

Evolution and consequences of economic crisis in Romania

Gina IOAN¹, Cătălin Angelo IOAN²

¹Danubius University of Galati, ginaioan@univ-danubius.ro

²Danubius University of Galati, catalin_angelo_ioan@univ-danubius.ro

Abstract. The paper treats the main Romania's macroeconomic indicators before and after the economic crisis began. It is determined a set of correlations of population occupancy level by investment in key sectors. Also, finally, it is determined the Okun's law in Romania. The analysis reveals that a higher occupancy labor will implicitly lead to an increase in the GDP. On the other hand, the structure and nature of investment in Romania must be redesign, in the purposes of achieving a compromise between technology and creating jobs. An increase in training of the population, fostering integration of graduates (especially those with secondary and higher education) in the labor market and limit migration will lead to increased investment in high efficiency especially in industry and a highly competitive on foreign markets. Also, a higher labor efficiency will increase the Okun's coefficient (1.72 for Romania as compared with 2 in most developed countries) so a higher potential GDP growth relative to labor.

Keywords: GDP, unemployment, Okun.

1 Introduction

2009 was the year when the economic and financial crisis has engulfed the entire World economy and the economies, whether developed or emerging experienced major structural changes. After a long period of economic growth, global GDP has experienced a decrease of 0.6%, felt especially in Europe – 4.3% and United States – 3.5%.

In Romania, the factors that have contributed in the period before the crisis, leading to overheating, and also drastically reduce economic activity. In addition to these internal factors, vulnerabilities of emerging economies like Romania have contributed to the deterioration of country's macroeconomic profile:

- ✓ Romanian economy's dependence of foreign capital flows from developed countries (in these countries, the decline being most severe);
- ✓ Romanian economy's dependence on imports and investment, with negative impact on private consumption;
- ✓ Dependence on trade, mainly by the Euro zone, with negative impact on external demand with the crisis.
- ✓ On the other hand, specific vulnerabilities of an economy in transition, like that of Romania, were, albeit in a small way, important factors that have mitigated the effects of contagion:
- ✓ Although exports are a real engine of economic growth in terms of macroeconomic stability, in terms of economic shock that one today, an economy heavily dependent on exports becomes very

vulnerable (Montalbano Pierluigi, 2009). Thus, in the Romanian economy compared to other countries of Central and Eastern Europe, the reduced share of exports in GDP (between 29% and 37% in 2000-2008) has contributed little to limit the negative effects of the crisis through the shopping channel;

- ✓ Low level of financial intermediation (NGO's credits to GDP) between 13% and 49% in 2000-2008, contributed to a smaller contraction in economic activity through the financial channel;
- ✓ Protection against external shocks, especially on the real economy, has constituted the exchange rate volatility that these shocks dissipated, first the nominal economy.

2 Analysis of macroeconomic indicators in 2009-2011

The absence of toxic assets in the Romanian banking system (one of the main causes of the global financial crisis) was not sufficient for Romania to be avoided recession. The real economy has experienced economic decline, after a period of 8 years of artificial growth, also accompanied by the accumulation of macroeconomic imbalances: the current account deficit, budget deficit, public debt.

In emerging countries, especially in the Central and Eastern Europe, the transition to a competitive market economy and, later, to a society ruled by knowledge, imposed the need for new technologies, an absolute prerequisite, but also difficult for countries in this area and for Romania as the investments were higher savings. Therefore, an important place in the economic balance is held by the public financially, represented the needs and state funding sources.

Table 1 Annual variation of GDP, Current account deficit, Budget deficit, Public debt in the period 2000-2011

Year	Annual variation of GDP (%)	Current account deficit (% of GDP)	Budget deficit (% of GDP)	Public debt (% of GDP)
2000	2.4	7.5	3.7	31.2
2001	5.7	5.8	3.3	28.6
2002	51.	3.4	2.6	28.8
2003	5.2	5.7	2.3	26
2004	8.5	8.4	1.1	22.5
2005	4.2	8.7	0.8	20.4
2006	7.9	10.3	1.7	18.3
2007	6.3	14	2.5	19.7
2008	7.3	12.3	4.8	21.3
2009	-6.6	4.5	7.2	29.5
2010	-1.6	4.1	6.5	37.8
2011	2.5	6.5	4.35	39.5

Source: INSSE, BNR, Ministry of Public Finances

From the data above, we see that the current account deficit widened in 2004-2008, when they took place also capital inflows. Unsustainability of the current account deficit is explained by the pro-cyclical nature of fiscal policy. A prudent fiscal policy could mitigate some vulnerabilities (a higher level of the domestic currency in real terms with negative impact on external competitiveness) generated by massive capital inflows, being known that often these large capital inflows are followed

by financial crises (Reinhart Carmen, Reinhart. Vincent, 2008).

Between the current account deficit, savings rate and investment rate is a directly link. If domestic savings can not cover investment, the current account deficit will widen by capital inflows from abroad. In Romania, the savings rate (final consumption -GDP/GDP) and investment rate (GFCF/GDP) in the period 2000-2011 is as follows:

Table 2 Evolution saving rate and investment rate during 2000-2011 (% of GDP)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Saving rate	11.98	13.33	15.31	13.73	13.04	10.81	11.92	11.84	16.07	18.91	19.08	21.32
Investment rate	20.43	19.58	21.24	22.00	22.03	24.11	26.35	31.39	32.51	24.57	24.32	24.87

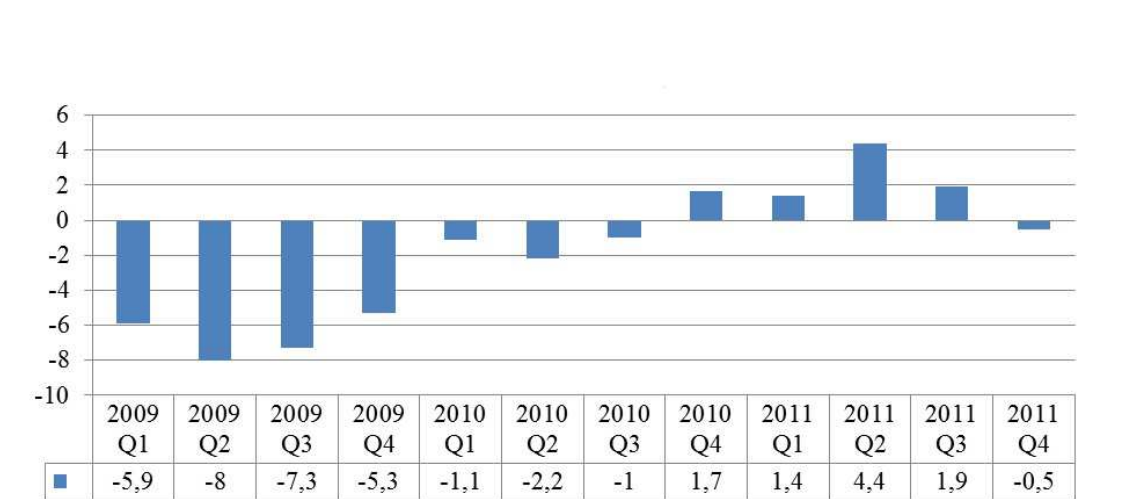
Own calculations, Source: INSSE

Other sources of vulnerability on the part of financial operators were growing debt since 2007 and share of over 3% of GDP budget deficit since 2008.

As regards the real economy, economic growth was hampered when the first signs of contamination of the Romanian economy.

For an overview, we shall analyze the evolution of GDP by category of resources and uses, using quarterly data.

In addition imbalances accumulated since 2009, GDP decreased considerably over seven quarters, the first sign of growth registered in the last quarter of 2010.



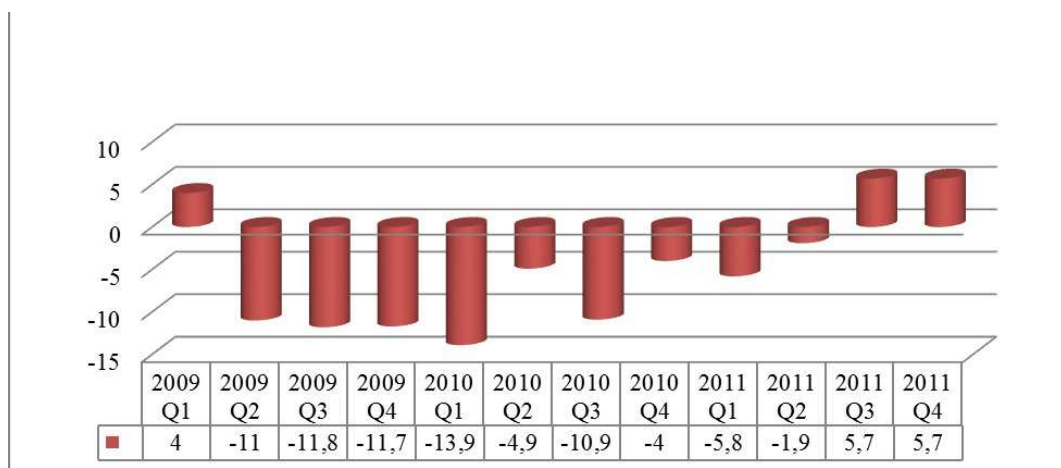
Source: INSSE

Figure 1 The evolution of GDP in 2009-2011 (%) – quarterly change

On the supply side, all sectors recorded negative developments, but sectors with a greater contribution to the decline in economic activity had constructions and services.

The decreasing access to credit and the deceleration of wages growth, will lead to lower private consumption. The construction sector was the first affected by the higher price of credit, because it assumed shock both by the investor and the buyer. This led on the one hand, to stop the ongoing projects, on the other hand, projects completed no longer find buyers, construction market recording in

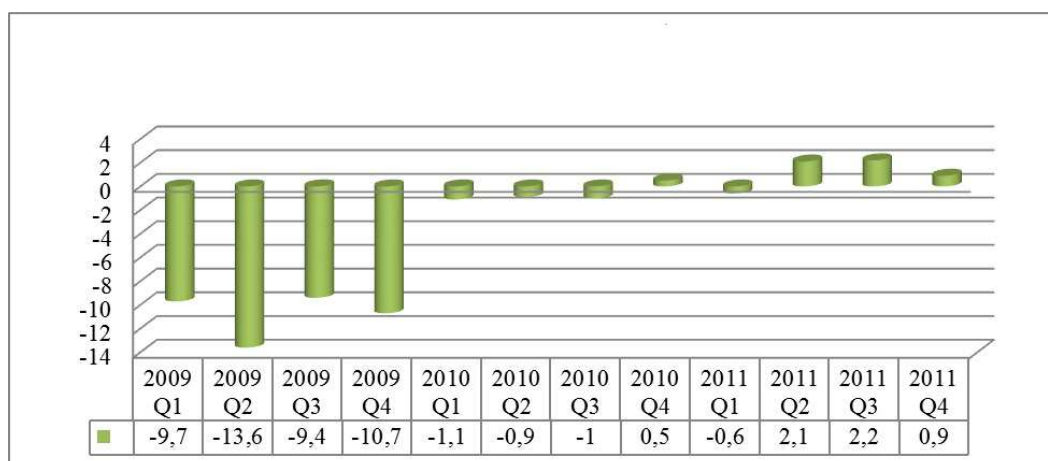
2009, a drop of almost 10% and 7.3% in 2010. After an oscillating evolution in 2011, with decreases in the first and second quarters, the construction sector has reversed trajectory, with an increase of 5.7% in the third and fourth quarters.



Source: INSSE

Figure 2 The evolution of the construction in 2009-2011 (%) – quarterly change

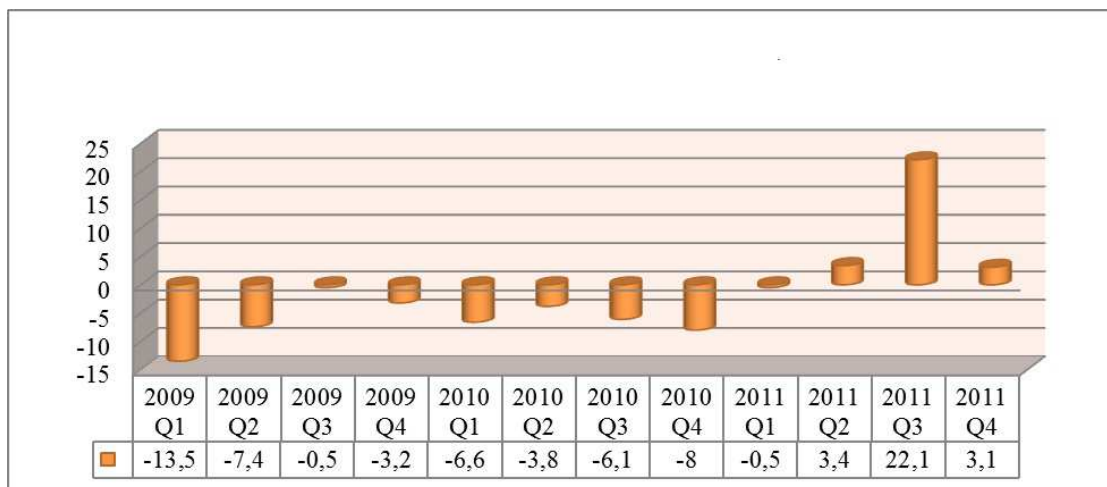
Another sector whose gross value added was significantly narrowed was the trade and services. Although the role of private companies in this sector has increased, economic crisis deeply affected, the return to growth just making felt in the second quarter of 2011. Due to lower domestic demand, has affected all major categories of services, and according to the Ministry of Finance, first in the state budget arrears are companies operating in trade and the provision of services.



Source: INSSE

Figure 3 The evolution of trade and services sector in 2009-2011 (%) – quarterly change

The development of agriculture until 2009, was one sinuous, the most fluctuating sector of the economy, largely depends on climatic factors. Although its share in GDP is high compared with Hungary, Poland and other countries, the lack of modern technical equipment, low investment capacity, provided no support for sustainable agriculture in terms of growth. Evolution in the period 2009-2011 shows a decrease of 3.3% in 2009, a more pronounced decrease in gross value added of 6.3% in 2010, increasing by 11.3% from 2011 mainly due to a good agricultural year in terms of climate, which brought an increase of 22.1% in the third quarter of this sector.

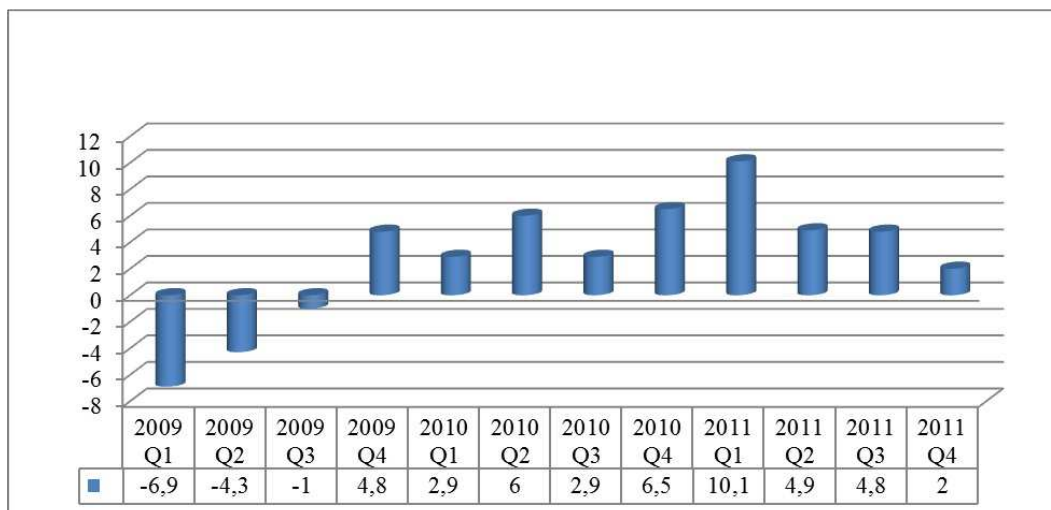


Source: INSSE

Figure 4 The evolution of Agriculture in 2009-2011 (%) – quarterly change

To ensure a sustainable development of this sector, are required in addition to modernization and refurbishment, reducing subsistence farms, improving the quality of this field and absorption of EU funds. The main source of exports, the industry has declined in the last quarter of 2008, industrial production decreasing in December from the previous month with 18%. Significant decrease in industrial production in the first three quarters of 2009 was driven primarily by:

1. A decrease of the activity in other sectors of economic activity leading to a decrease in activity related industries;
2. The decline of the demand in foreign markets of major trading partners as a result of the economic crisis;
3. The access heavier of the economic agents to finance through loans due to rules imposed by the NBR.



Source: INSSE

Figure 5 The evolution of Industry in 2009-2011 (%) – quarterly change

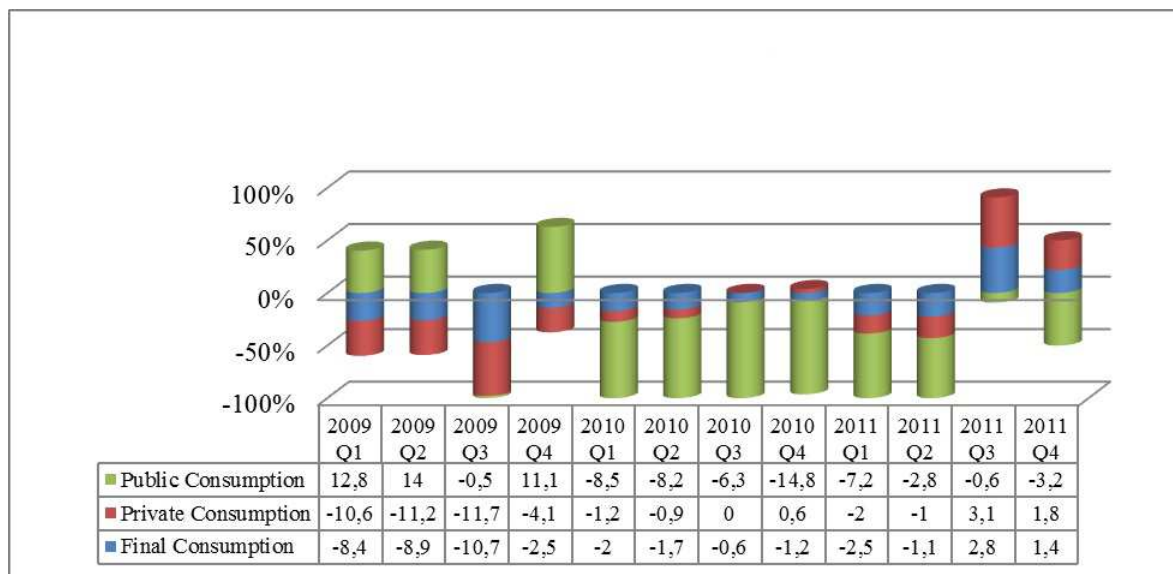
Industry return to ascending trend of 4.8% for 2010 and 5% in 2011 is due mainly to the European market integration of the Romanian industry. However, the growth of the Romanian industry is much lower than in the euro area over 7%, according to Eurostat.

Other factors that contributed to the resumption of growth in this sector has been slight improvement in European macroeconomic environment and a strong substitution effect of the crisis affected European consumers turned to cheaper products coming from Eastern Europe. All of these favorably influenced trained industrial exports, the main producer of tradable goods (tradable goods).

Regarding domestic demand, GDP decline is attributed to each component of its, greatest contribution being the restriction of private consumption and gross fixed capital formation.

Reducing household consumption was influenced by the negative dynamics of households' disposable incomes reduce consumer loans and a stronger inclination towards saving the population from the previous period (2000-2008).

Final consumption growth in the years prior to the crisis was mainly based on a pro-cyclical policy of income and a loosening of credit conditions, assigning to the boom period an unsustainable character, because it was not accompanied by an increase in the competitiveness of the Romanian economy plan externally.



Source: INSSE

Figure 6 The evolution of final consumption, private consumption and public consumption in 2009-2011 (%) – quarterly change

A reasearch of the consumer demand dependence for disposable income, in the period 2001-2011, using regression analysis, get to Romania a high marginal propensity to consume.

Because after Durbin-Watson test (Savin N.E., White, Kenneth J., 1977), we obtain that residual errors in the regression model undergoes a positive autocorrelation, was getting, finally, the modified regression equation as the consumer demand in the year “i” depends to a large extent on demand consumption in the year “i-1” and disposable income in the years “i” and “i-1”. For accuracy and adequacy of calculations we reduced all data (using GDP deflator) to level of the year 2000.

Table 3 Indicators used in modeling the consumer demand for disposable income during the period 2001-2011

Year/ Indicator	GDP deflator index (compared to 2000)	Consumption in constant prices of 2000 (mil. lei)	Disposable income in constant prices of 2000 (mil. lei)	Consumption in constant prices of 2000 (readjusted after Durbin-Watson test) (mil. lei) $V_i^* = V_i - \rho V_{i-1}$	Disposable income in constant prices of 2000 (readjusted after Durbin-Watson test) (mil. lei) $C_i^* = C_i - \rho C_{i-1}$
2001	0.727802	73312.7	85192.1	-	-
2002	0.589791	74973.5	88712.9	26159.2	31988.92
2003	0.475638	80296.6	91729.8	30376.44	32661.42
2004	0.413598	87291.8	98023.5	33827.38	36946.45
2005	0.368298	92456.7	103294.1	34334.63	38026.47
2006	0.332399	98013.6	110726.8	36452.46	41949.73
2007	0.294158	101466.0	117981.3	36204.94	44255.34
2008	0.263582	110946.4	131734.0	43386.67	53177.75
2009	0.247495	100056.3	121567.0	26184.02	33853.59
2010	0.238895	100301.0	121233.7	33679.91	40289.99
2011	0.223058	98515.1	115985.9	31730.97	35264.02

Own calculations based on INSSE, World Bank

Thus, based on the regression equation: $C=cV+C_0$, $C_0>0$, $c \in (0,1)$ (Appendix 1) where:

- C – consumer demand;
- V – disposable income;
- c – marginal propensity to consume, $c = \frac{dC}{dV}$;
- C_0 – autonomous consumption (consumption basis without any income)

we obtain: $C^* = 0.7411V^* + 4447.2128$ or else:

$$C_i = 0.7411V_i + 0.6658C_{i-1} - 0.4934V_{i-1} + 4447.2128$$

From these analyzes, it appears that marginal propensity to consume is 0.7411 which implies that an increase in disposable income of 1 billion lei, consumer demand will increase by an average of 741.1 million.

It also should be noted that R Square = 0.8764, indicating that consumer demand is explained at the rate of 87.64% of disposable income developments, the remaining 12.36% being the influence of other random factors.

The above analysis shows that in the case of Romania, during 2001-2011, there is a very high marginal propensity to consume of 74.11% relative to disposable income. Also, the percentage of 66.58% which is the influence of past consumption on the present leads to the conclusion that the consumption habits of the population is relatively stable, leading to the hypothesis persistence in consumption habits (Singh Balvir, Ullah Aman, 1976).

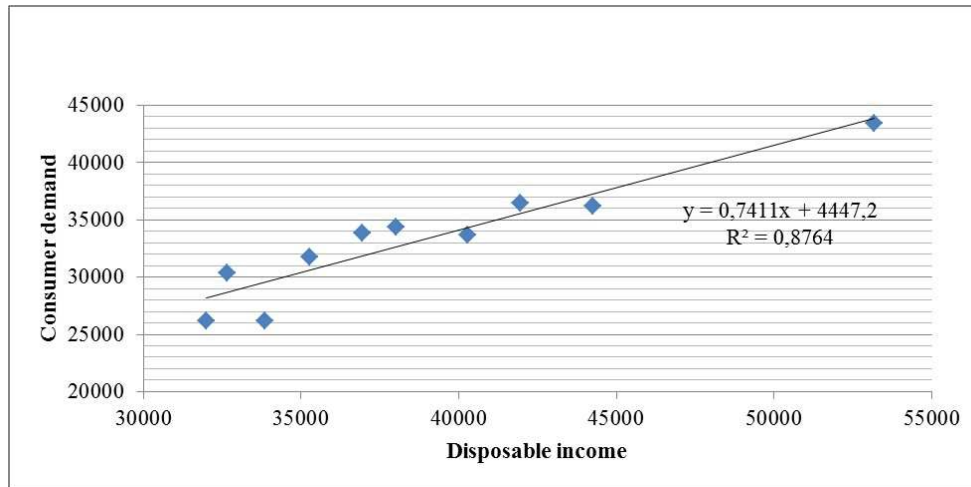
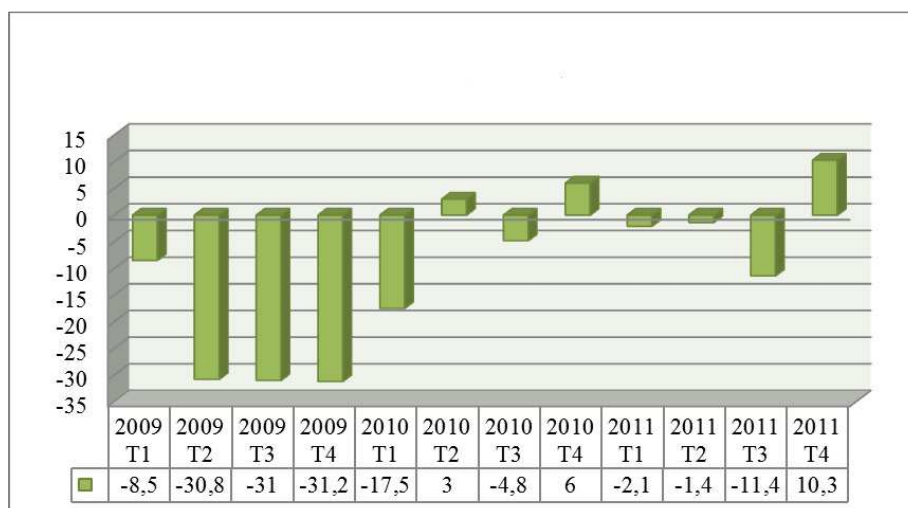


Figure 7 Dependence on consumer of disposable income in the period 2001-2011

Another interesting fact is the percentage of 49.34% respecting the previous income year calculation adversely affect consumption. The comparison of two percents (49.34% and 74.11%) reflects the fact that a far higher income leads to increased consumption, whatever the shortcomings of the previous period.

The persistence of uncertainties about future income, among the population and businesses agents, the increased risk aversion of the banks (due to rising bad loans with negative impact on profitability indicators) have made it difficult domestic financing private sector investment. Similarly, the volume of external financing declined sharply, negatively affecting investment demand. Funding has become increasingly difficult with worsening risk perception for Romania by some agencies (below investment grade). Thus, gross fixed capital formation decreased by 28.1% in 2009, 2.1% in 2010 and an increase of 6.3% over 2011.



Source: INSSE

Figure 8 GFCF developments in 2009-2011 (%) – quarterly change

The fact that this indicator, the share of gross fixed capital formation in GDP, ranged from a minimum

of 18.82% (2000) and a maximum of 31.92% (2008), demonstrates the inability of macroeconomic policies (fiscal and monetary) in stimulating investments. Another factor that negatively influenced investment, both domestic and external, was the difficult process of privatization of large companies, often conducted under less profitable for the Romanian state.

Transition, which was a mixed structure of the economy represented by a private sector in training, in particular by SMEs near to the public system through large companies, greatly delayed the investment process. Another thing to mention is that the financing of domestic investment has contributed greatly the money market, but not the capital market, insufficiently developed, should providing a much more long-term investment financing.

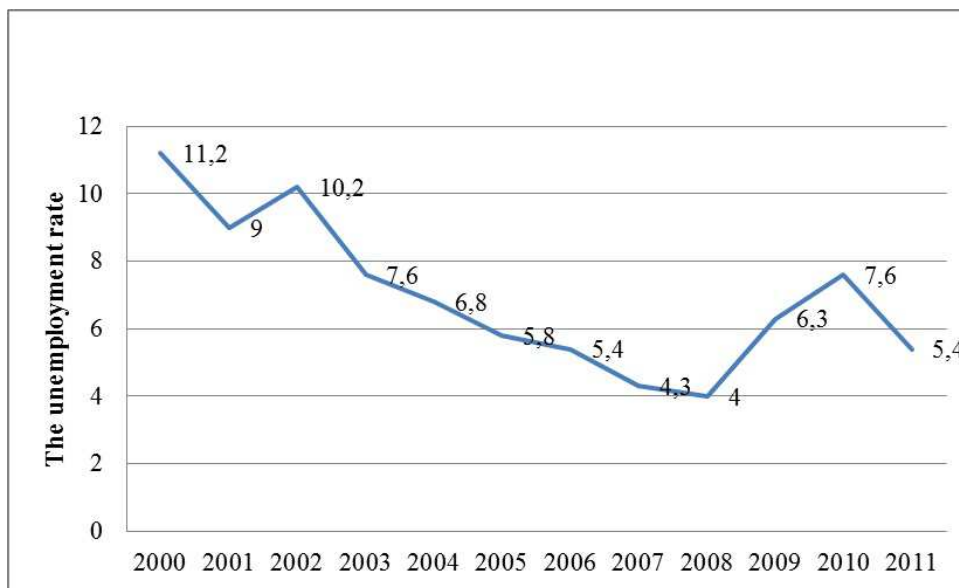
3 Impact of financial crisis on the labor market in Romania

Cumulation of internal and external factors, low effective demand in both its components, consumption and investment, difficult access to external financing, loss of foreign markets, but also reduce the internal market generated labor market imbalance where the most important resource is traded. This important production factor can influence the output either through an increase in employment in the economy or increase labor productivity through investment in education and vocational training.

Sustainability and competitiveness of an economic system is closely related to the level of employment in a social, economic and scientific-technical dynamics.

In Romania, size, dynamic, forms and unemployment characteristics have evolved differently from one year to another and from one month to another, depending on periods of economic boom or recession.

In the analyzed period, 2000-2011, the unemployment rate has been steadily decreasing until 2008, resuming the upward trend in 2009, driven by the economic crisis.



Source: INSSE, Ministry of Labour, Family

Figure 9 The annual average unemployment rate evolution during 2000-2011

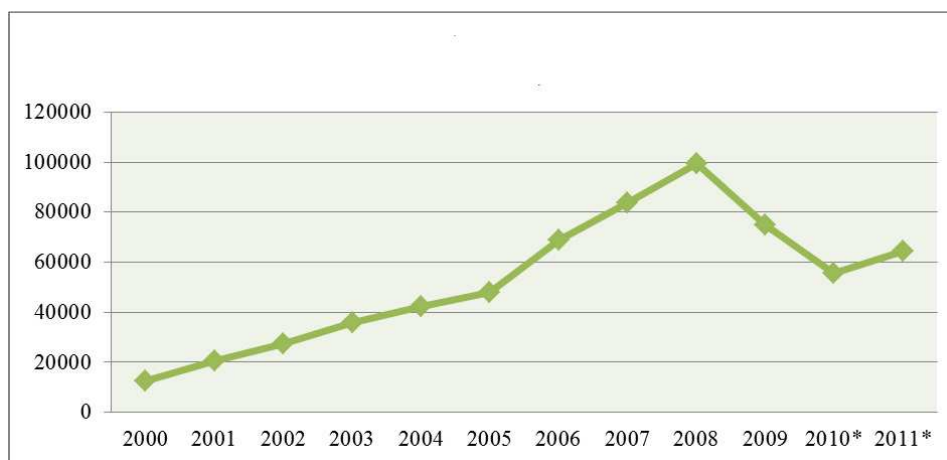
Drastic reduction in domestic and external demand made that 2010 to be the year with the greatest pressure on labor. In March 2010, it was at the threshold of 8.39% and from the second quarter, seasonal effects have lowered the unemployment rate to 7%.

Regarding the economic crisis on the labor market in Romania, public and private sectors have responded differently.

Analyzing the dynamics of the number of employees in different sectors of the economy, we see that the private sector was adjusted before the crisis, registering big savings plan (starting from 2008 in industry, construction, trade and services) while the public sector (particularly in public administration and defense) had an adverse reaction to the economic crisis, the number of employees continued to grow in 2009. Adverse reaction to the budget sector coincided with an election year in which the developers chose economic policies combined with inflation-unemployment lowest cost to them. Thus, adjusting the budget sector was postponed after elections in 2010, when the unemployment rate increased from 6.3% to 7.6%. Reducing the gap between the unemployed and increase the number of employees in all sectors of the Romanian economy, during the growth, was influenced by other factors such as labor migration and the informal economy.

4 The investment dynamics

A problem intensively studied in literature specialty is investment and its impact on economic growth and influence economic growth has on capital flows. In the current economic landscape, domestic and foreign investment, by volume, structure and their quality were the most important engine of economic growth because they provide efficient use of human resources available to the economy, innovative development of economy, the growth of scientific progress, increased productivity and gross domestic product. Stimulate investment, even if they generate microeconomic effects, in the case of investment in the sustainable projects, the economy, through training and multiplication mechanisms, will absorb the effects of general economic agents. In Romania, although experienced spectacular growth rates in 2000-2008, they were not largely sustained by the investment. In the context of economic integration, the accomplished and also foreign investments support growth in the economic conditions in each country.



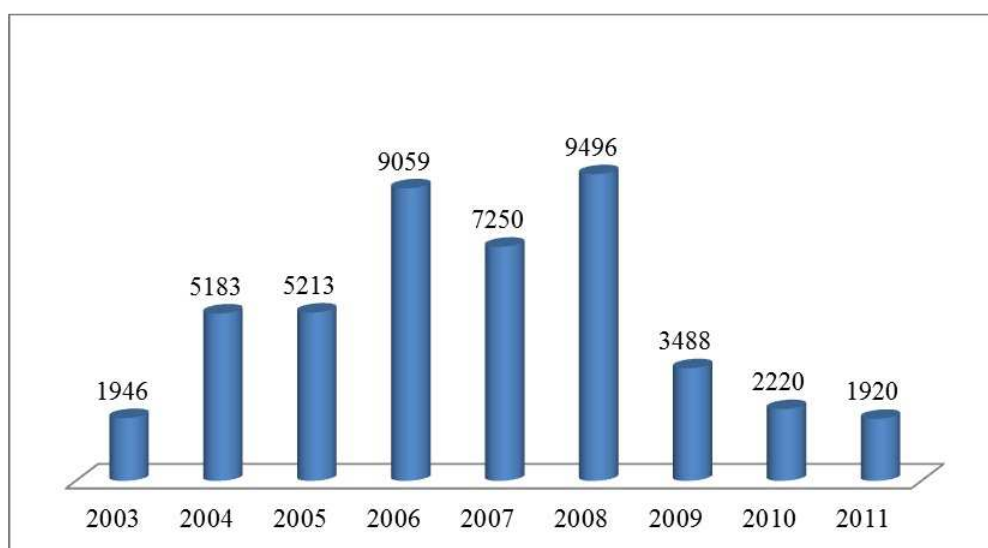
Source: INSSE (*2010 and 2011 data are provisional)

Figure 10 The evolution of net investments made between 2000-2011

The highest level of net investments in national economy was achieved in 2008 in the amount of 99525.6 millions lei. Sectors which turned the biggest investment in this year are industry, trade and services buildings.

Economic and financial crisis has changed the investment trend, in 2009 and 2010 it declined by about 25% and the return in 2011 meant an increase of only 15%.

Regarding FDI in Romania, the evolution is similar. 2006, 2007 and 2008 were the years in which they were attracted the largest amount of foreign direct investment. Favorable climate for foreign investors was generated mainly by the introduction in 2005 of the flat tax and the low cost of labor.



Source: NBR

Figure 11 The evolution of FDI flows in Romania between 2003-2011

Economic difficulties and uncertainties have led to lower FDI flows to Romania with 63.4% in 2009, 36.4% in 2010 and 13.5% in 2011.

The main economic activities have benefited from foreign investment are industry, construction, trade and real estate.

An increase in FDI flows, both in volume and structure, are recorded since 2004 with a positive impact on the budget deficit. Before 2004, most FDI flows were directed towards privatization process leading to positive effects minimal. After 2004, they were oriented mainly in greenfield investments, their impact on the economy is getting stronger, but not enough to strengthen our economic position in the European Union.

5 The employment dependence of the level of investment in main economy sectors

Another structural problem of the Romanian economy is the low level of employment below the European average.

An optimal level of employment is an increase in workload. Because of labors are also owners and end users, increasing consumption, especially if it is not oriented towards imports, will generate an increase in domestic production that will be reflected in the results of macroeconomic aggregates.

In the analyzed period, the employment of labor in Romania was on average 57.2%, without significant fluctuations during periods of economic boom or recession. This reveals that a high occupancy rate can be influenced to a greater extent by improving investment in human capital and education and training systems adapted to new competence requirements. According to Eurostat, in 2011, in Romania, the process of training attended 1.6% of the population between 25 and 64 years while the EU-27 average was 8.9%.

A socio-economic problem that adversely affects employment is the lack of appropriate conditions for the labor factor to be active and creative.

Scientific and technical progress, in which exponential growth we are witnessing, requires continuous adaptation to the demands of the economy, transforming human society to one based on knowledge, which are primordial ideas, and not use cheap labor skills and labor exploitation.

Production cycles become increasingly shorter, innovation requirement increases with increased globalization of the economy and the competitiveness in various markets.

We note also that the period of growth was not reflected in an improvement in employment in industry and agriculture - sectors tradable goods for export. These two sectors have experienced in 2003-2008 with massive employment reductions.

Consumption and investment stimulation by rapidly rising income and credit made the services, trade, construction to increase its share in GDP at the expense of industry and agriculture. Analysis dependence on the employment of investments in various sectors of the economy are made on time series data 2000-2008 due to lack of investment on the main activities of national economy in 2010-2011.

Table 4 Evolution of employment by main activity of national economy in 2000-2008 (thousand people)

Year	Agriculture*	Industry	Construction	Trade	Hotels and restaurants	Transport, storage and communication	Financial intermediation	Real estate and other services	Public administration and defense	Education	Health and social work	Other activities of national economy
2000	3575	4008	353	776	93	419	74	271	147	421	341	155
2001	3502	4034	340	804	79	401	68	282	143	422	347	158
2002	3015	4244	366	855	95	401	69	316	148	415	358	169
2003	2888	4118	396	906	105	402	72	355	155	420	359	189
2004	2638	4104	419	938	133	404	82	383	159	430	367	233
2005	2678	3946	463	1038	133	418	90	386	173	430	370	238
2006	2518	3938	513	1118	134	453	95	440	183	426	389	231
2007	2465	3916	594	1200	156	478	109	486	209	429	394	248
2008	2421	3838	680	1170	162	471	116	523	223	430	409	223

Source: INSSE

* including hunting and forestry, fishing and fish

Between the employment and efficiency of an economy is a close connection. Competitiveness and stability of an economic system we can achieve and maintain long both with indicators reflecting quality, quantity and diversity of goods and services in domestic and foreign markets, the evolution of prices and incomes and also through the state, structure, evolution and employment prospects conferred, in an economic and technical-scientific context dynamically.

In the "eternal" disputes regarding the adoption of the best strategy for economic growth and development, thus by increasing the employment rate, was always made the question to stimulate consumption and investment. If on consumer, the response is relatively simple, the investment efficiency related to the increase of the employment shows unusual characteristics specific to the Romanian economy.

Table 5 Increasing investment and employment in industry in 2000-2008

	Investment (million lei)	Population employed (thousands)
2000	4939.4	4008
2001	6077.03	4034
2002	6350.6	4244
2003	7050.54	4118
2004	8463.92	4104
2005	7639.95	3946
2006	9606.38	3938
2007	10519.2	3916
2008	11330.5	3838

Source: INSSE

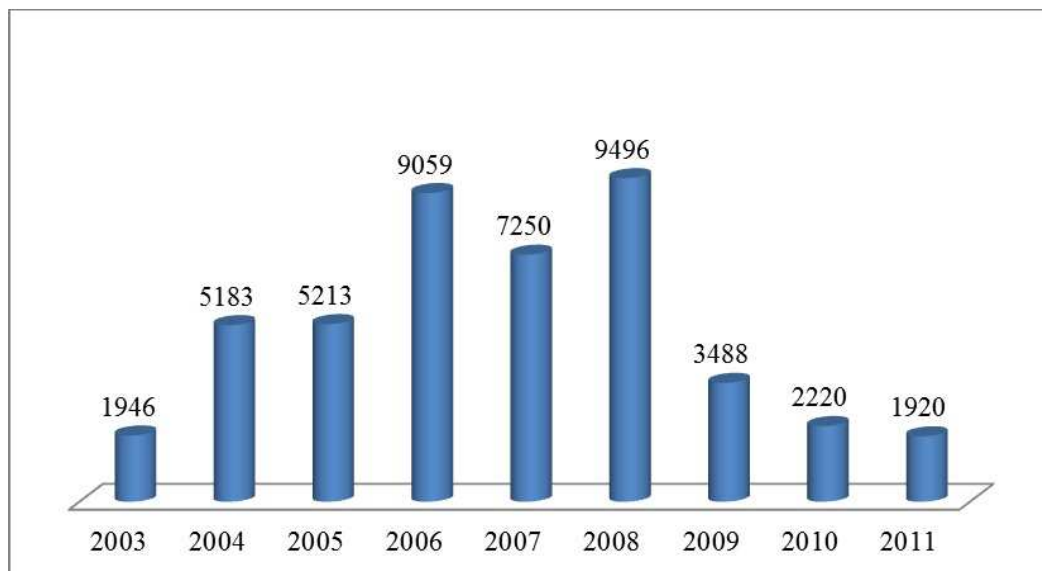


Figure 12 Dependence of population employed from investments in industry during 2000-2008

Analysis based on Table 5 (Appendix 2) reveals the following regression equation:

$$Po_i = -0.037436 * INV_i + 4315,6184$$

where:

Po_i – employment in industry;

INV_i – the volume of investment in industry

The significance of the regression equation is that at an investment of 1 billion lei, employment falls by 0.037436*1000≈37 people.

The analysis appears at first sight paradoxical. How can an investment of such magnitude to lead to lower job? The realities of the Romanian economy can give a satisfactory answer to this apparent dilemma. On the one hand, the technological endowment of Romanian industry is small compared with that of developed countries. Opening the economy to foreign investment facilitated the entry of multinational companies with advanced technologies. For this reason, small, bad technological enterprises go out of the market, fired a large number of employees. A small part of the labor force (the suitably qualified) was taken over by new firms because much higher productivity could generate a much higher production with much lower number of employees.

A second aspect consists of a series of investments that have not led to new jobs, being either oversized or operating more than necessary or with low yields to financing costs.

The solution to eliminate this paradox is not really complicated or new. On the one hand, the development of small and medium enterprises that require little investment can lead to absorption of a large number of people. On the other hand, we must not forget the fiscal relaxation and more, providing their facilities for survival or development. Also, investments can be channeled into new production lines, which can absorb a wider range of active population unemployed and access to markets most diverse. Quartering areas where production on the world market is already saturated can not lead to a real revitalization of industry or an efficient investment.

Table 6 Increasing investment and employment in trade in 2000-2008

	Investment (million lei)	Population employed (thousands)
2000	1387.4	776
2001	1628.77	804
2002	1834.82	855
2003	2580.29	906
2004	2907.45	938
2005	3166.33	1038
2006	4049.15	1118
2007	4950.96	1200
2008	5171.66	1170

Source: INSSE

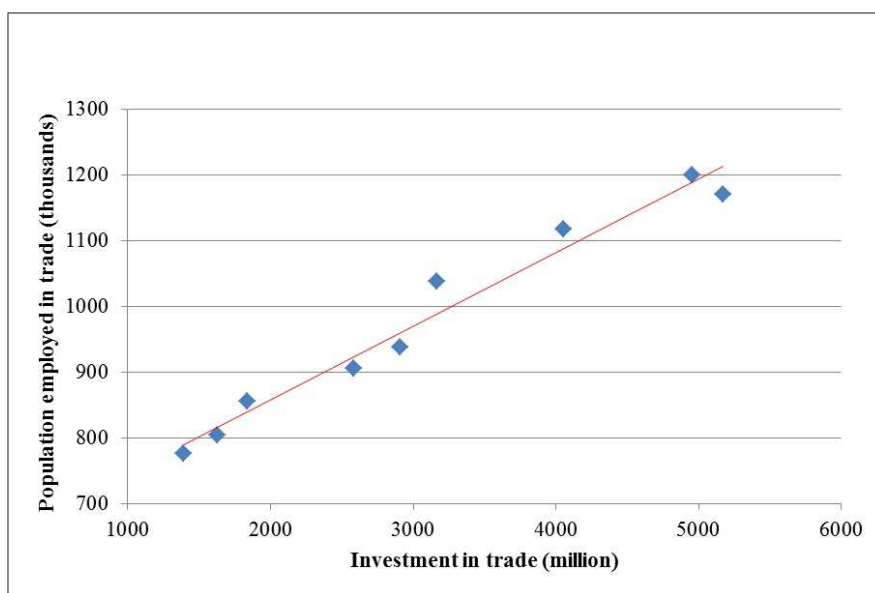


Figure 13 Dependence of population employed from investments in trade during 2000-2008

Following regression analysis performed on the basis of Table 6 (Appendix 3) follows the following equation:

$$Po_c = 0.1119 * INV_c + 634.20296$$

where:

Po_c – employment in trade;

INV_c – investments in trade volume

The significance of the equation is that at an investment of 1 billion lei, employment increases by $0.1119 * 1000 \approx 112$ people.

At a superficial analysis, trade seems a sector with potential in terms of job creation. On the other hand, we see that the average investment/new person employed amounted to $1000/112 = 8.93$ million/person which is huge in every way. How can nevertheless explain this phenomenon? In the analyzed period, Romania entered the retail chains whose expansion was mainly based on the increase in consumer credit, massive investment in large shopping centers. These, despite high investments, have created relatively few jobs under the application of superior management techniques and dynamic reallocation of staff. High volumes of sales of these mega-units allowed hiring contracts with suppliers which led to the dearth of responsible sourcing as opposed to small firms.

One way to solve this problem, in the direction of investment downwards relative to the number of new jobs created, is the emergence and development of small business units or niche or traditional in disadvantaged areas (in terms of distances from hipermarkets) or addressed to people with low incomes.

Table 7 Increasing investment and employment in construction in 2000-2008

	Investment (million lei)	Population employed (thousands)
2000	1067.3	353
2001	980.149	340
2002	1076.88	366

	Investment (million lei)	Population employed (thousands)
2003	1802.33	396
2004	1567.05	419
2005	1971.17	463
2006	3937.53	513
2007	4438.79	594
2008	3888.08	680

Source: INSSE

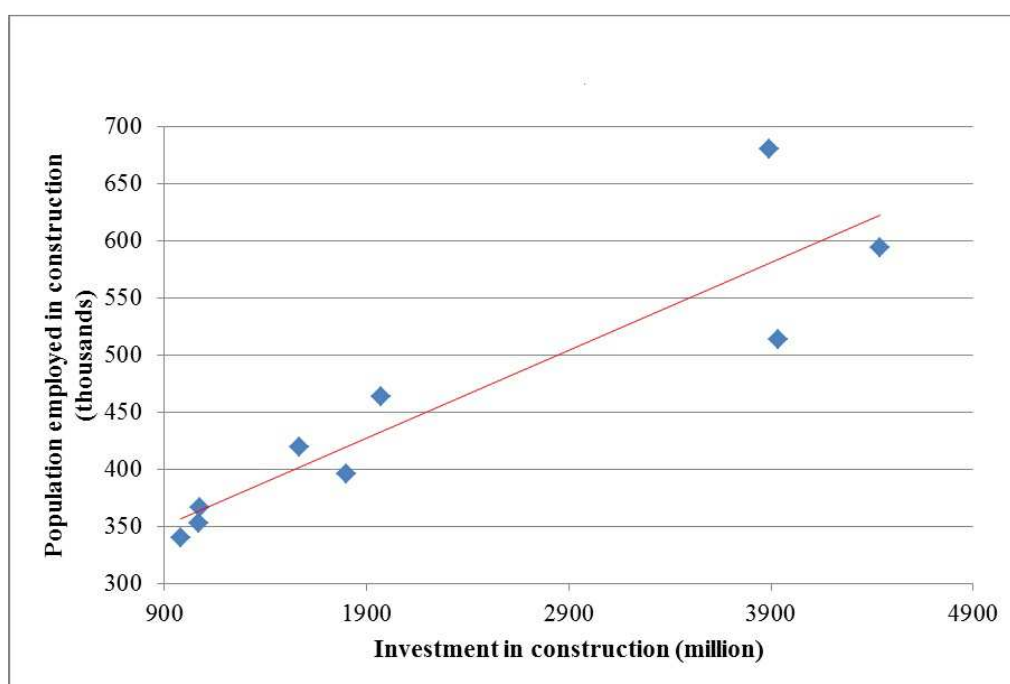


Figure 14 Dependence of population employed from investments in construction during 2000-2008

After the analysis (Appendix 4), the regression equation is:

$$Po_ct = 0.07706 * INV_ct + 280.72282$$

where:

Po_ct – employment in construction;

INV_ct – volume of investments in construction

The significance of the equation is that at an investment of 1 billion lei, employment increases by $0.07706 * 1000 \approx 77$ people.

The analysis of the result reveals, as above, a small number of new employees under a high investment effort. On the other hand, given a growing housing markets, development of construction companies is inevitable. The demand for new and cheap housing imposed to many companies a trend to nontraditional technology for Romanian market, which led to the need for investments in machinery and technologies.

Table 8 Increasing investment and employment in health in 2000-2008

Year	Investment (million lei)	Population employed (thousands)
2000	17.5	341
2001	22.4535	347
2002	153.069	358
2003	150.918	359
2004	153.685	367
2005	488.024	370
2006	185.666	389
2007	446.807	394
2008	482.844	409

Source: INSSE

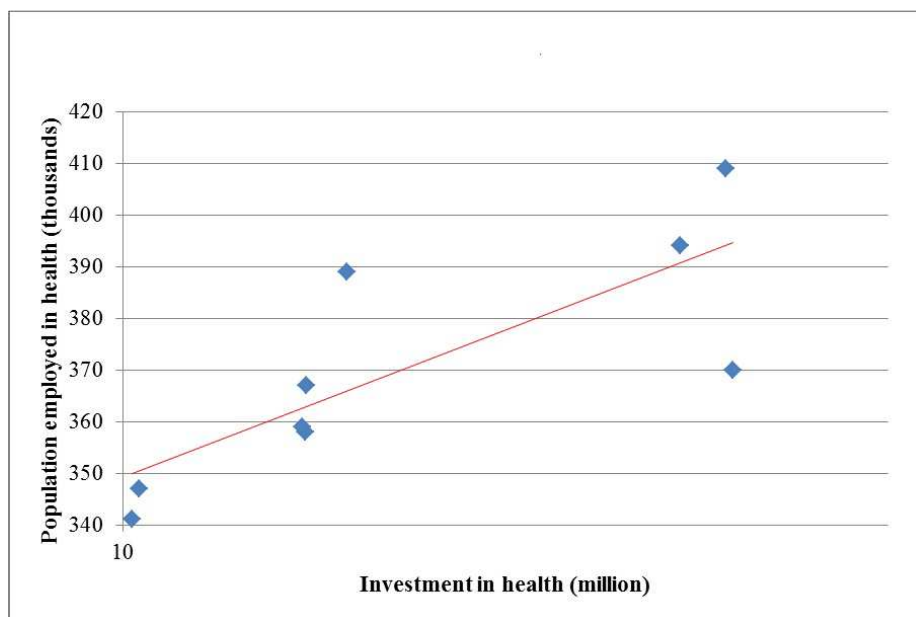


Figure 15 Dependence of population employed from investments in health during 2000-2008

The regression analysis performed on the basis of Table 8 (Appendix 5) reveals the following regression equation:

$$Po_s = 0.09512 * INV_s + 348.23950$$

where:

Po_s – employment in health;

INV_s – volume investment in health

The significance of the equation is that at an investment of 1 billion lei, employment increases by 0.09512*1000≈95 people.

Investments in health have recorded, especially in 2007-2008 a spectacular evolution, made especially in equipped private clinics set up at European level. Endowment costs with technology being very

high, led to a substantial level of public spending for these services which allowed a relatively rapid depreciation of the equipment purchased. In this way we can explain the high level investment despite a relatively small number of new jobs created. On the other hand, bear in mind that the establishment of a private healthcare units requires hiring experienced and therefore its migration from state units. On the other hand, low employability (and subsequently blocking positions) or emigration led to an insignificant increase staff in the system.

Table 9 Evolution of gross fixed capital formation and the unemployment rate during 2000-2011

Year	Gross fixed capital (billion lei)	Unemployment rate
2000	10.3158	11.2
2001	16.7539	9
2002	26.3297	10.2
2003	35.2015	7.6
2004	47.1797	6.8
2005	62.1078	5.8
2006	82.1434	5.4
2007	115.027	4.3
2008	145.188	4
2009	118.14	6.3
2010	119.885	7.6
2011	133.133	5.4

Source: INSSE

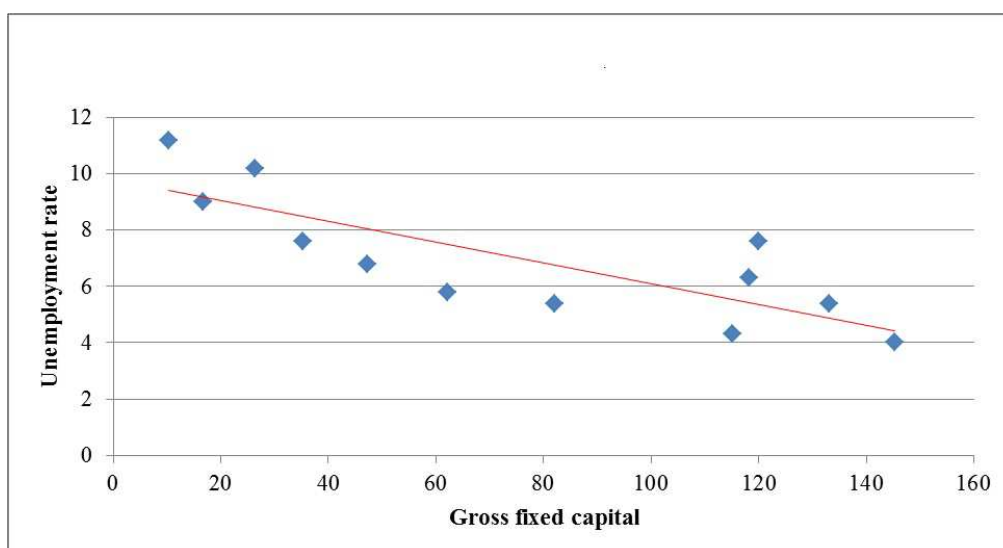


Figure 16 Evolution of gross fixed capital formation and the unemployment rate during 2000-2011

The regression equation (Appendix 6) is:

$$u = -0.03699 * GFCF + 9.77644$$

where:

u – unemployment

GFCF – gross fixed capital formation (billion lei)

The significance of the equation is that an additional one billion lei in gross fixed capital formation, the unemployment rate decreases by only $0.03699 \cdot 1 \approx 0.03\%$.

As in the case of employment, the conclusion is that, in particular, investments have not produced the expected results for the absorption population, being either ineffective or new technologies geared towards increased productivity factor so a diminution of work.

Concluding the tests done, we get sustained economic growth based on the potential of resources (human, financial) appropriate, priority being, for this, the efficiency of combination of factors of production and the quality and functionality of economic policies.

6 The dependence of GDP's relative variation for varying unemployment in the period 2000-2011 (Okun's Law)

At the end of this paper, we will investigate the dependence of GDP's relative variation on the absolute variation in the unemployment rate, law known in the literature as Okun's Law. Its general expression is (Smith R., 2010):

$$\frac{Y^* - Y}{Y^*} = c(u - u^*)$$

where:

Y – actual GDP; Y^* - potential GDP; u – unemployment rate; u^* – natural rate of unemployment; c – factor of proportionality

Specialized American Studies show an approximate value of c equals with 2.

Okun's law enforcement difficulty is the impossibility of determining potential output (that GDP in conditions of full employment of labor) and also the natural rate of unemployment. For this reason, it is used in practice, a modified form of it, as follows:

$$\frac{\Delta Y}{Y} = a - c\Delta u$$

where we supposed that $\Delta u^* \approx 0$ (change in the natural rate of unemployment is approximately zero) and the potential level of GDP has a value close to the actual value of the current.

Table 10 Relative variation of absolute GDP and changes in unemployment during 2000-2011

	Relative variation of GDP (Y)	Changes in the unemployment rate (u)
2000	2.4	-0.2
2001	5.7	-2.2
2002	5.1	1.2
2003	5.2	-2.6

2004	8.5	-0.8
2005	4.2	-1
2006	7.9	-0.4
2007	6.3	-1.1
2008	7.3	-0.3
2009	-6.6	2.3
2010	-1.6	1.3
2011	2.5	-2.2

Source: INSSE

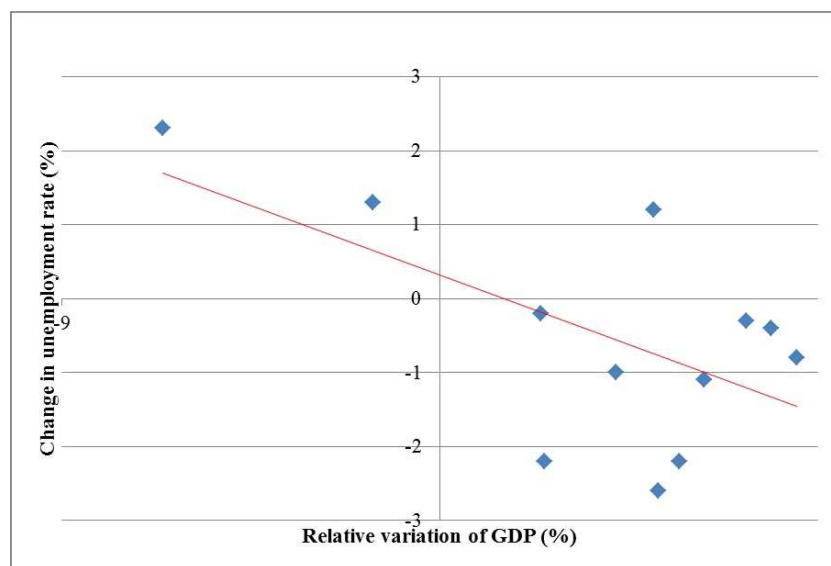


Figure 17 Okun's Law for Romania

The regression equation (Okun's Law, Appendix 7) is:

$$\frac{\Delta Y}{Y} = 3.048 - 1.72\Delta u$$

where: Y – GDP, u – unemployment.

The significance of the equation is that to lower the unemployment rate by 1%, GDP increases by 1.72%.

7 Conclusion

The above analysis reveals that a higher occupancy labor will implicitly lead to an increase in the GDP. On the other hand, the structure and nature of investment in Romania must be redesign, in the purposes of achieving a compromise between technology and creating jobs. An increase in training of the population, fostering integration of graduates (especially those with secondary and higher education) in the labor market and limit migration will lead to increased investment in high efficiency especially in industry and a highly competitive on foreign markets. Also, a higher labor efficiency will

increase the Okun's coefficient (1.72 for Romania as compared with 2 in most developed countries) so a higher potential GDP growth relative to labor.

8 Appendix

1. The regression analysis of consumer demand dependence of disposable income in the period 2001-2011

SUMMARY OUTPUT						
<i>Regression Statistics</i>						
Multiple R	0,93615389					
R Square	0,876384106					
Adjusted R Square	0,860932119					
Standard Error	1902,344299					
Observations	10					
ANOVA						
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	
Regression	1	205252476,8	205252476,8	56,71659685	6,7274E-05	
Residual	8	28951310,64	3618913,83			
Total	9	234203787,4				
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	4447,212844	3869,421679	1,149322357	0,283621783	-4475,689548	13370,11524
X Variable 1	0,741128641	0,098409837	7,531042216	6,7274E-05	0,514195148	0,968062133

RESIDUAL OUTPUT

<i>Observation</i>	<i>Predicted Y</i>	<i>Residuals</i>	<i>Standard</i>
1	28155,11772	-1995,918284	-1,112832746
2	28653,52763	1722,910028	0,960615829
3	31829,28824	1998,092864	1,114045193
4	32629,71981	1704,908471	0,950578985
5	35537,35819	915,1065698	0,510221568
6	37246,1099	-1041,171746	-0,580509744
7	43858,76483	-472,0920824	-0,263216953
8	29537,07456	-3353,050517	-1,869507607
9	34307,27728	-627,3690527	-0,349792289
10	30582,38887	1148,583748	0,640397764

Regression analysis provides the following results:

- the Durbin-Watson test statistic shows that the errors are uncorrelated;

- ρ - the empirical correlation coefficient (multiple R) is 0.936, while the critical value of the correlation coefficient for $N = 10$ and a significance threshold of 95% is $r_c=0.632$. Because $\rho > r_c$ follows that a linear dependence between variables may exist;
- Significance $F=0.000067$ (which is the probability that the regression equation can not explain the evolution of the endogenous variable – the phenomenon having purely random links) is much smaller than $\alpha=0.05$. From the econometric theory it is known that if Significance $F < \alpha$ then the null hypothesis H_0 is rejected with probability $1-\alpha=0.95$, so it is possible that at least one regression coefficient is different from 0. In this case, we can consider this requirement met;
- Values P-value is an essential indicator for the variables which significantly influence the process, revealing if they are less than $\alpha=0.05$. Thus, for the independent variable coefficient $P\text{-value}=0.000067 < 0.05$ and the constant term we have $P\text{-value}=0.2836$;
- Intervals [Lower 95%, Upper 95%] representing confidence intervals in which the coefficients are for the coefficient of the independent variable: [0.5142,0.9681] and for constant term: [-4475.6895,13370.1152]. Not belonging to 0 in the first interval implies that for a higher probability of 0.95 the coefficient of independent variable belongs to this interval. Further analysis confirmed that the regression constant term belongs to the interval [62.9066,8831.5191] with a higher probability of 0.71.

2. The regression analysis on the dependence of the employed population from the industry investment in 2000-2008

SUMMARY OUTPUT						
<i>Regression Statistics</i>						
Multiple R	0,649246943					
R Square	0,421521594					
Adjusted R Square						
	0,338881821					
Standard Error	100,8969353					
Observations	9					
ANOVA						
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	
Regression	1	51926,21473	51926,21473	5,100710974	0,058462692	
Residual	7	71261,34082	10180,19155			
Total	8	123187,5556				
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	4315,618414	136,7654072	31,55489757	8,29548E-09	3992,219616	4639,017213
X Variable 1	-0,037436192	0,016575869	-2,258475365	0,058462692	-0,076631893	0,00175951

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals	Standard
1	4130,70609	-122,7060896	-1,300122023
2	4088,117704	-54,11770387	-0,573399567
3	4077,876302	166,1236975	1,760149626
4	4051,672906	66,32709379	0,702763128
5	3998,761643	105,2383565	1,115044131
6	4029,6079	-83,60789967	-0,885860449
7	3955,992213	-17,99221321	-0,190634978
8	3921,8191	-5,819100115	-0,061655784
9	3891,446141	-53,44614143	-0,566284084

The regression analysis provides the following results:

- For the number of data $N=9$ and the number of degrees of freedom $k=1$ (number of independent variables), Durbin-Watson test error provides values: $dl=0.82$ and $du=1.32$ and Durbin- Watson statistics value: $d=$

$$\frac{\sum_{i=2}^n (e_i - e_{i-1})^2}{\sum_{i=1}^n e_i^2}$$

where e_i are residues derived from regression is $d=1.502$. Because $d \in (du, 4-du) = (1.32, 2.68)$

follows that the errors are uncorrelated;

- ρ - the empirical correlation coefficient (multiple R) is 0.649, while the critical value of the correlation coefficient for $N = 9$ and a significance threshold of 95% is $r_c=0.666$. Because $\rho \approx r_c$ follows that linear dependence between variables may exist;
- Significance $F=0.0585$ is fairly similar with $\alpha = 0.05$. From the econometric theory it is known that if F Significance $< \alpha$ then the null hypothesis H_0 is rejected with probability $1-\alpha=0.95$, so it is possible that at least one regression coefficient is different from 0. In this case, we can consider this requirement met;
- For P-values we have for the independent variable coefficient: $P\text{-value}=0.0585 \approx 0.05$ and for the constant term we have $P\text{-value}=8.29548 \cdot 10^{-9} < 0.05$;
- Intervals [Lower 95%, Upper 95%] are for the coefficient of the independent variable: $[-0.0766, 0.0018]$ and for the constant term: $[3992.2196, 4639.0172]$. Belonging to 0 at the first interval is close to the limit and in the case of the second interval 0 does not belong to it. Therefore, we consider with a probability over 0.95 that the regression coefficient values belong in these intervals.

3. The regression analysis on the dependence of the employed population from the trade investment in 2000-2008

SUMMARY OUTPUT						
<i>Regression Statistics</i>						
Multiple R	0.9833083					
R Square	0.966895212					
Adjusted R Square						
	0.962165957					
Standard Error	30,93408368					
Observations	9					
ANOVA						
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	
Regression	1	195641,5773	195641,5773	204,449778	1,94635E-06	
Residual	7	6698,422733	956,9175333			
Total	8	202340				
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	634,2029588	26,1833014	24,22165751	5,2038E-08	572,2892893	696,1166283
X Variable 1	0,111904864	0,007826285	14,29859357	1,94635E-06	0,093398642	0,130411087

RESIDUAL OUTPUT

<i>Observation</i>	<i>Predicted Y</i>	<i>Residuals</i>	<i>Standard</i>
1	789,4597678	-13,45976776	-0,45515349
2	816,4706068	-12,47060682	-0,43096927
3	839,5285613	15,47143873	0,534674435
4	922,9495545	-16,94955454	-0,585756351
5	959,5612184	-21,56121837	-0,745129942
6	988,5309497	49,46905028	1,709591265
7	1087,322337	30,67766339	1,060183389
8	1188,239886	11,76011372	0,406415478
9	1212,937119	-42,93711863	-1,483855512

Regression analysis shows that the empirical correlation coefficient ρ (multiple R) is 0.983, $r_c=0.666$ (for $N=9$ and $\alpha=0.05$) so linear dependence between variables may exist. How Significance $F=1.9463 \cdot 10^{-6} < 0.05$ it is possible that at least one regression coefficient is different from 0. Also, the independent variable coefficient $P\text{-value}=1.9463 \cdot 10^{-6} < 0.05$ and for the constant term $P\text{-value}=5.2038 \cdot 10^{-8} < 0.05$. Confidence intervals for the independent variable coefficients are: [0.09340,0.13041] and for constant term: [572.28929,696.11663], so with a probability over 0.95 regression coefficient values are in these intervals.

4. The regression analysis on the dependence of the employed population from the construction investment in 2000-2008

SUMMARY OUTPUT						
<i>Regression Statistics</i>						
Multiple R	0,914314689					
R Square	0,835971351					
Adjusted R Square						
	0,812538687					
Standard Error	50,67935509					
Observations	9					
ANOVA						
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	
Regression	1	91628,77633	91628,77633	35,67547197	0,00055714	
Residual	7	17978,77923	2568,397032			
Total	8	109607,5556				
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	280,7228213	34,1834209	8,212250674	7,7086E-05	199,8918752	361,5537674
X Variable 1	0,077064639	0,012902394	5,972894773	0,00055714	0,046555326	0,107573952

RESIDUAL OUTPUT

<i>Observation</i>	<i>Predicted Y</i>	<i>Residuals</i>	<i>Standard</i>
1	362,9739104	-9,973910392	-0,210392549
2	356,2576268	-16,25762684	-0,342943081
3	363,7124511	2,287548906	0,048254218
4	419,6184377	-23,61843769	-0,498214153
5	401,4869879	17,51301207	0,36942454
6	432,6305711	30,36942893	0,640621514
7	584,1671415	-71,16714146	-1,501220256
8	622,7967565	-28,7967565	-0,607447107
9	580,356117	99,64388297	2,101916874

Regression analysis performed shows that the empirical correlation coefficient ρ (multiple R) is 0.9143, $r_c=0.666$ (for $N=9$ and $\alpha=0.05$) so linear dependence between variables may exist. How Significance $F=0.0006<0.05$ is likely that at least one regression coefficient is different from 0. Also, the independent variable coefficient $P\text{-value}=0.00056<0.05$ and the constant term $P\text{-value}=0.00008<0.05$. Confidence intervals for the independent variable coefficients are: $[0.04656,0.10757]$ and for constant term: $[199.89188,361.55377]$ so with a probability over 0.95 regression coefficient values are in these intervals.

5. The regression analysis on the dependence of the employed population from the health investment in 2000-2008

SUMMARY OUTPUT						
<i>Regression Statistics</i>						
Multiple R	0,793867413					
R Square	0,630225469					
Adjusted R Square						
	0,577400536					
Standard Error	14,71713166					
Observations	9					
ANOVA						
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	
Regression	1	2584,064472	2584,064472	11,93045466	0,01063286	
Residual	7	1516,15775	216,5939643			
Total	8	4100,222222				
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	348,2394959	8,086644599	43,06353415	9,50423E-10	329,11762	367,3613718
X Variable 1	0,095120261	0,02753877	3,454049024	0,01063286	0,030001418	0,160239104

RESIDUAL OUTPUT

<i>Observation</i>	<i>Predicted Y</i>	<i>Residuals</i>	<i>Standard</i>
1	349,9041005	-8,904100455	-0,646789334
2	350,3752817	-3,375281674	-0,245178746
3	362,7994412	-4,799441168	-0,348628968
4	362,5948214	-3,594821448	-0,261126004
5	362,8580494	4,141950622	0,300869189
6	394,6605041	-24,6605041	-1,791326491
7	365,9001024	23,09989759	1,677964827
8	390,7399401	3,260059886	0,236809094
9	394,1677593	14,83224075	1,077406433

Regression analysis shows that the empirical correlation coefficient ρ (multiple R) is 0.794, $r_c=0.666$ (for $N=9$ and $\alpha=0.05$) so linear dependence between variables may exist. How Significance $F=0.0106<0.05$ is likely that at least one regression coefficient is different from 0. Also, the independent variable coefficient P value= $0.01063<0.05$ and the constant term P-value= $9.50422 \cdot 10^{-10}<0.05$. Confidence intervals for the independent variable coefficients are: [0.0300,0.1602] and for constant term: [329.1176, 367.3613] so with a probability over 0.95 regression coefficient values are in these intervals.

6. The regression analysis of unemployment dependence of gross fixed capital formation during 2000-2011

SUMMARY OUTPUT						
<i>Regression Statistics</i>						
Multiple R	0.801864165					
R Square	0.642986139					
Adjusted R Square						
	0.607284753					
Standard Error	1.413537256					
Observations	12					
ANOVA						
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	
Regression	1	35,98579091	35,98579091	18,01011695	0,001706053	
Residual	10	19,98087575	1,998087575			
Total	11	55,96666667				
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	9,77644398	0,777729783	12,57048938	1,88534E-07	8,043554034	11,50933393
X Variable 1	-0,03699489	0,00871733	-4,243832814	0,001706053	-0,056418311	-0,017571469

RESIDUAL OUTPUT

<i>Observation</i>	<i>Predicted Y</i>	<i>Residuals</i>	<i>Standard</i>
1	9,394812094	1,805187906	1,339403712
2	9,156635292	-0,156635292	-0,11621942
3	8,802379624	1,397620376	1,036998926
4	8,474168358	-0,874168358	-0,648610785
5	8,031036166	-1,231036166	-0,913397661
6	7,478772748	-1,678772748	-1,245606866
7	6,737557929	-1,337557929	-0,992434111
8	5,521017965	-1,221017965	-0,905964409
9	4,405215086	-0,405215086	-0,300659332
10	5,405863971	0,894136029	0,663426291
11	5,341326385	2,258673615	1,675878624
12	4,851214382	0,548785618	0,407185031

Regression analysis performed shows that the empirical correlation coefficient ρ (multiple R) is 0.802, $r_c=0.576$ (for $N=9$ and $\alpha=0.05$) shows that linear dependence between variables may exist. How Significance $F=0.0017 < 0.05$ is likely that at least one regression coefficient is different from 0. Also, the independent variable coefficient $P\text{-value}=0.0017 < 0.05$ and the constant term $P\text{-value}=1.88534 \cdot 10^{-7} < 0.05$. Confidence intervals for the independent variable coefficients are: $[-0.05642, -0.01757]$ and for constant term: $[8.04355, 11.50933]$ so with a probability over 0.95 regression coefficient values found in these intervals.

7. Okun's law dependence on relative GDP growth for varying unemployment Romanian economy during 2000-2011

SUMMARY OUTPUT						
<i>Regression Statistics</i>						
Multiple R	0.599840743					
R Square	0.359808917					
Adjusted R Square						
	0.295789809					
Standard Error	3.628426142					
Observations	12					

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	73.994404	73.994404	5.620336287	0.039228673
Residual	10	131.6547627	13.16547627		
Total	11	205.6491667			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	3.048133333	1.108502497	2.749775795	0.020486128	0.578235853	5.518030813
X Variable 1	-1.7204	0.725685228	-2.370724844	0.039228673	-3.337327452	-0.103472548

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals	Standard
1	3,392213333	-0,992213333	-0,28680262
2	6,833013333	-1,133013333	-0,327501336
3	0,983653333	4,116346667	1,189843926
4	7,521173333	-2,321173333	-0,670943003
5	4,424453333	4,075546667	1,178050548
6	4,768533333	-0,568533333	-0,164336483
7	3,736293333	4,163706667	1,203533494
8	4,940573333	1,359426667	0,392946876
9	3,564253333	3,735746667	1,079830209
10	-0,908786667	-5,691213333	-1,645064463
11	0,811613333	-2,411613333	-0,69708499
12	6,833013333	-4,333013333	-1,252472159

Regression analysis performed shows that the empirical correlation coefficient ρ (multiple R) is 0.5998, $r_c=0.576$ (for $N=12$ and $\alpha=0.05$) so linear dependence between variables may exist. How Significance $F=0.0392$ is likely that at least one regression coefficient is different from 0. Also, the independent variable coefficient $P\text{-value}=0.0392 < 0.05$ and the constant term $P\text{-value}=0.0205 < 0.05$. Confidence intervals for the independent variable coefficients are: $[-3.33733, -0.10347]$ and for constant term: $[0.57824, 5.51803]$ so with a probability of 0.95 regression coefficient values found in these intervals.

9 References

- Montalbano Pierluigi (2009), *Trade Openness and Vulnerability in Central and Eastern Europe*, World Institute for Development Economics Research, June
- Reinhart Carmen, Reinhart. Vincent (2008), *Capital Flow Bonanzas: An Encompassing View of the Past and Present*, NBER Working Paper
- Savin N.E., White, Kenneth J. (1977), *The Durbin-Watson Test for Serial Correlation with Extreme Sample Sizes or Many Regressors*, *Econometrica*, Vol.45, No.8, pp.1989-1996
- Singh Balvir, Ullah Aman (1976), *The Consumption Function: The Permanent Income Versus the Habit Persistence Hypothesis*, *The Review of Economics and Statistics*, Vol. 58, No. 1, pp. 96-103 Published by The MIT Press, 2009
- Smith R. (2010), Okun's Law, *Applied Statistics and Econometrics*, Birkbeck, February