ANALYSIS OF DETERMINANTS FACTORS OF THE ECONOMIC ENVIRONMENT ON FOREIGN DIRECT INVESTMENT IN ROMANIA

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ABSTRACT*:*
Foreign direct investment (FDI), as a component of international financial flows, are a major factor in accelerating economic growth in Romania. This paper aims analyzing the impact of macroeconomic flows that are materialized through indicators at macroeconomic level on FDI and achieving a forecast regarding the future economical growth of Romania based on a high volume of FDI. The purpose of this study is to identify macroeconomic factors of influence on Foreign Direct Investment (FDI) to the national economy level.

Keywords*:* *foreign direct investment (FDI), globalization, optimal structure, regression model.*

Clasificarea JEL: C01, C51, C52, E22, F2, P45.

Introduction

Positive implications of FDI at macroeconomic level are materialized by: supporting economical growth, equilibration of balance of payments, increasing the capital investments and restructuring the economic activity. Supporting of economic growth requires, on the one hand, workforce efficiency, creating new jobs, and on the other hand, increasing competitiveness of the real economy level. According to experts, the positive results recorded at macroeconomic level are due to FDI flows, but this is not always available. An example in this sense is represented by Romania which, though, recorded some economic growth rates this was not due in a very large extent to the volume of FDI attracted at national economy level.

FDI contribution to cover the deficit of financial resources used to finance some projects with macroeconomic impact (infrastructure) can be seen as a positive effect of FDI on the economy.

In terms of investor behavior, it is important to emphasize that it is influenced by a combination of many factors related to the external environment and personal expectations. Also demographic influences put their mark on consumer behavior and at an elementary level, personal expectations act as a filter: it explains why two consumers who have the same demographic profile may behave differently from one another, in similar situations aversion to risk is compounded by behavioral factors that can lead to increasing the pessimism on markets.

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The investors place predominantly their investments aiming a speculative logic, which may raise doubts about the capital market potential to finance economic growth.

Basically, it is made a mental dissociation between the idea of investing on the financial market and the idea of investing in the real economy. Probably to remedy this situation it is necessary a series of actions aimed at including disclosure to investors (Dragotă & Şerbănescu 2010).

MODELS FOR THE ANALYSIS OF FDI IN THE ROMANIAN ECONOMY LEVEL

Economists, throughout time, were interested to elaborate and objectify reliable models, to study the impact of FDI on national economy.

The Dunning Model had an important contribution to studying the FDI influence on production, has developed a model that aims to highlight three advantages, which are: localization, internationalization and property.

Dunning found a correlation between "components" of OLI paradigm and matrix FSA-CSA. It combines elements of OLI with FSA-CSA thus: O=FSA Firm Specific Advantages, L=CSA Country Specific Advantages and I is the indicator that reflects international relations between multinational companies.

The Dawn Holland & Nigel Pain. In the first phase they have developed two models for eight countries in transition among which Romania. One of the models takes into account the FDI factor in these countries, and the other one reflects the impact of FDI. The model, responsible with playback of FDI impact on economical growth is given by the production function CES (Constant Elasticity of Substitution) this being representative for these countries. Thus, according to CES function when the workforce grows, technical progress must increase. Starting from the fact that the model developed for studying the impact of FDI on national economy has in its structure demand of production factors (given that the marginal cost is equal with output price) and the technological program is given, it can be said that the impact of FDI on the national economy is influenced by the size of real aggregate stock of assets owned by foreign investors, but also by an exogenous element approximated as having a deterministic trend in time.

The Koning model. Another model for examining the impact of FDI for Romania and Bulgaria is the one elaborated by J. Konings. The researcher has made a model in which an exogenous variable could be a macroeconomic indicator or even the level of FDI, and in exogenous variables category are included various factors such as capital, share of production of foreign investors firms in the total production per branch, etc. The model was based on two objectives, namely: finding and substantiating some relations between foreign and local firms as well as to study the local firms externality. Following the study performed for Romania, Konings came to the conclusion that the reorganization process in our country wasn't too advanced and the competition dominates the technological process.

Xiaoying and Xiaoming (2005) study the impact of FDI on economic growth both in developed countries (21 in number) and in emerging countries (63), using cross-sectional data for the period 1970-1999. The results show that there is no endogeneity between the two variables over the entire period, but only between 1985-1999. The study shows that there is a strong complementary connection between FDI and economic growth for all countries examined. Moreover, FDI not only potentiate the economic growth by themselves, but also indirectly, through positive effects of interaction with human capital, and also by strong negative effects regarding the FDI interaction with technological gaps from emerging countries. Empirical results supports the new teories about FDI and economic growth, confirming that FDI flows are attracted to countries that have large sale markets. Furthermore, human capital and absorption capacity are very important for FDI to have positive effects on economic growth. Policy implications of the study are eloquent: since the studied variables tend to become endogenous, promoting human capital, technological skills and economic development will attract new flows of FDI. This will further stimulate economic growth and competitiveness.

DEVELOPMENT OF A MODEL FOR THE ANALYSIS OF FACTORS INFLUENCE ON FOREIGN DIRECT INVESTMENT

The purpose of this study is to identify macroeconomic factors of influence on Foreign Direct Investment (FDI) to the national economy level.

In approach to determine an optimal macroeconomic in terms of attracting Foreign Direct Investments (FDI) at national economy level, we opted to elaborate an econometric model whose dependent variable is volume of Foreign Direct Investments (FDI) expressed from econometric point of view through logarithm (LogFDI).

The independent variables used in the regression model are: *The size of Gross Domestic Product* of Romania expressed using LogGDP; *Annual unemployment rate* expressed using LogRS; *The annual inflation rate* expressed using LogRI; *The annual interest rate* expressed by using LogRD. Accordingly the dependent variable will be expressed as:

$$FDI = f(GDP, RS, RI, RD)$$

In order to validate the regression model, using Eviews program, to explain the main factors of influence on the volume of Foreign Direct Investments (FDI) attracted so far by national economy, it was considere a database composed of a sample of observations on the FDI, GDP, RS, RI and RD for a period of 20 years.

The database was created based on informations provided by National Bank of Romania (www.bnr.ro) and the National Institute of Statistics (www.insse.ro). Given the manner in which the data and reduced volume of sample (20 years) are presented we opted for a regression model that captures both at individual and general level the temporary variation and interaction between variables chosen for the study of dependent variable of FDI.

Following statistical correlation tests resulted that based on the four independent variables of the initial model it can be build three linear regression models statistically significant: a

first model that analyzes the GDP and UR influence on FDI and two models that analyze RI influence respectively IR on FDI.

Thus the regression model under test will have the following form: FDI = f (GDP, RS).

ANALYSIS OF DETERMINANTS FACTORS OF FDI

Following the parameters models estimation has resulted the next output:

FDI model= $f(GDP, RS)$	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-2787682.	567240.5	-4.914462	0.0001
LogPIB	2.363976	0.267267	8.844984	0.0000
LogRS	0.993380	0.394418	2.518593	0.0221
R-squared	0.822132	**F-statistic**		39.28832
Adjusted R-squared	0.801207	**Prob(F-statistic)**		0.000000
Durbin-Watson stat	0.916408			

The equation of regression is:

$$FDI = -\alpha_0 + \alpha_1 LogGDP - \alpha_2 LogRS$$

The significance of parameters:

From the elimination process of factors statistically insignificant compared to FDI dependent variable follows that only P-value of parameters LogGDP and LogRS is less than 0.05. So those regression parameters are statistically significant and they have significant influence on the FDI dependent variable.

From the analysis of regression equation resulted from the data processing it is found that LogGDP is positively correlated with FDI, ie if the value of this indicator increases by one percentage is noted an increase of foreign direct investment at the national economy level (FDI), it also LogRS is positively correlated with FDI ie in case of an increase with one percent in the annual rate of unemployment can notice an increase in foreign direct investment at the national economy level (FDI).

Coefficient C is the free term, more specifically the point where the explicative variables are 0. So FDI volume, if there would be no GDP or RS, it would be -2787682. Ie if it would not get a satisfactory volume of GDP and unemployment rate clearly there will be no foreign direct investment attracted to the national economy level.

GDP coefficient is 2.363976, which means that at the growth of GDP volume with one unit, FDI will increase with 2.363976 units and RS will remain constant.

RS coefficient is 0.993380, which means that at growth of RS with one unit, FDI will increase with 0.993380 units, and GDP will remain at the same level.

Validation of the model:

Fisher test (F test) is used for testing the validity of an econometric model. For this are specified the following assumptions:

- **model is statistically invalid** or otherwise the variation explained by the factor x is not significantly different from the variation explained by other factors. This is equivalent with the fact that factor of action x is not an essential factor of y.
- **model is statistically valid** or otherwise the variation explained by the factor x is significantly higher than the variation explained by other factors. This is equivalent with the fact that factor of action x is an essential factor of y.

The validity of the regression model is given by **F-statistic test**. Since the F test probability *(Prob(F-statistic))* is 0.000000 and is less than 5% it can be said that the regression model built is valid and can be used to analyze the dependence between FDI and the independent variables of the model.

R^2 coefficient is 0.822132 and highlights the degree of determination used to show to what extent the regression model explains the dependence between variables. Thus approximately 82.21% of the variation of FDI is explained by variation of parameters used in the regression model ie the value of **R^2** coefficient indicates a very high degree of explicitation of the model.

Determination of adjusted R^2 coefficient (*Adjusted R-squared*) is 0.801207. Calculated values of the *R-squared* and *Adjusted R-squared* for a regression model should check the next order relation: $R^2 ajusted \leq R^2$. In the case of analyzed regression model the value of coefficient R^2 ajusted is in accordance with the conclusions drawn from *R-squared* analysis.

The effective value of the dependent variable, its estimated value and errors from regression

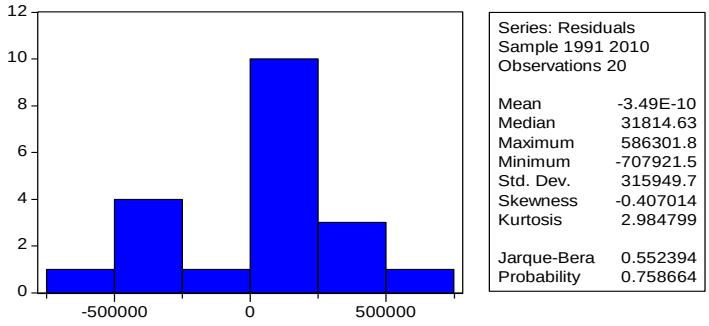
Verifying the hypotheses:

The assumption of normality is verified by Jarque-Bera test. Among the most important applications of repecting this hypothesis can be found in the application of the Central Limit Theorem and in the hypothesis of normal distribution of the parameters of an

econometric model. (Gujarati, 2009) Jarque-Bera test. (Jarque-Bera, 1981) is used to check whether a distribution of some values (in this case, estimated values of residues) is normal or not, or even close to it. Assumptions departing from this test are**:**

$\begin{cases} H_0 \ K = 3S = 0; \\ H_1 \ S \neq 0 sau \ K \neq 3; \end{cases}$ where K is the coefficient of vaulting of a distribution (kurtosis) and S is the coefficient of asymmetry (skewness).

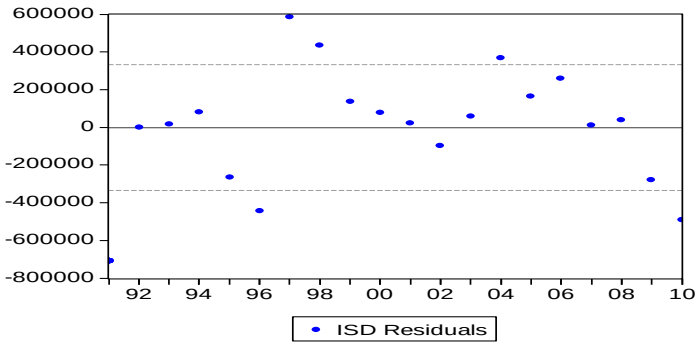
The test measures the difference between the coefficient of asymmetry and kurtotic of distribution analyzed with those of the normal distribution. The test has as null hypothesis: the series is normally distributed. Thus, if the probability associated of the test is superior to chosen relevant level (1,5% or 10%) then the null hypothesis is accepted. How Jaque-Bera has a value of 0.552394 and its probability is 0.758664 > 0,05, means that the residues follow a normal distribution.



The residues distribution –hypothesis of normality

For a normal distribution: The coefficient of asymmetry (skewness) is -0.407014 ie normal distribution is not symmetric and kurtotic (kutrosis) is 2.984799 How the value of this indicator is less than 3, then the distribution is called platikurtotica. According to the results of this model, the distribution of the dependent variable (FDI) has the average less than zero, presents positive asymmetry which meant that, in the period analyzed the FDI had an increasing trend, and kurtotic has a value below 3, as such this distribution is platikurtotica.

The hypothesis of autocorrelation of errors is verified by Durbin-Watson test. After applying the Durbin-Watson test for residues autocorrelation test, resulted a calculated value, 1.175751, which, as there it is not in the interval (1,8 - 2,2), means that there is autocorrelation between residuals.



Distribuţia reziduurilor

In figure *Distribution of residues* is represented the way they are distributed regression residues considered. We notice that they have a constant distribution, them being quite dispersed and autocorrelated.

The hypothesis of lack of correlation of errors is verified by applying Breusch-Godfrey test. Respecting the hypothesis of autocorrelation of errors implies that the residual variable is not correlated with variables of this kind in the past. In statistical terms this can be written $\text{cov}(\varepsilon_t, \varepsilon_{t-k}) \cong 0$ where k, represents the lag (delay) measured. If the phenomenon of error autocorrelation is present then the estimators obtained by applying the method of least squares are unbiased but are no longer effective. In this way using econometric model to analyze the relationship between variables should be made with caution. The model is applied to the residual values obtained by applying the method of weighted least squares (WLS).

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.445067	**Probability**	0.724578
Obs*R-squared	1.741354	**Probability**	0.627779

The null hypothesis of the two tests *F-Statistic* and *R-squared* is that there is no serial correlation of errors of the regression equation. If the probability associated with the two tests is below the level of relevance (5%) which is working at, then the null hypothesis is rejected, thus is rejected the inexistence of serial correlation. Otherwise the null hypothesis is accepted, (does not exist serial correlation). According to the results obtained on the basis of this regression, the probabilities are higher level of relevance (5%), which means that there is no serial correlation of errors.

Similar test (Serial Correlation LM test) for testing serial correlation of quadratic errors is ARCH LM Test. The test operates on the same principles as the test for autocorrelation of errors. Choosing all three lags for this test, according to the two associated probabilities the null hypothesis is rejected (inexistence of serial correlation of quadratic errors of the regression equation).

ARCH LM Test:			
F-statistic	3.570968	**Probability**	0.044183
Obs*R-squared	7.680180	**Probability**	0.053105

The hypothesis of heteroscedasticity is verified by applying the White test. This hypothesis assumed that variance of residues to be constant in relation to factor variables. Using Least squares method in circumstances where hypothesis of homoscedasticitate is not supported leads to moved estimators of variation of regression model coefficients and inefficient estimators. Thus it can be considered that the parameters obtained are not the best.

White Heteroskedasticity Test:			
F-statistic	1.653420	**Probability**	0.212848
Obs*R-squared	6.119903	**Probability**	0.190371

The null hypothesis of the two tests F-Statistic and R-squared is that there is heteroscedasticity of errors of the regression equation. If the probability associated with the two tests is less than the working relevance level (5%), then the null hypothesis is rejected, ie we have homoscedasticitate of errors. Otherwise the null hypothesis is accepted. According to the obtained results, the probability 0.212848 > 0,05, ie the null hypothesis is accepted, which means that we have heteroscedasticity - dispersion of residual variables is not constant (relationship between independent and dependent variable is not relatively stable).

The hypothesis of multicollinearity is checked against the criterion Klein. This hypothesis must be closely respected in case of models with several factors because it failure to comply amplifies variances of estimators and determine statistically insignificant for the parameters analyzed or in the worst case prevents parameter estimation. Essentially this hypothesis verify if variables factors, in our case GDP and RS are correlated or not.

Constituting a new regression model formed by independent variables, in other words a simple regression where the dependent variable is represented by GDP, and the independent one by RI. After we formed the model and test it, we will follow the values of R-squared and Adjusted R-squared and we will compare them with R-squared and Adjusted R-squared values from regression base. Based on this comparison we will establish whether there exist or not multicollinearity.

Dependent Variable: GDP **Method: Least Squares** **Included observations: 20**				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	1849029.	56384.47	32.79323	0.0000
RS	-0.278364	0.057242	-4.862900	0.0001
R-squared	0.567804	**Mean dependent var**		1671707.
Adjusted R-squared	0.543793	**S.D. dependent var**		284753.9
S.E. of regression	192331.5	**Akaike info criterion**		27.26647

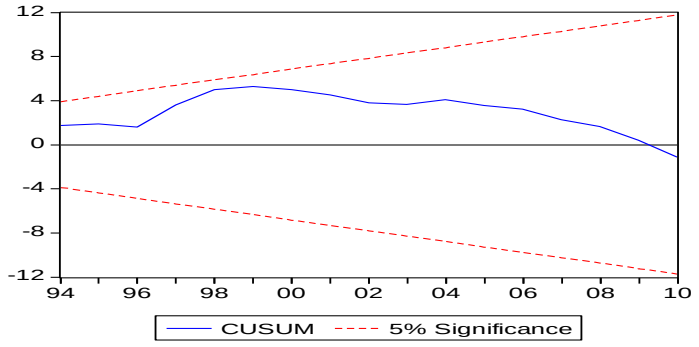
Sum squared resid	6.66E+11	**Schwarz criterion**	27.36604
Log likelihood	-270.6647	**F-statistic**	23.64780
Durbin-Watson stat	0.739284	**Prob(F-statistic)**	0.000125

As R-squared is 0.567804 from simple regression is lower than R-squared 0.810490 from multiple regression, and Adjusted R-squared is 0.543793 from simple regression is less than Adjusted R-squared 0.7881950 from multiple regression, and the difference between them is quite close as values, 0.242689 between R-squared and 0.244402 between Adjusted R-squared, it means that there are multicollinearity.

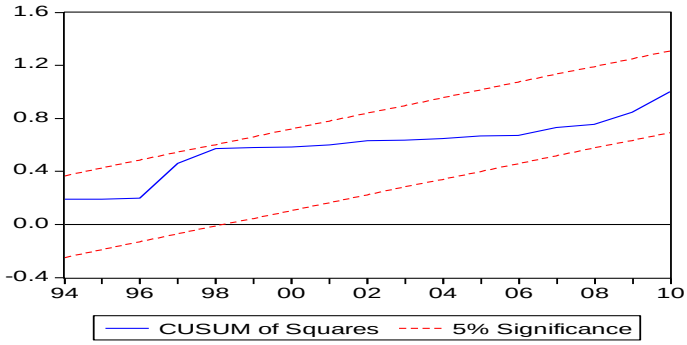
Stability tests of equation and estimated

The most used stability tests are: CUSUM Tests; CUSUM of Squares Tests; Recursive Coefficients.

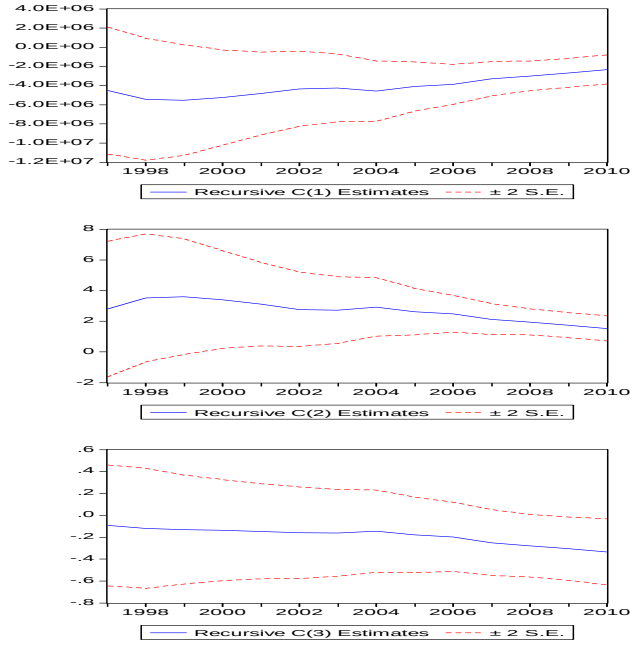
CUSUM Test is based on the cumulative sum of recursive error of the regression equation. Eview graphically depicts the cumulative sume of recursive errors along with the critical lines of 5%. Equation parameters are not considered establish whether the cumulative sum of reursive errors goes outside the two critical lines. For equation analyzed, CUSUM test is presented in the chart below. According to the statistical results, the coefficients of the equation are stable.



CUSUM of Squares test is calculated and interprets similarly with CUSUM test, except that instead of recursive errors are used squared recursive errors. For the equation analyzed, CUSUM of Squares test is presented in the chart below. According to the statistical results, the coefficients of the equation are stable.



Recursive Coefficients presents the regression equation coefficients calculated recursively. The coefficients shall be establish whether, with increasing the sample, their value does not change. For the equation analyzed, recursive coefficients are represented in the graphs below.



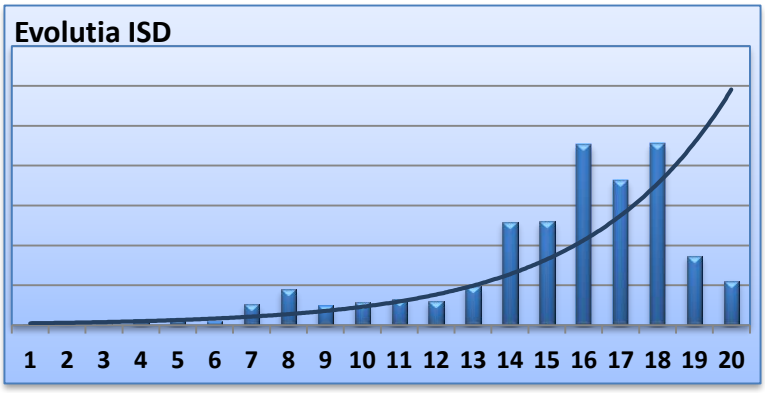
CONCLUSIONS

Evolution of FDI in Romania, had an oscillating behavior, behavior determined by the socio-economic but also political conditions in Romania located in the transition period. Thus there have been recorded explosive annual increases of over 150% but also sharp declines when the pace of reduction of investment over the previous year reached values of over 20%. For example in Romania, foreign direct investment (FDI) have reached 621

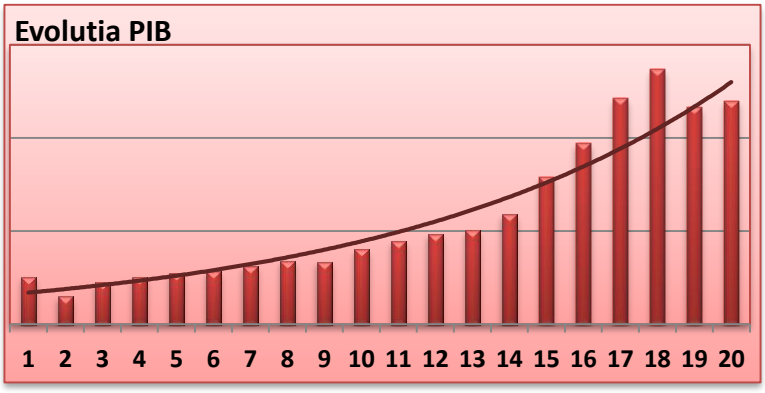
million euros at half of 2012 with a value 15 times lower compared to 2008, according to data published by the National Bank of Romania. [www.business24.ro]

As a whole during this period the average growth rate of investment was about 38% thereby bringing during the 20 years analyzed an annual average spore of about 0.53% billion euros.

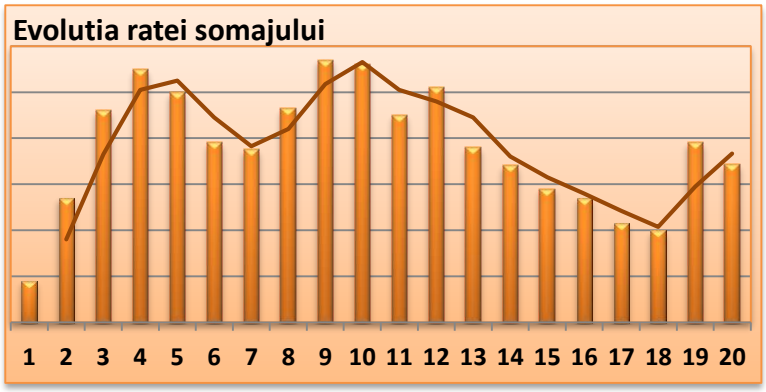
However, Romania is the 6th most attractive European country for investment in the next three years, according to the 840 business leaders surveyed by Ernst & Young (E&Y) within the report of European Attractiveness Survey. Romania has the advantage of a promising growth rate of GDP compared with the European average and of a valuable human capital. There are more and more investors attracted by the renewable energy sector. More privatizations are planned in the next period, encouraging investors around the world to look at our country. It is essential to stimulate this positive evolution through adequate economic strategies. [http://www.wall-street.ro]



In the period of the 20 years of analysis, GDP had an average annual growth in nominal terms by approximately 10%. Some periods had marked some significant declines. For example in 1992 we had a decrease of about 41% of GDP compared to previous year, and in 1999 a decrease of 1% from the previous year. These decreases can also be explained based on modification of the exchange rate.



The unemployment rate has evolved in close connection with economic development. A rapid and alarming growth in the early years of analysis made it hard in the fourth year of observation to reach a maximum of 11%. This maximum was caused mainly by changes at economic level, revamps, and especially the closure of some major industrial components from the system. There followed a short period of reducing the unemployment rate after wich the growing trend has returned. Conditions such as: start of negotiations for pre-accession at European Union, Romania's opening to the West continued with amplification of workers migration to countries like Spain, Italy, Germany, led to a significant reduction in the unemployment rate to a level close to the natural one registred in last years.



The study conducted by Ernst & Young (E&Y) within the European Attractiveness Survey report is based on a methodology that includes two analyzes of the number of projects financed by FDI, on the one hand, and a soft analysis of perception regarding the attractiveness of European countries for FDI, on the other hand. The first analysis includes only concretized projects of foreign investment in new assets or new jobs, being excluded portfolio investments, mergers and acquisitions. The other analysis defines attractiveness of a location regarding FDI through a mix between its image, investor confidence and perception regarding ability of that country to provide competitive benefits for investors. For this component, the research was realised by CSA Institute on a representative sample of 840 decision factors from companies around the world.

Despite the economy fragility from the euro area, investment flow to Europe has continued to grow, the number of projects being considerably higher than before the crisis, according to E&Y. For example in Europa, the number of investments increased by 2%, from 3.757 in 2010 to 3.906 in 2011. Although the evolution of projects number has been modest, in fact, their mean value was significantly higher and the number of jobs generated by FDI increased by 15%.

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*** Institutul Național de Statistică (www.insse.ro)