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Performance Evaluation of Public Pension Funds: The Reformed Pension System in Poland

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PERFORMANCE EVALUATION OF PUBLIC PENSION FUNDS: THE REFOMED PENSION SYSTEM IN POLAND

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ABSTRACT:

The paper is an updated first performance evaluation study of the Polish pension funds operating from 1999. The unconditional performance evaluation models are used. It is shown that pension fund managers did produce additional value due to active management. Therefore, unsatisfactory overall results for the public pension system cannot be attributed to the inefficiency of the investment process. The research presents some facts on pension funds' investment behaviour (successful diversification, returns clustering around median manager, positive timing skills).

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I. INTRODUCTION

Funded pension schemes are becoming a key point for modern economics and economic policy. Increasing demographic pressure combined with the need of reforming the existing ineffective and politically vulnerable systems bring about the current trends to privatise the modern welfare state and to use capital market-based solutions in the old-age provision.

The urge for reform is particularly strong within the industrialised countries. Poland is one of the first countries in Europe to have adopted a public, fully funded second old-age security pillar. The heart of the system consists of privately managed yet publicly owned pension funds that are the investment vehicles for retirement savings.

There is growing literature on performance evaluation of pension funds. However, not much research has been done into performance evaluation of mandatory public funds. This paper is an updated version of Stanko (2002) and, (up to the author's best knowledge, the first performance evaluation study of abnormal returns (alphas) of the Polish pension funds. The study is motivated by the need of analysing the investment efficiency of funds operating in different from UK or US institutional and legal framework. Also, findings of this paper help in answering the important question on which part of the system (financial institutions or system's design) is responsible for its relatively low system's efficiency. These issues, crucial for the European countries that have introduced the new pension system or intend to do so are elaborated in Stanko (2003).

We are particularly interested in the following three questions:

- How did the results of the funds compare to other investment opportunities in Poland during 1999 – 2003?
- Did the active management of the pension funds produce any value added? This question helps to analyse the new pension system from the overall design framework.
- What can be said about the funds' investment activity (diversification, asset allocation, asset selection and timing)?

The structure of the paper is as follows. The second section sketches the Polish pension reform and describes current pension market. Next, some previous studies on pension funds are discussed. Section IV presents information on the data used. Section V compares funds' recent results with other investment opportunities. Composite performance measures are calculated in section VI. Section VII introduces performance evaluation models used in the paper. Section VIII discusses the empirical findings. The last section concludes.

II. Brief Introduction To The Polish Pension System

The Polish new retirement system[1] started in April 1999. Currently there are 16 pension funds[2] run by private managing companies. They administer individual accounts for each insured and invest their savings in the capital market. The retirement age is set at 60 for women and 65 for men. Before reaching that age, the insured cannot withdraw their retirement assets. However, in case of death of the insured, the assets are subject to inheritance law.

Current assets of the pension funds system (end of March 2003) comprise of approx. 8.4 b USD with 11.23 m individual accounts. The market is of an oligopoly type – the first four funds have almost 75% of assets. The law roughly predefines the investment style as investment limits permit to hold maximum of 55% of portfolio in stock.

There exists a wide range of regulations concerning safety measures (reporting, guarantee and reserve funds, fund as a legal entity separated from managing company), minimal guaranteed rate of return, evaluation framework and similar.

This paper deals only with performance evaluation of pension funds. The overall economic efficiency of the second pillar (costs and performance monitoring issues) is discussed in Stanko (2003).

III. Previous Studies

Up to the author's best knowledge, so far there has been no research into Polish pension funds that uses finance theory to evaluate abnormal returns (alphas). The supervisory body, Committee of Insurance and Pension Fund Supervision) has just released (end of May 2003) a report on investment policy of fund administrators (KNUiFE, 2003), discussing period of 2000-2002. Some issues of monthly and quarterly bulletins by KNUiFE on the results of the pension funds are also available. However, these include only calculation of internal rate of return, the weighted average rate of return and mandatory minimum rate of return, specified by law.

The pension funds representative body, Chamber of Pensions Fund Administrators released last year a short commentary (IGFE, 2002) that presented the results of industry in comparison to other investment vehicles.

Numerous recent international papers discuss the problem of pension funds performance and measurement, but these funds differ in their nature and

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[1] For a more detailed description of the Polish system of public pension funds and a discussion of current problems, see Stanko (2003).

[2] The Ego fund has recently (January 2002) terminated its operations as a result of merger with the Skarbiec fund.

legislation environment from the public fully funded pension frameworks that were introduced in Latin America and recently, in Central and Eastern Europe. The Latin American studies do not provide estimates of alphas. Our study attempts to bring some insights on how the pension fund work in the European context.

Blake and Board (2000, p. 552) study the UK private pension funds and find that the average fund underperformed the market average by 0.45 percentage points per annum, before deducting any fund management fee. Another UK study into over 2000 segregated pension funds by Thomas and Tonks (2001, p. 17) during the period 1983-1997 found that most of the funds are "close-trackers" to the FT-All Share Index and that their average outperformance was significantly different from zero, around one half of a percentage point per year. The average selectivity alpha and the average timing parameters were both negative (Thomas and Tonks, 2001, p. 14). Also, Blake et al. (2001, p. 15) present evidences that the funds' results are very close to the benchmark and on average slightly underperform it. Blake et al. (1999) found a stock selection negative and the average market timing very negative.

There are relatively many studies into the American pension funds. Ippolito and Turner (1987) studied over 1500 US ERISA-based pension funds during the period of 1977-1983, and Lakonishok et al. (1992) examined 769 defined benefit funds in 1983-1989. Both studies conclude that, on average, the pension managers significantly underperformed the passive management style (represented by S&P index). Lakonishok et al. (1992) relates the average underperformance of 1.3% annually to the agency problems ("window-dressing"). A study of Coggin et al. (1993) on a random sample of 71 US equity pension funds during 1983-1990 found a significant positive selectivity and negative timing. Christopherson et al. (1998), using conditional performance evaluation framework evaluate 261 manager portfolios over 1980-1996 to the Russell 3000 benchmark and find that the average manager outperforms the Russel by 0.72% per annum.

IV. Data Description

A. Source

The sample covered in the analysis ranges from the beginning of June 1999 till the end of March 2003 and is the most comprehensive one. The system started in April 1999, but it was not before June 1999 when the majority of the funds launched their operations in the market and gathered enough premiums to invest.

The closing daily data on pension funds unit prices, stock and bond market indices were obtained from the Internet site of the economic journal "Parkiet" (www.parkiet.com/dane). The Merrill Lynch Polish Government Index (GOPL) was given courtesy of Mr. Phil Galdi from Merrill Lynch. Mr. Janusz Zielinski from the National Bank of Poland provided the data on Treasury Bills yields for the secondary market. The data concerning Polish mutual funds investing in bonds were retrieved from financial pages www.money.pl and www.tfi.hoga.pl.

B. Data description

We employ continuously compounded monthly rates of return. The assumption was that an investment starts in the morning of the first working day of month and ends in the morning of the first working day of the following month. Therefore, the closing values of the last trading day were used.

The returns from an investment in the stock market were calculated with the use of WIG and WIG20 indices (Warszawski Indeks Giełdowy, Warsaw Stock Index). The former represents a total return index that includes dividends and pre-emptive rights. The latter consists of 20 blue chips and does not account for dividends[3]. The pension funds are obliged by law to follow investment limits. Therefore, the pension managing houses invest heavily in blue chips equity, which are described by WIG20 index.

For bond returns, the Merrill Lynch GOPL and MFUND indices were used. The former is a proxy of profitability from investing in Polish government bonds and reflects accrued interest income. The latter index is the arithmetic average of the returns of the biggest three mutual funds investing in bonds and money instruments. It serves as another benchmark and reflects in particular the pension fund's strategy of preserving the portfolio's accumulated value.

In the case of missing data, an artificial time-weighted data was computed, they consist only 1.8% of all input values, though.

C. Distribution and statistical properties of returns and indexes

There are 883 monthly returns for 21 pension funds during the 46-month period of 1 June 1999 – 31 March 2003. Almost all (88% of all survived funds) of monthly returns for the pension funds are normal at 1% significance level. The monthly returns for stock and bond markets are normally distributed, while the mutual bond market and treasury bills are not.

As the data revealed heteroskedasticity, White (1980) heteroskedasticity -consistent covariance matrix estimators are employed. The investment results for pension funds are highly correlated with one another (most of them above 0.85), suggesting existence of common return generator factor or factors.

The augmented Dickey-Fuller and Phillips-Peron unit root tests for all fund, stock and bond excess returns, as well as for the averages, rejected the hypothesis of non-stationarity.

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[3] Income from dividends for the industry in 2002 amounted to nearly 95 m PLN, that is, to 6.17% of whole revenues from investments (KNUiFE, Quarterly Bulletin 4/2002).

V. PERFORMANCE VS ALTERNATIVE INVESTMENT VEHICLES

Table 1 presents the discretely compounded nominal rates of return achieved by the pension fund administrators during the period 1 June 1999 - 31 March 2003.

Nominal rates of return for the survived pension funds (Part C) ranged between 44% and 66% for the whole period, or 10% and 14% annually. The results of the three bank-based funds that appeared on the market later (Part B) are somehow lower than the outcomes of those that had started earlier. Their annual rates of return are lower than the arithmetic average of the early starters: 12.09%. Also, two of the late-starters experienced lower annual rates of return than their competitors.

All of the funds that ceased their activity (Part A) started their activity late (May-September 1999). Interestingly, several of the discontinued funds had quite high annual returns. The other fund that disappeared from the market, Rodzina, performed very well, however it started its operations as the last one amongst all 21 pension providers.

It is logical to assume then that performance was not the only reason for mergers or acquisitions that took place in the market. Rather, some funds started their marketing campaigns too late. Having failed to achieve an economically sound fragment of the market they were forced to quit. Up till now, none of the funds that had commenced their activity early have merged or been a subject of a takeover. The explanation lies rather in the economies of scale and timing of the marketing campaign and the number of initial customers. There seems to be no evidence indicating that the changes in the market were caused by choices of the consumers.

Thus, as long as the inferior investment skills are not the main cause for funds' disappearance from the market, the problem of survivorship bias[4] should not have any effect on the performance evaluation.

Table 1 Pension funds. The investment results for the period 1 June 1999 – 31 March 2003.

Table 2 presents some basic information on survived pension funds. The geometric annual real rates of return for the survived funds are quite diverse. The best funds earned in real terms around 7-8% p.a. while the worst one achieved a mere 2% growth. The funds managing the biggest parts of national pension savings have also wealthier-than-average members. These managing companies are branches of leading international insurers that had already recognizable trademark in Poland and stable clientele from the middle class. For instance, 22% of all insured are members of the Commercial Union fund; however this fund administers 28.5% of all savings. Only for the PZU fund, a national insurer, this relationship is opposite.

[4] Survivor effect is a problem when the evaluated performance is (usually) biased upside "due to exclusive focus on those institutions that survived throughout the evaluation period." (Davis and Steil, 2001). For this topic see for example Goetzmann et al. (1992), Elton et al. (1996), Garcia and Gould (1993).

Table 2 Basic facts on Polish pension funds (as of 31 March 2003).

An inspection of tables 2 and 3 reveals that in the investigated period it was a much wiser strategy to follow the bond markets than to invest in the stock market. The results of the best pension funds (first quartile equal 6.22% p.a.) were much lower than with the Merrill Lynch Polish Government Bonds index (9% p.a.) and the three biggest mutual funds investing in bonds and money instruments (7.5%). The pension funds present themselves a great deal better in comparison with mutual funds, especially those investing in shares (equity, balanced and growth funds) and retirement funds (Table 3). Half of all funds won with both of these investment vehicles.

Table 3 Pension funds vs. other investments. The investment results for the period 1 June 1999 – 31 March 2003.

Due to constant bear market, the rates of return earned by administrators of the pension funds are not much higher than the one earned by following the most naïve strategy that is saving monies in the bank account. Five of the funds earned even less than the bank account interests. Only the dollar deposits have brought negative rate of return.

Discussing the results one should remember that the funds are supposed to follow the prudent rule of diversification and also to operate within the investment limits specified by law. Therefore, they could not invest 100% of their assets into one asset bearing the highest return at the time (for instance in the bank accounts). The asset allocation benchmark that reflects the typical stock-bond combination employed by pension funds would have earned around 40-50% at the same period, which suggests that funds have actively adjusted their holdings as their average returns exceeded 50%. Equally important is the fact that the pension savings did not eroded due to inflation.

VI. COMPOSITE PERFORMANCE MEASURES

Table 4 presents the Sharpe and Treynor ratios[5] for pension funds and other investment vehicles during the period of 1 June 1999 – 31 June 2003. The

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[5] The ex-post Sharpe ratio is calculated as: $\frac{r_i - r_f}{\sigma_i^2}$, where $r_i - r_f$ is the differential return that is a difference between a return earned by a fund during a period and the return earned on a risk-free (usually represented by Treasury Bills) and σ_i^2 is the volatility this differential returns (Sharpe, 1994). The Treynor Ratio is calculated as: $\frac{r_i - r_f}{\beta_i}$, where: $\beta_i = \frac{\mathrm{cov}(r_i, r_m)}{\sigma_m^2}$ is the measure of systematic risk, or in other words, the relation between the covariance of fund and market portfolio

calculation period is appropriately reduced in cases when a fund or instrument existed for shorter time. The ratios were calculated on the basis of monthly continuously compounded returns.

The ratios are mostly negative since for majority funds their total returns were lower than Treasury Bills yield. The absolute values of the Sharpe indicator are small because during the period, the Treasury Bills and bond index returns were comparable. Even the best results achieved by mutual funds that invested in bond and money instruments are still much lower (0.17-0.15) than the historical Sharpe ratio for the American stock market of around 0.5. Again, such effect can be attributed to the bear market dominating during last three years.

Table 4 Composite performance measures for pension funds and other investment vehicles.

Both indicators do not quantify the value added of active portfolio management. However, they help in ranking the efficiency of the funds' investments. The Sharpe ratio uses the standard deviation for calculating its total risk of a portfolio. Thus, the ratio does not say anything about the diversification issues. Since the pensioners cannot split their retirement assets within several funds at the same time, this ratio is a useful measure. Since they put their entire premiums in a single well-diversified fund, the total risk is important. The Treynor grade is more suitable for the portfolios that are already diversified since only the non-diversifiable (systematic) part is taken into consideration.

An important function of the institutional investors is the risk diversification. The total risk for a well-diversified portfolio should be identical (in theory) or very similar (in practice) to the systematic risk, then. In the case of pension funds, as far as they do their diversification job well, both of the rankings should be identical. The rankings achieved by Sharpe and Treynor ratios (Table 5) are essentially the same and it implies that their portfolios were well diversified. Only four funds have slightly different ranks. The correlation ratios between the rankings are high and equal to 0.990 (Panel A, all funds) and 0.994 (Panel B, survived funds).

Table 5 Comparison of ranking persistency.

VII. METHODOLOGY

This section discusses the methodology for testing whether the pension funds' active management create some additional (compared to passive investing) value for the system members. Since the market is very new, the data series are short. Moreover, the author does not possess full information concerning the pension funds' portfolio structure (only the general public information was accessible). Some of the basic indices still do not exist (for example the dividend index). These facts

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returns and the volatility of the market portfolio.

altogether limit severely the usage of possible models of performance evaluation, particularly the conditional evaluation framework[6].

A. Unconditional market model

A basic Jensen's regression was used. As Cesari and Panetta (2002) remark, the Jensen's alpha can be treated as an unbiased performance measure if the manager of portfolio (fund) possesses security-specific information but no timing information. When the manager achieves successful timing, the measure is usually biased downward (Cesari and Panetta, 2002). The unconditional version of the market model is as follows:

$$\tilde{r}_{it} - r_{ft} = \alpha_i + \beta_{im}(\tilde{r}_{mt} - r_{ft}) + \tilde{\varepsilon}_{it}$$

where: r_{it} is the return of the i^{th} fund at the period t and r_{ft} is the risk-free return at the period t, r_{mt} represents the return of the benchmark market portfolio and β_{im} is the fund's beta, that its systematic risk. The tildes denote random variables. The returns in this paper include brokerage, service, depository and asset management fees. They do not include the up-load payment, though[7].

In the context of available data, the stock market indices (WIG and WIG20) were used as proxies for the market portfolio. It is hoped that as the pension market grows a new pension-oriented index will be created. This question is beyond the scope of the paper and is discussed further in Stanko (2003).

B. Unconditional two-index model

The portfolio structure of pension funds is an important issue in their performance evaluation. As opposed to the heavily researched mutual funds, the pension funds hold also considerable amounts of bonds and other interest-bearing instruments. Recently, they invested around 60-70% of assets in bonds and only 20-30% in stock (Table 6). According to the modern portfolio theory, bonds should be

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[6] For conditional models based on returns see Ferson and Schadt (1996); models employing portfolio holdings are presented in Ferson and Khang, (2002). Daniel et al. (1997) introduce characteristic-based benchmarks. Also, there exist numerous other methodologies employing: style analysis (Sharpe, 1992) ordered mean difference (Bowden, 2000), seemingly unrelated assets (Pastor and Stambaugh, 2002), stochastic discount factor (Farnsworth et. al, 2002), Bayesian performance (Baks et al., 2001) and flows (Guercio and Tkac, 2000).

[7] According to the Polish law, the up-load fees are deducted before contributions are calculated into investment units. Investment costs are calculated every working day. The fee for management (equal to monthly maximum 0.05% of accumulated assets) is calculated alike; however, the deduction takes place on the month's last working day. Therefore, the monthly returns are not affected, as they are calculated on the basis of last days of the succeeding months (the consequences of fee payment cancel out).

treated as a part of all risky portfolios. Usually (mainly due to data availability and frequency), it is the stock market index that represents the risky assets. The value of the beta shows the sensitivity of the fund's return to the return of the stock market benchmark. However, the monthly returns from the bond instruments (represented by GOPL) are low correlated with stock; merely 0.31 (correlation with WIG index) and 0.25 (with WIG20 index).

Table 6 Investment portfolio of Polish pension funds as of 31 March 2003.

The risk measure for bond instruments is probably better associated with the duration term. Since such data is not directly available, the solutions might be as follows. One may try to regress the two-index model and to estimate the parameters. Alternatively, as in Elton et al. (1993), one first regresses the bond returns against the stock exchange index and then uses such orthogonalized index to measure marginal return contribution to the stock index (i.e. the part of the returns that are uncorrelated with the main stock index). Blake et al. (2001, p. 15) use the multiple-index Jensen regression arguing in other paper that such approach "is likely to be more appropriate for the aggregate portfolio" (Blake et al., 1998, p. 5).

The following two-index model is considered:

$$\tilde{r}_{it} - r_{ft} = \alpha_i + \beta_{im}(\tilde{r}_{mt} - r_{ft}) + \theta_{im}(\tilde{r}_{bt} - r_{ft}) + \tilde{\varepsilon}_{it}$$

where: r_{it} is the return of the i_{th} fund at the period t and r_{ft} is the risk-free return at the period t, r_{mt} and r_{bt} represents the returns of the benchmark (stock and bond) market portfolios and β_{im}, θ_{im} are the fund's betas for stock and bond investments, respectively. The tildes denote random variables.

In the case when funds investments are mainly concentrated on specific subgroups of securities the market model and the two-index model might not describe properly a fund's investment strategy. Cesari and Panetta (2002) propose the five-factor model estimated by maximum likelihood method. However, in the context of Poland most of the investment in stocks is concentrated in blue chips and national bonds, therefore two-index model should suffice (Table 6).

C. Asset allocation benchmark

A synthetic index A_t represents the investment returns from strategic asset allocation portfolio at time t, employed by a pension fund. The asset allocation structure in last three years was approximately 30% of assets invested in stock and 70% in bond.

$$\tilde{r}_{it} - r_{ft} = \alpha_i + \beta_i(\tilde{A}_t - r_{ft}) + \tilde{\varepsilon}_{it}$$

Blake and Timmermann (2002, p. 110) argue that the strategic asset allocation is a risk decision, not the investment one and is usually determined by maturity structure of the anticipated liability cash flows. However, one may use the strategic asset allocation benchmark to judge the stock selection and market timing (i.e. tactical asset allocation) decisions. A comparison of empirical alphas and alphas derived from asset allocation portfolio gives some insights for portfolio attribution. We employ four benchmarks being a combination of stock (WIG, WIG20) and bond (GOPL, MFUNDS) indices.

D. Unconditional timing models

If a fund's performance is based not only on the security-specific information possessed by an investment manager but also on his or her timing strategy, then the alpha estimates from time series undervalue this timing ability (Cesari and Panetta, 2002). This is so because the composition, and therefore the risk of the portfolio, changes as the managers adjust their exposure to risk in reaction to the market trends. The performance measurement must therefore recognize the manager's micro-forecasting ability (security selection) and macro-forecasting ability (market timing).

The paper considered two models to estimate market timing. The first, based on Treynor-Mazuy test (1966) assumes a non-linear relationship between the risk and return:

$$\tilde{r}_{it} - r_{ft} = \alpha_i + \tilde{\beta}_i(\tilde{r}_{mt} - r_{ft}) + TM_i(\tilde{r}_{mt} - r_{ft})^2 + \tilde{\varepsilon}_{it}$$

The intercept alpha estimate measures the security selection ability, while the squared term represents the additional amount of return as a product of the timing ability. When the TM parameter is positive, this ability is superior, while negative value shows that the fund is losing the shareholders' money by engaging in speculative activity.

To derive the equation above, one needs to start with the standard Jensen model and then assume that changes of beta are only due to the market timing activity:

$$\tilde{r}_{it} - r_{ft} = \alpha_i + \beta_i(\tilde{r}_{mt} - r_{ft}) + \tilde{\varepsilon}_{it} \quad \textit{and} \quad \beta_i = \tilde{\beta}_i + TM\,(\tilde{r}_{mt} - r_{ft})$$

Merton (1981), and Henriksson and Merton (1981) define the market-timing ability as the skill of predicting whether the excess return on risky assets will be positive or negative, i.e. whether the return on risky assets will be higher than the risk-free rate at a particular period (Jagannathan and Korajczyk, 1986, p.220). If such a situation is predicted, then the manager weights his or her portfolio more heavily towards the risky instruments and the new beta of portfolio increases. Therefore, the Merton-Henriksson model assumes the following relation:

$$\tilde{r}_{it} - r_{ft} = \alpha_i + \beta_i(\tilde{r}_{mt} - r_{ft}) + TM_i \max[0,-(\tilde{r}_{mt} - r_{ft})] + \tilde{\varepsilon}_{it}$$

VIII. EMPIRICAL RESULTS

A. Alphas

Table 7 presents the results of the OLS regression for the unconditional market and two-index models. An arithmetic average of all fund's returns was used to represent the industry's results. Panel A shows the Jensen's alphas for all 13 funds that operated on the market within last four years. The estimates for various models range between 3 and 4.3 per cent per annum. All alphas are significant at 5%. The funds' active management has created an additional value comparing to the results that would have been obtained by a passive investment in stock and bond indices[8].

Table 7 Pension industry performance: Jensen's alpha (annualized monthly returns).

Panel B shows the outcomes for a wider sample of survived funds (16). The group incorporates three funds that started their activity later. The number of monthly observations is shorter (42 instead of 46) and that is probably the reason (along with lower investment efficiency itself) why the estimates are slightly less significant. The estimated alphas are around 2.7 – 3.9 per cents and are lower than that in Panel A. It may suggest that the investment efficiency of the latecomers was lower.

Panel C demonstrates results for a variable number of funds present at the market during the whole period of 46 months. Their alphas are significant and are a little lower than the first group (Panel A) but higher than the second group (Panel B). The values vary between 3 and 4.1% per annum. It implies that the latecomers and the discontinued funds had altogether somehow lower results. Due to short series of observations, the estimates for the survived latecomers and for the discontinued funds alone are not significant and are not presented here.

Few of the models revealed autocorrelation; therefore autoregression AR error models were used. For instance, a first-order serial correlation of error term would result in the following model:

$$\tilde{r}_{it} - r_{ft} = \alpha_i + \beta_{im}(\tilde{r}_{mt} - r_{ft}) + \theta_{im}(\tilde{r}_{bt} - r_{ft}) + \tilde{\varepsilon}_{it}$$

where

[8] However, these are the alphas that do not take into account the possible higher costs and fees that one must pay for such a superior investment service: "In this case, we can expect to observe abnormal performance only by examining gross returns, which do not have transaction costs, fees, or other expenses subtracted from them." (Grinblatt and Titman, 1989, p. 393).

$$\tilde{\varepsilon}_{it} = \rho\varepsilon_{it-1} + \tilde{v}_{it} \qquad \text{and} \qquad \tilde{v}_{it} \sim \mathrm{N}(0, \sigma_{it}^2)$$

Once the general boundaries for the alpha values have been drawn, it is interesting to analyse how the funds were performing on the individual basis. This information is presented in Table 8. Depending on the monthly model, there are around 10-12 significant alphas at the 10 % significance level in the case of market models and 7 in the case of two-index market models. The two-index models in general bring lower (0.5-1%) alphas than the market model. Practically all significant estimates are only in the group with the longest history (i.e. the early started survived funds). Slightly less than half of these funds reveal significant alphas.

Two-index models using the government bonds yields (GOPL) and the models with the MFUNDS index give the same 6 significant results. However, the returns from investing in blue chips (WIG20) should be underestimated and the performance overestimated[9]. However, the empirical results do not vary much. For most of significant alphas the WIG20 index used in place of WIG produces only slightly higher (0.02-0.4%) estimates of alphas. The probable explanation is that high-capitalized WIG20 drives the whole market index and is more volatile then the entire market. The funds invest mainly in blue chips. During the last four years, the WIG20 experienced more negative return than WIG (see Table 3). That is perhaps why that effect offset the dividend upshot.

Table 8 Individual pension funds performance: estimates of Jensen's alpha.

Next table presents the individual funds alphas and the industry average. As discussed, the group of two-index models seems to better represent investment portfolios of Polish funds. The estimates are 0.5-1% lower than in the case of single-factor market models. The "added-value" product of the active pension management in Poland can be assessed on average as 2.7-2.8 % per annum for the industry as a whole and 3.0-3.5 % for the early-starters. The best fund (Nationale Nederlanden) achieved alphas at the level of 6.0%, with the other funds at the level of 3-4% that is 0.5-1% better results than the average.

A direct comparison between funds is not possible because the portfolios have various levels of systematic risk (betas). A higher alpha usually means that the manager took more unsystematic risk by using private selection information to invest more in particular shares. Interestingly, there is quite strong relation for top funds between estimated alphas and the funds' positions in the total real return (see also Table 1) and Sharpe ratio rankings (Table 4). There is no strong connection between the investment results (alphas or raw returns) and size of the funds (market share).

Table 9 Pension funds with significant alphas.

[9] Alpha is a result not explained by the model. Investing in market portfolio should produce capital gains and dividend income. The later part is not accounted for by the index. Therefore the dividends artificially increase the value of alpha.

Following the methodology of Blake et al. (2001, p. 10-14), the annualised interquartile range in each of the models was calculated for raw annual continuously compounded returns and alphas. The interquartile range shows the difference between top 75% and 25% results. In the case of all survived funds, these ranges are practically identical: 150.8 basis points for raw returns and 152.2 for alphas arriving from GOPL-WIG20 model. However, if just the early starters are taken into account [10], the variability between return and abnormal return distributions increases. The interquartile range for raw returns is 61.5 basis points, with range for alpha of 76.9 annualised basis points. These results suggest that: 1) the fund industry returns (particularly the early starters) had tendency to cluster around the median value, and 2) the Jensen unconditional models managed to detect a portion of performance variability.

B. Asset allocation

Table 10 presents information about alphas from the asset allocation models for monthly returns. The alpha from the asset allocation benchmark shows results of the pension administrators' decision concerning the long-run risk profile of the managed portfolio.

Table 10 Abnormal returns from asset allocation and two-index models – comparison.

The alphas calculated on the basis of the 0.3WIG/0.7GOPL asset allocation model are approximately 0.5% lower than the ones derived from the two-index model. This may suggest that the asset allocation benchmark is more efficient and better represents long-run pension investment strategy.

There is another interesting fact (not presented in the table). For GOPL-based models, the asset allocation alphas are lower than the alphas from two-index models. The situation is opposite when MFUNDS is used. Besides stock and bonds, a pension fund maintains also cash and money-market instruments. The MFUNDS index does account for this part of holdings while the GOPL does not. That is probably why, under the bear market, the alphas from asset allocations for MFUNDS are higher.

The abnormal returns from asset allocation portfolios represent over 80% of total abnormal returns for individual funds and over 70% for the averages.

C. Timing

Timing models with monthly returns bring a few significant estimates (Table 11). In most some cases, to handle the autocorrelation, the autoregressive error term models were used. Apart from one, all the listed funds have positive significant estimates of the timing factor. It supports the observed facts: pension funds switched from stock assets towards bonds in order to defend against the bear

[10] None of the models gave significant alpha estimates for the survived latecomers. Thus, the estimation of interquartile range is higher if one skips those three funds.

market. A comparison of timing estimates sheds some light on the relative importance of timing strategy for each fund in its investment policy. Unfortunately, nothing can be directly inferred about their security selection skills, for with one exception, all the alphas are insignificant. Only the Pioneer fund reveals a negative timing skill and a positive selection capacity (alpha positive at 5% level and equal to 0.11).

Nevertheless, bringing together the information on timing and asset selection gives us some indirect idea about stock selection. Abnormal returns for GOPL-based asset allocation models are lower than total abnormal return, while the MFUNDS asset allocation alphas follow the opposite. Knowing that timing was positive for all of the above models induces a suggestion that security selection capability was negative. Such conclusions are weak, though, as are based on too few significant timing estimates.

Table 11 Timing models.

D. Size effect and performance

Regression of funds' returns on their final magnitudes did not produce any significant relationship. The average nominal rate of return for all the funds (12.09% p.a.) is lower than the average weighted by market share at the end of the period[11] (12.69%), which would imply that bigger funds had better returns in general than the small funds. One of the possible conjectures why the size effect is not caught in more evident form is that the time horizon is too short and the big funds have not yet: (a) achieved the critical magnitudes (organizational problems); (b) dominated the stock markets (impact of trading size on market).

E. Polish results in comparison to other studies

While comparing to the international results, the Polish pension industry recorded high economically and statistically significant abnormal results. There might be several reasons for being so. Firstly, the market during last four years was definitely bearish; therefore the low-risk strategy (loading off the idiosyncratic stock risk and investing more in government instruments with high real yield) relatively easy bitten up the indexes. Funds also had longer investment horizon than the individuals who do not possess much information and who are more prone to panic during market corrections. This issue is somehow supported by positive timing abilities revealed. The second likely explanation is that the market indices used were not efficient. It is particularly probable since the Polish capital market is definitely still far from being semi-efficient and its size and depth are limited. Particularly, recent developments have brought concerns of market saturation with pension fund investments. Finally, there might be other types of information that were not accounted for by the model used here.

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[11] One should weight the returns by the value of the fund at the end of each period (for instance a quarter). However, since there was no considerable change in the market structure within this period for the survived pensions, even such a rough calculation should work well.

IX. CONCLUSIONS

The gross investment results for the pension fund market are satisfactory. The market as a whole and half of the existing sample produced significantly positive results. Funds that started earlier experienced higher abnormal returns. The industry asset management results could be perhaps even better if some of the system-built problems were limited. The unsatisfactory net return for pension funds' members must be ascribed to the overall regulatory and organizational flaws affecting the pension framework (Stanko, 2003).

Positive alphas were achieved due to asset allocation and market timing. With respect to the performance attribution, asset allocation played a dominant role. Security selection during that time produced negative results (bear market), however one could question its relative importance. It is because most of the investments were located in blue chips partly in response to the investment law, partly due to herding around mode manager (effect of mandatory minimum rate of return). Moreover, the proof is indirect and weak that is the data is not long enough to obtain more statistically significant timing estimates.

The funds applied active trading techniques (positive timing) and accomplished diversification jobs. No relation between the size and performance was observed, probably due to the market's immaturity.

However, the annualised interquartile range in raw returns and in estimated alphas shows the industry's tendency to gather around the median fund manager. These findings are in line with a UK study by Davis et al. (2001) who attribute the effect in to: the predominance of a single investment style, the fee structures and performance evaluation incentives. In the Polish context, these issues are discussed in Stanko (2003).

One of the study's limitations is that it did not employ the conditional performance evaluation models due to lack of proper equivalents for the Fama-French (1993) multi-factor models and proxies for information variables. Also, the number of observations is still very small. One of the interesting questions is whether the funds follow the contrarian strategy. The next issue is to analyze the portfolio holdings of the funds and try to use this data within the weight conditional performance evaluation framework as well as to perform the Grinblatt and Titman F-test for performance measures. These issues are intended to be addressed in the future.

Tables

Table 1 Polish pension funds: nominal investment results for the period 1 June 1999 – 31 March 2003. Discrete rates of return (%).

	Nominal returns*		Market average**	
	whole period	p.a.	whole period	p.a.
A. Discontinued funds				
ARKA	13.89	7.35	17.48	9.18
EPOKA	8.62	5.36	16.79	10.30
PIONEER	32.25	14.36	25.12	11.36
RODZINA	43.51	18.14	28.56	12.29
EGO	53.60	12.72	55.24	13.06
B. Funds that started their activity after 1 June 1999				
ALLIANZ	51.97	12.39	44.77	10.88
KREDYTB	34.83	8.91	46.54	11.54
PEKAO	45.67	10.80	47.51	11.18
C. Funds that started their activity before 1 June 1999				
AIG	44.09	10.00	55.87	12.28
BANKOW	53.35	11.80	55.03	12.12
CU	56.99	12.49	54.70	12.05
DOM	55.13	12.14	54.87	12.09
NN	66.07	14.15	53.87	11.90
PBKORZEL	55.50	12.21	54.83	12.08
POCZT	45.65	10.31	55.73	12.25
POLSAT	61.27	13.28	54.31	11.98
PZU	55.95	12.29	54.79	12.07
SAMPO_NU	64.45	13.86	54.02	11.93
SKARBIEC	46.76	10.53	55.63	12.23
WINTERTH	53.44	11.82	55.02	12.12
ZURICH	55.88	12.28	54.89	12.09

Calculation period: 1 June 1999 – 31 March 2002. Discretely compounded nominal rates of return. Annual returns are geometric rates of return. For funds with shorter period of activity the calculation period is appropriately adjusted. Market average indicates the arithmetic average of returns achieved by the competitors.

Source: Author's calculations.

Table 2 Basic facts on Polish pension funds (as of 31 March 2003).

	Average real returns (p.a.)	Number of members*	Members (%)*	Net assets (m PLN)	Net assets (%)
Late-starters:					
ALLIANZ	5.46	239 261	2.1	905.4	2.7
KREDYT BANK	2.22	152 494	1.4	221.6	0.7
PEKAO	4.30	294 922	2.6	555.2	1.7
Early starters:					
AIG	4.01	877 114	7.8	2 861.8	8.5
BANKOWY	5.71	389 150	3.5	1 022.7	3.0
CU (Commercial Union)	6.36	2 535 855	22.6	9 557.3	28.5
DOM	6.03	246 593	2.2	573.9	1.7
NN (Nationale Nederlanden)	7.93	1 893 472	16.9	7 478.7	22.3
ERGO HESTIA (previously PBK ORZEŁ)	6.09	381 724	3.4	627.9	1.9
POCZTYLION	4.30	454 365	4.0	697.9	2.1
POLSAT	7.11	127 296	1.1	135.2	0.4
PZU	6.17	1 822 713	16.2	4 718.1	14.1
SAMPO	7.65	450 113	4.0	972.6	2.9
SKARBIEC	4.51	642 933	5.7	1 304.5	3.9
CREDIT SUISSE (previously WINTERTHUR)	5.73	345 754	3.1	810.5	2.4
ZURICH	6.16	377 196	3.4	1 107.7	3.3

* as of 28 March 2003. Real returns in %. Distribution of real rates of return: first quartile: 6.22% p.a., median: 5.88% p.a., third quartile: 4.46% p.a.

Source: KNUiE Monthly Bulletin 03/2003 and author's calculations.

Table 3. Pension funds vs. other investment vehicles. The investment results for the period 1 June 1999 – 31 March 2003 (discretely compounded rates of return, %).

		Nominal rates of return		Real rates of return	
		whole period	p.a.	whole period	p.a.
Pension funds	Survived (13 funds)	54.96	12.11	25.02	6.00
industry average	All survived (16 funds)	52.94	11.72	23.39	5.64
Equity market	WIG	-11.93	-3.26	-28.95	-8.53
	WIG20	-26.32	-7.66	-40.56	-12.69
	WIRR	-26.94	-7.86	-41.06	-12.88
Bond market	GOPL	72.60	15.30	39.25	9.02
Bond mutual funds	EuroOblig	57.82	12.64	27.33	6.50
	SkarbOblig	71.46	15.10	38.33	8.83
	SEB2	61.90	13.39	30.62	7.22
	average (MFUNDS)	63.73	13.73	32.09	7.53
Asset allocation	0.3WIG/0.7 GOPL	47.24	10.62	18.79	4.59
benchmarks	0.3WIG20/0.7GOPL	42.92	9.76	15.31	3.79
	0.3WIG/0.7MFUNDS	41.03	9.38	13.78	3.42
	0.3WIG20/0.7MFUNDS	36.71	8.50	10.30	2.59
Mutual funds*	Equity	-1.12	-0.29	-20.23	-5.72
	Balanced	24.02	5.78	0.06	0.01
	Growth	41.82	9.54	14.42	3.58
	Bonds	56.13	12.32	25.96	6.21
	Money	34.29	7.99	8.34	2.11
*Arithmetic average return for all funds existing during the period in each category.					
Av. risk-free rate	12 months Treasury Bil	12.90	3.22	-8.91	-2.41
Retirement funds	Average	48.88	10.94	20.11	4.90
Bank deposits**	USD	13.83	3.44	-8.17	-2.20
	PLN 1month	44.04	9.99	16.21	4.00
	PLN 1 year	47.16	10.60	18.73	4.58
** Average rates. Dollar investment includes exchange rate appreciation					
Inflation rate	CPI	23.95	5.76		

Returns in %. Calculation period: 1 June 1999 – 31 March 2003. Monthly returns (p.a.)

Description of abbreviations: **WIG** - Warsaw Stock Exchange Index, **WIG20** - Warsaw Stock Exchange Top 20 Blue Chips Index, **WIRR** - Warsaw Parallel Stock Exchange (secondary stocks), **GOPL** - Merrill Lynch Polish Government Bond Index, **EuroOblig, SkarOblig, SEB2** - three biggest mutual funds investing in bonds, **MFUNDS** - the arithmetic average for the biggest mutual funds investing in bonds, **Retirement funds** - mutual funds with retirement profile (third pillar), **USD** - American dollar, **PLN** - Polish New Zloty, **CPI** - Consumer Price Index. **Survived funds** include those funds that were operating from 1 June 1999 and that are still in the market (31 March 2003). **All survived funds** includes above position plus

late-coming funds that are still in the market (31 March 2003). That position is an arithmetic average of both groups.

Source: Author's calculations based on Parkiet(www.parkiet.com.pl), Merrill Lynch Bank, National Bank of Poland (www.nbp.pl), Hoga (www.tfi.hoga.pl).

Table 4 Composite performance measures for pension funds and other investment vehicles.

	Sharpe		Treynor
average of 4 mutual funds investing in bonds	0.171	MFUNDS	0.711
MFUNDS	0.151	average of 4 mutual funds investing in bonds	0.705
GOPL	0.114	GOPL	0.346
RODZINA	0.038	RODZINA	0.067
NN (Nationale Nederlanden)	0.031	SAMPO	0.034
SAMPO	0.031	NN (Nationale Nederlanden)	0.031
POLSAT	0.013	POLSAT	0.013
CU (Commercial Union)	- 0.011	CU (Commercial Union)	- 0.011
ALLIANZ	- 0.016	ZURICH	- 0.017
ZURICH	- 0.017	ALLIANZ	- 0.019
EGO	- 0.019	EGO	- 0.020
PZU	- 0.019	PZU	- 0.020
DOM	- 0.020	DOM	- 0.021
BANKOWY	- 0.021	BANKOWY	- 0.023
ERGO HESTIA (previously PBKORZEŁ)	- 0.023	ERGO HESTIA (previously PBKORZEŁ)	- 0.024
13 survived funds (early starters)	- 0.025	13 survived funds (early starters)	- 0.024
CREDIT SUISSE (previously WINTERTHUR)	- 0.033	funds existing at the market (variable)	- 0.025
PIONEER	- 0.051	CREDIT SUISSE (previously WINTERTHUR)	- 0.034
PEKAO	- 0.062	all 16 survived funds	- 0.065
all 16 survived funds	- 0.065	PEKAO	- 0.066
funds existing at the market (variable)	- 0.065	SKARBIEC	- 0.073
SKARBIEC	- 0.067	POCZTYLION	- 0.077
POCZT	- 0.075	PIONEER	- 0.078
AIG	- 0.091	AIG	- 0.096
3 survived funds (late starters)	- 0.094	3 survived funds (late starters)	- 0.100
KREDYTBANK	- 0.148	WIG	- 0.158
WIG	- 0.176	KREDYTBANK	- 0.158
5 discontinued funds	- 0.176	WIG20	- 0.168
WIG20	- 0.183	all funds	- 0.184
ARKA	- 0.288	5 discontinued funds	- 0.233
all funds	- 0.309	ARKA	- 0.348
EPOKA	- 0.392	EPOKA	- 0.623

Returns in %. Calculation period: 1 June 1999 – 31 March 2003. Calculations based on monthly differential returns (p.a.). The calculation period is shorter for those funds that started later or discontinued their activities.

Description of abbreviations: **MFUNDS** - is the arithmetic average of the three biggest mutual funds investing in bonds, **WIG** - Warsaw Stock Exchange Index, **WIG20** - Warsaw Stock Exchange Index for 20 biggest blue chips, **WIRR** - Warsaw Stock Exchange for Secondary Market (smaller stocks), **GOPL** - Merrill Lynch Polish Government Bond Index, **all funds** - the arithmetic average of all 21 funds (calculation period is shorter), **all 16 survived funds** - the arithmetic average of all funds that survived, **3 survived funds (late starters) -** the arithmetic average of all funds that survived but did not start on 1 June 1999, **5 discontinued funds** - the arithmetic average of the funds that did not survived, **funds existing at the market (variable)** - the arithmetic average of the changing number of funds that existed during the calculation period.

Source: Author's calculations.

Table 5 Comparison of ranking persistency.

	Sharpe	Treynor			Sharpe	Treynor
A. all funds (21)				**B. survived funds (16)**		
AIG	18	18		ALLIANZ	**5**	**6**
ALLIANZ*	**6**	**7**		KREDYTB	16	16
ARKA**	20	20		PEKAO	12	12
BANKOW	11	11		AIG	15	15
CU	5	5		BANKOW	9	9
DOM	10	10		CU	4	4
EGO**	8	8		DOM	8	8
EPOKA**	21	21		NN	**1**	**2**
KREDYTB*	19	19		PBKORZEL	10	10
NN	**2**	**3**		POCZT	14	14
PBKORZEL	12	12		POLSAT	3	3
PEKAO*	**15**	**14**		PZU	7	7
PIONEER**	**14**	**17**		SAMPO_NU	**2**	**1**
POCZT	**17**	**16**		SKARBIEC	13	13
POLSAT	4	4		WINTERTH	11	11
PZU	9	9		ZURICH	**6**	**5**
RODZINA**	1	1				
SAMPO_NU	**3**	**2**				
SKARBIEC	16	15				
WINTERTH	13	13				
ZURICH	**7**	**6**				
Correlation ratio	0.990			Correlation ratio	0.994	

Bolded areas indicate different ranking values. Calculation period: 1 June 1999 – 31 March 2003. The calculation period is shorter for those funds that started later or discontinued their activities.

Source: Author's calculations.

Table 6 Portfolio investments of pension funds (as of 31 March 2003). Polish zlotys (million PLN).

Investment	m PLN	%
National Investment Funds (privatization funds)	50.9	0.16%
Equities	8,023.4	24.46%
T-bills	1,089.1	3.32%
Bank securities and deposits	1,343.6	4.10%
Bonds	22,280.2	67.93%
Others	12.2	0.04%
Total	**32,799.4**	**100.00%**

Source: KNUiE Monthly Bulletin 03/2003 and author's calculations. 1 PLN = approx. 3.9 USD (March 2003).

Table 7 Pension industry performance: Jensen's alpha (annualized monthly returns).

	Panel A. Survived funds (13)									
Model	α	t-value	pval	stock factor	t-value	pval	bond factor	t-value	pval	R2
(1) Market model with WIG	0.0404	2.41	0.020	0.3091	9.34	0.000	-	-	-	0.8494
(2) Market model with WIG20	0.0433	2.80	0.008	0.2522	13.53	0.000	-	-	-	0.8815
(3) Two index model with WIG GOPL	0.0343	2.70	0.010	0.3116	16.00	0.000	0.2095	2.65	0.012	0.8824
(4) Two index model with WIG MFUNDS	0.0302	2.01	0.051	0.2943	9.77	0.000	1.0702	3.28	0.003	0.8786
(5) Two index model with WIG20 GOPL	0.0354	2.59	0.013	0.2408	16.88	0.000	0.2651	2.59	0.013	0.9079
(6) Two index model with WIG20 MFUNDS	0.0325	2.57	0.014	0.2404	16.55	0.000	1.1557	5.26	0.000	0.9160

Sample consists of 13 pension funds. The monthly returns from 1 June, 1999 till 31 March, 2003.

	Panel B. All survived funds (16) including late-comers									
Model	α	t-value	pval	stock factor	t-value	pval	bond factor	t-value	pval	R2
(1) Market model with WIG	0.0354	2.03	0.049	0.3006	9.00	0.000	-	-	-	0.8455
(2) Market model with WIG20	0.0385	2.51	0.016	0.2463	13.71	0.000	-	-	-	0.8852
(3) Two index model with WIG GOPL	0.0268	3.04	0.004	0.3288	25.45	0.000	0.2725	4.89	0.000	0.9524
(4) Two index model with WIG MFUNDS	0.0280	2.67	0.011	0.3273	21.73	0.000	0.7813	3.39	0.002	0.9410
(5) Two index model with WIG20 GOPL	0.0277	1.99	0.053	0.2336	16.20	0.000	0.2778	2.67	0.011	0.9144
(6) Two index model with WIG20 MFUNDS	0.0267	2.09	0.043	0.2345	15.79	0.000	1.0869	5.31	0.000	0.9177

Sample consists of 16 survived pension funds (including late starters). The monthly returns from 29 September, 1999 till 31 March, 2003.

	Panel C. Existing funds (varying between 13 and 21)									
Model	α	**t-value**	**pval**	**stock factor**	**t-value**	**pval**	**bond factor**	**t-value**	**pval**	**R2**
(1) Market model with WIG	**0.0380**	**2.39**	**0.021**	**0.2923**	**9.36**	**0.000**	**-**	**-**	**-**	**0.8484**
(2) Market model with WIG20	**0.0407**	**2.65**	**0.011**	**0.2376**	**12.73**	**0.000**	**-**	**-**	**-**	**0.8739**
(3) Two index model with WIG GOPL	**0.0323**	**2.00**	**0.052**	**0.2800**	**9.98**	**0.000**	**0.1824**	**1.31**	**1.473**	**0.8618**
(4) Two index model with WIG MFUNDS	**0.0281**	**2.05**	**0.047**	**0.2776**	**10.03**	**0.000**	**1.0532**	**3.57**	**0.001**	**0.8800**
(5) Two index model with WIG20 GOPL	**0.0327**	**2.45**	**0.018**	**0.2261**	**16.34**	**0.000**	**0.2665**	**2.72**	**0.009**	**0.9037**
(6) Two index model with WIG20 MFUNDS	**0.0300**	**2.43**	**0.019**	**0.2259**	**16.04**	**0.000**	**1.1385**	**5.24**	**0.000**	**0.9113**

Sample consists of the variable number of pension funds that existed at the market in that time (includes late-starters and discontinued funds). The monthly returns from 1 June, 1999 till 31 June, 2003.

All regressions were estimated with the White Heteroskedasticity-Consistent Standard Errors & Covariance technique. The averages are the arithmetic average performance of the all funds (equally weighted).

Source: Author's calculations.

Table 8 Individual pension funds performance: estimates of Jensen's alpha.

	Market models with		Two index models with WIG		Two index models with WIG20	
	(1) WIG	(2) WIG20	(3) GOPL	(4) MFUNDS	(5) GOPL	(6) MFUNDS
Discontinued funds (19-25 observations)						
ARKA	-0.0100	-0.0203	0.0004	0.0023	-0.0133	0.0115
	(-0.59)	(-0.83)	(0.02)	(0.09)	(-0.63)	(0.45)
EPOKA	-0.0601	-0.0637	-0.0610	-0.0444	-0.0607	-0.0427
	(-1.62)	(-1.63)	(-1.40)	(-0.87)	(-1.49)	(-0.89)
PIONEER	0.0267	0.0160	0.0715 *	0.0864 **	0.0699 *	0.0789 *
	(0.52)	(0.27)	(1.96)	(2.09)	(1.73)	(1.78)
RODZINA	0.0585	0.0529	0.0558	0.0682	0.0509	0.0637
	(0.87)	-0.74	(0.87)	(1.11)	(0.76)	(0.97)
Late starters (42-44 observations)						
ALLIANZ	0.0432 *	0.0480 **	0.0425	0.0344	0.0444	0.0389
	(1.73)	(2.27)	(1.26)	(1.14)	(1.64)	(1.58)
KREDYTBANK	-0.0049	-0.0001	-0.0082	-0.0041	-0.0057	0.0002
	(-0.21)	(-0.01)	(-0.29)	(-0.16)	(-0.26)	(0.01)
PEKAO	0.0339	0.0360	0.0234	0.0229	0.0225	0.0241
	(1.31)	(1.41)	(0.92)	(0.95)	(0.98)	(1.03)
Survived funds (46 observations*)						
AIG	0.0173	0.0199	0.0116	0.0080	0.0123	0.0108
	(0.93)	(0.70)	(0.56)	(0.42)	(0.48)	(0.70)
BANKOWY	0.0566	0.0628	0.0512	0.0389	0.0544	0.0448
	(1.30)	(1.59)	(1.17)	(1.02)	(1.45)	(1.37)
CU	0.0452 **	0.0477 **	0.0367 **	0.0353 **	0.0371 **	0.0370 **
	(2.46)	(2.49)	(1.96)	(2.05)	(2.17)	(2.04)
DOM	0.0436 *	0.0450 *	0.0368	0.0374	0.0355	0.0375
	(1.88)	(1.72)	(1.59)	(1.56)	(1.45)	(1.36)
EGO	0.0404 **	0.0422 **	0.0287	0.0231	0.0343 *	0.0329 **
	(2.03)	(2.02)	(1.39)	(0.71)	(1.79)	(1.71)
NN	0.0709 ***	0.0703 **	0.0617 ***	0.0600 ***	0.0596 ***	0.0592 ***
	(3.95)	(2.38)	(3.81)	(3.57)	(4.82)	(3.41)
ERGO HESTIA	0.0343 *	0.0365 **	0.0312	0.0264	0.0312	0.0279
	(1.91)	(1.98)	(1.46)	(1.45)	(1.51)	(1.51)
POCZTYLION	0.0278 *	0.0286	0.0261	0.0231	0.0248	0.0209
	(1.72)	(1.57)	(1.57)	(1.38)	(1.67)	(1.07)
POLSAT	0.0474 ***	0.0499 ***	0.0448 **	0.0397 **	0.0449 ***	0.0416 ***
	(2.68)	(3.18)	(2.36)	(2.12)	(2.94)	(2.67)
PZU	0.0364 *	0.0367	0.0237	0.0213	0.0221	0.0205
	(1.74)	(1.42)	(1.42)	(1.37)	(1.06)	(0.92)
SAMPO	0.0493 **	0.0503 *	0.0370 *	0.0348 *	0.0363	0.0048
	(2.11)	(1.89)	(1.76)	(1.71)	(1.58)	(0.13)
SKARBIEC	0.0268	0.0296	0.0274	0.0180	0.0301	0.0230
	(1.30)	(1.23)	(1.27)	(0.55)	(1.10)	(0.84)
CREDIT SUISSE	0.0346 **	0.0390 **	0.0336 **	0.0297 *	0.0378 **	0.0334 **
	(2.27)	(2.44)	(2.13)	(1.92)	(2.07)	(1.88)
ZURICH	0.0452 **	0.0473 **	0.0339 ***	0.0319 **	0.0345 **	0.0330 **
	(2.37)	(2.30)	(3.00)	(2.07)	(2.25)	(1.94)

* Ego fund has recently ended its operations (43 observations available).

Monthly gross continuously compounded rates of return used. Numbers in brackets represent White heteroskedasticity-consistent t-values. *, **, ***: represent estimates significant at 1, 5 and 10% significance level, respectively. Some of the models were estimated with an autoregressive error term (e.g. AR(1)) to correct the autocorrelation problem.

Source: Author's calculations.

Table 9 Pension funds with significant alphas.

	Alpha		Quartiles according to		
	single-index model	two-index model	real return p.a.	Sharpe ratio	market share
Nationale Nederlanden	7.0-7.1	5.9-6.2	1	1	1
Polsat	4.7-5.0	4.0-4.5	1	1	4
Commercial Union	4.8-5.2	3.5-3.7	1	1	1
Sampo	4.9-5.0	3.5-3.7	1	1	2
Ego	4.0-4.2	3.3-3.4	-	2	-
Zurich	4.5-4.7	3.2-3.5	2	2	2
Credit Suisse	3.5-3.9	3.0-3.8	3	3	3
Allianz	4.3-4.8	-	3	2	3
Dom	4.4-4.5	-	2	3	4
PZU	3.6	-	2	4	1
Ergo Hestia	3.4-3.7	-	4	4	3
Pocztylion	2.8	-	4	4	3
Industry arithmetic averages					
Early started survived funds (13	4.0-4.3	3.0-3.5			
All survived funds (17)	3.5-3.9	2.7-2.8			
Existing funds	3.8-4.1	2.8-3.3			

Approximate ranges of significant estimates. Correlation between rankings: real return vs. Sharpe ratio 0.82, real return vs. market share 0.39, Sharpe ratio vs. market share 0.22. Source:Author's calculations.

Table 10 Abnormal returns from asset allocation and two-index models – comparison.

Fund	alpha from WIG20/GOPL model	asset allocation benchmarks:	
		0.3WIG20/0.7GOPL	others (WIG/MFUNDS)
Nationale Nederlanden	5.96	5.08	4-6
Commercial Union	3.71	3.03	3.9-4.3
Sampo	-	3.73	4.4-4.7
Zurich	3.45	2.98	3.9-4.2
Credit Suisse	-	-	2.9-3.2
Polsat	4.49	-	4.1-4.5
PZU	-	-	3.15
survived funds (13)	3.54	2.55	3.4-3.8
all survived funds (16)	2.77	-	2.8-3.3
existing funds (variable)	3.27	2.4	3.2-3.6

Estimates significant at 10% significance level. Industry averages are the arithmetic averages. Calculation period: 1 June 1999 – 31 March 2003. Monthly continuously compounded annualized rates of return. "-" represents no significant result.

Source: Author's calculations.

Table 11 Timing models.

A. Treynoy-Mazuy timing model employing WIG index			
Fund	timing factor		remarks
Commercial Union	0.065	***	AR (1)
Dom	0.051	**	-
Nationale Nederlanden	0.047	**	AR (3)
Pocztylion	0.041	**	AR (3)
Credit Suisse	0.036	**	AR (2,3)

B. Treynoy-Mazuy timing model employing WIG20 index			
Pioneer	-0.074	*	alpha 0.11**
AIG	0.019	**	AR (1,2,3)
Nationale Nederlanden	0.023	**	AR (1)
Pocztylion	0.027	**	AR (2)

C. Henrikkson-Merton timing model employing WIG index			
Commercial Union	0.212	***	AR (1)
Nationale Nederlanden	0.196	***	AR (3)
Pocztylion	0.164	**	AR (3)
Skarbiec	0.247	**	AR (2)

D. Henrikkson-Merton timing model employing WIG20 index			
AIG	0.098	**	AR (1,2,3)
Nationale Nederlanden	0.097	**	AR (1)
Pocztylion	0.115	**	AR (2)
Skarbiec	0.110	*	AR (3)

Calculation period: 1 June 1999 – 31 March 2003. Monthly continuously compounded annualized rates of return were used. AR – autoregressive error term model. *, **, *** represent significant estimates at respectively 1, 5 and 10% significance levels.

Source: Author's calculations.

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