# Economic Interdependence Between The GDP and External Trade in Romania - A VEC Method Analyse

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## ABSTRACT

*Trading transactions between nations have a very long history, but in recent years international trade has become increasingly important with a larger share of GDP devoted to exports and imports and it is considered to be a major component of sustainable economic growth. The correlation between external trade flows and gross domestic product (GDP) have been analyzed in many specialized economic papers. The developed econometric models have demonstrated the strong connection between these macroeconomic indicators.*

*This paper once again demonstrates the long-term and short-term relationship between these variables using the VEC econometric model on quarterly GDP, Export, Import and GFCF data of Romania from 1995 to 2015.*

*The VECM analysis was performed using R statistical software and is based on data extracted from the Eurostat, European Union Statistical Office website and are expressed in millions of euro.*

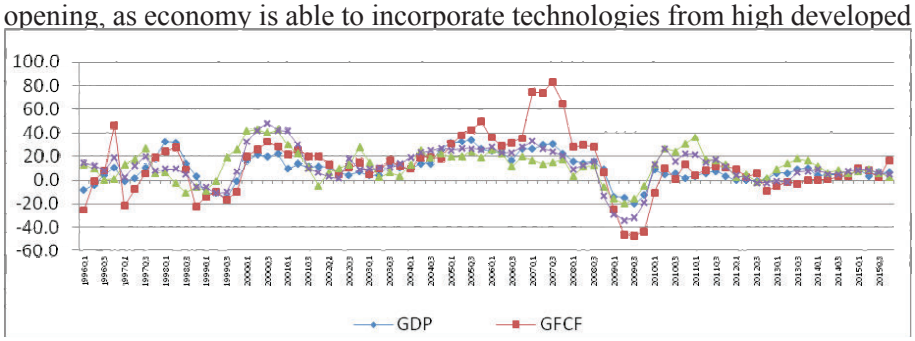
**Keywords:** *GDP, export, import, GFCF, vector correction error, heteroscedasticity, cointegration, stationarity*

**JEL classification:** *F14, F17, Q11*

## 1. INTRODUCTION

The relationship between GDP and external trade flows, export and import, has long been one of the most debated subject of international economic development, with particular attention to research. Fundamental economic theories show the contribution of exports to economic growth through the so called 'multiplying effect of external trade' (Tekin, 2012). At the same time, the growing exports generate higher degree of economic

opening, as economy is able to incorporate technologies from high developed




*Source data: Eurostat , New Cronos database, http://ec.europa.eu/eurostat/data/ database*

GDP, GFCF and trade flows, had oscillatory evolution but with similar trends (increase or decrease) over the selected period, as Figure 1 illustrates.

## 2. METHODOLOGICAL CONSIDERATIONS

***The research method selection***

In order to analyse the connection between GDP and external trade, the present paper aims to test a multivariate VEC model. Thus, the variables used in the analysis are GDP, GFCF, import and export. For generating the regression equation, a VEC model was used, after testing the stationarity of the selected series (Dickey-Fuller Augmented unit test), cointegration (Johansen cointegration test) and the causality link between the variables (Granger test and Wald test).

***Description of variables***

In the study of the economic interdependence between GDP, export, import and GFCF, quarterly data from 1995-2015, were considered, GDP as a dependent variable and export, import and GFCF as independent variables. Values are expressed in millions of euro.

GDP is a macroeconomic indicator reflecting the monetary value of final goods and services – that are bought by the final user – produced in a country, in a given period of time (quarter or year).

According to the expenditure computation method:

$$GDP = FC + GFCF + \Delta S + (E-I) \quad [1]$$

where: FC – final consumption, GFCF – gross fixed capital formation, $\Delta$ S – stock change, I – import and E – export.

Gross fixed capital formation represents the value of the durable goods acquired by resident units for the purpose of subsequent use in the production process.

Exports and imports of goods and services consist of selling or purchasing transactions in goods and services (sales, barter, donations, etc.) between residents and non-residents.

***Theoretical aspects of the proposed analysis***

R statistical software was used for analysis, by its package named vars(Pfaff, 2008a), which is specific for the VAR, SVAR and SVEC analyzes. R is by far the most used open source statistical software among scientific communities, since it envisages the advantages of an open source system: low costs related only with the training of users, technical support provided by a large community of users, continuous upgrade and linkage with the way statisticians think and work.

In R software, the Augmented Dickey-Fuller test is implemented within the function ur.df(), from the package urca(Pfaff, 2008b). Johansen cointegration test was performed using ca.jo() function. Moreover, Granger test for causality was computed by using grangertest() function and also Wald test with its specific wald.test() function and Arch test with arch.test() function.

For the four data series (GDP, exports of goods and services, import of goods and services and GFCF), we tested:

- stationarity – root unit test – Dickey-Fuller Augmented,
- cointegration – Johansen and cointegration test and
- causal link between variables (Granger test and Wald test).

For the regression equation, generated with the VEC model, the following residue tests were performed:

- the normality test of the residue (Jaque-Bera – Hitogram distribution test),
- Residue correlation test (Breusch-Godfrey test) and
- heteroscedasticity (Breusch-Pagan-Godfrey test and ARCH test).

## 3. THE VEC ECONOMETRIC MODEL ON QUARTERLY GDP, EXPORT, IMPORT AND GFCF FOR ROMANIA

**a. Basic statistics**

The table below shows the Summary Statistics: average, median, maximum, minimum, standard deviation values for each of the variables:

**Summary Statistics**

*Table 1*

| | GDP | GFCF | EXPORT | IMPORT |
|---|---|---|---|---|
| **Mean** | 21697.72 | 5704.752 | 7359.042 | 8743.940 |
| **Median** | 18949.60 | 4433.300 | 6665.900 | 8687.250 |
| **Maximum** | 47575.60 | 19176.20 | 16927.50 | 17653.10 |
| **Minimum** | 5821.300 | 880.9000 | 1546.600 | 1855.300 |
| **Std. Dev.** | 12534.30 | 4351.000 | 4708.647 | 5137.808 |
| **Skewness** | 0.335075 | 0.878157 | 0.489688 | 0.115374 |
| **Kurtosis** | 1.688394 | 2.912817 | 1.992009 | 1.458280 |
| | | | | |
| **Jarque-Bera** | 7.592937 | 10.82285 | 6.913274 | 8.505509 |
| **Probability** | 0.022450 | 0.004465 | 0.031536 | 0.014225 |
| | | | | |
| **Sum** | 1822609.0 | 479199.2 | 618159.5 | 734491.0 |
| **Sum Sq. Dev.** | 1.30E+10 | 1.57E+09 | 1.84E+09 | 2.19E+09 |
| **Observations** | 84 | 84 | 84 | 84 |

*Source: R output on Summary statistics*

On the basis of these statistics, we can establish that the GDP is between 5,821.3 million euro in the first quarter of 1997 and 47,575.6 million euro in the fourth quarter of 2015. The average value of this indicator for the period 1995-2015 is 21,697 EUR million. The values of the Skewness and Kurtosis tests show that the distribution considered is not a symmetrical one; the majority of the values are between the minimum and the average of the data series (the median of the series is less than the average of the series).

Similarly, the GFCF is between 880.9 million euro in the first quarter of 1997 and 19,176.2 million euro in the third quarter of 2008. The average value of this indicator for the period 1995-2015 is 5,704.8 million euro. The values of the Skewness and Kurtosis tests allow us to assert that the considered distribution is not a symmetrical one; the majority of the values are between the minimum and the average of the series (the median of the series is less than the average of the series).

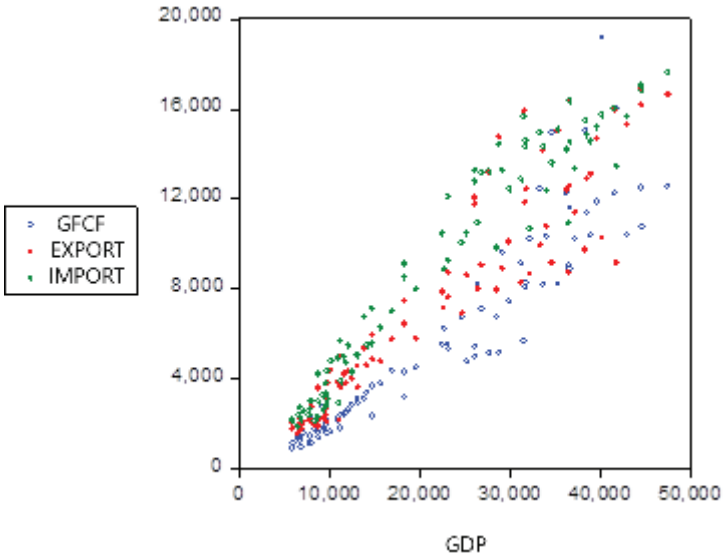
For export, the values are between 1,546.6 million euro in the first quarter of 1995 and 16,927.5 million euro in the 3rd quarter of 2015. The average value of this indicator for the period 1995-2015 is 7,359.0 million euro. Also, the values of the Skewness and Kurtosis tests allow us to assert that the considered distribution is not a symmetrical one; the majority of the values are between the minimum and the average of the series (the median of the series is less than the average of the series).

Imports have values ranging from 1,855.3 million euro in the first quarter of 1995 and 17,653.1 million euro in the fourth quarter of 2015. The average value of this indicator for the period 1995-2015 is 8,743.9 million

euro. As in the case of exports, the values of the Skewness and Kurtosis tests allow us to assert that the considered distribution is not a perfectly symmetrical one; the majority of the values are between the minimum and the average of the series (the median of the series is less than the average of the series).

**GDP as against Export, Import and GFCF**

*Figure 2*




The coefficients in the correlation diagram show that there are strong links between the four selected variables.

**The correlation coefficients**

*Table 2*

| | GDP | GFCF | EXPORT | IMPORT |
|---|---|---|---|---|
| **GDP** | 1 | 0.93 | 0.93 | 0.97 |
| **GFCF** | 0.93 | 1 | 0.78 | 0.88 |
| **EXPORT** | 0.93 | 0.78 | 1 | 0.96 |
| **IMPORT** | 0.97 | 0.88 | 0.96 | 1 |

*Source: R output on correlation coeficient*

**b. Stationarity and cointegration tests of the series**

***Stationarity test of the series (Unit root test – Dickey-Fuller Augmented)***

For each series, the stationary test (Unit root test – Dickey-Fuller Augmented) was performed on both the initial series and the differentiated series (order 1 and order 2). The tests indicated the following: the GDP, GFCF import and export data series are not stationary. They become stationary after the 2nd order differentiation.

**Augmented Dickey Fuller Test-statistic values**

*Table 3*

| Time series | Type: | VEC model | | | | | |
|---|---|---|---|---|---|---|---|
| | | The raw data series | | 1st order differentiated | | 2nd order differentiated | |
| | | t-Statistic | Prob. | t-Statistic | Prob. | t-Statistic | Prob. |
| GDP | Constant | -0.461219 | 0.8923 | -2.955982 | 0.0436 | -59.59698 | 0.0001 |
| | Constant, Linear Trend | -2.719189 | 0.2320 | -2.945832 | 0.1542 | -59.20549 | 0.0001 |
| | None | 1.226984 | 0.9428 | -2.332456 | 0.0199 | -59.97480 | 0.0000 |
| GFCF | Constant | -0.846903 | 0.7996 | -3.795122 | 0.0045 | -7.419878 | 0.0000 |
| | Constant, Linear Trend | -2.926148 | 0.1603 | -3.760478 | 0.0242 | -7.366210 | 0.0000 |
| | None | 0.426570 | 0.8033 | -3.642607 | 0.0004 | -7.468989 | 0.0000 |
| Import | Constant | -0.285973 | 0.9213 | -4.495050 | 0.0005 | -5.867686 | 0.0000 |
| | Constant, Linear Trend | -2.629423 | 0.2688 | -4.480220 | 0.0030 | -5.826303 | 0.0000 |
| | None | 1.621892 | 0.9737 | -3.867286 | 0.0002 | -5.907607 | 0.0000 |
| Export | Constant | 1.001181 | 0.9963 | -8.355813 | 0.0000 | -11.25015 | 0.0001 |
| | Constant, Linear Trend | -2.073932 | 0.5523 | -8.537736 | 0.0000 | -11.17962 | 0.0000 |
| | None | 3.695023 | 0.9999 | -7.329138 | 0.0000 | -11.32422 | 0.0000 |

*Source: R output on ADF tests*

**Cointegration test of the series (Johansen Test)**

The cointegration test of the GDP, Export, Import and GFCF series (Johansen Test) indicates the presence of:

- 4 cointegration equations (Trace Test), respectively
- 4 cointegration equations (Maximum Eigenvalue Test).

**Cointegration test of the series (Johansen Test)**

*Table 4*

| Test Type | No Intercept | Intercept | Intercept | Intercept | Intercept |
|---|---|---|---|---|---|
| | No Trend | No Trend | No Trend | Trend | Trend |
| Trace | 4 | 4 | 4 | 4 | 4 |
| Max-Eig | 4 | 4 | 4 | 4 | 4 |

*Source: R output on Johansen tests*

**Selection of the delay order (Schwarz criterion – SC)**

The selection of the delay order is based on the Schwarz criterion: the lowest SC coefficient indicates the delay order – in this case the selected delay order is 2.

**Schwarz criterion for lag selection**

*Table 5*

| Lag | 0 | 1 | 2 |
|---|---|---|---|
| SC | 67.35190 | 66.49417 | 64.97728* |

*Source: R output on Schwarz criterion*

Based on the above-mentioned analyzes we decided to apply the VEC model on the 2nd order differentiated data, the 2nd order delay and one cointegration equation.

**c. Estimation of the model parameters**

The VEC model was performed by using the facilities offered by the function SVEC(), which allows the user to set some parameters, i.e. the cointegration rank, maximum number of iteration, convergence value of algorithm, number of bootstrap replications.

The resulted regression equation is the following:

$$\Delta^2GDP=C_{(1)}*(\Delta GDP_{(-1)} -0.7277* \Delta GFCF_{(-1)}- 0.0284 * \Delta EXPORT_{(-1)} -0.4791 * \Delta IMPORT_{(-1)}- 260.0107) + C_{(2)} *\Delta^2GDP_{(-1)}+C_{(3)}*\Delta^2GDP_{(-2)}+ C_{(4)}*\Delta^2GFCF(-1) + C_{(5)}*\Delta^2GFCF_{(-2)}+C_{(6)} *\Delta^2EXPORT_{(-1)} + C_{(7)}*\Delta^2EXPORT_{(-2)}+ C_{(8)}*\Delta^2IMPORT_{(-1)}+ C_{(9)}*\Delta^2IMPORT_{(-2)}+ C_{(10)} \quad [2]$$

**Short-term Causality Granger under the VEC environment**

The short-term Causality Granger under the VEC environment shows that GDP is significantly influenced by imports and GFCF and less significant by exports;

**Short-term Causality Granger under the VEC environment**

*Table 6*

| Dependent variable: $\Delta^2$GDP | | | |
|---|---|---|---|
| Excluded | Chi-sq | df | Prob. |
| $\Delta^2$GFCF | 61.94723 | 2 | 0.0000 |
| $\Delta^2$EXPORT | 2.379645 | 2 | 0.3043 |
| $\Delta^2$IMPORT | 97.81950 | 2 | 0.0000 |
| All | 152.1148 | 6 | 0.0000 |

*Source: R output on Short-term Causality Granger*

**d. The empirical results of VEC model**

The ANOVA test indicates the validity of the selected model (F-statistic = 203.1143 and Prob (F-statistic) = 0.000000 <0.05). We noticed that the adjusted R2 is about 0.96 for the first equation, meaning that exports, imports and GFCF determine 96% of GDP and are very close to 1, suggesting that there is a strong link between variables.

Most of the coefficients are significant, indicating that exports, imports and GFCFs influence GDP, both in the short and long term (coefficient of cointegration equation is negative and significant).

**The coefficient of the VEC model**

*Table 7*

| | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C(1) | -4,2806 | 0,3423 | -12,5061 | 0,0000 |
| C(2) | 2,0418 | 0,2825 | 7,2271 | 0,0000 |
| C(3) | 1,1432 | 0,1435 | 7,9648 | 0,0000 |
| C(4) | -1,2675 | 0,3446 | -3,6788 | 0,0005 |
| C(5) | -1,8065 | 0,2295 | -7,8698 | 0,0000 |
| C(6) | 0,5773 | 0,5913 | 0,9764 | 0,3322 |
| C(7) | -0,1905 | 0,5955 | -0,3199 | 0,7500 |
| C(8) | -1,8822 | 0,3773 | -4,9885 | 0,0000 |
| C(9) | 0,7414 | 0,4060 | 1,8259 | 0,0721 |
| C(10) | -38,3786 | 199,0471 | -0,1928 | 0,8477 |

*Source: R output on VEC model*

The high value of the free term indicates a significant influence of the factors that determine GDP and were not included in the model.

**Tests diagnosis for residues**

***- Autocorrelation of errors***

The Residue Correlation Test (Breusch-Godfrey test) shows that errors are not correlated (does not reject the null hypothesis: there is no correlation of errors – Chi-Square Probability = 0.06> 0.05)

***- Homoscedasticity of random errors***

The Breusch-Pagan-Godfrey and ARCH tests show that the errors are not heteroscedastic (do not reject the null hypothesis: errors are homoscedastic):

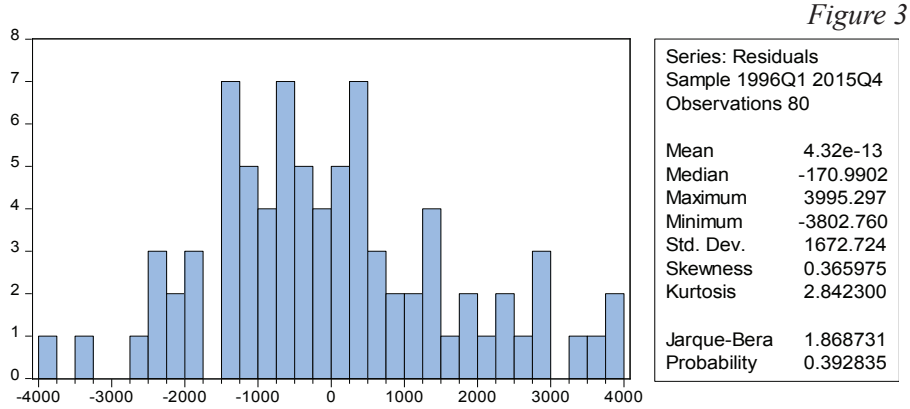
- Breusch-Pagan-Godfrey test (Prob. Chi-Square = 0.07> 0.05)
- ARCH test (Prob. Chi-Square(1)=0.97>0.05)

***- Random errors have normal distribution***

The Jarque-Bera test and the histogram indicate a normal distribution of residues (Jarque-Bera = 1.87 and probability = 0.39> 0.05 – does not reject the null hypothesis that residues are normally distributed):

**The Jarque-Bera test and the histogram**

*Figure 3*




*Source: R output on the Jarque-Bera test and the histogram*

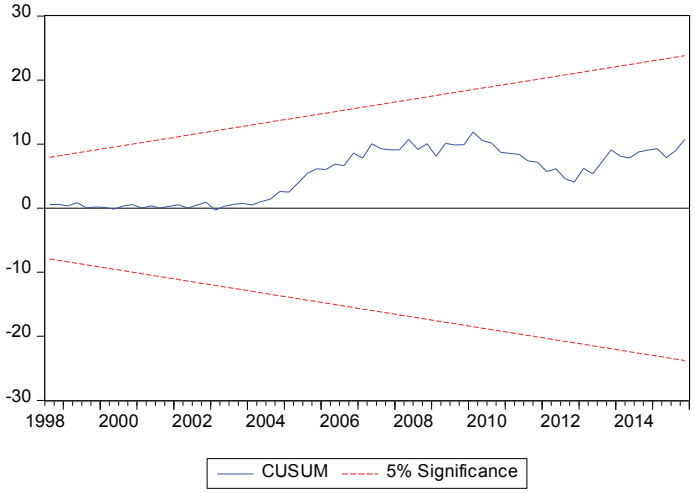
The previously generated regression function (GDP function of export, import, and GFCF) has the following characteristics:

- the R-adjusted is close to 1 (0.96), which means that exports, imports and GFCFs determine for 96% GDP and are very close to 1; it results that there is a strong link between variables.
- The ANOVA test indicates the validity of the model (F-statistic = 203.1143 and Prob (F-statistic) = 0.000000 <0.05).
- Most of the coefficients are significant, indicating that exports, imports and GFCFs influence GDP both in the short and long term (coefficient of cointegration is negative and significant).
- Residues are not autocorrelated, have a normal distribution and are homoscedastic

Moreover, the CUSUM test indicates the stability of the regression coefficients:

**The CUSUM test**

*Figure 4*




*Source: R output on CUSUM test*

In conclusion, the previously VEC model can be considered representative to describe autoregressive links between GDP as the dependent variable and export, import and GFCFs as independent variables.

The dispersion of forecasting errors for GDP is explained in the long term by 48-50% GDP, 28-29% of GFCF, 6-7% exports and imports in proportion of 12-16%.

**The Variance Decomposition diagram of ΔGDP**

*Figure 5*

| Period | S.E. | ΔGDP | ΔGFCF | ΔEXPORT | ΔIMPORT |
|---|---|---|---|---|---|
| 1 | 1777.006 | 100.0000 | 0.000000 | 0.000000 | 0.000000 |
| 2 | 2245.774 | 64.86742 | 33.14135 | 1.855387 | 0.135835 |
| 3 | 2472.162 | 53.53104 | 27.63598 | 3.951347 | 14.88163 |
| 4 | 2483.612 | 53.32394 | 27.40623 | 4.273487 | 14.99635 |
| 5 | 3016.434 | 67.15655 | 18.68581 | 3.892076 | 10.26557 |
| 6 | 3299.282 | 56.48911 | 30.21683 | 4.704797 | 8.589270 |
| 7 | 3461.774 | 51.31616 | 27.56136 | 5.878433 | 15.24406 |
| 8 | 3473.028 | 51.21318 | 27.42494 | 5.922749 | 15.43913 |
| 9 | 3829.084 | 59.20562 | 22.66376 | 5.362978 | 12.76764 |
| 10 | 4043.297 | 53.15111 | 29.75909 | 5.639006 | 11.45080 |
| 11 | 4169.178 | 49.99329 | 28.03509 | 6.395765 | 15.57585 |
| 12 | 4182.219 | 49.85006 | 27.91057 | 6.443036 | 15.79633 |
| 13 | 4458.535 | 55.37470 | 24.65510 | 6.021675 | 13.94853 |
| 14 | 4632.615 | 51.29337 | 29.66734 | 6.119221 | 12.92007 |
| 15 | 4738.316 | 49.03117 | 28.37191 | 6.731419 | 15.86550 |
| 16 | 4751.386 | 48.87560 | 28.26495 | 6.770001 | 16.08946 |

*Source: R output on Variance Decomposition diagram*

The importance of GFCF in GDP is relatively constant over time around 30%. Imports of goods and services in the first quarter of the forecast have a small contribution to GDP (under 1%), increasing very much from the second quarter of the forecast to approx. 15%, which remains relatively constant over time.

## 4. CONCLUSIONS

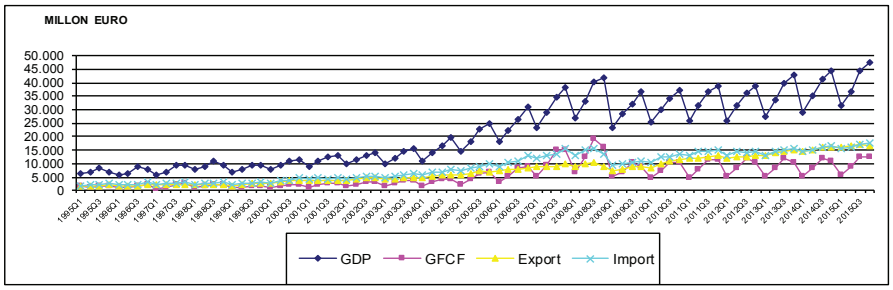
The stationary tests of the series (Unit root test – Dickey-Fuller Augmented) indicated that the series are not stationary and become stationary after the first differentiation (export, import and GFCF), respectively, after the second differentiation (GDP). The cointegration test of the series (Johansen Test) indicates the presence of 4 cointegration equations. The Short-term Causality Granger, under VEC environment, shows that there are bi-directional relations of influence between GFCF and GDP, imports and GDP and imports and GFCF. Unidirectional relations exist between: export and import (export influences import and not vice versa).

The VEC model – GDP based on export, import and GFCF – can be considered representative to describe autoregressive links between GDP, as the dependent variable, and export, import and GFCFs as independent variables because: the R adjusted index is close to 1 (0.96 ) which indicates that there is a strong link between the variables; the ANOVA test indicates the validity of the model (F-statistic = 203.1143 and Prob (F-statistic) = 0.000000 <0.05); most of the coefficients are significant, indicating that exports, imports and GFCFs influence GDP both on a short and long term (coefficient of cointegration equation is negative and significant); the residues are not autocorrelated, have a normal distribution and are homoscedastic; the CUSUM test indicates the stability of the regression coefficients. The coefficients of cointegration equations are negative and significant for all four regression equations, which means that in the long term there are causal bidirectional relations between the four selected variables.

In the long term, exports, imports and GFCF have an effect on GDP growth, with the largest impact on GFCF, followed by imports. In the short term, exports have a positive impact on GDP, and imports and GFCF have a slightly negative impact. All this suggests that Romania must continue to support exports in order to stimulate economic growth. However, it should be remembered that exports of primary products, products based on natural resources and low technology products (pauperization exports) do not lead to sustainable economic growth.

**Evolution of Romania's GDP, GFCF, export and import in the period 1996- 2015 (value in million Euro)**

*Figure 6*




Data source: Eurostat, New Cronos database http://ec.europa.eu/eurostat/data/database

The long-term effect of import on GDP growth can be explained by the fact that, through imports, it is allowed faster access to high technology, which is an important positive factor for sustainable economic growth. Another explanation for the long-term effect of imports on GDP growth may be the increase in consumption from import, which does not support sustainable economic growth.

The major long-term impact of gross fixed capital formation on GDP suggests the need to increase GFCF by facilitating investment.

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**Annex**

- millions euro -

| PERIOD | GDP | GFCF | Export | Import | PERIOD | GDP | GFCF | Export | Import |
|---|---|---|---|---|---|---|---|---|---|
| 1995Q1 | 6,418.0 | 1,505.2 | 1,546.6 | 1,855.3 | 2005Q1 | 14,691.7 | 2,336.2 | 5,937.8 | 7,111.5 |
| 1995Q2 | 6,811.3 | 1,367.5 | 1,735.1 | 2,138.4 | 2005Q2 | 18,317.6 | 4,282.9 | 6,427.7 | 8,517.1 |
| 1995Q3 | 8,327.6 | 1,713.7 | 1,888.3 | 2,121.4 | 2005Q3 | 22,664.1 | 6,224.3 | 7,149.8 | 8,857.4 |
| 1995Q4 | 7,082.8 | 1,560.6 | 2,069.7 | 2,539.5 | 2005Q4 | 24,694.7 | 6,728.4 | 6,904.1 | 10,048.2 |
| 1996Q1 | 5,875.7 | 1,120.9 | 1,755.7 | 2,127.1 | 2006Q1 | 18,323.7 | 3,181.8 | 7,465.7 | 9,097.1 |
| 1996Q2 | 6,541.7 | 1,354.1 | 1,906.6 | 2,408.0 | 2006Q2 | 22,508.7 | 5,524.2 | 7,852.4 | 10,463.2 |
| 1996Q3 | 8,688.6 | 1,860.4 | 1,892.7 | 2,306.2 | 2006Q3 | 26,447.1 | 8,196.6 | 7,980.5 | 10,926.6 |
| 1996Q4 | 7,866.4 | 2,288.1 | 2,095.0 | 3,027.0 | 2006Q4 | 31,293.2 | 9,135.4 | 8,267.2 | 12,859.1 |
| 1997Q1 | 5,821.3 | 880.9 | 1,996.0 | 2,174.7 | 2007Q1 | 23,118.4 | 5,540.3 | 8,725.2 | 12,086.4 |
| 1997Q2 | 6,666.8 | 1,249.3 | 2,247.2 | 2,711.5 | 2007Q2 | 29,146.1 | 9,616.4 | 8,919.1 | 13,259.6 |
| 1997Q3 | 9,613.6 | 1,962.9 | 2,388.3 | 2,768.6 | 2007Q3 | 34,672.2 | 14,955.7 | 9,150.4 | 13,589.0 |
| 1997Q4 | 9,317.6 | 2,734.0 | 2,221.7 | 3,269.1 | 2007Q4 | 38,406.0 | 15,073.0 | 9,736.5 | 15,499.4 |
| 1998Q1 | 7,704.5 | 1,092.0 | 2,135.4 | 2,387.2 | 2008Q1 | 26,850.2 | 7,085.6 | 9,033.2 | 13,156.6 |
| 1998Q2 | 8,774.1 | 1,591.5 | 2,186.3 | 2,974.1 | 2008Q2 | 33,352.2 | 12,454.6 | 9,934.4 | 14,960.7 |
| 1998Q3 | 11,008.5 | 2,140.2 | 2,142.1 | 2,916.7 | 2008Q3 | 40,224.7 | 19,176.2 | 10,273.7 | 15,726.1 |
| 1998Q4 | 9,658.5 | 2,115.2 | 2,094.3 | 3,089.5 | 2008Q4 | 41,835.4 | 16,029.5 | 9,142.6 | 13,444.1 |
| 1999Q1 | 6,795.6 | 940.4 | 1,944.8 | 2,245.9 | 2009Q1 | 23,173.0 | 5,311.8 | 7,611.1 | 9,268.5 |
| 1999Q2 | 7,847.1 | 1,434.2 | 2,176.7 | 2,649.7 | 2009Q2 | 28,508.8 | 6,739.1 | 7,955.3 | 9,823.5 |
| 1999Q3 | 9,371.9 | 1,787.5 | 2,560.1 | 2,619.5 | 2009Q3 | 32,196.1 | 10,221.7 | 8,666.0 | 10,658.1 |
| 1999Q4 | 9,592.0 | 1,913.5 | 2,640.3 | 3,313.0 | 2009Q4 | 36,530.9 | 9,031.6 | 8,726.8 | 10,926.9 |
| 2000Q1 | 7,948.1 | 1,128.4 | 2,762.2 | 2,968.4 | 2010Q1 | 25,231.9 | 4,762.9 | 8,613.0 | 10,492.1 |
| 2000Q2 | 9,533.9 | 1,801.2 | 3,119.6 | 3,780.4 | 2010Q2 | 29,932.6 | 7,422.5 | 10,090.1 | 12,454.7 |
| 2000Q3 | 11,218.7 | 2,365.6 | 3,591.3 | 3,885.6 | 2010Q3 | 34,083.1 | 10,344.5 | 10,787.5 | 12,373.2 |
| 2000Q4 | 11,734.8 | 2,446.3 | 3,774.8 | 4,718.0 | 2010Q4 | 37,254.2 | 10,225.6 | 11,399.2 | 13,360.3 |
| 2001Q1 | 8,717.7 | 1,370.3 | 3,585.4 | 4,214.6 | 2011Q1 | 26,143.3 | 4,964.6 | 11,766.1 | 12,781.0 |
| 2001Q2 | 10,871.2 | 2,255.3 | 3,816.9 | 4,896.7 | 2011Q2 | 31,702.1 | 8,057.1 | 11,860.6 | 14,338.2 |
| 2001Q3 | 12,484.6 | 2,846.3 | 3,995.3 | 4,282.5 | 2011Q3 | 36,682.2 | 11,591.7 | 12,588.5 | 14,537.2 |
| 2001Q4 | 13,128.7 | 2,941.3 | 3,602.0 | 5,025.0 | 2011Q4 | 38,590.0 | 11,376.7 | 12,881.2 | 14,869.3 |
| 2002Q1 | 9,728.3 | 1,555.6 | 3,812.9 | 4,350.3 | 2012Q1 | 26,140.2 | 5,433.4 | 12,041.2 | 13,272.2 |
| 2002Q2 | 11,571.2 | 2,369.7 | 4,200.7 | 4,963.6 | 2012Q2 | 31,769.3 | 8,280.9 | 12,424.2 | 14,595.3 |
| 2002Q3 | 13,048.6 | 3,143.7 | 4,543.5 | 5,048.0 | 2012Q3 | 36,329.4 | 12,247.2 | 12,414.6 | 14,209.0 |
| 2002Q4 | 14,106.4 | 3,379.2 | 4,578.6 | 5,489.8 | 2012Q4 | 38,961.1 | 10,381.4 | 13,119.9 | 14,558.3 |
| 2003Q1 | 10,138.8 | 1,629.2 | 4,369.3 | 4,773.6 | 2013Q1 | 27,726.1 | 5,146.7 | 13,176.4 | 13,223.0 |
| 2003Q2 | 12,093.8 | 2,604.3 | 4,306.9 | 5,485.1 | 2013Q2 | 33,726.9 | 8,180.7 | 14,171.9 | 14,345.3 |
| 2003Q3 | 14,760.6 | 3,656.6 | 4,837.8 | 5,590.8 | 2013Q3 | 39,664.8 | 11,865.1 | 14,678.1 | 15,205.5 |
| 2003Q4 | 15,649.3 | 3,790.3 | 4,752.9 | 6,286.9 | 2013Q4 | 43,011.6 | 10,392.5 | 15,300.6 | 15,668.2 |
| 2004Q1 | 11,153.0 | 1,788.5 | 4,962.2 | 5,675.5 | 2014Q1 | 28,794.9 | 5,162.7 | 14,749.1 | 14,427.4 |
| 2004Q2 | 13,849.0 | 3,105.9 | 5,376.7 | 6,749.3 | 2014Q2 | 35,329.3 | 8,227.5 | 15,047.4 | 15,090.9 |
| 2004Q3 | 16,885.4 | 4,368.0 | 5,746.5 | 6,982.5 | 2014Q3 | 41,605.6 | 12,234.2 | 15,961.1 | 16,024.3 |
| 2004Q4 | 19,575.5 | 4,498.6 | 5,799.2 | 7,982.3 | 2014Q4 | 44,638.3 | 10,761.3 | 16,176.8 | 16,860.1 |

*Source: Eurostat database, http://ec.europa.eu/eurostat/data/database*