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## Article

# Does risk aversion matter for foreign asset holdings of pension funds: The case of Poland

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## **Does Risk Aversion Matter For Foreign Asset Holdings Of Pension Funds – The Case Of Poland**

### **Abstract**

*In this study we explore the issue of foreign assets in mandatory pension funds portfolios. First we provide an overview of the regulatory policies regarding international assets and indicate the externalities which may account for the observed differences among the CEE states. Then, taking the perspective of portfolio theory, we run a simulation study to measure the diversification benefits that may be achieved by greater international asset allocation. By applying the specific constraints and exchange rate volatility to our optimization procedure, the study reflects the perspective of the Polish pensioner. However, the findings regarding risk aversion intensity and the discussed directions of further research should be of a universal character.*

**Keywords:** *pensions funds, currency risk, international portfolios*

### **1. Introduction**

Successful financial investing means managing the expected risk and return to achieve the desirable balance. It is no different in case of future

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retirees, if they keep at least part of their pension savings in financial assets. Additionally, if we consider the mandatory pension systems, which are oriented towards minimizing the risk of poverty in old age rather than maximizing the expected return, the question of risk-reduction opportunities seems to be crucially important. This investment objective may be achieved by holding a portfolio of different assets. The conclusion from the Markowitz (1952) seminal paper states that in such conditions the diversification benefits emerge (reducing the portfolio risk while keeping the return constant). The diversification potential is greater, all other things being the same, whenever the correlation coefficient between asset returns is lower. Consequently, investors should look for securities that do not exhibit strong returns co-movement.

In this paper we argue that that Polish Open Pension Funds (OPF), which constitutes the mandatory capital pension pillar in Poland, should change their strategic asset allocation. We provide evidence that OPF would achieve additional diversification benefits if they were investing more in foreign assets. Viceira (2010 p. 220) points out that emerging economies are typically characterized by small national stock markets and are subject to significant country-specific risks. Frequently, emerging markets do not have a widely diversified productive sector and instead are heavily concentrated in specific industries or services. Therefore, the need for international diversification may be even more pronounced in case of the economies like Poland.

The structure of this paper is as follows: In the next section we present an overview of the regulatory policy regarding the OPF and the countries that established mandatory capital pension pillars (second (II) pillars). We discuss the external effects of the regulations, which should explain the observed cross-country variation in this area. Finally, we present a review of the literature, indicating the gap we would like to close. Next we move to the Methodology and Data section, describing the assumptions of our analysis and the detailed characteristics of the time series employed. Finally, we present the results of our verification procedure together with the interpretation and discussion of the obtained estimates. In the last part we indicate the possible policy recommendations and frame the directions for further research.

## **2. Second pillar and its regulatory policies**

Recently we have witnessed in the CEE states large policy changes regarding the second pension pillar (known as pillar II). First of all, the existence of the mandatory capital pillar has been questioned, as some of the countries

reduced the size of the capital pillar. This move enabled the governments to obtain short term relief during the period of public finance distress.

**Table 1. Current changes in the II pillar contribution rates in selected countries**

Country	Historical II pillar contributions (% of gross salary)	Weakening of the second pillar
Bulgaria	5	Planned increases in the contribution rate delayed
Estonia	6	Transfers to II pillar temporarily suspended from 1 June 2009 until 31 December 2010. and also partly suspended in 2011. In 2014-2017 a compensation mechanism is planned that will transfer additional social tax revenues to the funded scheme.
Hungary	9,5	Nationalized private system.
Latvia	8	8% reduced temporarily to 2%.
Lithuania	5,5	Second pillar contributions temporarily reduced from 5.5% to 2% , with additional contributions from individuals now proposed.
Poland	7,3	In 2011 the second pillar contribution was reduced from 7.3% to 2.3%, with a possible increase to 3.5% in 2017 and beyond . Currently the existence of the mandatory capital pillar is under debate.
Romania	2	Postponed a planned increase in second pillar contributions in 2010, but reintroduced increases beginning in 2011.
Slovakia	9	Contributions were reduced from 9% to 4% of gross wages and, conversely, contributions to the first pillar increased from 9% to 14%.

Source: Own study based on Égert, (2012, p. 8), Segart and Vörk (2012, p. 8), and Schwartz (2012, p. 31).

We should be aware that this solution has become so popular because it is leads to a quick budgetary improvement and is not so costly in political terms, compared to structural reforms. Therefore, many argue that it resembles a painkiller rather than serious therapy.

At the same time regulatory shifts regarding the second pillar have been discussed. In the case of Poland the proposed ideas have covered the following topics: age-dependent portfolios, establishing an external benchmark, passive portfolio management, and finally greater foreign assets allocation. This last shift was additionally motivated by the ruling of the European Court of Justice of 21Dec 2011, which forced Polish government to increase the 5% limit on foreign assets allocation to comply with the rule of free movement of capital.<sup>1</sup>

<sup>1</sup> The limit will be rising gradually to 30% of the overall portfolio value.

**Table 2. Investment limits on foreign assets for mandatory pension funds in selected CEE countries (% of assets)**

Country	Foreign investments
Bulgaria	15%
Croatia	15%
Estonia	No limits on investments in the European Economic Area, OECD countries and certain other countries.
Hungary	Within investments made abroad, the ratio of investments in non-OECD countries shall not exceed 20%.
Latvia	No maximum limit for international investments, as long as pension funds invest in securities listed on stock exchanges in the Baltics, other EU member countries or the European Free Trade Area.
Poland	5%
Romania	No specific limits on investments in foreign assets. The limits are established for each asset class.
Slovakia	70% (Pension funds have to invest at least 30% of their assets into instruments of Slovak issuers).

Source: Own study based on OECD (2013), Pension Funds Online (2013).

As can be observed the diversity of the implemented solutions among the CEE states is large. We should be aware that the existence of the mandatory capital pillar leads to both some positive and some negative external effects.

First of all, pension funds create additional demand for the securities, supporting the development of the local capital markets. Nonetheless, if the demand rises much faster than the supply of securities, the risk of an asset bubble emerges. Therefore, the regulatory authorities must balance these two opposing effects. If the risk of a speculative bubble is significant, it should be more desirable to establish a stricter limit on foreign investments.

Secondly, purchases of foreign assets may lead to a depreciation of the local currency. As Roldos (2004, p. 20.) states, this exchange rate effect was observed in Chile (20% depreciation of the peso) after it increased the limit from 2% by end-1997 to 12 percent by end-1999, and in Canada (10 percent depreciation of the Canadian dollar) when the limit was raised by 10 percentage points to an overall 30% share in the period from January 2000 to January 2002. Later, following a similar policy shift in 2005 in Peru, a significant depreciation of local currency was also observed (Carmona 2006, p. 40.). Of course, the currency depreciation has both positive and negative consequences on the economy and the prevailing effect depends on the local economy's conditions (inflation, the openness of the economy, trade balance).

Somewhat surprisingly, despite this excessively restrictive constraint in case of Poland, OPF do not fully exploit this low limit on investing abroad, and investments in foreign assets accounted for less than 1% of the overall assets value in 2012. In fact, numerous studies identified the phenomenon of *home bias* (insufficient international diversification) among the private (Baxter and Jermann 1997) and institutional investors (Suh 2001). Sercu and Vanpee (2007) distinguish the possible explanations of home bias into five large groups, where the main attention is focused on: hedging domestic risk, implicit and explicit costs of foreign investments, information asymmetries, corporate governance and transparency, and behavioural biases. Additionally, due to the established investment limits, reaching the optimal mean-variance trade-off may not be possible. However, it is also quite likely that by exploiting the existing regulatory opportunities, the improvement of investment performance may be obtained.

We find only a few papers discussing the international diversification opportunities for mandatory pension funds. Mandatory capital pillars were implemented around the globe mostly in the late 1990s, and in some countries even later, so the scarcity of literature is not very surprising. In this study we would like to discuss two studies, as they reflect the perspective of the CEE pensioner.

Swinkels *et al.* (2005) analysed the case of Latvia by comparing the risk-return characteristics of simulated portfolios. The MSCI World total return index and the S&P/IFC Emerging markets index were used as the proxies of foreign equity investments for the developed and emerging economies respectively. Swinkels *et al.* (2005) found out that Latvian pensioners would benefit from international asset allocation no matter whether they were investing more in the emerging or developed economies. One should be aware however that Latvia is a special case because of the exchange rate peg of the Latvian Lat to the Euro since the end of 2004. This eliminates a substantial part of the exchange rate risk, and since July 2005 there are no restrictions on the asset allocation across the Eurozone markets. Hence, Swinkels *et al.* (2005) analysed the simulated portfolios characteristics where the share of foreign equities from the developed countries was 50% or even greater. For this reason the results cannot be easily transferred to those countries with highly restrictive regulatory policies.

Pfau (2011) addressed the problem of international diversification gains, running a broad comparative study. Using the traditional mean-variance framework, Pfau (2011) was looking for the portfolio that was maximizing the expected utility of the investor from a particular emerging market economy. The opportunity set was comprised at all times of local and foreign equities and fixed income instruments. The results of the conducted research exhibited that international diversification benefits may be highly cross-country variable. While China's optimal share of foreign assets was found to be extremely high

(99.78%), Columbia, Hungary, Poland, and Turkey were found to require no international diversification. The results obtained by Pfau (2011) tend to raise the new research questions. First of all, the published results were obtained by using the utility function that reflected the preferences of rather conservative investors. Secondly, similarly to Swinkeles *et al.* (2005), there were no constraints on foreign asset allocation, which is an assumption rather far from the reality of the mandatory capital pillars. Finally, the delivered estimates may be sensitive to the chosen sample period, especially in the case of expected asset returns.

### 3. Methodology and data

In this study we employ the mean-variance Markowitz (1952) framework. Just to recall, we must assume the normal distribution of asset returns, hence, the portfolio's expected return ( $R_p$ ) and risk ( $\sigma_p$ ) measured by standard deviation is presented as follows:

$$E(R_p) = \sum_{i=1}^n w_i E(R_i), \quad (1)$$

$$\sigma_p = \left( \sum_{i=1}^n w_i^2 \sigma_i^2 + \sum_{i=1}^{n-1} \sum_{j=i+1}^n w_i w_j \sigma_i \sigma_j \rho_{ij} \right)^{0.5}, \quad (2)$$

where  $R_i$  is the return on asset  $i$ ,  $w_i$  is the weighting of component asset  $i$ ,  $\sigma_i^2$  denotes its variance, and  $\rho_{ij}$  is the correlation coefficients between the returns of asset  $i$  and  $j$ .

In the optimization process, the investor is maximizing the utility function:

$$u = R_p - 0,5A\sigma^2 \quad (3)$$

where the parameter  $A$  reflects varying degree of risk aversion. An aggressive investor is thought to have a value of  $A$  about one; a value of three describes moderate risk aversion; while a value of five characterizes a rather conservative risk-return attitude. In our study all of the conducted simulations are done separately for each risk aversion level.

In order to more closely match reality, we apply a set of constraints during the portfolio selection process. First of all, the portfolio weights must be non-negative as the OPF are not allowed to take short positions. Secondly, as was mentioned earlier, the regulatory authorities apply the investment limits to several asset classes, especially to foreign investments, being the concern of our study.

The asset universe in our study contains the local (Polish) equity and government bond indices, together with the indices of the international equity and bond markets. Therefore, we utilized the following proxies: MSCI Poland (Polish equities; Reuters code: MSPLNDL), Thomson Reuters Polish Sovereign Polish Bond 10Y Index (Polish treasuries; Reuters code: BMPO10Y), MSCI World Index (World equities; Reuters code: MSWRLD\$(PI)), Thomson Reuters European Monetary Union Sovereign Bond 10Y Index (World Bonds; Reuters Code: BMEM10Y). It is worth noting that the MSCI World index consists of the markets of the 24 developed countries. Therefore, it should well the foreign allocation opportunities of OPF, which are allowed to invest mainly in the securities listed on the OECD markets.

The sample period spans the last ten years (2003-2012) and the data has a weekly frequency. A higher frequency is not recommended in the cross-country studies due to the different time zones around the Globe. In order to mirror closely the perspective of the Polish investor, all of the foreign indices values were converted into PLN using the USDPLN or EURPLN spot rate.

The use of the ten-years data period (522 observations for every series) should enable the attainment of relatively stable estimates of variances and covariances.

However, in case of the expected returns the story is a bit different. Dimson *et al.* (2006) provided a comprehensive analysis of the equity premia of the seventeen countries and a World index over a 106-year sample. He found that on average the investors expected a premium on the World index of around 3-3,5% on a geometric mean basis. What is also quite appealing is that the variation of the estimates through the decades was extremely high. It was possible to find decades with positive two digit excess returns, as well as prolonged periods of negative equity market premia. Consequently, Dimson *et al.* (2006, p. 11) conclude that it would be misleading to project the future equity premium from data for the previous decade. This statement seems to be even more justified if we take in account the extremely long perspective of a future pensioner. Because of this, we have decided to base the expected returns on assets on economic theory rather than short term statistics.

First of all, in the long run bond yields should equalize the nominal GDP growth, as it represents the opportunity cost of holding a government bond both in terms of investment opportunities (real GDP) and the time value of money (inflation). Additionally, in the long run income growth should be in line with the economy's potential output rate. Therefore, we should think first about the expected potential GDP and inflation rates for Poland and then the rest of the World.

The literature on potential output estimate is quite broad, but to the best of our knowledge PwC (2013) is the only study that projects the real GDP growth



rate over a very long time horizon. According to this report, the average real GDP growth rate for Poland is expected to reach 2.5% yearly, while the developed economies should experience a 2% output growth up to the year 2050. It is somewhat surprising that Polish economic growth is projected to be only a bit higher than that of countries like Germany, because Poland is still perceived as a catching-up economy. However, the authors note that after 2030 the rapid economic growth may drastically slow down due merely to worsening demographic conditions. Today Poland has one of the lowest fertility rates in the European Union (1.3), so it is expected that the total number of Polish working age population (people aged 15-64) will be 14% below the current figure (PwC 2013, p. 12).

In addressing the problem of expected inflation we base our figures on the inflation targets of the central banks. In Poland, since 2004 the National Bank of Poland has pursued a continuous inflation target at the level of 2.5%, with a permissible fluctuation band of +/- 1 percentage point. The inflation target<sup>2</sup> of the European Central Bank and Federal Reserve is considered to be 2% yearly.

Taking into account the output and inflation considerations together we receive an approximate 4% expected return on World government bonds and 5% on Polish treasuries. Then we assume a 3% equity premium for World bonds and 3.5% premium for Polish bonds. Consequently, the expected equity returns are 7% and 8.5% respectively. We decided to set the equity premium for the Polish market at a higher rate to compensate for the risks typical for the emerging markets (lower liquidity, inadequate sectoral diversifications), resulting in higher overall volatility.

All of the time series used in this study have been obtained from Reuters Datastream.

#### 4. Empirical results

We start our verification procedure by analyzing the expected return, risk, and co-movement measures to formulate initial remarks about the diversification potential of foreign assets.

First of all, looking at Table 1 we note that the most risky asset is the Polish equity index, while the least risky is the index of Polish treasuries. It is quite surprising that Polish bonds are less volatile than EMU bonds. To find the explanation of this phenomenon we should recall that after the emergence of the sovereign debt crisis in some of the EMU countries the disparity between the

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<sup>2</sup> Neither the ECB nor the Fed explicitly realize the DIT strategy, but 2% is considered to be a targeted value. (European Central Bank, 2013; Federal Reserve System, 2013).

bond yields of the membership states has risen dramatically. We could observe falling yields of the German Bunds and at the same plunging prices of the PIIGS treasuries. Currently, the situation on the sovereign debt market has become stabilized. However, still the large divergence between the bond yields, unknown during the pre-crisis period, is still present and it is hard to say if it is temporary or rather persistent state.

**Table 3. Return and risk**

	$Eq_{PL}$	$Bd_{PL}$	$Eq_F$	$Bd_F$
$R_{P,W}$	0.16%	0.09%	0.13%	0.08%
$\sigma_{P,W}$	3.57%	0.98%	2.37%	1.88%
$R_{P,Y}$	8.50%	5.00%	7.00%	4.00%
$\sigma_{P,Y}$	25.74%	7.04%	17.06%	13.53%

Note:  $Eq_{PL}$ ,  $Bd_{PL}$ ,  $Eq_F$ ,  $Bd_F$  denotes Polish equities, Polish bonds, foreign equity, and foreign bonds respectively.  $R_{P,W}$  stands for a weekly expected return,  $\sigma_{P,W}$  weekly standard deviation,  $R_{P,Y}$  and  $\sigma_{P,Y}$  are the returns and standard deviations on a yearly basis.

Source: Own study.

**Table 4. Correlation matrix**

	$Eq_{PL}$	$Bd_{PL}$	$Eq_W$	$Bd_W$
$Eq_{PL}$	1			
$Bd_{PL}$	0.26154	1		
$Eq_F$	0.38726	-0.1037	1	
$Bd_F$	-0.5173	-0.2179	-0.0511	1

Source: Own study.

The data displayed in Table 2. tells us the most about the diversification potential of the foreign assets. It is evident that foreign bonds should provide the greatest risk-reduction opportunities, as the correlation coefficients are negative. The interdependence between the Polish and World equity returns is also moderate. Summing up this point we can expect that foreign assets should account for a large share of the optimized portfolios. However, the international assets mix (World equities vs World bonds) may depend on the risk aversion intensity and the established investment limits. To address these issues we run a three-step procedure.

Firstly, we examine the case with the current 5% limit on foreign assets. Then, we deal with the cases of the projected targeted limit of 30%. Finally, we run the optimization procedure for the hypothetical “no limit” case to see the extent to which the discussed regulatory solutions are binding. The results of this procedure are displayed in Tables 5-7.

**Table 5. Optimal portfolios: 5% limit on foreign assets**

A	1	3	5
$W_{Eq\_PL}$	52.00%	16.51%	9.41%
$W_{Bd\_PL}$	43.00%	78.49%	85.59%
$W_{Eq\_F}$	5.00%	5.00%	5.00%
$W_{Bd\_F}$	0.00%	0.00%	0.00%
$R_{p\_W}$	0.13%	0.11%	0.10%
$\sigma_{p\_W}$	2.05%	1.11%	0.99%
$u$	0.001075	0.000878	0.00077
$R_{p\_Y}$	6.91%	5.67%	5.42%
$\sigma_{p\_Y}$	14.80%	7.97%	7.15%
$\Sigma F$	5.00%	5.00%	5.00%
$\sigma/R$	1596.69%	1042.14%	975.97%

Note: A stands for the risk aversion parameter value,  $w$  denotes a portfolio weight,  $u$  is the portfolio utility,  $\Sigma F$  is the total weight of foreign assets in the portfolio,  $\sigma/R$  is the risk/return ratio on a weekly basis.

Source: Own study.

**Table 6. Optimal portfolios: 30% limit on foreign assets**

A	1	3	5
$W_{Eq\_PL}$	44.41%	15.01%	10.38%
$W_{Bd\_PL}$	25.59%	54.99%	59.62%
$W_{Eq\_F}$	30.00%	19.14%	14.75%
$W_{Bd\_F}$	0.00%	10.86%	15.25%
$R_{p\_W}$	0.13%	0.11%	0.10%
$\sigma_{p\_W}$	2.03%	0.97%	0.81%
$u$	0.001121	0.000942	0.000866
$R_{p\_Y}$	7.15%	5.79%	5.50%
$\sigma_{p\_Y}$	14.67%	6.99%	5.84%
$\Sigma F$	30.00%	30.00%	30.00%
$\sigma/R$	1531.42%	895.07%	786.20%

Source: Own study.

Table 7. Optimal portfolios: no limit on foreign assets

A	1	3	5
$W_{Eq, PL}$	39.05%	15.47%	10.76%
$W_{Bd, PL}$	11.49%	44.38%	50.96%
$W_{Eq, F}$	48.47%	22.97%	17.87%
$W_{Bd, F}$	0.98%	17.17%	20.41%
$R_{p, W}$	0.14%	0.11%	0.10%
$\sigma_{p, W}$	2.13%	0.97%	0.80%
$u$	0.001132	0.000948	0.000872
$R_{p, U}$	7.32%	5.82%	5.52%
$\sigma_{p, U}$	15.39%	6.98%	5.80%
$\Sigma F$	49.45%	40.15%	38.28%
$\sigma/R$	1569.69%	889.31%	778.04%

Source: Own study.

Following an inspection and analysis of the obtained numbers, a few important facts can be noted.

Irrespective of the assumed foreign asset constraint, the weights of international securities reach their maximum limit for every given level of risk aversion. Therefore, relaxing the current international allocation restriction is definitely recommended from the point of view of portfolio theory.

The optimal mix of foreign assets depends heavily on the chosen risk aversion coefficient. The conservative and moderate risk-averse investors should put a greater weight to foreign bonds, while the low risk-averse investors should invest mostly in international stocks (in 5% of cases there were no foreign bonds in the optimized portfolio).

The improvement in the utility values between “30%” and “no limit” is very slight, and the optimal weights of foreign assets varies from 49.45% to 38.28%. Therefore, the targeted investment limit of 30% does not reduce the diversification opportunities very significantly. Additionally, we note that the current limit on domestic equities (40%) is not binding for conservative and moderately risk-averse investors, but reduces the investment opportunities of the investors who are looking merely for higher return.

We also repeated this three-step procedure for different scenarios varying in the level of expected returns. However, in each case the following relation:  $R_{Eq, PL} > R_{Eq, F} > R_{Bd, PL} > R_{Bd, F}$  held, so it is hard to deliver strong arguments against it. The obtained results were not very different from the presented numbers, hence, the soundness of the formulated findings was additionally supported.

## 5. Conclusions

In this study we have presented the argument in favour of greater international diversification of OPF portfolios, confirming the presence of the *home bias* phenomenon. The conducted research proved that the specific outcomes depend on the assumed investment restrictions and the degree of risk aversion. Therefore, in comparison to the previous literature our results better reflect the available policy choices and are more useful in terms of formulating the regulatory recommendations.

Besides the research objective we have addressed, new questions arise. First of all, OPF managers frequently argue that the observed low allocation in foreign assets results from a legal ban on currency hedging. In fact, the need for the use of FX derivatives is quite debatable. Viceira (2010, p. 220) notes that full currency hedging is a conventional practice among institutional equity investors in developed economies. This practice is optimal when equity excess returns are uncorrelated with currency excess returns. Applying the perspective of the emerging market investor, however, the recommendations may be quite different. Campbell *et al.* (2007), in examining the currency and equity returns over the period 1975-2005, found the currencies traditionally considered as reserve ones (e.g. USD, EUR, CHF) to be negatively correlated with global stock markets. During periods of equity market plunges, global investors rebalance their portfolios toward the less risky and more liquid assets like US treasury bonds or Swiss deposits, leading to appreciation of the reserve currencies. This phenomenon, known as the flight to liquidity/quality, has been confirmed by many studies (Gonzalo and Olmo 2005, Beber *et al.* 2006). Therefore, the need for currency hedging seems to be less justified in the case of foreign investors having international equity exposure denominated in reserve currencies.

Secondly, the optimal portfolios differ greatly for varying degrees of risk aversion. We may assume that risk aversion grows in line with the pension fund participants' age. The older the investors, the more portfolios should be oriented towards the protection of capital rather than maximizing the expected return. In this context the establishment of age-dependent portfolios seems evident, but this requires deeper research. We think that studies based on the dynamic portfolio theory may provide a valuable contribution in this respect.

Thirdly, the Markowitz approach assumes multivariate normal distribution. It is nowadays a well-recognized phenomenon that the empirical distributions are usually leptokurtic, which results in the underestimation of extreme events under the mean-variance framework. Again, this issue may be especially relevant for the wealth-protecting portfolios. Successful modeling of the higher

moments of the joint distribution is then necessary. The approach using copula functions (Denget *al.* 2011, Boubaker and Sghaier 2013) and the introduction of other measurements of risk (Sortino and Satchell 2001, Sortino and van der Meer 1991) seems to be potentially promising, but this area definitely needs further exploration.

Last but not least, the results of the conducted research may be even more favourable for the use of foreign assets if we take a broader perspective. In Poland, the mandatory pension system is based on a defined contribution rule and consists of two pillars: the non-financial pillar and the capital pillar (pillar II). In 2012 the overall contribution to the pension system was 19.55% of the gross salary, but only 11.8% percent of this sum (2.3% of the gross salary) was transferred to pillar II. If we keep in mind that the indexation of the receivables in the first pillar depends merely on the economy's wage bill (in the long run equal to nominal output growth), we can see that the overall pension savings portfolio is based on relatively low-risk assets (receivables from the I pillar + treasuries in the II pillar). Therefore, it is quite likely that the share of equity in pillar II, both local and foreign, may be even greater than our study predicts. In the further research we hope to explore this issue by adding non-market government commitments to the portfolio.

## References

- Baxter M., Jermann U. J. (1997), *The International Diversification Puzzle Is Worse Than You Think*, 'The American Economic Review' 87, no. 1
- Beber, A., Brandt M.W., Kavajecz K. A. (2006), *Flight-to-Quality or Flight-to-Liquidity? Evidence From the Euro-Area Bond Market*, 'NBER Working Papers' 12376
- Boubaker H., Sghaier N. (2013), *Portfolio optimization in the presence of dependent financial returns with long memory: A copula based approach*, Journal of Banking & Finance 37, no.2
- Carmona J. (2006), *Revisiting Legal Limitations on Foreign Investing by Pension Funds*, unpublished manuscript, available at: <http://www.law.harvard.edu/programs/about/pifs/llm/sp12.pdf>, [accessed on 28 July 2013]
- Campbell J. Y., Serfaty-de Medeiros K., Viceira L.M. (2007). *Global Currency Hedging*, 'NBER Working Papers' 13088
- Deng L., Ma C., Yang W. (2011), *Portfolio Optimization via Pair Copula-GARCH-EVT-CVaR Model*, 'Systems Engineering Procedia' 2
- Dimson E., Marsh P., Staunton M. (2006), *The Worldwide Equity Premium: A Smaller Puzzle*, 'EFA 2006 Zurich Meetings Paper', available at: [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=891620##](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=891620##), [accessed on 28 July 2013]

- Égert B. (2012), *The Impact of Changes in Second Pension Pillars on Public Finances in Central and Eastern Europe*, 'OECD Economics Department Working Papers' 942
- European Central Bank, *The definition of price stability*, available at: <http://www.ecb.int/mopo/strategy/pricestab/html/index.en.html>, [accessed on 28 July 2013]
- Federal Reserve System, *Why does the Federal Reserve aim for 2 percent inflation over time?*, available at: [http://www.federalreserve.gov/faqs/economy\\_14400.htm](http://www.federalreserve.gov/faqs/economy_14400.htm), [accessed on 28 July 2013]
- Gonzalo J., Olmo J. (2005), *Contagion Versus Flight To Quality In Financial Markets*, 'Universidad Carlos III, Departamento de Economía, Economics Working Papers' we051810
- Markowitz H.M. (1952), *Portfolio Selection*, 'The Journal of Finance' 7, no. 1
- OECD (2013), *Survey of Investment Regulations of Pension Funds*, available at: [http://www.oecd.org/daf/fin/private-pensions/2013\\_Survey\\_Investment%20Regulations.pdf](http://www.oecd.org/daf/fin/private-pensions/2013_Survey_Investment%20Regulations.pdf), [accessed on 28 July 2013]
- Pension Funds Online, *Country profiles*, <http://www.pensionfundsonline.co.uk/country-profiles>, [accessed on 28 July 2013]
- Pfau W. (2011), *Emerging Market Pension Funds and International Diversification*, 'Journal of Developing Areas' 45
- PwC (2013), *World in 2050*, available at: [pwc.com/gx/en/world-2050/the-brics-and-beyond-prospects-challenges-and-opportunities.jhtml](http://pwc.com/gx/en/world-2050/the-brics-and-beyond-prospects-challenges-and-opportunities.jhtml), [accessed on 28 July 2013]
- Roldos J. (2004), *Pension Reform, Investment Restrictions and Capital Markets*, 'IMF Policy Discussion Papers' 04/4
- Schwartz A.M. (2012), *Impact of Financial Crisis on Pension Systems – Europe and Central Asia*, '5th World Bank Contractual Savings Conference', January 9-11, 2012, Washington D.C., available at: <http://siteresources.worldbank.org/FINANCIALSECTOR/Resources/session1.pdf>, [accessed on 28 July 2013]
- Segaert S., Vörk A. (2012), *Annual National Report 2012. Pensions, Health Care and Long-term Care. Estonia, Assessing the socio-economic impact of social reforms project*, [online], [http://www.socialprotection.eu/files\\_db/1221/asisp\\_ANR12\\_ESTONIA.pdf](http://www.socialprotection.eu/files_db/1221/asisp_ANR12_ESTONIA.pdf), [accessed on 28 July 2013]
- Sercu P., Vanpee R. (2007), *Home Bias in International Equity Portfolios: A Review*, Manuscript, Katholieke Universiteit Leuven, available at: [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1025806](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1025806), [accessed on 28 July 2013]
- Sortino F., Satchell S. (2001), *Managing downside risk in financial markets: Theory, practice and implementation*, Butterworth-Heinemann Finance, Burlington
- Sortino, F., van der Meer R. (1991), *Downside Risk: Capturing What's at Stake*, 'Journal of Portfolio Management' 17, no. 4
- Suh J. (2005), *Home Bias Among Institutional Investors: A Study of the Economist Quarterly*, 'Journal of the Japanese and International Economies' 19, no. 1

Swinkels L., Vejina D., Vilans R. (2005), *Why don't Latvian pension funds diversify more internationally?*, Erasmus Research Institute of Management, Report Series Research in Management No. 2005-078

Viceira L. M. (2010), *Application of Advances in Financial Theory and Evidence to Pension Fund Design in Developing Economies* [in:] Richard Hinz, Heinz P. Rudolph, Pablo Antolín, and Juan Yermo (eds.), *Evaluating the Financial Performance of Pension Funds*, The World Bank, Washington D.C.

## Streszczenie

### **CZY AWERSJA DO RYZYKA WPŁYWA NA UDZIAŁ AKTYWÓW ZAGRANICZNYCH W PORTFELACH FUNDUSZY EMERYTALNYCH – PRZYPADEK POLSKI**

*W artykule podjęto zagadnienie inwestycji w aktywa zagraniczne dokonywanych przez fundusze emerytalne. W części pierwszej opracowania dokonano przeglądu polityk nadzorczych oraz wskazano efekty zewnętrzne inwestycji zagranicznych, które mogą odpowiadać za obserwowane różnice w regulacjach pomiędzy krajami Europy Środkowo-Wschodniej. Następnie wykorzystując teorię portfela przeprowadzono symulacje mające na celu oszacowanie korzyści dywersyfikacyjnych, jakie mogłyby zostać osiągnięte poprzez wyższy udział aktywów zagranicznych. Stosując specyficzne ograniczenia oraz biorąc pod uwagę zmienność kursu walutowego, zaprezentowane badanie oddaje perspektywę członka polskiego funduszu emerytalnego. Z drugiej strony, wnioski dotyczące stopnia awersji do ryzyka oraz wskazane kierunki dla dalszych badań powinny mieć charakter uniwersalny.*

**Słowa kluczowe:** fundusze emerytalne, ryzyko walutowe, portfele międzynarodowe