AN INVESTIGATION OF LONGRUN RELATIONSHIP BETWEEN ECONOMIC GROWTH, INVESTMENT AND EXPORT IN ROMANIA

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The objective of this study was to estimate the long-run relationship between economic growth, investment and export in Romania using trimestrial data from the National Bank of Romania as well as National Statistical Institute. The econometric methodology employed was the Cointegration and Granger Causality test.
First, the stationarity properties of the data and the order of integration of the data were tested using the Augmented Dickey-Fuller (ADF) test. We found that the variables were non-stationary in levels, but stationary in first differences; that is, they are integrated of order one (I (1)). Since we used single equation model(s), the application of Johansen multivariate approach to cointegration was necessary to test for the long-run relationship among the variables. The result showed the existence of a single cointegration equation between the variables. The result of the Granger causality test shows a bidirectional relationship between investment and economic growth and also a bidirectional relationship between investment and exports but the result of the causation between export and growth was statistically insignificant.

I. Introduction

In contemporary economic literature, different points of view have been formulated regarding the economic growth. Considering the different points of view regarding the content of the economic growth, it can be defined as that process of increasing the dimensions of the economic results, determined by the combination and usage of the production factors and underlined throughout macro-economical indicators such as the gross domestic product, the national gross product and the national income in real terms (Samuelson and Nordhaus 2000: 632).

The study of the economic growth has old implications. The preoccupations for the study of economic growth have existed since the beginning of the classical school, represented by Adam Smith, David Ricardo and Thomas Malthus. In Malthus' conception, the balance is realized when the income decreases to a level where the work-force offer grows with a diminished rhythm, and the economy is at a stationary state. The classics omitted in their models the contribution of the technological progress to the growth of the production per capita (Socol 2006: 62).

The Keynesian and Neokeynesian models of economic growth consider that the economy is inherently unstable, the intervention of the state being necessary in order to achieve balance. These models propose the utilization of budget and monetary policies to stimulate the economic grows. The Neoclassic theory of economic growth considers that the economy is stable and tends towards a complete use. The Neoclassics start from micro-economy, from the preferences of the households, the companies production functions, the structures of the market, etc. The investments have a short term effect over the national income through the aggregated demand; their effects on the long run manifest themselves through the growth of the potential national

income. On the long run, the technological modifications represent the main cause of economic growth, together with the capital investments and the new technologies (Angelescu 2006: 89).

The concept of economic growth on a long term was introduced by Solow and Swan in a macro-economic model that became a classic, by introducing into the models of growth accomplished by classic economists, Ramsey and Haveelmmo, a relation which expresses the population growth and a condition regarding the efficient use of the labor force (Scarlat şi Chirita: 60). From that moment, the theory of economic growth evolved rapidly as two generations of distinct models. The neoclassical model of Solow-Swan is based on the exogenous aspect of economic growth, sustaining the realization of a process of economic convergence between the countries. In his study, Solow starts from the following hypothesis: the capital is submitted to decreasing capacities; the countries which have at their disposal the same characteristics of demographic growth, technological progress and rate of investments, will have incomes which will converge towards the value present in the most developed country; the scale capacities are constant; the technological process is exogenous; the economy is perfectly competitive; the perfect mobility of the production factors (Marinaş 2010: 79-80).

The interest for the theory of economic growth reignited together with a research of Romer, giving birth to the second generation of economic growth models. Within those models, there are significant improvements, such as an attempt to explain aspects related to dates which had not been discussed in the neoclassical model, a more satisfactory explanation of the differences between the rates of economic growth in different countries, a central attention given to gathering of knowledge; an increased role given to the instruments of the macro-economical policies for the explanation of the growth process (Scarlat and Chiriță: 60).

II. Models of economic growth – a short literature review

This paper presents the relationship between the economic growth, exports and investments in Romania. A series of empirical studies tested the correlation between the dynamics of the exports and the process of economic growth, as well as the possibilities of transfer of the effects resulted from the two variables. Pereira and Xu used for the identification of the causal relation between these, the concept of causality in the Granger sense. According to this model, the exports uphold the economic growth, the estimating of the growth variable being improved through the inclusion of the export variable delayed in time. In a similar manner, the growth variable constitutes a cause of the export variable, if the estimation of the export variable registers a reduction of the forecast error, by including the delayed growth variable (Marinaş 2010: 280).

Starting from the same concept of causality in the Granger sense, Omoke Philip Chimobi studies the relation between the economic growth, investments and export. The role of this model was that it determined a long term relation between the three variables. In estimating this relation the Johansen co-integration test was also used, based on which the conclusion was that there was no long term connection between the three variables. Regarding the Granger causality test, it was found that between the investments and the economic growth there exists a bi-directional relations of causality, which from a statistical point of view was insignificant, and it also resulted that there exists a bi-directional relationship between investments and export (Chimobi 2010: 215).

Ullah, Zaman, Farook and Javid have shown with the help of a VECM model showed that the extending of export leads to an economic growth. They also checked whether there is a uni-directional or bi-directional causality between the economic growth, exports, imports, real fix capital and the income per capita (Ullah and others 2009: 269-270).

Subasat showed that the exports constitute a source of economic convergence, the countries with a medium level of development and with an expansion of export, grow faster than those which are not oriented towards export. His fundamental objectives are to try to obtain control over the structural characteristics which determine "the orientation of export" in order to derive an

indicator for the promotion of export which captures only the effects of the policies, and then in order to attest if this indicator is or not essential for the economic growth (Sabasat 2002: 333).

An analysis of the relation between growth, investments and exports, was accomplished by Dritsakis as well . He studied the relation between the three variables for Romania and Bulgaria, with the help of auto-regressive VAR model. The results suggest the existence of a relation of co-integration between the three variables, as well as a positive impact of the exports and the investments on the real GDP (Dritsakis 2004: 1831).

Regarding the investments, the neoclassical theory suggests the importance of the stock capital increase for the countries that are at a low level of economic development. The influence over the economic growth will be for a medium amount of time, until the moment in which a level of stationary balance of the income will be achieved. The sources for the investments refer to the growth of the savings rate, as well as to the fluctuations of the direct foreign investments. In the case in which these direct foreign investments presuppose also transfers of technology, then the process of real convergence will be a sustainable one. For the new members of the European Union, the direct foreign investments have upheld the process of economic growth, two of the channels for the transmission being represented by investments and exports (Marinaş 2010: 280). Modern theories of economic growth underline the unlimited potential of the technological progress, in order to save all the production factors and to sustain the increasing capacities of the investments (Socol 2006: 62).

III. Methodology

In order to investigate the causality between the nominal GDP (LGDP), direct investments (LDI) and export (LEXP) we used trimestrial desezonalized data in log for 2000:1 – 2010:4 collected from the Monthly Bulletins of the Romanian National Bank and the INSSE Tempo Online series available online on Romanian Statistical Institutes website. The VAR and VECM models have been largely used in macroeconomics, especially because the variables involved are endogenous and exogenous at the same time. It is known that VAR models are used for stationary data while VECM – for nonstationary ones. We investigated the stationarity of data, in order to establish whether a VAR or VECM is most suitable, then we studied the cointegration between the chosen variables as well as the Granger causality. We used the impulse response function as well as the variance decomposition in order to study the model's goodness of fit.

IV. The model

First we investigated the stationarity of data. We used the Augmented Dickey Fuller test, including in the equation a constant and a linear trend. Following Canova, the choice of the lag length was established using Schwartz's Info Criterion, as the AIC criterion has been proven to be inconsistent for more than 20 observations.

Table 1. ADF test for variables in level and first difference

	ADF test for variables in level		ADF test for the first difference of the variables	
	T statistic	Test critical values for 5% level	T statistic	Test critical values for 5% level
LGDP	-0.205027	-3.518090	-5.934518	-3.523623
LDI	-1.062859	-3.544284	-3.590803	-3.533083
LEXP	-2.626204	-3.520787	-5.001252	-3.523623

Source: Authors' calculus

ADF test shows that variables in level are not stationary, but all of them are integrated of order 1, I(1), for a 5% level of confidence.

We next investigated the existence of a cointegration relationship between the chosen variables, using Johansen methodology. The Johansen cointegration without deterministic trend test was then conducted. The Unrestricted Cointegration Rank Test (Trace) as well as the Maximum Eigenvalue test indicated one cointegrating equation at 0,05 level for the model without deterministic trend.

Given the results, a VECM Vector Correction Model with 1 cointegrating equation was estimated. Restrictions were placed on the coefficients of each cointegrating relation as well as on the adjustment coefficients, using the normalized cointegrating coefficients and adjustment coefficients. The VEC Granger causality/block exogeneity Wald test showed that the variables with significant impact on the evolution of GDP were both chosen variables, direct investments as well as export.

The cointegration relationship can be written as follows:

$$LogGDP = 0.163234 \, LogEXP + 0.459997 \, LogDI$$

and it reveals a positive correlation on long run between economic growth, exports and direct investments. A 10% increase in exports (in log) determines an increase of 1,6% of GDP in log. The result is consistent with the one of Marinaș. In his VECM model he found an elasticity of 18% of GDP at a increase of 1% of exports.

The VECM model is used in order to investigate the causal relationships between the chosen variables. We found that the model can be written as follows:

$$\Delta LogGDP_t = -0,29\Delta LogGDP_{t-1} - 0,07\Delta LogDI_{t-1} + 0,07\Delta LogEXP_{t-1} -$$
$$-0,11(LogGDP_{t-1} - 0,08LogDI_{t-1} + 0,07LogEXP_{t-1} + 3,6)$$
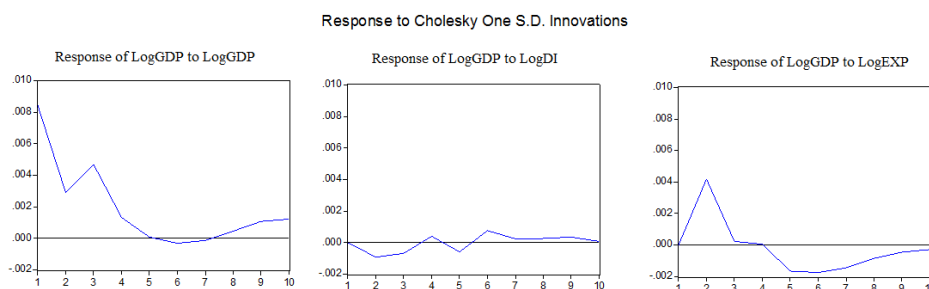
Graph 1. Impulse response functions of LogGDP to a 1% impulse of LogGDP, LogDI and LogEXP
Source: Authors' calculus

Graph 2. Variance decomposition of LogGDP – percent of LogGDP variance due to LogGDP, LogDI and LogEXP
Source: Authors' calculus

We conducted the pairwise Granger causality test with 2 lags. Granger causality tests are defined as joint tests (F-tests) for the significance of the lagged values of the assumed exogenous variable. The estimation result indicated that we reject the null hypothesis for both LogDI and LogGDP and conclude that there exists bidirectional causality between investment and economic Growth at the 5% level of significance. There was statistical significant relationship found to

exist between export and economic growth. Also, with regards to the relationship between investment and export, the result showed that we reject the null hypothesis, indicating that there is bidirectional relationship existing between investment and export in Romania.

V. Conclusions and further implications

The implications of the result is that increase in investment will lead to production of more good which will cause growth in the economy in one hand; and on the other hand, economic growth will guarantee increase in investment. This increase in investment will find development projects such as electricity supply, good road network, good medical care and host of other projects being carried out in Romanian economy. The growth of a country's economy increase the per capita income and subsequently the capability of the citizens to save and reinvest in the economy; hence, a bidirectional causality.

Also Investment which was seen to cause growth will equally enhance export, bearing in mind that increase in export of goods and services will necessitate (cause) Investment in the Romanian economy. It is therefore strongly recommended that policies aimed at increasing the level of Investment be formulated in Romanian economy as a means of engendering economic growth and export which will flow back to as investments.

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