Pension Insurance Cohesive Testing System

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Abstract

Many public pension systems worldwide are experiencing difficult economic period as its economy is in the period of financial crisis which affected to the social budget sustainability. Population aging and last decade economic circumstances are the factors the pension systems should overcome for maintaining either appropriate level of benefit amount for decent life in the developed countries or minimum subsistence allowances in developing and poor countries. The only prescription how to keep the pension system resistible is its periodical renovation by testing the system on (i) soundness and effectiveness within national financial and economic system, (ii) appropriateness of its organization and administration, (iii) compliance of parameters with international standards. The article presents Cohesive Testing System – new method of national pension systems testing and indexing based on international standards of pension security and new CTS indices of the researched set of pension systems.

Keywords: Pensions, pension benefit, replacement rate, PAYG, dependency ratio, cohesive testing, funded pension system, statistical formula, international donors, social security.

Introduction

A wide range of articles and researches have been developed in recent years around the pension insurance which secures people against old age and retirement from their work and in turn against loss of the income. But there are still no distinct methods for identifying all the relevant parameters of pension system and no appropriate analyzing method which

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would make a decision-making process more qualitative (actuarial systems are too heavy and requires special skill).

Scholars give plenty of examples how to deal with parametric reform of national pension systems and they usually refer to the particular situations and don't suggest standard mechanisms of whole pension system parametric assessment and synthesis. Therefore, the paper proposes special solution - Cohesive Testing System (CTS) which is a method of national pension security testing system.

The Cohesive Testing System is the process of integration of multiple data and knowledge based on international pension security standards, into a consistent, accurate and useful representation and provides information for decision making. The system applies multifactor analysis, helps to reduce data and information analysis time and accordingly helps to carry out quick and efficient assessment of national old age security and its consistency with international standards.

The research is still going on and this article is an attempt to inform first tangible outcomes and it takes into account "cross-national comparability" and avoids "at face values" and "naïve analysis" of the data (Hagenaars Jackues and Wim van Oorschot, 2014).

Methodology
The cohesive testing is an expertise of a national pension system by comparing its indicators with international standards and its evaluation. The method provides step by step analysis of each factor of pension system by calculating its values and results in the total CTS international index of a national pension system (like Human Development Index, Age Watch Index, Life quality rate, etc.).

A set of pension system parameters depends on variety of pension schemes i.e. policy choices, but all of them aim at some common set of goals. Three main objectives of the pension system are (i) consumption smoothing, (ii) insurance and (iii) poverty relief (N.Barr, 2001) and the main composition of parameters of the state PAYG systems in this term fall under the more or less unique rules. As it was stated in the report of Economic Policy Committee (2002) of the EU the parametric reforms are aimed at maintaining the basic structure of the existing system, influence the costs by keeping it in balance. This is applicable for both universal flat rate and earning related pension schemes. Not always the similar parameters may be good for comparison each other in various countries. It's important to find common denominator and in our case these are international social security standards and quasi comparative method which compares different variables with common pattern.

The Cohesive Testing System qualitative and quantitative decision-making would be crucial for achieving financially sustainable and effective pension security system.

By applying the CTS one can examine any national pension insurance scheme by comparing indicators with predefined standards and it makes explorers enable to see whole picture and synthesis of the studied pension system and to take well-balanced decision on further reform measures, Jos Berghman (Subchater 3.3, 1986) defines "social security research on an international comparative basis" as one of the lever of the scientific substantiation, i.e. scientific instrument

Set of basic parameters of CTS system contains various pension parameters the value or behavior (a status and changes over time of the certain variable) of which can be easily explained in spite of their difference from country to country.
CTS uses two groups of pension system indicators:
- qualitative variables which are scored "Yes" or "No" based on the pension pillars and methods of pension benefits indexation;

- quantitative variables are replacement rate, contribution rate, amount of persons protected or dependency rate, length of service, retirement age and other quantitative parameters of national pension system which may be measured by scores based on its values.

The CTS result facilitates the production of accurate situation awareness as complete as possible and helps to identify key gaps and prospects faced by the decision maker.

The main goal of the research is to design multi factor Cohesive Testing System that allows researchers and fund owners to examine existing pension system and make proper decisions by expanding the existing knowledge infrastructure for multi-criteria decision-making process using CTS system, processing steps of which comprise (i) collecting coherent international standards for the examined parameters of the pension insurance, (ii) compare dimensions with coherent set of combination of standards and define national pension system potentials by using cohesive formula and CTS index.

CTS Statistical formula

The formula is an ordinary linear equation with number of indicators and strengthened by adding a square root index of total value of quadratic equation.

$$c = \sqrt{\sum k_i^2}$$

where,

     c - CTS index;

     k - digital value of the metrics which represents pension indicator. Here k=0 as lower value and higher value of the indicator is calculated by formulas described in the table below;

     i - number of indicator.

The dependent variables in the formula are numbers of mentioned parameters in the Table 1 and each of them has their own rate in accordance with its values.

Table 1. CTS set of indicators and its evaluation techniques.

N	Items	Mean	Low values formula	High values formula	References
1	First pillar	Yes/No	0(No)	20(Yes)	Existence of public pension security system is reputed to be a guarantee of income security in old age.
2	Second pillar	Yes/No	0(No)	5(Yes)	CTS considers a funded pillar as supplementary pension income of insured persons.
3	Inflation adjustment	Yes/No	0(No)	5(Yes)	Pension adjustment based on customer price index (inflation) is a minimum level of pension amounts indexation, whereas wage based indexation allows to reach higher level of benefit adjustment.
4	Salary growing adjustment	Yes/No	0(No)	10(Yes)	
5	Adequacy (replacement rate)	Rate	0 if $x<40$	$10+(x-10)$	Article 28 and 67 of the ILO Convention 102 promulgated old age security minimum standards. World Bank recommendations, see Robert Holzmann and Richard Hinz.
6	Affordability (Contribution rate)	Rate	0 if $x>30$	$10-(x-20)$	World Bank recommendations, see Robert Holzmann and Richard Hinz.
7	Amounts of persons protected (dependency ratio)	Rate	0 if $x>40$	$10+(40-x)$	Article 27 of the ILO Convention 102 promulgated old age security minimum standards. According to the additional calculation it is equal to dependency rate of 0,40 which means that 2,5 workers for 1 pensioner.
8	Length of service	Rate	0 if $x<30$	$10+(x-30)$	Article 29 of the ILO Convention 102 promulgated old age security minimum standards.
9	Retirement age	Rate	0 if $x<60$	$10+(x-60)$	Article 26 of the ILO Convention 102 promulgated old age security minimum standards. World Bank recommendations, see Robert Holzmann and Richard Hinz.

The result of final calculations is a cohesion rate (CTS index) of a national pension system which determines how close its parameters are to those harmonized international standards. CTS index allows decision makers and reformers to estimate the current situation and also to understand how to refine the system and how to increase the cohesion rate. The high cohesion means that pension system is compliant with international social standards and does have an indication of sustainability of a national old age security system due to assumption that CTS rating considers how much the main indicators are coherent with economic theory of social security and classical pension equation $sWL=PN$, where "s" is a pension contribution rate, "W" is an average real wage, "L" is number of workers, "P" is average pension, "N" is a number of pensioners.

Discussion outputs

Based on the methodology described above, further we will go through the indicators of the CTS system by applying the technique to the set of public pension systems of twenty countries. Main indicators' values have been picked out from various articles and OECD statistical tables and quoted results and conclusions pertaining to the researched scope of pension systems.

a) Pension pillars.

Pension pillars are the major indicators within CTS system. Classical definitions of the first pillar is a pension system which organized publicly and by the principle pay-as-you-go (Nicolas Barr, 2001), thus mainly covers major part of population and second pillar is various types of funded pension schemes. CTS considers that PAYG scheme is more reliable and can withstand pressures and overloads and more isolated from external shocks as it was shown during the recent 2008-2009 financial crisis and main reason of the relative stability is in the redistribution of social contributions which is not time consuming procedure and fund is

redistributed through the reliable channels. On the contrary, the fashion of the latest decade, funded pension scheme is experiencing hard times due to risky nature of the pension assets which are to be managed through unstable market. Since the recent financial crisis funded pillars were diminished in certain extend in some countries we studied. Many countries now are restructuring of the management of pension assets and some countries significantly shrinking funded pension scheme parts. CTS treats funded pillar as a supplementary scheme and considers that PAYG is more appropriate pension scheme due its stability, coverage, endurance and sustainability.

All studied pension systems have major PAYG scheme which covers major part of population whereas the second pillar, as yet, is not developed well in many studied countries.

b) Benefits adjustment.

Pension adjustment becomes as a major instrument against devaluation of pension benefits. Research shows that mainly the pension adjustment techniques depend on economic situation of countries. Most popular techniques are simple adjustment of pension amount to CPI index like in Belgium, Austria, France, Romania and as a consequence, the real value of the pensions gradually diminishes every year. On the contrary, wage growth indexation which is financially reasonable and viable is not used by many countries, however Sweden, Great Britain (If wage growth index higher than CPI index growth or higher than 2,5%), Denmark, Lithuania still keeps wage based pension adjustments as such. Other countries invented flexible pension adjustment when calculation is based on combination of "wage", "contribution", "sustainability" factors in Germany, adjusting pension benefits to 50 % of CPI and 50% of contributory income growth in Bulgaria, to the weighted index of 20% of wage and 80% of price growth in Finland, to the weighted average of 20% consumer price growth and 80% growth of pension contributions in Estonia, to a coefficient drawing based on GDP or CPI fluctuations in Greece, to CPI and wage indices Latvia and Luxembourg, to certain percentage as a compensation for the raise of the retirement age in Netherlands, to household

CPI or general CPI indices plus part of an average wage growth in Poland. Sometimes countries valorize pensions based on budget abilities and less often even freeze pension indexations for some times like it was in Spain, and Ireland.

c) Pension benefits adequacy.

Most of the standards are promulgated by ILO conventions and particularly by ILO Convention 102 "Social Security (Minimum Standards) Convention". Maintaining adequate level of pension benefits is one of the major parameter of CTS and 40 percent of replacement rate is a minimum the system will consider. So what level we can declare more or less adequate and sufficient? Developing countries now is struggling to obtain the minimum standards but still it is remaining high plank. Some developing countries where ILO standards are not ratified, they establish own national standards based on minimum subsistence basket for pensioners which is smaller than the ILO minimum standards in value. As it is depicted in the Chart 1, European Union average varies around 60 percent and some countries traditionally pay more. Luxembourg, Austria, Netherlands, Denmark, Finland show relatively high replacement rates of 69-90 percents, whereas most of the continental countries reach 50-65 percents. Most recent European member States still have low level replacement rates of public pensions. World Bank experience generally stipulates that for employee with full service length as an initial target of retirement income replacement (net of tax) from public pension insurance systems would be about 40 percent of real earnings to maintain subsistence levels of income in retirement taking into account a general trend that the replacement rate of low income workers is higher than those who get high salary. By the opinion of World Bank experts the replacement rates above 60 percent is not viable when it is kept over the long period as it would requires higher contribution rates and negative effect to economy (Holzmann Robert and Hinz Richard, 2001).

Chart 1. Replacement rates.
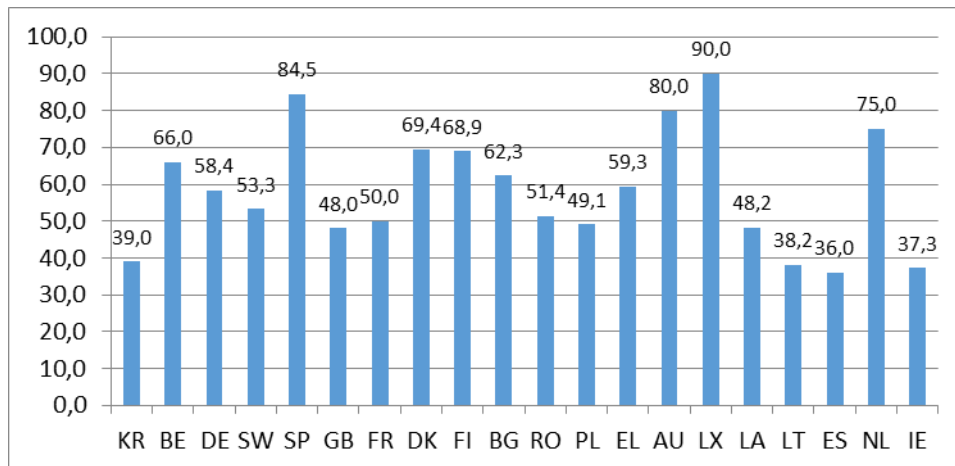
d) Pension system affordability.

Pension system affordability or social contribution rates refer to the economic and financial capacity of the business, individuals and whole society and uses contribution rate indicator which is balancing the social security equation $sWL=PN$ regarding old age security. The contribution rate is direct proportional to pension fund $(s=PN/WL)$ and it obviously means that the more contributions the more pension fund. On the other hand, the contribution rate is in the inverse proportion to wages and labour force (WL) and it says about economic pressure to employers and employees, hence, more contributions negatively affect wages and entire state budget. We would like to add another value to this equation: "degree of actuarial fairness" which was formulated by Eliza Baroni (2007) and it refers to the link between pension contributions and pension benefits.

After World Bank indications, CTS takes into consideration the 10 percent of pension contribution rate as a standard and "comfortable minimum" threshold for national economy and the rates higher than 20 percent of wage bill causes "direct" and also "indirect" costs of

high social contributions through budget burden and higher incentives for evasions accordingly (Robert Holzmann and Ricard Hintz, 2001).

Chart 2. Pension contribution rates.
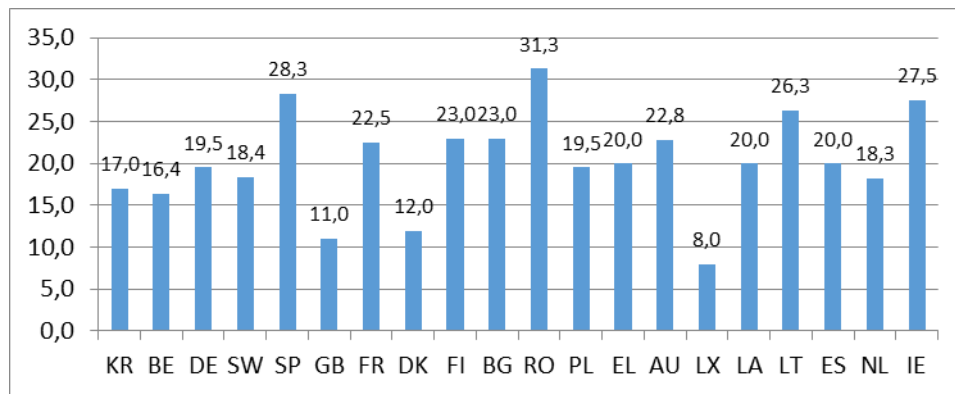
Above depicted chart shows pension contribution rates among studied set of pension systems. According to data studied, Spain, France, Austria, Finland, Ireland and Greece still hold high level of pension contributions to keep high adequate level of pension amounts. Latvia, Lithuania, Estonia have 20-26 percent pension contribution rate and it provides minimum income replacement rates among researched scope of countries.

e) Dependency ratio.

Amount of persons protected or dependency ratio has a twofold problem. In accordance with ILO Convention 102 a pension system should cover minimum not less than 20 percent of inhabitants or 50 percent of all employees. Secondly we have to keep effective proportion of active population which is not less than approximately 2,5 active workers who pays social

contributions to 1 pensioner (Calculation was made in accordance with a statement in ILO Convention 102 where 50 percent of all employees is approximately1/2.5) (ILO Convention 102, 1952). In our research we used economic old age dependency ratio which means the dependency of pensioners on number of active population.

Among European countries studied, the coverage of the public pension system varies between 24 and 44 percent of the economically active population. As illustrated in the Chart 2 the largest rate was achieved by Greece, Germany, Spain, Romania, Belgium, Bulgaria.

Other countries were able to keep the ratio under the necessary threshold. Ireland, Luxembourg, Poland, Great Britain and Netherlands' pension systems have large reserves regarding number of active population who can participate in redistributive pension system by providing highest correlation between active labour force and number of pensioners.

Chart 3. Dependency rates
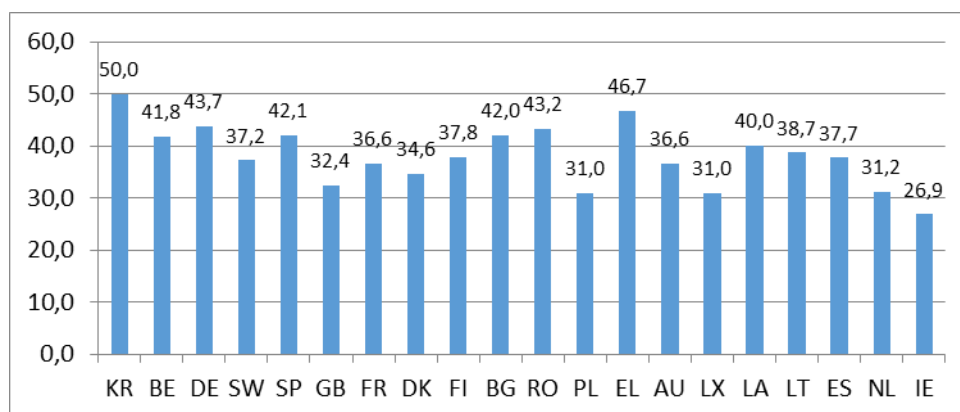
f) Length of service.

CTS treats length of service indicator by taking into account the requirement of the Article 29 of the ILO Convention 102 "a qualifying period which may be 30 years of contribution" (ILO Convention 102, 1952) and also minimum qualifying period which gives right citizens to be entitled to the state pensions. At the same time CTS is not concerning with various early retirement schemes which practically lead to additional deductions from pension amounts per pre-retirement periods (years, quarters or months) and this technique is actually grading and adjusting pension rights in accordance with the length of socially contributed service of citizen.

Chart 4. Length of service
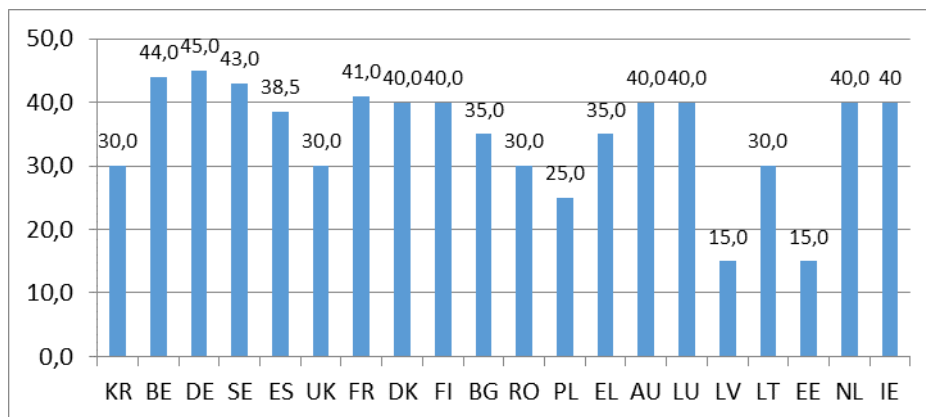
As the Chart illustrates, the service length is valued normally at 40 years in European Northern Atlantic countries and higher in some continental EU Member States (Belgium, Germany) and still low in Bulgaria, Romania, Poland and especially in Latvia and Estonia where the indicator rather applied as minimum requirement for entitlement.

g) Retirement age.

Retirement age is essential factor of pension system sustainability and it tends to increase. It's not necessarily because of aging population but quite often due to economic situation and lack of budget. Retirement age is the requirement after which person can apply to his pension benefit but economically people can be assigned to the pension benefit because of loss of income. Beneficiary earns his pension benefit and retirement age is not direct reason to be benefited. The ages are "situated between 60-65", but some countries establishes "flexible retirement age" an one can be retired "in a larger time span" (Pieters Danny, 2006, 51-58) and, according to this, CTS retirement age concept is: the more (lengthy) pension age the better a pension system and person as well as society would gain more from longer employment period.

Chart 5. Retirement age.
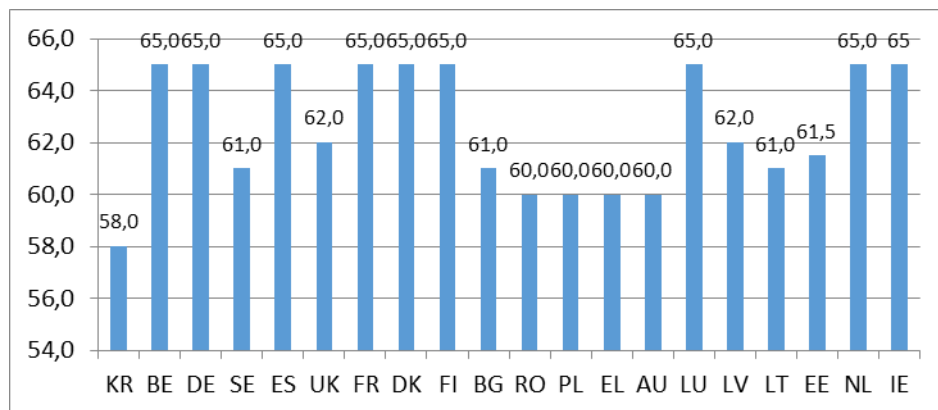
At the same time CTS establishes 60 years as a necessary minimum, although some international agencies put limitations on retirement age, particularly ILO 102 social security standards establish "65 years or such higher … with due regard to the working ability of elderly persons in the country concerned" (ILO Convention 102, Article 26, 1952).

The data (metrics) we have discussed above are processed by our multi-factor cohesive linear variables statistic formula.

Statistical processing of the results is carried out using the factorial analysis with post comparison of values with international standards.

Conclusion

Summary of analyzed factors in the previous chapter resulted in CTS indices (see table below) where Luxembourg, Netherlands, Denmark are leading the cohesive testing system range. Big group of continental countries Belgium, Germany, Austria, France and also Finland and Sweden are composes stable CTS rates (which is considered to be 36,00 an higher). Post crisis measures of Ireland pension system which has tightened national pension system conditions and conducted pension reform, brought necessary achievements and, as a result, Irish pension system is rated accordingly due to increased retirement age and length of service along with good perspectives in dependency ratio which may provide financial sustainability of public pension system in the future. Financial crisis dropped Greek pension system CTS rate by causing understandable negative effects to its adequacy.

Chart 6. CTS index table
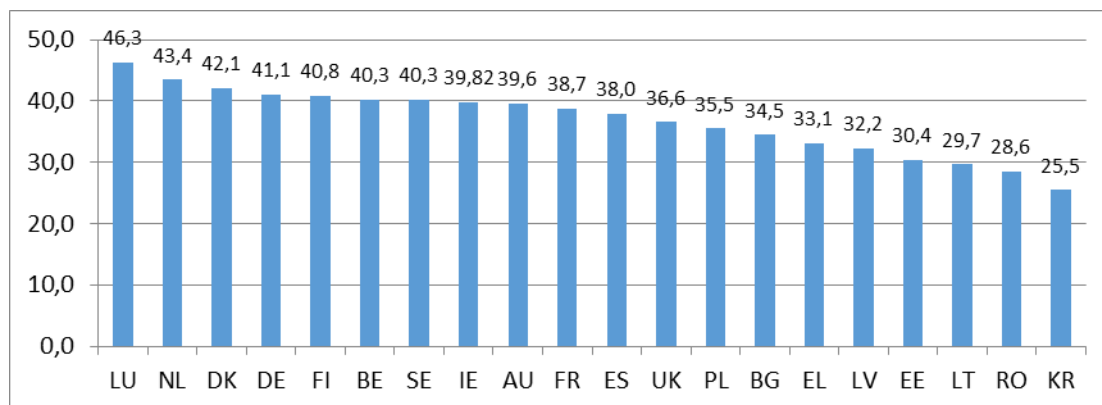
EU recent new members Lithuania, Estonia, Latvia, Romania led by Bulgaria and also Kyrgyzstan (the CTS rate may be typical for Central Asian post-soviet pension systems) which is a single representative of Central Asia are closing the studied set of the countries as almost all sensitive indicators are quite low than studied countries with stable CTS rate. CTS brought these countries up the rare because of relatively high dependency rates, low service length which resulted in inadequate pension amounts level. CTS calculations consider that universal pension system of United Kingdom is too liberal by having low level of required length of service and retirement age which resulted in low replacement although there is appropriate level of dependency of pensioners to active population (i.e. dependency ratio). Kyrgyzstan has a pension system which was updated during the post soviet period and poor economy affects pension system efficiency and CTS is equal to 25,5 is quite low.

Next chart shows CTS rates in the light of the public pension system expenditures in proportion to GDP.

Chart 7. CTS index table
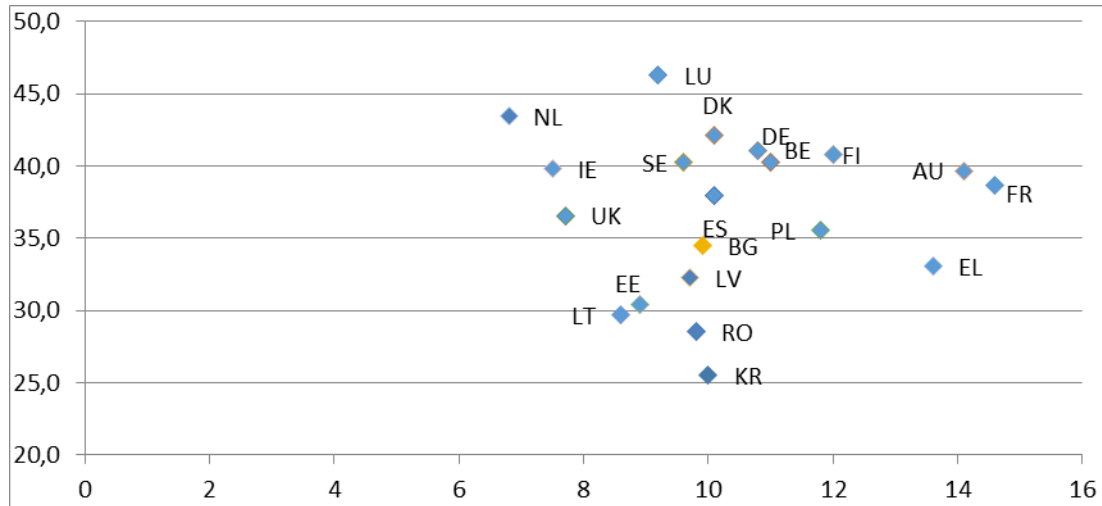
As the Chart shows, there is practically no correlation (correlation rate 0,014) between CTS rate and pension expenditures in general among studied set of pension systems, however when we make analysis of various groups of countries separately, then we can observe a distinct dependency between the CTS rate and expenditures.

We ranged the pension systems in accordance with CTS rates and composed two groups as it is shown in the charts below. First group contain CTS ratios less than 36,0 and represents mainly countries that join EU recently and their GDP size is lesser than other EU member states within studied scope. Second group consists of the EU developed Member States from both Atlantic and Continental Europe. Charts below contain the mentioned groups' projections and shows two controversial trends which are very interesting to observe.

Chart 8. CTS index table of Poland, Lithuania, Estonia, Latvia, Bulgaria, Romania
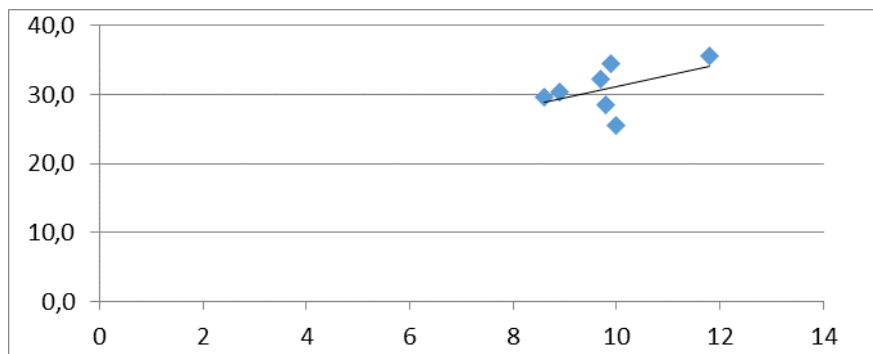
First group of researched pension systems' CTS rates depend on public pension expenditures and positive correlation which is equal to 0,74 and it is very high level dependency. It means that these countries' pension systems quality still rely on expenditures.

Chart 9. CTS index table of Luxembourg, Netherlands, Denmark, Germany, Belgium, Finland, Sweden, Austria, Ireland, France, Spain, UK, Greece
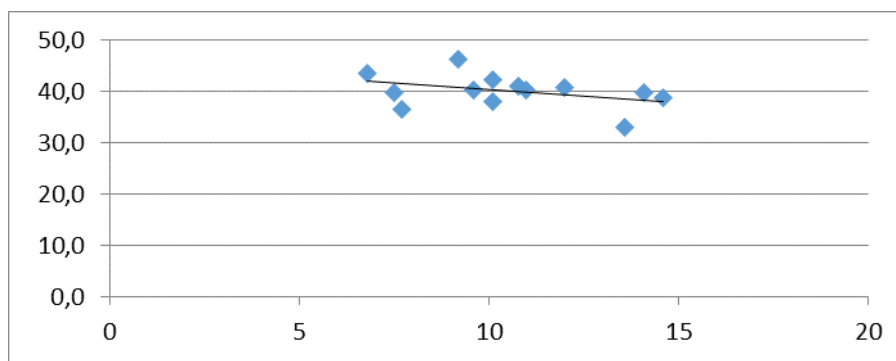
On the contrary, the rest of the studied countries, which are represented by EU developed Member States, have negative correlation rate -0,39 between CTS and pension expenditures

and it means that in some developed countries a direct budget subsidies, in most cases, are not able to improve its CTS rates, and pension systems require more rational restructuring.

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