t=1}^{T}\left[\frac{\left(X_{ijt} + M_{ijt}\right) + \left(X_{jit} + M_{jit}\right)}{Y_{it} + Y_{jt}}\right]$$

The ***trade openness***(*TROP*) measure is intended to capture the general openness in a pair of countries. According to Baxter and Kouparitsas (2005), this variable is a good measure of the extent to which the country is exposed to global shocks. Thus, it is possible that higher trade, in the aggregate, leads to more-highly correlated business cycles:

$$TROP_{ij} = \frac{1}{T}\sum_{t=1}^{T}\left[\frac{\left(X_{it} + M_{it}\right) + \left(X_{jt} + M_{jt}\right)}{Y_{it} + Y_{jt}}\right]$$

where *X*, *M* and *Y* denote exports, imports and GDP respectively.

In the theoretical literature, there is a wide common assent about the impact of bilateral trade and market openness on the business cycles. It is supposed to be a positive relationship; it is argued that the more intense trade is between two countries (or the more open to trade), the higher the trade variable, and the more synchronous the business cycles (Baxter and Kouparitsas, 2005). Hence, there are common factors that create spillover effects for more synchronized business cycles between country-pairs.

Trade specialization (*TRSP*) is measured by the cross-country difference between the average shares across time of a particular sector in total exports. To obtain an overall sectorial distance measure for total exports, we calculate the summation of the distances for all sectors. In our case, we have considered three sectors: goods exports, merchandize exports and services exports. The variable is calculated as follow:

$$TRSP_{ij} = \left[\left|\left(\frac{1}{T}\sum_{t=1}^{T} exs_{int}\right) - \left(\frac{1}{T}\sum_{t=1}^{T} exs_{jnt}\right)\right|\right]$$

where exs_{int} is the share of the sector *n* in the total exports of country *i*, at time *t*. Logically, differences in trade specialization patterns should be negatively related to business cycle correlation.

Like trade specialization, ***economic specialization*** (*ECSP*) expresses the share of an economic sector in the total economic outputs. It is the sum of the differences of sector shares in the economy's output. Here, the three main sectors are considered, agriculture, industry and services. The corresponding variable is calculated as follow:

$$ECSP_{ij} = \left[\left|\left(\frac{1}{T}\sum_{t=1}^{T} ecs_{int}\right) - \left(\frac{1}{T}\sum_{t=1}^{T} ecs_{jnt}\right)\right|\right]$$

where $ecs_{int}$is the share of the sector *n* in the total economy's output of country *i*, at time *t*. Once again, it is expected to obtain a negative relationship for this variable with business cycle synchronization.

It is noted that exs_{int} and ecs_{int} are the time average of the discrepancies in the economic structures between two countries.

For the trade and economic specializations, it is expected to have negative coefficients between these variables and business cycles. That is, the more similar the trade and economic structures of two countries, the higher is the cycle correlation.

Business cycle synchronization: specific determinants of economic and currency union

The other set of variables included in the analysis concern those used to assess the available suitable conditions to create an economic and monetary union. We consider the following variables:

Deposit interest rate differentials (*DIRD*) is used to determine whether differences in the monetary policy have an impact on BCS. According to Inklaar (2005), the relationship direction is not clear and is ultimately an empirical matter. This dissonance is justified by the fact that in ordinary periods, countries with similar monetary policy have more synchronized business cycles. But in the case of crisis or external shocks, business cycles may be less correllated due to the inability to respond by individual monetary policy in the presence of policy coordination (Inklaar, 2005). The variable is calculated by taking the absolute value of the mean sample of pair wise differences:

$$DIRD_{ij} = \left| \frac{1}{T} \sum_{t=1}^{T} \left(DIR_{it} - DIR_{jt} \right) \right|$$

Official exchange rate fluctuations (*OEXR*) is another important variable to evaluate the relationship between the monetary policy and BCS. The bigger the volatility of the exchange rate, the lesser the synchronization in business cycles. Hence, we expect a negative correlation in this case (Frankel and Rose, 2002). This variable is first calculated by using the standard deviations of the bilateral nominal exchange rates between two countries, and then the standard deviations are scaled by the mean of the bilateral exchange rates over the sample time period:

$$OEXR\_sd_{ij} = \frac{\sigma\left(OEXR_{ijt}\right)}{\frac{1}{T}\sum_{t=1}^{T} OEXR_{ijt}}$$

The literature suggests that the deposit interest rate and the official exchange rate are negatively correllated with business cycles, that is to say highly correlated cycles are recorded in the presence of more similar monetary policy.

Another important variable which can be included is the ***Fiscal deficit differential*** (*FIDD*). From a theoretical point of view, the direction of the correlation between the fiscal deficit differentials and BCS is, once again, not confirmed. Empirically, the variable is constructed as the mean sample of the bilateral differences of fiscal deficit (*FD*) ratios between two countries, and then taken as the absolute value:

$$FIDD_{ij} = \left| \frac{1}{T} \sum_{t=1}^{T} \left(FD_{it} - FD_{jt} \right) \right|$$

In most cases, similar fiscal policies correspond to increased correlation between business cycles. We expect the estimated coefficients to be negative, that is, a larger difference in fiscal deficit leads to less synchronized business cycles (Frankel and Rose, 2002).

Financial openness (*FIOP*) is a measure of capital account openness. We use the Chinn and Ito (2002) to measure the capital account openness, constructed as the first standardized principal component of the International Monetary Fund inverse binary indicators. Here, we measure the bilateral capital account openness as the average period of the sum of the Chinn and Ito's indicators (Chinn and Ito, 2002):

$$FIOP_{ij} = Kaopen_{ij} = \frac{1}{T}\sum_{t=1}^{T}\left(Kaopen_{it} + Kaopen_{jt}\right)$$

where *Kaopen* is the Chin and Ito's measure of capital account openness. It goes without saying that a more open capital account in a country leads to a more vulnerable situation to global financial shocks or economic crisis. Therefore, countries with high financial openness are likely to have high correlated business cycles (positive coefficients).

Monetary policy (*MOPY*), is expressed by the calculation of the Pearson coefficient of correlation calculated as the money and quasi money annual growth (M2 annual %):

$$MOPY_{ij} = Corr_{ij}(M2_{it}, M2_{jt})$$

Current account balance (*CUAB*) as a percent of GDP is defined as the sum of net exports of goods, services, net income, and net current transfers. To capture the relation between current account balance and BCS, we use the Pearson correlation coefficient between two countries:

$$CUAB\_corr_{ij} = Corr_{ij}(CUAB_{it}, CUAB_{jt})$$

Gross national savings as % of GDP (*GNSA*) expressed as gross national income less total consumption, plus net transfers.

$$GNSA\_corr_{ij} = Corr_{ij}(GNSA_{it}, GNSA_{jt})$$

We expect countries with similar monetary policies, current account balance and gross national savings to experience similar business cycles. Consequently, the estimated regression coefficients on these variables must be positive as regards the business cycles.

By considering the trade in ***oil market***, we are confronted with the nature of the economic structure for each country. Because European countries are relatively classified as oil importers, we use the value of oil importations (*OIIM*) as an exogenous variable in the regression model. In contrary, it is more logical to use the value of oil exportations (*OIEX*) for the GCC since their economies are widely dependent on the oil rents:

$$OIIM(EU)\_corr_{ij} = Corr_{ij}(OIIM_{it}, OIIM_{jt})$$

$$OIEX(GCC)\_corr_{ij} = Corr_{ij}(OIEX_{it}, OIEX_{jt})$$

Logically, countries with a similar profile of oil trading express more correlated business cycles. Then, we expect a positive relationship between oil imports or exports and business cycles synchronization within county-pairs.

We also consider introducing two gravity variables to the regression equation, namely ***geographical distance*** and ***population density***. Geographical distance is expressed in terms of distance between national capitals in kilometer units. And population density is mid year population divided by land area in square kilometers. It is well known that a large fraction of bilateral trade can be explained, in a statistical sense, by a set of gravity variables that include distance between countries, indicator variables for common language and adjacency, and variables that measure the difference between countries' levels of GDP (Baxter and Kouparitsas, 2005). Therefore, the gravity variables are usually included in the analysis as a set of *always-included* variables. However, it would be necessary to investigate whether the gravity variables are robust explanatory variables for business cycle synchronization in a first stage of analysis.

3.2. Extreme-bounds analysis

In order to precisely identify the main determinants of BCS across Euro area countries and GCC, we adopt a special type of regression called Extreme Bound Analysis (EBA) as proposed by Leamer (1983) and developed by Levine and Renelt (1992), Levine and Zervos (1993), and Sala-i-Martin (1997).

The principal is quite convincing: when we use a simple OLS regression, the estimated coefficients are often unstable and much conditional on the choice of information set. Avariable may appear as significant in one combination of repressors and not significant in another. In others words, a variable is considered robust when its statistical significance is not conditional on the information set, namely on whether other economic variables are included in the equation or not. Consequently, and before deciding if a variable is a robust determinant of BCS or not, we must run an important number of regression combinations. A determinant variable for the BCS must have the same behavior in all combinations (Baxter and Kouparitsas, 2005). The used criteria in robustness check of the entire variables are discussed in more detail in the next sections.

The regression is about a dependent variable Y with various sets of independent variables. In our case, Y is a vector of business cycle expressed as the cyclical component extracted by the Hodrick-Prescott Filter[4] of the GDP correlations Y_{ij} between pairs of countries i and j.

The general regression form as presented by Leamer (1983) based on the EBA is:

$$Y = \beta_i(I) + \beta_m(M) + \beta_z(Z) + \mu$$

The independent variables are classified into three categories, I, M and Z. I denote a set of *always-included* variables (The gravity variables, geographical distance and population density may fall into that group). The M-variable is the candidate variablewhich is being tested for robustness. At the same time, the Z-variables contain other variables identified as potential determinants of BCS.

The EBA is performed by the following algorithm:

1. Run a baseline bivariate regression[5] for each M-variable without any Z variables. A necessary condition for a variable to be a meaningful determinant of BCS is that it should be first significant in a bivariate regression. Otherwise, it is excluded from the analysis.
2. Varying the set of Z-variables (for each possible combination) included in the regression for a particular M-variable.
3. From these regressions, the EBA determined the highest and lowest values of confidence intervals constructed from the estimated β_m:

[4] Other researchers, such as Frankel and Rose (1998) and Rose and Engel (2002), have employed a variety of filters in their related investigations. According to Baxter and Kouparitsas (2004), frequently the filter used does not matter importantly for the results.

[5] In order to get robust estimators for the coefficients of the candidate explanatory variables and avoid heteroskedasticity and auto-correlation in the residuals, we apply to the OLS regressions a Newey-West correction for heteroskedasticity and auto-correlation in the residuals, which is less dependent on large sample properties.

The extreme upper bound (*EUB*) is equal to the maximum estimated β_m plus two times its standard error:

$$EUB = \beta_m^{MAX} + 2\sigma(\beta_m^{MAX})$$

The extreme lower bound (*ELB*) is the minimum estimated β_m, minus two times its standard error:

$$ELB = \beta_m^{min} - 2\sigma(\beta_m^{min})$$

4. An M-variable is robust if these highest and lowest values are of the same sign and if all estimated β_m coefficients are significant.

EBA robustness test results

Table 1 illustrates a summary of extreme bound analysis applied for both Euro Area and GCC. In parallel, Figure 1 represents the evolution of business cycle synchronization over time based on the average correlation coefficient of BCS. Obviously, the trend is positive for the two sets of countries. Business cycles have increased from 0.88 in the first period to 1.16 in the third period for the Euro Area. The situation is quite different for the GCC, since the coefficient drops down from 0.42 to 0.20 in the second period and rises again to 0.87.

On the one hand, there are many country pairs, which have experienced some interesting change in their degree of synchronization like Austria, Belgium and Ireland, which is not the case of other countries like Finland, Greece and Portugal. In addition, GCC country pairs are very weak and globally they are far from an economic and monetary union. Even for the strongest economies, the index of business cycle synchronization is very low and there is no perspective for any latent predisposing factors for a monetary union. The best values of BCS are for the following countries: Bahrain, Qatar and United Arab Emirates.

Moreover, the European integration is well captured in the third period. It is seen as the period of preparation for the European monetary union.

Other results are shown in Table 2, Figures 2 and 3. The table shows the biggest and lowest correlation coefficients of BCS in Euro area and GCC.

3.3. Wavelets in business cycle synchronization

Undoubtedly seen as a subject in progression, the application of wavelet theory in economics and finance is still in its beginning since wavelets models have not yet been explored in economic and finance literature. Nevertheless, there is a growing interest in applying wavelet theory to deeply understand BCS. The following works are considered among the most important in relation with business cycles: Raihan, Wen and Zeng (2005); Crowley and Lee (2005); Crowley, Maraun and Mayes (2006); Gallegati and Gallegati (2007); Yogo (2008); Aguiar-Conraria and Soares (2009).

Considered as a new engineering tool, wavelet analysis is widely related to applications of image processing, engineering, astronomy, meteorology and time series analysis.We can use them in order to unveil latent processes with changing cyclical patterns, trends and other non-stationary characteristics hence it is supposed to be very appropriate in studying synchronization in business cycles.

In the present study, we will focus on two models of continuous discrete wavelets transformations: the Cross Wavelets Coherence model (CWC) and the Stationary Wavelets Transform model (SWT).

As continuous and discrete in time frequency (scales), these two wavelets models are very appropriate in studying business cycle synchronization by offering the following advantages:

- Wavelets allow the examination of trends and seasonal time series without the need for prior transformations. Therefore, there is no need of any pre-process to deal with deterministic and stochastic trends due to the fact that wavelet filtering usually embeds enough differencing operations.
- Wavelets reduce computational complexity. All the wavelets models (even the most complex ones) can be computed with faster and efficient algorithms (Cohen and Walden, 2010a).
- Wavelets offer a more precise timing of shocks causing and influencing business cycles.
- Wavelets are nonparametric models and they are very suitable to examine nonlinear processes without loss of information.

3.3.1. Wavelets crossing and wavelets coherence

The cross wavelets transform (XWT) and wavelets coherence (WCT) are two other wavelets models allowing for the analysis of the temporal evolution of the frequency content of a given signal or timing series. The application of XWT and WCT to two time series and the cross examination of the two decompositions can reveal localized similarities in *time* and *scale*. Areas in the time-frequency plane where two time series exhibit common power or consistent phase behavior indicate a relationship between the signals (Cohen and Walden, 2010a). In our case, these two models are very appropriate to compare business cycle synchronization across a pair of countries both in terms of evolution in time and degree of synchronization.

In the following two sections, the cross wavelets and wavelets coherence models are presented according to the works of Torrence and Compo (1998), Torrence and Webster (1998), and Grinsted et al. (2004).

Cross Wavelet Transform XWT

Wavelets crossing and wavelets coherence are an extension of the Fourier Coherency Transform. The latter was often used to identify common frequency brands between two time series. Therefore, it is possible to develop a wavelet coherency which could identify both frequency bands and time intervals when the time series are related (Liu 1994).

Unfortunately, in Fourier analysis, it is necessary to smooth the cross spectrum before calculating coherency which is otherwise identically equal to 1. As a result, the used smoothing process in cross-wavelet spectrum was unclear and inadequate to define an appropriate wavelet coherency (Liu 1994).

To avoid this shortcoming, the wavelet coherency is used to maintain a smoothing process in both time and scale, with the amount of smoothing dependent on both the choice of wavelet and the scale.

The cross wavelet transform (XWT) of two time series X_n and Y_n with wavelet transforms $W_n^X(s)$ and $W_n^Y(s)$is defined as: $W_n^{XY}(s) = W_n^X(s)W_n^{Y*}(s)$. Where * is the complex conjugate of W_n^Y(s), n is the time index and$s$ is the scale. The cross-wavelet spectrum is complex, and hence one can define the cross-wavelet power as$|W_n^{XY}(s)|$. The complex argument $arg(W^{XY})$ can be interpreted as the local relative phase between X_n and Y_n in time frequency space. The theoretical cross-wavelet distribution of two time series with theoretical Fourier spectraP_k^X and P_k^Y is given in Torrence and Compo (1998) as:

$$D\left(\frac{|W_n^X(s)W_n^{Y*}(s)|}{\sigma_X\sigma_Y} < p\right) = \frac{Z_\nu(p)}{\nu}\sqrt{P_k^X P_k^Y}$$

Where $Z_\nu(p)$is the confidence level associated with probability p, σ_X and $\sigma_Y$are the respective standard deviations. If $\nu = 1$ (real wavelets), $Z_1(95\%) = 2.182$, while if $\nu = 2$ (complex wavelets), $Z_2(95\%) = 3.999$.

Wavelets Coherence Transform (WCT)

As the cross wavelet power is used to reveal areas with high common power, the cross wavelets coherence transform is a second useful technique that can be adapted to evaluate coherency in time frequency space. According to Torrence and Webster (1998), the wavelet coherence of two time series is given by the following formula:

$$R_n^2(s) = \frac{\left|S\left(s^{-1}W_n^{XY}(s)\right)\right|^2}{S(s^{-1}|W_n^X(s)|^2).S(s^{-1}|W_n^Y(s)|^2)}$$

where S is a smoothing operator in both time and scale. Here, the coherency parameter $R_n^2(s)$ is always included between 0 and 1, ($0 \leq R_n^2(s) \leq 1$). Hence, wavelet coherence is often seen as a localized correlation coefficient in time frequency space. It is an accurate representation of the normalized covariance between the two time series. Therefore, to assess the statistical significance of the estimated wavelet coherency, the Monte Carlo simulation methods are used, and the confidence interval is defined as the probability that the true wavelet power at a certain time and scale lies within a certain interval along the estimated wavelet power(Torrence and Compo, 1998). The theoretical wavelet power $\sigma^2 P_k$ with the true wavelet power, is defined as $\Psi_S^2(s)$. The confidence interval for $\Psi_S^2(s)$ is then:

$$\frac{2}{\chi_2^2(p/2)}|W_n(s)|^2 \leq \Psi_n^2(s) \leq \frac{2}{\chi_2^2(1-p/2)}|W_n(s)|^2$$

Where p is the desired significance (p = 0.05 for the95% confidence interval), χ_2^2 is a chi-square distributed variable with two DOFs (degree of freedom) (Jenkins and Watts 1968), and $\chi_2^2(p/2)$ represents the value of χ^2 at $p/2$.

XWT and WCT results

In what follows, we present the XWT and WTC results in a synthesized way. That is why we will limit the discussion for both Euro Area and GCC countries by taking only the highest five[6] and lowest five[7]coefficients of BCS between country-pairs.

According to figures 7a and 7b, most countries in the Euro area have expressed a relative important correlation in term of business cycles with the exception of Greece. The strongest similarities are likely common to the period slightly before 1999 (Euro adoption).

As in (Torrenceand Compo, 1998) and (Grinsted et al, 2004), both XWT and WCT figures have some decisive criteria that may be respected in the results'- interpretation.

In the XWT figures, the 5% significance level against red noise is shown as a thick contour. The black contour designates the 5% significance level estimated by Monte Carlo simulations beta surrogate series. The cone of influence, which indicates the region affected by edge effects, is shown with a thin black line. The relative phase relationship is shown as arrows (with in-phase pointing right, anti-phase pointing left. *The color code for power ranges from blue (low power) to red (high power).*

In the WTC figures expressing the coherence in the business cycles, the black thick contour designates the 5% significance level estimated by Monte Carlo simulations using beta

[6]***Euro Area***: AUT-BEL, AUT-NLD, BEL-ESP, BEL-FRA, BEL-NLD. ***GCC countries***: BHR-ARE, BHR-OMN, BHR-QAT, OMN-QAT, SAU-ARE.

[7]***Euro Area***: AUT-ITA, DEU-ESP, DEU-GRC, DEU-IRL, DEU-NLD ***GCC countries***: KWT-OMN, KWT-SAU, OMN-ARE, OMN-SAU, QAT-ARE.

surrogate series. The 5% significance level against red noise is shown as a thick contour. All significant sections show anti-phase behavior. *The color code for coherency ranges from blue (low coherency — close to zero) to red (high coherency — close to one)*.

Also, it is important to mention that the economy that is most different in the Euro area is the German economy since there are 5 coefficients, among the 10 lowest ones, that represent business cycles synchronization coefficients between Germany and Finland, Greece, Ireland, Netherlands, and Spain. Greece starts displaying some important zones of correlation starting from 2000, which may coincide with the strongest efforts of Greece to join the Euro area. According to figures, there is a very big important correlation in business cycles in the following country-pairs: Belgium-Netherlands, Greece-Spain, Greece-Ireland, Austria-Belgium and Ireland-Spain.

As mentioned above, the cross-wavelets transformation gives information on the delay, or synchronization, between oscillations or scales between two time-series. Unfortunately, this information is sometimes incomplete because there is always some redundancy in the time-series (Torrence and Compo, 1998). Consequently, wavelets coherence is used to avoid this situation.

While the cross-wavelet transform will tell us if the correlation is significant or not, the wavelet coherence transformation has the advantage of being normalized by the power spectrum of the two time-series (Torrence and Compo, 1998). Hence, all the regions, which represent high likely coherency between two countries, are synonymous of strong local correlation. In other words, countries with common high coherency areas represent strong possibilities of creating very similar business cycles.

Cycles with lowest coherency in the Euro area are recorded in the pairs of countries with less synchronous business cycles, mainly formed by Finland, Greece and Spain. For all the country-pairs, the incoherency was very significant in the period between 1980 and 1988. Paradoxically, some countries have recorded in the time of the monetary union a high level of incoherency especially after 2004, like Belgium-Spain, France-Spain, Greece-Spain, Greece-Ireland, Ireland-Spain. In general, most of the pairs are characterized a low level of coherence mainly between 1980 and 1995.

Looking at figures 7c and 7d, we observe that business cycles between GCC countries are not very synchronous, even for the neighboring countries. In addition, regions with high coherence are situated at low frequencies. The most synchronized business cycles are between Saudi Arabia and the United Arab Emirates.

Interestingly, for all the GCC countries, the phases aligned at high frequencies are not numerous, the majority of them occurred at low frequencies. In addition, coherency phases are notably scattered in a time interval of two years (on average). In the case of Saudi Arabia and the United Arab Emirates, there are several regions of high coherency both at low frequencies and, specially, at high frequencies (between 1998 and 2008).

It is interesting to mention that in the case of Euro area and even after the last global economic crisis, countries with strong correlation in business cycles have kept almost their main correlation and coherency areas. Contrary to Euro area, it seems like GCC countries have started a new stage of divergence in terms of business cycle synchronization. Furthermore, this divergence stages are situated at a low levels frequency. Hence, GCC countries are far likely from constructing an economic and monetary union at least in the next 5 years.

3.3.2. GA-wavelets model for bcs assessment

Some of the main fields in which SWT can be used are signal de-noising and pattern recognition. As argued by Bradley (2003), one of the biggest problems in using the discrete wavelets transformation (DWT) is the resulting shift-variance from the down-sampling process. Therefore, it is possible to skip the down-sampling process by running a stationary wavelets transformation (SWT). SWT is similar to the DWT except that in SWT, the signal is never sub-sampled and instead, the signal is up-sampled at each level of decomposition. Therefore, SWT is shift-invariant and this is a very important condition in studying business cycle synchronization (Torrenceand Compo, 1998). In addition, the main difference in the de-noising process in SWT in comparison with DWT is that in DWT only the approximation coefficients are decomposed, while in the SWT, both the detail and approximation coefficients are decomposed.

Since SWT can overcome two major shortcomings of the DWT, it is seen as an appropriate wavelets model to get a more complex and flexible analysis. So, why should we denoise a signal?

Denoising (also referred to as wavelet shrinkage) is to remove noise as much as possible while preserving useful information as much as possible. The basic noisy signal model as proposed by Guoxiang and Ruizhen (2001) takes the following form:

$$s(x) = f(x) + \xi(x)$$

Where *s(x)* is the observed signal, *f(x)* is the original signal, *ξ(x)* is Gaussian white noise with zero mean and variance σ^2. The objective of denoising is to suppress the noise part of the signal *s* and to recover *f*.

The principle idea behind *SWT de-noising* is that one can define a *noise threshold* such that variations in the data below the threshold are to be regarded as noise, whereas variations greater than the threshold are regarded as *signal*. The de-noising process is very beneficial in the context of models with regime shifts and other forms of discontinuities or points of non-differentiability (Torrenceand Compo, 1998). In others words, as the noise in a signal is mostly contained in the details of wavelet coefficients, that is, the high frequency range of the signal (Keinert, 2004), if we set the small coefficients to zero, much of the noise will disappear and of course, inevitably, some minor features of the signal will be removed as well or at least, distorted by the process. The denoising procedure can be done in three steps:

1. Select a wavelet and a level *n*, apply wavelet/wavelet packet decomposition to the noisy signal to produce wavelet coefficients.
2. For each level from *1* to *n*, choose a threshold value and apply thresholding to the detail coefficients.
3. Perform wavelet/wavelet packet reconstruction to obtain a denoised signal.
4. The most widely-used thresholding methods are hard-thresholding:

$$T_\lambda(x) = \begin{cases} 1 \; if \; |x| \leq \lambda \\ 0 \; otherwise \end{cases}$$

And soft-thresholding (Donoho and Johnstone, 1998; Donoho, 1995):

$$T_\lambda(x) = \begin{cases} x - \lambda \; if \; x > \lambda \\ 0 \; if \; |x| \leq \lambda \\ x + \lambda \; if \; x < -\lambda \end{cases}$$

Where λ can be calculated by Stein's Unbiased Risk Estimate method:

$$\lambda = \sqrt{2log_e\left(nlog_2(n)\right)}$$

Where n is the length of the signal. In this study, we used the soft-thresholding approach, because it has been reported that the soft-thresholding is more effective than the hard-thresholding (Gnanadurai and Sadasivam, 2006; Talukder and Harada, 2007).

SWT de-noising process and GA optimization results

After denoising a signal S, we get a denoised signal S_d and residuals S_r. As shown in figure 8, the wavelets transformation process in the SWT give us a common non-decimated approximation coefficients a for both original and denoised signals. The main difference between these signals after the stationary wavelets transform is the determination of non-decimated details coefficients in the original signal and denoised non-decimated details coefficients in the denoised signal. Usually, it is recommended to use at the most 5 detail coefficients (Torrenceand Compo, 1998).

The two signals are then used in the optimization process introduced by an appropriate genetic algorithm in order to understand if the denoised signal can reach higher levels of the constructed objective function or not.

Optimization process is run with Matlab optimization toolbox. The Optimization Toolbox functions minimize the objective or fitness function. That is, they solve problems of the form min $f(x)$. If we want to maximize $f(x)$, we can minimize $-f(x)$, since the point at which the minimum of $-f(x)$ occurs is the same as the point at which the maximum of $f(x)$ occurs (Matlab wavelets user guide, 2012).

For both Euro area and GCC, we introduce in the GA model the regression equations with Newey-West standard error with the GDP cyclical component as a dependent variable and the considered determinants of the business cycles presented in the previous section. Table 3 summarizes the information about the GA optimization and the obtained results:

As we can see, for both set of countries, the inclusion of a denoised signal in the cyclical component of the GDP doesn't reach a higher value[8] of fitness function. That is, stationary wavelets transform offer more ability to the genetic algorithm optimization in order to determine if the selected determinants of business cycles are the most appropriate. Since we have selected a set of business cycles variables based on the previous literature, and because all the variables were already validated by previous studies, we have obtained improved results with the inclusion of denoised signal.

In a second stage, we perform a multi objective optimization using multi objective genetic algorithm function (see figure 9).

The goal of the multi objective genetic algorithm is to find a set of solutions in that range (ideally with a good spread). The set of solutions is also known as a Pareto front. All solutions on the Pareto front are optimal (Matlab wavelets user guide, 2012).

The Genetic Algorithm solver assumes the fitness function will take one input x, where x is a row vector with as many elements as the number of variables in the problem. The fitness function computes the value of each objective function and returns these values in a single vector output y (Matlab wavelets user guide, 2012).

The figure 9 plots the Pareto front (limited to any three objectives) at every generation. Given a set of choices and a way of valuing them, the Pareto front is the set of choices that are *Pareto efficient*. As we can see the multi objective optimization between Euro area and GCC gives only 10 points in the Pareto front, most of them are closer to the objective function of the GCC optimization. This result is quite appropriate to conclude that the GCC countries optimization could not reach better levels than the Euro area. This can be explained by two

[8] In absolute value.

fundamental elements. First, the GCC could not achieve better optimization because the chosen business cycles determinants are not representative in the context of GCC economies (this statement was already confirmed in the EBA analysis). Second, the GCC are less determined than European countries to be engaged in an economic and monetary union. Logically, the second explanation is more relevant since our study has encompassed the most important determinants of business cycles that can act on business cycles. Once again, our study confirms the fact that the GCC could not achieve conditions of a propitious environment for a unique monetary area.

4. Summary and Conclusions

In this paper, we have tried to make a deeper understanding of the relationship between business cycles and the most important economic aggregates used in the literature in two economic groups, namely the Euro area and the GCC. The used variables were mainly based on the bilateral trade and economic specialization as basic determinants, and other specific variables in relation with the financial integration and coherence between countries. In addition, our work has tried to understand the spillover effects of business cycles.

The analyses have also included an Extreme Bound Analysis in order to evaluate the relative influence of every used variable. In addition, business cycles were assessed by two wavelets techniques: the wavelets crossing-coherency transformation and the stationary wavelets transformation. The first technique has identified the main intervals of correlation and coherence between country-pairs for both Euro Area and GCC. The second technique (combined with the Genetic Algorithm) was used to show the possible differences after denoising the business cycles index values and optimizing a created objective function.

The main results have showed that the chosen determinants of business cycles were very appropriate for the Euro area but not for the GCC. The reason was confirmed by the recorded divergence in the economic structure between GCC countries. The only common point of convergence was the oil exportations.

In addition, by considering denoised coefficients of business cycles coefficients, the GCC countries still have divergence in BC either in time or in scale. Paradoxically, the divergence has been increasing after the last global economic crisis.

The use of denoised index offers the advantage of dealing with smoother parameters. The technique is more suitable in the case were business cycles' indexes contain a very important part of noise.

The multi-objective optimization conducted between the Euro area and the GCC has shown that the GCC could not be compared to the Euro area. The latter has expressed very high correlation in business cycles in some country-pairs, contrary to GCC. In addition, most of the countries in the Euro area that were characterized by low index of business cycles have improved their synchronization process overtime, especially after 1999, like Spain, Italia, Greece and Finland. Euro Area countries have many possibilities for the synchronizing of their business cycles both in time and scale. However, GCC countries are still far from approaching an economic and monetary union. Except for Saudi Arabia and the United Arab Emirates, all the other country-pairs dot not represent any convergence possibilities in terms of business cycles.

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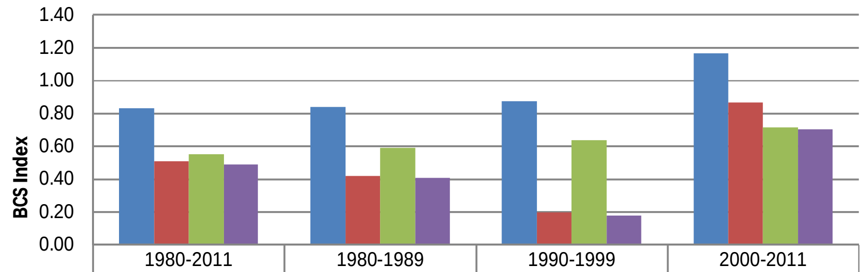
Figure 1: Business Cycle Correlation over Time



	1980-2011	1980-1989	1990-1999	2000-2011
Euro Area	0.83	0.84	0.88	1.16
GCC countries	0.51	0.42	0.20	0.87
Euro Area (denoised signal)	0.55	0.59	0.64	0.72
GCC countries (denoised signal)	0.49	0.41	0.18	0.70

Figure 2: Business Cycle Synchronization in the Euro Area (1980-2011)

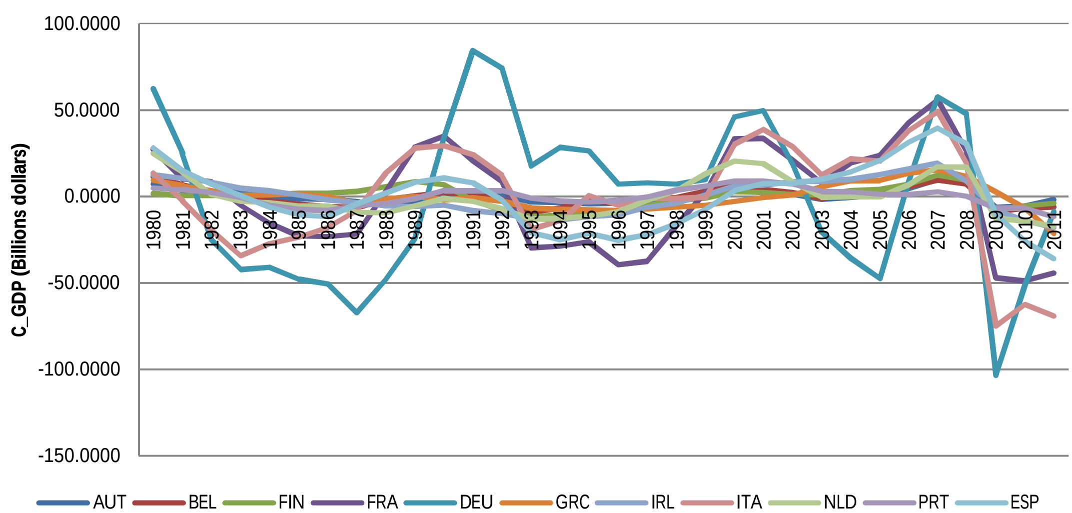


Figure 3: Business Cycle Synchronization in the GCC (1980-2011)

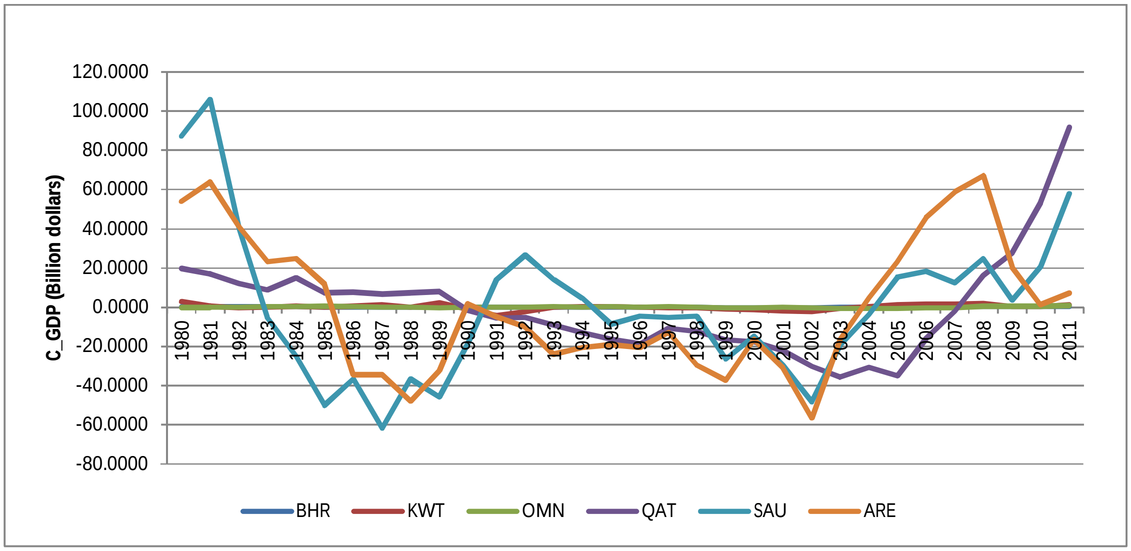


Figure 4: Largest and Smallest Ten Business Cycle Synchronisation for the Euro Area from 1980-2011

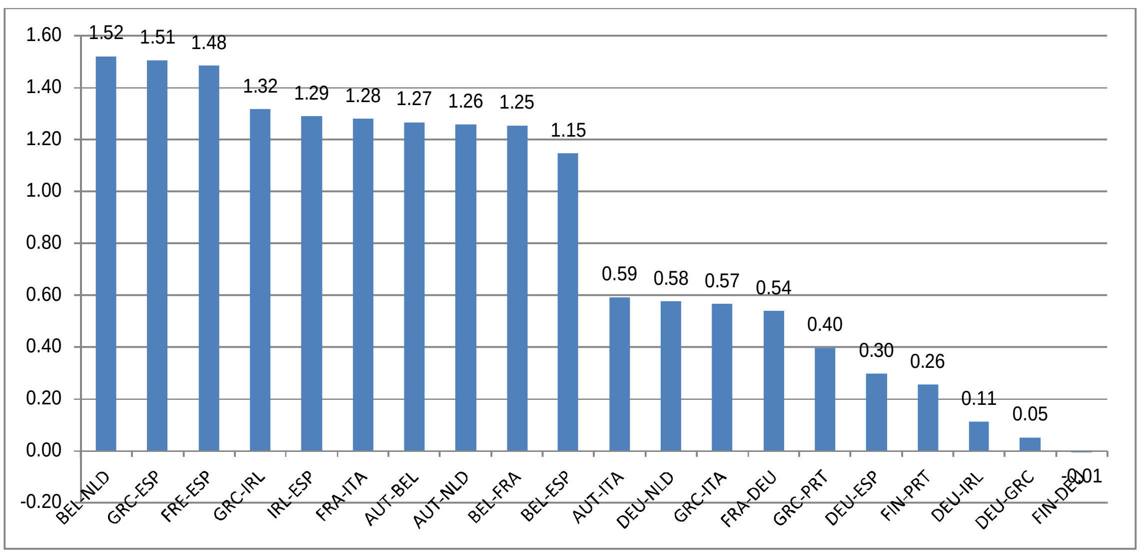


Figure 5: Business Cycle Synchronisation for the GCC from 1980-2011

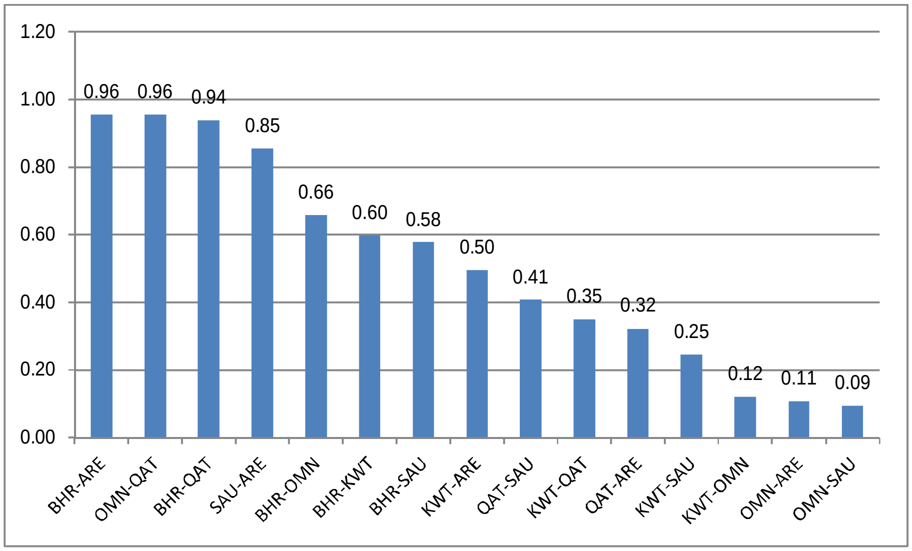


Figure 6(a): Business Cycle Components Extracted by the HP Filter (Euro Area)

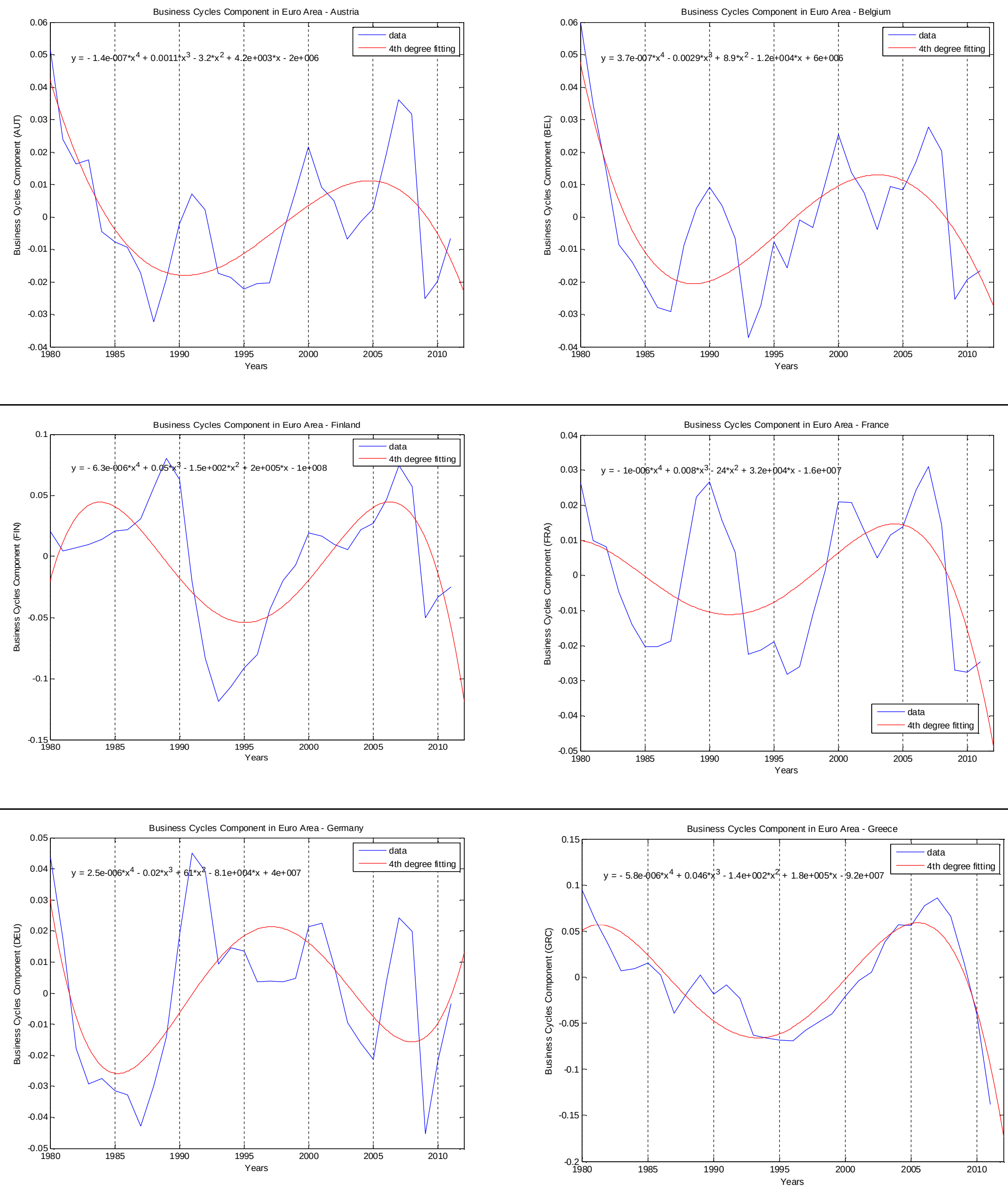
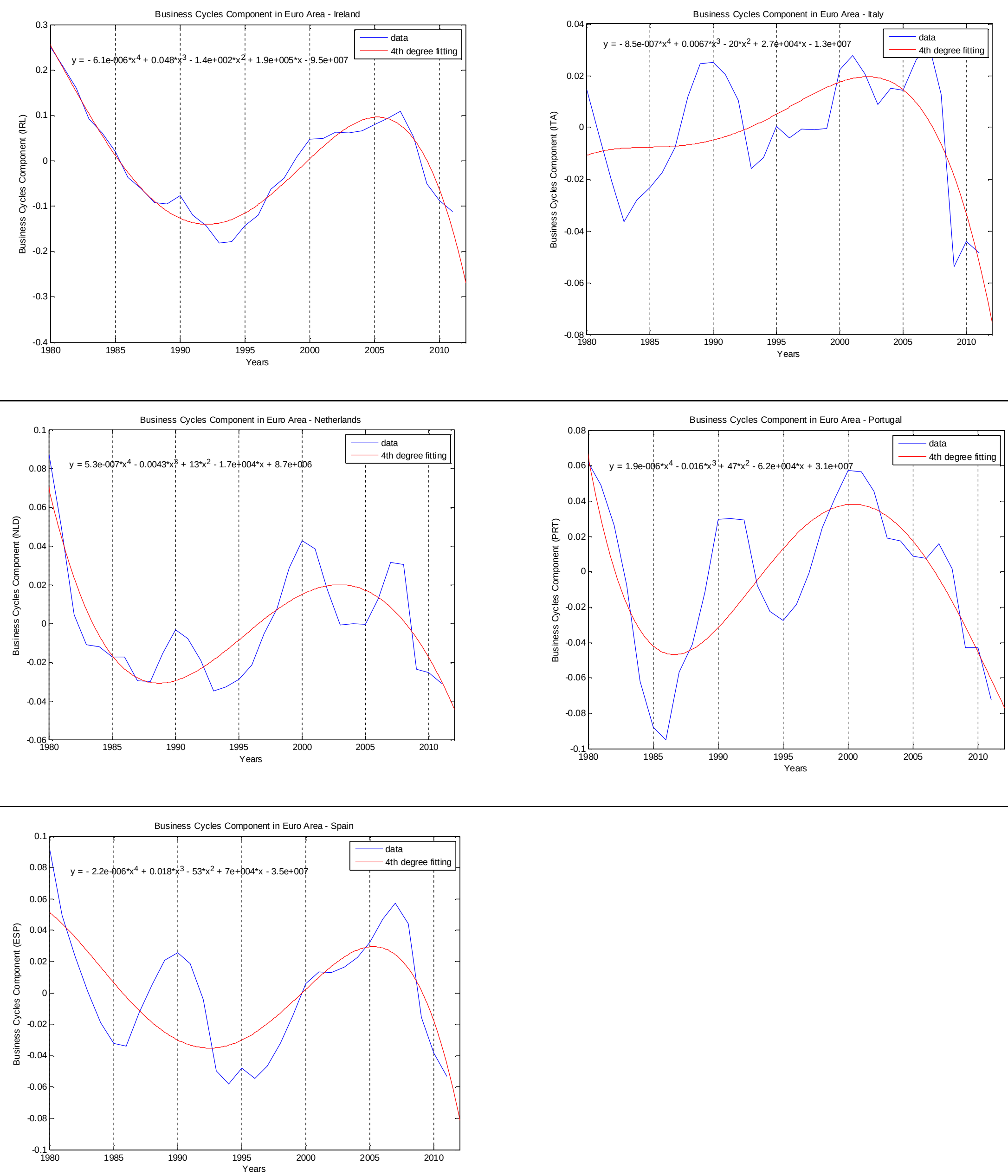
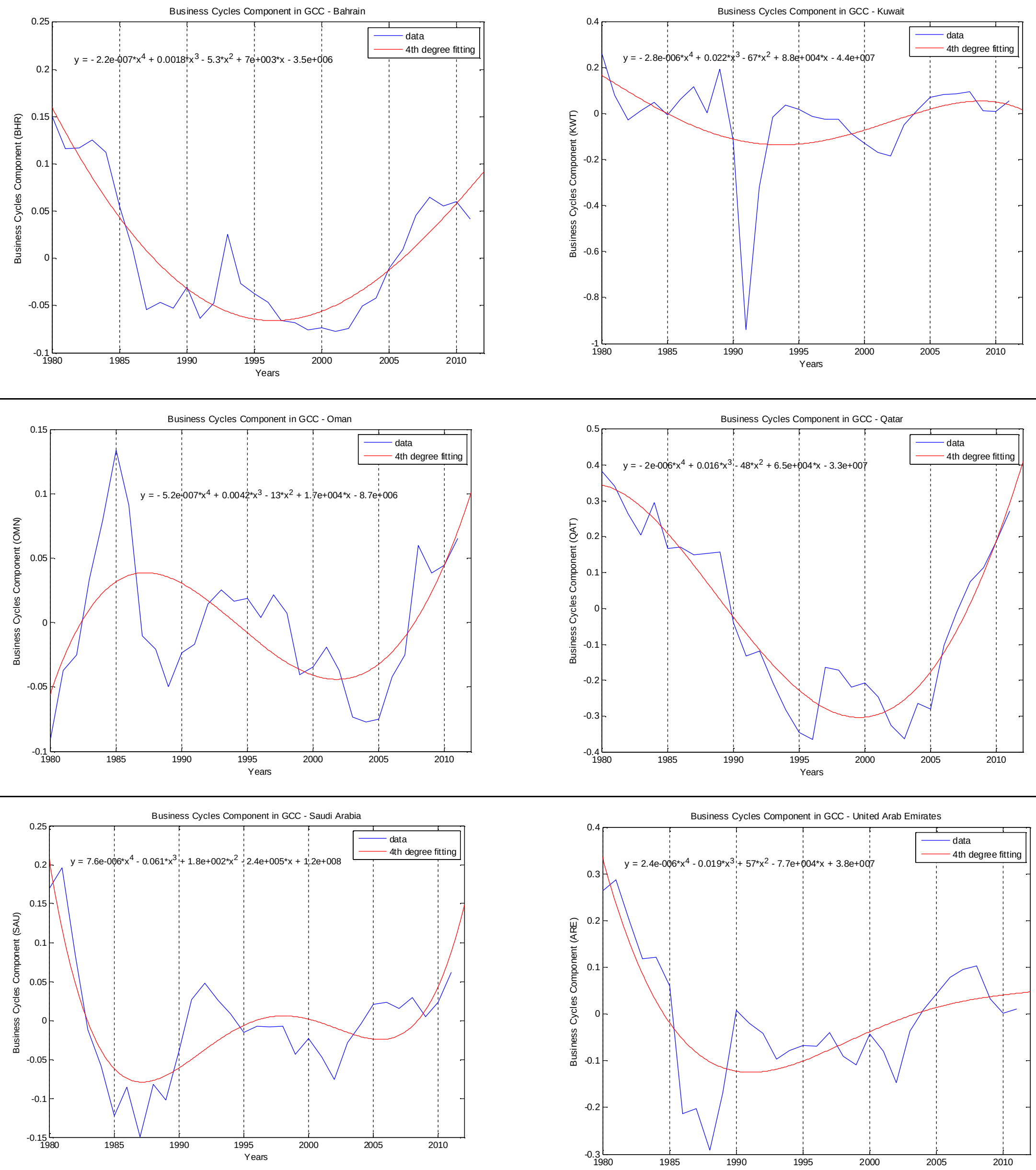


Figure 6(a): Continued



Notes: The line graphs are based on annual real GDP series and show the cyclical GDP component, scaled by overall GDP.

Figure 6(b): Business Cycle Components Extracted by the HP Filter (GCC countries)



Notes: The line graphs are based on annual real GDP series and show the cyclical GDP component, scaled by overall GDP.

Figure 7a: XWT and WTC for the 10 Highest BCS Coefficient in Euro Area

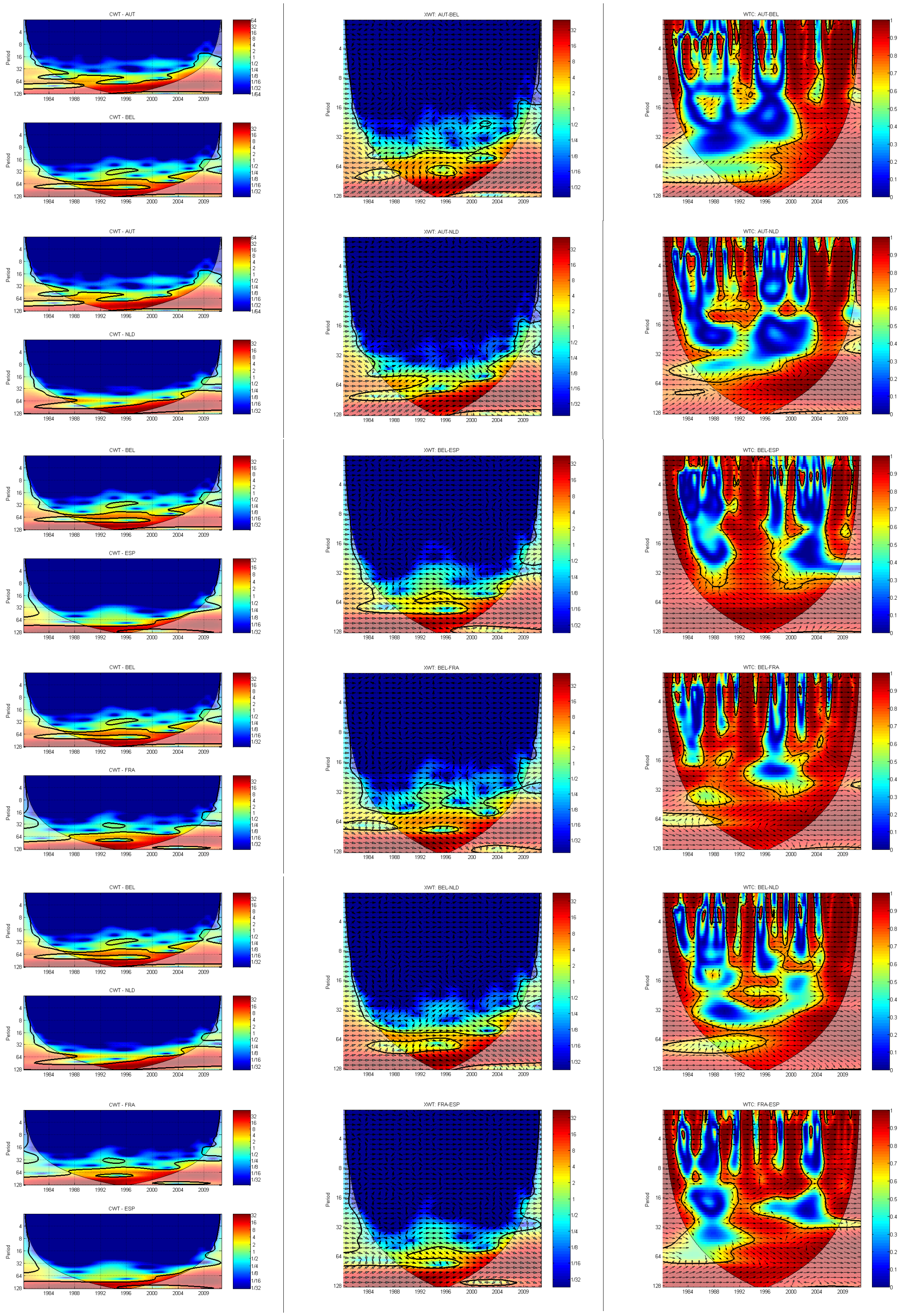


Figure 7a: Continued

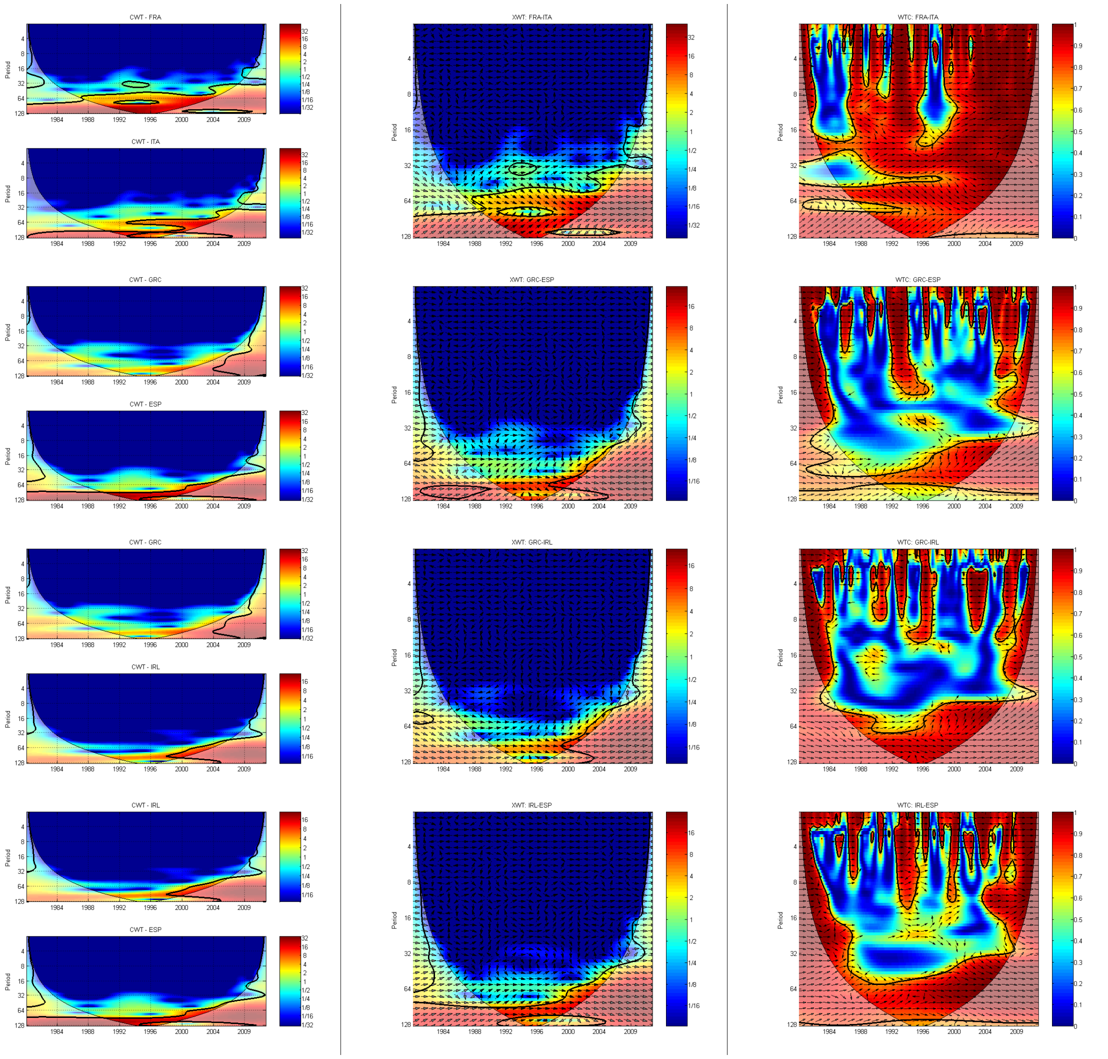


Figure 7b: XWT and WTC for the 10 lowest BCS coefficient in Euro Area

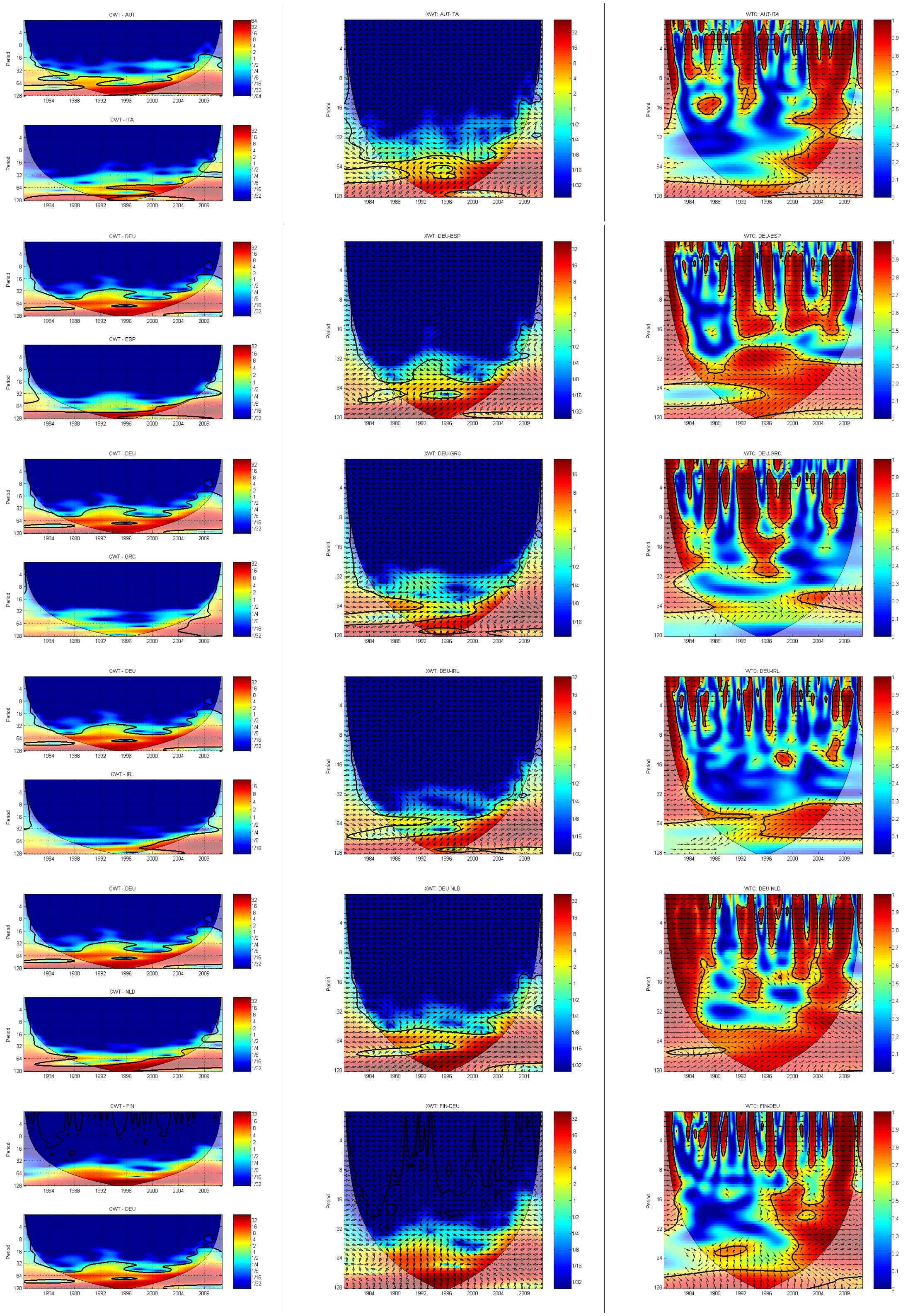


Figure 7b: Continued

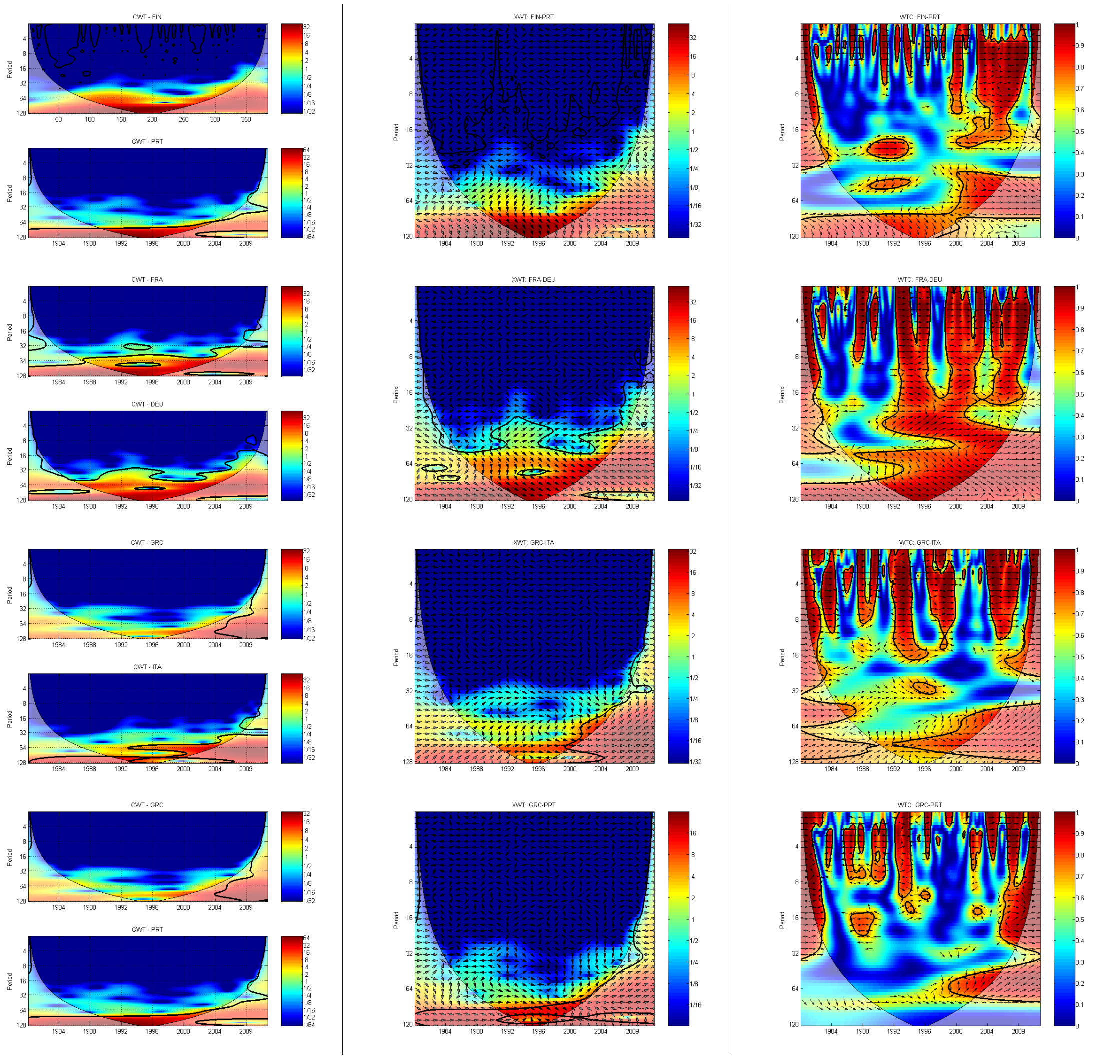


Figure 7c: XWT and WTC for the 5 highest BCS coefficient in GCC

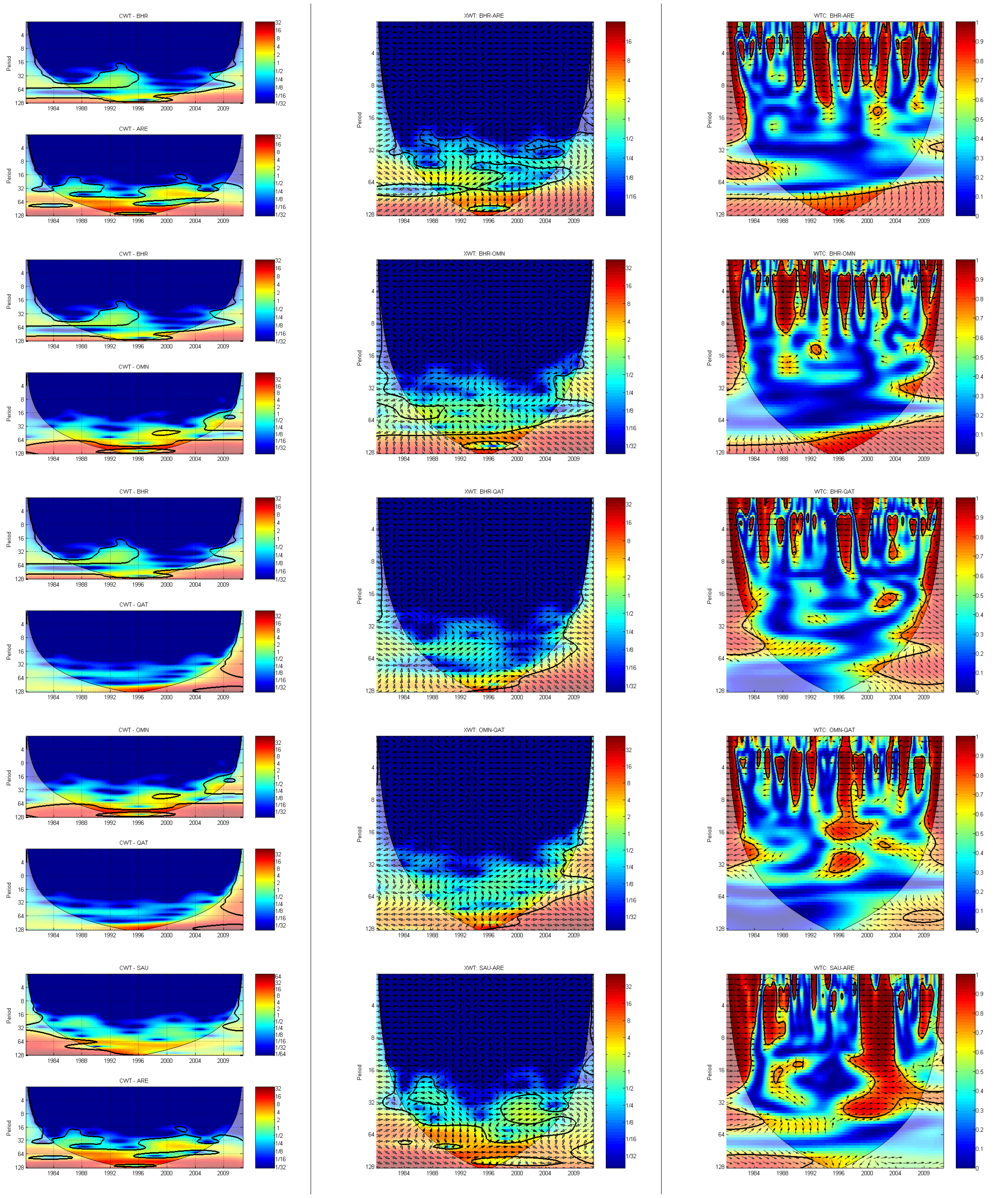


Figure 7c: XWT and WTC for the 5 lowest BCS coefficient in GCC

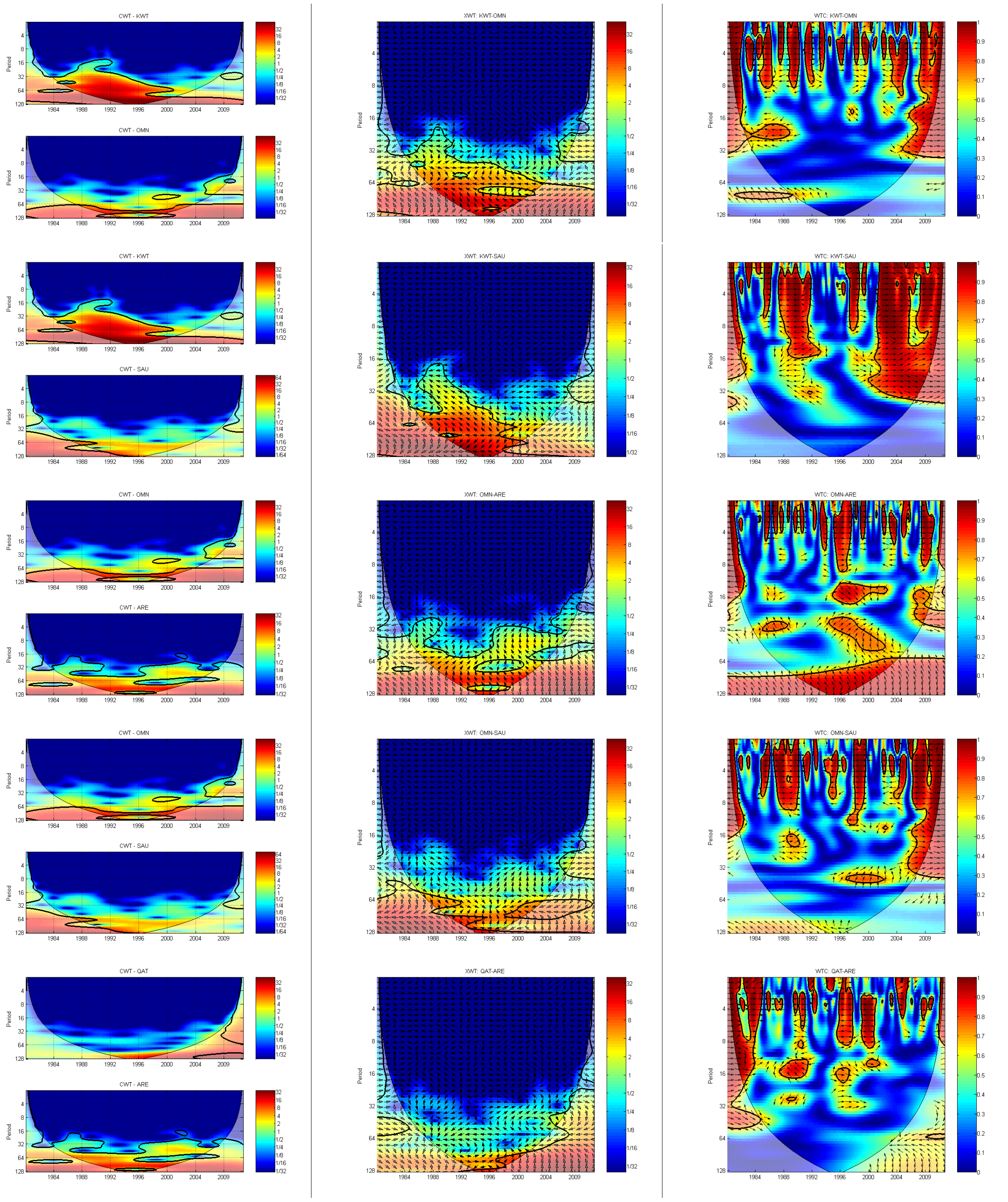
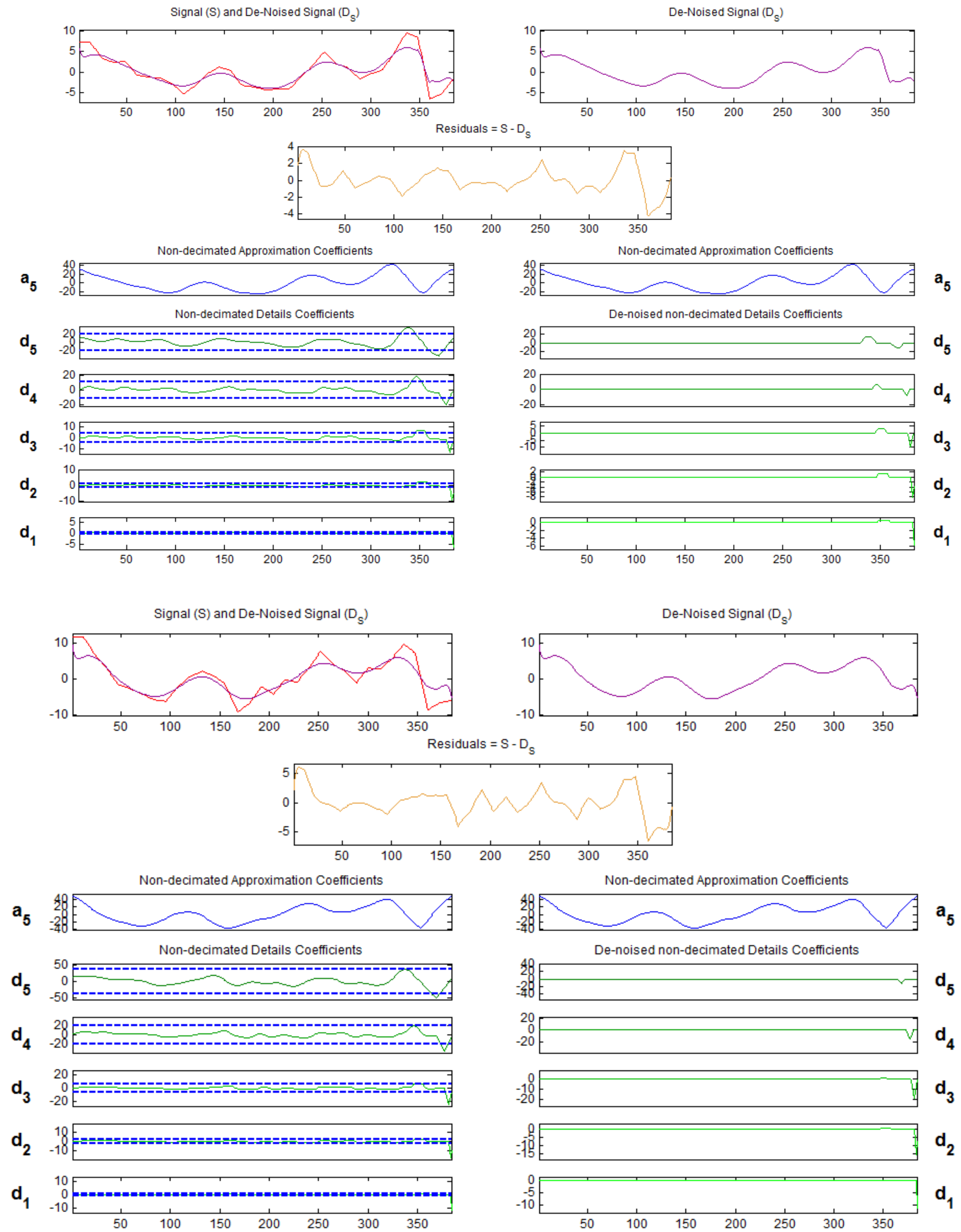


Figure 8: Stationary Wavelets Transform applied to denoise c_gdp component



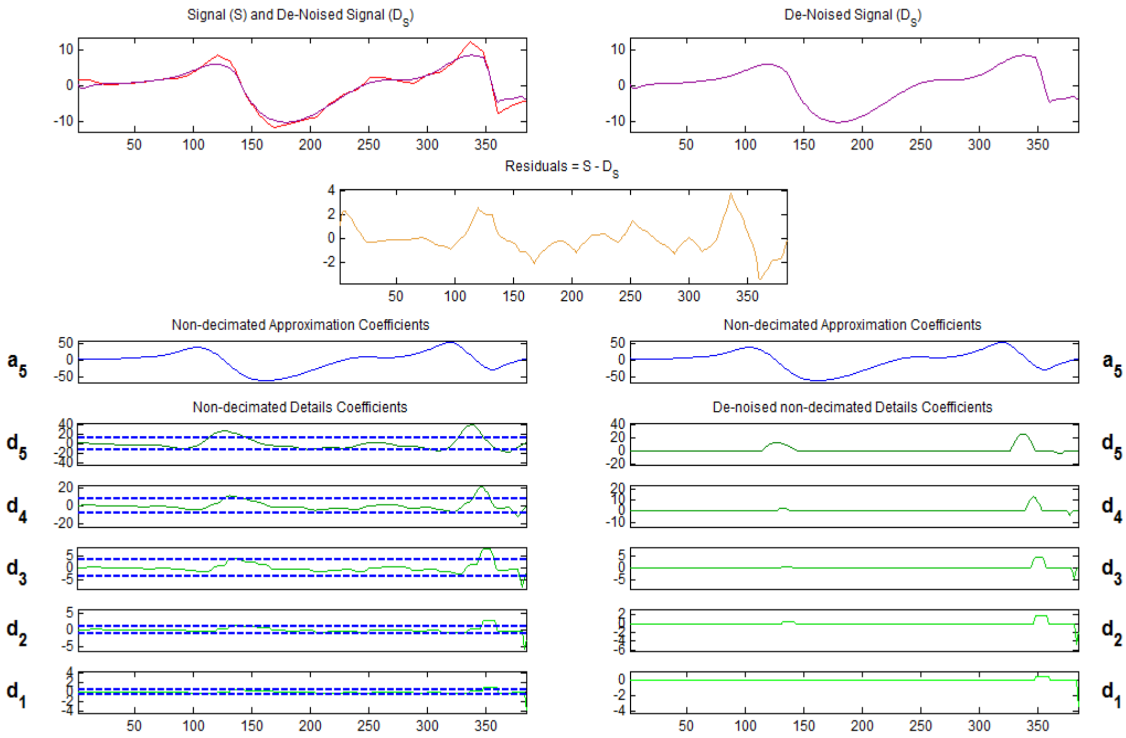


Figure. SWT for Finland c_gdp

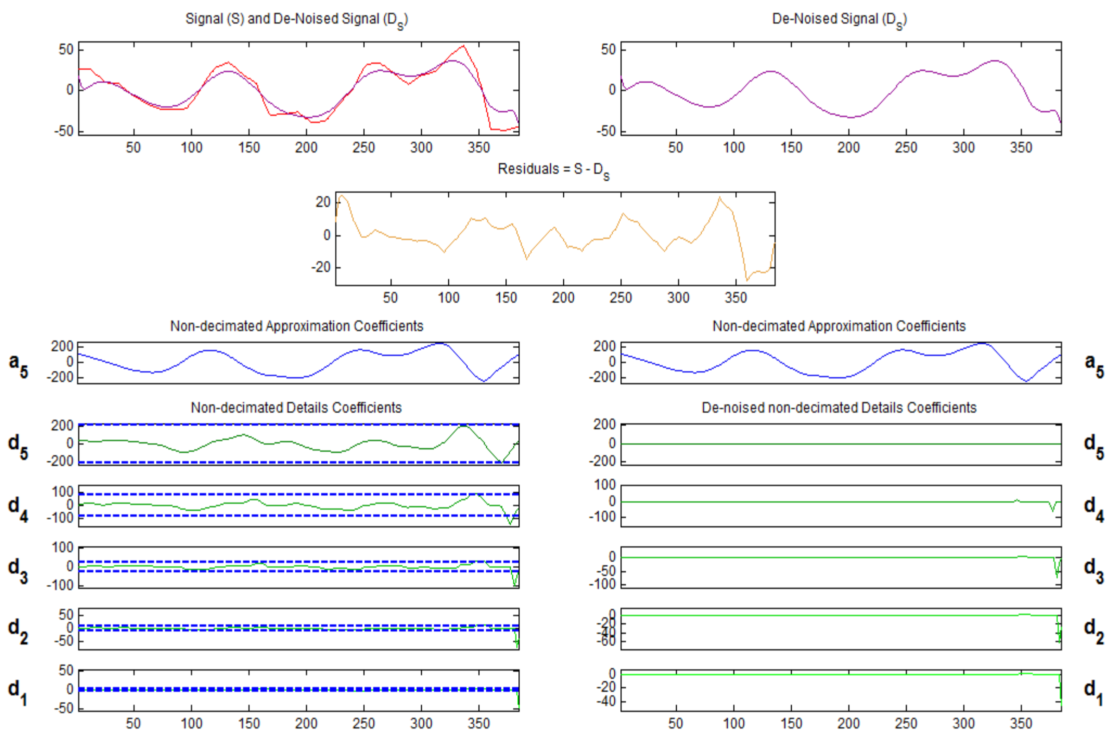


Figure. SWT for France c_gdp

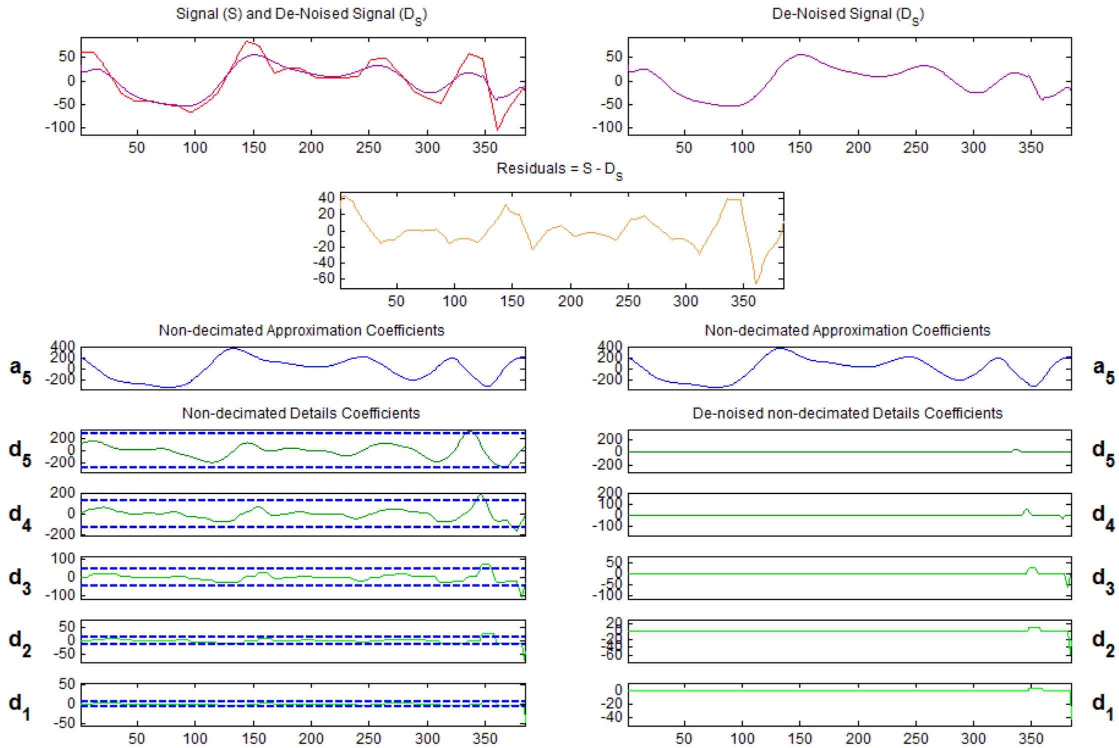


Figure. SWT for Germany c_gdp

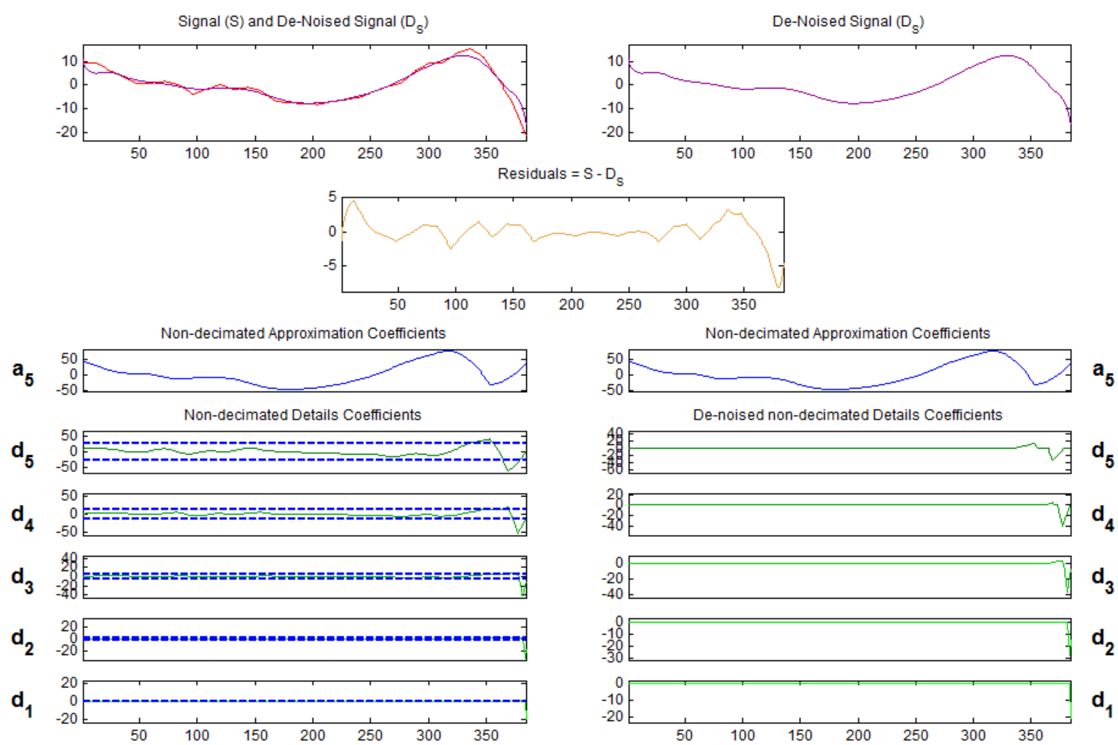


Figure. SWT for Greece c_gdp

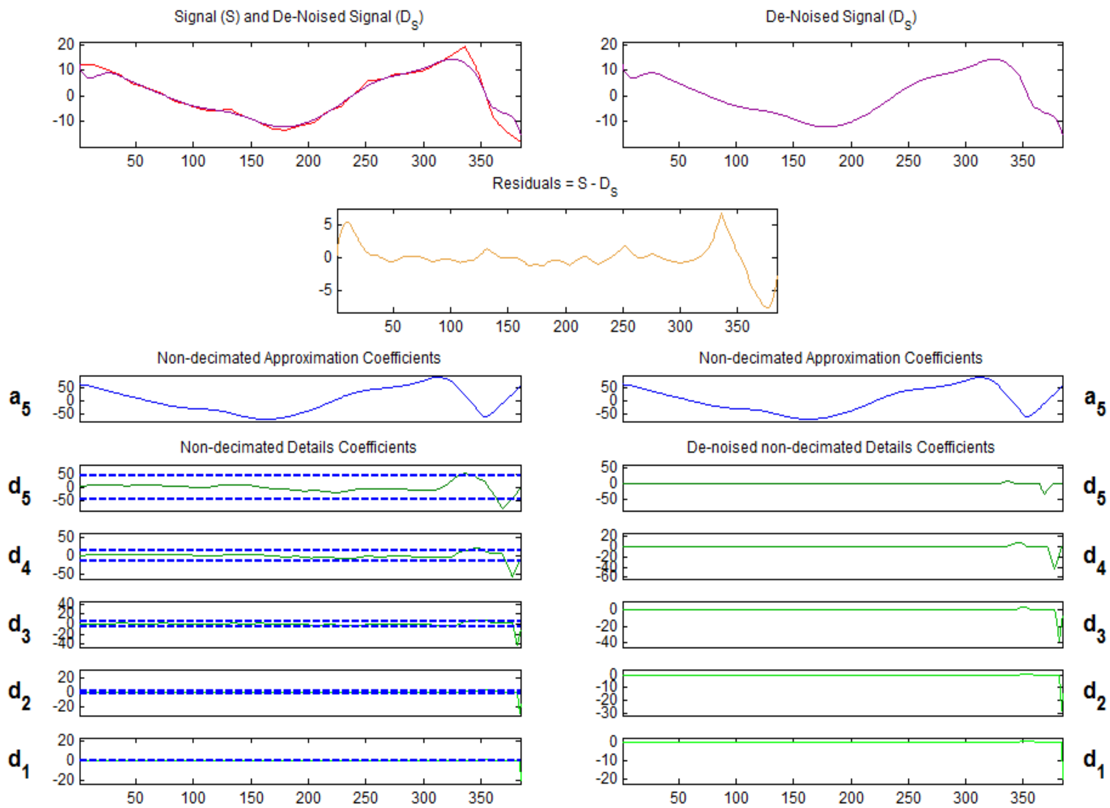


Figure. SWT for Ireland c_gdp

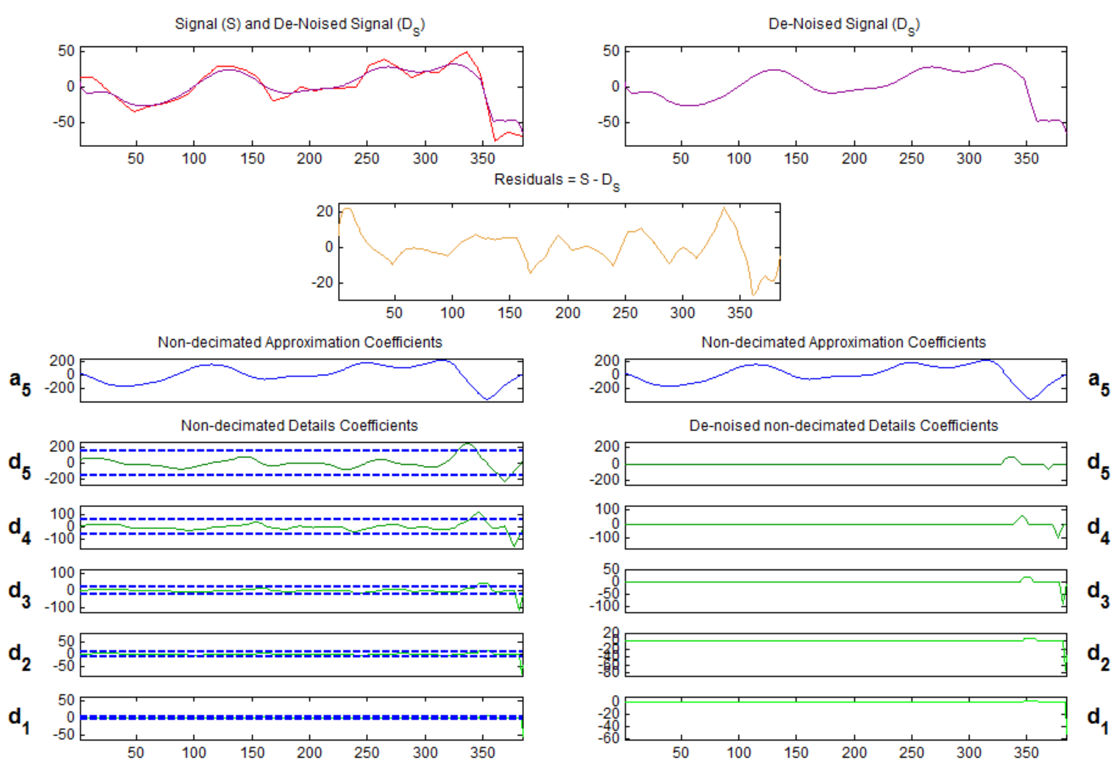


Figure. SWT for Italy c_gdp component

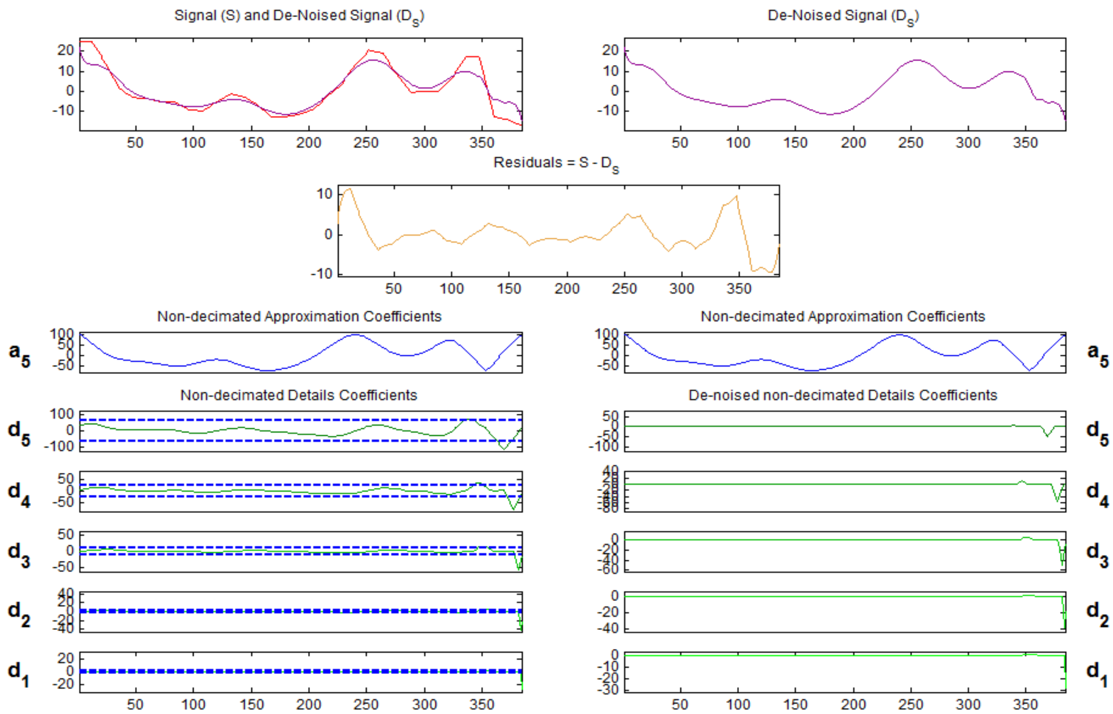


Figure. SWT for Netherlands c_gdp

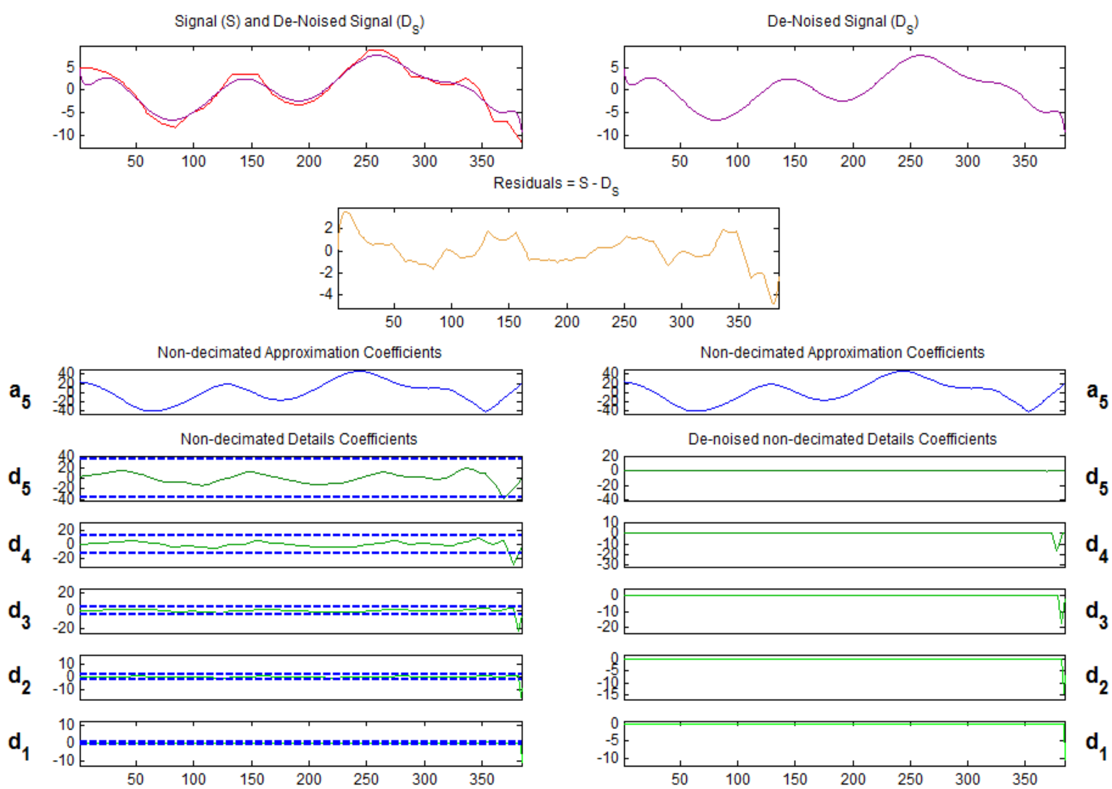


Figure. SWT for Portugal c_gdp

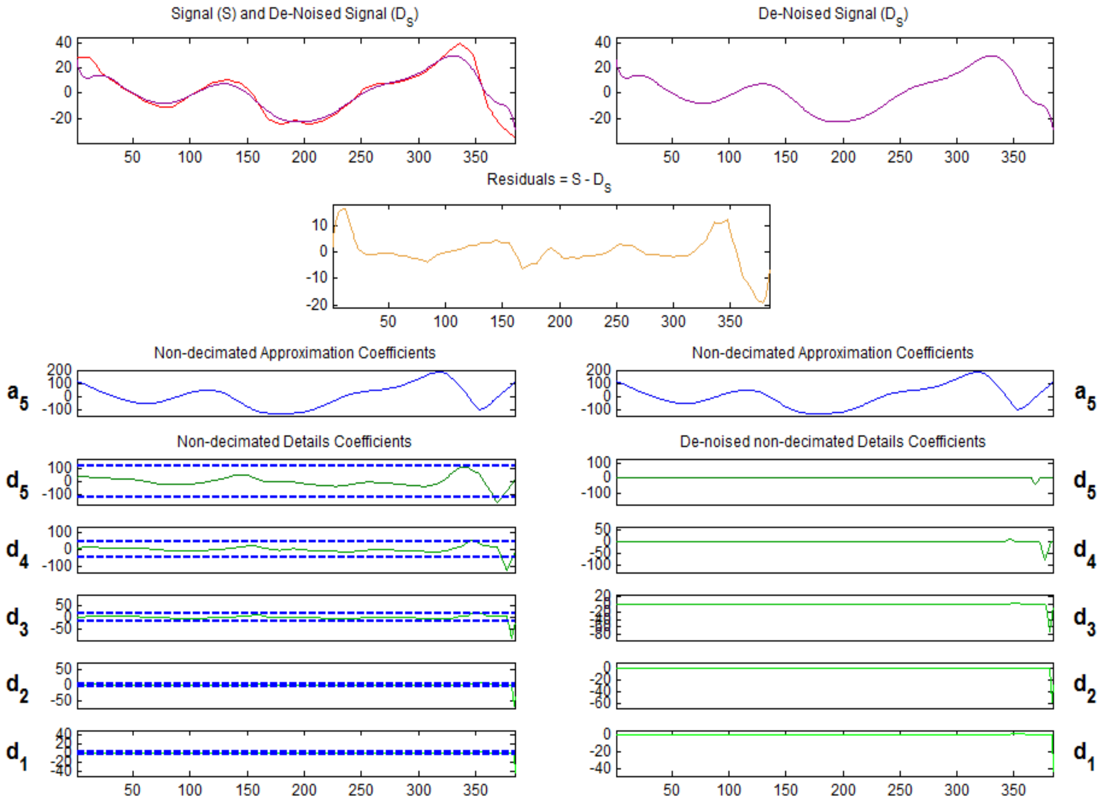


Figure. SWT for Spain c_gdp

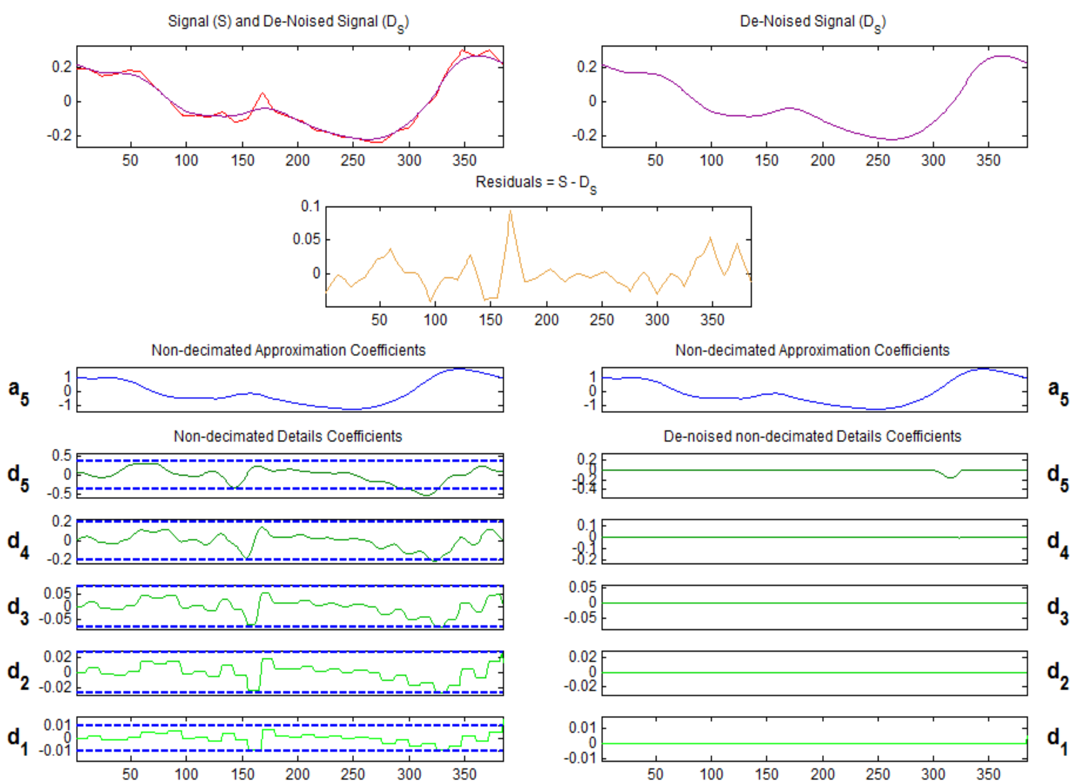


Figure. SWT for Bahrain c_gdp

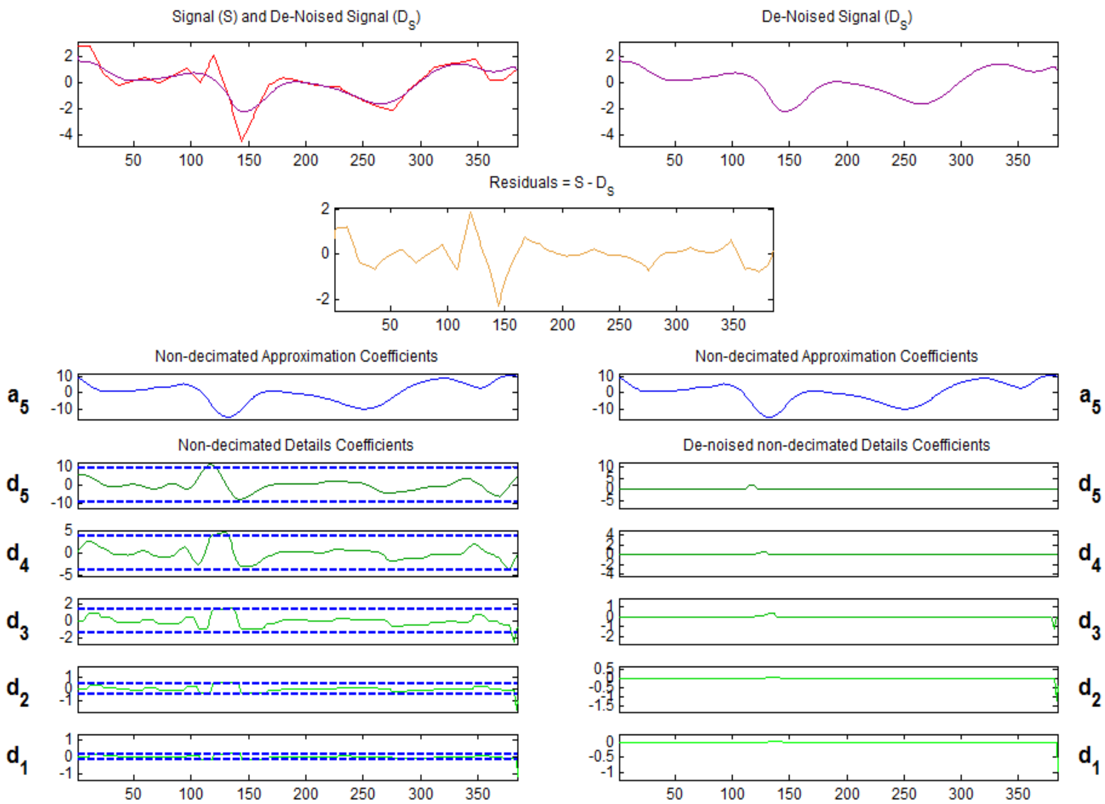


Figure. SWT for Kuwait c_gdp

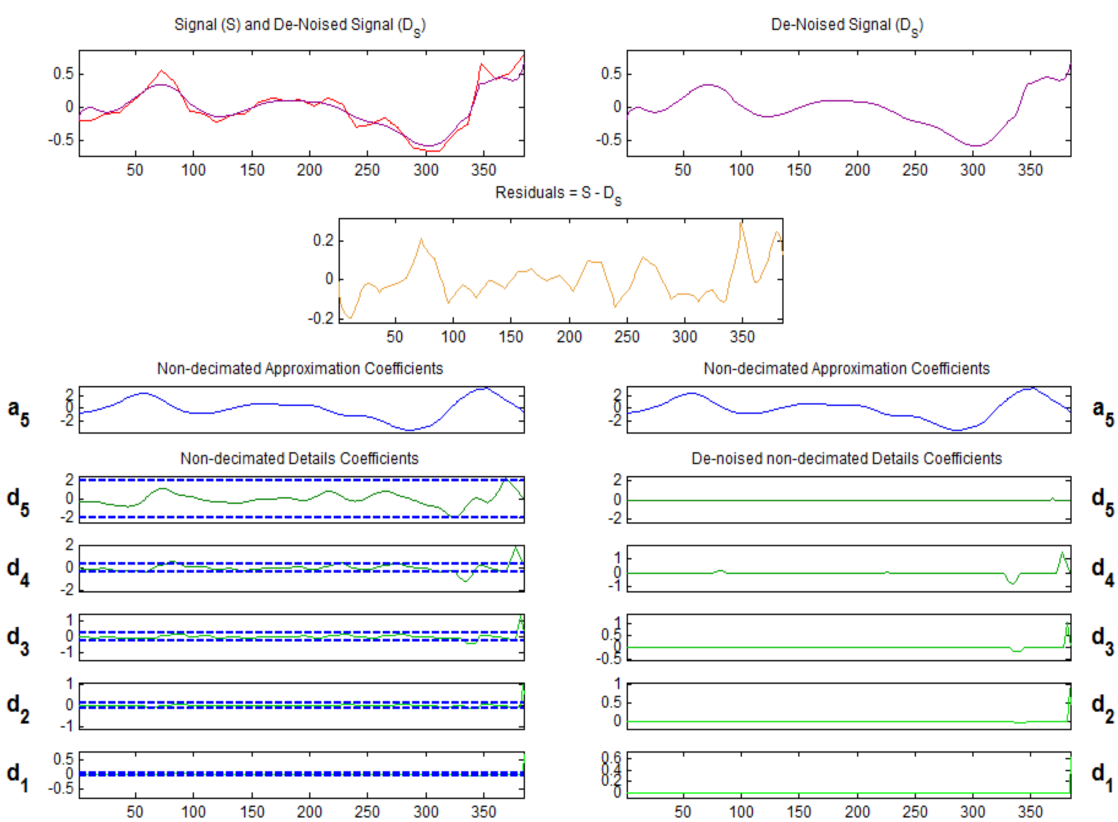


Figure. SWT for Oman c_gdp

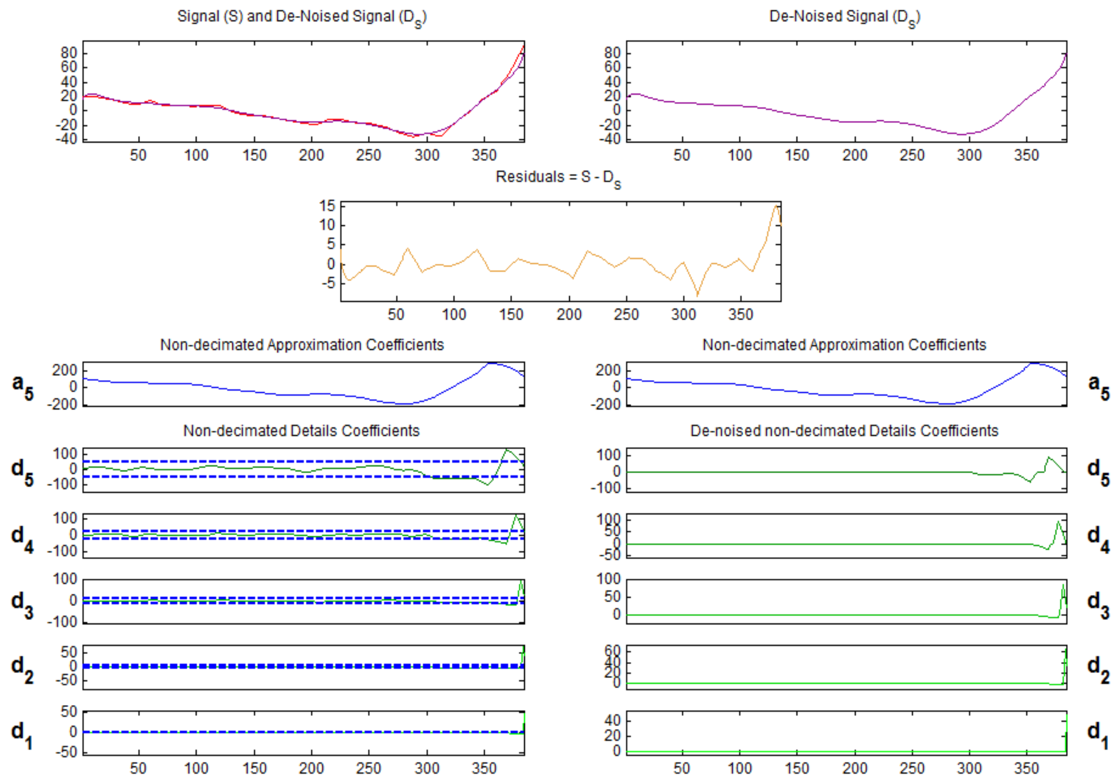


Figure. SWT for Qatar c_gdp component

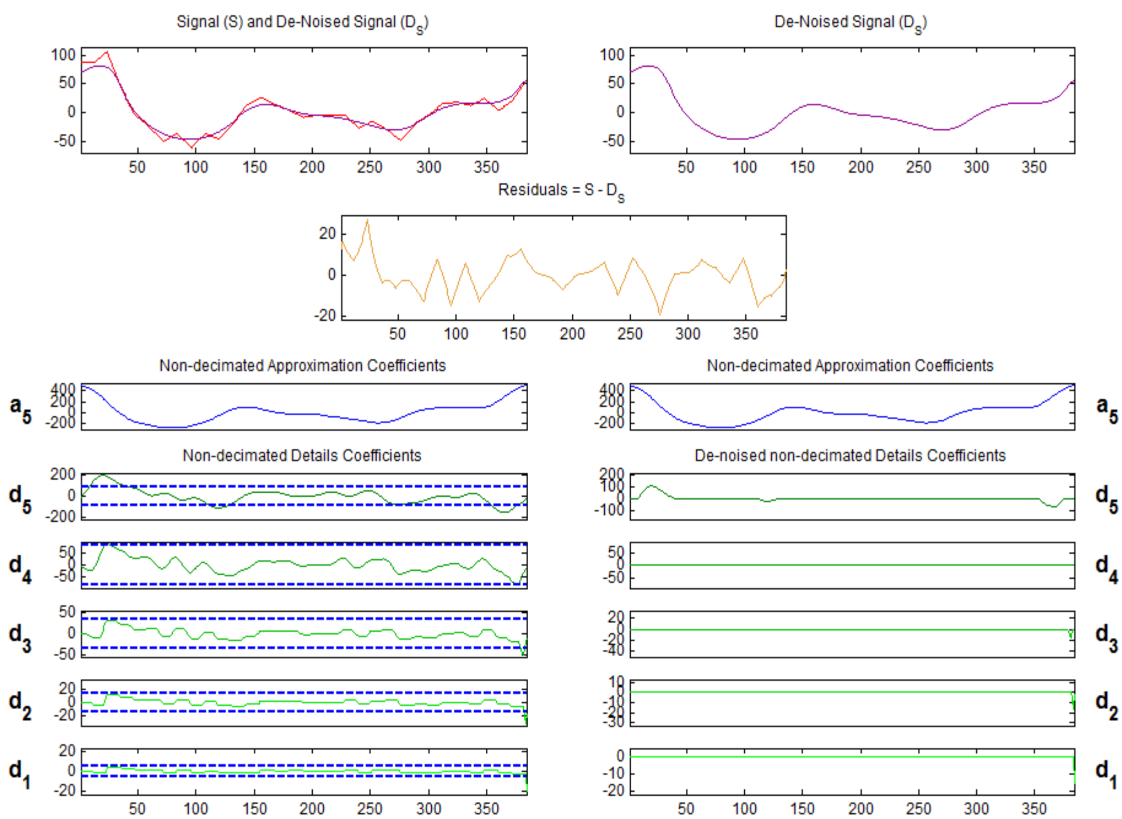


Figure. SWT for Saudi Arabia c_gdp

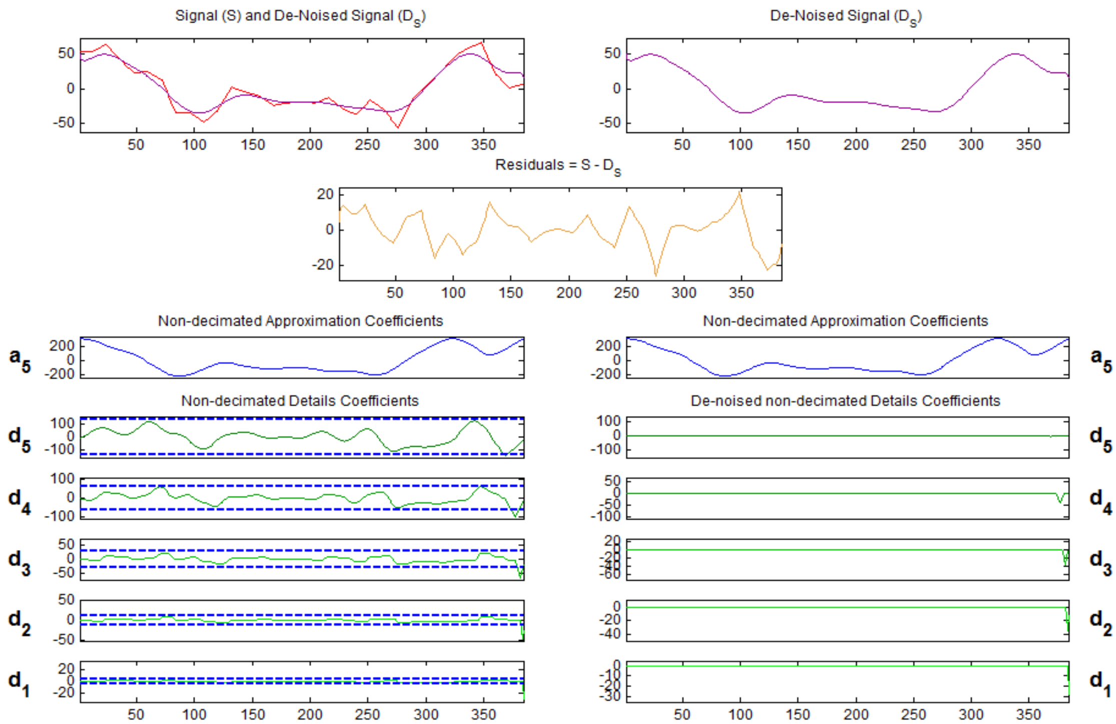
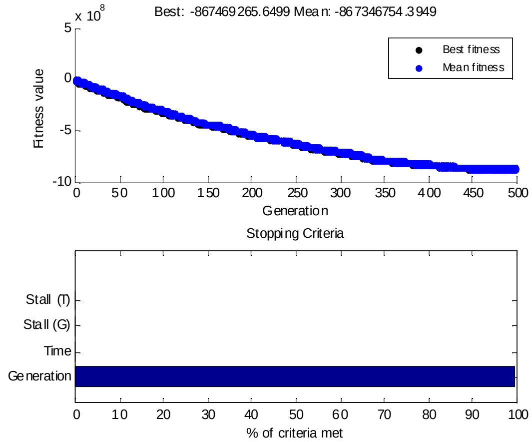
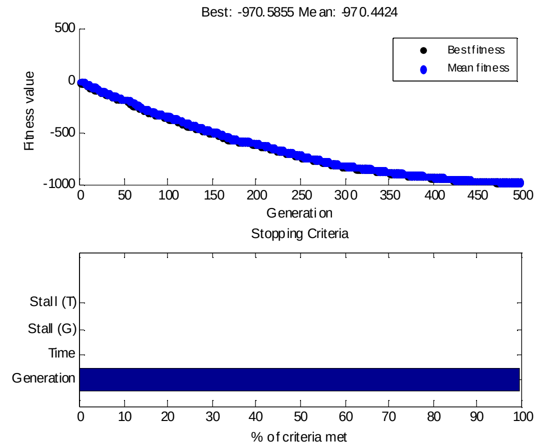


Figure. SWT for United Arab Emirates c_gdp component

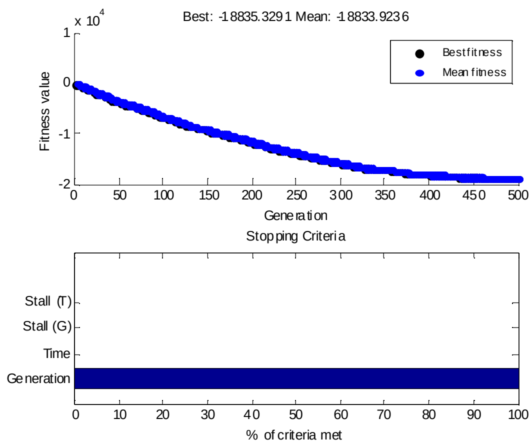
Figure 9: GA-Wavelets Optimization Applied on the Cyclical Business Cycle Synchronization Index



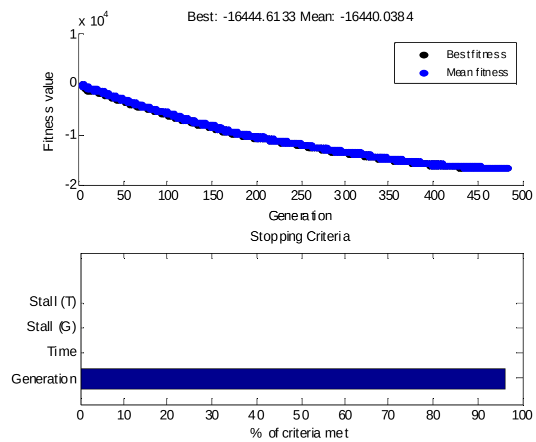
GA optimization for Euro Area c_gdp signal



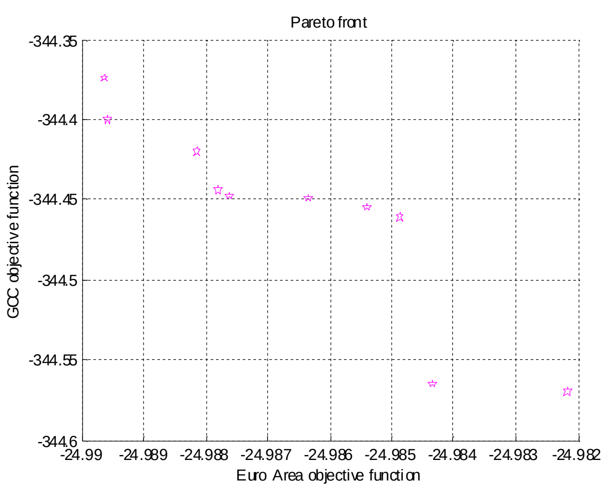
GA optimization for Euro Area c_gdp denoised signal



GA optimization for GCC c_gdp signal



GA optimization for GCC c_gdp desoised signal



Multi Objective GA optimization for Euro-GCC c_gdp

Table 1: EBA Analysis Results

		Euro Area			GCC	
Variables	**1980-1989**	**1990-1999**	**2000-2011**	**1980-1989**	**1990-1999**	**2000-2011**
Fundamental determinants of business cycle synchronization						
Bilateral Trade ***BLTRt*** (Trade criteria)	**Robust (+)**	**Robust (+)**	**Robust (+)**	Fragile	Fragile	Fragile Significant +
Bilateral trade ***BLTRy*** (GDP criteria)	**Robust (+)**	**Robust (+)**	**Robust (+)**	Fragile	Fragile	Fragile
Trade openness ***TROP***	**Quasi Robust(+)**	**Robust (+)**	**Robust (+)**	Fragile Significant+	Fragile	Fragile
Trade specialization ***TRSP***	**Quasi-Robust(-)**	**Robust (-)**	**Robust (-)**	**Quasi-Robust(-)**	**Robust (-)**	Fragile
Economic specialization ***ECSP***	**Robust (-)**	**Robust (-)**	**Quasi-Robust(-)**	Fragile	Fragile	Fragile
Specific determinants of economic and currency union						
Deposit interest rates differentials ***DRID***	**Robust (-)**	**Robust (-)**	Fragile	**Quasi-Robust (+)**	Fragile	Fragile
Official exchange rate fluctuations ***OEXR***	**Robust (-)**	**Robust (-)**	Fragile	Fragile Significant-	Fragile Significant-	Fragile Significant-
Fiscal deficit differentials ***FIDD***	**Robust (-)**	**Robust (-)**	**Robust (-)**	**Quasi-Robust(-)**	Fragile Significant-	**Quasi-Robust(-)**
Financial openness ***FIOP***	Fragile	**Quasi-Robust(+)**	**Robust (+)**	Fragile	Fragile	Fragile
Monetary policy ***MOPY***	**Robust (+)**	Fragile	**Robust (+)**	**Quasi-Robust (+)**	Fragile	**Quasi-Robust (+)**
Current Account Balance ***CUAB***	**Robust (+)**	**Robust (+)**	**Robust (+)**	**Robust (+)**	**Quasi-Robust (+)**	**Quasi-Robust (+)**
Gross national savings % of GDP ***GNSA***	**Robust (+)**	**Robust (+)**	**Robust (+)**	Fragile Significant+	Fragile	Fragile
Oil imports ***OIIM*** (only EA)	**Quasi-Robust(+)**	**Robust (+)**	**Robust (+)**	--	--	--
Oil exports ***OIEX*** (only GCC)	--	--	--	**Robust (+)**	**Robust (+)**	**Robust (+)**
Gravity variables						
Geographical distance ***GEOD***	**Robust (-)**	**Robust (-)**	**Robust (-)**	**Robust (-)**	**Robust (-)**	**Robust (-)**
Population density ***PODE***	**Robust (+)**	Fragile Significant+	**Robust (+)**	Fragile Significant+	**Robust (+)**	Fragile Significant +

Fragile significant with + or – signs indicate that the variable is significant only in the bivariate regression

Table 2: Correlation Matrix of Business Cycles between Countries (1980-2011)

	AUT	**BEL**	**FIN**	**FRA**	**DEU**	**GRC**	**IRL**	**ITA**	**NLD**	**PRT**	**ESP**
AUT	**1.0000**										
BEL	***0.8529***	**1.0000**									
FIN	0.5918	0.6365	**1.0000**								
FRA	0.7588	***0.8496***	0.7509	**1.0000**							
DEU	0.5572	0.5570	***-0.0055***	***0.4929***	**1.0000**						
GRC	0.6374	0.6415	0.6586	0.6938	***0.0517***	**1.0000**					
IRL	0.7706	0.7836	0.7096	0.7451	***0.1118***	***0.8658***	**1.0000**				
ITA	***0.5321***	0.7188	0.5621	***0.8561***	0.5903	***0.5123***	0.5583	**1.0000**			
NLD	***0.8507***	***0.9089***	0.5522	0.7408	***0.5194***	0.5870	0.7829	0.6258	**1.0000**		
PRT	0.5708	0.7335	***0.2501***	0.7288	0.6305	***0.3788***	0.5456	0.7390	0.7659	**1.0000**	
ESP	0.7781	***0.8168***	0.7866	***0.9024***	***0.2888***	***0.9061***	***0.8593***	0.6993	0.7659	0.5570	**1.0000**
	BHR	**KWT**	**OMN**	**QAT**	**SAU**	**ARE**					
BHR	**1.0000**										
KWT	0.5359	**1.0000**									
OMN	***0.5771***	***0.1206***	**1.0000**								
QAT	***0.7346***	0.3360	***0.7421***	**1.0000**							
SAU	0.5212	***0.2410***	***0.0940***	0.3859	**1.0000**						
ARE	***0.7422***	0.4587	***0.1064***	***0.3120***	***0.6935***	**1.0000**					

Notes: The highest coefficients and the lowest ones are in green bold and red bold respectively

Table 3: GA Optimization Variables

	Signal	Optimization equations (maximization)	Fitness function best value	Fitness function mean value)
Euro Area optimization	Original c_gdp	c_gdp = a_1(bltrt)+a_2(bltry)+a_3(trop)+a_4(trasp)+a_5(escp)+a_6(drid)+ a_7(oexr)+a_8(fidd)+a_9(fiop)+a_{10}(mopy)+a_{11}(cuab)+a_{12}(gnsa)+a_{13}(oiim)+a_{14}(geod)+a_{15}(pode)	-867469265,6499	-867346754,3949
	Denoised c_gdp	c_gdp_d =a_1(bltrt)+a_2(bltry)+a_3(trop)+a_4(trasp)+a_5(escp)+a_6(drid) +a_7(oexr)+a_8(fidd)+a_9(fiop)+a_{10}(mopy)+a_{11}(cuab)+a_{12}(gnsa)+a_{13}(oiim)+a_{14}(geod)+a_{15}(pode)	-970,5855	-970,4424
GCC optimization	Original c_gdp	c_gdp =a_1(bltrt)+a_2(bltry)+a_3(trop)+a_4(trasp)+a_5(escp)+a_6(drid) +a_7(oexr)+a_8(fidd)+a_9(fiop)+a_{10}(mopy)+a_{11}(cuab)+a_{12}(gnsa)+a_{13}(oiex)+a_{14}(geod)+a_{15}(pode)	-18835,3291	-18833.9236
	Denoised c_gdp	c_gdp_d =a_1(bltrt)+a_2(bltry)+a_3(trop)+a_4(trasp)+a_5(escp)+a_6(drid) +a_7(oexr)+a_8(fidd)+a_9(fiop)+a_{10}(mopy)+a_{11}(cuab)+a_{12}(gnsa)+a_{13}(oiex)+a_{14}(geod)+a_{15}(pode)	-16444,6133	-16440.0384
Euro Area & GCC Pareto multi-objective optimization	Denoised c_gdp_Euro	c_gdp_d =a_1(bltrt)+a_2(bltry)+a_3(trop)+a_4(trasp)+a_5(escp)+a_6(drid) +a_7(oexr)+a_8(fidd)+a_9(fiop)+a_{10}(mopy)+a_{11}(cuab)+a_{12}(gnsa)+a_{13}(oiim)+a_{14}(geod)+a_{15}(pode)	--	--
	Denoised c_gdp_GCC	c_gdp_d =a_1(bltrt)+a_2(bltry)+a_3(trop)+a_4(trasp)+a_5(escp)+a_6(drid) +a_7(oexr)+a_8(fidd)+a_9(fiop)+a_{10}(mopy)+a_{11}(cuab)+a_{12}(gnsa)+a_{13}(oiex)+a_{14}(geod)+a_{15}(pode)	--	--

Tables 4: Extreme Bound Analysis Results for the Euro Area from 1980 to 1989

Result of EBA on bltrt at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod pode]		Z = [bltry trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiim]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	4.6388	2.0949	2.2100	0.0310	-	-	-
EB Min	1.4404	6.2148	2.3872	2.6034	0.2335	66 doubles	133.98%	Robust
EB Max	11.1017	6.2971	2.4023	2.6213	0.2320		135.75%	
EB Min	1.1328	5.8856	2.3764	2.4767	0.2443	220 triplets	126.88%	Robust
EB Max	11.6649	6.7607	2.4521	2.7571	0.2215		145.74%	

Result of EBA on bltry at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod pode]		Z = [bltrt trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiim]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	12.3560	3.9631	3.1200	0.0030	-	-	-
EB Min	3.2864	12.4051	4.5594	2.7208	0.2242	66 doubles	100.40%	Robust
EB Max	26.9110	15.9038	5.5036	2.8897	0.2121		128.71%	
EB Min	3.2324	12.4585	4.6131	2.7007	0.2258	220 triplets	100.83%	Robust
EB Max	27.0332	16.6492	5.1920	3.2067	0.1924		134.75%	

Result of EBA on trop at .70 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod pode]		Z = [bltrtbltry trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiim]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	1.6196	0.6527	2.4800	0.0160	-	-	-
EB Min	-0.0275	1.6828	0.8552	1.9678	0.2993	66 doubles	103.90%	Fragile
EB Max	3.5256	1.8554	0.8351	2.2218	0.2692		114.56%	
EB Min	-0.0184	1.6023	0.8103	1.9773	0.2981	220 triplets	98.93%	Fragile
EB Max	3.5333	1.9463	0.7935	2.4528	0.2465		120.17%	

Result of EBA on trsp at .55 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod pode]		Z = [bltrtbltry trop ecsp drid oexr fidd fiop mopy cuab gnsa oiim]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	-1.4493	0.9468	-1.5300	0.1320	-	-	-
EB Min	-2.8832	-1.0986	0.8923	-1.2312	0.4343	66 doubles	75.80%	Fragile
EB Max	0.6527	-1.1745	0.9136	-1.2856	0.4209		81.04%	
EB Min	-2.7631	-1.0393	0.8619	-1.2058	0.4408	220 triplets	71.71%	Fragile
EB Max	0.5657	-1.2239	0.8948	-1.3678	0.4019		84.45%	

Result of EBA on ecsp at .65 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp drid oexr fidd fiop mopy cuab gnsa oiim]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	-0.0219	0.0139	-2.5800	0.0200	-	-	-
EB Min	-0.0460	-0.0262	0.0099	-2.6524	0.1465	66 doubles	119.68%	Fragile
EB Max	-0.0084	-0.0301	0.0109	-2.7682	0.1277		137.50%	
EB Min	-0.0449	-0.0260	0.0094	-2.7544	0.1298	220 triplets	118.77%	Fragile
EB Max	-0.0088	-0.0296	0.0104	-2.8507	0.1154		135.21%	

Result of EBA on drid at .70 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp ecsp oexr fidd fiop mopy cuab gnsa oiim]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	-0.0314	0.0125	-2.5000	0.0390	-	-	-
EB Min	-0.0958	-0.0501	0.0229	-2.1919	0.2725	66 doubles	159.67%	Robust
EB Max	-0.0089	-0.0562	0.0237	-2.3742	0.2538		179.11%	
EB Min	-0.0976	-0.0520	0.0228	-2.2813	0.2630	220 triplets	165.73%	Robust
EB Max	-0.0100	-0.0578	0.0239	-2.4207	0.2494		184.21%	

Result of EBA on oexr at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp ecsp drid fidd fiop mopy cuab gnsa oiim]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	-4.8530	1.4617	-3.3200	0.2536	-	-	-
EB Min	-11.1375	-6.4520	2.3428	-2.7540	0.2335	66 doubles	132.95%	Robust
EB Max	-0.8318	-4.0032	1.5857	-2.5246	0.2320		82.49%	
EB Min	-8.9640	-5.0012	1.9814	-2.5241	0.2443	220 triplets	103.05%	Robust
EB Max	-0.0354	-6.9809	3.4727	-2.0102	0.2215		143.85%	

Result of EBA on fidd at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp ecsp drid oexr fiop mopy cuab gnsa oiim]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	-0.0412	0.0185	-2.2300	0.0300	-	-	-
EB Min	-0.0809	-0.0453	0.0178	-2.5434	0.2385	66 doubles	109.87%	Robust
EB Max	-0.0223	-0.0583	0.0180	-3.2426	0.1904		141.40%	
EB Min	-0.0796	-0.0446	0.0175	-2.5470	0.2382	220 triplets	108.17%	Robust
EB Max	-0.0190	-0.0584	0.0197	-2.9671	0.2069		141.64%	

Tables 4: Continued

Result of EBA on fiop at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp	**X = [geod pode]**		**Z = [bltrt bltry trop trsp ecsp drid oexr fidd mopy cuab gnsa oiim]**					**CI 95%**
Estim.	**Bounds**	**Coeff.β**	**Std. Erro.**	**t**	**p-val**	**N. comb**	**% sign. coeff.**	**Result**
Bivar Reg.	-	1.8560	1.6425	1.1300	0.0123	-	-	-
EB Min	-1.0479	1.1023	1.0751	1.0253	0.0535	66 doubles	59.39%	Fragile
EB Max	4.0770	2.0320	1.0225	1.9873	0.0123		109.48%	
EB Min	-2.6518	3.2562	2.9540	1.1023	0.0235	220 triplets	175.44%	Fragile
EB Max	5.8983	2.8536	1.5223	1.8745	0.0412		153.75%	

Result of EBA on mopy at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp	**X = [geod pode]**		**Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop cuab gnsa oiim]**					**CI 95%**
Estim.	**Bounds**	**Coeff.β**	**Std. Erro.**	**t**	**p-val**	**N. comb**	**% sign. coeff.**	**Result**
Bivar Reg.	-	0.2532	0.1192	2.1250	0.1222	-	-	-
EB Min	0.0774	0.2156	0.0691	3.1203	0.6985	66 doubles	85.15%	Robust
EB Max	0.5350	0.3269	0.1040	3.1420	0.2251		129.11%	
EB Min	0.1102	0.2140	0.0519	4.1253	0.1253	220 triplets	84.52%	Robust
EB Max	0.3764	0.2512	0.0626	4.0120	0.2025		99.21%	

Result of EBA on cuab at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp	**X = [geod pode]**		**Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy gnsa oiim]**					**CI 95%**
Estim.	**Bounds**	**Coeff.β**	**Std. Erro.**	**t**	**p-val**	**N. comb**	**% sign. coeff.**	**Result**
Bivar Reg.	-	0.7374	0.2691	2.7400	0.0080	-	-	-
EB Min	0.1654	0.6361	0.2354	2.7026	0.2256	66 doubles	86.26%	Robust
EB Max	1.2558	0.7629	0.2464	3.0958	0.1989		103.46%	
EB Min	0.1640	0.6278	0.2319	2.7070	0.2253	220 triplets	85.14%	Robust
EB Max	1.2617	0.7636	0.2490	3.0663	0.2007		103.55%	

Result of EBA on gnsa at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp	**X = [geod pode]**		**Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy cuab oiim]**					**CI 95%**
Estim.	**Bounds**	**Coeff.β**	**Std. Erro.**	**t**	**p-val**	**N. comb**	**% sign. coeff.**	**Result**
Bivar Reg.	-	1.0012	0.3015	3.3210	0.0450	-	-	-
EB Min	0.8724	1.4520	0.2898	5.0102	0.3325	66 doubles	145.03%	Robust
EB Max	2.2582	1.6202	0.3190	5.0786	0.5210		161.83%	
EB Min	0.9846	1.6520	0.3337	4.9502	0.2553	220 triplets	165.00%	Robust
EB Max	2.4558	1.6897	0.3831	4.4111	0.3625		168.77%	

Result of EBA on oiim at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp	**X = [geod pode]**		**Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa]**					**CI 95%**
Estim.	**Bounds**	**Coeff.β**	**Std. Erro.**	**t**	**p-val**	**N. comb**	**% sign. coeff.**	**Result**
Bivar Reg.	-	0.7890	0.3921	2.0123	0.0444	-	-	-
EB Min	0.0071	0.1203	0.0566	2.1250	0.2252	66 doubles	15.25%	Fragile
EB Max	2.8048	1.3555	0.7247	1.8705	0.2444		171.80%	
EB Min	0.4373	1.4556	0.5091	2.8590	0.3325	220 triplets	184.49%	Fragile
EB Max	2.7917	1.4789	0.6564	2.2530	0.1125		187.44%	

Result of EBA on geod at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp	**X = [pode]**		**Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiim]**					**CI 95%**
Estim.	**Bounds**	**Coeff.β**	**Std. Erro.**	**t**	**p-val**	**N. comb**	**% sign. coeff.**	**Result**
Bivar Reg.	-	-0.9860	0.4640	-2.1250	0.0111	-	-	-
EB Min	-1.2055	-0.7890	0.2082	-3.7890	0.2253	66 doubles	80.02%	Robust
EB Max	-0.3097	-0.8522	0.2712	-3.1420	0.2222		86.43%	
EB Min	-1.1099	-0.5698	0.2700	-2.1101	0.1985	220 triplets	57.79%	Robust
EB Max	-0.0288	-0.5477	0.2595	-2.1110	0.2054		55.55%	

Result of EBA on pode at .70 confidence level and maximum VIF = 10								
Dvar = c_gdp		**X = [geod]**	**Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiim]**					**CI 95%**
Estim.	**Bounds**	**Coeff.β**	**Std. Erro.**	**t**	**p-val**	**N. comb**	**% sign. coeff.**	**Result**
Bivar Reg.	-	0.4351	0.2171	2.0000	0.0500	-	-	-
EB Min	0.0061	0.5361	0.2650	2.0231	0.2923	66 doubles	123.21%	Robust
EB Max	0.9281	0.4849	0.2216	2.1883	0.2729		111.44%	
EB Min	0.0038	0.5061	0.2511	2.0152	0.2932	220 triplets	116.32%	Robust
EB Max	0.9169	0.4707	0.2231	2.1096	0.2818		108.18%	

Tables 5: Extreme Bound Analysis Results for the Euro Area from 1990 to 1999

Result of EBA on bltrt at .75 confidence level and maximum VIF = 10

Dvar = c_gdp	**X = [geod pode]**		**Z = [bltry trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiim]**					**CI 95%**
Estim.	**Bounds**	**Coeff.β**	**Std. Erro.**	**t**	**p-val**	**N. comb**	**% sign. coeff.**	**Result**
Bivar Reg.	-	5.7877	1.4695	3.9400	0.0000	-	-	-
EB Min	1.5708	3.7650	1.0971	3.4317	0.1805	66 doubles	65.05%	Robust
EB Max	8.1659	5.9428	1.1115	5.3465	0.1177		102.68%	
EB Min	1.5518	3.7726	1.1104	3.3975	0.1822	220 triplets	65.18%	Robust
EB Max	8.1740	5.9288	1.1226	5.2814	0.1191		102.44%	

Result of EBA on bltry at .75 confidence level and maximum VIF = 10

Dvar = c_gdp	**X = [geod pode]**		**Z = [bltrt trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiim]**					**CI 95%**
Estim.	**Bounds**	**Coeff.β**	**Std. Erro.**	**t**	**p-val**	**N. comb**	**% sign. coeff.**	**Result**
Bivar Reg.	-	2.6788	0.7434	3.6000	0.0010	-	-	-
EB Min	0.4134	1.6209	0.6037	2.6848	0.2270	66 doubles	60.51%	Robust
EB Max	3.7373	2.5307	0.6033	4.1949	0.1490		94.47%	
EB Min	0.3387	1.5263	0.5938	2.5704	0.2362	220 triplets	56.98%	Robust
EB Max	3.7213	2.4908	0.6153	4.0484	0.1542		92.98%	

Result of EBA on trop at .75 confidence level and maximum VIF = 10

Dvar = c_gdp	**X = [geod pode]**		**Z = [bltrt bltry trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiim]**					**CI 95%**
Estim.	**Bounds**	**Coeff.β**	**Std. Erro.**	**t**	**p-val**	**N. comb**	**% sign. coeff.**	**Result**
Bivar Reg.	-	1.3534	0.3698	3.6600	0.0010	-	-	-
EB Min	0.1610	0.7969	0.3179	2.5065	0.2417	66 doubles	58.88%	Robust
EB Max	1.8987	1.2676	0.3156	4.0170	0.1553		93.66%	
EB Min	0.1615	0.8022	0.3203	2.5042	0.2419	220 triplets	59.27%	Robust
EB Max	1.8927	1.2529	0.3199	3.9165	0.1591		92.57%	

Result of EBA on trsp at .70 confidence level and maximum VIF = 10

Dvar = c_gdp	**X = [geod pode]**		**Z = [bltrt bltry trop ecsp drid oexr fidd fiop mopy cuab gnsa oiim]**					**CI 95%**
Estim.	**Bounds**	**Coeff.β**	**Std. Erro.**	**t**	**p-val**	**N. comb**	**% sign. coeff.**	**Result**
Bivar Reg.	-	-1.0470	0.4405	-2.3800	0.0210	-	-	-
EB Min	-2.1809	-1.3136	0.4337	-3.0291	0.2030	66 doubles	125.46%	Robust
EB Max	-0.0434	-0.7603	0.3584	-2.1212	0.2805		72.62%	
EB Min	-2.0359	-1.1628	0.4365	-2.6637	0.2286	220 triplets	111.06%	Robust
EB Max	-0.0333	-0.7321	0.3494	-2.0954	0.2835		69.92%	

Result of EBA on ecsp at .55 confidence level and maximum VIF = 10

Dvar = c_gdp	**X = [geod pode]**		**Z = [bltrt bltry trop trsp drid oexr fidd fiop mopy cuab gnsa oiim]**					**CI 95%**
Estim.	**Bounds**	**Coeff.β**	**Std. Erro.**	**t**	**p-val**	**N. comb**	**% sign. coeff.**	**Result**
Bivar Reg.	-	-0.0023	0.0075	-2.3100	0.0761	-	-	-
EB Min	-0.0196	-0.0104	0.0045	-2.2689	0.1249	66 doubles	451.10%	Robust
EB Max	-0.0040	-0.0133	0.0046	-2.8470	0.1159		576.88%	
EB Min	-0.0180	-0.0096	0.0041	-2.2917	0.1194	220 triplets	416.40%	Robust
EB Max	-0.0031	-0.0119	0.0044	-2.7019	0.1382		516.16%	

Result of EBA on drid at .75 confidence level and maximum VIF = 10

Dvar = c_gdp	**X = [geod pode]**		**Z = [bltrt bltry trop trsp ecsp oexr fidd fiop mopy cuab gnsa oiim]**					**CI 95%**
Estim.	**Bounds**	**Coeff.β**	**Std. Erro.**	**t**	**p-val**	**N. comb**	**% sign. coeff.**	**Result**
Bivar Reg.	-	-1.7890	0.6175	-2.8970	0.1240	-	-	-
EB Min	-2.0575	-1.1256	0.4660	-2.4156	0.1548	66 doubles	62.92%	Robust
EB Max	-0.2296	-1.2300	0.5002	-2.4589	0.1985		68.75%	
EB Min	-2.4573	-1.4500	0.5036	-2.8790	0.2013	220 triplets	81.05%	Robust
EB Max	-0.3994	-1.4111	0.5058	-2.7896	0.2001		78.88%	

Result of EBA on oexr at .75 confidence level and maximum VIF = 10

Dvar = c_gdp	**X = [geod pode]**		**Z = [bltrt bltry trop trsp ecsp drid fidd fiop mopy cuab gnsa oiim]**					**CI 95%**
Estim.	**Bounds**	**Coeff.β**	**Std. Erro.**	**t**	**p-val**	**N. comb**	**% sign. coeff.**	**Result**
Bivar Reg.	-	-4.7890	1.2777	-3.7480	0.0127	-	-	-
EB Min	-6.5812	-3.9550	1.3131	-3.0120	0.0125	66 doubles	82.59%	Robust
EB Max	-1.0451	-3.1125	1.0337	-3.0111	0.0225		64.99%	
EB Min	-5.8299	-3.5548	1.1375	-3.1250	0.0458	220 triplets	74.23%	Robust
EB Max	-1.2289	-3.4412	1.1061	-3.1110	0.0458		71.86%	

Tables 5: Continue

Result of EBA on fidd at .70 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp ecsp drid oexr fiop mopy cuab gnsa oiim]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	-0.0201	0.0120	-2.6800	0.0990	-	-	-
EB Min	-0.0467	-0.0234	0.0116	-2.0099	0.2939	66 doubles	116.40%	Robust
EB Max	-0.0015	-0.0262	0.0124	-2.1207	0.2805		130.32%	
EB Min	-0.0457	-0.0229	0.0114	-2.0062	0.2944	220 triplets	113.91%	Robust
EB Max	-0.0001	-0.0243	0.0121	-2.0115	0.2937		120.87%	

Result of EBA on fiop at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp ecsp drid oexr fidd mopy cuab gnsa oiim]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	5.5985	3.1294	1.7890	0.0562	-	-	-
EB Min	0.5369	4.7811	2.1221	2.2530	0.1025	66 doubles	85.40%	Fragile
EB Max	8.3324	4.1526	2.0899	1.9870	0.0985		74.17%	
EB Min	0.2360	4.0123	1.8881	2.1250	0.2855	220 triplets	71.67%	Fragile
EB Max	8.6269	4.2001	2.2134	1.8976	0.3012		75.02%	

Result of EBA on mopy at .65 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop cuab gnsa oiim]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	0.2377	0.1730	1.3700	0.1750	-	-	-
EB Min	-0.0354	0.2235	0.1295	1.7263	0.3342	66 doubles	94.03%	Fragile
EB Max	0.5592	0.2838	0.1377	2.0607	0.2876		119.40%	
EB Min	-0.0377	0.2244	0.1311	1.7122	0.3365	220 triplets	94.41%	Fragile
EB Max	0.5299	0.2616	0.1342	1.9498	0.3017		110.06%	

Result of EBA on cuab at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy gnsa oiim]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	2.7450	0.5732	4.7890	0.0639	-	-	-
EB Min	1.0372	2.4589	0.7109	3.4590	0.1589	66 doubles	89.58%	Robust
EB Max	2.9271	1.7893	0.5689	3.1452	0.2025		65.18%	
EB Min	0.8614	1.5623	0.3504	4.4580	0.2205	220 triplets	56.91%	Robust
EB Max	2.8702	1.9856	0.4423	4.4893	0.2322		72.34%	

Result of EBA on gnsa at .70 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy cuab oiim]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	0.2198	0.1087	2.0200	0.0480	-	-	-
EB Min	0.0032	0.1781	0.0875	2.0362	0.2906	66 doubles	81.04%	Robust
EB Max	0.4123	0.2294	0.0915	2.5084	0.2415		104.38%	
EB Min	0.0020	0.1792	0.0886	2.0227	0.2923	220 triplets	81.54%	Robust
EB Max	0.3821	0.2073	0.0874	2.3715	0.2540		94.32%	

Result of EBA on oiim at .70 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	0.2097	0.0807	2.6000	0.1150	-	-	-
EB Min	0.0002	0.2266	0.1132	2.0015	0.2950	66 doubles	108.05%	Robust
EB Max	0.4609	0.2376	0.1116	2.1285	0.2796		113.29%	
EB Min	0.0289	0.2148	0.1086	2.3112	0.2980	220 triplets	102.42%	Robust
EB Max	0.4735	0.2550	0.1093	2.3340	0.2577		121.59%	

Result of EBA on geod at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [pode]		Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiim]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	-0.0896	0.0321	-2.7890	0.1235	-	-	-
EB Min	-1.4325	-0.7896	0.3215	-2.4560	0.4563	66 doubles	881.60%	Robust
EB Max	-0.1444	-0.6570	0.2563	-2.5632	0.2598		733.59%	
EB Min	-1.4297	-0.7899	0.3199	-2.4690	0.4521	220 triplets	881.92%	Robust
EB Max	-0.1367	-0.9860	0.4246	-2.3220	0.3003		1100.94%	

Tables 5: Continue

Result of EBA on pode at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp	**X = [geod]**		**Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiim]**					**CI 95%**
Estim.	**Bounds**	**Coeff.β**	**Std. Erro.**	**t**	**p-val**	**N. comb**	**% sign. coeff.**	**Result**
Bivar Reg.	-	1.7560	0.8184	2.1456	0.1310	-	-	-
EB Min	-0.1721	1.4589	0.8155	1.7890	0.3356	66 doubles	83.08%	Robust
EB Max	2.9284	1.4589	0.7347	1.9856	0.3265		83.08%	
EB Min	-0.3259	1.5621	0.9440	1.6548	0.3211	220 triplets	88.96%	Robust
EB Max	3.3540	1.5632	0.8954	1.7458	0.2986		89.02%	

Tables 6: Extreme Bound Analysis results for the Euro Area from 2000 to 2011

Result of EBA on bltrt at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod pode]		Z = [bltry trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiim]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	3.7576	1.6133	2.3300	0.0240	-	-	-
EB Min	0.6015	2.7080	1.0532	2.5711	0.2361	66 doubles	72.07%	Robust
EB Max	6.0496	3.7122	1.1687	3.1764	0.1942		98.79%	
EB Min	0.4502	2.5386	1.0442	2.4311	0.2484	220 triplets	67.56%	Robust
EB Max	5.7711	3.4515	1.1598	2.9759	0.2064		91.85%	

Result of EBA on bltry at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod pode]		Z = [bltrt trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiim]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	2.6133	1.1452	2.2800	0.0270	-	-	-
EB Min	0.6122	3.4335	1.4106	2.4340	0.2482	66 doubles	131.39%	Robust
EB Max	7.6148	4.7026	1.4561	3.2296	0.1912		179.95%	
EB Min	0.9948	3.7052	1.3552	2.7341	0.2232	220 triplets	141.78%	Robust
EB Max	8.0990	4.9546	1.5722	3.1514	0.1956		189.59%	

Result of EBA on trop at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiim]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	0.4493	0.1589	2.8300	0.0070	-	-	-
EB Min	0.0568	0.3265	0.1348	2.4213	0.2493	66 doubles	72.67%	Robust
EB Max	0.7070	0.4386	0.1342	3.2677	0.1891		97.62%	
EB Min	0.0760	0.3236	0.1238	2.6134	0.2327	220 triplets	72.03%	Robust
EB Max	0.6801	0.4176	0.1312	3.1822	0.1938		92.95%	

Result of EBA on trsp at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop ecsp drid oexr fidd fiop mopy cuab gnsa oiim]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	-0.9105	0.2297	-3.9600	0.0000	-	-	-
EB Min	-2.6394	-1.6764	0.4815	-3.4816	0.1781	66 doubles	184.12%	Robust
EB Max	-0.1592	-0.6376	0.2392	-2.6656	0.2285		70.03%	
EB Min	-2.4576	-1.5739	0.4419	-3.5620	0.1742	220 triplets	172.87%	Robust
EB Max	-0.1723	-0.6214	0.2245	-2.7676	0.2207		68.25%	

Result of EBA on ecsp at .70 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp drid oexr fidd fiop mopy cuab gnsa oiim]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	-0.0075	0.0039	-1.9000	0.2760	-	-	-
EB Min	-0.0247	-0.0128	0.0059	-2.1534	0.2768	66 doubles	170.99%	Fragile
EB Max	-0.0007	-0.0118	0.0056	-2.1185	0.2808		157.63%	
EB Min	-0.0236	-0.0121	0.0057	-2.1128	0.2814	220 triplets	161.64%	Fragile
EB Max	-0.0005	-0.0113	0.0054	-2.0831	0.2849		150.95%	

Result of EBA on drid at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp ecsp drid oexr fiop mopy cuab gnsa oiim]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	-0.5469	0.4870	-1.1230	0.5213	-	-	-
EB Min	-1.5259	-0.5556	0.4852	-1.1452	0.5555	66 doubles	101.59%	Fragile
EB Max	0.2452	-0.4770	0.3611	-1.3210	0.6013		87.22%	
EB Min	-1.4044	-0.5321	0.4361	-1.2200	0.4120	220 triplets	97.29%	Fragile
EB Max	0.5103	-0.6510	0.5806	-1.1212	0.3985		119.03%	

Result of EBA on oexr at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp ecsp drid fidd fiop mopy cuab gnsa oiim]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	-0.9870	0.6796	-1.4523	0.2150	-	-	-
EB Min	-2.9969	-1.1256	0.9357	-1.2030	0.2555	66 doubles	114.04%	Fragile
EB Max	0.9327	-1.5699	1.2513	-1.2546	0.2521		159.06%	
EB Min	-4.0136	-1.7770	1.1183	-1.5890	0.2444	220 triplets	180.04%	Fragile
EB Max	0.7767	-1.5460	1.1614	-1.3312	0.2216		156.64%	

Tables 6: Continued

Result of EBA on fidd at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp ecsp drid oexr fiop mopy cuab gnsa oiim]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	-1.6590	0.4769	-3.4789	0.0222	-	-	-
EB Min	-1.7854	-1.1256	0.3299	-3.4123	0.1002	66 doubles	67.85%	Robust
EB Max	-0.6099	-1.4477	0.4189	-3.4560	0.2002		87.26%	
EB Min	-2.7320	-1.6659	0.5330	-3.1253	0.1562	220 triplets	100.42%	Robust
EB Max	-0.6763	-1.7850	0.5543	-3.2200	0.1988		107.59%	

Result of EBA on fiop at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp ecsp drid oexr fidd mopy cuab gnsa oiim]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	0.4969	0.1918	2.5900	0.1180	-	-	-
EB Min	0.1365	0.6890	0.2762	2.4942	0.2428	66 doubles	138.65%	Robust
EB Max	1.3240	0.7832	0.2704	2.8967	0.2116		157.60%	
EB Min	0.1214	0.6289	0.2537	2.4786	0.2441	220 triplets	126.55%	Robust
EB Max	1.2200	0.6961	0.2619	2.6574	0.2291		140.08%	

Result of EBA on mopy at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop cuab gnsa oiim]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	4.9960	1.7843	2.8000	0.0450	-	-	-
EB Min	0.2186	4.0123	1.8969	2.1152	0.1556	66 doubles	80.31%	Robust
EB Max	7.6586	4.2214	1.7186	2.4563	0.1111		84.50%	
EB Min	0.7634	4.2256	1.7311	2.4410	0.1256	220 triplets	84.58%	Robust
EB Max	9.2951	4.7780	2.2586	2.1155	0.1320		95.64%	

Result of EBA on cuab at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy gnsa oiim]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	0.2646	0.0864	3.0600	0.0030	-	-	-
EB Min	0.0487	0.1929	0.0721	2.6758	0.2277	66 doubles	72.91%	Robust
EB Max	0.4198	0.2641	0.0779	3.3918	0.1825		99.83%	
EB Min	0.0347	0.1784	0.0718	2.4831	0.2437	220 triplets	67.43%	Robust
EB Max	0.4243	0.2681	0.0781	3.4336	0.1804		101.34%	

Result of EBA on gnsa at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy cuab oiim]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	0.4430	0.1003	4.4200	0.0000	-	-	-
EB Min	0.0939	0.3003	0.1032	2.9102	0.2107	66 doubles	67.78%	Robust
EB Max	0.6391	0.4248	0.1072	3.9637	0.1573		95.89%	
EB Min	0.0737	0.2784	0.1023	2.7207	0.2242	220 triplets	62.84%	Robust
EB Max	0.6372	0.4241	0.1066	3.9802	0.1567		95.73%	

Result of EBA on oiim at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	1.7890	0.5389	3.3200	0.0552	-	-	-
EB Min	0.5299	1.2569	0.3635	3.4580	0.0523	66 doubles	70.26%	Robust
EB Max	2.9019	1.7740	0.5640	3.1456	0.0689		99.16%	
EB Min	0.5625	1.4599	0.4487	3.2536	0.0856	220 triplets	81.60%	Robust
EB Max	2.6753	1.6520	0.5116	3.2288	0.0985		92.34%	

Result of EBA on geod at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp	X = [geod]		Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiim]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	-2.4410	0.7838	-3.1144	0.0213	-	-	-
EB Min	-3.0225	-1.7852	0.6187	-2.8856	0.1205	66 doubles	73.13%	Robust
EB Max	-0.5533	-1.9820	0.7144	-2.7745	0.1166		81.20%	
EB Min	-2.8462	-1.4646	0.6908	-2.1202	0.2015	220 triplets	60.00%	Robust
EB Max	-0.2958	-1.4778	0.5910	-2.5006	0.2217		60.54%	

Tables 6: Continued

Result of EBA on pode at .75 confidence level and maximum VIF = 10								
Dvar = c_gdp		**X = [geod]**	**Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiim]**					**CI 95%**
Estim.	**Bounds**	**Coeff.β**	**Std. Erro.**	**t**	**p-val**	**N. comb**	**% sign. coeff.**	**Result**
Bivar Reg.	-	0.2533	0.0774	3.2700	0.0020	-	-	-
EB Min	0.0384	0.2023	0.0819	2.4691	0.2450	66 doubles	79.87%	Robust
EB Max	0.5106	0.3426	0.0840	4.0775	0.1531		135.27%	
EB Min	0.0371	0.1840	0.0734	2.5059	0.2417	220 triplets	72.65%	Robust
EB Max	0.5121	0.3425	0.0848	4.0398	0.1545		135.23%	

Tables 7: Extreme Bound Analysis results for the GCC countries from 1980 to 1989

Result of EBA bltrt on at .75 confidence level and maximum VIF = 10

Dvar = c_gdp	X = [geod pode]		Z = [bltry trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiex]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	0.4590	0.2570	1.7859	0.2310	-	-	-
EB Min	-0.0030	0.4552	0.2291	1.9870	0.2998	66 doubles	99.17%	Fragile
EB Max	1.2112	0.4411	0.3851	1.1455	0.2321		96.10%	
EB Min	0.0268	0.5532	0.2632	2.1020	0.2112	220 triplets	120.52%	Fragile
EB Max	1.3686	0.4897	0.4394	1.1144	0.2652		106.69%	

Result of EBA on bltry at .75 confidence level and maximum VIF = 10

Dvar = c_gdp	X = [geod pode]		Z = [bltrt trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiex]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	0.7890	0.5550	1.4216	0.2002	-	-	-
EB Min	-0.1403	0.6592	0.3998	1.6490	0.2111	66 doubles	83.55%	Fragile
EB Max	1.3600	0.5980	0.3810	1.5696	0.2321		75.79%	
EB Min	-0.1813	0.4886	0.3349	1.4587	0.1985	220 triplets	61.92%	Fragile
EB Max	1.3983	0.6520	0.3731	1.7474	0.2020		82.64%	

Result of EBA on trop at .45 confidence level and maximum VIF = 10

Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiex]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	-0.4549	0.1803	2.5200	0.0250	-	-	-
EB Min	-0.0371	-0.4376	0.2373	1.8437	0.3164	66 doubles	96.21%	Fragile
EB Max	0.9097	-0.3775	0.2661	1.4186	0.3909		82.99%	
EB Min	-0.1630	-0.3890	0.2760	1.4095	0.3928	220 triplets	85.52%	Fragile
EB Max	0.9410	-0.3890	0.2760	1.4095	0.3928		85.52%	

Result of EBA on trsp at .75 confidence level and maximum VIF = 10

Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop ecsp drid oexr fidd fiop mopy cuab gnsa oiex]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	-0.9860	0.4966	-1.9856	0.1122	-	-	-
EB Min	-1.5323	-0.7895	0.3714	-2.1256	0.2589	66 doubles	80.07%	Fragile
EB Max	-0.0423	-0.4589	0.2083	-2.2032	0.2559		46.54%	
EB Min	-1.2791	-0.6590	0.3100	-2.1256	0.2333	220 triplets	66.84%	Fragile
EB Max	-0.0263	-0.4455	0.2096	-2.1256	0.2005		45.18%	

Result of EBA on ecsp at .55 confidence level and maximum VIF = 10

Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp drid oexr fidd fiop mopy cuab gnsa oiex]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	0.0202	0.0145	1.3900	0.1880	-	-	-
EB Min	-0.0145	0.0225	0.0185	1.2155	0.4383	66 doubles	111.55%	Fragile
EB Max	0.0656	0.0251	0.0203	1.2391	0.4323		124.44%	
EB Min	-0.0077	0.0123	0.0100	1.2271	0.4353	220 triplets	60.98%	Fragile
EB Max	0.0557	0.0240	0.0159	1.5120	0.3720		118.98%	

Result of EBA on drid at .70 confidence level and maximum VIF = 10

Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp ecsp oexr fidd fiop mopy cuab gnsa oiex]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	0.1098	0.0669	1.6400	0.1240	-	-	-
EB Min	0.0039	0.1389	0.0675	2.0578	0.2880	66 doubles	126.45%	Fragile
EB Max	0.3022	0.1761	0.0630	2.7933	0.2189		160.31%	
EB Min	0.0000	0.1450	0.0725	1.9999	0.2952	220 triplets	132.00%	Fragile
EB Max	0.3027	0.1652	0.0688	2.4025	0.2511		150.39%	

Tables 7: Continued

Result of EBA on oexr at .65 confidence level and maximum VIF = 10

Dvar = c_gdp X = [geod pode] Z = [bltrt bltry trop trsp ecsp drid fidd fiop mopy cuab gnsa oiex] CI 95%

Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	-17.3547	5.6468	-3.0700	0.0090	-	-	-
EB Min	-33.2914	-15.1702	9.0606	-1.6743	0.3428	66 doubles	87.41%	Fragile
EB Max	2.4563	-12.8764	7.6663	-1.6796	0.3419		74.20%	
EB Min	-33.0301	-15.8533	8.5884	-1.8459	0.3161	220 triplets	91.35%	Fragile
EB Max	2.5163	-13.4400	7.9782	-1.6846	0.3410		77.44%	

Result of EBA on fidd at .75 confidence level and maximum VIF = 10

Dvar = c_gdp X = [geod pode] Z = [bltrt bltry trop trsp ecsp drid oexr fiop mopy cuab gnsa oiex] CI 95%

Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	-1.8790	0.9463	-1.9856	0.1220	-	-	-
EB Min	-3.0966	-1.5566	0.7700	-2.0215	0.2125	66 doubles	82.84%	Fragile
EB Max	-0.0838	-1.4459	0.6811	-2.1230	0.2560		76.95%	
EB Min	-3.3079	-1.6590	0.8244	-2.0123	0.3333	220 triplets	88.29%	Fragile
EB Max	-0.0753	-1.4440	0.6844	-2.1100	0.3102		76.85%	

Result of EBA on fiop at .75 confidence level and maximum VIF = 10

Dvar = c_gdp X = [geod pode] Z = [bltrt bltry trop trsp ecsp drid oexr fidd mopy cuab gnsa oiex] CI 95%

Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	0.2560	0.1755	1.4589	0.3410	-	-	-
EB Min	-0.1095	0.2156	0.1625	1.3265	0.2835	66 doubles	84.22%	Fragile
EB Max	0.6559	0.2330	0.2114	1.1020	0.2620		91.02%	
EB Min	-0.0921	0.1450	0.1186	1.2230	0.2111	220 triplets	56.64%	Fragile
EB Max	0.6191	0.2230	0.1980	1.1260	0.2356		87.11%	

Result of EBA on mopy at .75 confidence level and maximum VIF = 10

Dvar = c_gdp X = [geod pode] Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop cuab gnsa oiex] CI 95%

Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	0.8893	0.4610	1.9300	0.0760	-	-	-
EB Min	0.4909	1.6827	0.5959	2.8239	0.2167	66 doubles	189.22%	Fragile
EB Max	2.5807	1.4274	0.5767	2.4753	0.2444		160.51%	
EB Min	0.7262	1.8899	0.5818	3.2481	0.1901	220 triplets	212.52%	Fragile
EB Max	2.4182	1.3371	0.5405	2.4737	0.2446		150.36%	

Result of EBA on cuab at .70 confidence level and maximum VIF = 10

Dvar = c_gdp X = [geod pode] Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy gnsa oiex] CI 95%

Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	2.7901	0.7609	3.6700	0.0030	-	-	-
EB Min	0.7328	4.1263	1.6967	2.4319	0.2484	66 doubles	147.89%	Robust
EB Max	11.5432	5.8957	2.8237	2.0879	0.2844		211.30%	
EB Min	0.4501	4.0786	1.8142	2.2481	0.2664	220 triplets	146.18%	Robust
EB Max	11.4509	6.0949	2.6780	2.2759	0.2636		218.44%	

Result of EBA on gnsa at .65 confidence level and maximum VIF = 10

Dvar = c_gdp X = [geod pode] Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy cuab oiex] CI 95%

Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	2.0805	0.7385	2.8200	0.0150	-	-	-
EB Min	-0.1501	0.9840	0.5670	1.7353	0.3328	66 doubles	47.30%	Fragile
EB Max	3.8449	1.8487	0.9981	1.8522	0.3152		88.86%	
EB Min	-0.1231	0.9979	0.5605	1.7804	0.3258	220 triplets	47.96%	Fragile
EB Max	3.7458	1.7138	1.0160	1.6868	0.3407		82.37%	

Tables 7: Continued

Result of EBA on oiex at .75 confidence level and maximum VIF = 10

Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	3.0836	0.3803	8.1100	0.0000	-	-	-
EB Min	1.0492	2.4149	0.6828	3.5366	0.1754	66 doubles	78.31%	Robust
EB Max	4.2350	2.9820	0.6265	4.7598	0.1318		96.71%	
EB Min	0.9056	2.3425	0.7184	3.2606	0.1894	220 triplets	75.97%	Robust
EB Max	4.2579	2.9591	0.6494	4.5565	0.1375		95.96%	

Result of EBA on geod at .75 confidence level and maximum VIF = 10

Dvar = c_gdp		X = [pode]	Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiex]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	-0.0014	0.0003	-4.6700	0.0000	-	-	-
EB Min	-139.7827	-58.1530	40.8149	-1.4248	0.3896	66 doubles	4121987.52%	Fragile
EB Max	35.4566	-54.6263	45.0415	-1.2128	0.4390		3872008.79%	
EB Min	-141.0095	-52.6992	44.1552	-1.1935	0.4440	220 triplets	3735412.53%	Fragile
EB Max	30.4519	-46.6123	38.5321	-1.2097	0.4398		3303962.29%	

Result of EBA on pode at .75 confidence level and maximum VIF = 10

Dvar = c_gdp		X = [geod]	Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiex]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	0.7890	0.3209	2.4589	0.1250	-	-	-
EB Min	-0.3973	0.9860	0.6916	1.4256	0.1586	66 doubles	124.97%	Fragile
EB Max	2.5993	0.9876	0.8058	1.2256	0.1788		125.17%	
EB Min	-0.4006	0.7890	0.5948	1.3265	0.2023	220 triplets	100.00%	Fragile
EB Max	2.0295	0.8890	0.5702	1.5590	0.2005		112.67%	

Tables 8: Extreme Bound Analysis results for the GCC countries from 1990 to 1999

Result of EBA on bltrt at .75 confidence level and maximum VIF = 10

Dvar = c_gdp X = [geod pode] Z = [bltry trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiex] CI 95%

Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	1.1110	0.6214	1.7880	0.2310	-	-	-
EB Min	-0.3807	1.0263	0.7035	1.4589	0.2025	66 doubles	92.38%	Fragile
EB Max	2.4841	1.0555	0.7143	1.4777	0.2255		95.00%	
EB Min	-0.4692	0.9870	0.7281	1.3556	0.2231	220 triplets	88.84%	Fragile
EB Max	2.2226	0.8890	0.6668	1.3332	0.2500		80.02%	

Result of EBA on bltry at .75 confidence level and maximum VIF = 10

Dvar = c_gdp X = [geod pode] Z = [bltrt trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiex] CI 95%

Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	1.0145	0.5968	1.6998	0.3310	-	-	-
EB Min	-0.5162	1.0147	0.7655	1.3256	0.3214	66 doubles	100.02%	Fragile
EB Max	2.6493	1.1145	0.7674	1.4523	0.3251		109.86%	
EB Min	-0.8177	1.0250	0.9213	1.1125	0.3311	220 triplets	101.03%	Fragile
EB Max	2.5985	1.0012	0.7987	1.2536	0.3012		98.69%	

Result of EBA on trop at .75 confidence level and maximum VIF = 10

Dvar = c_gdp X = [geod pode] Z = [bltrt bltry trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiex] CI 95%

Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	2.1250	1.2204	1.7412	0.2150	-	-	-
EB Min	-0.7091	2.0125	1.3608	1.4789	0.3325	66 doubles	94.71%	Fragile
EB Max	5.6060	2.4530	1.5765	1.5560	0.3005		115.44%	
EB Min	-0.8744	2.1140	1.4942	1.4148	0.3002	220 triplets	99.48%	Fragile
EB Max	5.0025	2.1250	1.4387	1.4770	0.3102		100.00%	

Result of EBA on trsp at .75 confidence level and maximum VIF = 10

Dvar = c_gdp X = [geod pode] Z = [bltrt bltry trop ecsp drid oexr fidd fiop mopy cuab gnsa oiex] CI 95%

Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	-1.1616	0.4133	-2.8100	0.0940	-	-	-
EB Min	-2.5463	-1.6408	0.4527	-3.6241	0.1714	66doubles	141.25%	Robust
EB Max	-0.5319	-1.4020	0.4351	-3.2225	0.1916		120.69%	
EB Min	-2.5928	-1.6400	0.4764	-3.4424	0.1800	220 triplets	141.18%	Robust
EB Max	-0.5137	-1.4186	0.4525	-3.1353	0.1966		122.12%	

Result of EBA on escp at .75 confidence level and maximum VIF = 10

Dvar = c_gdp X = [geod pode] Z = [bltrt bltry trop trsp drid oexr fidd fiop mopy cuab gnsa oiex] CI 95%

Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	0.7890	0.5460	1.4450	0.1310	-	-	-
EB Min	-0.5744	0.8890	0.7317	1.2150	0.2355	66 doubles	112.67%	Fragile
EB Max	2.3023	0.8745	0.7139	1.2250	0.2256		110.84%	
EB Min	-0.2817	0.4458	0.3638	1.2255	0.2225	220 triplets	56.50%	Fragile
EB Max	1.2263	0.4889	0.3687	1.3260	0.2215		61.96%	

Result of EBA on drid at .45 confidence level and maximum VIF = 10

Dvar = c_gdp X = [geod pode] Z = [bltrt bltry trop trsp ecsp oexr fidd fiop mopy cuab gnsa oiex] CI 95%

Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	0.1939	0.1392	1.3900	0.1870	-	-	-
EB Min	-0.5491	-0.1716	0.1888	-0.9091	0.5303	66 doubles	-88.51%	Fragile
EB Max	0.1566	-0.1264	0.1415	-0.8934	0.5358		-65.20%	
EB Min	-0.5866	-0.2004	0.1931	-1.0379	0.4882	220 triplets	-103.36%	Fragile
EB Max	0.1549	-0.1381	0.1465	-0.9427	0.5188		-71.23%	

Tables 8: Extreme Bound Analysis results for the GCC countries from 1990 to 1999

Result of EBA on oexr at .75 confidence level and maximum VIF = 10

Dvar = c_gdp X = [geod pode] Z = [bltrt bltry trop trsp ecsp drid fidd fiop mopy cuab gnsa oiex] CI 95%

Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	-3.4500	1.2500	-2.7600	0.0160	-	-	-
EB Min	-6.7267	-3.4470	1.6399	-2.1020	0.0256	66 doubles	99.91%	Fragile
EB Max	-0.1437	-3.0125	1.4344	-2.1002	0.0320		87.32%	
EB Min	-7.2963	-3.4450	1.9257	-1.7890	0.0443	220 triplets	99.86%	Fragile
EB Max	0.4089	-3.4580	1.9335	-1.7885	0.0215		100.23%	

Result of EBA on fidd at .45 confidence level and maximum VIF = 10

Dvar = c_gdp X = [geod pode] Z = [bltrt bltry trop trsp ecsp drid oexr fiop mopy cuab gnsa oiex] CI 95%

Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	-0.0156	0.0054	-2.8700	0.0130	-	-	-
EB Min	-0.0336	-0.0110	0.0113	-0.9725	0.5089	66 doubles	70.42%	Fragile
EB Max	0.0127	-0.0100	0.0113	-0.8815	0.5400		64.01%	
EB Min	-0.0358	-0.0127	0.0115	-1.1007	0.4695	220 triplets	81.30%	Fragile
EB Max	0.0104	-0.0127	0.0115	-1.1007	0.4695		81.30%	

Result of EBA on fiop at .75 confidence level and maximum VIF = 10

Dvar = c_gdp X = [geod pode] Z = [bltrt bltry trop trsp ecsp drid oexr fidd mopy cuab gnsa oiex] CI 95%

Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	1.0450	0.5841	1.7890	0.0440	-	-	-
EB Min	-0.2075	1.0125	0.6100	1.6598	0.0525	66 doubles	96.89%	Fragile
EB Max	2.4529	1.1230	0.6649	1.6889	0.0320		107.46%	
EB Min	-0.2875	0.9870	0.6372	1.5489	0.0562	220 triplets	94.45%	Fragile
EB Max	2.0831	0.8890	0.5970	1.4890	0.0555		85.07%	

Result of EBA on mopy at .45 confidence level and maximum VIF = 10

Dvar = c_gdp X = [geod pode] Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop cuab gnsa oiex] CI 95%

Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	0.6482	0.3484	1.8600	0.0860	-	-	-
EB Min	-0.3349	0.2519	0.2934	0.8586	0.5483	66 doubles	38.86%	Fragile
EB Max	0.8587	0.2888	0.2850	1.0135	0.4957		44.56%	
EB Min	-0.3096	0.2874	0.2985	0.9628	0.5121	220 triplets	44.34%	Fragile
EB Max	1.0163	0.3172	0.3496	0.9074	0.5309		48.94%	

Result of EBA on cuab at .75 confidence level and maximum VIF = 10

Dvar = c_gdp X = [geod pode] Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy gnsa oiex] CI 95%

Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	2.3260	1.1703	1.9875	0.1222	-	-	-
EB Min	0.1138	2.1450	1.0156	2.1120	0.1458	66 doubles	92.22%	Fragile
EB Max	4.2757	2.1445	1.0656	2.0125	0.1524		92.20%	
EB Min	0.0128	2.1000	1.0436	2.0123	0.1659	220 triplets	90.28%	Fragile
EB Max	4.0765	2.0445	1.0160	2.0123	0.1644		87.90%	

Result of EBA on gnsa at .55 confidence level and maximum VIF = 10

Dvar = c_gdp X = [geod pode] Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy cuab oiex] CI 95%

Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	-0.3724	0.2002	-1.8600	0.0860	-	-	-
EB Min	-0.9289	-0.3436	0.2926	-1.1741	0.4491	66 doubles	92.26%	Fragile
EB Max	0.1483	-0.2491	0.1987	-1.2536	0.4287		66.89%	
EB Min	-0.6711	-0.2505	0.2103	-1.1911	0.4446	220 triplets	67.26%	Fragile
EB Max	0.1701	-0.2505	0.2103	-1.1911	0.4446		67.26%	

Tables 8: Continued

Result of EBA on oiex at .75 confidence level and maximum VIF = 10

Dvar = c_gdp   X = [geod pode]   Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa]   CI 95%

Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	2.7850	0.7356	3.7859	0.0091	-	-	-
EB Min	1.0360	2.4590	0.7115	3.4560	0.1023	66 doubles	88.29%	Robust
EB Max	4.0061	2.5656	0.7203	3.5620	0.1125		92.12%	
EB Min	0.7724	2.1456	0.6866	3.1250	0.1002	220 triplets	77.04%	Robust
EB Max	3.3059	2.0126	0.6466	3.1123	0.1012		72.26%	

Result of EBA on geod at .75 confidence level and maximum VIF = 10

Dvar = c_gdp   X = [pode]   Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiex]   CI 95%

Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	-0.2118	0.0886	-2.3900	0.1880	-	-	-
EB Min	-0.7450	-0.4171	0.1639	-2.5442	0.2384	66 doubles	196.96%	Robust
EB Max	-0.1004	-0.3054	0.1025	-2.9789	0.2979		144.21%	
EB Min	-0.7628	-0.4307	0.1661	-2.5936	0.2343	220 triplets	203.38%	Robust
EB Max	-0.1035	-0.3178	0.1072	-2.9653	0.2996		150.07%	

Result of EBA on pode at .75 confidence level and maximum VIF = 10

Dvar = c_gdp   X = [geod]   Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiex]   CI 95%

Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	0.3775	0.1614	2.3400	0.0360	-	-	-
EB Min	0.0930	0.3662	0.1366	2.6813	0.2273	66 doubles	97.01%	Robust
EB Max	0.7145	0.4627	0.1259	3.6749	0.1691		122.58%	
EB Min	0.1616	0.3925	0.1154	3.4002	0.1821	220 triplets	103.98%	Robust
EB Max	0.6892	0.4697	0.1097	4.2806	0.1461		124.43%	

Tables 9: Extreme Bound Analysis results for the GCC countries from 2000 to 2011

Result of EBA on bltrt at .75 confidence level and maximum VIF = 10

Dvar = c_gdp	X = [geod pode]		Z = [bltry trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiex]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	5.3260	2.1686	2.4560	0.0789	-	-	-
EB Min	-1.5930	4.2635	2.9282	1.4560	0.1125	66 doubles	80.05%	Fragile
EB Max	10.1588	4.4580	2.8504	1.5640	0.1570		83.70%	
EB Min	-1.5846	4.1155	2.8501	1.4440	0.1985	220 triplets	77.27%	Fragile
EB Max	10.9688	4.2256	3.3716	1.2533	0.2215		79.34%	

Result of EBA on bltry at .75 confidence level and maximum VIF = 10

Dvar = c_gdp	X = [geod pode]		Z = [bltrt trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiex]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	1.7890	1.2262	1.4590	0.2310	-	-	-
EB Min	-0.7517	1.4789	1.1153	1.3260	0.3335	66 doubles	82.67%	Fragile
EB Max	4.0544	1.5640	1.2452	1.2560	0.3320		87.42%	
EB Min	-1.1627	1.4560	1.3094	1.1120	0.3453	220 triplets	81.39%	Fragile
EB Max	4.0864	1.5493	1.2686	1.2213	0.3655		86.60%	

Result of EBA on trop at .75 confidence level and maximum VIF = 10

Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiex]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	2.0125	1.1249	1.7890	0.2215	-	-	-
EB Min	-0.4722	1.6590	1.0656	1.5569	0.2535	66 doubles	82.43%	Fragile
EB Max	3.3334	1.4589	0.9372	1.5566	0.2320		72.49%	
EB Min	-0.5389	1.4456	0.9922	1.4569	0.2552	220 triplets	71.83%	Fragile
EB Max	3.1613	1.3260	0.9176	1.4450	0.2326		65.89%	

Result of EBA on trsp at .75 confidence level and maximum VIF = 10

Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop ecsp drid oexr fidd fiop mopy cuab gnsa oiex]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	0.6814	0.6275	1.0900	0.2970	-	-	-
EB Min	-2.4260	-1.5483	0.4389	-3.5279	0.1758	66doubles	-227.22%	Fragile
EB Max	-0.6706	-1.5483	0.4389	-3.5279	0.1758		-227.22%	
EB Min	-2.5125	-1.5490	0.4818	-3.2153	0.2443	220 triplets	-738.67%	Fragile
EB Max	-0.6693	-1.5478	0.4393	-3.5236	0.2215		-738.10%	

Result of EBA on escp at .45 confidence level and maximum VIF = 10

Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp drid oexr fidd fiop mopy cuab gnsa oiex]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	-0.7092	0.4544	-1.5600	0.1430	-	-	-
EB Min	-0.1648	0.1944	0.1796	1.0823	0.4749	66doubles	-27.41%	Fragile
EB Max	0.5536	0.1944	0.1796	1.0823	0.4749		-27.41%	
EB Min	-0.1668	0.1982	0.1825	1.0859	0.2443	220 triplets	94.52%	Fragile
EB Max	0.5552	0.1952	0.1800	1.0845	0.2215		93.09%	

Result of EBA on drid at .75 confidence level and maximum VIF = 10

Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp ecsp oexr fidd fiop mopy cuab gnsa oiex]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	0.7489	0.4550	1.6459	0.2310	-	-	-
EB Min	-0.1874	0.6540	0.4207	1.5546	0.3256	66 doubles	87.33%	Fragile
EB Max	1.3409	0.5649	0.3880	1.4560	0.3366		75.43%	
EB Min	-0.2837	0.4589	0.3713	1.2360	0.4425	220 triplets	61.28%	Fragile
EB Max	1.3613	0.5146	0.4233	1.2156	0.4215		68.71%	

Tables 9: Continued

Result of EBA on oexr at .75 confidence level and maximum VIF = 10

Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp ecsp drid fidd fiop mopy cuab gnsa oiex]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	-0.2130	0.0866	-2.4589	0.1250	-	-	-
EB Min	-0.5064	-0.2136	0.1464	-1.4589	0.2055	66 doubles	100.28%	Fragile
EB Max	0.0801	-0.2156	0.1479	-1.4580	0.2050		101.22%	
EB Min	-0.8507	-0.3250	0.2628	-1.2365	0.2254	220 triplets	152.58%	Fragile
EB Max	0.1422	-0.3526	0.2474	-1.4253	0.2258		165.54%	

Result of EBA on fidd at .75 confidence level and maximum VIF = 10

Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp ecsp drid oexr fiop mopy cuab gnsa oiex]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	-1.1256	0.5665	-1.9870	0.1510	-	-	-
EB Min	-2.5095	-1.2563	0.6266	-2.0050	0.2563	66 doubles	111.61%	Fragile
EB Max	-0.0760	-1.1256	0.5248	-2.1448	0.2320		100.00%	
EB Min	-2.4549	-1.2230	0.6159	-1.9856	0.2522	220 triplets	108.65%	Fragile
EB Max	-0.0075	-1.2256	0.6091	-2.0123	0.2551		108.88%	

Result of EBA on fiop at .75 confidence level and maximum VIF = 10

Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp ecsp drid oexr fidd mopy cuab gnsa oiex]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	0.7890	0.4244	1.8590	0.0250	-	-	-
EB Min	-0.3285	0.8856	0.6070	1.4589	0.1256	66 doubles	112.24%	Fragile
EB Max	1.8811	0.7893	0.5459	1.4458	0.1525		100.04%	
EB Min	-0.2174	0.5698	0.3936	1.4477	0.2056	220 triplets	72.22%	Fragile
EB Max	1.3897	0.5698	0.4100	1.3899	0.2110		72.22%	

Result of EBA on mopy at .75 confidence level and maximum VIF = 10

Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop cuab gnsa oiex]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	1.1250	0.5660	1.9876	0.0420	-	-	-
EB Min	0.0076	1.2250	0.6087	2.0125	0.3256	66 doubles	108.89%	Fragile
EB Max	2.4348	1.2130	0.6109	1.9856	0.2785		107.82%	
EB Min	0.0068	1.2214	0.6073	2.0112	0.2985	220 triplets	108.57%	Fragile
EB Max	2.4384	1.2230	0.6077	2.0125	0.2858		108.71%	

Result of EBA on cuab at .75 confidence level and maximum VIF = 10

Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy gnsa oiex]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	3.2130	1.6402	1.9590	0.2105	-	-	-
EB Min	0.0016	3.1253	1.5619	2.0010	0.4012	66 doubles	97.27%	Fragile
EB Max	6.2084	3.1120	1.5482	2.0101	0.3025		96.86%	
EB Min	0.0032	3.2215	1.6091	2.0020	0.2258	220 triplets	100.26%	Fragile
EB Max	6.8276	3.4125	1.7075	1.9985	0.2215		106.21%	

Result of EBA on gnsa at .75 confidence level and maximum VIF = 10

Dvar = c_gdp	X = [geod pode]		Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy cuab oiex]					CI 95%
Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	2.5230	1.6310	1.5469	0.1310	-	-	-
EB Min	-1.1129	2.1250	1.6190	1.3126	0.1788	66 doubles	84.23%	Fragile
EB Max	5.9263	2.5520	1.6872	1.5126	0.2201		101.15%	
EB Min	-0.7582	2.4410	1.5996	1.5260	0.2502	220 triplets	96.75%	Fragile
EB Max	5.9958	2.5223	1.7368	1.4523	0.2411		99.97%	

Tables 9: Continued

Result of EBA on oiex at .75 confidence level and maximum VIF = 10

Dvar = c_gdp X = [geod pode] Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa] CI 95%

Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	3.7890	0.8499	4.4580	0.0050	-	-	-
EB Min	1.7014	3.4156	0.8571	3.9850	0.0236	66 doubles	90.15%	Robust
EB Max	5.3646	3.4411	0.9617	3.5780	0.0320		90.82%	
EB Min	1.6343	3.1100	0.7378	4.2150	0.0255	220 triplets	82.08%	Robust
EB Max	4.5901	3.2121	0.6890	4.6620	0.0441		84.77%	

Result of EBA on geodat .75 confidence level and maximum VIF = 10

Dvar = c_gdp X = [pode] Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiex] CI 95%

Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	-2.1250	0.5988	-3.5490	0.0150	-	-	-
EB Min	-3.6335	-2.2157	0.7089	-3.1256	0.1205	66 doubles	104.27%	Robust
EB Max	-0.8497	-2.2244	0.6873	-3.2363	0.1102		104.68%	
EB Min	-3.7163	-2.2256	0.7453	-2.9860	0.1501	220 triplets	104.73%	Robust
EB Max	-0.7102	-2.3260	0.8079	-2.8790	0.1589		109.46%	

Result of EBA on pode at .75 confidence level and maximum VIF = 10

Dvar = c_gdp X = [geod] Z = [bltrt bltry trop trsp ecsp drid oexr fidd fiop mopy cuab gnsa oiex] CI 95%

Estim.	Bounds	Coeff.β	Std. Erro.	t	p-val	N. comb	% sign. coeff.	Result
Bivar Reg.	-	3.5520	1.3892	2.5569	0.1590	-	-	-
EB Min	-0.3553	3.0125	1.6839	1.7890	0.2563	66 doubles	84.81%	Fragile
EB Max	6.4672	3.1123	1.6774	1.8554	0.2986		87.62%	
EB Min	-0.8626	3.1023	1.9824	1.5649	0.3256	220 triplets	87.34%	Fragile
EB Max	7.3710	3.2230	2.0740	1.5540	0.3354		90.74%	