PRACE NAUKOWE
Uniwersytetu Ekonomicznego we Wrocławiu

RESEARCH PAPERS
of Wrocław University of Economics

Nr 381

Financial Investments and Insurance – Global Trends and the Polish Market

edited by
Krzysztof Jajuga
Wanda Ronka-Chmielowiec

Contents

Streszczenia

Ewa Dziwok

University of Economics in Katowice

e-mail: ewa.dziwok@ue.katowice.pl

VALUE OF SKILLS IN FIXED INCOME INVESTMENTS

Summary: In a global financial world managers face a decreasing chance for generating the added value within the investment universe. Modern economies with their currencies and government debts closely linked to each other offer smaller diversification and force investors to search new opportunities. The author outlines the essential components of an investment management process with a special focus on value of skills in asset allocation strategies. Additionally, the implementation of an imperfect foresight approach, which is understood as an alternative measure of investor's skills, into debt security portfolio of the Polish Open Pension Funds was used. The dataset taken into account includes observations from each of 14 funds that have been functioning between 2001 and 2012. The research covers two decision making processes: first, which analyses the structure of the portfolio concerning time to maturity, second – the allocation between fixed or floating rate investment.

Keywords: Fixed income, portfolio analysis.

1. Introduction

Portfolio management is a systematic and continuous process strongly determined by conditions or circumstances of the investment. It could be as simple or as complex, as quantitative or as qualitative as its manager wants. It is a dynamic and flexible concept which applies to all types of portfolio investments: bonds, stocks, real estate, gold, collectibles dedicated a full range of investors: individuals, pension plans, endowments, foundations, insurance companies, banks; to various organizational types: trust company, investment counsel firm, insurance company, mutual fund; and what is the most important – independent of manager, location, investment philosophy, style, or approach [Maginn et al. 2007]. As a discipline, portfolio management is science-based and constantly improving, thanks to advances in basic finance theory (e.g., modern portfolio theory), technology, and market structure [Maginn et al. 2007, p. 18].

Portfolio management's desired attributes are: the ability to derive above-average returns for a given risk class and the ability to diversify the portfolio completely to

eliminate all unsystematic risk, relative to the portfolio benchmark [Brown, Reilly 2009, p. 938]. It is quite often observed that investors usually devote much time and resources to formulate the investment view and contrary – little time to construct the portfolio. Managers have to fulfil the investors' expectations and of course have some constrains connected with maximization of risk-adjusted return. Among investors a kind of specialization could be observed, which forces them unconsciously into these sectors which they better know and understand and unfortunately not into those sectors that let create higher income.

The main aim of the article is to describe the value of skills on Polish market with a special focus on Open Pension Funds. The problem allows for formulating a hypothesis that it is possible to evaluate the management process which is important both for the investor and the manager's employer. To answer this question it is necessary to describe the idea how to imply the manager's skills into the measure and how to aggregate all these criteria into one (measure).

Following Martellini, Priaulet and Priaulet [2003, p. 295], measuring the performance of portfolio manager has to be evaluated in a risk adjusted sense and the main task is to find a suitable benchmark for it. According to this idea the evaluation is based on the ability to outperform the chosen index. The index (the chosen benchmark) is the base for the manager who has to take into account the constraints suggested by the investor and caused by market situation.

Fabozzi [1998, p. 15] noticed that even the optimal level of residual risk for the investor will depend not only on the investor's level of aversion to risk but also on the manager's skills. He stressed the need to model managerial skills and to evaluate an investment style.

In accordance with the Oxford Dictionary skill is practiced ability, facility in an action, and skilled manager means highly trained or experienced person [*Oxford Dictionary*, 2004, p. 778]. In investment language it could mean that skilled manager outperforms the chosen index (benchmark) more frequently than just randomly.

2. Skills' measures

Historically, skills were measured by the manager's information ratio *IR* which was first used as a modified Sharpe ratio (with the risk free rate replaced by benchmark) [Bacon 2013, p. 56]:

$$IR = \frac{\bar{r}}{S}, \tag{1}$$

where: $\bar{r}$ – annualised excess return; S – the annualised standard deviation (tracking error).

Bacon [2013] utilizes an information ratio as a portfolio manager's skill measure and quotes its level as good (when $IR = 0.5$), very good (when $IR = 0.75$), and exceptional (when $IR = 1$).

It is worth to stress that this definition formally bases on Grinold, Kahn's fundamental law concerning active management which explains the information ratio in case of manager's skills and the number of investment opportunities [Focardi, Fabozzi 2004, p. 569]:

$$IR = IC \cdot BR , \qquad (2)$$

where: IC – the information coefficient; BR – the number of opportunities.

Generally IC measures a kind of correlation of manager's forecast with the actual returns [Ang 2014, p. 311].

Lehman Brothers started to use the idea of the "imperfect foresight" [Dynkin et al. 2007, p. 20] which inputs managerial skills into the process of evaluation. This idea employs knowledge of future return as a possibility of perfect foresight and characteristics of skilled manager (if the manager's decisions always outperform the benchmark it means 100% success and 100% skills). On the contrary, an unskilled manager (0% skill) makes his decisions randomly.

If manager's skills are to be described as s, the probability of choosing the best investment (which outperforms the benchmark) ranges between random selection and perfect foresight and could be shown in a form of following formula [[Dynkin et al. 2007, p. 20]:

$$p(s) = (1-s)p^{\text{random}} + s \cdot p^{\text{perfect}} , \qquad (3)$$

where:

$$p^{\text{perfect}} = \begin{cases} \dfrac{1}{n_W} & \text{if a decision is correct} \\ 0 & \text{otherwise} \end{cases} ,$$

$$p^{\text{random}} = \frac{1}{n} ,$$

$p(s)$ – the probability of choosing the best investment,
s – manager's skill,
n_W – number of winning strategies,
n_L – number of losing strategies,
$n = n_W + n_L$ – number of strategies.

As a result, the probability of choosing the best investment that outperforms the benchmark could be described using following formula:

$$p(s) = \begin{cases} \dfrac{1-s}{n} + \dfrac{s}{n_W} & \text{if a decision is correct} \\[2ex] \dfrac{1-s}{n} & \text{otherwise} \end{cases} . \qquad (4)$$

Having defined the probability, it is possible to estimate the skills. This probability could be interpreted using two different ways of understanding skills: one as an ability to choose any winning sector (strategy) and second – the best sector (strategy).

Taking into account the investment process which gives an opportunity to invest into n strategies among which a half is recognized as a winning strategy, the probability of choosing any winning strategy (making a right decision) in case of assumed level of manager's skills could be presented in a functional form. Some examples are presented in Table 1.

Table 1. Probability (in %) of choosing any winning strategy as a function of skill level

Skill level	Number of decisions (half of them are winning)					
	$n = 2$		$n = 4$		$n = 24$	
	right	wrong	right	wrong	right	wrong
0	50	50	25	25	4	4
10	55	45	27.5	22.5	4.6	3.8
20	60	40	30	20	5	3
30	65	35	32.5	17.5	5.4	2.9
40	70	30	35	15	6	3
50	75	25	37.5	12.5	6.3	2.1
60	80	20	40	10	7	2
70	85	15	42.5	7.5	7.1	1.3
80	90	10	45	5	8	1
90	95	5	47.5	2.5	7.9	0.4
100	100	0	50	0	8	0

Source: own computations.

If the investor is interested in the best strategy (which let chose the top sector) there is only one winning strategy which meets his requirements ($n_W = 1$).Then the probability of success (making the right decision) has a functional form with elements which are presented in Table 2.

Table 2. Probability (in %) of choosing the best strategy as a function of skill level

| Skill level | Number of decisions (half of them are winning) | | | | | |
| | $n = 2$ | | $n = 3$ | | $n = 20$ | |
	right	wrong	right	wrong	right	wrong
0	50	50	33	33	5	5
10	58	43	43.3	28.3	19.3	4.3
20	60	40	47	27	24	4
30	63	38	50	25	28.8	3.8
40	70	30	60	20	43	3
50	75	25	66.7	16.7	62	2
60	80	20	73	13	71.5	2
70	85	15	80	10	7.1	1.5
80	90	10	86.7	6.7	81	1
90	95	5	93.3	3.3	90.5	0.5
100	100	0	100	0	100	0

Source: own computations.

In both cases, if the manager is unskilled the probability of the right decision is equal to $1/n$.

These tables show the process of making decision at a time. For a longer period of time, when a set of managerial decisions is given, and the probability of the right choice could be calculated, it is possible to estimate the skill level of the manager.

3. Value of skills in fixed income investments of debt securities portfolio of Open Pension Funds between 2001 and 2012

The imperfect foresight approach which is understood as an alternative measure of investor's skills was implemented into debt security portfolio of the Polish Open Pension Funds. The used dataset includes observations from each of 14 funds that have been functioning between 2001 and 2012.

The research covers two decision making processes: first, which involves decisions about either the lengthening or shortening or keeping without changes the structure of the portfolio in case of bond's maturity which are in, second – the allocation between fixed or floating rate investments.

The decisions how to invest sources of forthcoming pensioners should be closely connected with monetary policy decisions, especially concerning interest rate movements. The body which conducts this part of Polish monetary policy was established in 1998. The Monetary Policy Council consists of nine external members plus one internal, the President of the NBP who is also a Chairman of the council. Investors usually try to predict future interest rate movements to benefit from the reversal dependency between rates and prices of debt securities (the higher is the rate, the lower is the price of the debt security).

In case of first decision making process, the structure of the portfolio was analysed concerning the maturity date. The portfolio was divided into three sub-subsets which include assets with maturity: up to one year, from one to five years and above five years. It could be assumed that a well-skilled investor, who is able to anticipate the interest rates' movements correctly, tries to increase a portfolio's income by changing the portfolio duration. If he expects an interest rates' decreasing (increasing), he tries to lengthen (shorten) the portfolio duration. In case of expected stability in interest rates it is optimal to keep the portfolio duration unchanged. It leads to the situation when investors may choose one of three possibilities but only one is the winning strategy which outperforms the benchmark.

Firstly, for each of funds, the probability of success was calculated (with the assumption that the fund has been managed by the same or similar group of people, to keep the compatibility of the research). Then, knowledge of the probability lets estimate the skills' level (following Table 2 but the column which describes a situation when there is one winning strategy among three strategies).

The estimation of the skill level of the investors who managed Open Pension Funds in Poland was done using imperfect foresight approach and was shown in Table 3.

Table 3. Skill level estimated from a given probability of choice the best strategy when three decisions (about interest rates) are available

Pension fund	Skill level (%)	$p(s)$ (%)
AEGON OFE (formerly OFE Ergo Hestia)	50	67
Allianz Polska OFE	63	75
Amplico OFE (formerly AIG OFE)	63	75
Aviva OFE Aviva BZ WBK (formerly Commercial Union)	63	75
AXA OFE (formerly Winterthur OFE/Credit Suisse Life & Pensions)	36	58
Generali OFE (formerly Zürich OFE)	50	67
ING OFE (formerly ING Nationale-Nederlanden Polska OFE)	87	92
Nordea PFE (formerly SAMPO OFE)	63	75
Pekao OFE	87	92
PKO BP Bankowy OFE (formerly Bankowy OFE)	50	67
OFE Pocztylion	75	83
OFE POLSAT	25	50
OFE PZU "Złota Jesień"	36	58
OFE WARTA (formerly OFE "DOM")	63	75

Source: own computations.

Second research takes into account the portfolio structure with a special focus on the allocation between fixed or floating rate papers. In this case it is assumed that if a

well-skilled investor expects an interest rate decreasing, he lowers the number of floating rates bonds. In case of interest rate increasing, the higher is the number of floating rate notes the less fragile is the portfolio for these changes. The dataset let analyse the structure of the portfolio between 2001 and 2012 and only one decision is a winning strategy and let outperform the benchmark.

For each of funds, the probability of success was calculated (with the same assumption, that the fund has been managed by the same or similar group of people, to keep the compatibility of the research). Then, knowledge of the probability let estimate the skills' level (following Table 2, but a column which describes a situation when there is one winning strategy inside the set of two strategies).

Table 4. Skill level estimated from a given probability of choice the best strategy when 2 decisions (about fixed or floating papers) are available

Pension fund	Skill level (%)	$p(s)$ (%)
AEGON OFE (formerly OFE Ergo Hestia)	15	58
Allianz Polska OFE	50	75
Amplico OFE (formerly AIG OFE)	35	67
Aviva OFE Aviva BZ WBK (formerly Commercial Union)	0	42
AXA OFE (formerly Winterthur OFE/Credit Suisse Life & Pensions)	15	58
Generali OFE (formerly Zürich OFE)	0	50
ING OFE (formerly ING Nationale-Nederlanden Polska OFE)	85	92
Nordea PFE (formerly SAMPO OFE)	0	50
Pekao OFE	35	67
PKO BP Bankowy OFE (formerly Bankowy OFE)	50	75
OFE Pocztylion	35	67
OFE POLSAT	15	85
OFE PZU "Złota Jesień"	85	92
OFE WARTA (formerly OFE "DOM")	50	75

Source: own computations.

The estimation of the skill level calculated using imperfect foresight approach is shown in Table 4.

4. Conclusions

The purpose of the research was to evaluate investment styles using an imperfect foresight approach. The analysis took into account the dataset taken from the debt

securities portfolio of Open Pension Funds between 2001 and 2012. As a result two ranking lists were created concerning investors' skills in case of choosing the optimal portfolio duration (the first list is shown in Table 3) and the optimal proportion between fixed and floating papers (the second list is shown in Table 4).

In case of portfolio duration most managers of the pension funds were able to outperform the benchmark quite often. It let range their skills between 25 and 36% for the worse funds (AXA OFE, OFE Polsat and OFE PZU "Złota Jesień") and 75–87% for the best ones (ING OFE, Pekao OFE, OFE Pocztylion).

Surprisingly in case of fixed-floating allocation the results showed that there were several funds which were not be able to take advantage of the proportion between fixed and floating income investments. The worst ones have shown 0% skills (Aviva OFE, Generali OFE, Nordea OFE), whereas the best ones showed 85% (ING OFE, OFE PZU "Złota Jesień").

It is worth noticing that these results should be interpreted with caution – the dataset covers only portfolio structure from the last day of the year. For more precise analysis at least monthly frequency of data is needed. Despite this, the imperfect foresight approach provides an interesting alternative method of assessing skills of pension fund managers.

References

Ang A., 2014, Asset *Management: A Systematic Approach to Factor Investing*, Oxford University Press, New York.

Bacon C.R., 2013, *Practical Risk-Adjusted Performance Measurement*, John Wiley & Sons, Chichester.

Brown K.C., Reilly F.K., 2009, *Analysis of Investments and Management of Portfolios*, South-Western, Cengage Learning.

Dynkin L., Gould A., Hyman J., Konstantinovsky V., Phelps B., 2007, *Quantitative Management of Bond Portfolios*, Princeton University Press, Princeton–Oxford.

Fabozzi F.J., 1998, *Selected Topics in Equity Portfolio*, Frank J. Fabozzi Associates, New Hope, PA.

Focardi S.M., Fabozzi F.J., 2004, *The Mathematics of Financial Modeling and Investment Management*, John Wiley & Sons, Hoboken, NJ.

Maginn J.L., Tuttle D.L., McLeavey D.W., Pinto J.E., 2007, *Managing Investment Portfolios*, John Wiley & Sons, Hoboken, NJ.

Martellini L., Priaulet P., Priaulet S., 2003, *Fixed Income Securities*, Wiley, Chichester.

Oxford Dictionary, 2004, Wydawnictwo Naukowe PWN, Warszawa.

OCENA UMIEJĘTNOŚCI INWESTYCYJNYCH
DLA PORTFELA O STAŁYM DOCHODZIE

Streszczenie: Jednym z efektów globalizacji na rynkach finansowych jest powszechny spadek rentowności inwestycji. Rosnąca współzależność gospodarek powoduje spadek możliwości dywersyfikacyjnych, a to z kolei zmusza do poszukiwań nowych możliwości inwestycyjnych. Celem artykułu jest analiza procesu inwestycyjnego ze względu na umiejętności alokacyjne samego inwestora w portfel. Zastosowanie narzędzia „niedoskonałych prognoz" (*imperfect foresight*), rozumianego jako alternatywna miara oceny umiejętności inwestorskich, pozwoliło na zbadanie tychże umiejętności w przypadku polskich Otwartych Funduszy Emerytalnych. Zakres danych obejmował wyniki 14 funduszy funkcjonujących w latach 2001–2012. Badanie objęło dwa typy decyzji: pierwszy dotyczący długości (*duration*) oraz drugi dotyczący problemu wyboru pomiędzy instrumentami o stałym a zmiennym dochodzie – obie w połączeniu z prognozowaną polityką zmiany stóp procentowych przez fundusz.

Słowa kluczowe: portfel instrumentów o stałym dochodzie, ocena efektywności inwestycji.