ANALYSIS OF FACTORS INFLUENCING THE RISK OF POVERTY FOR PEOPLE AGED OVER 65

Nicolae Daniel Militaru Ph.D.

Abstract: This article addresses a very topical issue that is the phenomena and factors influencing the risk of poverty for people aged over 65 years. Thus, for a time horizon of fifteen years that we consider representative, we determined the correlation of seven variables that influence the risk of poverty for a number of twenty-eight Member States of the European Union. We believe that in this way we can assess the impact of aging of the population on the pension systems and we will identify the necessary measures to support the sustainability and capability of the pension systems to provide future adequate replacement income.

JEL classification: G35, H55

Key words: pension, employment rate, risk of poverty, dependency ratio

INTRODUCTION

Given that the biggest challenge that the pension systems will face in the coming years is population aging, phenomenon which runs concurrently with the decrease in participation of old people within the employed population, it is necessary to adopt measures among Member States of the Union European for combating poverty and social exclusion and not least for the reform of social protection systems.

One of these measures is the Europe 2020 Strategy which sets out objectives such as getting at least 20 million people out of poverty and social exclusion and the increase of the workforce employment rate to 75% for the population group aged between 20 and 64 years.

Therefore, an adequate and sustainable pension system should provide a solution to protect retirees from poverty and to enable them to keep the same standard of living. The main way by which we can assess the effectiveness of measures taken at European level is to compare the standard of living of a person during employment years with the standard of living after retirement from the labor market.

2. OBJECTIVES

In the study we sought to identify the factors that influence the risk of poverty for people aged over 65 and the aggregate replacement ratio and to quantify this influence through econometric modeling.

The study includes the analysis of the 28 member states of the European Union for a period of fifteen years. The data will be structured in a panel and will be modeled using the Eviews 7.1 econometric software.

We believe that in this way we can assess the impact of population aging on the pension systems and we will identify the necessary measures to support the sustainability of the pension systems and their capability to secure an adequate income. The purpose of this study is to identify the best econometric relationships that characterize the risk of poverty for people aged over 65 years (RISKPOV) and the aggregate replacement ratio (ARR).

3. METHODOLOGY

Into the analysis, the data series that are used are annual and cover a period of fifteen years, from 1999 to 2013. The data source is EUROSTAT.

The variables are:

1.RISKPOV – designates the risk of poverty for people aged over 65 years (At-risk-of poverty rate, rate of elderly people, 65+);

2.ARR – designates the aggregate replacement ratio.

3.EMPLOLD – designates the employment rate of people aged between 55 and 64 years (Employment rate of older workers);

4.EXIT – designates the average exit age from the labour force;

5.MEANLIFE - designates the average life expectancy at the age of 65 for both women and men;

6.DEPEND - designates the old-age dependency ratio;

7.EXPENDOLD - Expenditure on care for the elderly.

We structured the data in a panel, where the identifiers of cross-sections are the countries included in the study, and for each cross-section there are seven time series. Therefore, we have a number of twenty-eight cross-sections with fifteen years of analysis (where data is available for the entire analyzed period) and seven statistical indicators for each cross-section according to the table below (Table no. 1).

Table no. 1 Data Panel Structure

Workfile structure: Panel - Annual		
Indices: COUNTRY x DATEID		
Panel dimension: 28 x 15		
Range: 1999 2013 x 28 -- 480 obs		
Object	Count	Data Points
series	10	4800
alpha	1	480
coef	1	750
Total	12	6030

Source: Author's estimates

We say that two phenomena are correlated when they have a common evolution (in interdependency). The simple correlation measures the degree of connection between two phenomena represented by variables. In case we seek a relationship between three or more variables, we call on the concept of multiple correlations. We say that a linear correlation exists when every couple of values (x, y) is on the same curve of defined or undefined allure.

Two variables can be:

•positively correlated when there is an simultaneous increase (decrease, constancy) of the values of the two variables forming the analyzed couple;

• negatively correlated, if the values of one of the variables increase, and of the other, forming the analyzed couple, decrease;

• uncorrelated, if there is no relationship between the variation of a variable and the variation the other variable, forming the analyzed couple;

The graphic representation gives only a perception of the correlation between two variables, but without an accurate assessment of the bond strength. Therefore, it is calculated a statistics named the simple linear correlation coefficient, denoted by R and is given by:

$$R_{x,y} = \frac{\operatorname{cov}(x,y)}{\sigma_x \sigma_y} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2}\sqrt{\sum_{i=1}^{n}(y_i - \bar{y})^2}}$$

Where:

cov(x,y)- represents the covariance of x and y;

σ_x, σ_y - represent the average squared deviation dependent on x and, respectively, of y;

$\bar{x}, \bar{y}$ - represent the arithmetic mean of the variables x and y;

n - represents the number of observations.

Where data series x_i and y_i , with $i=1,\overline{n}$, are centered, the formula becomes:

$$R_{x,y} = \frac{n\sum_{i=1}^{n} x_i y_i - \sum_{i=1}^{n} x_i \sum_{i=1}^{n} y_i}{\sqrt{n\sum_{i=1}^{n} x_i^2 - (\sum_{i=1}^{n} x_i)^2}\sqrt{n\sum_{i=1}^{n} y_i^2 - (\sum_{i=1}^{n} y_i)^2}}$$

By construction, the correlation coefficient takes values between -1 and 1, which means:

• close to 1, the variables are highly positively correlated;

• close to -1, the variables are highly negatively correlated;

• close to zero, the variables are not correlated.

4. ANALYSES

In the first stage, we will make an analysis of the correlation between the variables included in the analysis.

Table no. 2 Analysis of the correlation between the variables used in the estimates

	ARR	DEPEND	EMPLOLD	EXPENDOLD	MEANLIFE	RISKPOV	EXIT
ARR	1.000.000	0.136199	-0.284219	0.094274	0.101797	-0.485669	-0.323679
DEPEND	0.136199	1.000.000	-0.075239	-0.059152	0.256406	0.106504	-0.029074
EMPLOLD	-0.284219	-0.075239	1.000.000	0.607059	0.162966	0.097673	0.815165
EXPENDOLD	0.094274	-0.059152	0.607059	1.000.000	0.266626	-0.328259	0.378733
MEANLIFE	0.101797	0.256406	0.162966	0.266626	1.000.000	-0.036695	0.155706
RISKPOV	-0.485669	0.106504	0.097673	-0.328259	-0.036695	1.000.000	0.291242
EXIT	-0.323679	-0.029074	0.815165	0.378733	0.155706	0.291242	1.000.000

Source: Author's estimates

Follow-up the correlation analysis it results that the only variables that have a positive correlation are EXPENDOLD (expenditure on care for the elderly) and EMPLOLD (employment rate of older workers) that present a positive correlation of 0.6. Also, a positive correlation also exists between EXIT we have (average exit age from the labour force) and EMPLOLD (employment rate of older people) of 0.81. In the second stage, we performed the Granger causality tests for all these variables to better analyze the relationships between them.

Table no. 3 Granger Causality Tests

Pairwise Granger Causality Tests			
Date: 01/20/15 Time: 11:04			
Sample: 1999 2013			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Prob.
DEPEND does not Granger Cause ARR	232	0.63792	0.5293
ARR does not Granger Cause DEPEND		507.437	0.0070
EMPLOLD does not Granger Cause ARR	232	452.447	0.0118
ARR does not Granger Cause EMPLOLD		490.900	0.0082
EXPENDOLD does not Granger Cause ARR	78	116.708	0.3170
ARR does not Granger Cause EXPENDOLD		0.37153	0.6910
MEANLIFE does not Granger Cause ARR	202	195.599	0.1442
ARR does not Granger Cause MEANLIFE		0.59695	0.5515
RISKPOV does not Granger Cause ARR	232	103.375	0.3573
ARR does not Granger Cause RISKPOV		466.675	0.0103
EXIT does not Granger Cause ARR	63	0.16450	0.8487
ARR does not Granger Cause EXIT		0.83355	0.4396

Source: Author's estimates

Table no. 4 Granger Causality Tests

Pairwise Granger Causality Tests			
Date: 01/20/15 Time: 11:04			
Sample: 1999 2013			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Prob.
EMPLOLD does not Granger Cause DEPEND	394	303.558	0.0492
DEPEND does not Granger Cause EMPLOLD		175.221	0.1748
EXPENDOLD does not Granger Cause DEPEND	235	111.090	0.3310
DEPEND does not Granger Cause EXPENDOLD		0.55813	0.5731
MEANLIFE does not Granger Cause DEPEND	367	0.50715	0.6026
DEPEND does not Granger Cause MEANLIFE		0.60568	0.5463
RISKPOV does not Granger Cause DEPEND	258	905.160	0.0002
DEPEND does not Granger Cause RISKPOV		168.472	0.1876
EXIT does not Granger Cause DEPEND	135	0.22592	0.7981
DEPEND does not Granger Cause EXIT		0.04366	0.9573
EXPENDOLD does not Granger Cause EMPLOLD	230	0.76505	0.4665
EMPLOLD does not Granger Cause EXPENDOLD		247.410	0.0865
MEANLIFE does not Granger Cause EMPLOLD	360	0.07537	0.9274
EMPLOLD does not Granger Cause MEANLIFE		0.18180	0.8338
RISKPOV does not Granger Cause EMPLOLD	258	138.618	2.E-06
EMPLOLD does not Granger Cause RISKPOV		158.491	3.E-07
EXIT does not Granger Cause EMPLOLD	135	151.048	0.2247
EMPLOLD does not Granger Cause EXIT		0.82791	0.4393
MEANLIFE does not Granger Cause EXPENDOLD	233	0.22347	0.7999
EXPENDOLD does not Granger Cause MEANLIFE		105.350	0.3504
RISKPOV does not Granger Cause EXPENDOLD	100	0.63617	0.5316
EXPENDOLD does not Granger Cause RISKPOV		0.09772	0.9070
EXIT does not Granger Cause EXPENDOLD	110	232.151	0.1031
EXPENDOLD does not Granger Cause EXIT		0.57309	0.5655
RISKPOV does not Granger Cause MEANLIFE	228	212.697	0.1216
MEANLIFE does not Granger Cause RISKPOV		152.550	0.2198
EXIT does not Granger Cause MEANLIFE	135	385.781	0.0236
MEANLIFE does not Granger Cause EXIT		179.879	0.1696
EXIT does not Granger Cause RISKPOV	83	0.16436	0.8487
RISKPOV does not Granger Cause EXIT		0.07644	0.9265

Source: Author's estimates

Hence, according to this test, we can identify the following relationships between the analyzed variables:

ARR causes DEPEND;
EMPLOLD causes ARR;
ARR causes EMPLOLD;
EXPENDOLD causes ARR;
ARR causes RISKPOV;

EMPLOLD causes DEPEND;
RISKPOV causes DEPEND;
RISKPOV causes EMPLOLD;
EMPLOLD causes RISKPOV;
EXIT causes MEANLIFE.

5. CONCLUSIONS

Follow-up the econometric analysis we found that: the aggregate replacement ratio influences the elderly dependency ratio, the employment rate of people aged 55-64 influences the aggregate replacement ratio and vice versa, the expenditure on care for the elderly influence the aggregate replacement ratio, the employment rate of people aged 55-64 years influences the dependency ratio of elderly people, the risk of poverty for persons aged over 65 influences the dependency ratio of elderly people and the employment rate of people aged 55-64 years, while the average exit age from the labor market influences the average life expectancy at age 65 for both women and men.

Acknowledgement: This paper has been financially supported within the project entitled "**Horizon 2020 -Doctoral and Postdoctoral Studies: Promoting the National Interest through Excellence, Competitiveness and Responsibility in the Field of Romanian Fundamental and Applied Economic Research**", contract number POSDRU/159/1.5/S/140106. This project is co-financed by the European Social Fund through the Sectorial Operational Programme for Human Resources Development 2007-2013. **Investing in people!**

REFERENCES

1. Sims, C. Macroeconomics and Reality, Econometrica, Vol. 48, No.1 1980
2. Stancu, S. Econometrie, Teorie şi Aplicaţii utilizând Eviews [Econometrics. Theory and Applications using Eviews], ASE Publishing, Bucharest, 2011