INVESTMENT STYLE ANALYSIS FOR THE TURKISH INDIVIDUAL RETIREMENT FUNDS

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Abstract

Turkey, considered as an emerging market, has a considerable mutual fund capacity (*USD 21.32 billion*). However, Turkish pension fund sector, established in 2003, currently has achieved to USD 1.12 billion fund size and the capacity of this sector has enlarged in 37 times. In this study, the portfolio weights of the 11 actively managed Turkish individual retirement funds have been estimated and the investment styles of these funds have also been investigated. The goal of the study is to reveal the investment philosophies of Turkish individual retirement funds for the November 2003-March 2006 period. In order to estimate the investment philosophies, we used *"Style Analysis"* technique and estimated the portfolio weights of the pension funds in annual and periodical basis. As a result of Style Analysis, we observed that fund managers tend to invest mainly in the risk free assets (*60.6%*). Depending upon the positive indications and progresses in the Turkish economy, the fixed income (*risk free*) investments are gradually diminished for the last 20 months and the fund managers gave more importance to the securities in comparison to the earlier months. As we consider the individual retirement fund sector as a long-term investment tool, depending on the positive macro-economical ambience, we expect the individual retirement funds would achieve in a risk holding structure. Besides, we anticipate the Turkish Fund Sector would be developed in a significant manner on the following years and supported by the pension fund sector.

Key words: Finance, Emerging Markets, Individual Retirement System, Style Analysis.
JEL classification: G23, G11, G10.

1. Introduction

1.1. Turkish Pension Fund Implementations and the Possibility of Success

The basic item for the implementation of a successful individual retirement system is to establish a stable financial market structure within a consistent economical environment. Turkey has experienced an important progress for this issue so that, a consistent economical environment is constituted since last two years. Undoubtly, a stable and determined cabinet is a necessity for doing so. It can be easily realized such an ambience, if the government implements the politics without any compromise. There is a possibility for an additional rise in the weight of Turkish social security system reforms to the national budget.

For instance, most countries implement these reforms in a progressive manner. However, the process in Turkey would lead to a progressive transition so that, the current system depends upon willingness principle. Consequently, the probability of the participants to leave the old system is quite low and thus, this would not cause a significant increase in the budget. Under the framework of the studies carried out in the Turkish banking and insurance sector, particulary after the implementations regarding the 2001 financial market crisis, we may anticipate the sector in a strong structure. For this reason, there is not a problem with a strong and effective banking and insurance sector of which counted as pre-conditions.

The entrance of foreign institutions to the sector, could not be achieved to a desired level since 2001 crisis, is advantageous for these pre-conditions. Besides, we realized that the bank mergers in the banking system and increases in the concentration level of the sector would be a significant step for satisfying these pre-conditions.

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[1] We would like to thank referee and for their suggestions to make the paper more comprehensible. All the considerations, lackings and mistakes belong to authors.

The pension investment funds have a great importance either in governance or in transparency. Turkish Treasury and Capital Markets Board (*CMB*) will play a determining role in stabilization of these criterions.

Since the individual retirement system depends on willingness, the participation of the individuals should not be only provided by tax incentives but also there has to be full information regarding the system and its advantages. The CMB has a critical role in leading the participants to decide within the risk and return alternatives. The historical performances of the pension funds should be evaluated and then announced to public periodically for serving symmetrical information.

We believe that the pension funds with other institutional investors would come up to a desired quantity. Although the current fund legislation is quite effective, the pension fund managers may prefer a passive portfolio management style in their portfolios, if the macroeconomical variables could not be stabilized. Otherwise, the created capital in the Turkish individual retirement system might unfortunately auspices the budget deficits. And then, in this case the system, as the current social security system, might be a considerable burden for the national budget.

1.2. Evaluations on the Turkish Individual Retirement System and the Pension Funds

a. General Trend

Since Turkey has approximately USD 21.32 billion mutual investment fund and USD 1.07 billion investment trusts capacity and USD 1.51 billion insurance fund capacity, the individual retirement system and its vital element pension investment fund sector show a great deal of importance in terms of either in Turkish economy or in the money markets of which is critical for the whole economy.

It has been expected that the size of the Turkish pension investment funds would reach approximately to $ 23.96 billion in the mid-term. For the end of the mentioned period, the ratio of this sector to Turkish GDP is estimated as 4.9% and 2.5-3.0 million participants would be involved by the system. In the medium period, the establishment of the individual retirement system is of great importance in diminishing the deficit of the Turkish social security system and its burden to the government which nearly corresponds to $ 15.6 billion.

If we evaluate the first three years (*November 2003-March 2006*) of the Turkish individual retirement system, it can be reviewed that the sector has grown in a significant manner. In Table 1, the number of individual retirement contracts and the actual fund sizes are given together.

Table 1

Turkish Pension Fund Values and the Number of Contracts

Year	Number of Contracts	Number of Funds	Value of the Fund (USD)
2003 (*July*)	38,418	72	30.512.680
2004	1,036,602	81	219.294.495
2005	2,025,705	96	903.668.714
2006 (*March*)	2,213,576	96	1.129.002.897

Source: Turkish CMB and Treasury.

As we can see from the table above, the Turkish pension fund sector has increased the number of fund types by 40% and the total value of the pension funds ascends rapidly to USD 1.12 billion so that, the capacity of the pension fund sector has enlarged in 37 times within 3 years.

b. Technical Information about the Turkish Pension Fund Sector

The general situation of pension fund sector within individual retirement system is regularly monitored by the Turkish CMB so as to achieve the goals of current macro-economical program. The Turkish pension funds have started managing individual retirement savings on the different starting dates. This fund system was activated on July 2003, however, all the pension funds started to operate on a common date as November 2003. So we make our analyses and investigations within the time period of November 2003 to March 2006.

Within this framework, some evaluations regarding the pension funds are given below.

Table 2

Turkish Pension Funds and the Basic Technical Specifications

Pension Fund	Number of Fund	Fund Size (m. USD)	Capitalisation Ratio (%)
Ak Retirement	10	674	2.81
Anadolu Life Retirement	15	11,236	46.90
Ankara Retirement	5	375	1.56
Başak Retirement	5	487	2.03
Aviva (*Commercial Union*) Life & Retirement	8	2,622	10.94
Fortis Retirement (*Doğan Retirement*)	7	861	3.60
Garanti Life and Retirement	11	824	3.44
Koç Allianz Life and Retirement	8	824	3.44
Oyak Retirement	7	2,596	10.83
Vakıf Retirement	10	1,199	5.00
Yapı Kredi Retirement	10	2,262	9.44
Sector Total	96	23,959	100.00

Source: Turkish CMB and Treasury.
* Data are illustrated as of 16.03.2006.

As we generally overview the retirement sector, the below evaluations can be made:
- The size of the pension funds would be nearly $ 23.96 billion.
- On the basis of capitalization ratios, more than the half of the pension fund sector consists mainly of Anadolu Life & Retirement funds.
- Oyak Retirement, Aviva (Commercial Union) Retirement and Yapı Kredi Retirement funds would also have a great fund size (31.21%) in comparison with the remaining funds.
- We may state that the Turkish pension fund sector is appealing for foreign investors like Aviva, Fortis and Koç-Allianz retirement companies so that, their cummulized capitalization ratio (17.98%) within the sector is quite significant.

It may be denoted that the capitalization ratios of the remaining pension fund companies vary between the 1.56% and 5.00%. Besides, it is not found any relation between the number of pension funds of the sector companies and their capitalization ratios. In other words, currently we may signify the pension fund companies establish small sized funds but numerous.

In our studies, we realized that most of the companies in the pension fund sector give primer significancy on revenue purposed pension funds and secondarily onto the growth pension funds in their retirement plans offered to the investors. This situation can be considered as an important indicator of the pension fund sector to defend itself from the potential fluctuations in the Turkish financial markets.

According to our estimations, the applied macroeconomical development programs would lead to a security investment ambience in the economy and financial market for the medium period so that, the ratio of the growth pension funds in the portfolios of retirement fund companies might be increased.

In this study, our investigations are focused on estimating the Turkish pension fund exposures within November 2003-March 2006 period. In this perspective, it will be suitable to summarize the theory lies in the background of the mentioned estimation technique in the following part.

2. Literature

Style analysis, which shows the characteristics of the asset allocation models, had initially introduced by W.F. Sharpe in 1992, in this respect this method had used to state as a valuable tool for investors, plan sponsor and consultants in estimating the fund exposures.

Investors exactly desire to know the potential investment styles[1] so they may create the most available asset mix that fits their tastes. Besides, plan sponsors and consultants are interested in how well the portfolio managers meet the investment objectives.

Within this framework, W.F. Sharpe introduces an objective style model asset classes (or factors) and assumes that a mutual funds return is assumed to be a function of several factor exposures[2] and firm-specific risks. The factor exposures or sensitivities determine the investment style or asset allocation of the fund (Atkinson & Choi, 2001).

The impacts of the Style Analysis on practical implications have been quite extensive. Trizchinka (1995) argues that the advantage of the Sharpe's model is an empirical question since economic models can still be useful when economical data violate statistical assumptions of the models. Trizchinka (1995) defends Sharpe's style model due to its simplicity and objectivities.

On the other hand, Christopherson (1995) and Di Bartolomeo and Witkowski (1997) reveal a potential disadvantages of the Style Analysis though the model is based on historical correlations. The basic criticism is that the Style estimates based on historical data are unstable, and that the style is difficult to capture when a manager changes investment strategies.

In spite of the mentioned debates about its merits in a general point of view, the criticisms for the Style Analysis are quite positive, and it's generally accepted within the finance industry.

Since the assumptions and data of the Style Analysis are clear to the analyst, so the results can be replicated into different financial sectors, so that the fund exposures may successfully be estimated and the method has popular and applied to actual portfolios.

2.1. Investment Style Analysis in Portfolio Management

a. Introducing the Sharpe Style Analysis

Style Analysis can be defined as the measurement of an investment funds performance by means of a more recent return based approach.

Sharpe (1992) introduced this analysis by developing an "Asset Class Factor Model" to distinguish the performance of different funds with respect to "Style" and "Selection". Style Analysis may also be defined as reverse engineering of the asset mix structure in a portfolio (Jackson & Staunton, 2001).

In other words, Style Analysis, in effect, finds the weighted average of a set of market indexes that most closely tracks the returns of the portfolio being analyzed (Lobosco, 1999).

Style Analysis is also defined as the classification of the portfolios using either holdings or returns, in terms of some portfolio properties like size and orientation to "Growth" or "Value" (Kuberek, 1998).

In general, Style Analysis is a form of constrained regression that uses a weighted combination of market indexes to replicate, as closely as possible, the historical return pattern of an investment portfolio. The resulting coefficients, called Sharpe Style weights, are used to form inferences about a portfolio's behaviour and composition. The technique has been widely adopted in the investment industry (Lobosco & Dibartolomeo, 1997).

Investment funds create portfolios that are invested across a number of different national sectors (such as equities, bonds, and bills) and possibly international sectors (such as currencies, foreign equities and commodities). Within each sector funds can also hold different amounts of individual assets. Typically, there is no information available to external investors about the detailed choice assets a particular fund holds (Jackson & Staunton, 2001).

Besides, it is difficult to separate out the contribution to return made by sector choice on one hand, or asset choice within sectors on the other hand since different sectors perform differently. Sharpe Style Analysis can reveal the investment philosophies of the investment funds or actively managed portfolios (Jackson & Staunton, 2001).

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[1] The investment style means that the distribution of asset factor sensitivities of the financial assets (*factor sensitivities into security indexes, government bonds, treasury bills, cash etc.*) is defined by the investor.
[2] Factor exposures correspond to the financial instruments involved in the multi-factor model (*Style Analysis*) which is introduced by W.F. Sharpe.

The Style Analysis can be taught of as the process of forming a portfolio of market indexes that mimics, as closely as possible, the historical performance of a given portfolio (Lobosco & DiBartolomeo, 1997).

The main goal of Style Analysis is to construct a benchmark portfolio, from a set of known indexes (for which returns are available), against which to compare with an investment fund's actively managed portfolio (Sharpe, 1992; Jackson & Staunton, 2001).

Sharpe's (1992) Style Analysis has become a standard industry tool for inferring a fund's investment style. This technique has the advantage of requiring only rates of return as input data, so that usually several years of monthly returns are involved (Lobosco, 1999).

The factors are normally defined as market indexes representing various asset classes or investment styles. The mentioned indexes are usually selected to cover the range of investment choices available to the manager of the investment portfolio. Ideally, the indexes should reflect activity in different asset classes, they should be mutually exclusive and exhaustive, and their assets publicly quoted so that they can be tracked passively (Sharpe, 1992; Lobosco, 1999).

As an example, Sharpe (1992) used 12 indexes quoted in United States (US) Stock Exchanges, to cover the range of investment options available to US funds. The mentioned indexes were chosen to have as the minimum overlapping as possible (Jackson & Staunton, 2001).

Having the quadratic optimization, Sharpe Style Analysis solves for the sensitivity of the portfolio returns to factor that minimizes the variance of the residual returns, subject to the constraints that the factor weights are non-negative and sum to "1" (Sharpe, 1992; Lobosco, 1999; Jackson & Staunton, 2001).

The factor sensitivities are referred to as the Sharpe Style Weights. The index that results when these weights are applied to their respective indexes (and summed) is referred to as the Sharpe Style Index.

Finally, Sharpe Style Index is typically used as the style benchmark for this portfolio, which can serve as the basis for further performance analysis. Since Style Analysis constraints (non-negative weights that sum to "1") that the Style Index can be considered as investable benchmark, which also gives it more important. This property has undoubtedly contributed to the wide spread acceptance of this technique (Lobosco, 1999).

b. Sharpe Style Analysis Method

b.1. Asset Allocation and Portfolio Management Style

There exists generally accepted situation for that the asset allocation accounts for a large part of the variability in the return on a typical investors' portfolio. This situation is generally true, if the portfolio is invested into multiple funds which include a number of securities.

Widely, asset allocation is defined as the allocation of an investors' portfolio across a number of major asset classes. Asset allocation can not be carried out without defining the mentioned asset classes.

After having the definition of asset classes, it has great importance to estimate the exposures for each component of an investors' portfolio to movements in their returns. Then mentioned information may be cumulated so as to determine the investors' overall effective asset mix. The appropriate alterations can then be carried out unless it is able to reach a desired asset mix.

It is possible to estimate how effectively individual fund managers have performed their functions and the limit (if there any) to which value has been added to active portfolio management, if a procedure can be done for measuring exposure to variations in returns of main asset classes.

Consequently, the effectiveness of the investors' overall asset allocation may be carried out by having a comparison with that of one or more benchmark asset mixes. Within this framework, the asset allocation can be applied effectively by means of the asset class factor model given below (Sharpe, 1992).

b.2. Asset Class Factor Model

Factor models are widely used in investment analysis. The below asset class factor model which is used in estimating the investment the style of the funds, has the similar specifications with multi-factor return estimation model.

The equation of the Style Analysis for the "i"th investment fund using "n" passive indexes, where the returns from the indexes are denoted by f_1, f_2 …. f_n is as follows (Sharpe, 1992; Jackson & Staunton, 2001).

$$R_i = (b_{i1}f_1 + b_{i2}f_{2+} ......+ b_{in}f_n) + e_i , \qquad (2.1)$$

where

R_i is the return on the "i"th fund, b_{in} is the weight of the "i"th fund "n"th index (the sensitivities of the fund returns to the "n"th factor), f_n is the historical return on "n"th index (factor/asset class) and e_i is the residual or non-factor component of the return.

The below assumptions have to be made in order to simplify an exercise in data description.

- The non-factor return for one asset (e_i) is assumed to be incorrelated with that of every other (e_j). Here, the factors are the only sources of correlation between returns.
- In an asset class factor model, each factor represents the return on an asset class, and the factor sensitivities (b_{in}) are required to sum to "1" (100%). Besides, mathematical signs of the factor sensitivities are assumed to be positive.
- The return on an asset "i" is represented as the return on a portfolio, which is shown by the sum of the terms in the bracketed expression invested in the "n" asset classes plus a residual (e_i).

Within this framework, the sum of the terms in the brackets can be stated as the return attributable to "style" while the residual component (e_i) corresponds to the return attributable to "selection". So, the mentioned approach is able to separate the portfolio return into two major return components (Sharpe, 1992).

Style Analysis model is a standard multiple regression equation in which the asset classes are the independent variables and the return to the portfolio corresponds to the dependent variables (Lobosco & Dibartolomeo, 1997).

In the Style Analysis, the first action is to define the asset classes as market indexes representing various asset classes or approaches (styles) of investing. As an instance, it is possible to select indexes to represent investment in stocks, bonds, and money market instruments. By defining factors, the value of the asset class during any time period is merely the return on the market index for the time period in question. Traditional multiple regression calculations will provide a set of "coefficients" that will estimate how sensitive the return on the subject portfolio is to the returns of set of market indexes selected as asset classes (Lobosco & Dibartolomeo, 1997).

If there is assumed a casual relationship between the returns on the market indexes and the return of portfolio, it is possible to state that these factor sensitivity coefficients express the extent to which the returns on the subject portfolio are influenced by returns on the market indexes (Lobosco & Dibartolomeo, 1997).

Coefficients found out of the traditional regression process may take on either positive or negative values. But, investment practitioners usually find it intuitively unappealing that a market indexes exerted on a negative influence of the return on a subject portfolio. For instance, Style Analysis has the mentioned assumptions regarding to factor coefficients (Lobosco & Dibartolomeo, 1997).

Besides, by rearranging this multi-index model of returns as the difference among the fund return and the return due to the indexes are given below (Jackson & Staunton, 2001).

$$e_i = R_i - (b_{i1}f_1 + b_{i2}f_{2+} ......+ b_{in}f_n) . \qquad (2.2)$$

The Style Index of the various market indexes may reveal the investment behavior of the subject portfolio.

As in traditional regression, the portfolio weights are determined in order to minimize the sum of the squared differences between the actual dependent variable (the subject portfolio) and combination of the independent variables (the Sharpe Style Index). Due to the constraints on the portfolio weights, the problem of actually calculating the weights is solved by means of the technique "Quadratic Programming" after having determined the Sharpe Style Index, the historical returns of the subject portfolio can be compared with the returns of Sharpe Style Index. For this

reason, the portion of the return variability of the subject portfolio which is explained by the Sharpe Style Index is the correlation coefficient (R^2) statistics. It would be unrealistic to hope for a perfect fit ($R^2=1$ and $e_i = 0$) unless there exists an index to represent every possible asset behavior inside (Lobosco & DiBartolomeo, 1997).

c. Rolling Period Style Analysis

Style analysis may give inconsistent results if the investment objective of the portfolio has room for subjectivity. However best implementation of style analysis can be carried out in case of having well understood the objective of portfolio investment and when independent variables represent the investment style in a objective manner.

In the stability tests of style analysis, it would be advantageous to perform the analysis on two several funds and fund aggregates for a three year rolling period (Buetow et al., 2000).

The main goal of the rolling period analysis is to determine the variation of investment style of a specific fund or a portfolio. On the other hand, the major advantage of this method can be defined as the determination of the investment philosophies of fund managers in a dynamic economical environment so that, it would lead to increase in the level of information about the structure of the subject fund or portfolio.

The investment style in the previous analysis is effectively the average of potentially changing styles involved in the estimation period. The additional form of analysis is to carry out style analyses in order to determine how estimated investment style consisting in a time period. However, rolling-period form of style analysis is also called exposure analysis. These kinds of periodical analyses are applied to 24-30 month returns (Jackson & Staunton, 2001).

Besides[1], the main benefit of having periodical style analysis is the explicit determination of the variations of investment policies and philosophies of portfolio managers.

In addition, the rolling period analysis would be possible to estimate the behaviors of the portfolio managers under variable economic conditions.

3. Emprical Studies

3.1. The Methodology

The goal of this study is to estimate the investment styles (*portfolio weights*) and reveal periodic return distributions of Turkish pension investment funds, since the investors have limited information about the investment philosophies of the funds.

The Turkish Pension Investment Fund Properties (*portfolio value, unit price, number of certificates in circulation, shares ratio, government bond ratio, treasury bill ratio, reverse repo ratio, corporate bonds ratio, commercial papers ratio, foreign shares ratio*) are regularly announced to finance markets by CBM. The major specification of the investment funds is that the security of the investment, within the portfolio structure, can affect the fund return. The CBM announces only the total security ratio, whereas there is not given enough information about the index or indexes of which the asset classes are selected. For instance, the investors who allocated their assets for having an investment may not have exact information about the investment style of the fund which the securities are invested.

On the other hand, it has a great advantage of determining the fund exposures in terms of securities and risk free investment instruments. However, the Sharpe Style Analysis can provide to estimate the factor weights of the funds, so that by means of this method it is possible to determine how the portfolio securities are selected from which index or indexes.

As regarded previously, style analysis has two basic scopes. First one is to determine the variation of investment style index of the portfolio. The other issue is investigating the fluctuation of the style weights (*Rolling Period Style Analysis/Style Drift*) that corresponds to variation of the investment philosophy of the fund manager.

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[1] Further, a three-year rolling period to be representative of the way style analysis is usually applied. But, volatility of results is related to the length of the rolling period. For example, as the time period lengthens, the results will be more consistent. Besides Sharpe (1992) did not mention about the length of the rolling period used.

But, only the investigation of the investment style of the fund is not adequate by its own. The investors have to consider the style variations and its economical perspective. For this reason, we analyzed the pension funds either in annual or periodical basis.

Although individual retirement system founded a three years ago, 11 retirement companies are registered to Turkish CMB and 96 pension funds are actively managed now.

We carried out our studies onto whole Turkish pension fund sector. Since the companies are mainly managing growth and revenue purposed pension funds, we focused our study on these fund types so that, selected 11 pension funds are investigated by the Style Analysis technique.

Furthermore, because the system has been activated from August 2003, data formed after this date can be investigated (*see Annex-1*).

Daily return of retirement investment funds, announced by CBM, has been calculated by formula given below.

$$R_p = \frac{V_t - V_{t-1}}{V_{t-1}}, \tag{3.1}$$

where R_p = The daily return of fund "p" in "t" period.
V_t = The daily unit closure price (*TL*) of fund in "t" period.
V_{t-1} = The daily unit closure price (*TL*) of fund in "t-1" period.

This empirical study on individual retirement funds has been aimed for estimating the contents of retirement funds portfolios for individual investors. Accordingly, the selected asset classes which are supposed to take part in funds, in style analysis resembles to asset classes (*for example, indexes or foreign exchange rate*) are used in international investment funds sector.

But, results of portfolio component of individual retirement funds[1] are to be found at registration of pension investment fund at CMB.

For summarizing the emprical study, firstly the daily return of retirement investment funds was calculated and Annual Portfolio weights (*rate of factor loading*) of asset classes in funds were estimated by using style analysis for November 2003-March 2006 period. In order to determine the changes within the portfolio components of retirement investment funds in timely manner, we carried out periodical style analyses so that, monthly style weights for the mentioned time interval and fluctiations in the investment philosophies of these pension funds have been exposed.

3.2. An Investment Style Model for the Turkish Pension Funds

The style analyses are applied by means of the solver (*Excel Solver*) known as an analytical tool. In style analysis within the study, we established an asset class factor model (*equation 3.2*) and applied it to the 11 pension funds.

Seven asset classes, which assumed to be selected financial assets within the fund, are involved in our model. Selected asset classes are as follows: Istanbul Stock Exchange (ISE) indexes (Industrial, Service, Financials, Real Estate, Technology) for representing the securities, cash US Dollars and Turkish Government Internal Loan (GIL) Performance Index (*30 day based*) for representing the risk free assets.

The daily return of the mentioned asset classes is calculated by equation (3.2).

$$R_i = b_{i_{IND}} F_{IND} + b_{i_{SERV}} F_{SERV} + b_{i_{FIN}} F_{FIN} + b_{i_{REST}} F_{REST} + b_{i_{TECH}} F_{TECH} + b_{i_{CASH}} F_{CASH} + b_{i_{GIL}} F_{GIL}, \tag{3.2}$$

Where $\underline{R_i}$ = The weekly (*monthly*) return (*%*) on "i" pension investment fund,

$b_{i_{IND}}$ = Factor sensitivity of ISE-Industrials index in "i" fund,

$b_{i_{SERV}}$ = Factor sensitivity of ISE- Service index in "i" fund,

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[1] Portfolio weights, which are obtained by Style Analysis, represent asset classes that have only statistical similarities with selected asset classes.

$b_{i_{FII}}$ = Factor sensitivity of ISE-Financials index in "i" fund,

$b_{i_{REST}}$ = Factor sensitivity of ISE- Real Estate index in "i" fund,

$b_{i_{TECH}}$ = Factor sensitivity of ISE- Real Estate index in "i" fund,

$b_{i_{CASH}}$ = Factor sensitivity of Cash US Dollars index in "i" fund,

$b_{i_{GIL}}$ = Factor sensitivity of Government Internal Loan Performance index in "i" fund,

F_{IND} = The weekly (*monthly*) return (*%*) of ISE-Industrials index,

F_{SERV} = The weekly (*monthly*) return *(%)* of ISE-Service index,

F_{FII} = The weekly (*monthly*) return (*%*) of ISE-Financials index,

F_{REST} = The weekly (*monthly*) return (*%*) of ISE-Real Estate index,

F_{TECH} = The weekly (*monthly*) return (*%*) of ISE-Real Estate index,

F_{CASH} = The weekly (*monthly*) return (*%*) of Cash US Dollar index,

F_{GIL} = The weekly (*monthly*) return (*%*) of Government Int. Loan Performance index,

e_i = Non-systematical residual on "i" fund.

It is known that for estimation of portfolio weights, Style Analysis is used to determine the best factor sensitivities (b_{ij}) which has the sum of 100% and lies between "0" and "1".

The best set of factor loadings is constituted of the minimum variance value of the residual (e_i) that variance is given in equation (3.3)

$$e_i = R_i - (b_{i_{IND}} F_{IND} + b_{i_{SERV}} F_{SERV} + b_{i_{FIN}} F_{FIN} + b_{i_{REST}} F_{REST} + b_{i_{TECH}} F_{TECH} + b_{i_{CASH}} F_{CASH} + b_{i_{GIL}} F_{GIL}). \quad (3.3)$$

The residual (e_i) has interpreted as the difference between the return on fund (R_i) and the return on a passive portfolio, which has the similar investment style ($b_{i1}F_1 + ... + b_{in}F_n$).

The aim of our study is to select the weights of asset classes, which minimizes the variance of the residual return, shown above. By using the Excel Solver Function, which involves quadratic programming technique, optimal weights of all factor coefficients (b_{ij}) are estimated. With another expression, factor coefficients, which minimize the target cell under the stating restrictions, are estimated by writing sum of residual squares equation (shown at equation 3.4) to target function cell on solver function

We determine an objective function (Equation 3.2) and constraints for our style analysis model. The objective function and the constraints regarding the style analysis, used for estimating the contents of the pension funds, are as follows:

$$MinSe_i^2 = \sum_{i=1}^{n} (R_i - (b_{i_{IND}} F_{IND} + b_{i_{SERV}} F_{SERV} + b_{i_{FIN}} F_{FIN} + \\ + b_{i_{REST}} F_{REST} + b_{i_{TECH}} F_{TECH} + b_{i_{CASH}} F_{CASH} + b_{i_{GIL}} F_{GIL}))^2 \quad (3.4)$$

s.t.

$$b_{i_{IND}} + b_{i_{SERV}} + b_{i_{FIN}} + b_{i_{REST}} + b_{i_{TECH}} + b_{i_{CASH}} + b_{i_{GIL}} = 1, \quad (3.5)$$

$$0 \le b_i \le 1. \quad (3.6)$$

Relating to 11 Retirement Investment Funds investigated within the study, by giving the arbitrary values to the factor loadings, as in equation (3.4), under restrictions in equation (3.5) and (3.6) weights, which minimizes the objective function, are estimated within the stating periods and obtained general and periodical style analysis results are shown below.

3.3. The Results of Investment Style Analysis

The results found out of the analyses realized for determining to Investment Styles of individual retirement funds, are going to be evaluated whether annual basis or monthly basis for revealing the periodical changes in investment philosophy.

a. Style Analyses on Annual Basis

Portfolio weights, which are estimated for November 2003-March 2006, are between lower and upper limits shown below and it can be stated that the mentioned funds have an investment style similar with average factor loading coefficients as illustrated in Table 3.

Table 3

General Investment Styles of the Pension Funds in November 2003-March 2006

Asset Class	Factor Loading Coefficient	
	Lower -Upper limit	Average
b INDUSTRIALS	0-0,320	0,132
b SERVİCES	0-0,364	0,064
b FINANCIALS	0-0,140	0,042
b REAL ESTATE	0-0,280	0,118
b TECHNOLOGY	0-0,267	0,041
b CASH (*US DOLLARS*)	0-0,076	0,001
b GOV. INT. LOAN PERFORMANCE (*GIL*)	0,131-0,899	0,606

In general evaluation, we may express that the GIL Performance Index has the maximum style weight in Individual Retirement Investment Funds as a risk free tool, as the risky assets. The ISE-Industrial and ISE-Real Estate indexes are invested primarily with a notable fund weight. Furthermore, it can be important to note that the mentioned funds have also been invested into ISE-Services, Tecnology and Financial indexes in a considerable weight. However, the Cash (*US Dollars*) investment may not be taken into consideration due to its minor portfolio weight.

As it can be realized from Table 3, the important issue of average portfolio weight of the GIL Performance Indexes for November 2003-March 2006. Besides ISE-Technology, Services and Financial Indexes are existed in 4-6% portion of the fund content. ISE-Industrial and Real Estate indexes have 12-13% of existing ratio in funds.

According to annual evaluation, an important point appearing is that great amount (*60.6%*) of portfolio weights in individual retirement funds is the fixed income investment tools. The main reason of this situation can be expressed as the pension funds have been newly founded in mentioned period so that, the portfolio managers may perceive some risks in the sector. However, the Turkish economy is more stable in comparison with previous periods and the pension fund portfolio managers have gradually diminished the weight of the risk free instruments and diversified their funds with the security assets.

From an investor's point of view, the individual retirement funds, which must be seen as a long term individual investment tool, must have a portfolio content that involves style factors providing long term sustainable returns instead of high returns in short run

We realized that, in the portolio structure of the Turkish pension funds, there is a significant amount of total average factor loading for ISE-Technology, Industrials and Services indexes acompanying with the ISE-Real Estate and Financials indexes. We have estimated that the factor coefficients of the mentioned sector indexes have increased after year 2004, since we consider these sectors to be well instituted and developed in the near future. Furtherly, due to the positive indications of the Turish economy, we may state that the foreign direct investments will tend to be in a better and sustainable situation so that, the pension fund investments would also be increased.

b. Periodical (*Rolling Period*) *Style Analysis*

If monthly portfolio weights of individual retirement funds calculated by periodical style analysis are investigated in average values, the investment styles of the pension funds are assumed to have similar distribution to Figure 1.
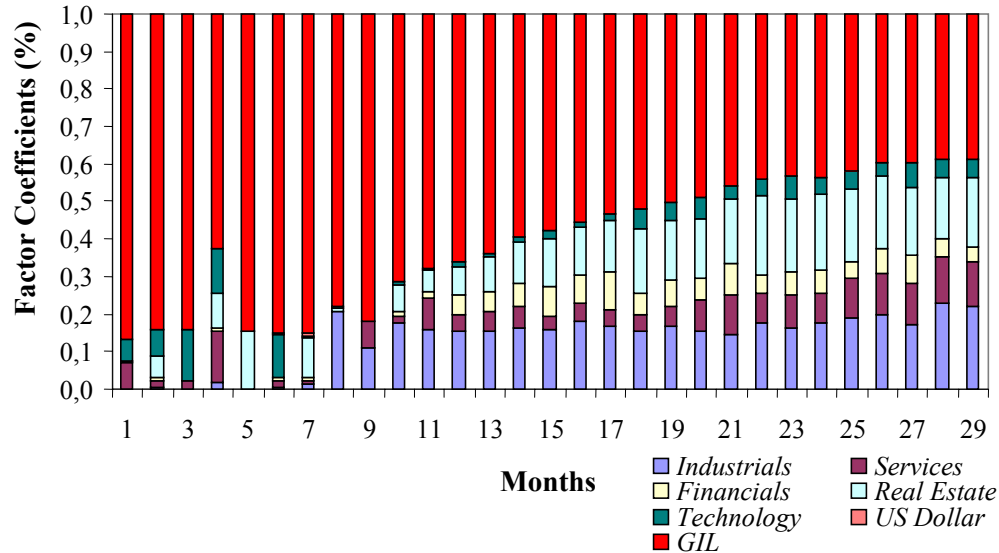

Fig. 1. The investigation of the variations in style weights of asset classes for Individual Retirement Funds in November 2003-March 2006

As can be seen from Figure 1, in general the factor loading coefficient of the GIL performance index in individual retirement funds is fluctuaing between 39%-85%. But the portfolio managers of the pension funds tend to invest into fixed income instrument by 80%-86% for the November 2003-April 2004 period whereas, this ratio is gradually reduced into 39% for the last 20 months.

If investment on ISE-Technology index is investigated; for November 2003-October 2004 period, but there is no factor loading for the November 2004-February 2005. In the remaining period, the factor loading of ISE-Tecnology index has differentially increased from 4% to 11%.

For ISE-Services index, it can be stated that there exist distinctive factor loadings (*17.17% and 22.30%*) in December 2003 and February 2004. Portfolio weight has been drawn back (*1.5%*) in April-May 2004 period and an important factor loading (*7.4% and 9%*) came out at July 2004 and November 2004. The loadings for December 2004-May 2005 variate between 3%-9%. For the remaining period, this index has a factor coefficient between 15%-19%.

As we investigate the investments on ISE-Real Estate index, we can state that there is an important factor loading (*24.12%*) on February 2004. However there is no style weight except March 2004 (*11.07%*). September 2004-February 2005 period has a decreasing factor loading (*15%-9%*) so that, the rest of the period shows an increasing trend (*18%-27%*). We also realize that the Turkish real estate sector has grown within last two years and conditionally the fund managers give a significant importance to this sector in their portfolios.

For evaluating the investments on ISE-Industrial index, it can be stated that there is not a regular factor loading for November 2003-April 2004 so that, we determine a single loading on February 2004 (*17.36%*). However, we realized that there is a significant increasing ISE-Industrial index investment for May 2004-March 2006 (*8%-28%*).

We have not realized a factor loading on ISE-Financial index until July 2004. But, this index shows an increasing trend (*2%-12%*) for the remaining period. However, we may state that the factor loading on Cash (*US Dollars*) is quite minor.

4. Results and Arguments

In this study, the portfolio weights of the 11 actively managed Turkish individual retirement funds have estimated and the investment styles of these funds have also been investigated. Our study aims to reveal the investment philosophies of Turkish individual retirement funds for the November 2003-March 2006 period. So as to estimate these investment philosophies, we used an estimation technique known as *"Style Analysis"* and carried out the analyses whether in annual or in periodical basis, then we estimated the portfolio weights of the Turkish pension funds.

As a result of Style Analysis, we observed that individual retirement funds tend to invest mainly in the risk free assets. However, we found out that depending on the positive indications and progresses in the Turkish economy, the fixed income (*risk free*) investments are gradually diminished for the last 20 months. Besides, the pension fund managers invest into the different securities in an increasing manner.

On the other hand, it is considered that individual retirement funds are assumed to be a long-term investment tool and would give a long term and adequate return instead of short term and high return. Depending on the positive macro-economical ambience, we expect the individual retirement funds would achieve in a risk holding structure. Due to the applied economical development programs in Turkey, we may state that the Turkish capital markets would become more effective in mid-term and fund sector will show an enlarging trend.

However, we realized that the Turkish pension fund sector is rapidly growing in terms of fund types and the total portfolio value of the pension funds currently achieved to USD 1.12 billion. The capacity of the Turkish pension fund sector enlarged in 37 times in comparison with November 2003.

According to records of the Turkish Treasury, the mutual and pension fund capacities are approximately USD 21.32 billion and USD 1.51 billion repectively. However, these funds have a critical importance for investment sector of Turkish economy and money markets. Turkish pension fund sector is assumed to achieve to $ 23.96 billion with 5.9% of GDP and 2.5-3.0 million participants in the mid-term. We anticipate the Turkish fund sector would be developed in a significant manner on the following years. And, in this point we foresee the individual retirement fund sector would support the investment sector.

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Annex 1

The Results of the Style Analyses Carried out on Yearly Basis (*November 2003-March 2006*) for Turkish Individual Retirement Funds
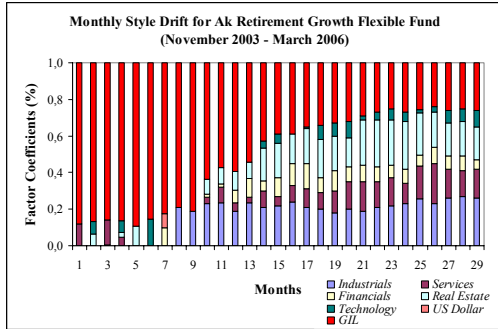
Pension Fund Name		Ak Retirement		*Anadolu Life & Retirement*		Ankara Retirement		Başak Retirement	
	Variables	Original Value	Final Value	Original Value	Final Value	Original Value	Final Value	Original Value	Final Value
Sum of Squared Residuals	ΣSe_i^2	341,552	119,068	672,450	341,446	461,098	173,241	530,552	201,447
Annual Factor Loadings	$b_{Industrials}$	0,100	0,1686	0,100	0,1597	0,100	0,1435	0,100	0,1082
	$b_{Services}$	0,100	0,0902	0,100	0,0937	0,100	0,0792	0,100	0,0292
	$b_{Financial}$	0,100	0,0576	0,100	0,0531	0,100	0,0444	0,100	0,0341
	$b_{Real\ Estate}$	0,100	0,1319	0,100	0,1497	0,100	0,1297	0,100	0,0944
	$b_{Technology}$	0,100	0,0368	0,100	0,0485	0,100	0,0424	0,100	0,0162
	$b_{Cash\ (\$)}$	0,200	0,0026	0,200	0,0000	0,200	0,0000	0,200	0,0000
	b_{GIL}	0,300	0,5143	0,300	0,4965	0,300	0,5618	0,300	0,7203
Pension Fund Name		Aviva (*Commercial Union*) Life & Retirement		Fortis (*Doğan*) Retirement		Garanti Retirement		Koç – Allianz Life & Retirement	
	Variables	Original Value	Final Value	Original Value	Final Value	Original Value	Final Value	Original Value	Final Value
Sum of Squared Residuals	ΣSe_i^2	211,489	97,155	158,211	48,567	410,643	335,644	348,645	201,175
Annual Factor Loadings	$b_{Industrials}$	0,100	0,0999	0,100	0,0979	0,100	0,1541	0,100	0,1003
	$b_{Services}$	0,100	0,0301	0,100	0,0239	0,100	0,0968	0,100	0,0374
	$b_{Financial}$	0,100	0,0287	0,100	0,0289	0,100	0,0490	0,100	0,0258
	$b_{Real\ Estate}$	0,100	0,0889	0,100	0,0994	0,100	0,1358	0,100	0,0898
	$b_{Technology}$	0,100	0,0381	0,100	0,0375	0,100	0,0508	0,100	0,0428
	$b_{Cash\ (\$)}$	0,200	0,0000	0,200	0,0000	0,200	0,0000	0,200	0,0013
	b_{GIL}	0,300	0,7202	0,300	0,7160	0,300	0,5213	0,300	0,7078

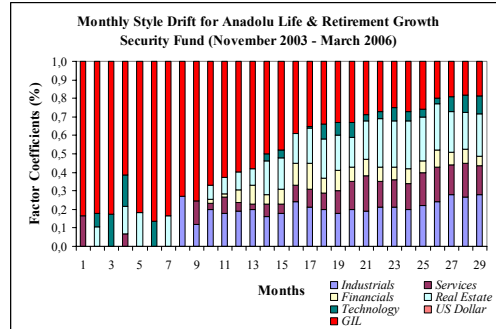| Pension Fund Name		Oyak Retirement		*Vakıf Retirement*		Yapı Kredi Retirement	
	Variables	Original Value	Final Value	Original Value	Final Value	Original Value	Final Value
Sum of Squared Residuals	ΣSe_i^2	242,327	99,031	368,839	182,124	510,268	241,032
Annual Factor Loadings	$b_{Industrials}$	0,100	0,0964	0,100	0,1613	0,100	0,1606
	$b_{Services}$	0,100	0,0330	0,100	0,1005	0,100	0,0873
	$b_{Financial}$	0,100	0,0266	0,100	0,0570	0,100	0,0517
	$b_{Real\ Estate}$	0,100	0,0910	0,100	0,1469	0,100	0,1371
	$b_{Technology}$	0,100	0,0364	0,100	0,0525	0,100	0,0515
	$b_{Cash\ (\$)}$	0,200	0,0000	0,200	0,0009	0,200	0,0011
	b_{GIL}	0,300	0,7192	0,300	0,4822	0,300	0,5113

Annex 2

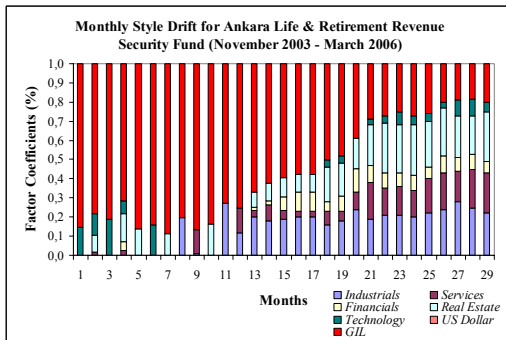The Periodical Style Analyses (Rolling Period) of the Turkish Individual Retirement Funds
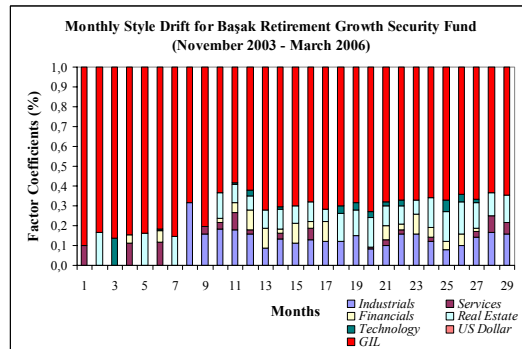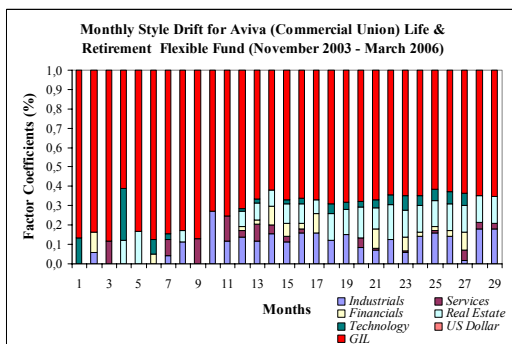
Ak Retirement

Monthly Style Drift for Ak Retirement Growth Flexible Fund
(November 2003 - March 2006)

Anadolu Life & Retirement

Monthly Style Drift for Anadolu Life & Retirement Growth
Security Fund (November 2003 - March 2006)

Ankara Retirement

Monthly Style Drift for Ankara Life & Retirement Revenue
Security Fund (November 2003 - March 2006)

Başak Retirement

Monthly Style Drift for Başak Retirement Growth Security Fund
(November 2003 - March 2006)

Aviva (Commercial Union) Life & Retirement

Monthly Style Drift for Aviva (Commercial Union) Life &
Retirement Flexible Fund (November 2003 - March 2006)

Fortis (Doğan) Retirement

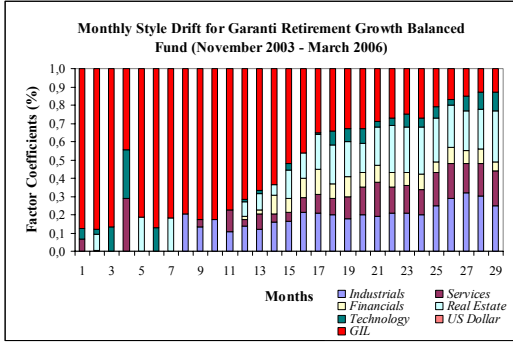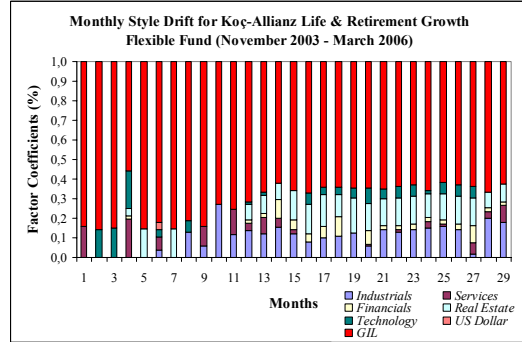Monthly Style Drift for Fortis (Doğan) Retirement Flexible
Fund (November 2003 - March 2006)

The Periodical Style Analyses (Rolling Period) of the Turkish Individual Retirement Funds (Cont'd)

Garanti Retirement

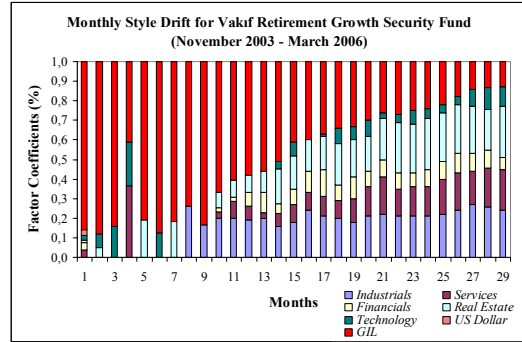Monthly Style Drift for Garanti Retirement Growth Balanced Fund (November 2003 - March 2006)

Koç – Allianz Life & Retirement

Monthly Style Drift for Koç-Allianz Life & Retirement Growth Flexible Fund (November 2003 - March 2006)

Oyak Retirement

Monthly Style Drift for Oyak Retirement Growth Balanced Fund (November 2003 - March 2006)

Vakıf Retirement

Monthly Style Drift for Vakıf Retirement Growth Security Fund (November 2003 - March 2006)

Yapı Kredi Retirement

Monthly Style Drift for Yapı Kredi Retirement Growth Security Fund (November 2003 - March 2006)