

Investment Performance of Voluntary Pension Funds' Portfolios

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Abstract

To ensure adequate retirement income it is usually recommended to save „more and for longer periods”. However, this is not enough. Consumers often overlook the importance of long-term returns on retirement investments. At the same time, the Bulgarians award a lower assessment for the market performance of the services „investment products and private personal pensions” compared to the average for the European Union.

The present research aims to analyze the investment results of the voluntary pension funds in Bulgaria for the decade, marked by unprecedented low interest rates and pandemic.

Keywords: investment portfolio performance, risk – adjusted return, asset allocation, voluntary pension funds, long-term saving

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Introduction

The market of services in the field of investment products and private personal pensions in Bulgaria receives a lower consumer rating, both in relation to the general market of services in the country and compared to the average rating for the European Union (European Commission 2018: 88). Competition among Voluntary Pension Funds (VPFs) in Bulgaria is weak (the market is highly concentrated)¹, and in recent years the number of savers has been growing at a slow pace (from -1 to 2-3% per year). The present study aims to discuss the investment results of VPFs in Bulgaria for the decade 2012-2021 and, at this starting point, to highlight some of the problems in the field of Supplementary pension insurance. To achieve the set goal, the following research tasks are formulated:

1. clarifying the trend in the assets allocation;
2. assessing and comparing the risk and return of investment portfolios;
3. critical analysis of the investment policy of VPFs.

The research is supported by official documents, published on the websites of the pension insurance companies (investment policies; rules of organizations; rules for monitoring, measurement and risk management; declarations related to sustainability in the financial services sector, etc.) and statistics of the Financial Supervisory Commission (FSC). Portfolio performance metrics for the studied ten-year period (2012-2021) uses data of net asset value per unit (announced by the FSC), the rate of inflation (by National Statistical Institute) and the risk free rate - EONIA index (by European Central Bank). Various indicators for risk (standard deviation, target downside deviation, portfolio β) and risk-adjusted return are used for the analysis of the investment performance of the portfolios. The traditional measures borrowed from the classical portfolio theory are Treynor ratio and Sharpe ratio, Jensen's Alpha and M-Squared (M2), and from the postmodern

¹ The value of the Herfindahl Hirschman index, measuring market concentration, decreased slightly for the period 2012-2021, maintaining its high values. Calculated on the basis of the market share of VPFs by net assets, at the end of 2021 the value of the index is 2695 compared to 2716 of December 2011. At the same time, the market share of the first three pension funds remained very high – 73%, and the share of the smallest three funds decreased even more from 2.02% to 1.18%. The values of the Herfindahl Hirschman index, calculated according to the market share of the funds by the number of insured persons, are slightly lower (own calculations based on the FSC's data). Other indicators can be used to study competition on the pension market, but usually the “picture” is preserved (For more details see: Tosheva (2012)).

theory – the Sortino and Omega ratios (See: Sharpe (1966), Treynor (1966), Jensen (1967), Modigliani, Modigliani (1997), Rollinger, Hoffman (2016), Keating, Shadwick (2002)).

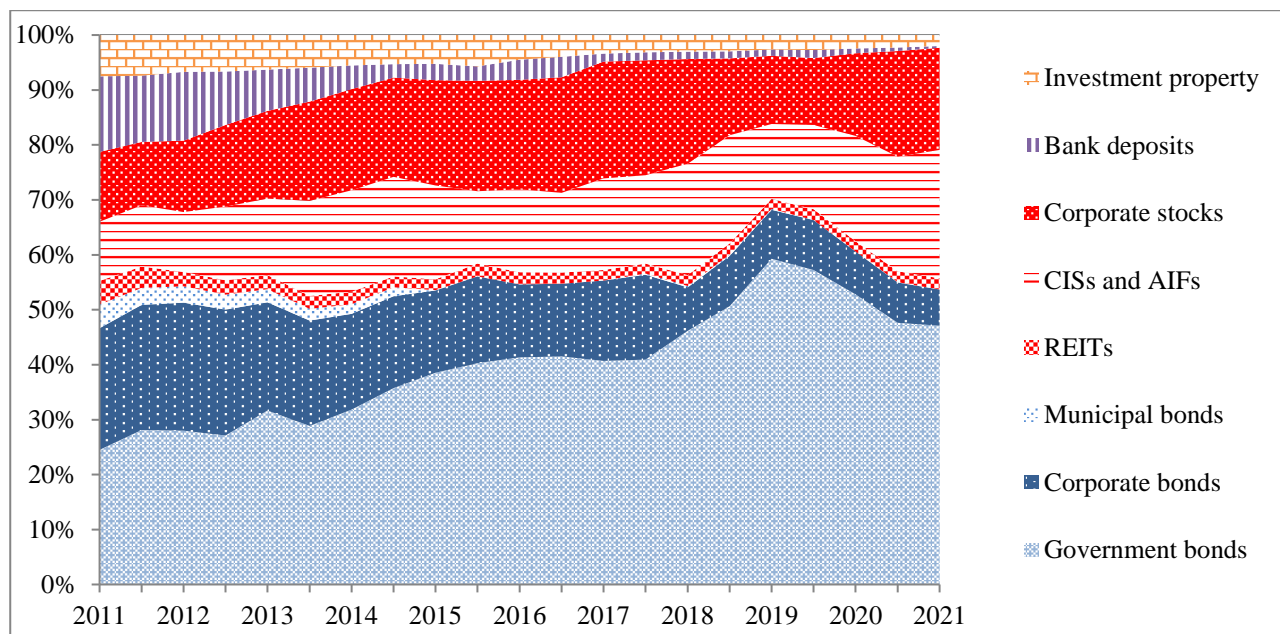
The present paper uses the time-weighted method to calculate the investment return of VPFs (according to the recommendations of Global Investment Performance Standards (CFA Institute)). This is the better method for comparing achieved returns both between different market participants and over different time intervals, as accounting of cash inflows and outflows can unnecessarily skew the results.

1. Analysis of asset allocation trend

Voluntary pension insurance system's net assets grew by 9.36% per year during the observed decade (2012-2021). The total value of assets under management increased 2,45 times and reached almost 1 382 million BGN at the end of the period. Positive growth was observed in 8 of the 9-th VPFs, the only exception being VPF „Future” .

The changes at asset distribution in the aggregate portfolio of the VPFs are due to increasing share of stocks and bonds at the expense of investments in bank deposits and investment properties. The trend is expected, bearing in mind that in 2016 the FSC found a series of problems in the practice of direct investments in properties. According to the regulator, real estate markets are not characterized by sufficient transparency and liquidity. In addition, pension funds have the opportunity to invest in the real estate market through REITs.

Analysing the VPF's portfolios two two main trends in investment properties are seen. At the one group of pension funds the share of investment properties in the portfolio decreased smoothly from 8-10% to 3-4% for the studied period („Doverie“, „Saglasie“, „Allianz Bulgaria“ and „CCB - Sila“) and up to 6% at „Toplina“. The other group of pension funds has no property investments at all („DSK - Rodina“, „UBB“ and „Pensionnoosiguriteln Institut“ (POI)). Only VPF „Future“ maintains a relatively stable level of investment properties in its portfolio - around 5-7%.



Notes: CISs – Collective Investment Schemes; AIFs - Alternative Investment Funds; REITs – Real Estate Investment trusts

Source: Author's analysis based on FSC's data.

Figure 1. Asset allocation in the VPFs aggregate portfolio

The share of investments in bank deposits, equal to 14% of the VPFs portfolio at the end of 2011, decreased significantly for the 10-year period. However, it is noteworthy that the share of this

instrument at the beginning of the period is very high at „Doverie“, „DSK - Rodina“ and „POI“ - over 20-25%, and slightly lower at the voluntary pension funds „Allianz Bulgaria“, „UBB“, „Future“ and „Toplina“, which start with approximately 12-18% of their total investment assets in bank deposits. Only „Saglasie“ and „CCB - Sila“ funds maintained a relatively low share of deposits in the portfolio throughout the analysed period.

VPFs' investments in stocks, rights and warrants increased by 16 percentage points as of December 2021 compared to 2011. The share of investments in REITs is in the range of 2 to 4%, and its lowest values are reported in recent years. VPFs' interest in CISs and traditional corporate stocks is growing, so these instruments individually reach around 20% of total investments. VPF „Saglasie“, „CCB - Sila“, „Future“ and „POI“ hold riskier portfolios. The share of stocks in the portfolios is usually over 40%, with a tendency to increase up to 60-70% of assets, and even 80% at VPF „Future“. Investments in CISs dominate the equity portfolio of „Allianz“, „UBB“ and „Toplina“ funds for most of the time. The ratios change several times at the „DSK - Rodina“ portfolio, while in the other VPFs, conventional investments in corporate stocks are predominant in the equity portfolio.

As could be seen from figure 1, debt securities remain the preferred investment vehicle for VPFs, with more than half of resources invested in them. The peak of 68% is observed towards the end of December 2019. The high share is entirely due to the participation of government securities in the aggregate portfolio. While at the beginning of the decade, investments in government and corporate bonds are almost equal (24.5% to 22.15%), in the following years the „scissors“ is gradually dissolve and investments in government bonds over poise 7 times more than those in corporate debt securities, with corporate bonds are dropped to the lowest share of 6.62% in December 2021. Most VPFs report debt in the amount of 50% of their investment portfolios, while at some pension funds the values reach 70-75%, with a pronounced dominance of government securities. The portfolios of VPFs „Saglasie“ and „Future“ make an exception. Over the period under review, their investments in bonds fell to around 20% and the face of the portfolios being set by corporate bonds. It is also noteworthy that investments in municipal bonds, which at the beginning of the period represented 4.30% of the aggregate portfolio, gradually decreased to zero in 2017, and for the 4 years after that, their share did not exceed 0.22%. Four of the VPFs have no investment in this instrument at all during the observed period.

From the analysis made, it can be concluded that there is no pronounced „herding“ behavior in VPFs investments. Regarding the policies for the formation of bond portfolios, more similarities can be found, but there is no grouping of pension funds according to their approach to equity investments. The outlined general trends in investment properties and bank deposits can easily be attributed to changes in market conditions, although there are also exceptions. At specific investment instruments and time intervals, the portfolios of VPFs „Saglasie“, „Future“, „POI“ and „Toplina“ stand out as different from the general background, but in themselves they are not alike. A comparison of the funds' investment portfolios grouped according to their market share also reveals no synchronous behaviour.

The assets under management of the VPFs licensed in Bulgaria, invested beyond the country's borders in 2020, amounted to 65% of the portfolio compared to 37% in 2010, and the investments in foreign currency compared to local have identical values (65% in 2020 and 35% a decade earlier) (OECD 2021: Figure 1.18). According to the share of foreign investments, Bulgaria ranks 11th out of 51 countries participating in the OECD study. However, it has to be noted that 9 of the countries that are ahead of Bulgaria in the list are members of the European Union (EU). Obviously, this practice is typical for EU countries (both developed and developing economies), considering the common market and harmonized legislation. Undoubtedly the interest of the insured persons is related to the realization of a higher risk-adjusted return regardless of the geographical focus of the investments, but it becomes clear that the Bulgarian capital market is „narrow“ for the free resources of the pension funds.

2. Evaluation of investment portfolios risk and return

During the studied 10-year period, the average frequency of positive return is 81 months (table 1). The highest value is reported by VPF „DSK - Rodina“, followed by „Doverie“ and „UBB“, while VPF „Future“ achieves a positive monthly return only in 66 periods, which ranks the fund in the last place by this indicator. The first place in average value of positive return is held by VPF „Saglasie“. VPF „Toplina“ realized the lowest average positive return, but at the same time the lowest average negative.

Table 1. Descriptive statistics of monthly returns (2012-2021)

	Mean return, %	Standard deviation, %	Excess Kurtosis	Skewness	Average positive return, %	Average negative return, %	Absolute frequency of positive return
„Doverie“	0.3659	1.1037	6.3731	-1.3899	0.8491	-0.8563	86
„Saglasie“	0.4673	1.5294	0.3141	0.0248	1.4034	-1.0386	74
„DSK – Rodina“	0.4009	1.1471	5.5198	-1.6414	0.9189	-1.0236	88
„Allianz Bulgaria“	0.3442	1.3156	10.1237	-2.0584	0.9386	-1.0993	85
„UBB“	0.4215	1.3125	11.3243	-2.1819	1.0082	-1.0624	86
„CCB - Sila“	0.4089	1.0940	1.2743	0.1432	0.9694	-0.7121	80
„Future“	0.2632	1.3977	1.3567	0.0808	1.1879	-0.8671	66
„Toplina“	0.3093	0.7545	8.4640	-1.1105	0.6238	-0.4544	85
„POI“	0.3734	1.6513	15.9828	-2.4513	1.1233	-1.1841	81
VOLIDEX	0.4041	1.0392	9.6850	-2.0843	0.8122	-1.0017	93

Source: Author's calculations.

VPF „Saglasie“ has the highest mean return for the period under review, but the fund also reports relatively high risk, only the returns of „POI“ is characterized by a higher standard deviation. The portfolio of „Toplina“ turns out to be the least risky. The returns distribution is characterized by increased kurtosis for all voluntary funds. „Saglasie“ VPF's kurtosis of 0.3141 shows an almost normal portfolio return distribution. On the opposite side, kurtosis of VPF „POI“ describes the most „fat tails“. The funds „Saglasie“, „Future“ and „CCB - Sila“ have a relatively symmetrical distribution of returns. The empirical distribution for all other funds has a longer tail on the left side (negative skewness).

When analysing the annual return, it is striking that VPFs „Saglasie“ and „CCB - Sila“ report only positive values, although at the end of 2018 the remaining 7 voluntary funds ended with negative returns. Losses range from -0.49% to -7.02%. The market index reports -3.78%. Overall, the studied period is characterized by low annual inflation, but the level of 7.75% in 2021 leads to negative real returns in 8 of the 9 VPFs. The deflationary processes from 2013 to 2015 increase the profitability of the funds. Due to the long-term nature of pension investments, attention should also be paid to the return indicators calculated for the entire period of analysis (table 2). Annualized returns are positive across all VPFs. Nominal values vary from 3 to 5%. The best performing funds are „Saglasie“, „UBB“ and „CCB - Sila“, which yield exceeding the reference index VOLIDEX. VPF „Future“ has the weakest performing, with a return of 3.08%. Real returns are also positive ranging from 1.23 to 3.71%.²

² It should be considered that the analysed results reveal the gross return on investment. In practice, the increase in the value of individual accounts is lower, as far as pension insurance companies charge fees for managing the VPFs and they are legislatively determined (Social Insurance Code, Art. 256). Currently, they are the following: one-time introductory fee (up to BGN 10), deductions from each instalment (up to 7%), investment fee (up to 10%), others (withdrawal, transfer - up to BGN 20) (Accessed 20/11/2023).

Table 2. Portfolio return of VPFs (2012-2021)

	Nominal return (annualized), %	Real return (annualized), %
„Doverie“	4.4045	2.5268
„Saglasie“	5.6084	3.7090
„DSK - Rodina“	4.8364	2.9509
„Allianz Bulgaria“	4.1010	2.2287
„UBB“	5.0681	3.1785
„CCB - Sila“	4.9446	3.0571
„Future“	3.0847	1.2307
„Toplina“	3.7400	1.8743
„POI“	4.4009	2.5232
VOLIDEX	4.8900	3.0035

Source: Author's calculations.

The comparative analysis of the investment results achieved by the VPFs inevitably goes through the indicators of risk and risk-adjusted return. According to the standard and target downside deviation, the portfolio of VPF „POI“ is the riskiest, the same is shown by the risk measure β (table 3). Looking at the risk indicators simultaneously, it could be concluded that the investments of VPF „POI“, also of „Allianz“, „UBB“ and „DSK - Rodina“ generate higher risk than the market average.

All VPFs realize a higher return than the risk-free one for the studied time period, so the Sharpe ratio assumes positive values. It is noteworthy that only one pension fund („Toplina“) has a higher indicator than the market index. VPF „Future“ is at the bottom of the ranking. Four of the voluntary funds have a Treynor ratio higher than the market. VPF „Future“ reports the highest value of 1.2134, followed by „Toplina“, due to the small β , so these portfolio returns have the least momentum compared to the market as a whole. „Allianz Bulgaria“ ranks last in this indicator.

Table 3. Risk and risk-adjusted return ratios of pension portfolios (2012-2021)

	Target downside deviation, %	Portfolio β	Sharpe ratio	Treynor ratio	Jensen's Alpha	M-Squared (M^2)	Sortino ratio	Omega (Ω)
„Doverie“	0.7407	0.9632	0.5187	0.5944	-0.0157	-0.0716	0.7728	2.5082
„Saglasie“	0.8316	0.7415	0.4406	0.9088	0.2211	-0.1527	0.8103	2.1738
„DSK - Rodina“	0.7837	1.0114	0.5296	0.6007	-0.0101	-0.0602	0.7752	2.4689
„Allianz Bulgaria“	0.9575	1.1883	0.4187	0.4635	-0.1749	-0.1755	0.5752	2.0735
„UBB“	0.9311	1.1946	0.4785	0.5258	-0.1014	-0.1133	0.6746	2.4003
„CCB - Sila“	0.5599	0.6178	0.5626	0.9963	0.2383	-0.0260	1.0992	2.7227
„Future“	0.8070	0.3167	0.3361	1.4832	0.2763	-0.2614	0.5820	1.6744
„Toplina“	0.4351	0.4251	0.6837	1.2134	0.2563	0.0999	1.1857	3.3334
„POI“	1.1996	1.2231	0.3512	0.4742	-0.1669	-0.2456	0.4835	1.9703
VOLIDEX	0.7165	1.0000	0.5876	0.6106	0.0000	0.0000	0.8523	2.7928

Notes: The calculations are based on monthly data. MAR is set on 0%, Risk free rate is EONIA index. The market is represented by the VOLIDEX index.

Source: Author's calculations.

Positive values of Jensen's Alpha demonstrate abnormal return of portfolio of securities over the theoretical expected return. As could be seen from the data in table 3, „Allianz”, „POI”, „UBB”, „Doverie” and „DSK – Rodina” underperform the market (VOLIDEX index). The portfolios of four of these funds are characterized by $\beta > 1$, which means that the additional risk taken did not contribute to a sufficient return to compensate for it. The portfolio, which outperforms the market, is characterized by a positive value of the M-Squared indicator. The calculations detect only one such voluntary fund and that is „Toplina“. The benchmark „beats“ the other portfolios on a risk-adjusted basis. „Toplina” ranks first among VPFs according to the Sortino ratio, just one another pension fund – „CCB – Sila” - achieves a value above the benchmark. VPF „POI“ remains at the bottom of the ranking. The Omega ratio - a risk - return performance measure, which takes into consideration all moments of the distribution (including skewness and kurtosis) rather than just the mean and standard deviation, tend to have higher usefulness for the analysis. According to this criterion VPF „Toplina“ leads the list again, followed by „CCB - Sila“. VPF „Future“ comes last.

In summary, the pension funds „Saglasie” and „CCB – Sila” outperform the benchmark with 2 and 3 of the calculated risk-adjusted return ratios, respectively. The results place VPF „Doverie“ in the middle of the ranking among other pension funds. The risk indicators of VPF „Toplina“ have the lowest values, and although the fund cannot „be proud“ with the highest yield, the risk-adjusted return coefficients define this portfolio as the most efficient. On the other hand, „POI” and „Future” portfolios are positioned at the bottom of the ranking by a series of measures. VPF „DSK - Rodina“ performs around the average level, while VPF „UBB“ usually ranks between 5th and 8th among pension funds. High risk indicators of VPF „Allianz” rank the fund among the worst performers.

3. Critical view into investment policy

The atypically large investments in bank deposits, characteristic of the Bulgarian practice, are significantly reduced during the period under review. Undoubtedly, this is a positive trend, considering that such investments are interpreted as inefficient management of pension funds' assets. In fact, unprecedentedly low interest rates (since late 2009 bank deposit rates fell below 1%, and after 2015 reached negative values) provide the necessary incentive for VPFs to reduce their holdings in banks to the usual amount of 1- 2% of the assets at pension systems in accumulation phase.

The increased interest in government securities can be interpreted as a more conservative investment policy. But is it justified? The combination of low interest rates, low inflation and a decline in the supply of safe assets makes low-risk investing more expensive. When higher-yielding bonds in pension fund portfolios mature, they are replaced by bonds with much lower returns.³ For comparison, funds from the most developed pension systems invest predominantly in stocks. Investments in debt securities make up about 1/3 of their portfolios, and the investment properties and other alternatives (infrastructure, private equity, hedge funds) commit nearly ¼ of resources (Thinking Ahead Institute 2022: 31). In fact, Bulgarian VPFs do not have a practical opportunity to invest a significant part of the assets under management in alternative investment instruments, insofar as investments in real estate and AIFs are legislatively limited by „ceilings”, and the direct investments in unlisted instruments are not permitted. However, they may reverse the ratio between stocks and bonds in search of higher yield and/or focus more on asset allocation than on active investment management.⁴

³ According to Bean et al (2015), low returns could change people's willingness to voluntarily pension insurance, directing their savings into more profitable alternatives. Currently, there is no outflow from the voluntary pension insurance system, but for the last 10 years, the assets increased with only 8.52%, reaching 646 thousand of pension lots.

⁴ Several studies conclude that a significant part (from 75 to 90%) of the volatility of pension funds' return is determined by asset allocation (Brinson et al (1986, 1991), Sharpe (1992), Ibbotson, Kaplan (2000), Abramov, Chernova (2015) (Cite by: Abramov, Radygin, Chernova 2015: 274)).

In the formal investment policy, VPFs „POI“ and „Toplina“ define the profiles of their portfolios as conservative to balanced, while in some time intervals of the studied 10-year period variable income securities reach a relative share of nearly 70%. Furthermore, the calculated indicators reveal two different „risk-return“ profiles (figure 2). It is also interesting that the significant changes in the investment policy of VPF „Toplina“ during the last 4 years of the decade (the fund abruptly switches to equity investments at the expense of debt investments) do not lead to a significant change in the risk-adjusted metrics of the fund, as far as a previous study (Georgiev, Mareva (2018)) ranked VPFs in an identical way.

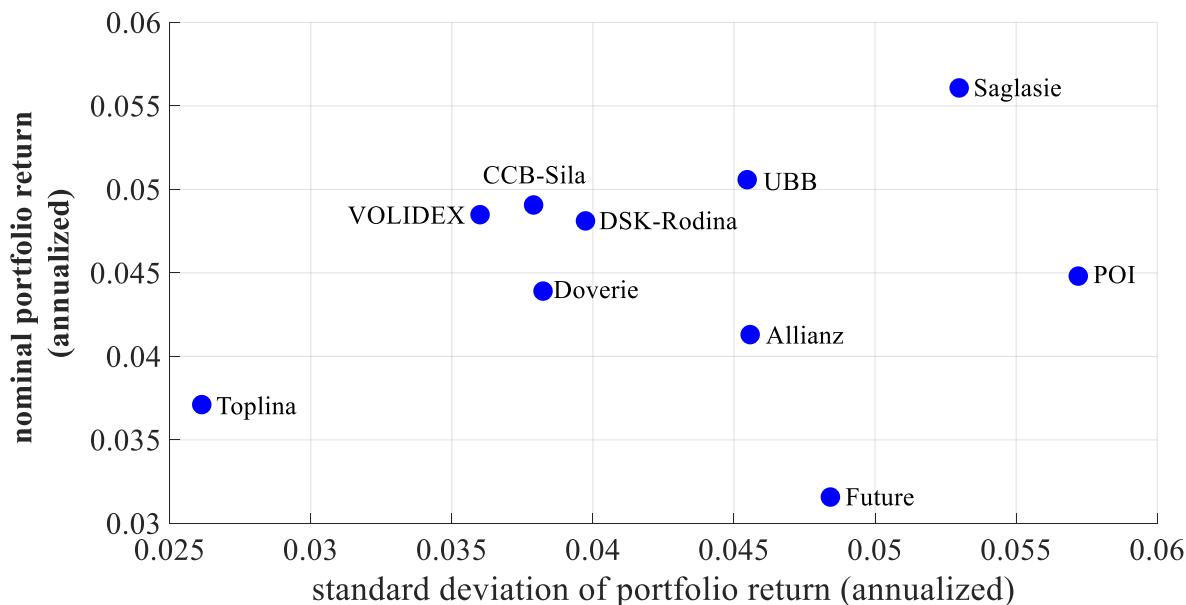


Figure 2. Risk - return profile of VPFs (2012-2021)

By taking on higher risk, VPF „Saglasie“ manages to add yield to the portfolio, while in other pension funds, the higher proportion of equity instruments proves to be unjustified („POI“ and „Future“). A similar situation is observed in more conservative portfolios. Although the share of the debt portfolio at „Allianz Bulgaria“ is significant, the fund is also characterized by relatively high risk ratios.

The VPFs return targets set in the investment policies are generally met, as most funds aim for a positive real return and only a few of them have specific targets. „DSK - Rodina“ VPF's real return for the period is very close to the target of 3%, „CCB - Sila“ and „Toplina“ funds' returns exceed the set limits of 3% and 1.8% respectively, while VPF „Future“ realizes a real return lower than the desired value.

The problem of low returns is often overlooked. Unfortunately, however, saving „more and for longer“ is not enough. Achieving adequate retirement savings and a high replacement rate could be possible if net returns are close to double digits (Better Finance 2019: 23). At the same time, a Schrodgers's reserch (2015) shows that cannot be expected the real stocks return to be higher than 8% in long term. In that case, for the diversified pension funds portfolios, a real return around 3-5% is more realistic. Near the lower border, with a 2.65% real return for the period 2011-2020, investment results of VPFs in Bulgaria rank the country second among 13 countries. However, after deducting the fees, the real net return for the period 2002–2020 is just 0.17% (Better Finance 2021: 21). It turns out that Bulgarians with voluntary pension insurance pay fees above the market rate, and receive a return lower than the market (Christoff 2020: 9-14).

The lower satisfaction of Bulgarian users of supplementary pension services compared to the EU average is not surprising. It could be justified not only with the achieved investment results,

but also with the limited investment choice. Although insured persons have a possibility to choose from 9 VPFs, their preferences for a particular risk profile (which usually changes with age) or their investment values and beliefs (for example, towards environmental, ethical or sustainable and responsible investments) cannot be accounted for in practice. The question of the multi-fund organization is on agenda again.

The detailed analysis of VPF's investment policy in Bulgaria reveals legislative gaps that could lead to serious financial consequences for persons of pre-retirement and retirement age. The investment restrictions intended in the Social Insurance Code do not limit the total level of securities with variable income, moreover, the criteria under which a portfolio is considered to be a conservative, balanced or dynamic are not defined. In practice, how risky a VPF's profile is depends entirely on the fund's investment policy.

Information about the chosen level of risk at which a particular pension fund is managed could only be found in its formal investment policy. Users cannot make an association between the name of the fund and its risk profile, and for any changes in investment objectives in terms of risk and return, they have to follow the formal policy again.⁵ As noted above, the investments of pension funds with a „conservative to balanced“ profile actually are far from conservative type. The remaining seven VPFs in Bulgaria define their portfolios as balanced, but actually there is a significant discrepancy in the proportion of their investments in stocks. The analysis shows that five of the funds disclose a share of securities with variable income exceeding 60-70%, and in some cases even 80%, which should characterize them as aggressive. Here are the following issues:

- conservative and conservative-balanced profiles are virtually absent among VPFs, i.e. even if insured persons wish to reduce their risk in pre-retirement age, they do not have such an option. Only after retirement, the individual pension lots are managed under stricter restrictions.⁶ The global crisis of 2008 caused up to 40% drop in the value of high-risk portfolios, and although 30% of the losses were recovered in a year, such recessions generate serious risk for the elderly;
- possible inconsistencies between the target risk level declared in the investment policy and the actual risk assumed by the VPF when constructing the portfolio are not monitored and sanctioned accordingly. This creates conditions for misleading the users.

Against this background, only three of the VPFs mention environmental, social and governance (ESG) risks in their investment policy (and relatively recently). In general, VPFs licensed in the country do not take into account how issues related to sustainability affect their results, condition and development and what is the impact of their investment decisions on people and the environment (so-called double materiality).⁷

Conclusion and recommendations

All VPFs in Bulgaria report positive real returns over the past decade. However, the values are far from what is needed to achieve adequate and sustainable retirement income. Investment performance is determined by many factors such as management style and quality, behavioural biases, market conditions, and size of assets under management to some extent. On the other hand, the volume of investment resources managed by the VPFs depends on the financial culture of the population and the trust of the beneficiaries in the system of voluntary pension insurance.

⁵ Investment policy is under review annually or even more often, in cases of significant changes in the economic situation. Insured persons have the opportunity to change their pension fund in case they do not agree with the investment policy and/or investment performance (ignoring the fact that the Bulgarian population has a lower financial culture than the average European), but the transfer of the individual lot is accompanied by time restrictions and fees.

⁶ The regulatory framework for payments funds' investments provides limits of 25% for securities with variable income (up to 20% for corporate stocks and CISs and up to 5% for stocks and shares of REITs) (Social Insurance Code, art. 178a).

⁷ The opinion is based on the declarations regarding sustainability in the financial services sector (EU Regulation 2019/2088), published by the pension insurance companies (Accessed 17/02/2023).

To increase credibility, VPFs could improve and/or change several aspects of their operations, including:

- active communication with the insured persons and potential consumers of the pension service;
- increasing in-house expertise and recognizing good governance as a driver of profitability;
- refinement of the risk profile, increasing transparency and accountability in the investment process, thus working towards a more recognizable, distinctive pension product;
- implementation of the ESG determinants in the investment policy, which aims to taking into account all risk factors (bearing in mind that the investment risk is assumed by the insured persons) and capturing good investment opportunities;
- initiation of discussions and legislative changes regarding the introduction of a multifund pension organization.

The time to initiate a change of the pension model, which have to inspire discussions, cause a new competitive environment and attract more users and resources to voluntary insurance in Bulgaria is coming.

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Appendix 1. Risk-Adjusted Return Ratios

$$\text{Sharpe ratio} = \frac{R_p - R_f}{\sigma_p} \quad (1)$$

$$\text{Treynor ratio} = \frac{R_p - R_f}{\beta_p} \quad (2)$$

$$\beta_p = \frac{\text{cov}(R_p, R_m)}{\sigma_m^2} \quad (3)$$

$$\text{Jensen's Alpha} = R_p - [R_f + \beta_p \cdot (R_m - R_f)] \quad (4)$$

$$M^2 = (R_p - R_f) \cdot \frac{\sigma_m}{\sigma_p} - (R_m - R_f) \quad (5)$$

$$\text{Sortino ratio} = \frac{R_p - R_f}{TDD} \quad (6)$$

$$TDD = \sqrt{\frac{\sum_{i=1}^n \min(0, R_i - MAR)^2}{n}} \quad (7)$$

$$\text{Omega} = \frac{\int_{MAR}^{\infty} (1 - F(x)) dx}{\int_{-\infty}^{MAR} F(x) dx} \quad (8)$$

Notes: R_p - mean portfolio return, R_f - mean risk free return (EONIA), σ_p – standard deviation of portfolio return, σ_m – standard deviation of market return, β_p – portfolio beta, $\text{cov}(R_p, R_m)$ – covariance of portfolio and market return, R_i –

portfolio return for period i , n – number of analysed periods, TDD – target downside deviation, MAR – minimum acceptable return, $F(x)$ – cumulative function of return distribution

Source: Sharpe (1966), Treynor (1966), Jensen (1967), Modigliani, Modigliani (1997), Rollinger, Hoffman (2016), Keating, Shadwick (2002).