

Developing countries' pension systems - some lessons from Russia

0. Introduction

A sharp decrease in fertility – in most countries it is now much less than two children per woman – coupled with increasing longevity has caused serious problems to state pension systems. Unfavorable demographic changes entail either a substantial increase of the cost of pension provision or a decrease in pension provision, or both.

A usual recommendation, supported by many institutions and professionals, is to mitigate state pension systems problems caused by unfavorable demographic changes by the introduction of a substantial obligatory funded pillar. During the last 10-15 years many developing countries, including some former socialist countries and USSR republics, substituted their pure PAYGO state pension systems with mixed ones, which include more or less substantial funded pillars. How successful were those reforms? Can we be sure that funded pension provision will provide higher pensions than PAYGO?

In the year 1998 there was a debate in the Institute of Actuaries concerning the role of the state in the pension provision. The motion was “This house believes that the aims of universal social security in old age are best met by the development of independently funded and invested pension provision”. There was a hot discussion and the votes were almost equal: 60 in favor of the motion and 68 against it.

Eight years passed and the perception of advantages and disadvantages of PAYGO and funded pensions changed quite dramatically. In the year 2006 there was a discussion on IACA section of International Congress of Actuaries in Paris. The main idea of the speaker was that both PAYGO and funded pension systems have advantages and disadvantages, and the funded system cannot be viewed as superior. The speaker obviously expected a hot discussion on the subject, but there was virtually none at all.

W. Easterly, former World Bank expert on underdeveloped countries, wrote an interesting book about the stimulation of economic growth in developing countries¹. The author showed that the history of rich countries supporting poor countries' development is more of a history of failures than successes; economic growth proved to be a much more subtle issue than expected. The history of improvements of developing/underdeveloped countries' pension systems is not a story of total success either. Countries differ and recommendations that proved right in one country may not be good for another one.

It is well known that, compared to developed countries, developing countries have some additional problems. In this paper I would like to discuss two of them:

1. High real wage growth; if the country is really developing. Of course, if the country is just an underdeveloped one, there might be no wage growth at all.

¹ William Easterly (2000). *The Elusive quest for growth: Economists' Adventures and Misadventures in the Tropics*. MIT Press, Cambridge, Massachusetts, London England.

2. Higher uncertainty about future longevity than in developed countries.

Real wage growth in developing countries might be much higher than in developed ones. This fact does cause problems to the funded pillar, but causes no additional problems to PAYGO system. High real wage growth might make the funded pillar less effective in developing countries than in developed countries. The main topics to be discussed are as follows:

- 1) Are there (can we expect to have) investments with average expected real (geometric²) return higher than real wage growth?
- 2) Developing countries' capital markets are underdeveloped. The usual recommendation is to diversify by investing part of assets in developed markets. If developing markets offer higher expected return, than this would lead to a decrease in expected return.
- 3) The higher the expected average return, the higher is its volatility. It might lead to high volatility of savings and even high volatility of pension amounts. For an obligatory funded pension system, high volatility of savings, and particularly of pension amounts in successive years of retirement, are of a particular importance.
- 4) Pension liabilities are long term. Theoretically this gives the possibility of achieving high investment returns on pension funds. But could a fund manager, whether it is a monopolist state institution or a competing private fund manager, have sufficiently long-term investment horizons?
- 5) The usual measures for increasing the stability of return on pension funds lead to a decrease in the average expected return. How high would this decrease be?

When an actuary is involved in modeling a state pension system and comparing expected outcomes of different scenarios of its development, the key point is the assumptions. To compare the merits of funded and PAYGO systems, the most important non-demographic parameters are the rates of wage growth and the expected investment returns. Setting consistent assumptions for these main parameters is an extremely important task; unfortunately it is also an extremely difficult one.

Another developing countries' problem considered in this paper is forecasting future longevity. Developing countries have comparably low longevity; in fact in many countries, including Russia, there is not yet any increase in longevity. This makes longevity forecasts in developing countries much more uncertain than in developed ones.

The annuity market, which is necessary to provide whole life funded pensions, is quite a serious problem even for developed countries. High uncertainty of longevity forecasts makes pricing much more difficult and leads to higher premium margins, which constitute a substantial additional problem for the development of an annuity market.

1. Method of comparison of PAYGO and funded pension systems

The recommended funded pillar is defined contribution, so direct comparison with a defined benefit PAYGO system is a bit complicated. On the other hand, Notional Defined

² In the following text I will always mean *geometric* average rates of return or wage growth; to be short the word "geometric" will usually be omitted.

Contribution system (NDC) is a PAYGO system arranged like a defined contribution system. For every person his/her pension contributions are accumulated using some notional interest rate. At retirement those accumulations (notional capital) are divided by suitable annuity value to calculate the pension amount.

An NDC system's notional interest rate is an implicit rate of return based on the pension tax rate and demography, which guarantees long-term sustainability of an NDC pension system. In the long run an NDC system would provide the same *sustainable* average level of pensions as a "usual" defined benefit PAYGO system. It makes the NDC system a very useful instrument for analyzing PAYGO system, and, particularly, for comparison with a funded pension system. Comparison of two kinds of defined contribution (DC) systems – funded and notional – is obviously much more straightforward than direct comparison of defined contributions funded and defined benefit PAYGO systems. The comparative advantages mostly depend on rates of return and, to a lesser extent, on expenses.

Calculation of the implicit return on an NDC system is not a simple task³, but for our purposes we can use a simple approximation, which is equal to the rate of wage growth g plus the rate of growth of the labour force (payers), λ . This $g+\lambda$ notional rate of return is a simplification, which is good enough for the purposes of this paper.

When fertility is high the population is growing and the parameter λ is positive. In this case the NDC rate of return $g+\lambda$ is higher than the rate of wage growth g . On the other hand, when fertility is low the population is decreasing and the parameter λ is negative. In this way the NDC rate of return explains why a PAYGO system is more effective when fertility is high and the population is growing.

For Russia, modelling carried out by the Independent Actuarial Informational Analytical Center⁴ showed that the average implicit rate of return of an NDC system for the next 40 years will be approximately equal to wage growth rate minus 1%. Taking into account a higher level of expenses, the funded system must achieve a rate of return at least equal to wage growth to provide for more or less same level of pension as PAYGO.

2. Expected vs actual returns on pension funds

The perceived advantage of a funded pension system over PAYGO is based on the (implicit) assumption that the return on pension funds is higher than the NDC rate of return. For comparing funded and PAYGO pension systems this assumption is the most important one. So it is reasonable to assume that setting consistent assumptions about wage growth and expected rates of return should have been one of the most important issues when a country considered introducing an obligatory funded pillar. But was it?

Some developed countries, like USA, UK and Canada, have long periods of uninterrupted development of securities markets; they have long-term statistics of wage growth and

³ Ole Settergren, D. Mikula, 2006. The Rate of Return of Pay-As-You-Go Systems: A More Exact Consumption-Loan Model of Interest. In *Pension Reform. Issues and Prospects for Non-Financial Defined Contribution (NDC) Schemes*, R. Holzman and E. Palmer (eds).

⁴ V. Baskakov, A. Lelchuck, D. Pomazkin, 2003. "Modelling the Pension System of the Russian Federation", pp. 10-90. In *The Pension System: A model for Russia and International Experience*. Moscow.

the returns on different types of investments. These data provide a sound basis for setting model parameters.

In Table 1 we can see long-term data for three countries: USA, UK and Canada. In these countries, for the periods of time shown in Table 1, investments in stocks yielded a comfortable margin above wage growth. This margin was both due to high investment return and low wage growth. Note that with investment in bonds the margin would have been quite low.

Table 1. **Average real rates of return and wage growth**

Country	Years	Average real geometric rate of return		Average geometric real wage growth
		Stocks	Bonds ⁵	
USA ⁶	1871-1995	6.9%	2.8%	1.5%
UK ⁷	1899-2006	5.3%	1.1%	1.0%
Canada ⁸	1924-2000	7.0%	2.9%	1.5%

Note. Bonds data: Gilts in UK, Long term in USA and Canada.

Developed countries with a smaller volume of statistics could base their assumptions both on their own statistics and on the data of other developed countries. Developing countries, since they have no relevant data or only scarce data, could base their assumptions on developed countries' data. But how relevant is this data for developing countries? Obviously, not very much.

So the basis for setting assumptions about wages and returns in developing countries was weak. Generally it was just assumed that the rate of return would be higher than the wage growth rate. For example, the authors of the Polish pension reform wrote about this key issue: "Generally international experience shows that in the medium term returns of private pensions' funds are higher than wage growth⁹".

In Russia the expected real rate of return was assumed to be equal to 7%. The expected real wage growth rate was at first taken to be as low as 3%. From a general economic growth point of view, such a low rate of real wage growth was a conservative assumption, but it was too favorable for the funded pension system, when compared with a PAYGO one. Later some higher values of wage growth rates were assumed, but they were always lower than expected real rate of return.

It is reasonable to assume¹⁰ that in other countries that decided to introduce a funded pillar in their state pension system, real rates of return were assumed to be comfortably higher than real wage growth rates. Otherwise those countries would not have been able to justify the implementation of a funded pillar.

⁵ Gilts in UK, Long term bonds in USA and Canada.

⁶ Alier, M. and D. Vittas (2001). Personal Pension Plans and Stock Market Volatility. In *New Ideas About Old Age Security*, R. Holzman and J. Stiglitz (eds.) The World Bank, Washington, DC.

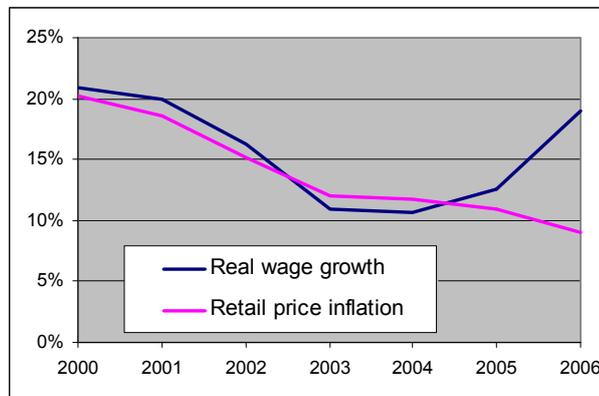
⁷ Sources: (1) Barclays Capital and (2) Watson Wyatt website: Long term statistics.

⁸ 1924-2000 Economic Tables, taken from Canadian Institute of Actuaries' website.

⁹ A. Chlon, M. Gora, and M. Rutkowski (1999), Shaping Pension Reform in Poland: Security through Diversity. Social protection Discussion Paper No. 9923, World Bank Pension Reform Primer, Washington D.C.

¹⁰ The history is written by the winners.

In developing countries current levels of wages are many times lower than in developed ones. For example, in the middle of 2007, the average wage in Russia was about 500 USD, in Ukraine half that, etc. If the country is really developing, the gap between its wages and those of developed countries would narrow. So it is reasonable to expect more substantial real wage growth in developing countries, than in developed ones. For example, in the last seven years (2000-2006) average annual real wage growth in Russia was about 15% and it is not declining yet (Graph 1).



Graph 1. Real wage growth and retail price rates in Russia

Of course, in future real wage growth will become lower, but how much lower? For example, if we assumed that real wages quadrupled in 20 years, it would mean more than 7% average real annual wage growth rate.

So, the question is: are there any investments with expected average return higher than real wage growth? Could we expect that at least the most profitable assets, like equities, would be profitable enough in the long run? Based on historical data we can see that in most profitable and stable capital markets like USA, UK, Canada long term rates of return on stocks have been lower than the levels of wage growth discussed above.

Of course, there is a possibility of higher returns in more risky developing capital markets than in less risky developed markets. But is it reasonable to base such an important decision on this assumption? Developing countries' capital markets are quite small, underdeveloped and highly unstable. The usual recommendation to cope with these problems is to invest some part of the assets in developed markets. But investments in developed markets would conflict with the hope of getting a higher rate of return by investing in more risky markets during the period of faster growth of a developing economy.

It is well known that the actual return on pension funds might be (and was in many countries) quite low. Unfortunately, the Russian obligatory DC pillar is an example of such a situation.

In Russia an employee can keep his *obligatory* funded pension savings with the State Pension Fund or transfer them to one of the non-state pension funds. At the moment the overwhelming majority of employees keep their savings with the State Pension Fund. If a person chooses the State Pension Fund, he/she is supposed also to choose a fund manager (like in Sweden). If he/she has not chosen a fund manager, the investments

will be managed by a public fund manager - a state bank, named VEB. At the moment VEB manages about 95% of all obligatory pension savings.

During the last three years (from 01.07.2004 till 01.07.2007) the average real annual rate of return of all Russian fund managers was equal to 7.2%. The public fund manager (VEB) had a negative average real rate of return (-1.6%) – one of the lowest results among all fund managers. Compared with wage growth both returns were negative: 6.0% on average for all fund managers and -13.7% for VEB. So, for 95% of contributors the investment results were disastrous. The government's main concern was about the safety of savings, so VEB invested mainly in government bonds; the rates of return on government bonds were lower even than price inflation.

Russia is not the only country with relatively low rates of return. For example, in Hungary in the years 1998-2005 the average real rate of return on pension funds was equal to 3.9% a year¹¹, whilst average real wage growth was 5.3% a year.

3. Volatility of savings and pension amounts

In the absence of drastic changes in pension contribution/tax rates, PAYGO income is relatively stable. Its sources of volatility, such as changes in average wages and unemployment, are relatively minor, compared to the volatility of investment returns. The State's implied obligation is to maintain the replacement ratio. From this point of view volatility of wage levels is less important. So in the PAYGO system asset-liability matching is quite good. As far as the funded pillar is concerned, volatility of asset values can be very high and asset-liability matching really poor.

To compete with the PAYGO system the funded pillar needs a high level of return. The higher the expected average return, the higher its volatility. Serious problems stem from the fact, that the state's *obligatory* DC pension system should not allow high volatility of savings and pension amounts in successive years of retirement.

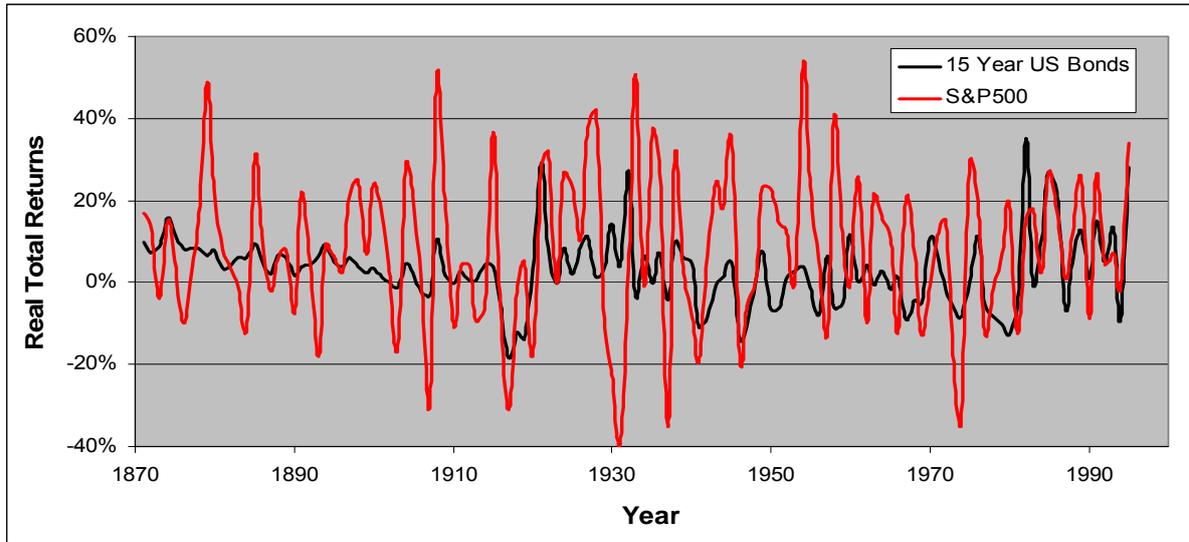
M. Alier and D. Vittas used historical data for the USA to investigate the impact of the volatility of investment returns volatility on replacement rates in the context of personal (DC) pension plans and to explore simple financial strategies to cope with this problem¹². The main idea of the analysis was to assess the possible pension savings and pension amounts if DC pension plans had been introduced in the USA in the year 1871. Modelling, based on real historical data, enabled volatility analysis without additional assumptions about investment returns and provided really objective results; although it does not, of course, take into account possible future changes.

The historical data used by M. Alier and D. Vittas consisted of real total returns on S&P stocks, 15 Year US Bonds and commercial papers, and also wage growth rates in the industry for 125 year periods of time; from 1871 until 1995. Those historical data, kindly provided to the author by M. Alier and D. Vittas, can be used to illustrate the expected volatility of DC pensions.

¹¹ G. Impravido, R. Rocha (2006) Competition and Performance in the Hungarian Second Pillar. World Bank Policy Research Working Paper 3876.

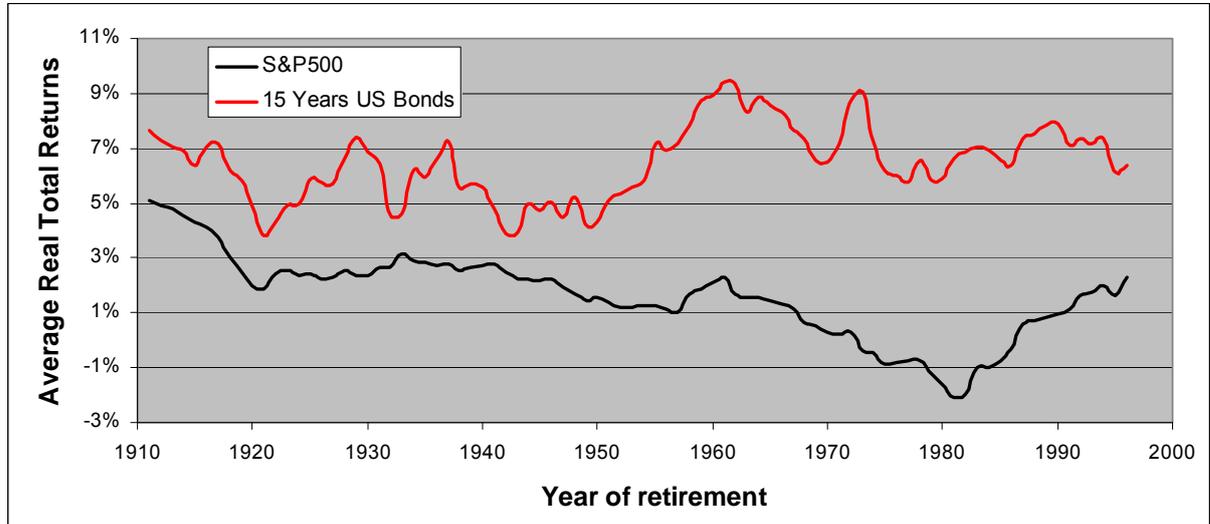
¹² Alier, M. and D. Vittas (2001). Personal Pension Plans and Stock Market Volatility. In *New Ideas About Old Age Security*, R. Holzman and J. Stiglitz (eds.) The World Bank, Washington, DC.

Graph 2 shows the volatility of real total returns on USA S&P500 stocks and 15 Year US Bonds. You can see that annual real total returns vary in a very broad band: from -40% to 54% for stocks and from -18% to 35% for bonds.



Graph 2. Annual real total returns on S&P stocks and 15 year US bonds.

Following M. Alier and D. Vittas the author analyzed 40-year saving periods; this gave 86 cohorts of contributors, retiring in the years 1911 to 1995¹³. From Graph 3 we can see that the average 40-year (geometric) returns are, of course, much more stable than annual ones. But the volatility is still quite high: returns on stocks vary from 3.8% to 9.4% and returns on bonds vary from -2.1% to 5.1%.



Graph 3. Average (geometric) real total annual return for 40 years savings periods for S&P stocks and 15 year US bonds by the year of retirement, %.

Such high volatility of average returns leads to high volatility of savings.

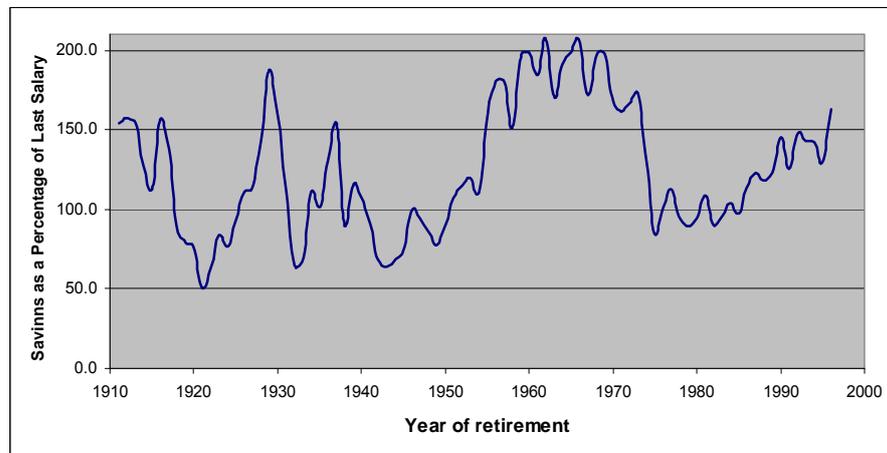
Assuming that:

- an employee paid 1% of his/her earnings during 40 years;
- had average earnings in the industry; and

¹³ Although the examples in this paper are not exactly the same as in M. Alier and D. Vittas paper, Graphs 2 to 5 provide very close illustrations to their results.

- 100% investments in S&P stocks

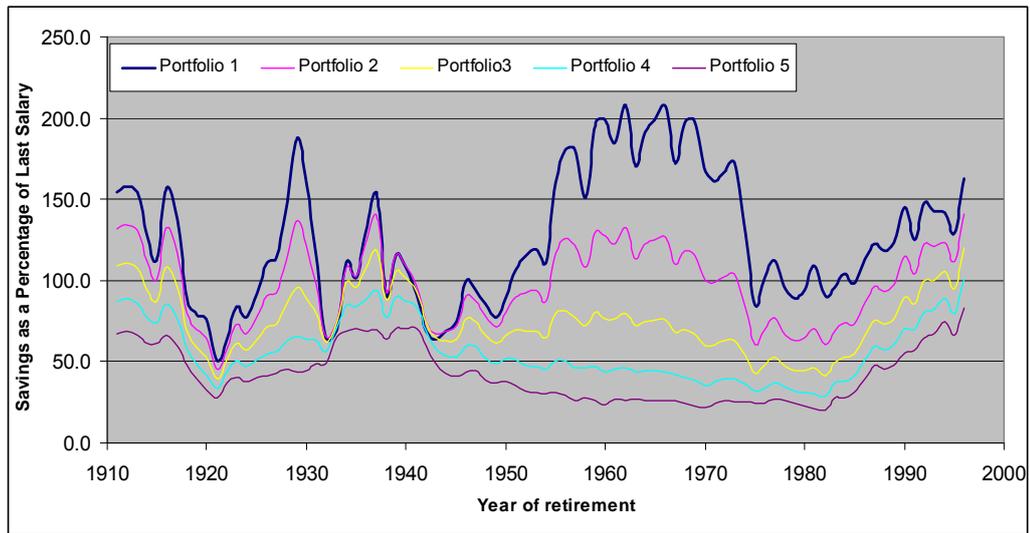
let us calculate savings by date of retirement for the 86 cohorts. Those savings, as a percentage of the final salary, are shown in the Graph 4. The band of savings values is quite broad; the ratio of the maximum to the minimum is about 4.1. Moreover, there are cases of very high differences between savings in consecutive years of retirement, i.e. people who retired in the year 1932 would have one-third of the pension of those who retired in the 1929; people who retired in the year 1975 would have half the pension of those who retired two years before, etc. Differences between savings amounts depend not only on the average real rate of return during the savings period; even more important might be high (negative or positive) return in the year or two before retirement. For example, in year of retirement 1975 the average 40 year return on stocks was equal to 6.2%, which is quite close to the 125 year average value of 6.9%.



Graph 4. Savings as a percentage of final salary, depending on the year of retirement; 100% investments in S&P stocks.

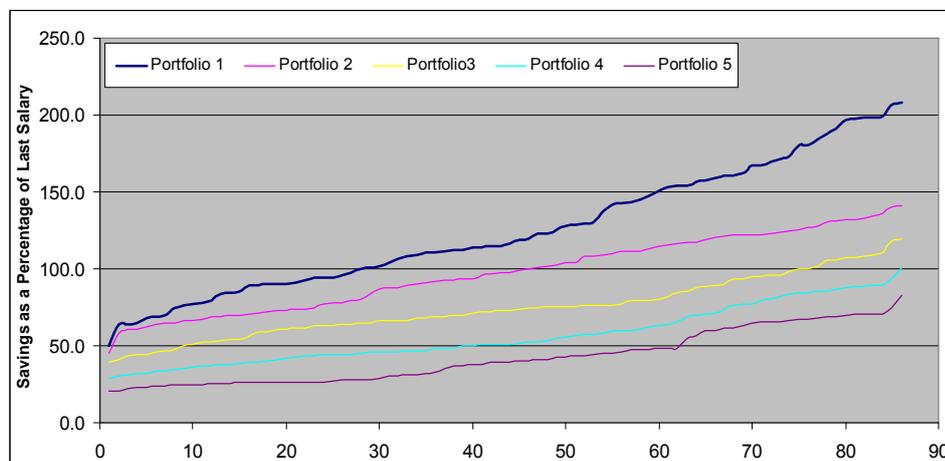
A usual recommendation to address the volatility of returns is portfolio diversification, by means of which the volatility of returns can be substantially reduced. To analyze this recommendation, let us compare possible savings amounts under the assumption that an employee could choose one of the following portfolios:

Portfolio	S&P Stocks	15 years bond
1	100%	0%
2	75%	25%
3	50%	50%
4	25%	75%
5	0%	100%



Graph 5. Savings as a percentage of final salary, depending on the year of retirement and investment portfolio.

From Graph 5 we can see that the cost of lowering the volatility is a substantial decrease of savings. From the savings value point of view (taking no account of volatility), portfolio 1 is superior to portfolio 2, etc. To prove this statement we sort the savings for all portfolios in ascending order. In this way we obtain Graph 6, on which the abscissa is no longer a year of retirement; it is just numbering the saving values from the lowest (1) to the biggest (86). Comparing the worst results for all portfolios, the second worst results, etc., we see that in all cases portfolio 1 provides higher savings than portfolio 2, portfolio 2 provides higher savings than portfolio 3, etc.



Graph 6. Savings as a percentage of final salary, sorted in ascending order.

M. Alier and D. Vitas analyzed some other "simple" solutions like:

- gradual switch from an all equity portfolio to an all bond portfolio a few years before reaching retirement age
- gradual purchase over a number of years (say five years before retirement) of several fixed (nominal or real) annuities, which would start making payments as from the date of retirement.

They showed that these “simple” solutions would have entailed a substantial decrease in replacement ratio.

Note. Use of derivatives and synthetic products might be more effective than “simple” solutions, but this is unrealistic for developing countries.

What can be said about the volatility of savings in developing countries? Obviously, it will be substantially higher than volatility assessed using historical data from the USA. So for developing countries this problem is even more serious.

A closely related problem is investment managers’ time horizon. By nature pension investments are long-term. But can a fund manager, whether a monopolist state institution or competing fund managers, have a sufficiently long-term investment horizon? For a DC obligatory pension system, the law usually permits change of fund manager *at least* once a year. In such a situation fund managers are more concerned about competition with other fund managers, which is mostly based on short-term investment performance. An important issue is that fund managers compete between themselves only; as pension contributions are obligatory, contributors cannot invest them elsewhere.

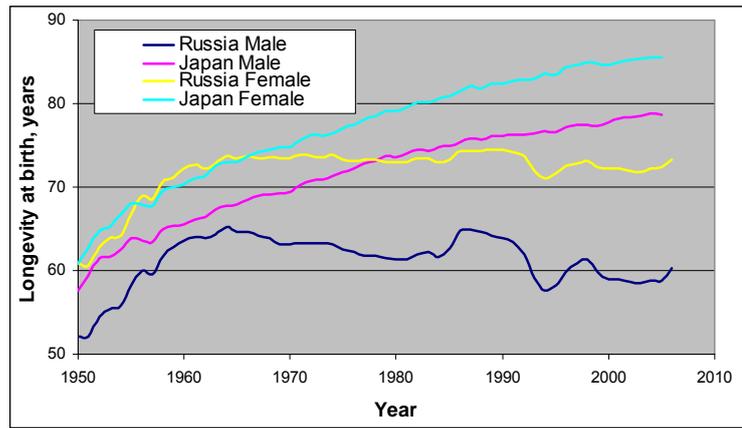
4. Longevity

Another problem for developing countries considered in this paper is forecasting future longevity.

The decumulation (payout) phase of defined contribution pillars starts substantially later than the accumulation one, but it does not make it less important. The success of the decumulation phase greatly depends on the annuity market, which is not well-developed even in many advanced OECD countries; in most developing countries there are virtually no such markets at all. The development of the annuity market is of particular importance for countries which implemented obligatory DC pillars, particularly for those such as Russia which prescribed annuitisation of the obligatory savings.

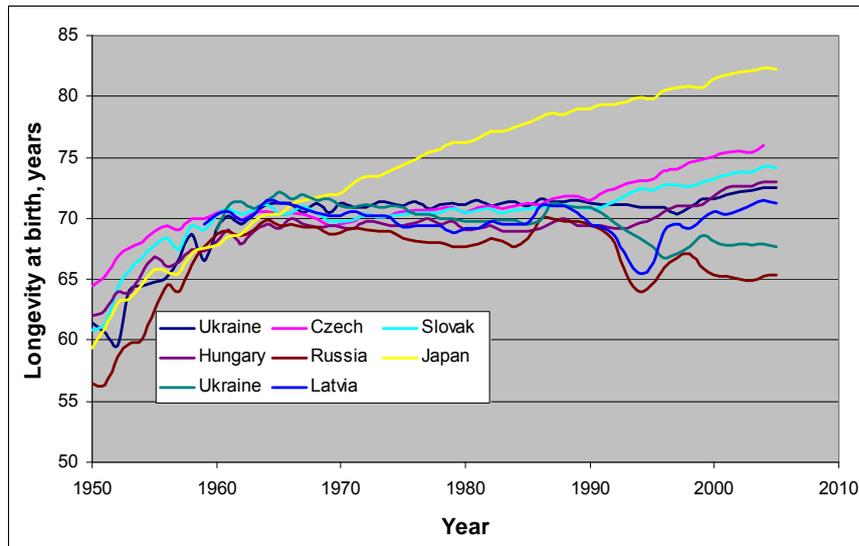
Longevity is one of the key factors which defines annuity prices. As mortality is changing with time, the key point is the forecast of future longevity. Developed countries usually have a long history of population mortality data, which they can use as a base for the forecasts. Unlike the situation with investment returns data, some developing countries have quite a good history of population mortality data; in particular, Russian data is among the best in the world. So, at first glance, at least those developing countries which have good mortality data should be able to have as good mortality forecasts as developed countries. But actually it is not so.

Developing countries have much lower longevity than developed ones; in Russia expected longevity at birth is about 60 years for males and about 73 years for females. Even more important is the fact that the longevity has not been growing from the middle of the 1960s (Graph 7). At the same time, in developed countries there has been a steady increase in longevity. Graph 7 shows the steady increase in Japanese longevity, which in 1950 was quite close to Russian longevity. In the middle of the 1960s it was still very close, but then the difference grew very fast.



Graph 7. Longevity at birth in Russia and Japan¹⁴

The absence of longevity growth for a substantial period of time (at least 30 years) was a characteristic feature for all European Socialist countries and former Soviet republics (Graph 8)¹⁵. In some of them longevity has already started growing again, while in others, like Russia and Ukraine, it has not yet.



Graph 8. Longevity at birth (total – male and female) in European former socialist countries and Japan¹⁶

Both the above-mentioned factors make longevity forecasting much more uncertain than for developed countries:

- Low current longevity in developing countries means (as in the case of low wages) that there is a potential for faster longevity growth in future than in developed countries. Higher growth rates are generally more uncertain than lower ones.

¹⁴ Source: The Human Mortality Database, www.mortality.org, except longevity data in the Russian Federation for the years 1950-1958, which were provided by E. Andreev.

¹⁵ It is worth mentioning that the growth in longevity at birth in the 1950s was mainly due to a sharp decrease in infant mortality.

¹⁶ Source: The Human Mortality Database, www.mortality.org, except longevity data in the Russian Federation for the years 1950-1958, which was provided by E. Andreev.

- Absence of steady mortality growth in some developing countries or relatively short periods of longevity growth in others means that those developing countries have no or very little relevant data to forecast longevity trends.

High uncertainty of longevity forecasts makes pricing much more difficult and leads to the need for higher margins, which causes substantial additional problem for the development of the annuity market.

Conclusion

Thirteen years have passed since the publication of the World Bank's famous research concerning the old-age crisis¹⁷. We have accumulated a lot of experience; there are new data and new ideas. Probably it is time to analyze the situation in pensions around the world, assess the results of the reforms and prepare new recommendations. Office of the Chief Economist of the World Bank issued a report, which is a substantial step in this direction¹⁸, but one report can not solve all problems.

To develop reasonable recommendations concerning developing countries pension systems we, first of all, must pay special attention to the assumptions used. Experience showed that not all of them are correct. The author thinks that actuaries should be more involved in these activities and hope that it will happen.

¹⁷ World Bank (1994): *Averting the Old-Age Crisis: Policies to Protect the Old and Promote Growth*, New York (Oxford University Press).

¹⁸ R. Holtzman, Richard Hintz. (2005) *Old Age Income Support in the 21st Century*. World Bank, Washington, D.C.