Public pension funds management type: Pay as you go (PAYG)

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This article is based on the analysis of pay as you go (PAYG) pension funds type, which Barr and Diamond used to establish a set of principles for pension design in economic theory. Considering this analysis, this study tried to demonstrate the PAYG pension system type as a degree of bearing the expenditure of generations which can not be seen as a zero algebraic sum. This is so for the simple reason that some generations bear the high costs (or lower) depending on their income made to support the "retired" generation, but could take advantage of their low support (or higher) when they get to "retirement" age. The findings lead to the belief widely recognized that in current conditions, to maintain reliability, these systems should become a mandatory mix of systems necessary for a proper balance between generations, particularly in low-income countries.

Key words: Pension, social insurance, pay as you go (PAYG) system.

INTRODUCTION

In most countries, the main source of income for persons under the age of retirement pension is represented with social protection systems, so, in these circumstances, the pension is a form of distribution, more or less uniform income or consumption during the entire life of withdrawal from active life.

Thus, the only pension income replacement for generations withdrawn from active life in one form or another, and its size, depends on many factors which contribute to its formation during storage. In the literature, there have been many studies and research from this point of view, trying to find a model or an explanation of proper management at an appropriate solution on the formation and distribution of pension income between different generations.

Additionally, from this point of view, this paper tried to consider some models of accumulation and consumption in the type of pay as you go (PAYG) pension funds and alternative solutions to these funds are widely accepted as a necessity in terms of relieving public funds generated by such budgets.

THE RATIONAL CONSUMPTION - FISHER’S MODEL

Fundamentally, different nature of the acts and processes define individual behavior in a PAYG system; how they behave in the economy is not a mechanical sum of repeated acts, but the result of accumulation of active life.

In general, the behavior is a set of external reactions that challenge the individual stimuli. In terms of psychological behavior, the global response of the individual was objectively observable. In this regard, the result of accumulation of active life poses a question naturally in the minds of each individual on how and by whom the existence of these necessities will be provided "tomorrow". Starting from here, an ideal situation of Fisher model, no doubt, was proposed as shown in Figure 1.

Under these conditions, the rational individual consumes a certain amount of goods and services - \( C_1 \) during active and quantity of the same goods, lower the inactive - \( C_2 \). For uniform consumption throughout the life of individual bearings to save a certain amount - \( C_1' - C_1 \) for the period of old age - \( C_2' - C_2 \). Equalization is the point's consumption, while in point of individuals
consume more when young, and in point $d$, more in old age.

Fisher's model is based on three assumptions (Barr, 2001):

1. Action-oriented individual is rational with well-behaved utility;
2. Individual action is based on certainty;
3. The market is perfectly competitive in behavior.

In such ideal conditions, the welfare state should intervene only in case of point $f$ to raise general living standards of the individual to the point $e$ only if it aims to raise the standard of living of the individual to a certain threshold $bb$.

To counter the risk of old age, the individual binding must ensure a free and competitive market, becoming a part of income from active life to retirement savings in the form of annuities, being forced to design a remote landing needs goods and services, even if they are changing. Faced with these problems, the individual may or is required to ensure the public pension system, which consists of traditional pay-as-you-go (PAYG), or a private insurance company, on the principle accumulation funds. In a healthy economy, between public and private insurance should not be relations of exclusion. In the absence of competition, the two systems can influence and support each other - the extension and generalization of public systems would reduce the possibilities of the private organization, and the latter in case of failure, would find support in the first (Zamfir and Zamfir, 1995).

From the economic point of view, we can say that there are significant differences between systems based on accumulation and pay-as-you-go (PAYG). However, they have different financial mechanisms, but that the same principle ensures the realization of future income of individuals and their welfare. Public pension schemes PAYG type, which can be translated as "pay as they are called" persisted for over a century and will continue to supply pensions to a lesser or greater extent, based on a broader or narrower solidarity. Such public pension insurance systems are traditionally organized, and their structure gradually defines benefit payment systems. In such systems, current benefits are financed by current taxes or contributions (Hyman, 1999). Pension amount is often determined by the size of contributory base and active life, and especially, the contributions depends on the mechanism (Hemming, 1998). A easy PAYG system type can be illustrated by the following relationship (Barr, 2001):

$$rWS = PN$$

where: $r$ = rate of contribution to the PAYG system, $W$ = nominal wage environment, $S$ = number of employees; $P$ = average nominal pension, $N$ = number of pensioners.

So: $P = \frac{rWS}{N}$,

Pension is in direct dependence: the contribution rate to the PAYG system, with nominal wages, the number of employees and retirees are depending on the opposite number. Pension increase or decrease depending on the factors namely:
\[ \Delta P = \frac{\partial P}{\partial r} \cdot \Delta r + \frac{\partial P}{\partial W} \cdot \Delta W + \frac{\partial P}{\partial S} \cdot \Delta S + \frac{\partial P}{\partial N} \cdot \Delta N \]

Increased growth rate pension account
Pension increase a unit increase in the rate
Pension increase a unit nominal wage growth
Nominal wage growth
Pension increase a unit increase in the number of employees
Increasing the number of pensioners
Decrease increase pension of pensioners account

or

\[ \Delta P = \frac{WS}{N} \cdot \Delta r + \frac{rS}{N} \cdot \Delta W + \frac{rW}{N} \cdot \Delta S - \frac{rWS}{N^2} \cdot \Delta N \]

Divide both sides of this relationship to \( P = \frac{rWS}{N} \) and obtain:

\[ \frac{\Delta P}{P} = \frac{\Delta r}{r} + \frac{\Delta W}{W} + \frac{\Delta S}{S} - \frac{\Delta N}{N} ; \]

That is, the percentage increase in the rate of nominal wages, the number of employees minus the percentage increases in the number of pensioners. Knowing the evolution of each of the factors that influence the amount of retirement, pension can be expected.

**ATKINSON-STIGLITZ THEOREM**

It starts from a model that takes two periods of life analysis of an individual, the first period in which the work with capital accumulation and consumption alternated with the second period characterized only by consumers (Atkinson and Stiglitz, 1976).

One of the characteristics of the first period is that the accumulation of savings by taxation is used to finance consumption in the second period, thereby generating a further accumulation of additional capital by taxation in the second period. The theorem itself implies that when tax methods are available, the nonlinear income taxes for the differential consumption tax should be zero in the first and second period, but the following two conditions must be met:

1. All consumers have preferences that can be separated between consumption and labor;

2. All consumers have the same function as sub-utility consumption (Diamond, 2009):

\[ u^h \left[x_1, x_2, z\right] = u^h \left[\phi\left[x_1, x_2\right], z\right], \]

where: - \( x_1 \) and \( x_2 \) - are levels of consumption; - \( z \) - is earnings.

From analysis of these conditions that the first condition is the inter-temporal marginal rate of substitution in consumption does not depend on labor reserves, while the second assumes that all consumers have the same interest in uniform consumption throughout lifecycle.

The theory which stipulates that single or more periods of employment can be extended to the consumers to have multiple periods of earnings provided lifetime taxation can be a general function of all earnings from all periods of an interesting extension (Kaplow, 2006; Konishi and Pareto, 1995; Laroque, 2005) is that any taxation of income earned by assuming the same preferences, moving from tax/consumption tax to tax consumption distortion, can be connected with a change in tax returns in order to have a gain of Pareto type.

Having only one active period analysis, the model is characterized by the accumulation of income tax savings, for retirement is focused on the fact that a fee based on the non-linear differential gains between the two periods (work, storage, consumption-retirement consumption).

**PAYG SYSTEM ANALYSIS**

The main advantage of the public PAYG system is to provide a guaranteed minimum income to those who due to illness or opportunity could not have enough help for retirement during their working lives. Solidarity system is beneficial for the disabled or survivors' benefits while ensuring acceptability for young people or countries with high employment work (Cace, 2004; Davis, 1998).
Table 1. Simplified pay-as-you-go system.

<table>
<thead>
<tr>
<th>Period</th>
<th>Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>+ 1 UM</td>
</tr>
<tr>
<td>2</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>+ 1 UM</td>
</tr>
<tr>
<td>3</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>+ 1 UM</td>
</tr>
<tr>
<td>4</td>
<td>D</td>
</tr>
<tr>
<td></td>
<td>+ 1 UM</td>
</tr>
</tbody>
</table>

Period Generation


Table 2. "Pay as you pay".

<table>
<thead>
<tr>
<th>Generations to benefit from spending</th>
<th>M (Ø)</th>
<th>A (2Ø)</th>
<th>B (3Ø)</th>
<th>C (4Ø)</th>
<th>D (5Ø)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (Ø)</td>
<td>$r_A = \frac{P_A N_M}{W_A S_A}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B (2Ø)</td>
<td>$r_B = \frac{P_B N_A}{W_B S_B}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C (3Ø)</td>
<td>$r_C = \frac{P_C N_B}{W_C S_C}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D (4Ø)</td>
<td>$r_D = \frac{P_D N_C}{W_D S_D}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Elaborate by authors.

A major disadvantage of this system is its viability, for countries with high life expectancy at the time of withdrawal, or an aging or for countries with high population dependency withdrawn from the occupied, it is not viable. Such systems are not sustainable over time if there are adverse demographic trends or staff layoffs. PAYG system that has a cohesive group perspective, which allows redistribution of income collected from its members, which can be considered as a pyramid scheme (Table 1).

Starting from this scheme, we considered generations $A, B, C, D$, working in different periods, in different economic situations and with different economic potentials, not to have an algebraic sum (+ 1 UM − 1 UM) equal to zero: some generations bear the major costs (or small) to support the generation that is "retired", but might take a little support (or higher) when they get to "retirement" age. We recognize that the active life of a generation is $\phi$ years; generation $A$ in years $\phi$ "bear the burden" to support the retirement generation $M$, generation $A$ will be retired over $\phi$ years and will be supported by the following generation $B$ (Table 2).

From the hypothesis that $r_A = r_B = r_C = r_D$ get $W_B \cdot S_B = P_A \cdot \frac{N_A}{W_A \cdot S_A}$, where apparently it can create the impression that an increase in retired generation $A$ to generation $M$ has become a "burden" additional generation $B$ that pay for pensions generation $A$. In fact, increase in the number of pensioners (aging population) is due to the technical and scientific success of this "old" generation. All these "elders" have created high efficient productive funds, which ensure greater share of labor in the final product cost structure, or in the language of formulas:

$\frac{N_A < W_B}{N_M} < \frac{W_A}{W_B}$

In other words, these funds increased "burden" or considerably increased the possibilities to support the "burden".
ALTERNATIVES TO THE PAYG

Since 1994, due to various crises that have faced various countries, the World Bank (WB), through social division, suggested implementing a new pension system concept based on the three-pillar approach that has turn out to be very popular today (Stegăroui, 2004).

The three pillars proposed by the objectives differ from one another which it suggests, the principles relating to the contributions and benefits, the administrative nature of public, private or mixed, optional or mandatory component, leading to a combination of different elements between them and most appropriate ways. Design and practical implementation of a new pension system is directly related to the need and capacity of the company and value systems available to state a given time (Table 3).

The fundamental principle underlying the multi-pillar pension system is to diversify the sources of the income from pensions by their bearing, to the state and the private (Stegăroui, 2004).

The first pillar is a mandatory public pension system, PAYG type, which ensures that all participants have a certain amount of income to cover the needs arising from old age. If this system is designed on the testing needs, then its beneficiaries should only be those who need this support. The true universal base is supposed to be the same for all (Barr, 2004). This should be a public pillar with a redistributive component required, because the state has provided leverage through mechanisms tax administration, transfer and indexation of payments, which is essential for low income (Hemming, 1998).

The second pillar is a mandatory component based on capitalization, which privately managed and promotes the principles of mandatory participation in the new system for new people entering the labor market; equal treatment for all participants, contributions, capitalization and investment assets are prudent and efficient in a manner.

The main objective of this pillar is to provide an incentive for individuals to distribute evenly over the life consumption, bringing the number of arguments in favor of this system by reducing the problems of imperfect information and better protection against risk (Barr, 2000; Davis, 1998).

The third pillar is a voluntary scheme based on capitalization and defined contribution funded to provide participants the opportunity to accumulate additional savings in a compulsory system, given the choice and opportunity of each system. Under this scheme, the state must intervene by setting maximum permitted tax exemption for individual participation.

CONCLUSIONS

Moral effect of the work in the PAYG system type is determined by the generous incentives that could increase the volume of profits, which directly leads to beneficiaries for a general trend of earlier retirement, a phenomenon that can be reduced by introducing the direct role of restrictions on reducing these facilities; nevertheless, it cannot be entirely reduced. In systems based on accumulation, funds generally allocated to work motivation are reduced in case of excessive labor taxation. But if some of the tax is directed to a pension fund, it is seen as a motivation for future welfare of the person concerned, leading to a direct link between contributions and benefits.

Direct effect on the economies of construction principle appears in a PAYG system, which is designed to promote pension insurance, which guides the system that aimed at a relatively low savings than they would have done otherwise. The phenomenon itself can be defined as the effect of substitution of assets. Such conditions are due to low individual savings directly to the low rate of savings with direct implications on investment and labor productivity, and in case of accumulation, funds are based on these systems because the principle on which they are designed are based on mandatory savings that will lead to increased volume at micro and macro storage.

Return on the PAYG pension system is actually lower than in other systems based on accumulation, which in turn creates a balance due to the low risk. A comparison of these considerations shows that it is hard to believe...
that one can certainly find strong evidence to buttress the
fact that funded systems would satisfy all these failures.
Nonetheless, it was profitability calculated that the two
systems are contradictory and inconclusive.

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