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**Financial performance of
the Czech private
pension scheme:
Its current position and
the comparison with other
CEE countries**

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IES Working Paper: 9/2011



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Bibliographic information:

Hlaváč, J. (2011). “Financial performance of the Czech private pension scheme: Its current position and the comparison with other CEE countries” IES Working Paper 9/2011. IES FSV. Charles University.

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Financial performance of the Czech private pension scheme: Its current position and the comparison with other CEE countries

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March 2011

Abstract:

This paper focuses on the comparison of financial performance of the Czech voluntary private pension scheme with five other reformed private pension schemes in the region of Central Eastern Europe (Bulgaria, Croatia, Hungary, Poland and Slovak Republic). The current state and the recent development of the Czech private pension scheme are analyzed in the first part of the paper. In the main part of this work we construct the dataset of periodic scheme returns covering the last decade, and estimate the schemes Sharpe ratios (SR) for four reference benchmarks. The findings suggest that except for Poland none of the schemes managed to beat its long-term domestic benchmark (10-year government bonds) as the SRs estimates turn out to be negative. The highest underperformance was found in the case of the Czech Republic. Such poor results were assigned to the presence of restrictive annual minimum return guarantees and ineffective legislation arranging the PF costs allocation.

Keywords: Private pension schemes, Czech voluntary pension scheme, financial performance, Sharpe ratio

JEL: G23, G28, O57, H55

1. Introduction

The phenomenon of population ageing, occurring in many developed countries across the world, resulted into the shift in traditional understanding of the role of state in the economics of pension. The shift was augmented by the World Bank (1994) report, which came out with the recommendation to base the countries pension system on 3-pillars. The message was clear. It suggested to diversify the sources of pension system financing by introducing mandatory (II. pillar) and voluntary (III. pillar) pension schemes. This shift in understanding was accompanied by the gradual move towards diverse pension arrangements where the future pension provisions are backed by the assets.

Under such an arrangement, the level of future pensions (paid out from this scheme) becomes directly dependent on the annual rates of returns generated by the assets of the scheme participants. Thus, the (under)achievement of the scheme shall be derived from the ability of the scheme to generate sufficient returns that would facilitate the adequate pension provisions in the future. This leads us to the area of pension scheme financial performance evaluation. In the academic literature, this area has not been examined extensively yet for various reasons. In fact, the impulse for the development of pension specific evaluation framework tracks back to Campbell and Viceira (2002). In their work, the long-term investment horizon and objectives of pension industry (to deliver adequate levels of future pensions) were emphasized in contrast with the other forms of collective investment that are primarily concerned with the short-term profit maximization. This means that to compare the monthly or quarterly scheme returns may not be totally meaningful, unless measured against a (set of) specific benchmark(s) that reflect on the above mentioned characteristics.

The joint research project of Organization for Economic Co-operation and Development (OECD) and World Bank (WB) 2007-2010 is by far the most comprehensive published study that focused on the comparison of the financial performance of respective private pension schemes. As part of the output the program delivered the initial assessment of financial performance of private pension schemes in OECD countries. In total, 23 countries with available historic data entered into this comparison. In this working paper we will take the advantage of the built-up methodological background delivered by the research program to compare the financial performance of the Czech voluntary private pension scheme with other reformed private pension schemes within the Central-Eastern Europe (CEE) region.

The Czech voluntary private pension scheme, which is going to be analyzed in this study, has been implemented in 1994. The scheme could be described by the following characteristics. Up to date, it has reached a significant coverage exceeding 70 percent of total workforce. Maturity of the scheme brings the economies of scales, and it gets relatively cheaper to operate the scheme. Also the increasing engagement of employers could be perceived as a clear accomplishment. On the other hand, the decreasing average contribution rate (relative to the gross wage), and high levels of acquisition costs could be treated as current threats that might prevent the scheme from the successful future evolution. The aim of this work is to come up with the comparative analysis of the financial performance of Czech voluntary private pension scheme with other private pension schemes in chosen CEE countries that reformed their pension systems recently.

The structure of the paper proceeds as follows. In the following chapter we will briefly describe some features of the Czech voluntary private pension scheme. The focus will be laid on the legislative settings of the pension scheme, the historical financial performance and its cost position. The third chapter (the main part of this work) will focus on the evaluation of the financial performance private pension schemes in six CEE countries (Bulgaria, Croatia, Hungary, Poland and Slovak Republic). The beginning of this chapter will lay down the motivation for such an evaluation and introduce the employed methodology. The following part of the chapter will describe the basic characteristics of the observed pension schemes and introduce the employed data. The remaining part of the chapter will present the results and bring in the short discussion of results obtained. The chapter four concludes.

2. The voluntary private pension scheme in the Czech Republic

2.1. Regulatory framework

The origins of the private pension scheme in the Czech Republic date back to 1994 when the Czech parliament approved The State Contributory Supplementary Pension Insurance Act¹ (SCSPIA). The SCSPIA sets forward the regulatory framework for pension fund activities in the Czech Republic. The scheme was initially proposed in order to provide citizens with (supplementary) option to gather their additional savings for the future retirement outside of the traditional PAYG system. The participation in the system is voluntary. Any permanent

¹ Act No. 42/1994 Col.

resident of the Czech Republic older than 18² is allowed to participate in the private pension scheme through signing the contract with any of the established voluntary private pension funds (PFs).

2.1.1. Regulatory framework for PFs investment policies

SCSPIA allows PFs to invest into the most of the accessible assets such as state bonds, corporate bonds, mutual funds, shares, real estates, and property³. In fact, this legal definition does not prevent PFs to invest into the most of the financial instruments traded in the Czech market. When any financial instrument is being acquired, the buying price must correspond to the lowest attainable market price, on the other hand, the sale of the instrument needs to be realized through the highest market price available at a given moment. PFs are also allowed to place its assets into bank accounts. However, the deposited amount is limited to CZK 20 mil. per one bank.

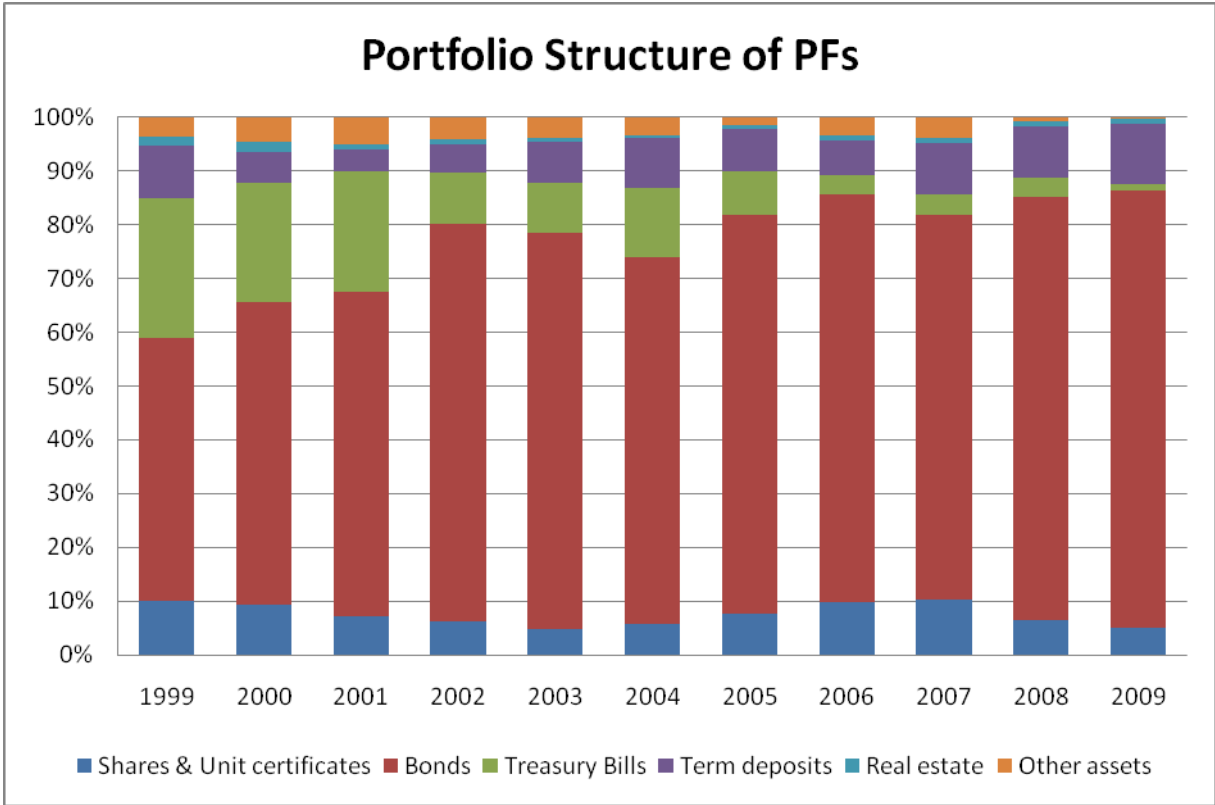
There are a few legal regulations imposing limits on the exposure to the respective asset classes within the PFs portfolio. In practice, however, these limits do not have significant influence on the portfolio structure. The development of the PFs portfolio structure is documented in the Figure 1. As visible, the bonds together with treasury bills stand for the largest share of PFs portfolio. In 1999 both combined stood for almost 75 percent of the total portfolio size, which was also the lowest share reached in the past decade. On the other hand, the highest share of bonds and treasury bills was reached in 2008 as it topped at 85 percent. Since 1999, the combined share of PFs investments into shares, unit certificates, real estate and other instruments potentially offering a higher return, has not exceeded 16 percent. The lowest representation of these instruments in PFs portfolio was reached in 2009 at the level of 6.2 percent.

Together with term deposits, bonds and treasury bills are seen as the most secure investments instruments. On the other hand, the potential return reached on these investments is relatively low compared to other more risky instruments. The main driver for the conservative structure of PFs portfolio over time is another legislative arrangement, which imposes an obligation on PFs shareholder to compensate any negative return on PFs portfolio for the period of one year.

² The participation in the system is also allowed to the individuals older than 18 years of age with permanent residency in other EU states under the condition that this individual is covered by the Czech social security system or health insurance scheme.

³ SCSPIA also allows PFs to invest into foreign (only OECD) markets.

Figure 1: The development of the Czech Pension Funds portfolio structure



Data source: The Association of Pension Funds of the CR Annual Reports 1999-2009

2.1.2. Profit distribution

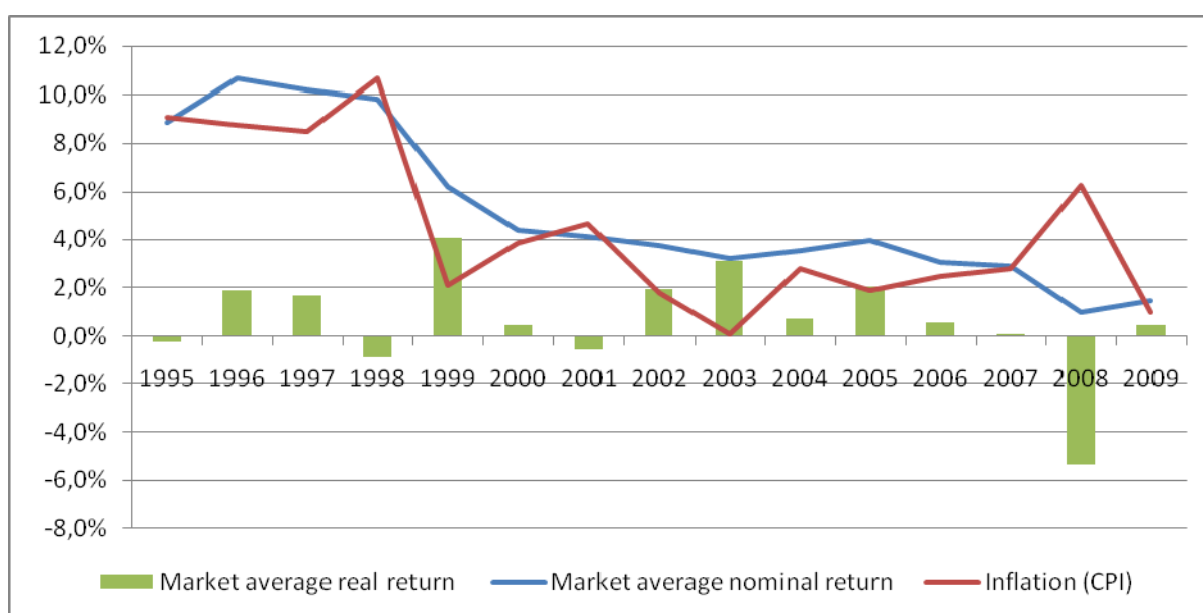
The distribution of PF profit is also arranged by SCSPIA. At least 5 percent of the generated profit goes directly into the reserve fund. The board of directors then decides about the distribution of maximum 10 percent of annual profit, which may go to clients or to the shareholder of the PF. The remaining amount (minimum 85 percent) is distributed to the PFs participants.

Importantly, when PF experiences a financial loss (net annual profit ≤ 0) over the fiscal year, the loss will be reimbursed from the means of PFs reserve fund or other funds created from the profit generated in previous years. If these means are not sufficient to cover the financial loss, the remaining amount will be paired up with the drop of its equity. However, the total amount of equity cannot fall below CZK 50 mil. In that case the shareholder needs to add up its own capital if the continuation of the PFs activity is the desired outcome. Thus, even if the minimum return is not guaranteed explicitly, the SCSPIA poses the requirement on PFs shareholders to compensate its clients for any PFs negative returns.

2.2. Financial performance of the Czech private pension funds

Since 1994, the Czech pension funds market has gone through significant development. In the period 1994-1996 the Czech Ministry of Finance together with the Czech Ministry of Labour and Social Affairs granted the permission to operate in the market of pension supplementary insurance to 44 pension funds. Indeed, it was followed by the process of rapid market concentration as in 2002 there have been only 13 active pension funds left, 6 largest funds held 83 % of total assets⁴.

Figure 2: Average nominal and real annual returns of Czech voluntary private PFs



Data source: The Association of Pension Funds of the Czech Republic, Czech Statistical Office, own calculations

A couple of important findings concerning the financial performance of the scheme could be drawn from the Figure 2. First, the average nominal returns have been falling since the introduction of the scheme. In the first five years of operation the scheme delivered on average 9 percent annually, between the years 2000-2004 it was almost 4 percent and since 2005 the scheme delivered an average annual return over the level of 2,5 percent. Second, the positive real returns have been delivered for most of the period observed. In fact, besides the initial year of operation, there are three other years when the real returns turned up to be negative (1998, 2001 and substantially in 2008). Indeed, these were the periods of lowest economic performance when PFs realized the losses due to the unfavorable macroeconomic conditions. The legislative condition promising the positive nominal returns, which lead to the

⁴http://www.cnb.cz/miranda2/export/sites/www.cnb.cz/cs/dohled_financni_trh/souhrnne_informace_fin_trhy/archiv/penzijni_fondy/VZ_PF_2002.pdf

strictly conservative portfolio allocations, prevented the system from significant losses experienced by foreign PFs in 2008 and 2009⁵. Finally, the Figure 2 shows that the average annual y/y changes of nominal returns are lower than the changes in inflation rates. Thus, the levels of the real annual returns are relatively randomly (and evenly) distributed in time.

In total, the financial results are not very positive. After first five years of positive financial performance, the levels of returns were decreasing continuously in the following decade. Possibly, the lowest acceptable benchmark in the form of positive average real annual returns was beaten most of the time. The financial performance of the scheme will be further analyzed in the following chapter, where results will be compared with several other benchmarks and with the results of other reformed schemes.

2.3. Cost position of the Czech PFs industry

In the following section the cost position of industry during the last decade will be analyzed. Indeed, the efficiency under which the individual PFs operate is essential as it directly influences the financial performance of the whole scheme. Importantly, the legislation does not impose any legal limits on individual cost items. This was the reason for initial high relative operating expenditures level. In total, there are nine PFs entering into the analysis. These are the funds which were active over the whole observation period. There are two main sorts of operational expenditures. These are the administrative costs and the acquisition costs. Also, the acquisition costs amortization is going to be analyzed in this section.

2.3.1. Administrative expenditures

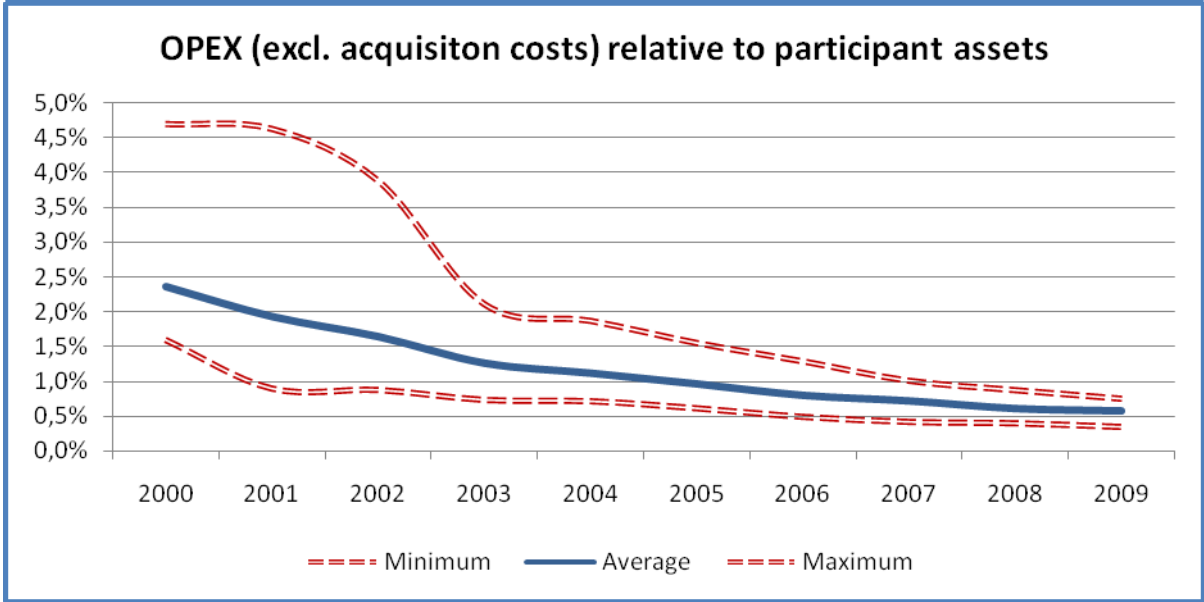
Administrative expenditures are spent on the day-to-day activities of PFs, and include mainly salaries of PFs employees, marketing costs, rent, etc. It is reasonable to expect that the relative importance of these costs will start to decrease once the sector starts to expand (increase in AuM) as the economies of scales will likely occur. On the other hand, once the scheme will get closer to market saturation, it is likely the decrease of administrative costs will slow-down up to the point until it levels-off.

The development of administrative costs of Czech PFs over last decade is presented in Figure 3. Annual reports of 9 Czech pension funds from the period 2000 – 2009 were used as a data source for the construction of Figure 3. For each year the data of PFs operational expenditures were spotted. Their absolute values were compared with the participant means of each

⁵ See chapter 3 for more information

respective fund so that comparable relative values of OPEX could be obtained. Further, for each year the maximum and minimum values together with average value of OPEX (with respect to the total assets of the participants) were counted so that the curves of minimum, maximum and average OPEX curves could be obtained. Finally, all three curves were smoothed for the purpose of easier comparison.

Figure 3: Operating expenditures of Czech PFs without acquisition costs (excl. Aegon PF)



Source: author’s calculation; data source: Annual reports of Czech pension funds 2000 – 2009

After the process of market concentration in late 90s, when through various merging activities the larger PFs acquired the smaller ones, the situation in private pension sector delivered a stable number of pension providers. Since then, the PFs focus moved towards a delivery of increasing operational efficiency. Keeping in mind similar portfolio placement strategies (delivering similar financial returns), an increased efficiency has been the first natural step for PFs to gain the comparative advantage over its competitors. Indeed, the scheme also benefited from its internationalization as the Czech PFs became a part of strong bank/insurance groups. In order to become more competitive, shareholders often prevented PFs from additional costs, for which they would have been charged otherwise. Regardless of its source, the presence of economies of scale resulting from increased competitive pressures over the last decade is apparent from the Figure 3.

There are three main observation points resulting from Figure 3. First, with growing competitive pressures all PFs were becoming relatively more efficient over the time. As the level of OPEX is reflected fully in income statements, the focus was to minimize the financial

burden of every individual PF. Second observation is that the differences between the best and the worst performing PFs were decreasing steadily in time. In 2000 the difference between PF with the highest levels of OPEX (ČSOB Progres – 4.7%) and the lowest ones (ING PF – 1.6%) exceeded 3 percentage points. The same difference in 2009 did not exceed 0.4 percentage points, which is reflecting the successful effort of PFs with low operational efficiency to pair up with the best market practices. Finally, the average value of PFs relative levels of OPEX (excluding acquisition costs) did fall almost four times during the last decade, from 2.35 percent to 0.58 percent with continuous but decelerating declining trend. Naturally, the increasing levels of PF assets also have a direct influence on the relative amount of the OPEX as it stands in the denominator. It is a question to which level the PFs are able to suppress their OPEX, however it is reasonable to estimate that most of the cost-cutting potential has already been used.

2.3.2. Acquisition costs

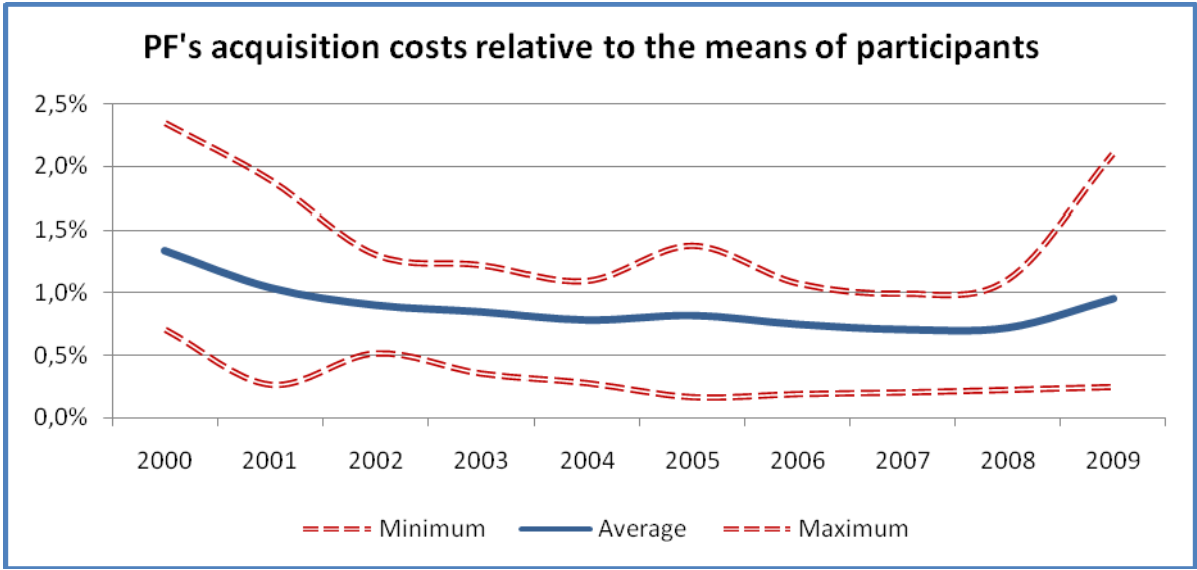
Another important aspect of the cost efficiency analysis of the private pension scheme - the acquisition costs - is going to be analyzed. Due to the relatively stable number of net participants inflow into the scheme⁶ one would expect the brokerage fee to be distributed relatively evenly over the observed period⁷. For the construction of Figure 4 the same data source as in case of OPEX costs analysis was used (see below).

A number of findings reflecting the overall cost-effectiveness of PFs and the mutual relation of administrative and acquisition costs could be obtained from the Figure 4. First, in comparison with Figure 3 it is apparent that both cost elements expressed relatively to the participant means show similar dynamics. As well as the curve representing administrative expenditures, the shape of an average acquisition expenditures curve is also downwards sloped (omitting an upswing in 2009 which is going to be explained 2.3.3. However, an average administrative cost curve is steeper. This signals that the relative costs cutting was more intense in the area of everyday operation of PFs rather than the in the way new clients are being acquired. This is an important observation. It reflects the state of market saturation as most potential members already participate in the scheme, and it is getting more expensive for agents to bring other clients into participation in the scheme.

⁶ Over the period 1996-2009 the average net inflow of participants into the scheme reached 221 thousand, which is around 4,5% of total workforce.

⁷ With stable share of participants inflow one would expect the average share of acquisition costs (expressed as relative to means of participants) to fall steadily as there is a growth of AuM.

Figure 4: PFs acquisition costs relative to the assets of participants



Source: author's calculation; data source: Annual reports of Czech pension funds 2000 – 2009

2.3.3. Accrued costs

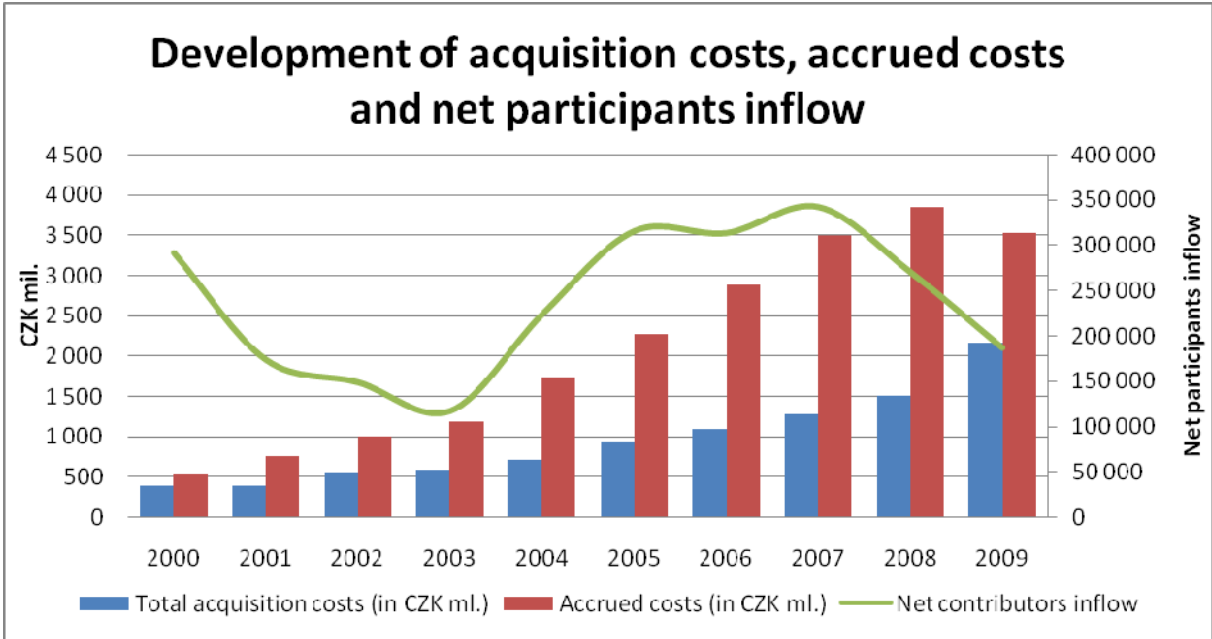
However, the cost analysis is not complete without reflecting on the specificity of the accounting rules according to which the acquisition costs are reported. There is a balance sheet item called accrued costs which reflect the acquisitions that happened in past but for which the PF has not paid yet⁸. Figure 5 is presented for better understanding of the last claim. It compares the absolute values of acquisition costs, accrued costs together with the net inflow of the participants. The data source is the same as in two previous cases.

One important conclusion that could be drawn from Figure 5 is that it confirms the above mentioned findings. Acquisition of clients is becoming more expensive in the nearly saturated market. To document this statement, over the period of 2007-2009 the acquisition costs per client were more than two times higher than in the period 2000-2002 neglecting the change in the accrued costs. Further, despite the rising absolute value of accrued costs in the PFs balance sheets over the last decade⁹ (its value is depicted on the primary vertical axis), in relative terms the scheme experienced its stable decline. Both trends (higher acquisition cost per one contract and the lower accrued costs in relative and possible also absolute terms) are expected to last in the near future as a result of market situation.

⁸ The remuneration of PFs agents for client's acquisition is annually added to the accrued costs item on the asset side of balance sheet. In the end of each accounting period the part of the total accrued costs⁸ (according to the PF's internal accounting rules) is reflected into the profit and loss statement, and for this amount the total accrued costs is adjusted.

⁹ The only exception is year 2009, when also the absolute value of accrued costs on year over year basis declined, which is also the explanation for the upswing of the curve of relative acquisition costs in 2009 documented in Figure 4.

Figure 5: Acquisition costs, accrued costs and the net inflow of scheme participants



Source: author’s calculation; data source: Annual reports of Czech pension funds 2000 – 2009

Overall, the development of the cost position of Czech private pension scheme can be reflected positively. The initial high levels of relative operating expenditures were suppressed to the acceptable current levels. Several factors stand behind this shift: economies of scales, increasing intra-industrial competition and the effort of shareholders to protect PFs from any additional costs. Even though the current institutional setting does not impose any ceilings on the individual cost items (the rule of the prudent man), one can expect that the pressure resulting from the factors mentioned above will lead to the increased operational efficiencies in the everyday activities of PFs. On the other hand, the growing costs per new contracts combined with already high coverage may lead to the idea of imposing more strict regulation in the area of contract transfers in order to prevent the scheme from the redundant acquisition costs arising from pulling clients from one PF to another.

3. Comparison of the PFs financial performance within the chosen CEE countries

3.1. Motivation for pension funds financial performance evaluation

Recent reformed actions triggered mainly by the WB (1994) report move us into the situation in which a significant part of the future pension provisions are becoming directly dependent on the future discounted yields that are to be delivered by these assets. However, the increased

linkage between the levels of future pensions and the performance of invested assets leads the participants into the situation when part of their retirement income will be subject to the market uncertainties connected with the investment process. Its potential consequences can be well documented on the recent financial crisis. To back up the last statement with numbers, according to the estimates of Antolin and Stewart (2009), the financial losses of OECD PFs in 2008 topped up to \$3.5 trillion or to about 20% of its total asset value in relative terms. Although OECD (2010) states that around \$1.5 trillion have been already regained in 2009. But still, the investment losses experienced in 2008 have not been yet fully recovered by most of the OECD countries.

Besides the investment returns there are also other factors with direct impact on PFs ability to deliver adequate future pensions. These are the administration costs and investment management fees that need to be paid for scheme running or the legislative arrangements determining the retirement age. These factors also co-determine the levels of retirement pensions. Thus, the examination of asset-backed pension schemes based ultimately on the investment returns would be wrong, as the asset returns are only one of the factors (though important) determining the ability of the system to deliver adequate retirement income.

Over the last two decades, a vast amount of recent academic debate and research already focused on these other factors as the determinants of future pensions in funded schemes. As a result of this debate, some of the research findings have already been reflected in the political actions in recent years. Since then, many countries introduced various mechanisms to decrease the cost burden. Among others, the imposition of ceiling limits on administrative costs or investment management costs (CEE countries), or the introduction of “blind trust” accounts (Sweden) and bringing in the lottery mechanisms that “distribute” new participants among existing PFs (Poland) could be picked out as the examples of successful effort to bring research findings into the political actions.

On the other hand, the area of financial performance of pension funds has not been examined extensively yet for various reasons. One of the reasons may be an implicit reliance on the competitive model that it will provide the optimal asset allocation. In this model the PF managers will compete for funds, and the individuals will place their assets into the funds based on their risk preferences, which will lead to the desired outcome – an optimal asset allocation. However, as Rudolph et al. (2010) points out, this model builds on the premises that the contributors have the ability to identify the factors determining the adequate levels of

retirement income, compare these factors with the investment performance of available PFs, and choose the outcomes which optimize their retirement income with respect to their individual preferences. This line of reasoning, however, does not reflect the limitations an average contributor faces.

Often, the market does not provide simple information based on which individuals are able to make their decisions. Furthermore, even if such information is publicly available, due to its complexity it may not be understandable for an average contributor, which may lead to the suboptimal investment decisions (see e.g. Lusardi and Mitchell, 2006 or Clark et al., 2010).

On the top of that, the evidence from decision-making theory points out on the presence of an excessive risk aversion or a decision avoidance. As Campbell (2006) or Benartzi and Thaler (2007) point out, under such conditions, people rely on simple heuristics being reflected in the choices of naïve investment strategies (I will invest either into bonds or equity), mental accounting treating differently their “old money” (the already invested amounts) and “new money” (amounts not yet contributed) or through the peer effects (I will invest similarly as my spouse, friend, colleague etc.). Many individuals simply lack the formal investment training, which often leads to the sub-optimal portfolio allocation choices.

Some governments, with the intention to prevent contributors from any loss-making decision, imposed certain regulatory restrictions, typically a sort of minimum return guarantees. This brings another aspect, which may distort market from the optimal asset-allocation. The studies of Basak and Makarov (2008) and Castaneda and Rudolph (2009) demonstrate that the presence of minimum return guarantees may lead to the market situation with multiple equilibria or no equilibrium at all. Under such arrangements the asset returns may be partially protected, however, at the cost lowering potential portfolio yields as the managers prefer more conservative risk-return portfolio allocations. Again, this process may end up with the sub-optimal portfolio allocations.

After taking into consideration the findings presented above, the evaluation of financial performance of respective pension schemes based on the comprehensive methods is needed. Through comparison of financial performance of various pension schemes, the best case practices can be identified, and better understanding of typical drivers of successful performance could be achieved. Based on the findings of such research, important policy recommendations could be drawn. Therefore, the following section will be focused on the methodological issues of PFs performance evaluation, so that it could be used for an empirical

study focused on the comparison of the Czech private pension scheme with other neighboring countries.

3.2. Evaluation of financial performance of private pension funds

The development of performance measurement framework specific to the pension funds industry is a relatively new topic in the academic literature (see e.g. Rudolph, 2010). In fact, the impulse for the development of industrial specific evaluation framework tracks back to Campbell and Viceira (2002). In their work they emphasized the objective of the pension industry that is to ensure an adequate retirement income to future pensioners, and which is thus naturally different from the other forms of collective investment that are primarily concerned with the short-term asset maximization. Different objectives then define a different timeframe over which the performance should be tracked, and which are also associated with the different levels of risk tolerance. Their work started to change the way researchers think about the portfolio and investment characteristics of pensions. Since then, a vast amount of academic research has been targeted to the development of optimal asset-allocation strategies incorporating fundamentals of life-cycle savings and management of risk.

Despite the different objectives of pension industry and other forms of collective investment, the typical approaches used to measure the PFs performance have been so far mostly identical to the ones applied to other types of investment opportunities. Possibly, due to the relatively short time period for the implementation of new theoretical findings, most of the empirical research in the area of evaluation of pension funds performance mostly focused on the aspect whether the scheme delivered a reasonable rate of return over some observation period. Naturally, this approach does not necessarily represent the above mentioned objectives of the funded pension schemes. This means that to compare the monthly or annual returns may not be totally meaningful, unless measured against a specific (set of) benchmark(s) that comply with the above mentioned objectives.

So far, the most comprehensive published study, which focused on the comparison of pension funds industry financial performance, comes from the joint research program of OECD and WB¹⁰. In connection with three private sector entities¹¹, this research program gathered all available information concerning the financial performance of pension fund industries. As a

¹⁰ The results of the research program were summarized in the final report: *Evaluating the Financial Performance of Pension Funds*, edited by Richard Hinz, Heinz P. Rudolph, Pablo Antolin, and Juana Yermo. The World Bank, 2010.

¹¹ These entities are two world-wide pension providers: Spanish based BBVA, and Dutch based ING Group. Third entity employed in the research program was the Dutch Association of Industry-Wide pension Funds (VB).

core part of the output, the program delivered the initial assessment of PFs financial performance of OECD countries. Also some non-member countries with reformed pension systems were included in the report. In total, 23 countries entered into the analysis, and these were the countries for which the basic historical data were available, inclusive of the mix of occupational and personal schemes as well as defined-benefit (DB) and defined-contribution (DC) systems.

In my paper, I will take the advantage of the built-up methodological background delivered by the research program as presented in Walker and Iglesias (2007), Antolin (2008), Tapia (2008a) and some other relevant academic sources that can be used for comparison of the financial performance of Czech private pension scheme with other reformed private pension schemes within the CEE region. The results may help us to understand whether the assets invested into the Czech private pension scheme were able to deliver adequate returns in comparison with chosen benchmark instruments, and also, in comparison with other pension schemes within the region, even though we are aware of intrinsic differences across different pension schemes.

3.3. Methodology

In the following passage the methodological approaches used for the analysis measuring the risk-adjusted financial performance of private pension schemes will be presented. Methodology then will be applied to the data for countries that have been selected for the purpose of financial performance comparison of the Czech system with other CEE countries. Walker and Iglesias (2007) provide a good summary of alternative methodologies generally used for the evaluation of financial performance of pension industries. However, most of the alternative methodologies require more detailed data (in terms of frequency of portfolio returns or stratification of PFs portfolio including separation of local/foreign bonds and stocks in time) than the observed schemes could deliver. Thus, the chosen methodology reflects a reasonable trade-off the level of input data detail and the information that could be obtained from these data.

Generally speaking, the objective of most of the measures used to evaluate portfolio performance is to assess whether the managers were able to bring any additional value compared with alternative investment strategies. These are usually represented by accessible and typically well-diversified benchmarks. Thus, when analyzing the aggregate PFs (scheme) returns of the individual country, the basic research question is whether, after reflecting on the

different investment limits (typically set by the regulator) and active managerial portfolio decisions, the scheme has been able to deliver any welfare premium with respect to feasible alternative (usually passive) investment strategies. Thus, in order to come up with such an assessment the returns of the schemes need to be compared with a reasonable benchmark(s).

One of the most typical measures in the modern portfolio theory remains the “Sharpe ratio” (SR)¹². Sharpe (1966) came out with the measurement used to rank the performance of mutual funds. If the investors combine a single risk-free asset with the portfolio whose performance is to be evaluated, then, under the condition of the same risk position (volatility), the SR is the measure according to which the portfolio could be ranked. It is a measure of the excess (differential) return per unit of risk. The condition of the same perception of risk is essential in this case.

The idea of SR is based on the prospects of the Markowitz (1952) mean-variance portfolio theory. There, it is assumed that the individual characteristics of portfolio (mean return and standard deviation) are sufficient statistics to evaluate individual investment portfolio. Thus, only first two moments of a distribution enter into the analysis when SR is used to evaluate the investment portfolio. It is very likely that most of the variability of portfolio performance we analyze - aggregate financial performance of pension schemes over the 10-year period - will be captured by its return mean and standard deviation.

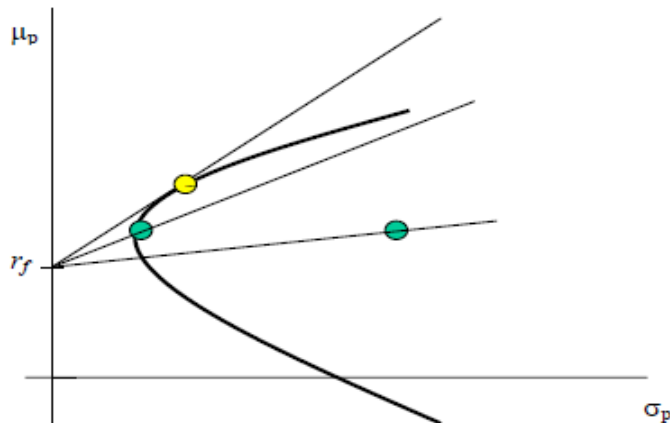
Sharpe (1994) reminds that there are two types of the SR ratio: ex ante and ex post SR. In most cases, the performance measures are computed using historic data, and while ex post SRs are used for empirical observations, the ex ante values are mostly only a subject of theoretical discussions. However, it is assumed that (either explicitly or implicitly) that the historic values have at least some predictive power. For the objective of pension schemes financial performance comparison the ex post SR ratios will be used.

As Walker and Iglesias (2007) state, the portfolio with the highest SR shall be preferred among investors if (at least) the following conditions hold: 1) The same planning horizon is shared by all investors; 2) consumption goods prices are uncorrelated with asset returns; 3) there are no other sources of wealth; 4) no short-sale restrictions for the risk-free asset take

¹² Sharpe ratio was originally introduced as “reward-to-variability ratio”. While used frequently, the terminology has not been consistent until 1994 when Sharpe came up with its unification. Prior to that some (e.g. Radcliff (1990); Haugen (1993)) called SR the “Sharpe Index”, others used a term Sharpe Measure (e.g. Reilly (1999); Elton and Gruber (1991); Bodie, Kane and Marcus (1993)).

place. If these conditions hold, the SR is monotonically increasing transformation of welfare. The highest SR value is then the one, which maximizes the expected return per unit of risk.

Figure 6: The Sharpe Ratio



Source: Antolin (2008)

Figure 6 graphically represents the Sharpe ratio. On the horizontal axis the standard deviation of portfolio returns is depicted. Vertical axis captures the portfolio returns. The SR of observed schemes is then represented by the slope of the line linking the risk-free alternative with the ratio of portfolio *excess (differential) returns* with respect to the *standard deviation* of this portfolio. If the above mentioned assumptions hold, then the most desired option for shareholders will be the portfolio with highest SR, which is with line with the steepest slope in the Figure 6.

Numerically, the SR could be presented as follows:

Let R_t be the return on the portfolio reached between dates $t - 1$ and t , R_{Ft} be the return on the benchmark (risk-free alternative) portfolio reached in the same period and denote by μ and σ its return and variance:

$$(1) \mu \equiv E(R_t)$$

and

$$(2) \sigma^2 \equiv var(R_t)$$

Then the Sharp ratio (SR) is defined as the ratio of difference between return of portfolio and the risk-free alternative with respect to standard deviation of the observed difference:

$$(3) SR \equiv \frac{\mu - R_{Ft}}{\sigma}$$

Universally, SR in this form represents the ratio of historical average excess return per unit of historic excess return variability. As μ and σ are unobservable they must be computed by using the historical data. Having a sample of historical returns (R_1, R_2, \dots, R_T) the estimators are the mean and variance of this sample:

$$(4) \hat{\mu} = \frac{1}{T} \sum_{t=1}^T R_t$$

$$(5) \hat{\sigma}^2 = \frac{1}{T} \sum_{t=1}^T (R_t - \hat{\mu})^2$$

Then the estimator of the Sharpe ratio (\widehat{SR}) is defined as follows:

$$(4) \widehat{SR} = \frac{\hat{\mu} - R_f}{\hat{\sigma}}$$

Furthermore, under the assumption that the returns are independently and identically distributed (IID), Lo (2002) develops a methodology for evaluating a reliability of estimation of SR. Under the IID assumption of portfolio returns, Lo (2002) shows the standard error for estimator of Sharpe ratio \widehat{SR} can be expressed as indicated in equation (5):

$$(5) SE(\widehat{SR}) = \sqrt{\left(1 + \frac{1}{2}SR^2\right)/T}$$

Following another step of Lo (2002), by substituting \widehat{SR} for SR the standard error might be computed. The 95-percent confidence interval for SR to appear around the estimator \widehat{SR} is then settled as follows:

$$(6) \widehat{SR} \pm 1.96 \sqrt{\left(1 + \frac{1}{2}(\widehat{SR})^2\right)/T}$$

Both findings presented in equation (5) and (6) will be used in this work for the purpose of empirical comparative analysis, as the estimated results will be observed whether they are significantly different from zero. Moreover, as Lo (2002) suggests, similar results will be obtained even if the IID assumption does not hold, as long as the stationarity assumption of the historical returns is not violated.

Benchmarks used for SR computations:

The choice of benchmark that would fulfill the requirement of risk-free marketable security, and that would also reflect the industrial objectives, needs to be considered carefully. A couple of considerations arise.

First limitation may be an absence of the truly “risk-free” alternative in the market of country analyzed. This could be worked out by the choice of low-risk alternative. Also, adjusting portfolios for domestic inflation and keeping it denominated in the local currency helps to mitigate this potential limitation. Second, proper investment horizon needs to be taken into account. In case of pensions the investment horizon should be considered long-term. Thus, the low-risk benchmark asset used for SR computation should reflect long-term horizon (e.g. 10 or 20 years), however if marked to market it would show a considerable volatility, therefore it would not be convenient for the SR computation. Under the assumption that excess returns are uncorrelated over the time, one can use e.g. monthly (quarterly) returns of long-term bonds instead. Another issue arising is the usage of non-domestic currency benchmark as a “risk-free” asset. Besides potentially low absolute default probabilities of respective benchmark asset, there is a country currency risk entering into the consideration. However, for more diverse information to be obtained from the comparative analysis also foreign-based benchmark assets denominated¹³ into the domestic currency will be utilized in our computations.

In the aforementioned OECD WB (2010) research project, four alternative low-risk benchmark assets were chosen for computation of SRs. The returns on the following assets were used as low-risk benchmarks: return on local 3-month Treasury bills (local T-bill), 10-year local government bond (local T-bond), and 3-month U.S. Treasury bill (U.S. T-bill) together with 10-year U.S. Treasury bonds (U.S. T-bond), both denominated into the local currency.

Each of these low-risk benchmark assets was used for a different purpose so that the provided financial performance evaluation of respective pension schemes would offer more complex information. For the purpose of comparison of financial performance of Czech private

¹³ The annualized yields of the foreign based risk-free assets are denominated into the local currencies. The foreign exchange rates fluctuations are fully accounted for as the changes in the historical exchange rates are reflected in each observation of the risk-free returns. Thus, the differences between portfolio returns and foreign based risk-free benchmark returns are influenced by the FX rate development. In our case the real long-term appreciation of CEE currencies (increasing the denominated excess returns) may potentially lead to the higher SR levels. On the other hand, the fluctuations in the FX development also increase the volatility of excess returns having the opposite effect on the SR levels.

pension scheme with other CEE reformed countries, similar benchmarks will be used. In order to adjust for the regional differences, the German bonds (with the lowest European default probabilities) instead of U.S. bonds will be used. To summarize, the following four benchmarks will be used for this objective.

- 1) Returns on the local 3-month Treasury bills (local T-bill) - STL
- 2) Returns on the local 10-year government bonds (local bond) - LTL
- 3) Returns on the German 3-month Treasury bills (GER T-bill) - STG
- 4) Returns on the German 10-year government bonds (GER bond) - LTG

Applied to these benchmarks the SRs may provide a meaningful answer to the question, whether the portfolio managers in respective pension schemes have been able to deliver the risk premium over the returns of the chosen country-specific and international low-risk reference benchmarks.

Limitations of the SRs comparability:

There are certain limitations for SR interpretation that need to be kept in mind. Based on the macroeconomic development the SR is expected to vary over the time periods and across asset classes. Therefore, to compare pension funds (schemes) that invest into the different asset classes or over the unmatched time frame may not be always meaningful (see e.g. Walker and Iglesias (2007)).

Furthermore, in some cases the SRs values do not necessary correspond with its original usage intention: to reward excess returns and penalize for increased risk. This is documented by Harding (2002). The standard deviation used in the denominator of SR reflects on the distance of each return (positive or negative) from the mean return. This approach neglects the difference in risk perception between large positive and negative returns, not negligible in e.g. dynamic investment strategies. In fact, if there is an outstanding excess return in one period, its removal from the sample may paradoxically lead to an increase of SR, as if it remained involved in the sample, the increase in the mean return would be out weighted by an increase in the returns volatility.

The limitations are even stronger when attempting to compare the SR values across countries. Besides the above mentioned problems there are also other factors that hinder such a comparison. First, it is not always the same investor facing the problem of portfolio allocation. With different perception of welfare also comes the different perception of risk

(one can assume that countries with lower welfare would be less risk-averse), which aggravates the SR comparison. Further, as described already above, the currency risk together with interest rate risk are country specific measures. Final consideration comes in the case of absence of risk-free country specific asset benchmark. The low-risk alternatives may not be always associated with similar levels of risk. Again, the same (or very close) perception of risk is essential condition so that we may compare its different levels across countries. Therefore, for any comparative purposes it is necessary to keep these potential flaws in mind when interpreting the SRs.

3.4. Analyzed countries

The goal of this work is to come up with the comparison of the financial performance of the Czech private pension scheme with other relevant private pension schemes within the Central-Eastern Europe (CEE) region with the ambition to answer the question whether the Czech scheme delivered any premium with respect to the chosen low-risk reference benchmarks, and how it stands internationally. The choice of the countries for such comparison was conditioned by the presence of the reformed private pension scheme of an adequate size which can offer at least 5-year track record, and for which also the data were accessible.

In total there are 6 countries entering into the analysis. These are: the Czech Republic, Bulgaria, Croatia, Hungary, Poland and the Slovak Republic. Despite of sharing some similar features each of these pension schemes has its unique characteristics that need to be kept in mind when the results will be interpreted. The basic characteristics of the private pension schemes in respective countries that enter into the analysis are summarized in Table 1¹⁴:

Table 1: Characteristics of the private pension schemes in the chosen countries

Country	Year of reform	Mandatory		Voluntary	
		Occupational	Personal	Occupational	Personal
Bulgaria	2002	√	√		√
Croatia	2002		√		√*
Czech Rep.	1994				√
Hungary	1998		√	√*	√*
Poland	1999		√	√*	√*
Slovak Rep.	2005		√		√*

Source: *Author*; Notes: √ = this scheme enters into the analysis; √* = will not be analyzed

¹⁴ The details of the five pension systems are to be found in Hlaváč (2011).

3.5. Data description and other considerations:

3.5.1. Data description

Various data sources have been identified so that the analysis comparing the financial performance of private pension schemes would become plausible. The periodic returns of the observed schemes were gathered mainly through the interaction with the pension fund associations of chosen countries or from the active market participants. The series of data for country specific benchmarks have been obtained from a number of databases. For the returns on the benchmark indices, the Global Financial Data is the most utilized source. Alternatively, other databases are also used to complement the necessary data.

One of the goals of this work was to come up with the dataset, which would allow us to compare the financial performance of chosen pension schemes over the last decade (2000 – 2010). Unfortunately, some limitations hindering such a comparison need to be taken into account. Obviously, part of the chosen schemes were implemented later than in 2000, thus there are no observation points dating back to 2000. This is the case of Bulgaria (2002), Croatia (2002) and the Slovak Republic (2005). Furthermore, the data for some countries in the required form (as collected) were not available from the very beginning of schemes operation due to various reasons. For example, for some countries there has been a change of regulatory agency (e.g. the case of Bulgaria or Poland), which brought an alteration in the reporting standards (usually bringing the more detailed scheme information). However, the new regulatory agencies often do not publish data from the earlier periods. The sources of periodic returns of the observed schemes in the aggregated form are presented in Table 2.

Table 2: Pension scheme returns: Dataset description

Country	Data frequency	Period ¹⁵	Data source
Czech Republic	Quarterly calculated returns (40 observations)	2000-2010	Czech Association of Pension Funds, Annual Reports of PFs
Poland	Monthly returns (130 observations)	2000-2010	Polish Financial Supervisory Authority
Hungary	Quarterly calculated returns (43 observations)	2000-2010	Hungarian Financial Supervisory Authority
Slovak Republic	Monthly returns (63 observations)	2005-2010	The Association of Pension Funds Management Companies
Bulgaria	Quarterly calculated returns (27 observations)	2004-2010	Bulgarian Association of Supplementary Pension Security Companies
Croatia	Quarterly calculated returns (35 observations)	2002-2010	Raiffeisen Mandatory Pension Fund Management Company Plc.

Source: Author

In order to come up with the aggregate rates of return for a given period of time the following considerations need to be taken into account. In fact, the aggregate rate of return should be understood as a growth of the total wealth as opposed to the beginning of the period. First, the returns for each pension fund for a given period are to be counted. From these returns the weighted average return (reflecting the relative asset weight of each fund at the beginning of the period) will be calculated. This approach assumes all the inflow and withdrawals to happen at the end of each period, and is often titled as time weighted returns (Walker and Iglesias, 2007).

3.5.2. Other considerations

The investment regulation is a complex issue surrounding each of the respective pension schemes. As most of the observed schemes are mandatory and of the defined-contribution type and most of the observed CEE countries also share the characteristics of relatively underdeveloped capital market, one may expect the schemes will operate in relatively strongly regulated environment, which is also the case. Most of the observed schemes have regulation standards in the form of investment restrictions or minimum return guarantees in place. The differences in regulation standards are important as they directly influence the potential structure of schemes portfolios. As a consequence, these differences have a strong impact on the potential returns that could be delivered by the respective schemes. In the following table, the investment regulations in target countries are summarized.

¹⁵ Observations for 2010 cover either first half or first three quarters of the year 2010, depending on the data availability at the time of the work completion.

Table 3: The summary of investment regulation features in target countries

Country	Minimum return guarantee	Equity exposure	Mutual funds exposure	Direct limits on foreign investment
Bulgaria	60 percent of the asset weighted average performance over last 24 months	mandatory \leq 20%; voluntary – no limit	Mandatory \leq 15% voluntary – no limit	Foreign currency limits (outside BGN and EUR): mandatory \leq 20%; voluntary \leq 30%
Croatia	Weighted arithmetic mean of average rates of return of all PFs over the previous three years, reduced by two percentage points.	\leq 30%	\leq 15%	\leq 15% (MPF) \leq 20% (VPF)
Czech Republic	Implicitly annual return \geq 0 (see section 2.1.2.)	No limit	\leq 10% in close-ended \leq 15% in open-ended	Restricted only to securities traded in OECD markets. 70% needs to be denominated in CZK
Hungary	85 % of the official return index of long-term government bonds over the last 3 years	\leq 50% (MPF), \leq 60% (VPF)	\leq 50%	\leq 20% (MPF) \leq 30% (VPF)
Poland	The lower of the following 2: The average nominal annualized rate of return of the last 36 months of all PFs minus 4 percentage point or 50% of the rate.	In total \leq 60%; up to 50 % into the stock exchange listed companies, up to 10 % into the non-listed stocks	\leq 20%	\leq 5 %
Slovak Republic	A comparative element: The average yield during the past 24 months. The PFs need to guarantee the lower of following two: - conservative (90% or minus 1% point) - balanced (70% or minus 3% points) - growth (50% or minus 5% points)	0 - conservative 50% - balanced 80% - growth	0 - conservative 50% - balanced 80% - growth	\leq 50%

Source: Author

3.6. Results

In the following subchapter, we present the results of the observations for individual countries. First, the annual nominal and real returns of pension schemes will be introduced. This analysis serves as a basic orientation in the financial performance among the respective pension schemes. However, various factors¹⁶ prevent us to base the comparative analysis of

¹⁶ Among these factors one can mention e.g. different stages of financial markets development and other economy characteristics (being reflected in different country-specific risk positions). Also the differences in investment regulation (asset exposure limits and minimum return guarantees), reporting frameworks and methodologies used for portfolio valuations cannot be ignored. Furthermore, the results of the scheme observations are often reached over the unmatched time periods – another factor that also needs to be kept in mind.

the financial performance of pension schemes solely on the basis of just reported returns. To account for some of these factors, the analysis based on the Sharpe ratios was conducted. The main strength of the used methodology is the adjustment for the country specific risks by comparing the scheme returns against the country-specific benchmarks. This kind of analysis also considers the volatility of observed returns. In brief, it provides the answers to the question whether the respective pension schemes over the observation period have beaten the country-specific low risk benchmarks.

3.6.1. Schemes investment returns and standard deviations

We start the analysis of private pension schemes financial performance by the observation of nominal and real returns of each respective scheme delivered over the period observed. The real investment returns and the standard deviations of these returns will serve as the initial standpoint for evaluation of the financial performance. There are many restrictions such as idiosyncratic characteristics of each respective scheme, the regulatory restrictions together with different reporting frameworks, different time periods covered, also the uneven fee levels (see e.g. Tapia and Yermo, 2008) and a range of other limitations that prevent from constituting the analysis of the financial performance just on the real returns of the system. However, it is still useful to examine the distribution of the investment returns across the observed countries to get the initial view of the fact how the Czech scheme stands in comparison with other reformed countries. These results are summarized in the table below. There are three columns in Table 4, the first column stands for the average annual returns, the second for the average real returns (nominal returns adjusted for inflation rates), and the last column stands for the standard deviation of the average real returns.

Table 4: The average nominal and real scheme returns reached over the periods observed.

Country	Pillar	Average annual return	Average real annual returns ¹⁷	Standard deviation of real returns	Period ¹⁸
BLG UPFs	II.	4,54%	-0,55%	9,84%	2004-2010
BGL OPFs	II.	3,96%	-1,29%	10,94%	2004-2010
BLG VPFs	III.	4,24%	-0,92%	11,85%	2004-2010
CRO	II.	5,61%	2,81%	8,56%	2002-2010
CZE	III.	3,03%	0,51%	2,53%	2000-2010
HUN	II.	6,59%	0,65%	10,86%	2000-2010
POL	II.	8,50%	4,99%	8,24%	2000-2010
SVK C.	II.	2,71%	0,01%	1,44%	2005-2010
SVK B.	II.	1,45%	-1,25%	4,72%	2005-2010
SVK G.	II.	1,13%	-1,57%	5,62%	2005-2010

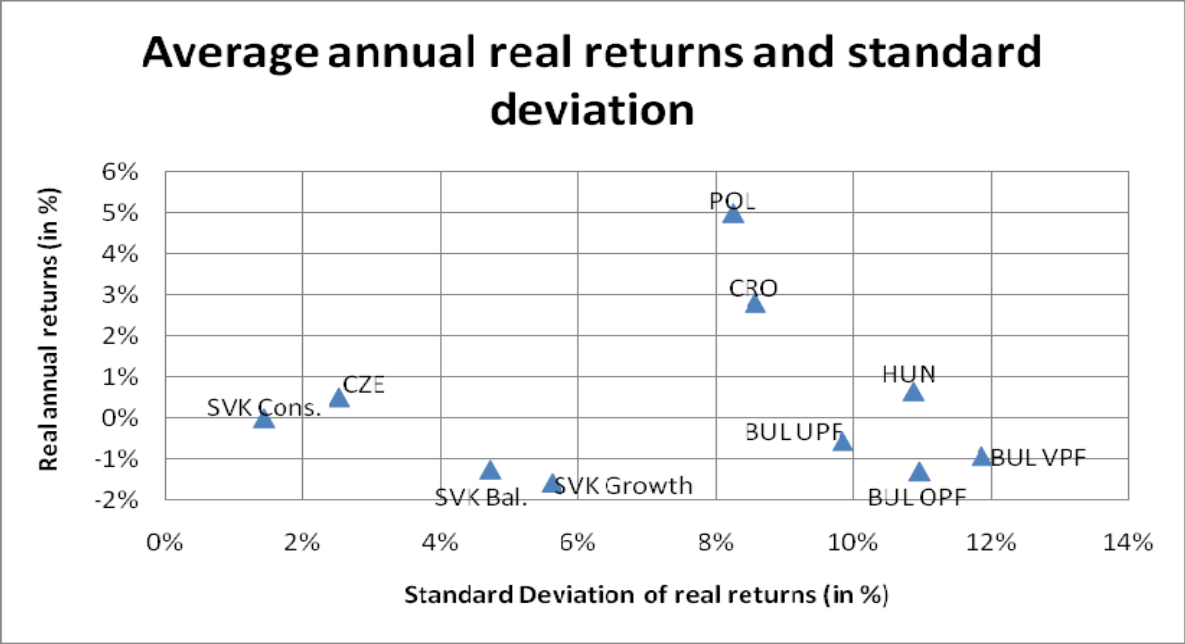
UPFs = Universal pension funds; OPFs = Occupational pension funds; VPFs = Voluntary pension funds, C. = Conservative; B. = Balanced; G.= Growth.

¹⁷ The country's annual inflation rates were obtained from Eurostat:

<http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&language=en&pcode=tsieb060&tableSelection=1&footnotes=yes&labeling=labels&plugin=1>. Data for Croatia were obtained Croatian bureau of statistics: <http://www.dzs.hr/>.

¹⁸ Observations for 2010 cover either first half or first three quarters of the year 2010, depending on the data availability at the time of the work completion.

Figure 7: The average annual real returns and standard deviation over the period observed



Source of Table 4 and Figure 7: Author’s calculations

Keeping in mind the limited data comparability stemming from the factors mentioned above, the ambition of this section is to provide us with the initial overview that will set the boundaries for respective performances. The calculations from the collected data suggest that there is no clear relationship between the real scheme annual returns and the standard deviation of these returns. There are countries with low levels of real returns in combination with low volatility of returns (Czech Republic or all three Slovakian schemes), there is a country with relatively high real returns that were reached with medium volatility (Poland), and finally there is also a country that experienced the low (negative) real returns in combination with high volatility of these returns (all observed pension schemes in Bulgaria).

These preliminary findings roughly correspond with the ones of Tapia (2008a). In his research project he gathers the data for 23 OECD countries over the period 2000-2005, and he also does not find a clear connection between the real returns of the scheme and the standard deviation of these returns. However, he points out that most of the countries experienced the low levels of returns with the relatively low levels of volatility.

Generally speaking, the levels of investment returns and the volatility of these returns vary over time. Indeed, the values of observed parameters also depend on the length of the observation period that has been covered. This influence is especially evident in the case of Bulgaria, where the standard deviation of returns ranged from 15 to almost 18 percent with

the average real returns turning out to be negative. The positive market situation in 2007 materialized in the returns as high as 15-18 percent. However, these high levels of returns were more than offset in 2008 when all three Bulgarian pension schemes realized remarkable losses amounting to negative annual investment returns in the range of 35 to 40 percent. The presence of the global financial crisis in 2008-2009 loaded the financial performance of most of the observed systems significantly. However, its foot-print is even more evident in the case of schemes with relatively short periods of operation. In these cases it is reasonable to expect that the returns variation will decrease as the differences in consecutive returns will stabilize with the growing maturity of the scheme, and also possibly due to the expected stabilization of the situation in the world financial markets.

3.6.2. Sharpe ratios

As addressed in the methodological section, four alternative benchmarks are used as a proxy for the risk-free (or low risk) asset in order to estimate the scheme SRs. Due to different yields on domestic risk-free (low risk) benchmark assets, the analysis also uses the international risk-free benchmark¹⁹ so that the scheme performance could be compared with the reference asset that is available to all schemes, and which also embodies the same and the lowest possible (contrary the respective domestic benchmarks) level of risk. Thus, as reference benchmarks the returns on the following instruments were used: A short-term local T-bill (STL), a long-term local government bonds (LTL), a short-term German T-bill (STG), and long-term German government bond (LTG) both denominated into the local currency²⁰. The quarterly (monthly) holding period returns of the benchmark assets have been tracked. These returns were subtracted from the returns of the schemes so that the excess returns and standard deviation of these returns could be obtained. Out of these values, the estimation of SR for each respective benchmark is obtained. Further, by employing a procedure introduced in Lo (2002), the results were tested whether the estimated SRs significantly differ from zero.

The chosen methodology tackles some of the limitations mentioned in the section 3.6.1. that aggravate the international comparison of the schemes financial performances. Mainly, the methodology accounts for the risk levels of the respective schemes as the country-specific risk premiums are reflected in the investment returns of the observed benchmarks used for SRs

¹⁹ German bonds and T-bills were chosen as European reference benchmarks as these instruments bear the lowest risk out of the available instruments within observed categories.

²⁰ The limitation of this approach is that the exchange rate fluctuations are fully projected into the returns on German benchmarks denominated into the domestic currencies. Thus, the volatility of excess returns may artificially lower the value of estimated SRs.

computations. The methodology also captures the elementary dynamics of the state of the economies as the risk-free changes are reflected in the changes of excess returns. However, the other limitations such as the various investment restrictions, the minimum return guarantees, the diverse fee structures or the unmatched observation periods remain unresolved. Its impact on the financial performance of pension schemes is not treated by this type of analysis, and therefore needs to be considered when interpreting the results.

Table 5 below summarizes the results of the SRs computations for each of the observed pension schemes. There are three indicators for each of the benchmarks: Sharpe ratio (SR), t-test of SR estimate, and excess scheme return over the observed benchmark (ER). Altogether, there are six CEE countries (including the Czech Republic) entering this data exercise. If more schemes for individual country are present (the case of Bulgaria and the Slovak Republic), the results for each of them are presented separately. Data sources of the scheme returns and observation periods are also mentioned in this table. The scheme returns, depending on the reporting standards of the respective schemes, are derived either from asset weighted returns of scheme index values (if available) or from the aggregate scheme returns. Nevertheless, both are expressed as periodic annualized net returns²¹, so that scheme excess returns (the difference between scheme returns and returns of chosen benchmarks) and standard deviation of returns necessary for SR computations could be obtained.

To understand the SR correctly, it represents the ratio of the scheme excess returns with respect to the standard deviation of these returns. Thus, a positive value of SR indicates that the scheme managed to deliver higher returns than its low-risk reference benchmark. On the other hand, negative SR value signals that the returns on low-risk reference benchmark were higher than the ones delivered by the pension scheme. The inability of the scheme to deliver higher returns respect to its reference benchmark will be addressed as an underperformance of the scheme. Also, as the SR is a measure of excess returns over the unit of risk, the higher volatility of the returns also results in the lower values of SR. In general, the scheme with the highest value of SRs shall be preferred among the investors (see the section 3.3).

²¹ By net returns we mean the returns which are available to the scheme participants. Those are the investment returns net of all types of fees and scheme periodic costs. However, the returns are not adjusted for the up-front (contribution) fees, which are in place in Poland, Slovakia, Bulgaria and Hungary.

Table 5: Summary of the results obtained

Benchmarks used for Sharpe ratios computations												Scheme
STL			LTL			STG			LTG			
SR	t-test	ER	SR	t-test	ER	SR	t-test	ER	SR	t-test	ER	
Czech Republic - quarterly calculated aggregate scheme returns: Sep 2000 – Sep 2010												
0,12	0,77	0,20	-1,01	-4,50	-1,61	0,81	3,98	1,29	-0,14	-0,91	-0,23	
Bulgaria - quarterly calculated (asset weighted) index returns: Apr 2004 – Sep 2010												
0,06	0,32	0,98	-0,09	-0,45	-1,34	0,12	0,61	1,83	0,02	0,10	0,35	<i>UPFs</i>
0,01	0,07	0,21	-0,13	-0,66	-2,11	0,06	0,33	1,06	-0,03	-0,13	-0,41	<i>OPFs</i>
0,03	0,13	0,48	-0,10	-0,51	-1,84	0,07	0,37	1,32	-0,01	-0,04	-0,15	<i>VPFs</i>
Croatia - quarterly calculated (asset weighted) index returns: Apr 2002 - Sep 2010												
0,10	0,58	1,04	-0,09	-0,52	-0,93	0,26	1,40	2,63	0,10	0,55	0,98	
Hungary - quarterly calculated aggregate scheme returns: Jan 2000 - Sep 2010												
-0,10	-0,67	-1,46	-0,03	-0,21	-0,46	0,31	1,92	4,34	0,20	1,30	2,86	
Poland - monthly calculated (asset weighted) index returns: Jan 2000 - Oct 2010												
0,13	1,44	2,21	0,15	1,67	2,57	0,40	4,07	6,96	0,32	3,35	5,49	
Slovak Republic - monthly calculated (asset weighted) index returns: Apr 2005 – Jun 2010												
-0,09	-0,72	-0,18	-0,61	-3,78	-1,19	0,60	3,74	1,17	-0,07	-0,57	-0,14	<i>Cons.</i>
-0,34	-2,48	-1,86	-0,53	-3,44	-2,87	-0,10	-0,75	-0,52	-0,34	-2,44	-1,83	<i>Bal.</i>
-0,34	-2,47	-2,29	-0,49	-3,27	-3,30	-0,14	-1,10	-0,95	-0,34	-2,44	-2,25	<i>Gro.</i>

STL = Short-term (3-month) local T-bills; LTL = Long-term (10-year) local government bonds; STG = Short-term (3-month) German T-bills; LTG = Long-term (10-year) German government bonds; SR = Sharpe ratio; t-test = t-test value of the SR estimate; ER = scheme excess return over the observed benchmark (for comparative purposes annualized and expressed in percentage points). Source: Author's calculations

In the following section the results of the observations will be presented separately for the Czech Republic and jointly for all other countries observed. Before summarizing and discussing the obtained results for other countries, again, the limited cross-country comparability of the pension schemes financial performance should be stressed. The ambition of this work was not to analyze whether the respective pension schemes were able to deliver an adequate level of pensions for future pensioners. Such a question is beyond the scope of this work. Rather, the applied methodology addressed the question whether the analyzed pension schemes were able to generate any premiums with respect to the country specific low-risk benchmarks over the period observed (Sharpe ratios).

The results for the Czech Republic

The results for the Czech voluntary private pension scheme indicate on the positive values of SRs (0.12 and 0.11) when measured against both (local and foreign) short-term benchmark instruments, although only in the case of German 3-month T-bills it proved to be significantly different from zero. On the other hand, SR values for both long-term benchmark instruments turned out to be negative. This was especially evident in the case of Czech 10-year government bonds where the SR estimates (-1.01) reached the lowest value out of all schemes observed.

To understand the results correctly, this does not mean that the scheme has delivered the highest negative excess returns over this respective benchmark²², but it rather signals that the scheme (negative) excess returns in combination with the relatively stable volatility of the PF returns (expressed by its standard deviation²³), resulted in the largest negative performance based on the SR indicator. The highest negative value of SR estimate reflects on the fact that the negative excess returns over this benchmark have been delivered persistently over the period observed. Moreover, this underperformance is underlined by a strong statistical significance of this estimate.

The results for other countries

In total there were five other CEE countries analyzed: Bulgaria, Croatia, Hungary, Poland, and the Slovak Republic. The original intent was to come up with the dataset of the schemes returns covering the period 2000-2010. However, this had to be adjusted depending on the year of the system introduction and/or the data availability. The initial standpoint of the financial performance was provided by the observation of the real returns delivered by the respective pension schemes. The substantive influence of the world financial crisis was evident²⁴ from the results obtained. Consequently, the countries with shorter observation periods (SVK, BLG) managed to deliver only the negative real annual returns. Out of the countries analyzed the highest real annual returns were delivered by the Polish mandatory pension scheme.

²² The Slovakian growth and balanced scheme (-3.3 percent and -2.87 percent respectively) as well as the Bulgarian OPF and VPF schemes experienced higher negative excess returns than the Czech voluntary private pension scheme (-2.11 percent and -1.84 percent respectively) when measured against the domestic long-term benchmark.

²³ The standard deviation of the PFs returns turned up to be much lower in the case of the Czech Republic (1.59 percent) in comparison with the e.g. Slovakian growth and balanced schemes (6.71 percent and 5.43 percent) or Bulgarian OPF and VPF schemes (16.42 percent and 17.75 percent).

²⁴ The validity of this statement could be documented on 3 countries (Poland, Hungary and the Czech Republic). In comparison with Tapia (2008b) who covers the period 2000 - 2005, the real scheme returns dropped by 2.7 percentage points in the case of Poland, 1.6 percentage points for Hungary, and 0.5 in the case of the Czech Republic.

The results of the computations (as presented in the Table 5) suggest that the examined schemes were not outperformed by the domestic short-term benchmarks (except for Slovakian balanced and growth schemes and Hungary). In fact, most of the SR values for domestic short-term benchmarks were positive, though the SR estimations rarely turned out to be significantly different from zero. On the other hand, all of the analyzed schemes (except for Polish mandatory pension scheme) have been outperformed by its local long-term (10-year government bond) benchmark as the SR estimates turned out to be negative (ranging from -1.01 to -0.03). The highest underperformance was tracked in the case of the Czech Republic and the Slovak Republic. Besides the Czech Republic, the statistical significance of the results was also validated in the case of the Slovak Republic and Poland.

The comparison against the international benchmarks brings similar results. The short-term international benchmark was beaten in most of the cases (except for Slovakian balanced and growth scheme) as most SRs turned out to be positive. In addition, the majority of the results were also supported by its statistical significance. Further, the comparison with the long-term international benchmarks resulted into a mixed success as only some of the countries outperformed its benchmark returns (SRs ranging from -0.34 to 0.32). However, merely the results for Poland turned out to be statistically significant from zero. In general, the results of the comparisons of schemes financial performance with the international benchmarks turned out to be more positive due to the interest rate differential and domestic currency appreciations appearing in most of the countries over the period observed (both systematically lowering the benchmark returns).

3.7. Discussion of the obtained results

Generally, out of the presented findings there is one that stands above the others. It is the finding that only one of the six countries observed (Poland) managed to beat its long-term domestic benchmarks as SR turned out to be negative in all of remaining cases. Such a financial performance should be treated as markedly unsatisfactory. Assuming normal shape of the yield curve²⁵ in long run and taking into account the schemes investment horizon (which should reflect the working age period of its participants ranging from 30 to 40 years), the expectation on the pension scheme returns to systematically outperform the returns on 10-year government bonds is legitimate. Poor financial performance documented in this study

²⁵ By the standard shape of the yield curve we mean the yield curve with the positive sloping meaning that bond yields rise as their maturity lengthens.

could be in some cases partially justified by the relatively short period of scheme operation in combination with the occurrence of the world financial crisis. However, this argument is not valid for the schemes operating over the whole observation period (2000-2010, i.e. CZE, HUN, POL). The disability of the schemes to generate sufficient returns to cover its potential losses, so that the domestic long-term benchmark could be systematically outperformed, invokes the need to revise the schemes initial design, and identify limitations hindering such a delivery. These limitations then should be addressed by the policy recommendations that would facilitate an adequate outcome. Through the identification of countries with such underperformance this study may serve as a basis for the further research in the respective countries that would come up with the analyses addressing these limitations.

The financial performance of the Czech voluntary private pension scheme (and its comparison with other chosen CEE countries) has been relatively satisfactory when measured against the foreign (German) benchmarks. Also, the scheme managed to beat its local short-term benchmark, although this result is not significantly different from zero. On the other hand, the strong underperformance of the scheme has been identified when the returns on the Czech government 10-year bonds were used as its reference benchmark. In fact, the value of SR reached for the long-term local benchmark points out on the worst result in this category (SR value of -1.01!).

This does not mean that the scheme delivered the highest negative excess returns with respect to this benchmark but the already high levels of negative excess return were accompanied by the relatively stable volatility of the PF returns, which resulted in the largest negative performance based on the SR indicator. The highest negative value of SR estimate reflects on the fact that the negative excess returns over this benchmark have been delivered with relatively stable persistency over the period observed. Moreover, this SR estimate is strongly statistical significant. To quantify it, in average over the period observed, the returns of the scheme have been outperformed by the Czech 10-year government bonds by 1.61 percentage points annually. Such a poor financial performance reached against the domestic long-term bonds could be explained by several factors.

The presence of the legislative arrangement requiring PFs to deliver the non-negative returns per each fiscal year prevents the scheme from accomplishing its maximal long-term potential returns. This short-term oriented legislative measure shifts the investment focus of PF managers from “maximizing the long-term returns” approach rather to “minimizing the short-

term losses” strategy. This is reflected then by the choice of a strongly conservative investment strategy²⁶. With no incentives to deliver (or penalizations for not delivering) higher portfolio returns in the long-run (where the fluctuations of the returns would be intrinsic and inevitable), the PFs behave rationally within the legally defined boundaries and “voluntarily” provide the scheme participants with stable (but low) annual returns.

Next factor, weighting the financial performance of the scheme downwards, is the amount of total PFs costs that absorb a part of the realized scheme returns. As mentioned in the Chapter 2, there are no legal limitations on the level of PFs costs, and these costs directly lower the net profit of the scheme. As documented in the section 2.3., the cost side of PFs (Czech equivalent to fees) expressed in relative terms improved in the second part of the decade due to the economies of scale, and an increasing maturity of the scheme. However, the level of acquisition costs deteriorates relatively slowly and still considerably burdens the performance of the scheme. In fact, the PF returns underperformed against returns of the 10-year Czech government bonds by 1.61 percentage points annually. Interestingly, this roughly corresponds to the historic average level of the sum of operational and acquisition costs of the system.

Also, the market situation, where the investment strategies of PFs do not differ from each other, may be far from optimal. As all the participants need to be treated equally, the PFs do not have a room for creating more investment strategies to satisfy the diverse needs of participants (stemming from e.g. different age categories), which could diversify the system resources, and could offer a wider range of more complying risk/return combinations.

4. Concluding remarks

The Czech voluntary private pension scheme was introduced in late 1994, and since then it has experienced a substantial development. After 15 years of its existence, a time of evaluation has come. Therefore, the first aim of this work was to analyze the position of the Czech voluntary private pension scheme, identify its main features and track its recent development. The core part of this study then focused on the evaluation of the financial performance of Czech scheme with respect to other reformed private pension schemes within the CEE region.

²⁶ Since 1999 the average equity exposure has not exceeded 8 percent with marginal exposures to other riskier asset classes.

The Czech scheme could be summarized by the following attributes: By 2009, the sector gathered the assets amounting to the 6 percent of the Czech GDP. The scheme coverage exceeds 70 percent of the total workforce, and lately it has gained an increasing popularity among employers which is being reflected through their higher participation in the scheme. In addition, it gets relatively cheaper to run the scheme due to the occurrence of the economies of scale. All these attributes could be perceived as clear accomplishments. On the other hand, the participant's contribution rate expressed relatively to the average gross wage is decreasing steadily since the scheme has been introduced. Moreover, as the assets of participants are not separated from PFs assets, the current levels of acquisition costs still markedly lower the ability of the scheme to deliver adequate returns to its participants.

The main body of this work analyzed the financial performance of the Czech private pension scheme with respect to other reformed schemes within the CEE region. The financial performance was measured by the ex-post Sharpe ratios. The findings suggest that most of the observed pension schemes outperformed their short-term local and short-term foreign risk-free (low-risk) reference benchmarks, although about half of the estimated values of SRs were not significantly different from zero. On the other hand, the underperformance of the observed schemes was identified when measured against the long-term local and long-term foreign benchmarks. These findings were especially evident in the case of domestic 10-year government bonds as none of the schemes (except for Polish mandatory scheme) managed to deliver higher returns than the returns on this reference benchmark. Assuming normal shape of the yield curve in the long-term, and given the investment horizon of the pension scheme, the expectation to systematically outperform such a benchmark is legitimate. If this expectation is not met, it invokes the need to revise the initial design of the scheme, and to identify its weaknesses that prevent from fulfillment of such an expectation. Through the identification of the countries with such underperformance this study may serve as a basis for the further research in the respective countries that would come up with the analyses addressing these limitations.

The financial performance of the Czech voluntary private pension scheme among other reformed private pension schemes within the CEE region has been relatively satisfactory when measured against domestic and foreign short-term benchmarks. However, the strong underperformance was identified in the case of both long-term benchmarks. In fact, the observed scheme performance when measured against the local long-term benchmark was the weakest out of the countries analyzed as the estimated value of the SR turned out to be largely

negative. The highest negative value of SR estimate does not reflect on the delivery of the highest negative excess returns (which is also not the case) but rather on the fact that the high negative excess returns were delivered persistently (low volatility of the returns) over the period observed. Moreover, this finding is supported by its strong statistical significance. To quantify the result, during last decade the scheme returns have been outperformed by the returns of the Czech 10-year government bonds in average by 1.61 percentage points annually.

Such an underperformance could be explained mainly by the following two factors. The first is the presence of the legislative arrangement requiring the non-negative returns to be delivered every fiscal year. This results in the very conservative portfolio allocations. The natural investment strategy of PF reflected in the “maximizing the long-term returns” (accepting the volatility of these returns) approach is replaced by the “preventing the short-term losses” approach. As a result, with no incentives to deliver (or penalizations for not delivering) higher portfolio returns in long-term, the scheme provides its participants with stable but low annual returns. The second factor that contributed to the scheme poor financial performance is the level of PFs costs. As assets of the participants are not separated from the PFs assets, these costs are directly subtracted from the investment profit which is going to be distributed among the scheme participants as a net profit. Thus, the results of this study suggest that in order to become competitive in the area of scheme financial performance, these two identified factors shall be treated accordingly.

References:

1. Antolin, P. (2008), "*Pension Fund Performance*", OECD Working Papers on Insurance and Private Pensions, No. 20, OECD publishing.
2. Antolin, P. and F. Stewart (2009): "*Private Pensions and Policy Responses the Financial and Economic Crisis*", OECD Working Papers on Insurance and Private Pensions No. 36, OECD publishing.
3. Basak, S. and Makarov, D. (2008): "*Strategic Asset Allocation with Relative Performance Concerns*", Working Paper, London Business School.
4. Benartzi, S. and Thaler, R. (2007): "*Heuristics and Biases in Retirement Savings Behavior*", *Journal of Economic Perspectives* 21 (3): 81–104.
5. Campbell, J. Y. and Viceira, L. (2002): "*Strategic Asset Allocation: Portfolio Choice for Long-term Investors*", Oxford University Press.
6. Campbell, J. Y. (2006): "*Household Finance*", *Journal of Finance* 61: 1553-1604.
7. Castaneda, P. and Rudolph, P.H. (2009): "*Portfolio Choice, Minimum Return Guarantees, and Competition in Defined Contribution Pension Systems*", Working Paper, published in World Bank (2010) project on Investment Performance of Privately Managed Pension Funds.
8. Elton, E. J. and Gruber M. J. (1991): "*Modern Portfolio Theory and Investment Analysis*", 4th edition. New York: John Wiley & Sons.
9. Harding, D. (2002): "*Critique of the Sharpe Ratio*", Winton capital Management.
10. Haugen, R. A. (1993): "*Modern Investment Theory*", 3rd edition. Englewood Cliffs, NJ: Prentice-Hall.
11. Hlaváč, J. (2011): "*The performance of the Czech Private Pension scheme: Current Design and its position within CEE countries.*" Master paper. Charles University in Prague, Faculty of Social Sciences, Institute of Economic Studies, 2011, 107 pages. Supervisor: Ondřej Schneider.
12. Lusardi, A. and Mitchell, O., S. (2006): "*Financial Literacy and Planning: Implications for Retirement Wellbeing*," Tech. rep., Pension Research Council, Wharton School, University of Pennsylvania.
13. Lo, A. (2002) "*The Statistics of Sharpe Ratios*", *Financial Analysts Journal* 58 (4): 36-52.

14. Markowitz, H. (1952): "*Portfolio Selection*", Journal of Finance, 7(1), 77-91.
15. OECD (2010): "*Pension Markets in Focus*", Issue 7.
16. Radcliff, R. C. (1990): "*Investment Concepts, Analysis, Strategy*", 3rd edition. New York: HarperCollins.
17. Reilly, F. K. (1989): "*Investment Analysis and Portfolio Management*", 3rd edition. Chicago: The Dryden Press.
18. Rudolph, H.P., Hinz, R., Antolin, P. and Yermo J. (2010): "*Evaluating the Financial Performance of Pension Funds*", Chapter 1 in World Bank (2010) project on Investment Performance of Privately Managed Pension Funds.
19. Sharpe, W. F. (1966): "*Mutual Fund Performance*", Journal of Business 39 (S1).
20. Sharpe, W. F. (1994): "*The Sharpe Ratio*". Journal of Portfolio Management 21 (1).
21. Stanko, D. (2003): "*Performance Evaluation of Public Pension Funds: The Reformed Pension System in Poland*", The Pensions Institute Birkbeck College, University of London, Discussion Paper PI-0308, 1–32.
22. Tapia, W. (2008a), "*Comparing Aggregate Investment Returns in Privately Managed Pension Funds: An Initial Assessment*", OECD Working Papers on Insurance and Private Pensions, No. 21, OECD publishing.
23. Tapia, W. (2008b), "*Description of Private Pension Systems*", OECD Working Papers on Insurance and Private Pensions, No. 22, OECD publishing.
24. Tapia, W. and Yermo, J. (2008): "*Fees in Individual Account Pension Systems: A Cross-Country Comparison*", OECD Working Papers on Insurance and Private Pensions, No. 27, OECD Publishing.
25. Walker, E., and Iglesias, A. (2007): "*Financial Performance of Pension Fund Systems around the World: An Explanatory Study*", report prepared for the OECD – World Bank 2010 project on Investment Performance of Privately Managed Pension Funds.
26. World Bank (1994): "*Averting the old age crisis*", World Bank Policy Research Report, World Bank, Washington, D.C.
27. Zalewska, A. (2006): "*Is locking domestic funds into the local market beneficial? Evidence from the Polish pension reforms*", Emerging Markets Review, 7(4), 339-360.

E-sources:

1. http://www.cnb.cz/miranda2/export/sites/www.cnb.cz/cs/dohled_financni_trh/souhrnne_informace_fin_trhy/archiv/penzijni_fondy/VZ_PF_2002.pdf, (downloaded: 1.8.2010)
2. <http://www.reuters.com/article/idUSLDE6BT11Y20101230>, (5.1.2011)
3. <http://hnonline.sk/ekonomika/c1-48881860-treti-pilier-v-tomto-roku-zarobil>, (1.1.2011)

Data sources:

1. Annual reports of the Association of Pension Funds of the Czech Republic (1996-2009).
2. Annual reports of the Czech pension funds 2000-2010.
3. Polish Financial Supervisory Authority.
4. Hungarian Financial Supervisory Authority.
5. The association of Slovakian Pension Funds Management Companies.
6. Bulgarian Association of Supplementary Pension Security Companies.
7. Raiffeisen Mandatory Pension Fund Management Company Plc. (Croatia)
8. European Central Bank
9. EUROSTAT
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