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Does Regulation Hurt Pension Funds' Performance? Evidence from Strongly Regulated Pension Fund Industries*

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Abstract

This paper presents an analysis of pension funds' performance in Poland and Hungary as representative Eastern Central European countries. In the theoretical literature it is argued that investment limits and performance regulations may have a negative influence on the performance of funds. In particular for Poland, our empirical findings do not support this prediction. Consequently, strict regulations do not necessarily harm the performance of the pension funds.

JEL Classification: G23, G28

Keywords: Pension fund management, investment and performance regulation, performance measurement, Eastern Central European stock markets, Emerging Markets.

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1 Introduction

Following the proposal of the World Bank (1994), pay-as-you-go pension systems in Eastern Central European (ECE) countries have been complemented by a capital market based element in the form of privately managed pension funds in the end of the 1990s. Contributions made by future retirees on their accounts in pension funds, successfully invested in capital markets, should facilitate accumulation of future pensions and thus reduce the fiscal burden resulting from excessive pension liabilities.

Since the transfer of contributions to a defined contribution system exposes future pensions to a number of market-related and agency risks, ECE governments imposed strict investment and performance regulations on the pension fund industry (OECD (2006)). In the finance literature it is argued that pension funds facing more liberal regulation regimes are more likely to perform better than pension funds facing stricter investment regimes (Chan-Lau (2005), Davis (2002)). We investigate empirically to which extent regulations on the pension fund industry hurt the performance of private pension funds in ECE countries. Our analysis focuses on the pension fund markets of Poland and Hungary. We explore and compare the performance of pension funds within and between those markets, using established performance measures. A comparison of our results with studies on the performance of pension funds operating in less stringent regulatory environments enables us to draw conclusions on the implications of investment regulations for the pension funds' performance.

There is scarce, mostly speculative empirical literature discussing the effects of investment and performance regulation of pension funds on their investment behavior and their portfolio return performance. The investigations rely on simple descriptive statistics analyzing pension funds' portfolio returns and thus do not account for exposure to various types of risk that may have impact on the conclusions on the performance outcomes (World Bank (2000a,b)). As to the best of our knowledge, the empirical analysis on Polish pension funds by Stanko (2003) is the first study on a strongly regulated ECE market considering those factors. However, none of the mentioned studies has accounted for the presence of diverse investment and performance regulations in these capital markets and no comparative analysis on the performance implications of these regulations has been achieved.

The paper thus contributes to the existing literature in the following ways: First, it complements the available evidence on institutional investors' portfolio performance operating in lax regulatory environments and guided by "prudent man" laws by analyzing the behavior

of pension funds acting under much stricter regulations. Second, the paper will empirically contribute to the above mentioned hypothesis about the link between the strength of regulation and portfolio performance, since some of the ECE countries' regulations are stricter than others. Third, the paper will have important investment policy implications for the privately funded pension systems in ECE countries. Finally, this paper is the first to provide a comprehensive comparison of privately managed pension fund performance in ECE countries.

The structure of the paper is as follows. Section 2 presents the pension fund industry and the regulations in Poland and Hungary. In section 3 the methodology used to investigate portfolio performance is outlined. Section 4 describes the data, while section 5 reviews and interprets the empirical findings. Section 6 summarizes and concludes.

2 Pension Fund Industry and Regulatory Framework in Poland and Hungary

As pointed out by Chan-Lau (2005), the main determinants of pension funds' investment performance may be grouped into three categories: investment regulations, investment practices and the ability to diversify the portfolios abroad. Below we review those factors in the context of mandatory pension funds acting on the Polish and Hungarian markets.

The first transfer of money to Polish pension funds took place on May 19, 1999. Due to organizational, as well as financial problems, the majority of Polish pension funds started their activity on the market in June 1999. As of October 1999, the number of active funds rose from 15 to 21. Due to acquisitions and a merger it was reduced to 15 again, as of December 2004. The Polish pension fund market is highly concentrated. In terms of market share, as measured by net assets, the market can be divided into three groups: very large funds (market share higher than 20%), large funds (market share between 5% and 20%) and small funds (market share below 5%). In August 2007, the funds Commercial Union (27%) and ING (23%), representing the group of largest funds, jointly held 50% of the market share. Approximately a further quarter was held by the group of large funds that included PZU (14%) and AIG (8%). The remaining quarter of the market was distributed between 11 small funds with market share below 5% (www.knf.gov.pl).

In addition to the prudent man rules, Polish pension fund managers have to follow quan-

titative investment limits regulated in the Law on Organisation and Operation of Pension Funds from August 28, 1997. Here we focus on quantitative limits imposed on investment in particular types of assets and do not review the regulations restricting the concentration of holding securities of the same issuer. The overall investment in bonds and bills issued by Treasury and National Bank of Poland is not subject to constraints. A maximum of 40% of the accumulated assets under management may be invested in shares of domestic listed companies, in addition, no more than 25% in investment funds. The investment in bank deposits and foreign assets is limited to a maximum of 20% and 5%, respectively. Investing in instruments with a low degree of security and liquidity, including derivatives, is limited to 5%. Investing into real estate is prohibited (UNFE (2000), OECD (2006)).

Table 1 provides data on the quantitative limits faced by the Polish pension funds and their actual portfolio composition for the period between April 2002 and August 2007. The quantitative regulations are deemed responsible for the distribution of shares versus bonds in the funds' portfolios of about 31% to 64%. The remaining marginal fraction of the portfolios is dispersed across other asset categories. Table 1 reveals that Polish pension funds diversify less than they are allowed by the quantitative investment limits. In particular, the fraction of investment in foreign assets is substantially lower than the legal limit of 5% (www.knf.gov.pl).

Table 1 about here

To guarantee future pension payments, the pension funds' performances are observed, evaluated and compared with the industry's average return on a regular basis by the Insurance and Pension Funds Supervisory Commission (KNF). Pension funds are required to guarantee a minimum rate of return on their investments. The Polish law defines this mandatory minimum as "the rate of return lower by 50% than the weighted average rate of all funds established for a given period, or the rate of return four percentage points lower than the aforesaid average, whichever is lower". The measure is calculated and announced on a quarterly basis for the previous 36-month period. A rate below the required threshold should be made up from pension funds' reserve account. If these assets will not suffice to cover the deficit, it has to be financed by the so-called Guarantee Fund, which was introduced to secure future pension payments[1] (www.knf.gov.pl).

[1]Such performance regulations in combination with the high concentration of the pension fund industry in Poland can be seen as reasons for herding behaviour by Polish pension funds and to similar composition of the funds' portfolios. Voronkova and Bohl (2005) investigate this typical feature of the Polish pension fund market in detail.

Mandatory pension funds in Hungary were introduced in January 1998 as a second tier within the new three-tier pension system (World Bank (2007)). Four funds started their activity on the market during the first quarter of 1998. Since 2001 18 mandatory private pension funds are active on the market, which accumulated about EUR 2.5 billion in assets under management. The concentration of the Hungarian pension fund market is similar to the one in Poland. Using the earliest available data, on December 31, 2005 one very large and four large Hungarian pension funds, holding about 80% of assets, dominated the market, whilst the very large fund held 25% on its own. The remaining 20% of the market was held by 13 small funds (www.pszaf.hu). The oligopolistic structure of the Polish and Hungarian pension fund markets is similar to the one in the UK, where 50% of voluntary pension fund assets were held by five managing houses in 2002 (Blake and Timmermann (2002)).

Investment limits in Hungary are somewhat less strict than those in Poland. Holdings in government bonds and bank deposits are not limited. Investment in domestic stocks and investment funds is limited to 50% each, investment in foreign assets is limited to 30% and investment in real estate may reach a maximum of 10%. It is prohibited for pension fund managers to invest in loans (OECD (2006)). Despite the less restrictive limits Hungarian pension fund managers diversify their portfolios even less, which becomes apparent from the data provided in Table 1. More than 75% of assets are invested in government bonds, while only 10% of assets are held in stocks. As is the case of Polish pension funds, only a minor fraction of the overall portfolios are invested in foreign assets.

In order to ensure the security of future pensions the Hungarian Financial Supervisory Authority (HFSA) monitors the pension funds' performance. Funds are expected to achieve a minimum rate of return, which is defined as 85% of the return on long-term government bonds. Funds failing to achieve the performance target for three consecutive years may be subject to a government enquiry. However, in contrast to Poland, the Hungarian pension fund managers cannot be held liable for not delivering a minimum rate of return since their assets are not kept segregated from the participants' assets. Unlike in Poland, pension funds in Hungary are subject to long-term performance regulations: the pensions that they disburse should be at least at the level of 25% of a comparable public pension benefit on the retirement at the statutory pension age. In particular, after 15 years of participation in a pension fund, the total pension from the first and the second pillar should reach 92% of a corresponding old-style pension.

Similar to the Polish pension funds, Hungarian ones suffer from a lack of sufficiently liquid stock market. The number of stocks listed on Budapest Stock Exchange fluctuated between 49 and 66 during the sample period. However, the five most traded shares accounted for over 80% of the stock market capitalization and around 90% of its turnover (Budapest Stock Exchange (2006)). This, in combination with the present investment and performance regulations, has resulted in a very high fraction of domestic bonds in the Hungarian pension fund portfolios, which amounted to about 70% during our sample period (Hungarian Financial Supervisory Authority (2005)). This effectively negates the opportunity to invest up to 50% of the portfolio into equities.

Analysis of the portfolio compositions of the pension funds in the two countries shows that pension fund managers heavily invest in government bonds. Pension funds in both countries underutilize limited opportunity to invest in stocks and their investments in other allowed financial instruments are minor. Our analysis suggests that investment regulations do influence portfolio choices of the pension funds managers and may therefore affect the performance of the pension funds.

3 Performance Measures

To provide a first insight into the investment performance of the pension funds and their ranking Sharpe (1966) and Treynor (1965) ratios are calculated. While the Sharpe ratio considers the total risk of a portfolio, the Treynor ratio takes the systematic risk into account. A well diversified portfolio features a total risk equal to the systematic risk. Thus, through a comparison of the two ratios, a rough estimate of the diversification capability of the managers is possible. An identical ranking of the performance measures indicates a high diversification capability.

Detailed information about the portfolio structure of the individual funds is available for a limited period due to the access to general public information only. Therefore, the analysis is constrained to established unconditional performance measures based on the CAPM. Jensen's (1968) regression:

$$r_{it} - r_{ft} = \alpha_i + \beta_i(r_{mt} - r_{ft}) + \epsilon_{it}, \tag{1}$$

is used to model the unconditional market model. r_{it} is the return of pension fund i at time t, r_{ft} the risk-free rate and r_{mt} the return of the market portfolio. The coefficient α_i

indicates the Jensen's α of fund i, the coefficient β_i denotes its beta. While a positive and significant α indicates a superior risk-adjusted performance of a fund, a negative value reports an inferior performance assuming that the fund manager potentially does not show stock selection ability, but timing ability (Cesari and Panetta (2002)). Stock selection ability refers to the allocation of funds' assets within different investment instruments, whereas market timing concerns changes of the funds' asset allocation across those instruments.

In addition to stocks, pension funds' portfolios contain bonds which have to be taken into account. This can be achieved by estimating a two-index model, including stock and bond returns:

$$r_{it} - r_{ft} = \alpha_i + \beta_{1i}(r_{mt} - r_{ft}) + \beta_{2i}(r_{bt} - r_{ft}) + \epsilon_{it}. \tag{2}$$

The structure of the two-index model can be justified using two different considerations. If a fund is composed out of three portfolios (stocks, bonds and risk-free assets), its return is the weighted average of the returns given by the previously defined portfolios. β_{1i} (β_{2i}) indicates the sensitivity of fund i excess return to a change of the excess return of the stock index (bond index). Given the two beta coefficients the return of a fund is interpreted as its excess return compared to the combination of the stock and bond excess returns. α_i indicates the additive value achieved through active management compared to a passive investment strategy, subject to the same risk (Elton et al. (1993)). Yet, the model may also be seen as a two-factor equilibrium model, with the stock benchmark and the bond benchmark being the factors.

In both models (1) and (2), Jensen's α is affected by the information available to the manager. Exclusive availability of security-specific information leaves the measure unbiased. However, if the management resorts to timing information, its value is generally biased downwards (Cesari and Panetta (2002)). In order to capture possible market timing ability of fund managers we apply the approaches by Treynor and Mazuy (1966) and Henriksson and Merton (1981). The Treynor-Mazuy approach is based on the idea that managers are able to predict the market trend and the extent of future excess returns. Thus, a fund manager adapts the beta of the fund continuously to his forecasted market trend. The fraction of the market portfolio held by the managers increases (decreases) when they expect the general stock market to rise (fall). In order to capture the timing ability, Treynor and Mazuy (1966) add the squared excess return of the market portfolio to the basic Jensen regression:

$$r_{it} - r_{ft} = \alpha_i + \beta_i(r_{mt} - r_{ft}) + \gamma_i(r_{mt} - r_{ft})^2 + \epsilon_{it}. \tag{3}$$

$\hat{\gamma}_i = 0$ indicates no timing ability, and $\hat{\gamma}_i > 0$ that the manager has access to and successfully uses timing information, while α_i measures the share of the fund's performance achieved through selectivity. The contribution to the performance of a fund achieved by timing ability corresponds to the product of the γ coefficient and the variance of the excess market return σ^2_{erm}. The sum of the selection contribution and the timing contribution is equal to the total performance. The Treynor-Mazuy approach may only detect timing ability, the structure of the estimated model complies with the managers' timing ability. Using a multi-beta-strategy or the three-factor model by Fama and French (1993) may solve this shortcoming (Prather and Middleton (2006)).

The Henriksson-Merton approach (1981) is based on the idea that managers use forecasts of excess market return for the following period, and adjust the beta accordingly. The product of the excess market return and a dummy variable is added to the basic Jensen regression:

$$r_{it} - r_{ft} = \alpha_i + \beta_i(r_{mt} - r_{ft}) + \gamma_i(r_{mt} - r_{ft})D_t + \epsilon_{it}. \tag{4}$$

The dummy variable D_t takes the value 0 if $(r_{mt} - r_{ft}) > 0$ and -1 if $(r_{mt} - r_{ft}) \leq 0$. A positive value of γ_i indicates that the manager has timing ability. The Henriksson-Merton approach regards time-varying beta-factors of the Jensen model as evidence for timing activity. However, an instability of this risk-measure is not necessarily due to timing activities. Another critical assumption of the approach is that managers only take the forecasted trend of the market return into account and not the absolute level of the excess return in order to determine the beta. The performance achieved by timing and selectivity may be biased, if their behavior does not correspond to the assumptions of the model.

Since we are not interested in the fund-specific performance of the pension funds, but rather in the performance of the whole sector the models are estimated using pooled ordinary least squares (OLS). Given the the small samples, pooling information across funds has the potential advantage of gaining power compared to estimates based on a fund-by-fund analysis (Chevalier and Ellison (1999)). We correct the standard errors by using the method proposed by Newey and West (1987) with a lag length of three in order to account for possible heteroscedasticiy and serial correlation. The statistical inference is strengthened by calculating bootstrapped standard errors, based on a resample of the residuals with 10,000 replications.

4 Data

Our empirical investigation is based on two samples containing panel data of Polish and Hungarian private pension funds. The sample covering portfolio returns of Polish pension funds runs from June 1999, the time the majority of funds entered the market, to August 2007. The data for the 52-week t-bill yield, which proxies the risk-free-rate, is available up to April 2007. The estimations are adjusted accordingly if necessary. The 21 Polish pension funds can be classified into survived and discontinued funds. The group of survivors, containing 15 pension funds, includes those funds active on the market during the whole sample period. The group of discontinued funds contains those six funds entering the market late and quitting it before the end of the sample period. The classification of the pension funds allows us to identify the influence of discontinued pension funds on the aggregate results. In addition, we may draw conclusions on the behavior of pension funds with respect to mergers and acquisitions.

The returns of the pension funds, provided by Analizy Online under www.analizy.pl, are measured as the monthly change in pension funds' unit value. The end-of-month data of the Polish total return index WIG and the price index WIG20 are used as proxies for the Polish stock market portfolio. We use the WIG20 in addition to the WIG, as we expect pension fund managers to invest heavily in blue chips as a consequence of the existing investment constraints and performance regulation. In order to incorporate a benchmark for the returns on bonds held by the funds, the end-of-month data of the Morgan Stanley Capital International index (MSCI) for Poland, a total return index, is used.

The choice of the benchmark is decisive, as it is difficult to distinguish between benchmark inefficiency and abnormal returns due to the interdependence between performance evaluation and the choice of the benchmark (Lehmann and Modest (1987), Grinblatt and Titman (1994), Blake et al. (2002)). The use of different benchmarks provides a possibility to check the robustness of the estimations. We include the MSCI as an explanatory variable into the two-index model, in order to proxy the profitability of investing in government bonds, and the corresponding interest income of the funds. Using the MSCI as a benchmark is important, as managers invest mainly into local government securities. The risk-free rate as well as the benchmark indices are obtained from Thomson Financial Datastream.

Concerning the sample of Hungarian private pension funds, data are provided by the Hungarian Financial Supervisory Authority (HFSA). The dataset contains quarterly annu-

alized net rates of returns of 18 mandatory private pension funds from the first quarter of 1998 until the last quarter of 2004. Due to the fact that some pension funds only started their activity on the market after the first quarter of 1998 and due to additional missing values, the set of data is fragmentary. The names of the pension funds are not provided by the HFSA. Instead, pension funds are identified by numbers. As a proxy for the risk-free-rate, we use the one-year discounted t-bill rate. The market portfolio benchmark is proxied by the Budapest stock index (BUX). In order to incorporate a benchmark for the returns on bonds held by the funds, the total return index MSCI for Hungary is used. The t-bill-rate is obtained from Global Financial Data (www.globalfindata.com). The BUX and the MSCI are obtained from Thomson Financial Datastream. For the purpose of the empirical analysis continuously compounded rates of return are used.

5 Empirical Findings and Comparison with Existing Literature

Sharpe and Treynor ratios for the Polish pension funds are presented in Table 2. As the returns of the pension funds are similar to the level of the t-bill rates, the absolute values of the performance ratios are small. The ratios are mainly positive and have similar rankings. Indeed, they differ in some cases, but those minor differences may be neglected since the correlation between the ranking values is high. This result suggests diversification ability of fund managers. By comparing the survived and the discontinued funds it becomes apparent that all discontinued funds performed worse than the survived funds. The Treynor ratios based on the WIG and the WIG20 are highly correlated indicating robust results.

Table 2 about here

All Sharpe ratios and a substantial number of Treynor ratios of Hungarian pension funds, presented in Table 3, are negative. Those Treynor ratios that are positive result from negative β-factors. A negative β-factor results from a negative covariance between the excess return of the pension fund and the excess return of the market portfolio. This indicates a counter-cyclical investment strategy. The reason for Hungarian pension funds coming off so badly here can be seen in the dynamics of the t-bill rate. Unfavorable monetary and fiscal conditions over the sample period exerted pressure on the government securities markets

and caused the Hungarian t-bill rate to be higher than in other Central European countries[2]. The rankings of the Sharpe and Treynor ratios of all but one Hungarian pension fund differ strongly, suggesting a lack in managers' diversification ability. The considerable difference in Polish and Hunagrian Sharpe and Treynor ratios indicates that Polish pension funds perform better than Hungarian ones, despite facing a stricter regulatory framework.

Table 3 about here

The estimated performance measures for Polish pension funds based on the CAPM, presented in Table 4 in Panel (A), support the conclusions drawn from the Sharpe and Treynor ratios. The estimated α coefficients of the Jensen model are positive and significant, indicating that the funds' management created an additional value compared to a passive investment strategy. The funds outperform the market by 3.71% and 2.11% per annum using the WIG20 and the WIG, respectively[3]. The coefficients of the two-index model largely support the above findings. As the WIG does account for dividends, while the WIG20 does not, the difference in the estimates is not only due to the included stocks.

Table 4 about here

The empirical results for the Treynor-Mazuy and Henriksson-Merton model in Panel (A) display inconsistent results, depending on the chosen benchmark. Results based on WIG20 suggest that Polish pension fund managers do not possess any timing ability, while their selectivity ability remains stable with respect to the findings of the Jensen and two-index models. When estimated with the WIG, both models indicate timing ability, but no selectivity ability. Thus, pension fund managers show a selectivity ability with respect to "blue chip" stocks and show basically no such ability concerning stocks of smaller companies. Managers tend to hold stocks of "blue chip" companies, while they trade those of small and medium size companies. Their intention is to profit by a long-term-investment in "blue chips" and by timing the rising and falling prices of the remaining stocks of small and medium size companies, simultaneously. This finding is in line with the fact that "blue chips" constitute a significant proportion of the funds' portfolios. Such portfolio structure is attributed to the

[2]The macroeconomic situation in Hungary is discussed in (IMF (2006); Government Debt Management Agency (AKK) (2004).

[3]The estimation of the Jensen model by single funds supports the findings, and indicates a low dispersion of the performance measures. We find that a high value of net assets does not guarantee the highest performance. The estimations for single funds are available upon request.

existence of minimum required rate of return and the resulting security orientation of the managers (KNF (2007)).

The estimation results for the groups of survived and discontinued Polish pension funds in Panel (B) and (C) of Table 4 support our findings by the Sharpe and the Treynor ratio evidencing a worse performance of discontinued pension funds. While the estimated performance measures for survived pension funds are similar to those of the whole market, the performance measures of the discontinued funds are different. According to the Jensen and the two-index model, discontinued funds are not able to beat the market. In addition, the results of both timing models deny the managers of discontinued funds any timing ability.

We do not find evidence confirming the statement by Chan-Lau (2005) and Davis (2002) that the performance of pension funds is adversely affected by the strict regulatory framework, in regard to the Polish pension funds. Although our sample period is larger, our estimation results for the Polish pension fund market are in line with the findings of Stanko (2003). Thus, our results seem to be robust with respect to the sample length, showing that Polish pension funds continuously outperform the market at a constant level in the long-run.

When looking at the Table 5, the estimations of the Jensen model, Hungarian pension funds were not able to beat the market in the observed period. In fact, they underperform the market by 5% per annum. The estimations of the two-index model lead to a minor increase in the α estimate compared to the Jensen model, still indicating that Hungarian pension funds are not able to beat the market. The estimation results for the Treynor-Mazuy and the Henriksson-Merton model indicate no timing ability of Hungarian pension fund managers, as the values of $\hat{\gamma}$-coefficients are close to zero and not significant. This outcome is similar to the estimations for the Polish market when the WIG20 is used, as BUX and WIG20 are official blue-chip stock indices although they differ in terms of size and number of stocks included.

Table 5 about here

A number of reasons may cause this evidence of underperformance by Hungarian pension funds. The relatively short sample period and the dynamics of the t-bill rate might lead to the negative and insignificant α-estimates. Hungarian pension fund managers face an illiquid and small stock market, which limits their diversification opportunities. The usage of returns on government bonds as a benchmark in the Hungarian performance regulation further affects the portfolio diversification, as it keeps security oriented managers from investing

into assets other than bonds. As a result, Hungarian pension fund members do not benefit from the profit opportunities available on their domestic stock market (Hungarian Financial Supervisory Authority, 2007). Such an investment strategy may contribute to a reduction of the fund returns. Finally, the legislative framework itself has been subject to numerous changes, providing additional uncertainties for managers and participants (World Bank, 2007). We therefore cannot rule out that performance regulations might have an adverse effect on the performance of the funds operating on the Hungarian market, aggravated by the underdeveloped local stock market and instability of the regulation itself.

A comparison of the performance of pension funds active in the strongly regulated markets of Poland and Hungary with such active in less regulated markets shall give evidence on whether investment limits and performance regulations in fact harm the performance of pension funds. We chose the UK market for a comparison, as UK pension fund managers face probably the fewest externally imposed constraints. This market is, similar to the Polish market, highly concentrated, providing a proper basis for a reasonable comparison.

Blake et al. (2002) analyze the portfolio composition and performance of UK pension funds during 1986-1994 using the Jensen regression. UK pension fund managers face no constraints in regard to their investment decisions. This is reflected in the portfolio structure of the funds, holding a larger portfolio weight in equities and a lower part in bonds than pension funds in Poland and Hungary. Blake et al. (2002) present a cross-sectional distribution of unconditional α-estimates, which ranges from -4.59% per annum to 4.68% per annum. Compared to the present estimates for Polish pension funds, the range of the values is smaller, regardless of the chosen market portfolio. Less than 50% of the observed UK pension funds achieve a positive α, whereas the ratio of positive α-parameters of Polish pension funds is higher than 85%. On average, UK pension funds have an α estimate of -0.047% per annum. This indicates, that UK pension funds tend to underperform the market in general.

Besides the UK pension fund market, the US market is much less regulated than the Polish and Hungarian ones. The empirical findings by Christopherson et al. (1998) and Lakonishok et al. (1992) on the performance of pension funds operating on the US market support our findings. Despite US pension funds face a less regulated framework, they show a poor performance in comparison to Polish pension funds. Our findings on Polish pension funds that a large amount of net assets does not necessarily guarantee the highest perfor-

mance, are in line with the results of Blake et al. (2002) and Lakonishok et al. (1992) for the UK and the US market, respectively. A comparison of the empirical findings for the UK, US, Polish and Hungarian pension fund markets with respect to the regulatory framework supports our previous finding. The argument of Chan-Lau (2005) and Davis (2002) of regulations having a negative effect on the funds' performances can not be confirmed.

6 Concluding Remarks

The aim of this paper is to investigate the influence of a strict regulatory framework on the performance of pension funds active on ECE markets. We apply established performance measures for a comparative analysis. We find evidence of outperformance by Polish pension funds and significant underperformance by Hungarian pension funds, although Hungarian pension funds face less restrictive investment limits than their Polish counterparts. Investment limits and performance regulations influence the investment decisions of pension funds. The impact on a fund's performance, however, depends on the type of the performance evaluation benchmark used by the regulation. In Poland it leads to similar portfolio compositions of the managers, while in Hungary it leads to an exceeding investment into government securities.

The international comparison suggests that Polish pension funds, despite facing the strictest regulatory framework compared to Hungary, the UK and the US, outperform the market, while pension funds active on the compared markets are, in general, not able to beat the market. Thus, the argument given in Chan-Lau (2005) and Davis (2002) that pension funds facing no investment restrictions are more likely to perform better than funds facing stricter regulations can not be supported, relying on our empirical findings.

References

Blake, D., B. Lehmann, and A. Timmermann (2002). Performance clustering and incentives in the UK pension industry. *Journal of Asset Management 3*, 173–194.

Blake, D. and A. Timmermann (2002). Performance benchmarks for institutional investors: Measuring, monitoring and modifying investment behaviour. In J. Knight and S. Satchell (Eds.), *Performance Measurement in Finance: Firms, Funds and Managers*. Oxford.

Budapest Stock Exchange (2006). Annual report 2005, and earlier years. *www.bse.hu*.

Cesari, R. and F. Panetta (2002). The performance of Italian equity funds. *Journal of Banking and Finance 26*, 99–126.

Chan-Lau, J. A. (2005). Pension funds and emerging markets. *Financial Markets, Institutions and Instruments V. 14, No.3*, 107–133.

Chevalier, J. and G. Ellison (1999). Are some mutual fund managers better than others? cross-sectional patterns in behavior and performance. *The Journal of Finance LIV, No. 3*, 875 – 899.

Christopherson, J. A., W. E. Ferson, and D. A. Glassman (1998). Conditioning manager alphas on economic information: Another look at the persistence of performance. *The Review of Financial Studies 11 No. 1*, 111–142.

Davis, E. P. (2002). Pension fund management and international invetment - a global perspective. *The Pensions Institute - Discussion Paper PI - 0206*.

Elton, E., M. Gruber, S. Das, and M. Halavka (1993). Efficiency with costly information: A reinterpretation of evidence from managed portfolios. *The Review of Financial Studies 6*, 1–22.

Fama, W. and K. French (1993). Common risk factors in the returns on bonds and stocks. *Journal of Financial Economics 33*, 3–53.

Government Debt Management Agency (AKK) (2004). Debt management report, and earlier years. *http://www.akk.hu*.

Grinblatt, M. and S. Titman (1994). A study of monthly mutual funds returns and performance evaluation techniques. *Journal of Financial and Quantitative Analysis 29*, 419–444.

Henriksson, R. and R. Merton (1981). On market timing and investment performance. Part II. Statistical procedures for evaluating forecasting skills. *Journal of Business 54*, 513–533.

Hungarian Financial Supervisory Authority (2005). Annual report 2004, and earlier years. *www.pszaf.hu*.

Hungarian Financial Supervisory Authority (2007). The operation and risks of the supervised sectors. *www.pszaf.hu*.

IMF (2006). Hungary: 2006 article iv consultation - staff report; staff supplement and public information notice on the excecutive board discussion, october 2006. *IMF country report 06/379*, http://www.imf.org/external/pubind.htm.

Jensen, M. (1968). The performance of mutual funds in the period 1945-1964. *The Journal of Finance 23*, 389–416.

KNF (2007). Open pension funds market in 2006. *www.knf.gov.pl*.

Lakonishok, J., A. Shleifer, and R. Vishny (1992). The structure and performance of the money management industry. *Brookings Papers: Microeconomics*, 339–391.

Lehmann, B. and D. Modest (1987). Mutual fund performance: A comparison of benchmarks and benchmark comparisons. *The Journal of Finance 42*, 233–265.

Newey, W. K. and K. D. West (1987). A simple, positive semi-definite, heteroscedasticity and autocorrelation consistent covariance matrix. *Econometrica 55*(3), 703–708.

OECD (2006). Survey of investment regulations of pension funds, and earlier years. *www.oecd.org*.

Prather, L. and K. Middleton (2006). Timing and selectivity of mutual fund managers. an empirical test of the behavioral decision making theory. *Journal of Empirical Finance 13*, 249–273.

Sharpe, W. (1966). Mutual fund performance. *Journal of Business 39*, 119–138.

Stanko, D. (2003). Polish pension funds. does the system work? cost, efficiency and performance measurement issues. *The Pensions Institute Birkbeck College, University of London, Discussion Paper PI-0302*, 1–32.

Treynor, J. (1965). How to rate managemant of investment funds. *Harvard Business Review 43*, 63–75.

Treynor, M. and K. Mazuy (1966). Can mutual funds outguess the market. *Harvard Business Review 44*, 131–136.

UNFE (2000). Security through competition - performance analysis of the second pillar. Warsaw.

Voronkova, S. and M. Bohl (2005). Institutional traders' behavior in an emerging stock market: Empirical evidence on polish pension fund investors. *Journal of Business Finance and Accounting 32*, 1537–1560.

World Bank (1994). Averting the old-age crisis: Policies to protect the old and promote growth. New York: Oxford University Press.

World Bank (2000a). Portfolio limits. Pension investment restrictions compromise fund performance. *World Bank's Pension Reform Primer, www.worldbank.org/pensions*, 1–7.

World Bank (2000b). Regulating private pension funds' structure, performance and investments: Cross-country evidence. *World Bank Social Protection Discussion Paper Series No. 0113*, 1–52.

World Bank (2007). Pension reform and the development of pension systems: An evaluation of world bank assistance. *IEG Working Paper 39145*.

Table 1: Portfolio Limits on Pension Fund Investment in Selected Asset Categories

	Poland		Hungary	
Asset category	Investment limits	Actual portfolio share	Investment limits	Actual portfolio share
Equity	40.00	31.57	50	9.68
Real Estate	0.00	0.00	5.00 directly, 10.00 together with real estate investment funds	0.00
Government Bonds	No Limit	63.79	No Limit	75.20
Investment Funds	25.00	0.32	50.00	6.43
Loans	Equal to the investment in the shares of the borrower	0.13	0.00	0.00
Bank Deposits	20.00	3.03	No Limit	0
Foreign Assets	5.00	0.57	30.00	N.a.

Note: The table shows the quantitative investment limits and actual shares of assets in the portfolio for Polish and Hungarian pension funds, indicated as % of the pension funds' investment portfolios. The quantitative investment restrictions refer to 2006 for Polish mandatory (open) pension funds and to 2004 for Hungarian mandatory pension funds (OECD (2006)). The actual shares of assets in the portfolios of Polish pension funds are calculated using data provided by www.knf.gov.pl. The shares of assets in Hungarian pension funds portfolios are calculated using the arithmetic average for all pension funds for the period of 1998 to 2004 given in the dataset provided by the PSZAF.

Table 2: Sharpe- and Treynor-Ratios of Polish Pension Funds

	Sharpe		Treynor			
Pension Fund		Rank	WIG20	Rank	WIG	Rank
Survived Pension Funds, Market Share in %						
Commercial Union, 26.65	0.1628	**6**	0.1650	**9**	0.1413	**8**
ING NNP, 23.44	0.1675	5	0.1669	**7**	0.1454	5
PZU, 13.73	0.1709	3	0.1809	3	0.1489	3
AIG, 8.29	0.1425	12	0.1444	12	0.1238	12
AXA, 4.30	0.1580	**10**	0.1588	11	0.1377	11
Generali, 3.68	0.1684	**4**	0.1685	**5**	0.1429	**6**
Nordea, 3.52	0.1750	2	0.1896	2	0.1586	2
Bankowy, 3.09	0.1027	15	0.1101	15	0.0976	15
Skarbiec - Emerytura, 2.52	0.1272	13	0.1302	13	0.1146	13
Allianz Polska, 2.46	0.1531	**11**	0.1619	**10**	0.1418	**7**
AEGON, 2.19	0.1592	**7**	0.1660	**8**	0.1411	**10**
Pocztylion, 2.02	0.1250	14	0.1256	14	0.1082	14
Pekao, 1.62	0.1582	**9**	0.1711	4	0.1455	4
DOM, 1.53	0.1592	**8**	0.1684	**6**	0.1413	**9**
Polsat, 0.96	0.2278	1	0.2381	1	0.2000	1
Average	0.1572		0.1630		0.1392	
Discontinued Pension Funds						
Arka Invesco	-0.2884	20	-0.3797	20	-0.3260	20
Epoka	-0.4007	21	-0.6869	21	-0.5865	21
Kredyt Banku	-0.0306	18	-0.0342	18	-0.0287	18
Rodzina	0.0363	16	0.0865	16	0.0604	16
ego	-0.0207	17	-0.0252	17	-0.0204	17
Pioneer	-0.0523	19	-0.1848	19	-0.1336	19
Average	-0.1261		-0.2041		-0.1724	
All Pension Funds						
Average	0.0762		0.0581		0.0502	

Note: The maximum length of the sample period is June 30 1999 until August 31 2007. Bold figures indicate a change in the ranking of Sharpe- and Treynor-ratios. Survivors are sorted according to their market share in August 31 2007.

Table 3: Sharpe- and Treynor-Ratios of Hungarian Pension Funds

	Sharpe		Treynor	
Pension fund		Rank	BUX	Rank
1	-0.3349	**1**	0.5654	**12**
2	-0.9032	**12**	-4.0950	**14**
3	-2.4869	**18**	94.8481	**1**
4	-0.6509	**6**	1.2730	**9**
5	-0.7673	**9**	-9.4016	**16**
6	-0.7737	**10**	-1.9371	**13**
7	-0.5448	**4**	3.1133	**3**
8	-1.1744	**13**	1.7182	**5**
9	-0.6757	**7**	1.6192	**6**
10	-1.5921	15	-4.1980	15
11	-0.8883	**11**	2.1686	**4**
12	-0.5967	**5**	1.5404	**8**
13	-0.3686	**3**	0.9318	**10**
14	-0.3400	**2**	0.7472	**11**
15	-1.2894	**14**	-12.9053	**18**
16	-1.5941	**16**	1.5648	**7**
17	-0.7616	**8**	-9.4526	**17**
18	-1.9346	**17**	6.0912	**2**
Average	-0.9821		4.1218	

Note: The maximum length of the sample period is 1998q1 until 2004q4. All pension funds are considered. For the calculation of the Treynor ratio the BUX is used as market portfolio. Bold figures indicate a change in the ranking. The Treynor ratio of pension fund three is an outlier. This results from a covariance of the excess return of this funds and the corresponding excess return of the market portfolio being close to 0.

Table 4: Pooled Estimates for the CAPM-Based Models by Group of Polish Pension Funds

	Model	$\hat{\alpha}$	$\hat{\beta}_1$	$\hat{\beta}_2$	$\hat{\gamma}$
(A) All Pension Funds					
WIG20	Jensen	0.0371^{***}	0.2520^{***}		
	Two-index, MSCI	0.0335^{***}	0.2354^{***}	0.3302^{***}	
	Treynor-Mazuy	0.0369^{***}	0.2520^{***}		0.0002
	Henriksson-Merton	0.0404^{***}	0.2475^{***}		-0.0087
WIG	Jensen	0.0211^{***}	0.2968^{***}		
	Two-index, MSCI	0.0187^{***}	0.2772^{***}	0.3157^{***}	
	Treynor-Mazuy	0.0070^{*}	0.2984^{***}		0.0206^{***}
	Henriksson-Merton	0.0064	0.3195^{***}		0.0444^{**}
(B) Survived Pension Funds					
WIG20	Jensen	0.0393^{***}	0.2621^{***}		
	Two-index, MSCI	0.0350^{***}	0.2449^{***}	0.3387^{***}	
	Treynor-Mazuy	0.0349^{***}	0.2623^{***}		0.0050
	Henriksson-Merton	0.0368^{***}	0.2656^{***}		0.0067
WIG	Jensen	0.0211^{***}	0.3059^{***}		
	Two-index, MSCI	0.0180^{***}	0.2856^{***}	0.3336^{***}	
	Treynor-Mazuy	0.0056	0.3069^{***}		0.0234^{***}
	Henriksson-Merton	0.0035	0.3329^{***}		0.0539^{**}
(C) Discontinued Pension Funds					
WIG20	Jensen	0.0091	0.1948^{***}		
	Two-index, MSCI	0.0106	0.1835^{***}	0.2587^{***}	
	Treynor-Mazuy	0.0338^{**}	0.1929^{***}		-0.0201
	Henriksson-Merton	0.0495^{**}	0.1463^{***}		-0.0917
WIG	Jensen	0.0084	0.2409^{***}		
	Two-index, MSCI	0.0093	0.2274^{***}	0.2099^{***}	
	Treynor-Mazuy	0.0108	0.2400^{***}		-0.0032
	Henriksson-Merton	0.0260	0.2130^{***}		-0.0496

Note: The table presents the pooled OLS estimates of the CAPM regressions based on the WIG20 and the WIG as benchmarks for each model and group. All models are estimated with Newey-West standard errors. The partitioning into groups is the following: In (A) all funds are included, in (B) only survived funds including late-starters are considered and in (C) only funds that started their activity later than June 1999 and quit the market prior to July 2005 are considered. *,**,*** represent estimates significant at 10%, 5%, 1 %, respectively.

Table 5: Pooled Estimates for the CAPM-Based Models by Group of Hungarian Pension Funds

	Model	$\hat{\alpha}$	$\hat{\beta}_1$	$\hat{\beta}_2$	$\hat{\gamma}$
All Pension Funds					
BUX	Jensen	-0.0503^{***}	-0.0176^{**}		
	Two-index, MSCI	-0.0459^{***}	-0.0340^{***}	0.1501^{***}	
	Treynor-Mazuy	-0.0535^{***}	-0.0093		0.0075
	Henriksson-Merton	-0.0570^{***}	0.0020		0.0295

Note: The table presents the pooled estimation results of the CAPM-models for the Hungarian pension funds with the BUX used as benchmark. All models are estimated with Newey-West standard errors. *,**,*** represent estimates significant at 10%, 5%, 1 %, respectively.