**Should pension funds invest more in foreign assets – the case of Poland**

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**Abstract**

In this paper we discuss the diversification opportunities provided by investing in foreign assets. In particular, we verify the hypothesis that the observed weight of foreign assets in the portfolios managed by Polish Open Pension Funds (OPF) is too low to achieve the maximum risk-reduction gains. The results of the carried research confirm our initial assessment, so we consider the potential explanations of the observed *home bias* phenomenon. Finally, we conclude that in the case of Poland the main driving force of the current engagement in foreign assets may be the regulatory issues: the legal ban on using the FX derivatives and the mechanism of calculating the minimum required rate of return.

1. **Introduction**

The general conclusion from the Markowitz (1952) seminal paper states that rational and risk-averse investors should hold the portfolios that maximize the risk adjusted return. Investors can exploit diversification opportunities (reducing the portfolio risk while keeping the return constant) by keeping the mix of different assets. The diversification potential is greater, other things the same, whenever the correlation coefficient between asset returns is lower. Consequently, investors should look for the securities that do not exhibit strong co-movement.

In the early years of development, Modern Portfolio Theory (MPT) was discussed mainly in the local context. The risk-reduction gains could be achieved by selecting equities of different companies to eliminate the specific firm-level risk. Since the 70’s when the restrictions on international capital flows started to be removed, the investors gained additional diversification opportunities by investing their funds abroad. Keeping foreign assets investors are able to diversify not only firms’ specific risks, but also country-idiosyncratic risk which is non-diversifiable in the local context. Numerous studies confirmed the benefits of international asset allocation (Grubel, 1968; Levy and Sarnat, 1970). However, in the more recent papers this risk-reduction gains where fund to be diminishing (Baca *et al.*, 2000; Brooks and Del Negro, 2002; Niemczak, 2010; Kurach, 2011), due to the international market integration process.

To assess the diversification benefits of international investing one should keep in mind also the exchange rate fluctuations. Most of the existing studies present the perspective of the US investor by employing the USD denominated returns. Hedging the currency risk may actual increase or reduce the diversification benefits. Therefore, the conclusions from the previous research may not be universal and the FX risk should be taken into account.

All of these considerations are valid also for the pension funds’ asset management process. Since the 80s’ mainly Latin America states and from the end of the 90s’ Central and Eastern European countries implemented serious reforms of their pensions systems. In general, the pension systems have been transformed, partly or wholly, towards the systems based on the defined contribution (DC) rule. Under the DC rule the individual accounts are set up for the participants, where the fixed contributions are transferred by employers and employees. The future pension is calculated individually for each participant and depends solely on the value of accumulated receivables increased by the rate of return. The receivables may be of non-financial (NDC) or financial character (FDC). In this paper we will focus on this part of the system, where the receivables collected by future pensioners take the form of financial market instruments. Using the “pillars” terminology FDC refers to the second and third pillar. As the third pillar plays rather the supplementary role, in this study we will employ data from the second pillar, which is usually mandatory.[[2]](#footnote-2) Hence, in this work we define the second pillar as the one that follows the FDC rule and is obligatory in its nature.[[3]](#footnote-3)

 Second pillar is usually privately managed. As the investment target is of special social importance it is no surprising that pension funds’ investment policy is heavily regulated. One of the most important regulation applies to the imposed investments limits established mainly to ensure enough diversification of pension savings portfolios. However, the objective of the established investment restrictions may not be the risk reduction solely.

Pension funds manage large pool of funds and their demand for securities may be of crucial importance for the development of the local financial markets. On the other hand, if an increase in the securities supply is not as rapid as an increase in the demand from the pension sector, the excessive demand may create the asset bubble. Surprisingly, this issue in case of the emerging economies seems to be overemphasized as the empirical research does not support this view. Verifying this relationship in case of Poland, Voronkova and Bohl (2003) did not confirm the hypothesis that pension funds trading may significantly affect security prices. Also contrary to the intuitive reasoning Walker and Lefort (2002) actually proved that pension funds had a stabilizing effect on security prices across a sample of 33 emerging countries. Some explanation of these unexpected results can be found in Bebczuk and Musalem (2009). They concluded that even though pension funds’ assets in the emerging countries were growing relatively to the size of their financial markets, the average share of pension fund assets in the sum of market capitalization and bank deposits amounted to 16,0 percent in the emerging countries and 21,7 percent in the developed countries in 2006–07 years.

Perhaps the more probable macroeconomic consequence of pension funds sudden shift towards foreign assets may be the exchange rate depreciation. Roldos (2004) noted this effect was observed in Chile (20% depreciation of peso) after increasing the limit from 2% by end-1997 to 12 percent by end-1999 and in Canada (10 percent depreciation of the Canadian dollar), where the limit was raised by 10 percentage points to overall 30% share in the period from January 2000 to January 2002. Carmona (2006) states that the depreciation effect occurred also in case of Peru in 2005.

Therefore, government needs to balance various consequences while establishing the limits for pension funds foreign activity. Consequently, the regulations vary significantly across the countries:

[Insert Table 1. here]

 In this paper we will not develop the area of macroeconomic consequences of pension funds foreign activity, leaving this broad question for further research. Rather than, we would like to focus on the diversification properties of the pension funds’ portfolios. Thus, this study represents mainly the perspective of the single pension system participant. We tend to realize this research objective by verifying the following hypothesis: in case of Polish Open Pension Funds (OPF) the observed weight of foreign assets is too low to achieve the maximum risk-reduction gains. Two premises motivated us to formulate such a hypothesis. First of all, Poland is the country with one of the most restrictive limits on foreign investment, so it is quite tempting if this constraint is really harmful for future pensioners. OPF are the institutions of the mandatory second pillar, so the results are important for the vast majority of Polish society. Secondly, the availability of the detailed data on pension funds’ portfolios make the verification process feasible.

The paper continues as follows. The next paragraph contains the detailed description of the employed methodology. Moreover, we present the alternative approaches of measuring the diversification gains indicating their advantages and weaknesses. Then, we present the data used in this study. Next part contains the results of the empirical research. In the last section we make the concluding comments and describe the possible directions for further research.

1. **Methodology**

To measure the diversification gains after changing the portfolio weights one can use portfolio performance ratios. This approach can be found for example in Rubens *et al.* (1998). The most widely used measure of portfolio performance is perhaps the Sharp ratio assessing the risk-adjusted portfolio’s return. The Sharp ratio (*Sh*) is defined as:

$Sh=\frac{R\_{p}-R\_{f}}{s\_{p}}$ (1)

where $R\_{p}$ and $s\_{p}$ denote portfolio’s realized return and standard deviation of returns respectively, while $R\_{f}$ is a risk free rate. The used measure of risk, standard deviation measures therefore the overall portfolio risk. Because of its simplicity and intuitive character it is perhaps the most popular way of portfolio performance assessment. Substituting the realized values by the expected ones we get the formula for the tangency portfolio, which is maximized in Markowitz portfolio optimization process:

$\frac{R\_{p}-R\_{f}}{s\_{p}}\rightarrow max$ (2)

 Using the Sharpe ratio for the diversification potential assessment one shortcoming emerges, however. We need to employ the expected values, especially the expected returns are the . Frequently, the mean values of realized returns over the long periods are taken as the expected ones. The standard argument in favour of this approach states that expectations are on average, and on the whole, correct (Elton *et al.*, 1995, p. 339). Unfortunately in the last years, due to the global financial market meltdown, this method may not work. In our study, if we were to estimate the expected returns as the average returns from our sample period, in some of the cases we would find the returns of risky assets lower than the risk free rate or even negative. Clearly, these estimates would seriously flaw MPT, because in such a case a risk-averse investors should not take any long position in the risky assets. It is also debatable if it is possible to rank portfolios with the negative Sharpe ratio scores. Finally, following Merton (1980) and Jorion (1985), Petrella (2005) notes that the expected returns are more difficult to estimate than variance. For this reason we decided to assess the diversification benefits in a rather non-mainstream way.

 Let’s define the minimum variance portfolio (MVP) as the one that minimizes portfolio returns standard deviation:

$s\_{p}=\sqrt{V\_{p}}=\sqrt{\sum\_{i=1}^{N}w\_{i}^{2}s\_{i}^{2}+2\sum\_{i=1}^{N-1}\sum\_{j=1}^{N}w\_{i}w\_{j}s\_{i}s\_{j}ρ\_{ij}}\rightarrow min$ (3)

where $w\_{i}$ denotes the weight of *i*-th asset in the portfolio ($i=1,..,N)$, $s\_{i}$ its standard deviation, while $ρ\_{ij}$ is the correlation coefficient between returns of assets *i* and *j*. In our study we run the optimization procedure for the portfolio containing only two assets: the local and foreign market indices. Then, we compare the uncovered portfolio weights (3) with the actual OPFs portfolio assessing the size of home bias phenomenon and the potential for further risk reduction.

 Note that we do not take any return estimates, as they are perhaps much more uncertain than variance or correlations. Being precise, comparing only the standard deviations of different portfolios is not a way of assessing the diversification benefits, but provides the information on risk-reduction properties as only the risk characteristic without return is analysed. This approach has been supported also by Jagannathan and Ma (2003). They even state that due to the instability of the expected returns’ estimates based on the sample mean, little is lost by ignoring totally the mean estimates and instead study the MVP.

 We will run optimization procedure two times. First, without imposing the short sale restriction, hence the only optimization constraint would be:

$\sum\_{i=1}^{N}w\_{i}=0$ (4)

In many cases the optimization procedure without imposing the “short-sale” constraint delivers the result where *e.g.* one of the asset receives the weight over 100%, while the other one is recommended to be sold heavily getting the weight -50%. Definitely such weights are rather unrealistic in pension funds asset allocation policy. For this reason, we will treat these results with cautious if they were found quite extreme.

In the next step we will implement short sale constraint adding the following condition:

$0\leq w\_{i}\leq 1$ (5)

The results of this part will be especially useful, because short sale is frequently prohibited in pension funds activity. It is also quite interesting if this constraint really limits the risk-reduction potential. Comparing the results from the first and second step we will deliver the answer also to this research question.

1. **Data description**

In this study we use monthly data for the period 01.2002 – 12.2011 and calculate logarithmic returns using indices closing values for the last business day of each month. We focus our research attention solely on the equity sector. This choice is motivated by the existence of the broad and well established index of Polish stocks, while the bonds’ market indices in Poland do not have usually such a long history of listing. In this case the choice of Polish equities average is rather natural and we utilize WIG index published by Warsaw Stock Exchange, denominated in PLN.

As a measure of foreign stock market performance we employ two regional indices provided by Morgan Stanley Capital International, namely: World (WRD) and European Economic and Monetary Union (EMU) indices. Nowadays, the WRD covers 24 developed market country indices[[4]](#footnote-4), while EMU spans 11 local markets (MSCI, 2012).[[5]](#footnote-5) The first of the regional proxies is denominated in USD, the second in EUR.

Comparing the rate of returns denominated in different currencies we ignore the exchange rate fluctuations. Such a situation is possible if the currency risk is fully hedged. Currently in Poland, the regulations regarding OPF prohibit this type of hedging. For this reason, we utilize the spot exchange rates and recalculate the foreign indices into the PLN values. This transformation enables us to present the perspective of Polish investor who does not hedge currency risk at all.

All of the employed equity indices and spot exchange rates time series were obtained from Thomson Reuters Datastream. We collect the data on OPF portfolios from KNF - Polish Financial Supervision Authority website (KNF, 2012).

1. **Empirical results**

Assessing the diversification potential of foreign assets we start from the general outlook at the data series to make a few remarks regarding time series statistics and the conclusions for risk management process.

[Insert Table 2. here]

The annualized returns vary significantly from the lowest -1,17 % for EMU'' to 9,46% for WIG and the existence of negative returns supports our verification approach. In case of normal distribution the values of skewness and kurtosis statistics should be zero. As it is quite common for the financial assets returns series these parameters are mostly far from zero. For 3 of 5 of the analysed time series skewness is significantly lower than zero, indicating that returns distributions are skewed to the left. On the other hand, the values of kurtosis are everywhere well above zero. Hence, the investigated distributions have a more acute peak around the mean and fatter tails comparing to normal one. This finding indicates that the probability of extreme market moves are higher than normal distribution predicts. Finally, the Jarque-Bera test rejects the null hypothesis on normality at 1% significance level for the majority of indices and the only exceptions is EMU denominated in PLN (significant at 10%).

Now we move to correlation analysis. Before we start to assess the degree of interdependence between variables we need to verify the stationarity of the investigated series. Unless time series are stationary, we are not able to obtain meaningful sample statistics.

We use two standard tests for this purpose: Augmented Dickey–Fuller (ADF) and Kwiatkowski–Phillips–Schmidt–Shin (KPSS). In case of ADF test null hypothesis states that series has a unit root (variable is not stationary), while null of KPPS states that variable is stationary. The test statistics for both of the tests have been presented in Table 3.

[Insert Table 3. here]

In case of all of the analyzed variables KPPS test statistics are insignificant at 10% value, which strongly supports the null on stationarity. ADF test results lead also to the similar conclusion rejecting the null hypothesis on unit root at 1% significance level for all of the time series. These converging conclusions support the robustness of the results and enable us to run the correlation analysis.

We start from the case with the returns denominated in different currencies. This applies to the situation, when the currency volatility can be perfectly hedged. Recall, the risk reduction potential is higher, when correlation coefficient is lower, other things the same.

[Insert Table 4. here]

We observe that correlation coefficients in Table 4. are quite high and the highest co-movement can be observed between the WRD and EMU indices. Correlation between Polish market and two regional indices is only a little bit lower. Consequently, after hedging the currency fluctuations the potential of international diversification seems to be rather limited.

The situation changes, when indices values are recalculated into PLN ones. The Table 5. presents the diversification opportunities from the perspective of Polish investor, who is not hedging exchange rate risk.

[Insert Table 5. here]

We conclude that in case of Poland the diversification potential of international equity investing has its root mainly in the exchange rate fluctuations rather than cross-country varying equity market trends. Probably the following mechanism is in work: whenever global risk aversion rises, the capital flows from the stock market to the “safe-heavens” assets like US T-bonds, German bunds etc. This leads to the appreciation of USD and EUR against emerging market currencies. Hence, from the perspective of the emerging market investor foreign currency appreciation effect neutralizes falling equity prices in the developed countries.

In the last step of our verification procedure we look for the share of foreign assets that minimizes the portfolio risk (3). We run the optimization procedure for two assets portfolio containing the WIG index and one proxy of foreign equity market (WRD and EMU). We provide t

he results with and without short sale constraint.

[Insert Table 6. here]

[Insert Table 7. here]

Two important facts should be noted. The optimal share of foreign assets is substantial, well above the regulatory maximum limit of 5%. The other interesting conclusion can be drawn after comparing the portfolios presented in Table 6. And 7. We find the simulation results highly similar. The additional gain of using short sale was noted only in case of hedged returns with WRD index.

1. **Final conclusions**

The data regarding actual foreign equity investment made by the OPF presents as follows:

[Insert Table 8. here]

[Insert Table 9. here]

Undoubtedly, the results of our study indicate that the observed weight of foreign assets is insufficient to fully exploit risk-reduction opportunities resulting from international investing. Moreover, we found the currently maximum limit still well above the actual OPF engagement in foreign assets. Summing up, the home-bias is present.

The motives of the domestic assets preference over the foreign ones have been broadly described in the literature, but the variety of likely explanations has not led to the commonly accepted view. Sercu and Vanpee (2007) distinguish the potential explanations 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. In this paper we also would like to add the sixth group, i.e. the regulatory solutions. Frequently, the fund managers indicate the legal ban on using FX derivatives as the main obstacle for international assets allocation (Popiołek, 2011). For example, in case of rising foreign asset prices the possible PLN appreciation may reduce the overall return. Though, this statement ignore the downside risk when the foreign assets prices drop and simultaneously the domestic money depreciates. As our study reveals, taking the perspective of Polish investor, currency hedging using the forward contracts increase the correlation between asset prices. However, at the same time the hedging activity reduces the overall portfolio risk (see Table 6. And 7.) as the volatility of hedged foreign equity returns is substantially lower (see Table 2.). Fund managers may also consider taking the long position in the currency options, but the option premiums paid may be quite high.

The other important regulation reducing the international engagement may be the mechanism of calculating the OPF minimum required rate of return. In general, whenever the realized return of a particular pension fund is significantly lower than the average calculated from the returns realized by the all OPF, the underperforming fund needs to cover the shortage in return from its capital. This situation naturally leads to mimicking the portfolios of pension funds having the greatest weight in the described average value by the rest of the competitors. If the largest OPF for any reason do not engage in international assets, the other smaller funds will follow this policy being afraid of regulatory punishment in case of the negative outlier results. This herding behaviour among Polish OPF was confirmed by Chybalski (2009).

The situation could be different if the benchmark portfolio was based on the performance of the domestic and international markets rather than performance of OPF itself. This seems to be the necessary condition, but not the sufficient one. To induce a serious shift towards international investments the weight of foreign assets in this benchmark should be set at a higher level, determined by the simulation studies. For pragmatic reasons, we are not likely to expect this maximum limit to be as high as the weights presented in tables 6. and 7., especially if we discuss also the fixed income part of the OPF portfolios. The increased demand for foreign assets would lower the demand for domestic treasury bonds rising the cost of budget deficit financing. Therefore, the planned regulatory changes need a broader consideration and an in-deepth research balancing the interest of future pensioners and the local economy as well.

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**Table 1.** Investment maximum limits on foreign assets for mandatory pension funds in the selected CEE countries (% of assets)

|  |  |
| --- | --- |
| **Country** | **Foreign investments** |
| Bulgaria | 15% |
| Croatia | 15% |
| Estonia | No limits for EFTA and CEFTA countries  |
| Hungary | 30% |
| Latvia | No limits for EFTA and CEFTA countries |
| Poland | 5% |
| Romania | No limits for UE and EEA countries  |
| Slovakia | 70% |
| Slovenia | No limits for OECD countries; however, due to the regulation stipulating that 80% of assets must be denominated in the same currency as liabilities, there is an effective 20% limit on non-Euro investments  |

Note: according to the sentence of the European Court of Justice from 21st Dec 2011, Polish government was forced to increase this limit. Currently, the new solution has been under debate.

Source: Chybalski (2011)

**Table 2.** Summary statistics

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|   | WIG | WRD' | EMU' | WRD'' | EMU'' |
| Mean | 9,46% | 2,01% | -3,39% | -0,25% | -1,17% |
| Std. dev. | 23,63% | 17,38% | 20,11% | 26,09% | 25,72% |
| Skewness | -0,58 | -0,98 | -0,81 | 0,17 | -0,02 |
| Kurtosis | 1,97 | 2,35 | 1,43 | 3,29 | 1,14 |
| Jarque-Bera | 23,24 | 42,59 | 21,31 | 47,83 | 5,36 |
| *p-value* | 0,000 | 0,000 | 0,000 | 0,000 | 0,069 |

Note: ' - foreign indices denominated in USD or EUR,'' - foreign indices returns denominated in PLN. Means and standard deviations have been annualized.

Source: own study

Table 3. Stationarity tests' results

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  Index Test  | WIG | WRD' | EMU' | WRD'' | EMU'' |
| ADF | -9,471\*\*\* | -8,453\*\*\* | -9,262\*\*\* | -14,824\*\*\* | -13,224\*\*\* |
| KPPS | 0,156 | 0,077 | 0,105 | 0,08 | 0,078 |

Note: \*\*\* - significant at 1%, \*\* - significant at 5%, \* - significant at 10%.

Source: own study.

Table 4. Correlations (currency hedging case)

|  |  |  |  |
| --- | --- | --- | --- |
|  | WIG | WRD' | EMU' |
| WIG | 1 |  |  |
| WRD' | 0,769551 | 1 |  |
| EMU' | 0,747077 | 0,900881 | 1 |

Source: own study.

Table 5. Correlations (no currency hedging case)

|  |  |  |  |
| --- | --- | --- | --- |
|  | WIG | WRD'' | EMU'' |
| WIG | 1 |  |  |
| WRD'' | 0,350581 | 1 |  |
| EMU'' | 0,347897 | 0,238466 | 1 |

Source: own study.

**Table 6.** MVP portfolios (short sale restricted)

|  |  |  |  |
| --- | --- | --- | --- |
| 1. | WIG | EMU' | std. dev. |
| 19,55% | 80,45% | 5,74% |
| 2. | WIG | WRD' |  |
| 0,00% | 100,00% | 5,02% |
| 3. | WIG | EMU'' |  |
| 56,45% | 43,55% | 5,83% |
| 4. | WIG | WRD'' |  |
| 57,55% | 42,45% | 5,87% |

Source: own study.

**Table 7.** MVP portfolios (short sale allowed)

|  |  |  |  |
| --- | --- | --- | --- |
| 1. | WIG | EMU' | std. dev. |
| 19,55% | 80,45% | 5,74% |
| 2. | WIG | WRD' |  |
| -6,13% | 106,13% | 5,01% |
| 3. | WIG | EMU'' |  |
| 56,45% | 43,55% | 5,83% |
| 4. | WIG | WRD'' |  |
| 57,55% | 42,45% | 5,87% |

Source: own study.

**Table 8.** Aggregate OPF investment portfolio’s structure (in mln PLN) – the selected numbers

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date | Total portfolio | of which foreign (foreign portfolio) | Shares | of which foreign (foreign shares) |
| 2002-12-31 | 30 487,51 | 437,29 | 8 613,32 | 365,21 |
| 2003-12-31 | 44 232,83 | 307,64 | 14 337,35 | 175,73 |
| 2004-12-31 | 61 560,12 | 920,92 | 20 760,61 | 574,91 |
| 2005-12-30 | 85 925,31 | 1 030,39 | 27 239,90 | 580,59 |
| 2006-12-29 | 116 216,49 | 1 506,09 | 39 925,35 | 962,36 |
| 2007-12-31 | 139 594,34 | 1 455,08 | 48 765,98 | 917,74 |
| 2008-12-31 | 138 205,72 | 885,64 | 29 875,09 | 421,93 |
| 2009-12-31 | 179 039,86 | 1 333,84 | 54 631,37 | 862,75 |
| 2010-12-31 | 221 461,73 | 1 521,78 | 80 667,73 | 1 017,07 |
| 2011-12-31 | 226 203,63 | 1 092,75 | 69 933,36 | 619,46 |

Source: KNF (2012).

**Table 9.** Aggregate OPF investment portfolio’s structure - the selected ratios

|  |  |  |  |
| --- | --- | --- | --- |
| Date | Shares / Total portfolio | Foreign portfolio / Total Portfolio | Foreign Shares / Shares |
| 2002-12-31 | 28,25% | 1,43% | 4,24% |
| 2003-12-31 | 32,41% | 0,70% | 1,23% |
| 2004-12-31 | 33,72% | 1,50% | 2,77% |
| 2005-12-30 | 31,70% | 1,20% | 2,13% |
| 2006-12-29 | 34,35% | 1,30% | 2,41% |
| 2007-12-31 | 34,93% | 1,04% | 1,88% |
| 2008-12-31 | 21,62% | 0,64% | 1,41% |
| 2009-12-31 | 30,51% | 0,74% | 1,58% |
| 2010-12-31 | 36,43% | 0,69% | 1,26% |
| 2011-12-31 | 30,92% | 0,48% | 0,89% |

Source: KNF (2012).

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2. The mandatory character is not the only difference. The issues of payout rules and succession also matters. (Góra, 2003, p. 142.) [↑](#footnote-ref-2)
3. The „pillar” terminology may be to some extent misguiding (Góra, 2003, p. 143.), hence we defined for our purposes the second pillar once again. [↑](#footnote-ref-3)
4. Canada, United States, Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, Australia, Hong Kong, Japan, New Zealand, Singapore. [↑](#footnote-ref-4)
5. Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, and Spain [↑](#footnote-ref-5)