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THE INFLUENCE OF SUBJECTIVE LOSS PERCEPTION ON INDIVIDUAL PREDICTION OF PENSION SCHEME RATE OF RETURN

Abstract: The article presents how people subjectively measure the effects of the Polish retirement system. To verify this a survey was conducted in which respondents had to estimate the sum that was going to be collected in the retirement account through the institution of social insurance by 10, 20 or 30 years and individually. The sum was going to be collected thanks to regular payments of 5000 PLN every year. The hypotheses put at the beginning were fully confirmed and the survey proved that hyperbolic discounting really works and that the level of subjective rate of loss is quite high.

Key words: pension scheme, hyperbolic discounting, retirement savings.

1. Introduction

Collecting funds for retirement through a pension scheme is usually criticized. This concerns mainly the efficiency of the accumulated sum of money, which is measured by the rate of return. People tend to perceive their own actions as more efficient than others, in particular if the activities are undertaken by public institutions. Moreover, people perceive differently currently owned funds from those that they have had before or will have in the future. The first effect is connected with subjective loss perception, while the second one with hyperbolic discounting. Both of them can determine the effects of the pension scheme and the way of appraising it by individual participants.

2. What is hyperbolic discounting and subjective loss perception?

Discounting is a method for transferring quotas from different moments in time to one dimension. The term "hyperbolic" means that it is carried out maintaining the downward trend in the discount rate, which means that the longer is the time interval taken for analysis, the lower the discount rate is included in the estimates (cf. [Dasgupta, Maskin 2005]) This rule was proved by Benzion et al. in studies conducted

on students, who were asked to specify the current value of deferred gratification and deferred cost, or to specify how much they would pay for the acceleration of receiving the award, or how much they would like to get for the acceleration of the necessity of paying the obligation [Tyszka (ed.) 2004, pp. 61–62].

Apart from this rule it is important to point out that people discount various sums of money differently. Benzion's studies mentioned before have shown that the discount rate is high for small sums, and increase when the declared interest rate is closer to the market level. Furthermore, the discount rate varies depending on the direction of discounting. For profits the discount rate was higher when they were postponed and lower in the case of accelerating them. For losses it was the opposite [Tyszka (ed.) 2004, pp. 61–62].

The psychological effect connected with thinking about what people could do with the money transferred to the obligatory system, how they could multiply them, is also very important. People subjectively evaluate the rate of return and think that they would be able to achieve a higher rate of return while investing individually. In practice it seems that the long-term rate of return from the public pension scheme is always higher than the one achieved individually. It does not change the fact that most people treat the contributions to the pension scheme similarly to paying taxes. The measure of the tax treatment of savings in the public pension scheme (t_c) can be estimated mathematically. It depends on the amount of contributions (c), costs of participating in the public system (k) and subjective loss perception (s), which takes values from the interval (0.1). It must be mentioned that the parameter s can have negative values from the interval (–1.0) if the estimated rate of return is negative.

$$t_c = f(c, k, s), \tag{1}$$

$$s = (r_{nat} - r_{ins})/r_{nat}, \tag{2}$$

where: r_{nat} – vision of the rate of return achieved individually,
r_{ins} – vision of the rate of return achieved in public system.

The measure of the tax treatment of savings in extreme situations may be equal to 0 or 1. When it is 0, this means that contributions to the system are treated like savings. When it is 1, people perceive it as a typical tax contribution [Góra 2003, p. 489]. The higher are: c, k and s, the measure of the tax treatment of contributions is closer to 1. Usually people think that they are able to achieve a higher rate of return through individual saving ($r_{nat} > r_{ins}$). If this occurs, people avoid paying contributions. Only good education can make people reduce a subjective loss perception and weaken identifying pension contributions with taxes [Góra 2003, p. 490]. The subjective loss perception is going to be estimated in the further part of this article.

The main problem that arises during the organization of the pension scheme is to inform society about the need of saving for retirement purposes. If individuals are aware that their financial future depends on it, they will be willing to participate in the pension scheme. The necessity of securing the future may be perceived as an

excessive burden and because of the effect of short-sightedness people may treat it as completely unnecessary. Therefore, it is the state which should care about public education in this field. The example of the United States indicates that the increase in awareness of the need of protecting for the elderly is a key factor for the increase in additional savings in pension funds. It was proved that even using tax reliefs was less effective than the increase in the awareness of American society [Liberda 2000, p. 137].

3. Effects of participation in the Polish pension scheme

Since 1999 Poland has a new pension scheme based on individual retirement accounts. This system is divided into two parts: pillar I and II. In the first pillar contributions (up to 12.22% of the contribution base) are recorded on the accounts in the Polish Social Insurance Institution (ZUS) and indexed annually so that the accumulated capital would not lose its value, mainly due to the process of rising prices. Sums collected by ZUS are constantly transferred to the payment of pension benefits. This means that the state promises to repay accumulated capital as insured annuity payments on retirement. In the second pillar there were established commercial institutions, whose task was to multiply savings by investing them at the capital market. From 21 established at the beginning of implementing the system of open pension funds (OFE) there remains only 14. Every insured person must choose one fund, to which a contribution (7.3% of the base) is transferred. Monitoring of the second pillar led to many changes, especially connected with charges paid by members of the funds and possibilities of changing the fund. According to the Act of March 25, 2011 [Ustawa z dnia 25 marca 2011...], which changed some other acts connected with the functioning of the social insurance system, the second pillar was divided into two components reducing the contribution transferred to OFE (from 7.3 to 2.3%, assuming a gradual increase in contributions to 3.5% from 2017). The main reason for such a radical move was the fact that in the portfolios of pension funds about 60–70% of assets were investments in government bonds. It should be emphasized that financing the current pension benefits is not possible without increasing the public debt (primarily through the issue of bonds). Due to the saving component in the pension scheme, part of the money that should have been transferred to ZUS, is now transferred to OFE, which causes financial problems for the Social Security Fund. The principles of the reform were that deficits in ZUS should be financed from the income from privatization. But it turned out that they are not sufficient to cover current pension obligations. Of course, each issue of bonds is directly associated with increasing debt. As the limit of public debt nears 55% of GDP, the government decided to reduce the saving component of the system and to create in the second pillar special sub-accounts in ZUS, in which there will be recorded accumulated capital. It will also be indexed, like in the first pillar, but the rate will be dependent on economic growth.

For the purposes of this article calculations were done based on actual data from the years 2000–2009. Only the last 10 years were taken under consideration to allow comparison with the results of the survey.[1] It was assumed that each year 5000 PLN in real terms was paid to the pension scheme.[2] From this sum part was transferred to the individual account in ZUS (3130 PLN), and the remaining amount (1870 PLN, which gives 155.83 PLN per month) was transferred to OFE. Funds collected in the first pillar were annually indexed basing on the real valorisation indicators. It turned out that actually the amount collected at the account in ZUS increased from 31,300 PLN to 42,081 PLN, giving an annual discount rate of 5.3%. In the second pillar calculations were done monthly based on real accounting unit values of the selected fund (at the end of the month)[3] and considering costs associated with the charge of distribution and management. Over 10 years there were gathered the sum of 30,645,75 PLN, the total sum of the contributions was at the level of 18,700 PLN. In this case, the annual discount rate was 8.8%. Combining the amounts collected in both pillars the annual discount rate was 6.7%.

4. Empirical analysis of the tendency for hyperbolic discounting in the context of measuring the effects of participation in the pension scheme

In order to verify whether hyperbolic discounting really works and whether it is applicable to estimate the amounts accumulated in the pension scheme as well as how subjectively are measured losses, a survey was carried out. The content of the questionnaire is presented in Annex 1.

The first task was connected with measuring the sum (including capital and earned interest) which according to the examined persons they would be able to accumulate in the pension scheme, assuming that there is the same amount of 5000 PLN transferred each year. The second task was connected with measuring the sum that respondents would be able to accumulate themselves if they had the same amount of money and could have freely invested it. At the beginning there were two research hypotheses created. First, that the respondents will be thinking that the amount of money would be higher when it is accumulated individually. Secondly, the lengthening of the forecast period will result with estimating discount rates at a lower level.

The survey was conducted among 229 persons, of whom 187 were women and 42 men. All the respondents were students of master studies in economics. The analysis was carried out for three periods of saving:

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[1] Measuring effects for 20 and 30 years is impossible, because of the too short time of the functioning of the new pension scheme.

[2] Contribution is calculated for the basis at the level of about 2.130 PLN gross monthly.

[3] The OFE Polsat was chosen as the one that achieved the highest rate of return.

10 years – 74 persons,
20 years – 75 persons,
30 years – 80 persons.

The respondents were not measuring the discount rate directly, but had to point out the nominal amount of gathered funds. Based on these predictions the interest rate was calculated by researchers. To do this some assumptions were made:

– the amount of contributions is transferred once a year anticipating the moment of calculating interests,
– in the analyzed period the prices remain at the same level (no inflation).[4]

The discount rate was measured according to the formula [Bogacka-Kisiel 2000, p. 89]:

$$W_n = L \times q \times \frac{q^n - 1}{q - 1} \tag{3}$$

where: L – same amount of regular contribution, q – $q = r + 1$, r – interest rate, W_n – capital and interest after n time periods.

The average values of the measured amounts and interest rates for several time periods are presented in Table 1.

Table 1. Average values of measured amounts and interest rates for several time periods

Item	10 years	20 years	30 years
Amount accumulated in the pension scheme	52,755	98,933	156,100
Amount accumulated individually	66,527	152,615	235,433
Interest rate for the amount accumulated in the pension scheme	0.9635	–0.6307	0.0138
Interest rate for the amount accumulated individually	4.4324	2.2955	2.1288
Subjective loss perception $s = (r_{nat} - r_{ins})/r_{nat}^*$	0.7826	1.2748	0.9935

$^*r_{nat}$ – vision of the rate of return achieved individually, r_{ins} – vision of the rate of return achieved in public system.

Source: own calculations.

According to the presented data, it can be concluded that the first hypothesis was confirmed entirely, because for each of the forecasted periods the discount rate estimated for funds collected independently was higher than for the amounts collected through the pension scheme. The subjective loss perception for participation in the

[4] Respondents were informed about this assumption before the survey.

obligatory pension scheme indicates that the respondents perceive the Polish pension scheme as a tax rather than savings (values close to 1). For the 20 year period the value of s was higher greater than 1, due to the fact that the average discount rate for institutionalized system was in minus.

The second hypothesis was confirmed only partially. The discount rates realized for the independently gathered money were getting lower along with extending the forecast period. The estimated discount rates for amounts collected through ZUS and OFE were very low, for 20 years, even in minus, which means that the respondents believed that there is less money, rather than more. Such a situation is possible, even when there is no inflation, because the decline of capital may be caused by high costs or the poor functioning of OFE. It can be also caused by the omission of the state "promises" of paying pensions. However, taking into account the results of calculations based on data for the years 2000–2009, negative rates of return should not be expected. Thus, from the obtained results there were excluded observations in which the discount rate was in minus. This amounted to 37 observations. The results of the survey after this operation are shown in Table 2.

Table 2. Average values of measured amounts and interest rates for several time periods (only for discount rates in plus)

Item	10 years	20 years	30 years
Amount accumulated in the pension scheme	55,618	111,700	164,818
Amount accumulated individually	69,576	169,822	253,327
Interest rate for the amount accumulated in the pension scheme	2.1305	1.2300	0.5121
Interest rate for the amount accumulated individually	5.6593	4.1272	2.6409
Subjective loss perception $s = (r_{nat} - r_{ins})/r_{nat}$ *	0.6235	0.7020	0.8061

* r_{nat} – vision of the rate of return achieved individually, r_{ins} – vision of the rate of return achieved in public system

Source: own calculations.

For such modified results, it appears that both hypotheses are confirmed fully, because also for discount rates realized by the pension scheme hyperbolic discounting works. It can be also noticed that the subjective loss perception for participating in the obligatory pension scheme grows with time. This means that the longer contributions are transferred to the institutionalized system, the more they are perceived as taxes, and less as savings.

It is also interesting how the respondents plan to invest money on their own to achieve this positive effect of a higher discount rate.

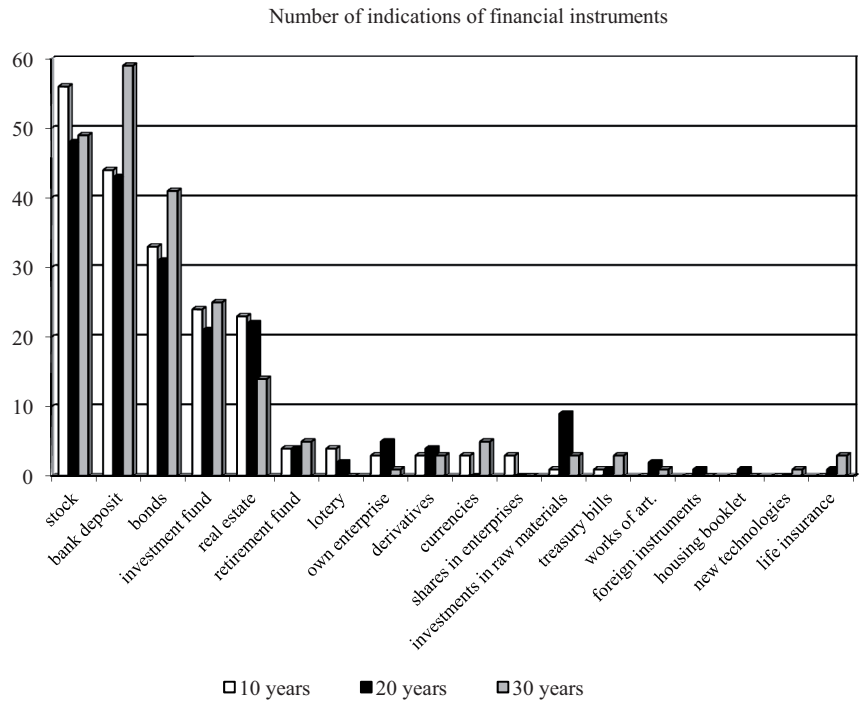

Figure 1. Instruments used for investing for gathering funds for retirement

Source: own calculations.

The results shown in the graph (Figure 1) are connected with the observation, in which the gap between the discount rates is positive and satisfies the assumption made at the beginning that the rate obtained individually is higher than that achieved through a pension scheme. In this case, all observations that meet this condition were included, regardless of the value of the rate (positive and negative). Pointing out financial instruments was spontaneous, in an open question so as not to give solutions, but rather to check the financial market knowledge among the respondents. It turned out that the most popular instruments are shares (the stock market game), bank deposits (in fixed-term deposits and current accounts) and bonds (treasury, none of the respondents indicated other types, such as municipal or commercial). The respondents were also more willing to invest money in bonds and bank deposits, and less likely in shares with a lengthening of the forecast period. This is a perfect example of the short-sighted loss avoiding, which means that people consider short-term price fluctuations as too important in relation to long-term investments

[Zielonka 2006, p. 99]. It seems, therefore, that the effects estimated by respondents are not supported by good knowledge of the financial markets and the tendencies in the behaviour of investors. In this context, these results may be an example of excessive self-confidence, which is also regarded as a deviation from the rationality of investors [Zielonka 2006, p. 55].

5. Summary

The results of the survey allow us to confirm that for each of the forecasted periods, the discount rate for funds collected individually is higher than for the amounts collected through the pension scheme. Therefore, the subjective loss for participating in the obligatory system is high (closer to 1 than 0), and as a result the contribution is treated more as a tax than savings. It is quite worrying that some respondents assumed that the capital accumulated in the pension scheme will be lower than the sum transferred to it. This demonstrates clearly the lack of trust in the institutional public pension scheme.

It should also be noticed that after eliminating observations with negative rates of return, the discount rates are getting lower along with the lengthening of the forecast period. This is consistent with the hypothesis of hyperbolic discounting. It confirms the fact that people do not estimate the results obtained in time rationally, because in practice they should expect higher and higher rates of return, especially if the capitalization is applied.

Estimated discount rates (for 10 years of saving) for the amounts accumulated through the pension scheme deviate from those actually earned in years 2000–2009. Undoubtedly, such a perception may be affected by the changes made in 2011 and by publicizing in the media the negative financial results of the OFE received during the crisis. The average discount rate for the amount accumulated independently for the same time (10 years) is closer to that actually achieved by the system, although still lower.

It must be noticed that the described survey is not representative for the whole population because it was conducted only with a group of students of economics and the appropriate gender structure was not maintained. However, it can lead to an additional conclusion that if economists cannot reasonably estimate the effects of the pension scheme, it is very likely that "ordinary citizens" would have even more difficulties in this area. This shows clearly how important is education and public awareness of the principles of saving for retirement purposes.

Annex 1

Ankieta na potrzeby badawcze

Załóżmy, że każdego roku odprowadzasz do systemu emerytalnego kwotę 5000 zł.

Jaka kwota uzbiera się na koncie emerytalnym po upływie 10/20/30 lat? ……
…….

Gdybyś mógł (mogła) sam (sama) inwestować tę kwotę, to ile udałoby Ci się zgromadzić w tym samym czasie?

……

Jakie znasz dostępne na rynku instrumenty, w które można by zainwestować powyższą kwotę?

……
……
……
……

Metryczka: Płeć (K/M) ……. Wiek …….

Questionnaire

Let us assume that every year you transfer to the pension scheme 5.000 PLN.

What sum will you collect at your pension account after 10/20/30 years? ……
……

If you could invest the money yourself, how much could you collect in the same time? ……

What instruments do you know to invest such a sum of money? ……
……

Gender (F/M) ……. Age …….

References

Bogacka-Kisiel E. (ed.), *Usługi i procedury bankowe*, AE, Wrocław 2000.

Dasgupta P., Maskin E., Uncertainty and hyperbolic discounting, *American Economic Review* 2005, vol. 95, no. 4.

Góra M., Inne spojrzenie na podstawowe zagadnienia ekonomii emerytalnej, *Ekonomista* 2003, nr 4.

Liberda B., *Oszczędzanie w gospodarce polskiej, teorie i fakty*, PTE, Warszawa 2000.

Tyszka T. (ed.), *Psychologia ekonomiczna*, GWP, Gdańsk 2004.

Ustawa z dnia 25 marca 2011 r. o zmianie niektórych ustaw związanych z funkcjonowaniem systemu ubezpieczeń społecznych, DzU 2011, nr 75, poz. 398.
Zielonka P., *Behawioralne aspekty inwestowania na rynku papierów wartościowych*, CeDeWu.pl, Warszawa 2006.

WPŁYW SUBIEKTYWNEJ OCENY STRATY NA SZACOWANIE INDYWIDUALNEJ STOPY ZWROTU Z SYSTEMU EMERYTALNEGO

Streszczenie: Niniejsze opracowanie ma na celu przedstawienie tego, jak w sposób subiektywny oceniane są efekty działania polskiego systemu emerytalnego. W tym celu przeprowadzone zostało badanie, w ramach którego uczestnicy mieli oszacować kwotę, jaka zostanie zgromadzona na rachunku w ramach systemu emerytalnego w ciągu dziesięciu, dwudziestu lub trzydziestu lat oraz we własnym zakresie przy założeniu regularnych corocznych wpłat kwoty 5000 zł. W wyniku badania potwierdziły się postawione na wstępie hipotezy o działaniu w tym przypadku dyskontowania hiperbolicznego oraz występowaniu wysokiego poziomu subiektywnej oceny straty.

Słowa kluczowe: system emerytalny, dyskontowanie hiperboliczne, oszczędzanie na emeryturę.