A Critical View on Pension Savings in Slovakia

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In almost all countries around the world, pension systems are based on several pillars. This is also the case of Slovakia with its three-pillar pension system. The paper presents a case study underlying the risks that can seriously affect the amount of future pensions. The case study clearly indicates that current pensions in Slovakia paid under all three pillars do not correspond with the expectations from the implementation of the three-pillar pension system. The aim of the paper is to the risks that can seriously affect the amount of future pensions. Our own contribution is the determination of the amount of pension for a specific pensioner specified in the presented case study. Within the saving phase of pension contributions the development of investment fund returns, the amount of future pensioner´s contributions, as well as administrative costs are analyzed on a monthly basis. The payout phase is modelled using actuarial functions applying the mortality tables of Slovakia.

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INTRODUCTION

Since almost all economically active people are interested in their future retirement, a great number of economists and mathematicians are engaged in research into the pension systems around the world. Over the years, there has been general recognition that serious economic problems have plagued and continue to plague many aged persons in almost all countries. We will mention at least some of the contributions we worked with in our study. For example, the paper Schulz and Carrin (1972) examines the personal savings rates required to provide an average worker with adequate retirement funds, the influence of various definitions of adequacy, inflation, and economic growth on the magnitude of the retirement preparation.

After 2000, most defined benefit pension plans saw a decline in funding ratios, mainly due to lower asset prices. Weller and Wenger (2009) identify four indicators for the reckless investment behavior of pension plans: no portfolio balance, conflicts of interest for employers, conflicts of interest for managers, and failure to implement best investment practices. Rydqvist et al. (2014) make a very interesting finding which contributes to policy debates on effective taxation and to financial economics research on the long-term effects of taxation on corporate finance and asset prices. Konicz and Mulvey (2016)

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provide some guidelines to individuals with defined contribution pension plans on how to manage pension savings both before and after retirement. Albrecher et al. (2016) offer a summary of the main topics and findings from the Swiss Risk and Insurance Forum 2015. Dolls et al. (2018) also suggest how can retirement savings be increased, and they emphasize that the increase in tax deductible items increases the increase in savings on pension accounts.

Kieren and Weber (2021) suggest that policy makers should consider offering combined sequential and annuity solutions. Beneficiaries who refuse a full annuity could retain some of their accumulated wealth while gaining protection against the risk of longevity.

Modelling of pension saving and insurance in Slovakia is presented in several papers. The most significant of them include the works Melicherčík et al. (2015a, 2015b). Moreover, we were inspired by psychological assessment of this issue in Bačová and Kostovičová (2018).

The pension system in Slovakia is based on the three pillars. The first one is a pay-as-you-go pillar, it is a defined benefit scheme regulated by the Act no. 461/2003 Coll. on Social Insurance.[2] Compulsory pension insurance in the Slovak Republic is administered by the Social Insurance Agency. Persons insured only in the first pillar pay contributions only to the Social Insurance Agency and, at old age, they will be provided with the income only by the Social Insurance Agency in accordance with the number of years of service, income during their working life and current pension amount in a given year. The second pillar is partially voluntary and is a funded scheme representing appreciation in the funds of the pension management companies under the Act no. 43/2004 Coll. on Old-age Pension Savings. The third pillar is entirely established on a voluntary basis and the terms and conditions of its operation are laid down by the Act no. 650/2004 Coll. on Supplementary Pension Savings. Its main advantage is obtaining of the supplementary pension for an employee and the tax benefit granted to the employer who remits the contributions for an employee in a certain amount.

In the Slovak Republic, the second pension pillar was established on 1 January 2005. Its aim was not to ruin the public finances, ensure a reasonable pension amount and appreciate savers´ money. The main background to its establishment particularly included the unfavourable demographic trends and jeopardised future solvency of the Social Insurance Agency. This pillar is regulated by the Act no. 43/2004 Coll. on Old-age Pension Savings and have been made an integral part of the pension system in the Slovak Republic.

The amount of social security contributions is 18% of the assessment base, i.e., the average monthly wage. Since its beginning, contributions to the second pillar were 9%, however in 2012, the premium rate for the second pillar was decreased by the amended act to 4% and this was applied until 2016. In the following years, the premium rate was increasing by 0.25 percentage points until 2020, since it has remained at the level of 5% of the assessment base.

In Slovakia, savers´ funds in the second pillar are managed by the pension management companies. Employees choose a management company according to their interest and preferences and they entrust it with appreciation of their funds. According to the Act no. 43/2004 Coll., the pension management companies are obliged to administer one guaranteed bond fund and one non-guaranteed equity fund.

Appreciation obviously does not only depend on the choice of the management company but also on the investment strategy of the fund chosen by the client.

Only insurance or reinsurance companies meeting the requirements set for such activities according to the Act no. 39/2015 Coll. on Insurance and amending and supplementing certain acts can perform insurance and reinsurance activities. In this case, the pension management companies but also supplementary pension insurance companies have to follow this act. They also secure payments of (provisional) pensions resulting from the character of their activities. Pursuant to Section 23 of this act,

[2] Links of the Acts are in the References.

the insurance and reinsurance companies are required to manage funds of their clients with prudence. This fact affects the total amount of pension in the payout phase of the pension insurance.

In the Slovak Republic, the third pillar of the pension system was established by the Act no. 650/2004 Coll. on Supplementary Pension Saving and amending and supplementing certain acts of 1 January 2005. This pillar is managed by the supplementary pension companies. Supplementary pension saving is voluntary and the employees themselves decide on the entry into this scheme. The main advantage of the conclusion of the supplementary pension saving contract is a contribution provided by an employer. Information concerning supplementary pension saving is published in the collective agreements of companies as a result of bargaining between the trade unions and employers or an employer agrees on them with the authorised representatives of the employees. The voluntary nature of the employer´s contributions, however, excludes risk at work. In such cases, the employer is obliged to pay contributions to the employees of at least 2% of their assessment base. An employee who performs hazardous work may or may not save in the third pillar.

The third pillar is a defined contribution and funded scheme as well as the second one and, therefore, its aim is not only to save but also appreciate cash resources accumulated in the funds.

According to the Income Tax Act no. 595/2003 Coll., an employee can reduce his/her tax base by EUR 180 which represents a maximum tax allowance related to the contributions paid to the third pillar. The amount of this type of the tax allowance is derived from the amount an employee provably has paid. At the same time, a taxpayer may deduct this tax allowance only when he/she concluded a contract after 31 December 2013 and paid supplementary pension contributions based on the participation agreement and, moreover, he/she has not concluded any other contract in accordance with the Act no. 650/2004 Coll.

This advantage of the tax base reduction may also be used by the employer in relation to contributions to the employees. It differs in particular in terms of the amount of the claimed tax allowance. The employer may contribute up to 6% of the employee´s gross wage and these contributions are exempted from the income tax and social security and healthcare insurance contributions.

This paper presents a case study in which the future amount of pension is modelled for a pensioner born on 1 May 1958 who retired on 1 January 2021 and, obviously, was paying social insurance required by law. He entered the second pillar on 1 January 2005 at the age of 46 and 8 months and on 1 July 2009 he also started to contribute to the third pillar of pension saving. Our future pensioner joined the second pillar at a relatively late age and therefore, the contribution period and opportunities to appreciate his savings were not very favourable. This has translated into the amount of his pension. In the study, we lay emphasis on real appreciation of savings and careful determination of the pension amount which a pensioner will receive.

Our own contribution is the determination of the amount of pension for a particular pensioner specified in the presented case study. Based on the Council Directive 2004/113/EC of 13 December 2004 implementing the principle of equal treatment between men and women in the access to and supply of goods and services, we apply the unisex life tables of the Slovak Republic of 2019 to model a survival function.

With regards to appreciation of financial resources during the payout phase under the second and third pillars, we use yields modelled by means of the Smith-Wilson yield curve published on the website of the European Insurance and Occupational Pensions Authority, 2021 and AAA-rated bond yields which are traded in the euro area, modelled by means of the Svensson yield curve published on the European Central Bank´s website (European Central Bank, 2021), both of 30 November 2020.

Based on the above assumptions, we set the following hypotheses at the beginning of our work:

H1: The life expectancy of a 62-year-old pensioner is (for 2020) 19.14 years.

If a 62-year-old pensioner specified in our study lives further 19 years, the entire amount saved in the second and third pillars will be returned to him in the form of monthly pension payments.

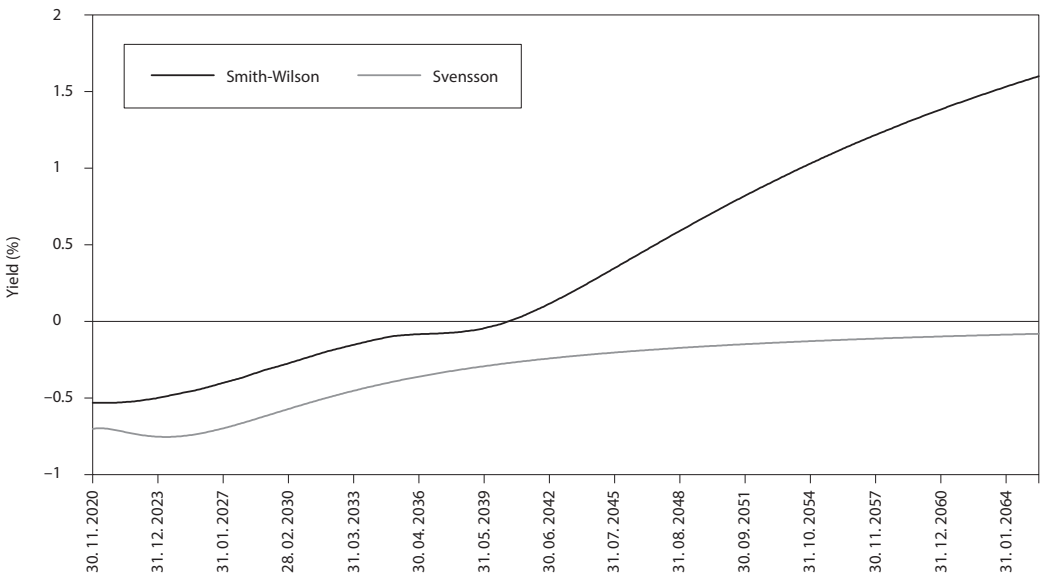
H2: If a 62-year-old pensioner specified in our study receives a pension from all three pillars, his monthly pension will be at least 30% higher than a pension that he would receive only from the first pillar.

The paper is organized as follows. Section 2 – Preliminaries, gives information about basic data related with yields of risk-free bonds traded in the euro area and life tables of the Slovak Republic. It also gives basic actuarial notation of the survival function and probability of death. Section 3 – Savings phase of old-age and supplementary pension savings, describes the development of appreciation in individual funds in more detail. Section 4 – Payout phase of pension savings, offers basic models for determining the amount of monthly pensions from all three pillars of pension savings. Section 5 – Conclusion, offers our thoughts and ideas on how to more accurately model the amount of pensions, but also our attitude as such to the idea of long-term savings in such funds.

1 PRELIMINARIES

The basic building blocks in our modelling are the above-mentioned Smith-Wilson and Svensson yield curves which are shown in Figure 1. Technical notes relating to both yield curves published on the websites of mentioned institutions and make an integral part of our modelling (Technical notes, 2020; Technical documentation – EN, 2021).

Figure 1 Smith-Wilson and Svensson yield curves, business day – November 30, 2020



Source: Own construction using the European Insurance and Occupational Pensions Authority and the European Central Bank (2021)

Since the survival and mortality probabilities represent the basic building block in actuarial modelling, we will remember them:

${}_tp_x$ – the probability that individual at age x survives at least to age $x + t$,

${}_tq_x$ – the probability that individual at age x dies before age $x + t$,

${}_{r|t}q_x$ – the probability that individual at age x survives r years, and then dies in the subsequent t years, that is, between ages $x + r$ and $x + r + t$.

The probability ${}_{r|t}q_x$ can be calculated by formula (Dickson et al., 2009):

$$ {}_{r|t}q_x = {}_rp_x - {}_{r+t}p_x . \quad (1) $$

As our model assumes monthly pension payments while the pensioner is alive to determine monthly mortality probabilities as main variables, we apply the so-called fractional age assumption – for integer x, provided the uniform distribution of deaths in every age interval $[x, x + 1]$, and for $0 \leq s < 1$, assume that ${}_sq_x = s \times q_x$. For more information see, for example Dickson et al. (2009).

2 SAVINGS PHASE OF OLD-AGE AND SUPPLEMENTARY PENSION SAVINGS

We suppose in our case study that the saver was born on 1 May 1958 and is a man. We also assume that he entered the second pillar on 1 May 2005 at the age of 46 years and 8 months and was saving until 31 December 2020. He retired on 1 January 2021 at the age of 62 years and 8 months. This assumption is determined in accordance with the Act no. 461/2003 Coll. and the Annex 3a prescribing the retirement age. On 1 January 2021, the saver´s period of service is 40 years and 8 months. To determine the amount of contributions paid to the Social Insurance Agency and pension management companies, we build our model on the development of the average monthly salary since 2005.

We assume that the saver also makes contributions to the third pillar and suppose that his employer contributes 2% of the assessment base. This fact is mostly conditional upon the employer contributing the same amount.

Modelling of the respective performances of both funds is set on the first day of the month for the second and third pillars.

2.1 Valuation in funds and investment strategy of the second pillar

The level of appreciation and saved amount depend on the development of the pension unit value in the fund. Our model includes funds appreciation for the period whose performance is already known. The Act no. 43/2004 Coll. also determines an investment strategy regulating a transfer of net assets from another fund to the bond fund. Section 92 of the Act provides for the saver´s net assets transfer according to his age.

Appreciation of savings depends on the pension unit value and time of purchase. Due to the availability of data on the websites of pension management companies, our model shows saving in the equity and bond funds of VÚB Generali d. s. s., a. s.

To determine fund performance, we use the indicator of the cumulative fund return. This indicator reflects the case of a full amount of one-off investment at the beginning of the period. However, saving in the second pillar is regular, thus the contributions are credited continually which also affects appreciation of the funds.

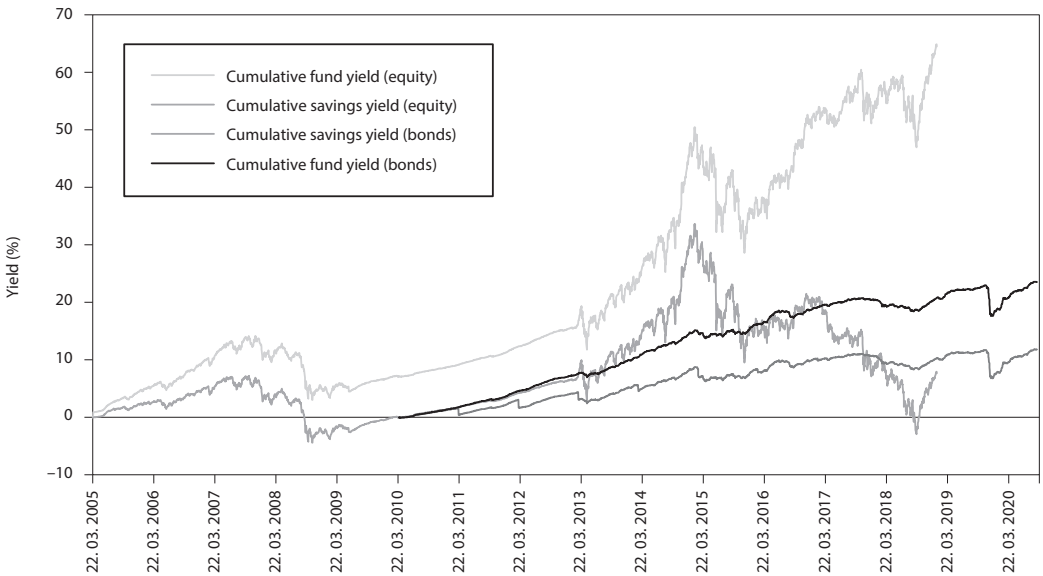
Overall yield of savings is significantly affected mainly by fluctuations of the fund appreciation. Compared to the cumulative fund return, the real savings appreciation is substantially lower, in some phases of saving it is even negative. This situation is illustrated in Figure 2 defining appreciation of both funds.

The cumulative savings return in the equity fund was 7.65% on 1 May 2019 but as a result of the assets transfer, this figure does not reflect real appreciation. If the charges are also taken into consideration, the cumulative fund return of 9.66% would be achieved.

The cumulative fund return represents appreciation based on the pension unit value in the fund, while the cumulative savings return also takes the amount of paid contributions and the saver´s account value into account. The data are modelled for the period of saving in the bond fund from 1 May 2010 to 31 December 2020 without accounting for charges.

As Figure 2 shows, the return of the fund is higher than that one of savings which mainly results from the fund investment strategy as individual contributions are paid regularly. It also implies that if the total amount of contributions was paid as a one-off payment, the saver would achieve appreciation

Figure 2 Equity and bonds fund cumulative yields in the second pillar (free of charges)



Source: Own construction using data from the web page of the Generali, d.s.s. (2020)

equalling to the cumulative fund return of 23.38%, without taking account of charges. The return of the bond fund in our model, in the case of regular contributions was 11.29% on 31 December 2020 and if its value also took charges into account, the final cumulative savings return would only be 9.12%, see Figure 2. The cumulative savings return is accompanied by larger fluctuations compared to the cumulative fund return since always on 1 May in a particular year, a part of the account value of the equity fund is deposited to the fund following the set investment strategy. Charges mentioned in connection with funds are stipulated in Section 63 of the Act no. 43/2004 Coll. Pursuant to this Act, the pension management companies usually invoice maximum charges.

The total contributions to the second pillar made by our saver bring the total to EUR 9 969.22. If he saved in the funds of VÚB Generali d. s. s., the resulting amount saved by means of an investment strategy would be EUR 11 300.58 after their appreciation in the funds and including all charges.

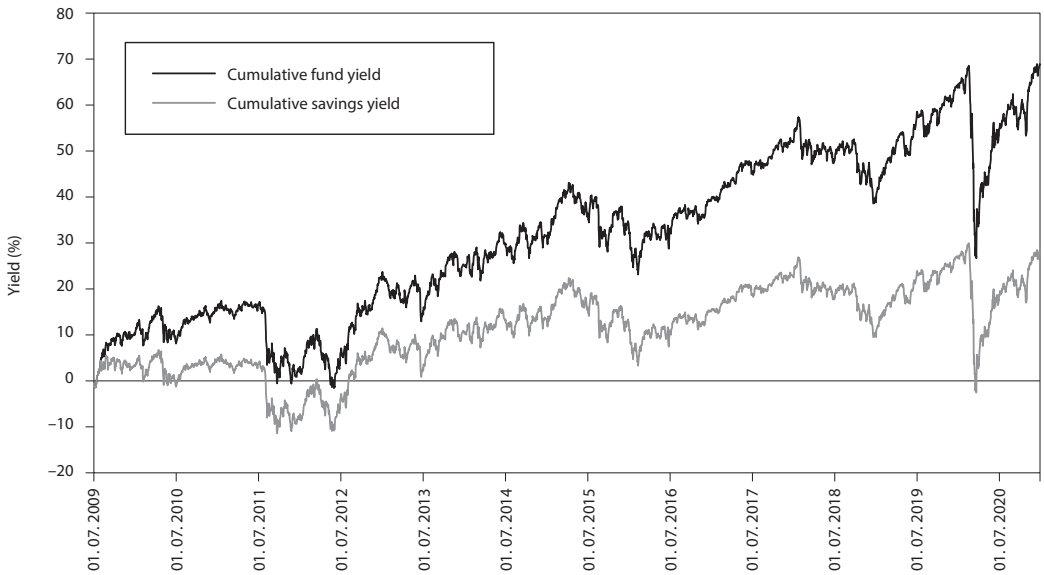
2.2 Valuation in funds and investment strategy of the third pillarr

In this part of the paper we focus on appreciation in the funds of the company NN Tatry – Sympatia, d. d. s., a. s. which has been operating in the Slovak market since 2006 (Company NN Tatry – Sympatia, 2020). Cumulative appreciation of the growth contribution pension fund amounted up to 68.92% from 2009 to the end of 2020. This situation is illustrated in Figure 3.

The growth fund was repeatedly achieving significantly higher appreciation compared to the savings in the fund. This is primarily due to regular investments and fluctuations in financial markets. The cumulative fund return reached up to 28.70%, excluding charges in the fund.

The charges in the contribution fund influenced the level of savings appreciation more than in the case of the second pillar. It is mainly due to higher rates which are the basis for the calculation of those charges. The saver´s return achieved after including the charges is 11.53% representing substantially lower savings appreciation than the fund potential. Our saver was saving in the third pillar from 2009

Figure 3 Equity fund cumulative yields in the third pillar (free of charges)



Source: Own construction using data from the web page of the NN Tatry – Sympatia, d.s.s. (2020)

to 2020. As a result of the amended Act no. 650/2004 Coll., the amount of a charge for fund management and appreciation was changed several times during this period. All amendments of charging policy are reflected in our model. The amount of the charge for the whole saving period was EUR 526.61 for fund management and EUR 202.94 for appreciation.

Thus, if we saved in the growth fund of NN Tatry – Sympatia, d. d. s., the resulting saved sum would amount to EUR 5 548.35 after appreciation in the fund including all charges.

3 PAYOUT PHASE OF PENSION SAVINGS

We recall that in our case study, we consider the saver who retired on 1 January 2021 at the age of 62 years and 8 months. He was pension insured in the first pillar for 40 years and 8 months. He started to save in the second pillar at the age of 46 years and 8 months and was contributing to it for 15 years. He was contributing to the third pillar since 2009, for 10 years and 6 months. The payout phase of our saver´s pension insurance consists of the payout either only from the first pillar or from the first as well as second pillars or also from all three pillars.

In this part we also use the term insurance as we model the amount of pensions in the second and third pillars by means of the saved amount representing a single premium for a lifetime monthly arrear pension.

3.1 Permanent pension from the first pillar

The amount of the permanent[3] monthly pension MP_1 paid from the first pillar is determined in accordance with the Act no. 461/2003 Coll. based on the relation:

[3] Life time or whole life pension.

$$MP_1 = APSP \times PIP \times CPV\,, \tag{2}$$

where:

APSP – average personal salary point,

PIP – pension insurance period,

CPV – current pension value, which is determined based on the growth of the average wage.

The average personal wage point *APSP* is determined as a proportion of the amount of personal wage points calculated over particular calendar years for the period of reference and the number of years of the pension insurance period. The personal wage point is a proportion of a personal assessment base and general assessment base. The general assessment base is 12 times the average monthly wage in the Slovak economy for a given year determined by the Statistical Office of the Slovak Republic. Since we assume that our pensioner was receiving the average wage throughout his active working life, the average personal point is *APSP* = 1.

The current pension value *CPV* applicable as of 31 December of a calendar year is changed as of 1 January of the following year by means of the index representing a proportion of the average wage determined for the third quarter of the preceding calendar year and average wage determined for the third quarter of the calendar year two years preceding the calendar year since which the pension value has been adjusted. The sum of the pension value identified in this way is always applied from 1 January to 31 December of a calendar year. The current pension value applied to calculate the pension benefit is a pension value valid in time of entitlement to draw a pension. It reflects a monetary value of the average personal wage point. In 2021, its value is *CPV* = 14.2107 EUR. For more information, see Social Insurance Agency, 2021.

The pension insurance period *PIP* is 40 years and 8 months, i.e., *PIP* = 40.6667 years.

Based on Formula (2), our saver´s pension amount paid from the first pillar is MP_1 = 573.51 EUR.

3.2 Permanent pension from the second pillar

As we model the permanent pension paid from the second pillar (but also from the third pillar) by means of the actuarial functions, we first recall basic symbols and formulas:

- S – accumulated sum in the Old-Age Pension Saving Scheme, gross single premium;
- $R_{t^*}(z)$ – Smith-Wilson yield curve or Svensson yield curve, respectively; continuous compounding yield in % p.a. from business day t^*;
- $P(z) = \exp\left(-\frac{R_{t^*}(z)}{100\%} \times z\right)$ – discounting factor with continuous compounding yield $R_{t^*}(z)$;
- x – retirement age;
- ω – maximum age to which a person can live to see (regarding used life tables ω = 105 years;
- t – number of months in the model, i.e., $t = 1, 2, \ldots, \omega - x + 1$;
- α – initial costs as an absolute amount in monetary units independent on an accumulated sum;
- β – administrative costs as a % p.a. from yearly annuity;
- γ – collection costs as a % p.a. from yearly annuity.

This product contains permanent monthly annuity and payment of a lump sum equal to not yet paid monthly annuities in the case of the beneficiary death during the period of the first seven years of pension payment (Section 32, Paragraph 2 of the Act no. 43/2004 Coll.).

Monthly pension annuity MP_2 of this product is given by formula:

$$MP_2 = \frac{S \times \left(1 - \frac{\alpha}{100\%}\right)}{12 \times \left(a_x^{(12)} \times \left(1 + \frac{\beta}{100\%} + \frac{\gamma}{100\%}\right) + (MA)_{x:7}^{(12)}\right)}, \tag{3}$$

where:

$$a_x^{(12)} = \sum_{t=1}^{12\times(\omega-x+1)} \frac{1}{12} \times {}_{\frac{t}{12}}p_x \times P\left(\frac{t}{12}\right) \tag{4}$$

is expected present value of whole life benefits in advance in the amount of $1/12$ of monetary units (m.u.), 12-times per year, conditional upon the beneficiary life, and:

$$(MA)_{x:7}^{(12)} = \sum_{t=1}^{83} \frac{84-t}{12} \times {}_{\frac{t}{12}|\frac{1}{12}}q_x \times P\left(\frac{t+1}{12}\right) \tag{5}$$

is the expected present value of the sum of not yet paid monthly annuities in the case of the beneficiary death during the period of the first seven years of pension payment. For more information, see Špirková, Szűcs and Kollár (2019).

One-off costs of the insurance company – α in the amount of EUR 200, administration costs β as 1% of the yearly pension and collection costs γ in the amount of 0.2% of the yearly pension are also embedded in Formula (3).

Provided that our future pensioner chooses the funds of VÚB Generali d. d. s., a. s., he would receive the pension from the second pillar amounting to EUR 44.63 when calculating the returns by means of the Swensson yield curve. When applying the Smith-Wilson curve, this amount would be EUR 46.57.

3.3 Permanent pension from the third pillar

The so-called monthly benefit paid from the third pillar of pension saving will be calculated on the basis of the relation:

$$MP_3 = \frac{S \times \left(1-\frac{\alpha}{100\%}\right)}{12 \times a_x^{(12)} \times \left(1+\frac{\beta}{100\%}+\frac{\gamma}{100\%}\right)}, \tag{6}$$

where relations and variables have the same meaning as in the relation for the calculation of the pension paid from the second pillar.

However, here it is a monthly permanent arrear pension the saver will be paid while he is alive. After his death, the survivors will receive neither any pension nor other benefits.

When calculating the same costs as in the calculation of the pension paid from the second pillar and using the Svensson curve, our pensioner would receive the pension from the third pillar amounting to EUR 21.91 and, when applying the Smith-Wilson curve, the pension amount would rise to EUR 22.88. For comparison, see Tables 1 and 2.

3.4 Pension form the first and second pillars simultaneously

If our saver received the pension from the first pillar as well as the second one, he would be paid the decreased pension from the first pillar as his pension insurance period will be reduced and recalculated according to the formula:

$$PIP^* = 365 \text{ days} \times \sum_{i=1}^{16}\left(1 - \frac{c_i\%}{22.75\ \%}\right), \tag{7}$$

where c_i is an amount of contributions paid to the second pillar (in %) in particular years and the value (18.00 + 4.75)% = 22.75% represents the total contributions to the Social Insurance Agency and contributions to the Reserve Fund of Solidarity in %.

Our saver´s pension insurance period was reduced by 4.6081 years and thus, his pension from the first pillar (when also receiving the pension from the second pillar) will be EUR 512.42.

Tables 1 and 2 clearly demonstrate the pension our pensioner may expect.

Table 1 Monthly pensions from individual pillars using the Svensson yield curve, business day – November 30, 2020

	Monthly pension annuity (EUR)
Only the first pillar	573.51
First and second pillars	512.42 + 44.63 = 557.05
First, second and third pillars	512.42 + 44.63 + 21.91 = 578.96

Source: Own construction

Table 2 Monthly pensions from individual pillars using the Smith-Wilson yield curve, business day – November 30, 2020

	Monthly pension annuity (EUR)
Only the first pillar	573.51
First and second pillars	512.42 + 46.57 = 558.99
First, second and third pillars	512.42 + 46.57 + 28.88 = 581.87

Source: Own construction

CONCLUSION

The saving as well as payout phase of pension insurance is affected by many factors. If our pensioner decided not to join the second pillar in the past, he would currently receive his monthly pension only from the first pillar in the amount of EUR 573.51. However, if he also joined the second pillar, as assumed in our case study, his so-called pension insurance period in the first pillar would be reduced by more than 4 years and 7 months which resulted in the decline of his pension from the first pillar to EUR 512.42. It would be reasonable when the monthly pension paid from the second pillar would be high enough, when added to the pension paid from the first pillar, to sufficiently exceed the monthly pension only paid from the first pillar. Our pensioner saved EUR 11 300.58 in the second pillar which is substantially less than the overall fund potential. As results from our model, his total pension paid from both pillars would only amount to EUR 558.99. Admittedly, this situation is because our pensioner joined the second pillar at a relatively late age when it is generally no longer even recommended to join it. Furthermore, regular investments of low sums and the situation in financial markets could not guarantee high appreciation.

In our case study, we also assume that our future pensioner was saving in the voluntary third pillar 2% of his assessment base and the same amount was also contributed by his employer. Therefore, if he earned the average wage and saved in this pillar in the equity fund of the NN Tatry – Sympatia d. d. s., a. s., his savings appreciation would reach 11.53%, counting for EUR 5 548.35. In view of the relatively high charges, appreciation of this investment is significantly lower as the fund potential reached 68.92%. To be closer to the fund potential, at least the mixed investment strategy would have to be chosen. The problem of one-off and regular investments could be solved for example by state interference when the saver would be provided with a repayable grant at the beginning of saving which would be repaid during a half of the pension insurance period and he would regularly save during the second half as up to now.

Thus, the pension paid from the third pillar could, to a certain extent, match the pension to the amount of EUR 581.87. We can see that voluntary contributions made by the employee and employer are a part of this adjustment representing the opportunity cost. Both parties could invest this money in a much more efficient way compared with the voluntary savings.

Assessment of formulated hypotheses

To H1: Our pensioner saved in the second and third pillars sum of EUR 16 848.93. We calculated the amount of the monthly pension at EUR 66.54. This means that the amount saved would be exhausted after more than 21 years. Therefore, we reject hypothesis H1.

To H2: As can be seen from Tables 1 and 2, our pensioner will not receive the pension he would probably expect. In our modelling, the fact that if economically active people save in all three pillars, their pension will be "decent", has not been proven. Our quite high expected percentage, set out in hypothesis H2, has not been demonstrated. Therefore, we reject hypothesis H2.

In this paper, we have used the Life tables of the Slovak Republic, 2019, published on the website of the Statistical Office of the Slovak Republic, however, the insurance companies model pensions by means of adjusted tables since – based on their expertise – people who are healthier, have better genetic background, are relatively richer join the second and third pillars. This results in a significantly higher probability of their older-age survival (Kainhofer, Predota and Schmock, 2021). The effect of such modelling will be that the pension amounts can even be substantially lower than we present.

It is recognised that profit testing of such products including individual financial flows, not only those modelled in this paper, is also an integral part of modelling. Modelling of financial flows including inflation, international accounting standards and other items entering the accounts of insurance companies is also essential to determine the pension amount correctly. This is modelling we want to address in the near future. In addition to actuarial modelling, the idea of a broader discussion on pension savings on social networks within participatory governance is very interesting, as mentioned by Murray Svidroňová et al. (2018).

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