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Regulatory induced herding? Evidence from Polish pension funds

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Abstract

The paper documents herding among pension fund managers in Poland. Herding occurs despite the lack of an economically significant link between fund performance and the flow of new capital or members. To explain this phenomenon, the paper outlines a model that attributes herding to performance incentive contracts imposed by the authorities in Poland. The model shows that penalties for underperformance imposed by the regulator are likely to cause fund managers to follow each other's portfolio choices and pursue similar investment strategies. Since herding causes similar portfolio allocations by all funds, the results call for a reduction in the number of funds, or a review of the relative performance incentive system and current constraints on portfolio allocation. The latter could also help reduce the dominance of government bonds in investment portfolios of pension funds.

Keywords: Pension funds, Herding, Portfolio choice

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INTRODUCTION

Pension reforms have topped political agendas around the world in the recent years. Aging populations, increasing life expectancy and economic transformations have put a strain on the existing systems and questioned the ability of governments to deliver retirement benefits on a pay-as-you-go basis. The resulting move towards funded pensions was given an additional boost in developing countries by an influential World Bank study "Averting the Old Age Crisis" (World Bank, 1994). The study promoted a three-pillar system based on a public funded component, privately managed mandatory savings accounts and voluntary retirement savings. Since 1994, reforms along these lines have been pursued by more than 20 countries in South America, Europe and Central Asia. The original enthusiasm for mandatory accounts has since been tempered by substantial costs of running the system and its vulnerability to political and macroeconomic risks. The latter has been well illustrated by Argentina's default on sovereign obligations which led to large pension losses by local workers.

This paper points out further vulnerabilities in the mandated accounts. It analyses the experience with the reformed second pillar of the funded pension system in Poland and documents both the substantial reliance on investments in government bonds and herding among pension funds managers. The resulting lack of competition between pension funds in terms of portfolio selection severely restricts investment choices available to consumers. The analytical model proposed in the paper associates the herding patterns with relative performance contracts imposed by the Polish pension funds' regulator.

The main attractiveness of relative performance contracts is that they allow managers to be rewarded for performing better than their peers regardless of the common movements in asset prices. Given their popularity in the financial sector, it is no surprise that they emerged as a preferred regulatory tool in the endeavour to reform and privatise pension systems in developing countries. A number of countries, including Chile, Mexico and Poland, incorporated severe penalties for underperformance relative to the sector's benchmarks into their freshly privatised pension systems. The main intention behind these moves was to provide security to investors that returns on their pension accounts would not fall below those achieved by investors who allocated their savings to other funds. However, as often happens with even the best intended regulatory instruments, besides the desired objective, the penalties have also had a strong impact on the decision process of fund managers.

A key by-product of the relative performance contracts is that managers become interested not only in their own performance but also in the performance of an average portfolio in the sector, influencing their investment decisions and potentially resulting in herd behaviour (Roll, 1992). Investment managers follow the herd to maintain their reputation, which suffers less when other investors also make unprofitable investment decisions (Scharfstein and Stein, 1990). Managers also follow each other to avoid the risk of underperforming as compared with their peers (Blake and Timmermann, 2002). When the evaluation benchmark is set to a weighted average, the safest investment strategy is to follow market leaders and invest in the same asset classes.

This paper formally investigates the proposition that managers of pension funds in Poland, one of the countries with underperformance penalties imbedded in the privatised pension system, follow each other's investment choices despite a very tenuous link between performance and flow of new capital. The contribution of this paper is three-fold. First, it provides a comprehensive description of the Polish pension fund sector. It documents the strong and increasingly homogenous reliance on government bonds in investment portfolios, the lack of persistence in relative performance of Polish pension funds and an economically insignificant link between performance of pension funds and flow of new capital and members. This evidence differs from results obtained for markets with mature investment funds (Scharfstein and Stein, 1990). Secondly, the paper proposes a simple model describing a mechanism through which the regulatory penalties for underperformance cause funds to

allocate capital in similar portfolios. The model puts forward a hypothesis that can be directly tested using the available data. Thirdly, the paper provides an in-depth empirical analysis of the determinants of change in portfolio compositions of private pension funds in Poland. It is shown that pension funds in Poland change portfolio allocations in response to how far they deviate from the average pension fund portfolio in an earlier period. Although there is weak evidence that funds herd more following poor performance relative to their peers, there is no indication that weak funds herd in general more than the better performing ones. When controlling for the changes in portfolio weights resulting from movements in the stock market index, the regressions explain up to 35 per cent of the variability in the portfolio weights of the main asset classes.

The empirical analysis is based on data publicly available from the Polish pension fund regulator. The data set includes an unbalanced panel of monthly portfolio holdings in the main asset classes of all 17 private pension funds operating the second obligatory pillar of the pension system in Poland. The data used in this paper start in April 2002 and end in August 2005, providing more than 600 observations.

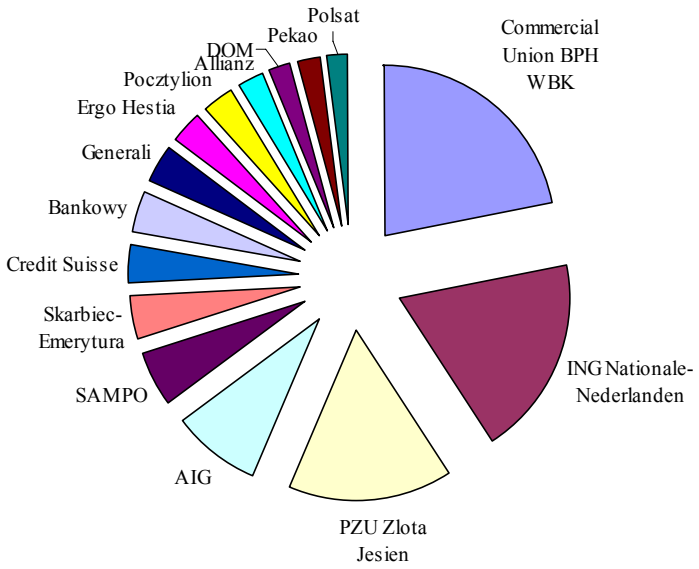
The paper builds on Voronkova (2004) and Voronkova and Bohl (2005) who also document herding among pension funds in Poland. However, while these two studies concentrate on equity investments, this paper looks at all main categories of assets including bonds and bank deposits. Furthermore, the measure used in the earlier papers and first proposed by Lakonishok *et al.* (1992) creates a disparity between theoretical models and empirical approaches to testing herding, as it concentrates on statistical tests of correlated trading (Bikhchandani and Sharma, 2000). This paper follows an approach first applied by Friend *et al.* (1970) and recently pursued by Froot and Tjornhom (2002), Sias (2004) and Pomorski (2005) who directly explain changes in portfolio composition between different time periods. Lastly, the results in this paper go beyond those of Voronkova (2004) and Voronkova and Bohl (2005) by showing that the tendency to follow an average industry portfolio is stronger when a pension fund performs below its peers. This is consistent with patterns documented for the mutual funds in the US (Pomorski, 2005).

The paper is organised as follows. Section 1 provides a description of the pension funds sector in Poland. It documents changes in the valuation of pension funds' investments, the lack of persistence in performance of funds and the very tenuous link between the funds' performance and the flow of new capital or members. Section 2 outlines the economic methodology used in the paper and derives testable hypotheses regarding herding among pension fund managers and cross sectional variations in the intensity of this phenomenon. Section 3 describes the data and documents the increasingly converging portfolio allocation of pension funds in Poland. Section 4 presents results of the empirical analysis and confirms that pension funds attempt to follow average portfolio allocation and that this trend is stronger following poor performance. Section 5 concludes the paper and offers some policy recommendations.

1. PENSION FUNDS IN POLAND

The new three-pillar pension system was introduced in Poland in 1999. The first pillar is a reformed pay-as-you-go system managed by the Social Insurance Institution (ZUS), a state-owned entity. The second and third pillars of open pension funds are run by private managing companies, and privately funded pension security schemes. The sector is regulated by Insurance and Pension Funds Supervisory Commission (KNUiFE). The first two pillars are compulsory and the third one is voluntary.[1]

Figure 1: Market share as measured by the number of members



Source: KNUiFE, August 2005.

The second pillar of the pension fund system, which is the subject of this paper, is based on defined contributions. The amount of future pensions accumulated in this pillar depends on returns on invested assets. Employees transfer 7.3 per cent of their gross salary through the ZUS to the pension funds, which invest it mostly in domestic financial instruments. At the end of August 2005, the 15 pension funds operating within the second pillar had a total of 11.6 million members and an aggregated portfolio in excess of PLN 76 billion (€19.5 billion or US$ 23 billion). Most of the assets were invested in Treasury bonds and bills (63 per cent), followed by equities (31 per cent) and bank securities and deposits (4 per cent).

As shown in Figure 1, the pension fund industry in Poland is highly concentrated, which is typical for developing countries with pension systems based on the Latin American model (Hadyniak and Monkiewicz, 1999). In August 2005, the four largest funds, Commercial Union, ING Nationale-Nederlanden, PZU Złota Jesien and AIG, controlled about 65 per cent of the market when measured by the number of participants and about 73 per cent when measured by net assets under management. Despite some minor changes, the market shares have been relatively stable through the last three years.

The sector has nevertheless undergone a substantial consolidation in recent years. In 2001, Epoka, Pioneer and Rodzina funds were taken over by the Pekao fund, while Pocztylion took over Arka Invesco. In 2002, Skarbiec Emerytura and BIG Bank Gdanski funds were merged. Finally, in 2004 Kredyt Bank was taken over by Polsat, reducing the number of funds to just 15 from 21 in 2001.

[1] For a detailed description of the three pillars see Mech (2001).

Investment activity of the second pillar pension funds in Poland is subject to strict regulation. In order to limit the risks to investment, the 1997 Law on Organisation and Operation of Pension Funds imposed a number of restrictions on asset allocation in various financial instruments. For example, the proportion of funds invested in shares is limited to 40 per cent of the total portfolio and there is a strict 5 per cent limit on foreign investments.

Funds are also required to guarantee a minimum rate of return on their investments. Pursuant to the Act on the Organisation and Operation of Pensions Funds, the mandatory minimum rate of return was set every quarter as the lower of the (i) half of the weighted average rate of return on all funds for the past two years, and (ii) 4 percentage points below the sector average return in the past two years. The approach was somewhat modified in April 2004 when KNUiFE started computing the minimum required return on the basis of three and not two years of past returns and restricting maximum participation of each fund in the benchmark portfolio at 15 per cent, regardless of its actual share in net assets of the pension system. The rates are published at the end of March and September each year.

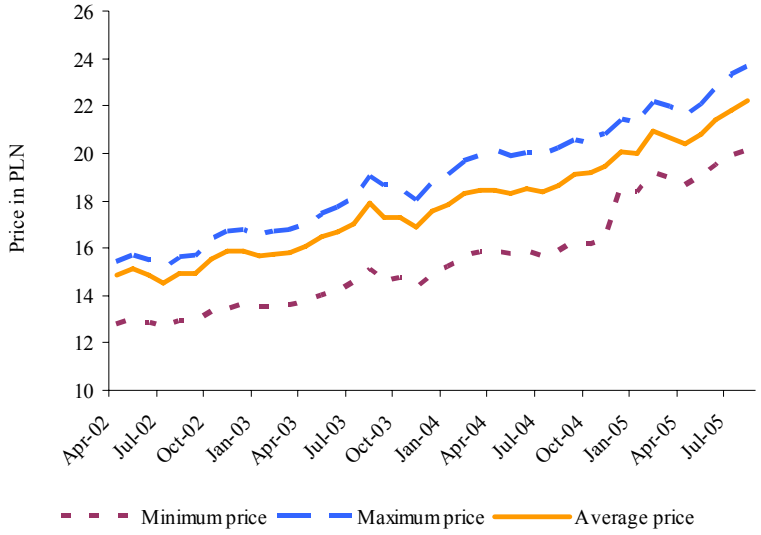
If a fund does not meet the minimum prescribed return, the shortfall is first covered from a special reserve account to which pension funds make regular contributions. If those assets are insufficient, the balance is taken from the fund's own assets. Once own assets are depleted, the fund manager is declared bankrupt and the difference is covered from the Guarantee Fund supplied jointly by all pension fund societies. Eventually, if required, the state budget is to cover any remaining shortfalls. According to the sector regulator, the guaranteed rate of return makes the participant confident that the rate of return offered by each fund would not be significantly worse than the average rate of return for all funds, offering a minimum guarantee of safety (KNUiFE, 2000).

This system has been closely modelled on some of the Latin American pension reforms. For example, in Chile regulations also provide for the use of the weighted average and for the comparison of fund performance against the industry benchmark. The calculations are based on the real rate for the past 12 months and the minimum rate of return is equal to the lower of the half of the average real rate or a rate of 2 per cent lower than the industry average. In Peru the required rate of return of a pension fund has to fall between 50 and 150 per cent of the average rate of return in industry. The surplus is set aside for reserves and the deficit offset against these reserves.

The existence of the penalty system in Poland and the risks that pension fund managers may be asked to contribute their own funds is not a theoretical one. In the short history of Polish private pension funds, fund managers have already been requested to cover the differences between achieved returns and minimum required growth of assets. For example, the Bankowy pension funds had to contribute PLN 3.7 million (€1 million) to make up the shortfall in returns in June 2001, followed by further penalties of PLN 35.4 million (€9.4 million) in October 2001 and PLN 16.4 million (€4.5 million) in March 2002 (KNUiFE, 2003).

Strict investment limits and penalties for underperformance contribute to the highly correlated performance of all funds on the market. Figure 2 depicts prices of units in each pension fund between April 2002 and August 2005. When the pension reform was implemented in May 1999, all pension fund units were priced at PLN 10. The growth in price since then reflects the growth in value of managed assets. In April 2002, the lowest price of a unit in a pension fund was just 14 per cent below the sector average, while the highest price was no more than 4 per cent above the average. The variability of prices of units in the second pillar pension funds did not change much till August 2005, when the lowest priced fund was less than 10 per cent below the sector average, while the most expensive fund stood at 6.5 per cent above the sector average. The increase in the lowest price of pension fund units at the end of 2004 reflects the takeover of the poorly performing Kredyt Bank fund by the Polsat fund.

Figure 2: Price of units in the second pillar open pension funds



Source: KNUiFE, August 2005.

Despite the relatively good performance of the pension sector, there is little evidence of persistence in performance of individual fund managers. Table 1 provides results of a simple analysis of persistence in performance in the period covered in Figure 2. The funds were grouped into quartiles on the basis of cumulated performance until April 2002 and then in April 2003, April 2004 and April 2005 on the basis of performance in the most recent 12 month period. The table shows empirical frequencies of transition between performance quartiles at subsequent measurement points.

Table 1: Persistence in performance: empirical frequencies

		Performance in period t+1			
		1st quartile	2nd quartile	3rd quartile	4th quartile
Performance in period t	1st quartile	25%	25%	8%	42%
	2nd quartile	18%	36%	27%	18%
	3rd quartile	42%	17%	33%	8%
	4th quartile	17%	25%	25%	33%

Source: Own calculation based on KNUiFE data from August 2005.

Note: Figures in each column show percentages of funds in each of the four performance quartiles, conditional on the fact that they were in the same performance quartile in the preceding period (specified in the second row of the table). For example, 42 per cent in the penultimate row of the first data column means that, on average, 42 per cent of top quartile performers in one period ranked in the third quartile in terms of performance in the next measurement period.

In the absence of persistence, the values in all cells should be around 25 per cent, indicating that no matter in which quartile performance of a fund falls in period *t*, it is equally likely for the fund to fall into any performance quartile in period *t+1*.

A formal test of persistence based on the above evidence is described among others in Keller *et al*. (1990) and relies on a chi-square statistic. The value of the statistic is obtained by

summing up the squared differences between theoretical and empirical counts in each of the cells in Table 1 divided by the empirical count in each cell. For a 4 by 4 matrix, the statistic has a chi-squared distribution with 9 degrees of freedom. The value of this chi-squared statistics for the data summarised in Table 1 is 12.07, which is not sufficient to reject the null hypothesis of no persistence in the performance of second pillar pension funds in Poland at any reasonable level of statistical confidence. This differs from results obtained in the US and the UK where persistence in performance, particularly among the best and worst performing funds, is well documented (e.g. Carhart, 1997; Blake and Timmermann, 1998).

Funds acquire new members and additional contributions in two main ways. First, participants are allowed to change pension funds and reallocate their savings. Second, every month a new cohort of people enter the pension system and need to select funds in which to allocate their pension investments. Each person obliged to be a member of an open pension fund should conclude the contract with their selected fund within a week from commencement of the pension obligation. Otherwise, a fund is selected through a lottery conducted by ZUS (in 2004 about 12 per cent of new members were assigned through the lottery). Until April 2004, each fund participated in the pool of new members according to their share in the total number of members of all funds. Currently, only funds which have reached rates of return higher than the average rate of return of all funds participate in the lottery. To be assigned new members, a fund's assets also cannot exceed 10 per cent of the sum of assets of all funds. The shares in the pool of new members are equal for all eligible funds (KNUiFE, 2005).

Table 2 tests the link between past performance of pension funds and flow of new funds and members. Flow of new funds and members are measured by first difference and growth rates in respective monthly figures. In each row the dependent variable is regressed on cumulated returns achieved by the fund over the period specified in the first column. The table reports results both for fixed and random effects panel data regressions. The R-square statistics come from the corresponding pooled data OLS regressions: robust OLS with residuals clustered at fund level for the random effects and OLS with fund specific dummies for the fixed effects.

The table shows that there is practically no relationship between past performance and flows of new funds or members for horizons shorter than one year. Although past returns achieved by a fund over the last 12 and 18 months are positively related to flow of new contributions, the relationship between past performance and selection of funds by investors is much less evident when the fund's growth is measured by number of new members. This suggests that people are not responsive to past performance when choosing their pension funds or when switching between different providers. Furthermore, for both the flow of new contributions and the flow of new members, the relationship dies out when past performance is measured over a two year horizon. Even more importantly, the relationship between performance and flow of new contributions and members, although statistically significant for some cumulative performance over some horizons, lacks economic significance. The regressions, even with the assistance of fund specific dummies, explain less than 3 per cent of changes in the additional contributions and less than 8 per cent of changes in the flow of new members. Given that this relationship is only present in a few time horizons and that R-squared coefficient in regressions without dummies are low or negligible, past performance of a fund cannot be considered as a significant determinant of future flow of new members and contributions.

The results in Table 2 differ from those documented for US managed funds where investors locate their capital into best performing funds and withdraw from poor performers (Sirri and Tufano, 1998). Given this pattern and the fact that a manager's remuneration depends on the amount of funds under management, managers of the US mutual funds have strong interest in outperforming their competition, or at least following each other's portfolios so as not to be caught behind in performance rankings. Since such explicit pressure does exist in Poland, it is very likely that herding behaviour is caused by non-market forces imposed through regulatory rules.

Table 2: Fund performance and flow of new assets and members

Panel A: Flow of new contributions

Cumulative returns over the past:	Additional contributions (in PLN millions)				Growth of contributions (in per cent)				No of Obs.
	Fixed effects		Random effects		Fixed effects		Random effects		
	Slope	R^2	Slope	R^2	Slope	R^2	Slope	R^2	
1 month	18.0 (0.12)	0.00	20 (0.13)	0.00	3.33 (1.37)	0.01	3.40 (1.41)	0.00	639
3 months	82.3 (0.85)	0.00	83.9 (0.88)	0.00	5.65 (3.63)**	0.02	5.69 (3.72)**	0.02	605
6 months	-38.1 (-0.31)	0.00	-32.1 (-0.27)	0.00	0.48 0.24	0.00	0.63 0.32	0.00	554
12 months	20.9 (2.05)*	0.01	20.0 (2.05)*	0.01	7.51 (4.58)**	0.05	7.31 (4.65)**	0.05	455
18 months	33.6 (2.29)*	0.02	27.1 (2.07)*	0.01	7.04 (2.86)**	0.03	6.26 (2.85)**	0.02	359
24 months	35.5 (1.80)	0.01	24.5 (1.54)	0.01	0.51 (0.15)	0.01	1.18 (0.44)	0.00	263

Table 2 (cont.): Panel B: Flow of new members

Cumulative returns over the past:	New members (in thousands)				Growth of new members (in per cent)				No of Obs.
	Fixed effects		Random effects		Fixed effects		Random effects		
	Slope	R^2	Slope	R^2	Slope	R^2	Slope	R^2	
1 month	20.7 (0.58)	0.03	24.5 (0.68)	0.00	0.10 (0.87)	0.02	0.10 (0.93)	0.00	607
3 months	-22.7 (-0.99)	0.03	-18.4 (-0.80)	0.00	-0.03 (-0.46)	0.02	-0.03 (-0.37)	0.00	573
6 months	-36.5 (-1.21)	0.03	-24.9 (-0.84)	0.00	-0.06 (-0.61)	0.02	-0.03 (-0.38)	0.00	522
12 months	17.6 (0.91)	0.06	23.2 (1.22)	0.00	0.02 (0.34)	0.04	0.05 (0.79)	0.00	423
18 months	78.9 (2.61)**	0.08	81.9 (2.91)**	0.03	0.16 (1.56)	0.06	0.22 (2.25)*	0.01	327
24 months	-5.01 (-0.11)	0.06	24.2 (0.66)	0.00	0.09 (0.57)	0.07	0.22 (1.65)	0.01	231

Source: Own calculation based on KNUiFE data from August 2005.

Note: In each regression the dependant variable is regressed on cumulative returns over a single period specified in the first column. For fixed effects regressions, t-statistics are given in brackets after the estimates. For random effects regressions, z-statistics are given in brackets. Estimates significant at 5 per cent significance level are marked with *. Estimates significant at 1 per cent significance level are marked with **. R-squared statistics reported for fixed effects models are the R-squared statistics from pooled data OLS regressions with fund specific dummy variables. R-squared statistics reported for random effects models are the R-squared statistics for pooled data OLS regressions with robust errors and data clustered on funds' level.

2. METHODOLOGY

The effects of asymmetric relative performance contracts on portfolio choice decisions made by fund managers have been widely discussed in the literature.[2] This section does not deal with the general case, but provides a specific analytical description of the portfolio choice under an incentive system which includes penalties for achieving returns below a minimum benchmark. It derives hypotheses which are later tested in the empirical section.

Let R_t be the vector of returns at time t on all assets available on the market in which a pension fund can allocate its funds. Let $w_{t,i}$ be a vector of portfolio weights selected at time t by a manager of fund i. Let $w_{t,A}$ be a vector of portfolio weights in a weighted average portfolio of all pension funds operating in the market.

A return on fund i at time t can be decomposed in the following way:

$$R_t\, w_{t,i}' = R_t\, w_{t,A}' + R_t\, w_{t,Di}', \qquad (1)$$

where $w_{t,Di}$ is the deviation of portfolio weights selected by the manager of fund i from average portfolio weights in the industry.

Let R_t be a random variable such that $R_t \cdot w_{t,Di}'$ is equal to $r_{p,Di} > 0$ with probability p_{Di} and $r_{1\text{-}p,Di} < 0$ with probability $1\text{-}p_{Di}$. Let $p_{Di} \cdot r_{p,Di} + (1\text{-}p_{Di}) \cdot r_{1\text{-}p,Di} > 0$. When return $r_{1\text{-}p,Di} < r_m$ is achieved, the fund has to pay penalty $B_{Di} < 0$ for underperforming the average portfolio by more than the allowed margin r_m. Therefore, the expected payout to the fund manager is $p_{Di} \cdot \alpha \cdot r_{p,\,Di} + (1\text{-}p_{Di}) \cdot B_{Di}$, where α is the management fee earned on funds under management. The manager enjoys only a share α in the profits but has to cover full shortfall below the minimum required return r_m, so that $B_{Di} = r_{1\text{-}p,Di} - r_m$. Hence, unless $r_{p,Di}$ is very high, or p_{Di} is very close to one, or $r_{1\text{-}p,Di} - r_m$ is very close to zero, the manager will maximise expected profit by minimising the deviation from the average portfolio, $w_{t,Di}$.

More formally, if $p_{Di} \cdot \alpha \cdot r_{p,\,Di} + (1\text{-}p_{Di}) \cdot (r_{1\text{-}p,Di} - r_m) < 0$,[3] then the objective function of the fund manager takes the following form:

$$Min(w_{t,Di}) \,/ I_t(w_{t-1,A}, \omega_{t-1,i}), \qquad (2)$$

where the information set I_t consists of average weights in the sector at time $t\text{-}1$, $w_{t-1,A}$, and additional relevant information observable by the manager of fund i regarding movements of average sector portfolio weights between $t\text{-}1$ and t, $\omega_{t-1,i}$.

Using (1), the objective function (2) can be restated in the following way:

$$Min(w_{t,i} - w_{t,A}) \,/ I_t(w_{t-1,A},\ \omega_{t-1,i}). \qquad (3)$$

To solve (3), the fund manager selects $w_{t,i}$ so that

$$w_{t,i} = E_{t-1,\,i}\,(w_{t,A}), \qquad (4)$$

where $E_{t-1,\,i}\,(w_{t,A})$ is the vector of asset weights in the aggregate portfolio of all pension funds at time t, expected by the manager of fund i at time $t\text{-}1$.

Given the available information set $I_t(w_{t-1,A},\ \omega_{t-1,i})$ equation (4) can be presented as a linear combination of the two factors:

$$E_{t-1,}\,(w_{t,A}) = \beta_i \cdot w_{t-1,A} + (1\text{-}\beta_i)(w_{t-1,i} + \omega_{t-1,i}),$$

[2] See e.g. Devenow and Welch (1996) for a review of related literature.

[3] This condition is not particularly restrictive. For example, with management fees at 5 per cent of funds under management (α=5%) and equal probabilities of low and high payoffs (p_{Di}=0.5), the inequality is satisfied as long as every per cent of return below r_m in the case of the unfavourable outcome $r_{1\text{-}p,Di}$ is compensated by no more than 20 per cent of additional $r_{p,\,Di}$ return in the case of a favourable outcome. Only strategies with very high expected returns would violate this constraint.

where $\beta_i > 0$ is the weight that the manager of fund *i* assigns to last period portfolio weights. Following (4):

$$w_{t,i} = \beta_i \cdot w_{t-1,A} + (1-\beta_i) \cdot (w_{t-1,i} + \omega_{t-1,i}),$$

which is equivalent to

$$w_{t,i} - w_{t-1,i} = -\beta_i \cdot (w_{t-1,i} - w_{t-1,A}) + (1-\beta_i) \cdot \omega_{t-1,i} \qquad (5)$$

or, given that ω_{t-1} is other relevant information observable by the fund manager:

$$w_{t,i} - w_{t-1,i} = -\beta_i (w_{t-1,i} - w_{t-1,A}) + \gamma_i X_t + \varepsilon_{t,i} \qquad (6)$$

where X_t is the vector of additional explanatory variables, γ_i is a vector of linear coefficients, and $\varepsilon_{t,i}$ is independently identically distributed random noise.

Equation (6) provides a testable implication that a difference between portfolio weights at time *t* and *t-1* for fund *i* is negatively related to the difference between portfolio weights of fund *i* at time *t-1* and portfolio weights in the average portfolio of all funds at time *t-1*.

Furthermore, if following Daniel *et al.* (1998), fund managers' confidence about private signal increases with good past performance, then managers of funds with poor records would put less emphasis on private signals $\omega_{t-1,i}$ than managers of funds with strong performance records. This results in a second testable hypothesis that β_i is a negative function of a fund's relative performance, i.e. it is higher for poorly performing funds and lower for well performing funds.

This conjecture can be formalised by assuming that the coefficient β_i is a function of accumulated past performance of fund *i*. Given that in Poland units of all funds have originally been priced at the same level (PLN 10 in May 1999), current price $P_{t,i}$ includes information about cumulative performance of a fund since the beginning of the reform. Let

$$p_{t,i} = P_{t,i}/P_{t,A} - 1,$$

where $P_{t,A}$ is the average price of a unit in a private pension fund at time *t*, be the relative price of fund *i* at time *t*.

Following the above discussion we assume that:

$$\beta_i = \gamma_i - \varphi_i p_{t,i}, \qquad \varphi_i > 0 \qquad (7)$$

to indicate the fact that the better the performance (i.e. the higher the $p_{t,i}$), the lower the β_i. Putting (7) into (6) yields the following testable equation:

$$w_{t,i} - w_{t-1,i} = -(\gamma_i - \varphi_i p_{t,i})(w_{t-1,i} - w_{t-1,A}) + \varepsilon_{t,i}$$

which is equivalent to:

$$w_{t,i} - w_{t-1,i} = -\gamma_i (w_{t-1,i} - w_{t-1,A}) + \varphi_i (p_{t,i})(w_{t-1,i} - w_{t-1,A}) + \varepsilon_{t,i} \qquad (8)$$

If past performance influences confidence of fund managers then the relationship between the lagged distance of the fund's and the average portfolio weights should be stronger for poorly performing funds. The quantitative implication of this is that φ_i should be significant and positive.

3. DATA

All data related to private pension funds used in this paper come from the Polish Insurance and Pension Funds Supervisory Commission (KNUiFE). The monthly data on holdings and performance of individual funds are available on the web page of KNUiFE starting from April 2002.[4] The sample used here finishes in August 2005. For each fund, the data include information on price, holdings of major asset classes, number of customers, price of accounting units and other details.

There were 17 funds in the sample in April 2002. In 2002, Skarbiec-Emerytura merged with Ego (BIG Bank Gdanski) and, in 2004, Kredyt Bank was taken over by Polsat, reducing the number of funds to 15 at the end of the sample in August 2005. Two funds changed name in the sample period: from Zurich to Generali and from Winterthur to Credit Suisse Life and Pensions. The data on market shares and returns of individual funds has been summarised in Section 1.

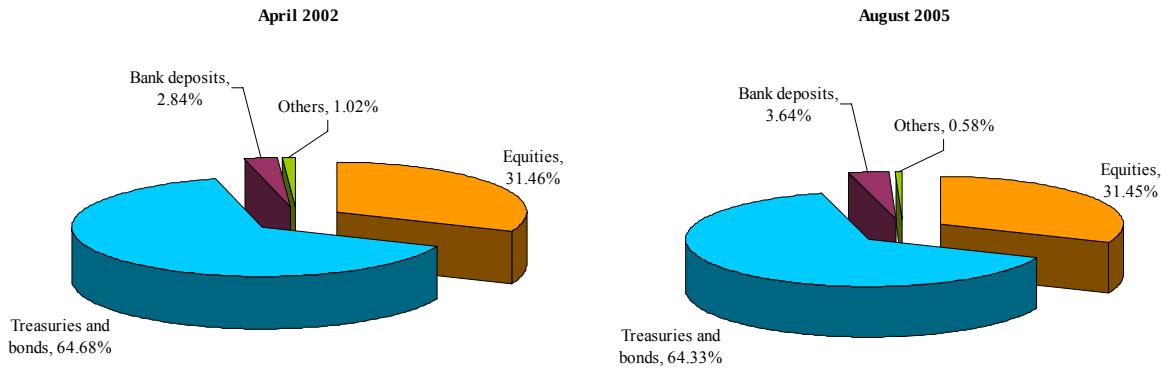
Asset classification standards have been changed four times during the sample period: in March 2003, January 2004, January 2005 and June 2005. Nevertheless, throughout the sample period it is possible to consistently identify four main types of assets held by pension funds: treasuries and bonds, equities, bank deposits, and other assets. Treasuries and bonds consist of bonds, bills and other securities issued, guaranteed or backed by the Treasury or the National Bank of Poland (including loans and credits), bonds, revenue bonds, and other debt securities issued by local government entities, their associations and the capital city of Warsaw, bonds and other debt securities issued by listed companies, as well as fully secured bonds and debt securities issued by other issuers. Equity includes shares of companies listed on the stock exchange, and quoted on the regulated stock market, as well as stock rights, share rights and debentures convertible into the shares of these companies. Bank deposits include bank deposits and bank securities denominated in Polish currency. Other assets combine all other financial instruments, including shares of companies not listed on the stock exchange, investment certificates in closed end investment funds, units of open-end investment funds, letters of charge and deposit receipts.

Figure 3 shows compositions of aggregate portfolios of pension funds in the second pillar of the system in April 2002 and August 2005. Around 65 per cent of assets have been allocated into treasuries and bonds, most of which is accounted for by government papers. Only about 31.5 per cent of assets have been invested in domestic listed equity. Equity portfolios of pension funds have been dominated by the largest listed companies, closely resembling the composition of the WIG-20 market index which accounts for the 20 largest companies listed on the Warsaw Stock Exchange. Bank deposits and other instruments had only marginal roles in portfolios of private pension funds.

The composition of the aggregate portfolio of pension funds did not change in the last 3.5 years. Nevertheless, there have been substantial changes in portfolios of individual funds. Figures 4 and 5 depict shares of equity investments and shares of treasuries and bonds in portfolios of pension funds in Poland. In each figure, the average share in the sector portfolio is presented alongside the lowest and the highest share of this asset category in portfolio of any of the pension funds. The closer the three lines to each other, the smaller the difference in portfolio compositions of individual pension funds.

[4] See www.knuife.gov.pl

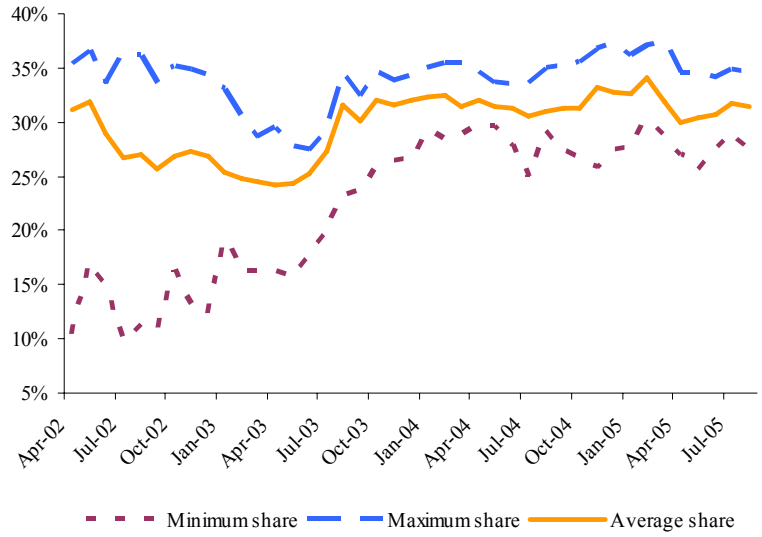
Figure 3: Portfolio composition of Polish pension funds



Source: KNUiFE, August 2005.

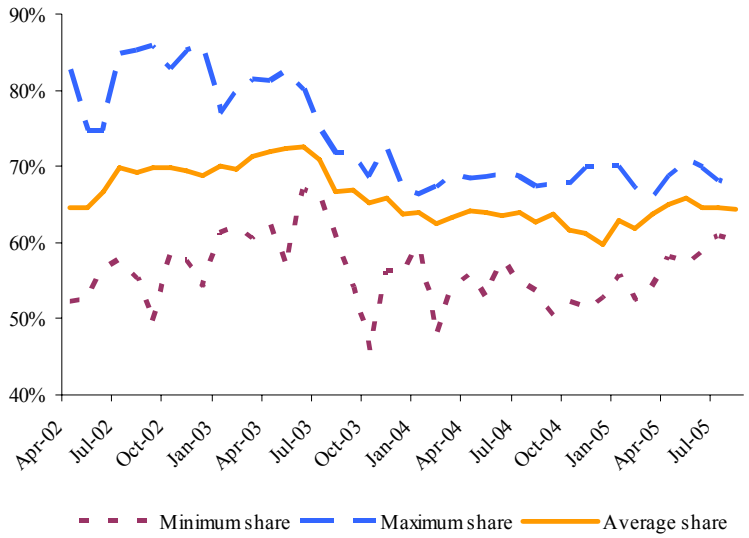
At the beginning of the sample, portfolio composition of individual funds varied widely, ranging from 10 to 35 per cent allocation in equity holdings and from 52 to 83 per cent allocation in treasuries and bonds. This changed through time and by the end of 2003 portfolio allocation of all funds co-moved closely, loosing most of the inter-fund variability and severely limiting investment choices between bonds and equity to individual investors choosing between funds. Although through the sample period pension funds did not manage to diversify away from treasuries and bonds, they achieved a remarkable convergence in terms of portfolio choice and asset selection.

Figure 4: Share of equity investments in portfolios of pension funds in Poland



Source: KNUiFE, August 2005.

Figure 5: Share of treasuries and bonds in portfolios of pension funds



Source: KNUiFE, August 2005.

4. EMPIRICAL ANALYSIS

This section provides empirical tests of the hypotheses outlined in section 2. First, it tests the proposition that the difference between portfolio weights at time *t* and *t-1* for fund *i* is negatively related to the difference between portfolio weights of fund *i* at time *t-1* and portfolio weights in the average portfolio of all funds at time *t-1*. This hypothesis has been summarised in equation (6):

$$w_{t,i} - w_{t-1,i} = -\beta_i (w_{t-1,i} - w_{t-1,A}) + \varepsilon_{t,i}, \qquad \beta_i > 0 \qquad (6')$$

Although the model does not define the length of time between period *t* and period *t-1*, the specification implies that it should be close to the delay with which portfolio weights of funds become publicly available to other managers. In Poland this period is equal to one month and therefore monthly portfolio weights are analysed in the empirical part of this paper.

Table 3 provides estimates of the parameters of equation (6') for each of the four asset classes. For each asset category, "Lagged distance" denotes the difference between weight of a given asset class in the portfolio of fund *i* and weight of this asset class in an average portfolio of all funds in the previous month. The dependant variables are the differences between weights of each asset class in the portfolio of fund *i* in period *t* and *t-1*. The parameters are estimated using unbalanced panel data described in section 3.

Table 3: Determinants of changes in portfolio weights

	Bank deposits	Treasuries & bonds	Equity	Others
Fixed effects				
Constant	0.005 (4.62)**	-0.000 (-0.02)	-0.000 (-0.36)	-0.000 (-1.56)
Lagged distance	-0.647 (-16.12)**	-0.357 (-10.96)**	-0.181 (-6.99)**	-0.096 (-4.51)**
R-squared	0.30	0.17	0.09	0.03
Random effects				
Constant	0.004 (3.24)**	0.000 (0.03)	-0.000 (-0.30)	-0.000 (-1.14)
Lagged distance	-0.478 (-13.44)**	-0.258 (-9.18)**	-0.145 (-6.34)**	-0.071 (-4.10)**
R-squared	0.22	0.11	0.06	0.03
Model type	Inconclusive	Fixed effects	Fixed effects	Inconclusive
Observations	639	639	639	639

Source: Own calculation based on KNUiFE data from August 2005.

Note: For fixed effects regressions, t-statistics are given in brackets after the estimates. For random effects regressions, z-statistics are given in brackets. Estimates significant at 5 per cent significance level are marked with *. Estimates significant at 1 per cent significance level are marked with **. R-squared statistics reported for fixed effects models are the R-squared statistics from pooled data OLS regressions with fund specific dummy variables. R-squared statistics reported for random effects models are the R-squared statistics for pooled data OLS regressions with robust errors and data clustered on funds' level. Model type is only reported if both the Hausman and the Breusch-Pagan Lagrangian multiplier tests point to the same model.

For ease of comparison, the R-squared statistics reported for the regression with fixed effects come from OLS regressions with fund-specific dummy variables and the R-squared statistics for random effects regressions come from OLS regressions with robust errors and data grouped by pension funds. The detailed results from the respective OLS regressions are very close to these obtained from panel data models and are not reported in the table. The

Hausman (null hypothesis of a random effect model) and the Breusch and Pagan Lagrangian multiplier (null hypothesis of a fixed effect model) test are used to select between models with random and fixed effects. If both tests deliver the same outcome, this is reported in the row "Model type". Otherwise model is described as inconclusive. The table lists estimates obtained using regressions with both fixed and random effects.

The results in the table show a strong significant relationship between the lagged distance between the fund's holding and the industry's holding of each asset class and the change in the fund's portfolio holding between subsequent months. The relationships are statistically significant at 1 per cent significance levels for all asset groups and for both fixed and random effects regressions. The economic relevance of the relationship is confirmed by high R^2 statistics, which go up to 30 per cent for bank deposits. This implies that 30 per cent of the variability of the weights of bank deposits in portfolios of pension funds in Poland can be explained by deviations from average holdings in the sector in the preceding month. This is fully consistent with the implications of the theoretical analysis in Section 2.

The table indicates that the strongest herding occurs for bank deposits. This effect could be partially due to the fact that, unlike bond and equity prices, the nominal value of bank deposits remains constant in time and therefore most of the changes in their share in an investment portfolio are attributable to new funds directed to and redirected from this asset category. This effect can be separated by explicitly controlling for changes in asset valuation and their impact on asset shares in portfolio of pension funds (Pomorski, 2005).

Although there are no return data that could be unambiguously assigned to the four asset categories available in the dataset used in this paper, changes in equity valuation can be approximated by an appropriate stock market index. Changes in the valuation of a fixed income asset can be tracked using returns on money market. Given the well documented fact that equity portfolios of Polish pension funds closely resemble the composition of WIG-20 (Voronkova and Bohl, 2005; KNUiFE, 2004), returns on the WIG-20 index can be used to control for impact of asset valuation on changes in portfolio holdings. The three-month inter-bank interest rate, WIBOR, can control for changes in valuation of a portfolio holding related to developments on fixed income markets.

It is assumed that both the intercepts and the coefficients in the regressions used in Table 3 can vary with returns on the WIG-20 index of the twenty largest companies listed on the Warsaw Stock Exchange and returns on the three-month deposits approximated by WIBOR. Hence, the following regression is estimated in Table 4:

$$w_{t,i} - w_{t-1,i} =$$

$$= \lambda_{1,i} + \lambda_{2,i}\,(w_{t-1,i} - w_{t-1,A}) + \lambda_{3,i} \cdot R_{WIG20,t} + \lambda_{4,i} \cdot R_{WIG20,t}\;(w_{t-1,i} - w_{t-1,A})$$

$$+ \lambda_{5,i} \cdot R_{WIBOR,t} + \lambda_{6,i} \cdot R_{WIBOR,t}\;(w_{t-1,i} - w_{t-1,A}) + \xi_{t,i}\,, \qquad (9)$$

where $R_{WIG20,t}$ is a monthly return on the WIG-20 index at time t, $R_{WIBOR,t}$ is the three-month Warsaw inter-bank offering rate, and λ's denote regression coefficients.

The table confirms that the relationship between changes in portfolio weights and lagged deviation from average portfolio allocation in the sector persists even when controlling for changes in asset valuation. The coefficients are significantly negative for all asset classes except "Others". In the "Others" class, adding the control variables resulted in loss of significance of the coefficients and change of sign. The relatively low R-squared in these regressions suggest, however, that the model may still suffer from omitted variable problem which may affect the sign and significance of the coefficients. Correct specification may be particularly difficult as the class includes a large number of asset categories and accounts only for around 0.5 to 1 per cent of pension fund assets in the sample period.

Returns on WIG-20 have a significant positive impact on equity holdings. This is not surprising, as a bullish stock market not only increases the value of existing equity holdings

but also makes this asset category appear more attractive for future investments. Similarly, high returns on the stock market reduce the relative size of holdings in treasuries and bonds. This results from the increased equity holdings and often also from declining bond prices during rapid upward moves on the stock market. The impact of stock returns on bank deposits and other assets is less pronounced.

Table 4: Changes in portfolio weights and market movements

	Bank deposits	Treasuries & bonds	Equity	Others
Fixed effects				
Constant	-0.003 (-0.44)	-0.014 (-1.80)	0.001 (0.26)	0.005 (3.50)**
Lagged distance	-0.809 (-3.67)**	-0.651 (-4.05)**	-0.509 (-4.34)**	0.237 (1.56)
WIG-20 (return)	-0.026 (-1.51)	-0.115 (-5.97)**	0.137 (12.49)**	0.003 (0.75)
WIG-20 · Lagged distance	-0.751 (-1.43)	-0.887 (-2.37)*	-0.924 (-3.64)**	0.438 (1.48)
WIBOR	0.001 (1.24)	0.003 (2.02)*	-0.001 (-0.79)**	-0.001 (-3.93)**
WIBOR · Lagged distance	0.024 (0.71)	0.049 (1.87)	0.046 (2.79)**	-0.059 (-2.47)*
R-squared	0.31	0.25	0.35	0.07
Random effects				
Constant	-0.001 (-0.11)	-0.015 (-1.83)	0.003 (0.59)	0.005 (3.10)**
Lagged distance	-0.555 (-2.50)*	-0.446 (-2.86)**	-0.406 (-3.55)**	0.238 (1.66)
WIG-20 (return)	-0.025 (-1.41)	-0.117 (-5.92)**	0.138 (12.44)**	0.002 (0.60)
WIG-20 · Lagged distance	-0.606 (-1.12)	-0.838 (-2.19)*	-0.906 (-3.55)**	0.367 (1.26)
WIBOR	0.001 (0.67)	0.003 (2.06)*	-0.001 (-1.09)	-0.001 (-3.44)**
WIBOR · Lagged distance	0.012 (0.34)	0.031 (1.33)	0.038 (2.35)*	-0.053 (-2.35)*
R-squared	0.23	0.19	0.32	0.05
Model type	Inconclusive	Fixed	Fixed	Inconclusive
Observations	639	639	639	639

Source: Own calculation based on KNUiFE data from August 2005.

Note: For fixed effects regressions, t-statistics are given in brackets after the estimates. For random effects regressions, z-statistics are given in brackets. Estimates significant at 5 per cent significance level are marked with *. Estimates significant at 1 per cent significance level are marked with **. R-squared statistics reported for fixed effects models are the R-squared statistics from pooled data OLS regressions with fund specific dummy variables. R-squared statistics reported for random effects models are the R-squared statistics for pooled data OLS regressions with robust errors and data clustered on funds' level. Model type is only reported if the both the Hausman and the Breusch-Pagan Lagrangian multiplier tests point to the same model.

Although there is also no uniform significant relationship between stock market returns and the intensity with which fund managers follow the average portfolio, the relationship is negative for most asset classes (except "Others"). This suggests that during bullish markets, fund managers follow each other's investment decisions more closely than when returns on stock exchange are low.

The impact of WIBOR on asset holdings is less clear, though higher value of the inter-bank rate tends to increase the holdings of treasuries and bonds and decrease the holdings of equity. This may, at least to some extent reflect managers' response to changes in relative returns available on the bond and the stock markets. The coefficients on the interaction term between WIBOR and asset shares in total portfolios are positive (except for "Others"), suggesting that during times of higher interest rates managers follow each other's decisions more closely than during times of low interest rates.

As outlined in Section 2, there is an influential stream in the financial literature arguing that fund managers' confidence about private signals increases with good past performance of their funds (Daniel *et al*, 1998). In such case, the coefficient β_i should be negatively related to a fund's relative performance and φ_i should be positive in the following regression (see Section 2 for a detailed explanation).

$$w_{t,i} - w_{t-1,i} = -\gamma_i(w_{t-1,i}-w_{t-1,A}) + \varphi_i\,(p_{t,i})(w_{t-1,i}-w_{t-1,A}) + \varepsilon_{t,i}\,. \qquad (8')$$

Table 5: Changes in portfolio weights and funds' performance

	Bank deposits	Treasuries & bonds	Equity	Others
Fixed effects				
Constant	0.001 (0.14)	-0.014 (-1.62)	-0.000 (-0.10)	0.006 (3.69)**
Lagged distance	-0.810 (3.68)**	-0.625 (-3.85)**	-0.504 (-4.27)**	0.325 (2.00)*
Performance	0.205 (1.91)	0.101 (0.84)	-0.099 (-1.48)	0.014 (0.62)
Lagged distance · Performance	0.140 (0.17)	0.805 (1.15)	0.298 (0.66)	0.669 (1.59)
	0.31	0.25	0.35	0.07
Random effects				
Constant	-0.002 (-0.22)	-0.018 (-2.17)*	0.004 (0.93)	0.005 (3.34)**
Lagged distance	-0.568 (-2.56)**	-0.424 (-2.69)**	-0.403 (-3.53)**	0.294 (1.88)
Performance	-0.044 (-1.97)*	0.014 (0.57)	0.011 (0.77)	-0.001 (-0.14)
Lagged distance · Performance.	1.659 (2.26)*	1.539 (2.46)*	0.936 (2.36)*	0.655(1.77)
R-squared	0.24	0.20	0.33	0.06
Model type	Inconclusive	Fixed	Fixed	Random
Observations	639	639	639	639

Source: Own calculation based on KNUiFE data from August 2005.

Note: For fixed effects regressions, t-statistics are given in brackets after the estimates. For random effects regressions, z-statistics are given in brackets. Estimates significant at 5 per cent significance level are marked with *. Estimates significant at 1 per cent significance level are marked with **. R-squared statistics reported for fixed effects models are the R-squared statistics from pooled data OLS regressions with fund specific dummy variables. R-squared statistics reported for random effects models are the R-squared statistics for pooled data OLS regressions with robust errors and data clustered on funds' level. Model type is only reported if both the Hausman and the Breusch-Pagan Lagrangian multiplier tests point to the same model.

Table 5 provides an empirical test of this hypothesis for each asset class. Equation (8') is estimated with an intercept which, similarly as the regression's slope, is allowed to be a linear function of the fund's relative performance (Performance), as defined in Section 2. Other variables are defined as in Table 3. The regression controls for returns on stock market (WIG-20) and fixed income markets (WIBOR), as in the regressions reported in Table 4.

Coefficients on the control variables are not reported in the table.

The estimates presented in the table demonstrate that the statistical relationship of the lagged distance between funds' holdings and the industry's average holding of each asset and the change in the fund's portfolio holding between subsequent months reported in Tables 3 and 4 persists when controlling for the relative performance of pension fund. The R^2 statistics suggest that the relative performance of a fund has little additional information for explaining changes in portfolio holdings.

Statistically significant positive coefficients at the interaction term between a fund's performance measure and lagged distance from an average industry portfolio in regressions with random effects support the hypothesis that $\varphi_I > 0$. This implies that fund managers herd more following periods of poor performance as compared to their peers. The strength of this relationship is however undermined by the fact that it is not significant in the fixed effect models, which appear to offer a better specification for equity and treasuries and bonds asset classes. To check whether this effect depends on recent performance or whether funds with a poor track record always put more emphasis on past average portfolio allocation in the sector, regression (9) was estimated allowing variations in herding coefficient $\lambda_{2,i}$. No relationship between point estimates of herding coefficients and cumulative performance record of funds before the beginning of the sample was detected. This implies that there is no evidence that weak funds herd systematically more than their better performing counterparts.

Table 6: Impact of the regulatory changes in April 2004

	Bank deposits	Treasuries & bonds	Equity	Others
Fixed effects				
Constant	0.001 (0.16)	-0.020 (-2.09)*	0.002 (0.34)	0.007 (4.05)
Lagged distance	-1.028 (-4.49)**	-0.710 (-4.16)**	-0.503 (-3.91)**	0.148 (0.94)
April 2004	-0.005 (-2.10)*	0.004 (1.55)	-0.000 (-0.27)	-0.001 (-1.82)
April04 · Lagged distance	0.248 (3.24)**	0.065 (0.95)	-0.004 (-0.07)	0.028 (0.73)
R-squared	0.32	0.25	0.35	0.07
Random effects				
Constant	0.004 (0.47)	-0.019 (-2.19)*	0.003 (0.70)	0.006 (3.61)
Lagged distance	-0.889 (-3.83)**	-0.535 (-3.14)**	-0.396 (-3.19)**	0.162 (1.10)
April 2004	-0.005 (-2.05)*	0.004 (1.38)	-0.001 (-0.39)	-0.001 (-1.48)
April04 · Lagged distance	0.339 (4.44)**	0.080 (1.24)	-0.009 (-0.15)	0.035 (0.96)
R-squared	0.25	0.20	0.32	0.06
Model	Inconclusive	Fixed	Fixed	Inconclusive
Observations	639	639	639	639

Source: Own calculation based on KNUiFE data from August 2005.

Note: For fixed effects regressions, t-statistics are given in brackets after the estimates. For random effects regressions, z-statistics are given in brackets. Estimates significant at 5 per cent significance level are marked with *. Estimates significant at 1 per cent significance level are marked with **. R-squared statistics reported for fixed effects models are the R-squared statistics from pooled data OLS regressions with fund specific dummy variables. R-squared statistics reported for random effects models are the R-squared statistics for pooled data OLS regressions with robust errors and data clustered on funds' level. Model type is only reported if both the Hausman and the Breusch-Pagan Lagrangian multiplier tests point to the same model.

Lastly, Table 6 tests whether the regulatory changes in April 2004 (described in section 1) had any significant impact on herding behaviour of pension funds in Poland. The changes reduced the share of the largest funds in the benchmark portfolio and altered the way in which new members who did not choose their funds are allocated to the funds in the sector. The new allocation system benefits the best-performing small funds.

The regression allows the coefficients to vary with a dummy variable which is set to 1 from April 2004. If the coefficients at the dummy variable or the interaction terms between the dummy variable and lagged distance from an average portfolio in the sector are consistently significant, then it would suggest that the regulatory reform had potentially some impact on the market. The lack of a consistent pattern across asset classes documented in Table 6 (statistically significant reduction in herding has been detected only for bank deposits) indicates that the reform did not reduce the tendency of fund managers to follow each other's choices, at least for the largest two asset groups of equity and treasuries and bonds.

5. CONCLUSION

The paper documents herding among pension fund managers in Poland. It extends earlier studies that concentrate on equity investments and analyses all classes of assets, including bonds and treasury bills which form the majority of portfolios of analysed pension funds. Rather than analysing correlations between asset holdings, the paper confirms a direct relationship between divergence from an average industry portfolio and subsequent changes in portfolio allocation. The documented pattern is consistent with hypotheses derived from a model of regulatory induced herding.

The paper uses panel data of portfolio holdings of Polish pension funds from 2002 to 2005. It shows that changes in portfolio weights of individual funds respond to the difference between portfolio weights of the fund and average portfolio weights in the sector in the preceding month. This relationship is significant even when controlling for changes in asset valuation approximated by returns on the relevant stock market index and fixed income instruments. There is weak evidence that funds herd more following poor performance relative to their peers. There is however no evidence that weak funds herd systematically more than the better performing ones. Herding among Polish pension funds occurs despite the lack of an economically significant link between fund performance and flow of new capital or members.

A stylised theoretical model for the empirical analysis provides a plausible explanation for this phenomenon. The model draws on asymmetric relative performance incentives contracts imposed by authorities in Poland and shows that they can cause herding behaviour similar to that observed on the market. Such contracts, which envisage severe penalties for under-performing an average sector portfolio by more than a fixed margin, are present in many countries that recently implemented pension reforms, including Chile, Mexico and Poland, and are likely to distort investment behaviour of fund managers.

The regulatory rules that contribute towards herding behaviour have been intended to provide additional security to participants of the pension system and reassure them that their savings would grow at rates not significantly lower than in other funds. Nevertheless, they resulted in a situation where all funds follow similar investment strategies and the participants of pension systems have little choice in the portfolio allocation of their savings. This prevents individuals from selecting portfolios matching their risk preferences and from adjusting portfolio composition to accommodate different investment horizons. Furthermore, lack of heterogeneity in portfolio choice among funds reduces an important element of competition and can potentially lead to inefficient portfolio allocations. This calls for an in-depth analysis of the existing regulations to verify whether social benefits of lower perceived risks compensate the inefficiencies which the under-performance penalties introduce into the system.

As a result of herding, all pension funds operating in the second pillar in Poland hold very similar portfolios. This leads to a situation where a large number of management teams are employed and paid for implementing the same investment strategy. If the intention of the reform, as implied by the relative performance regulation, is that all second pillar funds provide investment portfolios with very similar risk and return profiles, then one needs to question whether economies of scale in fund management would not be better explored on a market with no more than three to five large funds competing against each other to minimise management fees. The current market set-up with around 15 funds results in potentially higher management fees without additional real choice offered to consumers. An alternative would be to provide consumers with a broader investment choice and allow them, as it is the case in the voluntary third pillar of the pension system, to choose their own portfolio compositions and risk profiles. This would push the funds operating in the second pillar to offer investment vehicles with different risk exposures and call for substantial revision of the current comparative performance regulation.

The paper also documents the large shares of government papers in portfolios of pension

funds. Such a portfolio composition weakens the impact of the reform, which originally called for reducing the reliance on the state and increased investment of pension savings in private projects. The main benefit of the reformed system, which continues to rely on state obligations, is that these obligations are now transparently accounted for by the portfolio of government bonds held by pension funds. However, the reliance of future pensions on profitable long-term investment is yet to develop. Undoubtedly, this could be encouraged by weakening stringent investment rules and, perhaps even more importantly, by fiscal reforms reducing the budget deficit and decreasing the supply of new government papers to the market.

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