Shadow economy, economic growth and labor market - Romanian case

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SHADOW ECONOMY, ECONOMIC GROWTH AND LABOR MARKET.  
ROMANIAN CASE

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Abstract: the shadow economy is represented by the whole economic activities which are realized at the border of the criminal laws, social laws or fiscal laws or which are skipping (massive) from the inventory of national accounts. The paper is intended to quantify and analyze the impact of the shadow economy on the main variables that may characterize economic growth and labor market, for the Romanian case.

Keywords: shadow economy, effects, economic growth, labor market

JEL Cod: O17, O40, J40

The paper is intended to quantify and analyze the impact of the shadow economy (S) on the main variables that may characterize economic growth and labor market, for the Romanian case. The economic growth is being treated through gross domestic product (GDP) as an essential variable for measuring economic growth, and labor market is treated through unemployment rate (RS) and net average monthly salary (SNL).


The analysis of the impact of the shadow economy on economic growth and labor market is made for the 1990-2007 years, watching the effects of the shadow economy on gross domestic product, unemployment rate and average net monthly salary. The analysis method used is the econometric modeling, by using the software package EViews 5.0.

Accordingly, we have built three one-variables regression models like:

\[ Y_t = \alpha + \beta_i X_{it} + \epsilon_t \] 

where
- \( Y_t \) is the dependent variable;
- \( \alpha \) the intercept coefficient;
- \( \beta_i \) the slope coefficients;
- \( X_{it} \) the independent variable;
- \( \epsilon_t \) the random variable;
- \( i \) the number of the variables;
- \( t \) the time interval (1990-2007).

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2 Copyright © 1994-2004 Quantitative Micro Software, LLC, All Rights Reserved.
Concretely, it will be looked up for quantifying the relationship that exists between the shadow economy level and the GDP volume, the unemployment rate and average net monthly wage.

The time series are illustrated in Table 1.

### Table 1

**Shadow economy level, GDP volume, unemployment rate and medium net monthly wages, in Romania, in 1990-2007 period**

<table>
<thead>
<tr>
<th>Year</th>
<th>Shadow economy level</th>
<th>GDP</th>
<th>Unemployment rate</th>
<th>Medium net monthly wages</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>u.m</td>
<td>% of GDP</td>
<td>Mil. Ron</td>
<td>%</td>
</tr>
<tr>
<td>1990</td>
<td>18</td>
<td>0.09</td>
<td>1.6</td>
<td>0.70</td>
</tr>
<tr>
<td>1991</td>
<td>16</td>
<td>0.22</td>
<td>3</td>
<td>1.18</td>
</tr>
<tr>
<td>1992</td>
<td>16</td>
<td>0.60</td>
<td>8.2</td>
<td>3.26</td>
</tr>
<tr>
<td>1993</td>
<td>16</td>
<td>2.00</td>
<td>10.4</td>
<td>10.13</td>
</tr>
<tr>
<td>1994</td>
<td>18.3</td>
<td>4.98</td>
<td>10.9</td>
<td>19.85</td>
</tr>
<tr>
<td>1995</td>
<td>18.3</td>
<td>7.21</td>
<td>9.5</td>
<td>28.30</td>
</tr>
<tr>
<td>1996</td>
<td>19.3</td>
<td>10.89</td>
<td>6.6</td>
<td>43.37</td>
</tr>
<tr>
<td>1997</td>
<td>19.3</td>
<td>25.3</td>
<td>8.9</td>
<td>94.05</td>
</tr>
<tr>
<td>1998</td>
<td>19.3</td>
<td>37.38</td>
<td>10.4</td>
<td>136.03</td>
</tr>
<tr>
<td>1999</td>
<td>34.4</td>
<td>54.57</td>
<td>11.8</td>
<td>199.01</td>
</tr>
<tr>
<td>2000</td>
<td>34.4</td>
<td>80.38</td>
<td>10.5</td>
<td>291.16</td>
</tr>
<tr>
<td>2001</td>
<td>36.1</td>
<td>116.77</td>
<td>8.8</td>
<td>365.97</td>
</tr>
<tr>
<td>2002</td>
<td>36.1</td>
<td>151.48</td>
<td>8.4</td>
<td>452.57</td>
</tr>
<tr>
<td>2003</td>
<td>37.4</td>
<td>197.56</td>
<td>7.4</td>
<td>565.81</td>
</tr>
<tr>
<td>2004</td>
<td>37.4</td>
<td>246.47</td>
<td>6.3</td>
<td>687.51</td>
</tr>
<tr>
<td>2005</td>
<td>26.8</td>
<td>288.05</td>
<td>5.9</td>
<td>848.00</td>
</tr>
<tr>
<td>2006</td>
<td>26.8</td>
<td>344.54</td>
<td>5.2</td>
<td>1,099.00</td>
</tr>
<tr>
<td>2007</td>
<td>26.8</td>
<td>404.71</td>
<td>4.57</td>
<td>1,266.00</td>
</tr>
</tbody>
</table>


1. **The modeling of the impact of show economy on gross domestic product** is based on a one-variable regressive model like:

   \[ Y_i = \alpha + \beta_i X_i + \varepsilon_i \]  

   where \( Y_i \) is the dependent variable – GDP (gross domestic product), \( \alpha \) the intercept coefficient, \( \beta \) the slope coefficients, \( X_i \) the independent variable - \( S \) (the shadow economy level, as a weight of GDP), \( \varepsilon_i \) the random variable, \( i \) the number of the variables - 1, and \( t \) the time interval (1990-2007).

   The mathematical model will be:

   \[ P.I.B. = \alpha + \beta S + \varepsilon_i \]  

After modeling the two time series, the results obtained shall become (Table 2):
Statistical tests related to the modelling of the shadow economy level impact on the volume of GDP

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C(2)</td>
<td>4.718776</td>
<td>1.024301</td>
<td>4.606826</td>
</tr>
</tbody>
</table>

Dependent Variable: PIB
Method: Least Squares
Date: 08/06/08   Time: 23:28
Sample: 1990 2007
Included observations: 18
PIB=C(2)*S

On a first view, the intercept coefficient - $\alpha$ was negative. Given that the economy operates with positive values the regression was recast by exuding the intercept coefficient.

Analyzing the data from Table 2, we can draw the following conclusions:
- the values of standard errors of the regression coefficient are inferior to the value of the coefficient, taken as a module, which strengthens the validity of their estimation, sustained also by small value of probability;
- the correlation coefficient, with a value of 23.15% shows that the statistical relation between the dependent variable - GDP and the endogenous variable S is relatively strong; the changes of the shadow economy are included in an appreciable proportion in the changes of the gross domestic product;
- the Durbin-Watson test, with a value slightly above the critical threshold 2, indicates that the residual variables are not auto-correlated.

As a result, with some clauses, we may appreciate that the model shall be considered representative for the description of the linkage between shadow economy level and GDP volume at a macroeconomic level.

After establishing the coefficients, the model can be:

$$\text{GDP} = 4.718776333 \times S$$

Analyzing this model we may say that, in the Romanian case, the shadow economy has a low impact, but a beneficial one, on the efficiency of the functioning of the economy, so an increase of its level with 1% determines an increase of GDP with 4.7%. In other words, the shadow economy is a “necessary evil”, its mechanisms support an legal economic growth of the country.

The trend of historical GDP, estimated GDP with the model and the residual values in Romania for the time interval 1990-2007 are presented in Figure 1.
2. The modeling of the impact of shadow economy on unemployment rate is based on a one-variable regressive model like:

\[ Y_t = \alpha + \beta_s X_t + \epsilon_i \]  \hspace{1cm} (5)

where \( Y_t \) is the dependent variable - RS (unemployment rate), \( \alpha \) the intercept coefficient, \( \beta \) the slope coefficients, \( X_t \) the independent variable - S (the shadow economy level, as a weight of GDP), \( \epsilon_i \) the random variable, \( i \) the number of the variables - 1, and \( t \) the time interval (1990-2007).

The model will be:

\[ RS = \alpha + \beta_s S + \epsilon_i \]  \hspace{1cm} (6)

After modeling the two time series, the results obtained shall be (Table 3):

<table>
<thead>
<tr>
<th>Statistical tests related to the modelling of the shadow economy level impact on the unemployment rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent Variable: RS</td>
</tr>
<tr>
<td>Method: Least Squares</td>
</tr>
<tr>
<td>Date: 08/07/08 Time: 01:08</td>
</tr>
<tr>
<td>Included observations: 16 after adjustments</td>
</tr>
</tbody>
</table>
\[ RS = C(1) + C(2) \times S(-2) \]

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C(1)</td>
<td>11.93074</td>
<td>1.292809</td>
<td>9.228540</td>
<td>0.0000</td>
</tr>
<tr>
<td>C(2)</td>
<td>-0.136497</td>
<td>0.048501</td>
<td>-2.814313</td>
<td>0.0138</td>
</tr>
</tbody>
</table>

R-squared 0.361324
Mean dependent var 8.491875
Adjusted R-squared 0.315705
S.D. dependent var 2.041631
S.E. of regression 1.688881
Akaike info criterion 4.002478
Schwarz criterion 4.099051
Log likelihood -30.01982
Durbin-Watson stat 2.146311

Analyzing the data from Table 3, we can draw the following conclusions:

- the values of standard errors of the regression coefficient are inferior to the value of the coefficient, taken as a module, which strengthens the validity of their estimation, sustained also by small value of probability;
- the correlation coefficient, with a value of 36.13% shows that the statistical relation between the dependent variable - RS and the endogen variable - S is relatively moderate; the changes of the shadow economy are included in an appreciable proportion in the changes of the unemployment rate;
- the Durbin-Watson test, with a value slightly above the critical threshold 2, indicates that the residual variables are not auto-correlated.

We may appreciate that the model shall be considered representative for the description of the linkage between shadow economy level and unemployment rate at a macro economic level.

As a result, the model can be written:

\[ RS = 11.9307 - 0.136497 \times S \] (7)

Analyzing this model we may say that, in the Romanian case, the shadow economy has a moderate impact over the unemployment rate, an increase of 1% determines a decrease of 0.13% for the unemployment rate. This is fully evident after about 2 years because the shadow economy behaves like an “absorber” on the labor market, so the deficit offer of employment compensated by illegal employment created by shadow economy (illegal work).

The trends of historical RS, estimated RS with the model and the residual values, in Romania’s case for the time interval 1990-2007 are presented in Figure 2.
3. The modeling of the impact of show economy on net average monthly salary is based on a one-variable regressive model like:

\[ Y_t = \alpha + \beta X_t + \varepsilon_t \]  

where \( Y_t \) is the dependent variable - SNL (net average monthly salary), \( \alpha \) the intercept coefficient, \( \beta \) the slope coefficients, \( X_t \) the independent variable - \( S \) (the shadow economy level, as a weight of GDP), \( \varepsilon_t \) the random variable, \( i \) the number of the variables - 1, and \( t \) the time interval (1990-2007).

The model will become:

\[ SNL = \alpha + \beta x S + \varepsilon_t \]  

After modeling the two time series, the results obtained shall be (Table 4):

<table>
<thead>
<tr>
<th>Table 4</th>
</tr>
</thead>
</table>

**Statistical tests related to the modelling of the shadow economy level impact on the net average monthly salary**
Like in the first model, the intercept coefficient - $\alpha$ was negative, so the regression was recast by exuding the intercept coefficient.

Analyzing the data from Table 4, we can draw the following conclusions:
- the values of standard errors of the regression coefficient are inferior to the value of the coefficient, taken as a module, which strengthens the validity of their estimation, sustained also by small value of probability;
- the correlation coefficient, with a value of 23.15% shows that the statistical relation between the dependent variable - SNL and the endogen variable -S is relatively small; the changes of the shadow economy are included in an diminished proportion in the changes of the net average monthly salary;
- the Durbin-Watson test, with a value slightly above the critical threshold 2, indicates that the residual variables are not auto-correlated.

Accordingly, we may appreciate that the model shall be considered representative for the description of the linkage between shadow economy level and net average monthly salary at a macro economic level.

As a result, the model can be written:

$$\text{SNL} = 14.5102 \times S$$

Analyzing this model we may say that, in the Romanian case, the shadow economy has a moderate impact over the net average monthly salary, but a positive one, an increase of 1% determines an increase of 14.5% for the net average monthly salary. In other words, through new work places created by the shadow economy the illegal earnings are growing up which are revolved through the input.

The trends of historical SNL, estimated SNL with the model and the residual values, in Romania’s case for the time interval 1990-2007 are presented in Figure 3.
Analyzing the four models we may conclude that paradoxically the shadow economy has some visible effects over the legal economic and social life, the main ideas are presented next:

- the shadow economy has a low impact, but a benefic one, on the efficiency of the functioning of the economy, so an increase of its level with 1% determines an increase of GDP with 4.7%. In other properly, the shadow economy is a “necessary evil”, its mechanisms support a legal economic growth of the country.

- the shadow economy has a moderate impact over the inflation rate, an increase of 1% determines a decrease of 6.1% for the inflation rate. In this case, the inflationary pressure is caused by the sustentation of the shadow economy for the goods and services offer on real market and is supplementing the legal offer (compensates the goods and services legal supply).

- the shadow economy has a moderate impact over the unemployment rate, an increase of 1% determines a decrease of 0.13% for the unemployment rate. This is fully evident after about 2 years because the shadow economy behaves like an “absorber” on the labor market, so the deficit offer of employment compensated by illegal employment created by shadow economy(illegal work).

- the shadow economy has a moderate impact over the net average monthly salary, but a positive one, an increase of 1% determines an increase of 14.5% for the net average monthly salary. In other words, through new work places created by the shadow economy the illegal earnings are growing up which are revolved through the input.

References

2. Feige Edgar, (2004), The underground economy and the currency enigma, Supplement to Public Finance/ Finances Publiques, No.49.