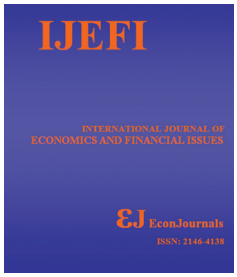

International Journal of Economics and Financial Issues

ISSN: 2146-4138

available at http: www.econjournals.com

International Journal of Economics and Financial Issues, 2015, 5(2), 427-433.

Analysis of Factors Affecting Growth of Pension Mutual Funds in Turkey

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ABSTRACT

In this study, the level of relationship between the real growth rate (GR) of the stock pension mutual funds that have been involved in the individual pension system and the variables such as the number of fund participants, the real fund returns, fund operating expenses and share of fund assets to the total assets of the funds are analyzed with panel data methodology. The results have reported that apart from the fund operating expenses, the selected independent variables are statistically significant on the the real GR of the stock pension mutual funds.

Keywords: Private Pension Funds, Panel Data, Growth, Turkey
JEL Classifications: C33, G22, G23

1. INTRODUCTION

Social security plays an important role for the healty functioning of the social life. People want to have the confidence factor against the risky situations that underlie the social security. There are different types of social security systems in the world. However, the current social security system of the country can not provide a satisfactory system alone. In addition, these systems are faced with certain difficulties.

Difficulties in the social security systems force many countries around the world to put the systems into effect, which are complementary existing social security systems. One of these systems is the private pension system.

In the private individual retirement system, individuals save their earnings during their active working periods and invest their earnings to the long-term financial assets to get better lives or improve life standard in the post-retirment period. Being voluntary, effective financing, and professional fund management are the most important mainstays of the individual retirement system (Korkmaz and Uygurtürk, 2007). The private pension system which has been practiced for many years in the world went into operation on October 27, 2003 in Turkey.

Private pension system plays an important role to increase savings rate in the economy and to transfer idle funds in to the financial system, and thus provides the efficient allocation of the resources. Considering that domestic savings amount/gross domestic product (GDP) ratio is an important indicator for the sustainable growth of the national economy, in developing countries where the level of saving rates are very low, such as Turkey, the importance of private pension system is increasing even further. Pension funds assets in countries, which have private pension systems, have reached a significant percentage of GDP.

Analyzing Table 1, pension funds to GDP ratios in selected OECD countries are observed to have quite a large size. Accordingly, The Netherlands takes the first-rank place with 160.2% and it is followed by Iceland, Switzerland and the United Kingdom with 141.0%, 113.6% and 95.7% respectively. Pension fund assets as a proportion of GDP equal to 3.8% in Turkey and varied in the other countries. These achieved values show clearly how important pension funds are for the national economy.

The United States owned the majority of assets under the management of all the OECD countries, with assets worth USD 11.6 trillion in 2012. Other countries with large pension fund systems include the United Kingdom with assets in 2012 worth USD 2.3 trillion and a share of 11% of OECD pension fund market; Japan, with USD 1.4 trillion (6.7%); Australia with USD 1.4 trillion (6.3%); the Netherlands with USD 1.3 trillion (5.8%); Canada with USD 1.2 trillion (5.5%); Switzerland with USD 0.7 trillion (3.4%). For the other remaining 27 OECD countries, total pension fund assets in 2012 were valued at approximately USD 1.8 trillion of the OECD-area total (OECD, 2013).

How high the amount of savings that are collected in private pension system, such a transfer of sources (funds) to the financial system and thus sustainable economic growth can be provided in the long-term. While the system is important for the state in this aspect, it is also important for the institutional and individual participants in terms of offering tax advantages and higher real return opportunities. In order to provide more resources to the economy, the state desires the growth of the system by the number of participants, participant contributions or fund returns, it doesn't matter by which means the state achieves this goal the institutional and individual investors aim to get higher returns from the funds within the system compared to the alternative investments.

Turkey and Denmark came through the global economic and financial instability with the best results in nominal terms, with a return equal to 11.6% and 8.5% respectively. However, after taking the inflation into account, Denmark and the Netherlands are the two countries which performed the best over the period, with a real return equal to 6.1% and 3.5% respectively.

The growth of private pension system, which has a history of approximately 10 years period in Turkey, was improved tremendously during the last decade. However, as a result of the fund returns remain low against the returns of alternative instruments because of the reasons such as high fund operating costs, funding cuts and poor fund management reasons, the interest in the system has decreased and the rapid growth process has slowed down over time. The components of this growth composition that occured in the last decade is important to illuminate the future of the system. The major components of the growth composition are the variables like the number of participants, participant shares, fund returns, fund operating expenses, funding cuts and the poor management which affects the amount of savings directly or indirectly collected in the system. Indeed, the state must have seen this development; it has made a new legislation that can steer individual savings to the private pension system in the long-term (Table 2).

The most significant reform was the transition to the new incentive system, referred to as "state subsidy," where the government makes a direct contribution to the accounts of participants; differ from the former incentive system in which contributions to the system were deducted from the tax base. Apart from the state subsidy, a significant part of the legal framework governing the individual pension system was revised, and new extensive regulations were introduced. Accordingly, a number of reforms were put into effect with a view to ensure a more effective functioning of the system by minimizing costs and maximizing benefit to participants (EGM, 2014).

Table 1: Pension funds to GDP ratios in selected OECD countries, 2012

OECD countries	%	OECD countries	%
Netherlands	160.2	Poland	17.2
Iceland	141.0	Mexico	12.3
Switzerland	113.6	Sweden	9.2
United Kingdom	95.7	Portugal	8.8
Australia	91.7	Spain	8.4
United States	74.5	Germany	6.3
Canada	67.3	Korea	5.4
Denmark	50.1	Belgium	4.6
Japan	26.3	Turkey	3.8

Source: OECD (2013), OECD Private Pensions Outlook 2013, OECD Publishing, 2011. GDP: Gross domestic product

Table 2: Pension fund nominal and real 5-year (geometric) average annual returns in selected OECD countries over 2008-2012

Country	5-year average return (%)	
	Nominal	Real
Turkey	11.6	3.4
Denmark	8.5	6.1
Mexico	7.7	3.2
Netherlands	5.6	3.5
Iceland	4.2	−2.9
Hungary	4.1	−0.4
Germany	3.9	2.4
Norway	3.6	0.9
Korea	3.2	0.1
Slovenia	2.7	0.6

Source: OECD (2013), OECD Private Pensions Outlook 2013, OECD Publishing, 2015

Mutual funds are popular investment vehicles among investors. Mutual funds are displayed activity for long years in Turkey, but pension funds are a new investment vehicle in Turkish capital market. For this reason, there is not much academic research related to pension funds. The studies related to pension funds in Turkey are focused on performance measurement of funds in a specific time period in general. Therefore, the aim of this study differs from other studies.

The goal of this study is to investigate the level of relationship between the real growth rate (GR) of the stock pension funds that has been involved in the private pension system and the variables such as the number of fund participants, the real fund returns, fund operating expenses and share of fund assets to the total assets of the funds involved in this study during the last decade in Turkey and illumine the possible causes of the arrangements that have been done by the state within the framework of the results to be obtained.

2. LITERATURE REVIEW

The results obtained from empirical research on mutual funds are summed up below.

Allerdice and Farrar (1967) indicate that investors are more sensitive to performance, sales charges and expense ratios than

commonly believed. Kasanen et al. (2001), in their study, focused on the micro level relationship between the external fund growth and the prior performance, the management fee, the load fees, advertising, as well as services of Finnish equity funds. The results from the empirical analysis show that investors of the mutual funds seem to be rather ignorant of the prior performance and neither the level of management fee nor the level of load fees seems to be related to the external fund growth. Fernando et al. (2003) indicate that the growth of mutual funds is likely to be determined by a number of factors (the level of income, per capita income etc.). Ramasamy and Yeung (2003), study on the mutual fund purchaser in emerging country, Malaysia, shows that among the factors dominating the selection of mutual funds, there are consistent past performance, size of funds and cost of transactions.

Fortin and Michelson (2005) examined the benefits of active international mutual fund management. The result of their study shows that there is no relationship between the total return and the expense ratio, but there is a significant positive relationship between the total return and turnover, and a significant positive relationship between the total return and the fund size. Huhmann and Bhattacharyya (2005) state that mutual fund advertisements do not provide the information necessary for the optimal investment decisions.

Nazir and Nawaz (2010) investigated the role of various factors in determining the mutual funds growth in Pakistan. The results have reported that the assets turnover, the family proportion, and the expense ratio are positively leading the growth of the mutual funds, in contrast with the management fee and the risk adjusted returns which are negatively associated with the mutual funds growth. Nathaphan and Chunhachinda (2012) aimed at exploring determinants of the mutual fund growth in Thailand. Their study results show that tree determinants affecting the mutual fund growth are types of Asset Management Corporations (AMCs), the administrative expense ratio, and the size of AMCs. In addition, negative relationship between the administrative expense ratio and the mutual growth, positive relationship between the funds growth and the management fees and negative relationship between the size of the AMCs and the mutual fund growth are found.

3. DATA AND RESEARCH METHODOLOGY

Appropriate to the objective of the study, compared to the other pension funds, eight equity pension funds that have been traded in Turkey since the beginning of the private pension system and whose rates of return are constantly changing and highly realized, where there is a continues and high levels of mobility in the number of participants and participant shares have been selected from the population of the data set. The pension funds included in the analysis are given in Appendix 1.

A data set has been created by using the monthly data on variables such as real increase in the fund assets, the number of fund participants, the ratio of fund assets to group assets (assets belonging to all funds involved in the study), the real fund returns (risk-free interest rate adjusted returns of funds) and fund operating expenses related to these funds and covers the period of January 2006-September 2013. Considering issues such as variability and non-stationarity, the series belonging to the variables have been obtained by applying logarithmic and proportional transformations to this data set. As a result, the data set exactly consists of montly data covering the period between February 2006 and September 2013. Additonally, due to using monthly data, seasonal adjustment has been applied to the data that has been used to generate the series of variables. Various information related to the variables used in the study is given in Table 3.

3.1. Model and Analysis Method

To analyze the level of relationship between the real growth in the fund's assets and other variables, a regression model is constructed as follows:

$$GR_{it}=\beta_0+\beta_1 RRF_{it}+\beta_2 GSFA_{it}+\beta_3 FOE_{it}+\beta_4 \ln NP_{it}+\varepsilon it \quad (1)$$

In many statistical and econometric models the cross sectional and time series data take place separately. However, in most instances, using these two types of data separately is insufficient to achieve the objectives of studies and obtain meaningful results. Recently, considering this problem, panel data analysis methods that allow a combined usage of cross-sectional and time-series data have been developed. Panel data analysis can be defined as a method of analysis that attempts to predict the relationships between the variables using the cross sectional data with time dimension where it is not adequate to study only with time series data or cross-sectional data separately (Greene, 2003). Due to the characteristics of the data set, the panel data analysis method has been used in this study.

3.2. Panel Unit Root Tests

To obtain significant relationships between the variables in the regression models, the series of variables must be stationary. There are different models and related tests that have been developed to investigate the stationarity of the series of variables, in other words, to determine whether there are unit root in the series of variables or not. In this study, as a consequence of the characteristics of the data set, the unit root models and tests which have been developed for the panel data models are used. Panel unit root tests can be analyzed in two groups. The unit root tests proposed by Levin et al., (LLC) (2002), Breitung (2000) and Hadri (2000) are considered as one of these groups and expressed as common unit root tests. The null and the altervative hypothesis related to these tests are H_0: $\beta_i=0$ (each individual time series (Yit) contains a unit root) and H_1: $\beta_i < 0$ (each time series does not contain a unit root [which is stationary]) (Baltagi, 2005).

Besides LLC, there are some other important tests that take place in the literature which are called individual unit root tests of Maddala and Wu (1999), and Im et al. (IPS) (2003), Moon et al., (2005). The null and the altervative hypothesis related to these tests are H_0: $\beta_i=0$ (for all i [series of each unit is not stationary]) and H1: $\beta_i < 0$ (at least series of one unit is stationary). Here, the acceptance of null hypothesis (H_0) refers to the existence of a unit root and the acceptance of alternative hypothesis (H_1) refers that there is not a unit root.

In this study, to determine the existence of the unit root in the series of variables included in the analysis, the ADF-Fisher, LLC

and IPS unit root tests are applied. The results obtained from the tests are given in Table 4.

Besides the stationarity, the presence of the multicollinearity between the variables used in models is another significant problem that prevents to obtain meaningful, healthy and accurate results from the analyses. Therefore, the variable/s that causes this problem should be identified and should be removed from the model if necessary. In this study, multicollinearity problem has been determined by the analysis of correlations between the variables and the variance inflation factor (VIF) values. For the correlation coefficient, the range of values from 0.68 to 1 is considered which was specified by Taylor in 1990 and accepted by many researchers as an indicator of the strong correlation between the variables (Taylor, 1990). As the VIF value, "4" is decided out of the values from 4, 5 and 10 which are accepted by the most researchers as indicators of upper limit that there is no multicollinearity problem (O'Brien, 2007). The statistical values that show the correlation between the independent variables are given as a table in Appendix 2, and the VIF values calculated for each independent variable are given as a table in Appendix 3. By examining the data in these tables, it can be deducted statistically that none of the existing independent variables cause correlation and multicollinearity problems in the model.

After the analyses to determine the stationarity and multicollinearity problems the model given in Equation 1 is reconstructed as follows:

$$GR_{it}=\beta_0+\beta_1 RRF_{it}+\beta_2 D(GSFA_{it})+\beta_3 D(FOE_{it})+\beta_4 D(\ln NP_{it})+\varepsilon_{it} \quad (2)$$

In many studies researchers prefer to work with pooled or panel data set according to the characteristics and the aim of the study. However, the properties of the data set may not always allow pooled data. Therefore, it must be determined whether the data set that will be used in the study may be pooled or not. This determination can be done by the *F*-test which can identify the presence of fixed effects (Hsiao, 2003). *F*-test is applied to test the null hypothesis (H_0;$\mu_1=\mu_2=\ldots\ldots=\mu_{N-1}=0$) which refers that the constant term is the same for all units. Null hypothesis (H_0) will be rejected when the calculated *F*-test statistic is bigger than the *F* table value ($P<0.05$). If this is the case, then it can be deduced that the constant term is different for all units which will shows that the data set can not be pooled (Greene, 2003; Baltagi, 2005). In this context "redundant fixed effects" *F*-test is applied to the model given in Equation 2 to research the existence of the fixed effects. Statistical test results are shown in the Table 5.

F-test results for the model shows the presence of fixed effects at a significance level of 1%, in cross section and period dimension. The existence of fixed effects in either cross section or period means that pooled data set is not suitable to use in this study. Consequently, in this study panel data set and intended models and analyses will be used.

Estimating models in cross section and period dimension via efficient estimators are important to gain reliable and significant results. In general, Hausman test is used in the selection of efficient estimators. Hausman test, when the selection should be done between fixed effects and random effects, is used to

Table 3: Information about the variables used in the study

Variable	Description	Symbol of variable
GR	Changes occurring in the Fund's assets adjusted by the rate of fund returns ([Period end assets-(previous period end assets* [1+periodic rate of return of the fund shares])])/previous period end assets	GR
The real return of the fund	([Period end fund unit share value/funds value at beginning of the period]−1)-risk-free interest rate	RRF
Group share of fund assets	Asset value of the fund adjusted by the return of the fund/asset value of the group funds (all of the funds involved in the study) adjusted by the returns of the funds	GSFA
Fund operating expenses	Fund operating expense deduction rate made over the amount of contributions on the basis of the period	FOE
Number of participants	Logarithm of the number of participants in the relevant funds by the end of the period	lnNP

GR: Growth rate

Table 4: Results of unit root tests

Variable	Statistic *P*	Level of unit root					
		Intercept			Intercept and trend		
		Levin et al. *t* value	Im et al. W-statistic	ADF-Fisher Chi-square	Levin et al., *t* value	Im et al., W-statistic	ADF-Fisher Chi-square
GR	Statistic	−14.206	−17.664	169.814	−16.738	−18.281	257.760
	P	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*
RRF	Statistic	−27.540	−23.967	289.055	−30.748	−24.128	359.741
	P	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*
D (GSFA)	Statistic	−15.849	−19.041	161.001	−20.734	−21.723	316.367
	P	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*
D (FOE)	Statistic	−31.683	−26.468	253.325	−35.478	−27.580	410.378
	P	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*
D (lnNP)	Statistic	−8.818	−14.398	164.257	−9.266	−14.651	201.906
	P	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*

The lag lengths are determined by Schwarz Info Criterion. "D" mark indicates that the series of variables are at the level of first difference. *Significance level of 1%, **Significance level of 5%, ***Significance level of 10%. GR: Growth rate

determine which estimator is more efficient and to decide on the model (Greene, 2003). By using this test, whether the difference between parameter estimators of fixed effects model and parameter estimators of random effects model is statistically significiant or not can be examined/investigated (Cameron and Tivedi, 2005). In this sense, Hausman test is a kind of Wald χ^2 test which has a k-1 degree of freedom (Yaffee, 2003). Hausman test is applied to the model in Equation 2 in order to test the "at the same time random effects exist in either cross section or period dimension" hypothesis. The statistical test results are shown in the Table 6.

According to Hausman test statistics given in Table 6, null hypothesis which shows that random effects estimator is respectively and concurrently more efficient in cross section and period dimension for model, is not rejected. In accordance with the obtained results, the model will be estimated on the assumption that there are random effects in cross section and period dimension, and will be named as bileteral random effects model.

In empirical studies estimating the models, another issue to be considered is the existence of heteroscedasticity and/or autocorrelation in models. Conclusive estimates on models should be done after researching aforementioned problems and after if possible overcoming those issues.

In order to investigate whether there is a heteroscedasticity problem or not in models, Lagrange multiplier (LM) test, which is developed for bilateral random effects models, is one of the most apparent. The test hypothesis are as H_0: $\sigma_\mu^2 = \sigma_\lambda^2 = 0$, there is constant variance and H_1: $\sigma_\mu^2 \uparrow \tilde{A}_\lambda^2 \uparrow 0$ there is heteroscedasticity (Baltagi, 2011).

Null hypothesis of "constant variance exists in minimal values of LM statistic," is irrefutable ($P > 0.05$) and it's decided that explanatory variables have constant variance. Breusch and Pagan LM (1980) test has been applied to the model to determine the heteroscedasticity and the results given in Table 7 have been obtained.

Probability value with regard to the existence of heteroscedasticity for model has been obtained as $P > 0.05$. These values show that there is not any heteroscedasticity problem in the model.

Wooldridge (2002) serial correlation test is one of the tests which isused to investigate the existence of linear serial correlation among serials that belong to the variables in panel data models. The main purpose of this test, which was discovered by Wooldridge, is to analyse the error terms that are associated with its own deferred value (Drukker, 2003). In the analysis process, the parameters belonging to the residual deferred value is tested if they are equal to −0.05 or not (Wooldridge, 2002). According to the applied serial correlation test results, if the F statistic probability values are significant ($P < 0.05$), H_0 hypothesis (there is no serial correlation) is rejected; otherwise H_0 hypothesis is accepted. Within the framework of this information, serial correlation test results applied to the model are shown in Table 8.

As a result of Wooldridge test $P > F$ value is obtained as $0.3173 > 0.05$ for the model. This obtained value shows that null hypothesis (H_0) which is "there is no serial correlation among the serials belong to variables within the model," is not rejected, and this value shows that the serial correlation problem in the series does not exist at 5% significant level. Deducing that, there is not any heteroscedasticity and serial correlation problems, the results of the model which are estimated by panel EGLS method, are shown in Table 9.

As a result of the model's estimation the statistics in Table 9 have been obtained. According to the probability value (P [F-statistic] = 0.000), the model is significant at 1% level and to the R-squared value (R^2=0.444), the dependent variable can be clarified by independent variables at the rate of 44.40%. When results with regard to the coefficients of the variables in the model were analyzed, it was concluded that the interdependet variables which interact with the dependent variable (GR) in the same direction at 1% significant level are "GSFA" (5.56 times) and "InNP" (0.26 times). And the interdependet variable which interacts with GR in the opposite direction at 1% significant level is "RRF" (0.12 times).

According to these results: when the value of the variable "GSFA" changes, the value of the variable "GR" changes in the same direction at 5.56 times. This result shows that the individual or institutional participants take the asset size of funds into account in the same group and compare them with each other when they are selecting the funds to participate.

The relation between the variable "GR" and the variable "lnNP" shows that the funds can grow at a rate (26%) of an increase in the number of participants, compared to the previous period. However, the relationship between the number of participants and

Table 5: Results of redundant fixed effects test

Cross section and period tests	Statistic	df	*P*
Cross-section *F*	8.396	(7.633)	0.000
Cross-section Chi-square	65.349	7	0.000
Period *F*	8.808	(91.633)	0.000
Period Chi-square	602.161	91	0.000
Cross-section/period fF	8.617	(98.633)	0.000
Cross-section/period Chi-square	623.857	98	0.000

Table 6: Results of hausman random effects test

Cross section and period tests	Chi-square statistic	Chi-square df	*P*
Cross section random	0.000	4	1.000
Period random	0.000	4	1.000
Cross-section and period random	0.000	4	1.000

Table 7: Results of Breusch-Pagan LM test

Heteroscedasticity test hypothesis	Test results
Test: Var (u) = 0	Chi-square (1)=0.000 *P*>Chi-square=1.000

LM: Langrange multiplier

Table 8: Results of Wooldridge serial correlation test

Serial correlation test hypothesis	Test results
H_0: No first order serial correlation	*F* (1,7)=1.159 *P*>*F* = 0.3173

Table 9: Estimating results of the model

Dependent variable: GR
Method: Panel EGLS (Two-way random effects)
Sampe (adjusted): 2006M02-2013M09
Periods included: 92
Cross-sections included: 8
Total panel (balanced) observations: 736
Total panel (balanced) observations: 824

Variable	Coefficicent	Standard error *r*	*t*-statistic	*P*
C	0.022	0.002	8.044	0.000
RRF	−0.122	0.031	−3.928	0.000
d (GSFA)	5.566	0.280	19.853	0.000
d (FOE)	−3.756	9.181	−0.409	0.682
d (lnNP)	0.266	0.027	9.849	0.000
R-squared	0.444	Mean dependent variable		0.010
Adjusted R-squared	0.441	SD dependent variable		0.039
SE of regression	0.029	Sum squared residuals		0.631
F-statistic	145.994	Durbin-Watson statistic		1.727
P (*F*-statistic)	0.000			

R-squared value shows the percentage of variation occuring in the dependent variable that can be explained by the independent variables, $P<0.01$ indicates the level of 1%, $P<0.05$ indicates the level of 5% relationships between the dependent and each independent variables, the *P* (*F*-statistic) value indicates that at which level the model is significant ($P=0.000$ indicates 1% significance level). SE: Standard error, SD: Standard deviation, GR: Growth rate

the growth of the fund have occured within low levels emphasizes that the new contribution of the participants to the fund may be more important than the number of participants in terms of the growth. Indeed, considering that the changes in fund assets and fund returns provided by the participants' contribution and the growth is calculated as proportional increase that adjusted to the returns of the fund's assets, it can be said that the growth is largely or completely provided with the participants' contribution.

Inverse relationship between the variables "GR" and "RRF" at a level of 12% is explained as follows: some fund participants can change or leave their fund by thinking (considering) that in a given time they get a lot more returns than expected (a reasonable level over the risk-free interest rate) and much more can not be obtained, and thus taking more risk is unnecessary. This situation will bring about a reduction in fund assets and will occurs a negative impact on the fund's growth. As well as, when the stock market comes to a reasonable level, in other words, when a significant decline has occurred in the stock market and the related private pension funds yields, contribution to these funds so that the real fund assets will increase and this will occurs a positive impact on the fund's growth.

It can be seen that there is not any significant relationship between fund operating expenses (FOE) and GR from the probability value given in Table 9. Generally, the funds in a competitive environment usually determine the expenses, charges and costs at a close level to each other to attract more participants to them. Therefore, it can be said that these ratios that are close to each other do not have any impact on participants' funding decisions.

4. CONCLUSION

Private pension funds which became effective in October, 2003 in Turkey has been growing rapidly and becoming one of the basic building blocks. Even though there is a well established control system and regulation to prevent account holders against losses, they still carry on investment risks. This risk is both related with economy as a whole and with the assets price risk in the seleceted funds. Pension funds managers heavily invest in equities and treasurary bills, notes and bonds. This portfolio combination allows investors to utilizie risky and unrisky assets.

Researches with regard to private pension funds are of great importance for investors and public authorities. Purpose of this study is to investigate the level of relationship between the real growth rate of the stock pension funds that has been involved in to the private pension system and the variables such as the number of fund participants, the real fund returns, fund operating expenses and share of fund assets to the total assets of the funds involved in this study during the period of February 2006-September 2013.

As a result, apart from the fund operating expenses, the selected independent variables are statistically significant on the the real growth rate of the stock pension funds. It is identified that the presence of pension funds operating in Turkey is affected by largely changing in participants shares and funds return. Change in fund returns does not provide a numerical change in fund shares (in unit basis). In such a case, it is not realistic to speak of the fund growth in real terms. What is important/essential is the real growth, it can be concluded that in terms of stock-based pension funds, the size of these funds consist of participants' contribution. It can be interpreted that changes in fund assets are affected directly or indirectly by this participants' contribution. Furthermore additonally the level of fund returns affects participants' decision whether to subscribe or quit the fund. Additionally, a participant will prefer the funds with more assets to the rest of the funds in the same group.

The results of this study are significant in terms of providing important informations for the existing or potential participants of private pension system to make decision to join or leave the system and to make changes in the mix of funds.

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Appendix 1: Pension funds included in the analysis

Fund code	Fund name
ANS	Aegon Emeklilik ve Hayat A.Ş. Stock Income PMF
AZH	Allianz Hayat veEmeklilik A.Ş. Stock Growth PMF
AH5	Anadolu Hayat Emeklilik A.Ş. Stock Growth PMF
AG3	Anadolu Hayat Emeklilik A.Ş. Stock Growth Group PMF
AEB	Avivasa Emeklilik ve Hayat A.Ş. Stock Growth Group PMF
GEH	Garanti Emeklilik ve Hayat A.Ş. Stock Growth PMF
BEH	Groupama Emeklilik A.Ş. Stock Growth PMF
VEH	Vakıf Emeklilik A.Ş. Stock Growth PMF
YEH	Yapı Kredi Emeklilik A.Ş. Stock Growth PMF

PMF: Pension mutual fund

Appendix 2: Correlation table of independent variables used in the study

Variables	GR	GSFA	FOE	lnNP
GR	1.00000	0.00326	0.00115	−0.02109
GSFA	0.00326	1.00000	−0.08975	0.63459
FOE	0.00115	−0.08975	1.00000	−0.27728
lnNP	−0.00210	0.63459	−0.27728	1.00000

GR: Growth rate

Appendix 3: VIF values of independent variables used in the study

Variables	R^2	VIF value
GR	0.130	1.150
d (GSFA)	0.202	1.254
d (FOE)	0.003	1.003
d (lnNP)	0.030	1.031

VIF value is calculated by using the formula ($1/[1-R^2]$). R^2 values are obtained from the estimated regression models that each independent variable is used respectively as the dependent variable and the others are independent. If the VIF value is ≥4 it can be said that there is a multicollinearity problem depending on the dependent variable of the model. The upper limit value "4" is accepted as "5" or "10" by some researchers. VIF: Variance inflation factor, GR: Growth rate

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