

Empirical Analysis of Risk Taking, Investment Efficiency and Diversification in Turkish Defined Contribution Pension Plans ¹

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Submitted by: 26.09.2022

Accepted by: 28.12.2022

Article Type: Research Article

Abstract

This article empirically studies the risk levels of individual pension portfolios, investment efficiency and also the diversification of the pension investors in Türkiye with a novel administrative data with the month-end snapshots in December 2019. To examine the risk taking behavior, investment efficiency and the level of diversification of the Turkish pension investors, we compute beta coefficients, total risk together with idiosyncratic and systematic risk, Sharpe Ratio, the loss from under-diversification of investors' pension portfolios. The results indicate that a substantial heterogeneity is evident in portfolio risk and the idiosyncratic risk contributes much more. We also find significant evidence on the inefficiency of investment and our results suggest that most of the Turkish pension investors design their portfolios inefficiently. The losses from under-diversification is widespread among Turkish investors as only a quarter of investors achieve risk reward profile better than the risk reward profile of the domestic benchmark equity index BIST 100.

Keywords: Pension Funds, Retirement, Risk, Investment Inefficiency, Under-diversification

Citation: Gülay, G., Korkmaz, E. and Ersan, Y. (2022). Empirical analysis of risk taking, investment efficiency and diversification in Turkish defined contribution pension plans. *Anadolu Üniversitesi Sosyal Bilimler Dergisi*, 22(4), 1313-1330.

¹ This study does not require ethics committee permission.

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Türkiye'deki Bireysel Emeklilik Sistemi Yatırımcı Portföylerinin Risk Alma, Yatırım Etkinliği ve Çeşitlendirmesinin Ampirik Analizi

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Başvuru Tarihi: 26.09.2022

Kabul Tarihi: 28.12.2022

Makale Türü: Araştırma Makalesi

Öz

Bu makale, bireysel emeklilik portföylerinin risk seviyelerini, yatırım verimliliğini ve ayrıca Türkiye'deki emeklilik yatırımcılarının çeşitlendirilmelerini Aralık 2019'da ay sonu anlık görüntülerini içeren yeni ve özel bir idari veri seti ile ampirik olarak incelemektedir. Türk emeklilik yatırımcılarının risk alma davranışını, yatırım verimliliğini ve çeşitlendirme seviyesini incelemek için beta katsayıları, toplam risk ile kendine özgü ve sistematik riskler Sharpe Rasyosu hesaplanmış, ayrıca yatırımcıların emeklilik portföylerini az çeşitlendirilmelerinden kaynaklanan zararları hesaplanmıştır. Sonuçlar, portföy riskinde önemli bir heterojenliğin belirgin olduğunu ve kendine özgü riskin çok daha fazla bulunduğunu göstermektedir. Ayrıca elde edilen sonuçlarda, yatırımların verimsizliğine dair önemli kanıtlar bulunmuştur. Türk emeklilik yatırımcılarının çoğunun portföylerini verimsiz olarak tasarladığı da gözlenmiştir. Yatırımcıların yalnızca dörtte biri, yerel gösterge sermaye endeksi BIST 100'ün risk ödül profilinden daha iyi bir risk ödül profili elde etmiştir. Bu sonuç da yetersiz çeşitlendirmeden kaynaklanan kayıpların Türk yatırımcılar arasında yaygın olduğunu göstermektedir.

Anahtar Kelimeler: Emeklilik Fonları, Emeklilik, Risk, Yatırım Etkinliği, Yetersiz Çeşitlendirme

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Introduction

The social security systems in many countries provide different services to their members including pensions in the retirement period plus disability and health care assistance. When certain conditions are met these retirement pensions usually pay a satisfactory amount of salary to their members after they leave their job. Although some countries have relative advantage over the others with higher birth rates, younger population and continuous and systematic immigrations, in general dropping birth rates, aging population, and increasing health expenses makes the sustainability of these services harder every year.

To improve social security systems, regulators make important changes in the legislations and improve these systems to secure adequacy and sustainability in pensions. The private pension systems as a support for the classic social security systems would support the future payments and strengthen the retirement plans (Ionescu, 2013). Pension funds are assets generated and managed by the pension companies, in accordance with the terms of the pension agreements to support retirement plans. While these assets are generated, the generators should take into consideration of each participant's individual risk allocation and fiduciary ownership for the purpose of managing the contributions.

This study for the first time in the literature analyzes the risk taking behavior, investment efficiency, and loss from under-diversification of individual pension portfolios in Türkiye in defined contribution pension plans. To measure the corresponding relations, we utilize an unusually administrative data set covering the universe of all individual retirement accounts in Türkiye. The concerning data set has information on portfolio details, choices of funds, and fund types. In addition, we exploit a kernel density approach to illustrate the statistical distribution of the outcomes we study. For a more rigorous examination, we divide our population into percentiles and also we compute Gini Coefficient for each outcome of interest to quantify the inequality.

Our results imply that a substantial heterogeneity arises regarding to total risk among individual pension portfolios. Additionally, total risk exposed to pension investors is disproportionately comes from idiosyncratic risks, suggesting the chief source of variation in portfolio risk is idiosyncratic risk rather than the systematic risk. After quantifying the related risk measures, results show that there is high level of inefficiency of investment in pension portfolios in Türkiye. This leads to a conclusion that a vast majority of Turkish pension investors are under-diversified, which results in sizable welfare losses.

This article contributes to various branches of the literature. Prior research has emphasized the role of various factors on equity participation such as the propensity of direct stock or equity fund ownerships. Particularly, a growing body of literature points out that equity ownership in stock market portfolios changes regarding to demographic factors, the level of wealth, preferences, and beliefs (Calvet et al. (2007, 2009, 2021), Guiso et al., 2013 and Gomes et al. 2021). Moreover, Egan et al. (2021) documents that income, education, and gender determine the equity fund ownership in pension plans of 401(k) in the United States. Consistently, Cole et al. (2014) and Black et al. (2018) report that level of risk taking and demographic features such as education is positively related in the United States and Norway, respectively. Our study contributes to the literature by providing the first evidence on the risk-taking in retirement accounts in a middle-income country, Türkiye. Besides, this article is the first describing the risk-taking of Turkish pension investors in the literature by using an administrative dataset spanning the universe of individual pension portfolios.

Pension Systems in the World and Türkiye

Two models dominate the financing of the social security systems in the financial world. One of these models is defined as the distribution model PAYGO (Pay-As-You-GO) and the other one is the funding model (Funding). The traditional pension systems which are called Pay-As-You-Go (sometimes abbreviated as PAYG) Pension Systems are accepted as linkage between generations where the working young generation pay premiums which in turn financing the pension payments and expenditures of the old people (Börsch-Supan et al. 2016).

The distribution model on the contrary is based on the premiums deducted from the wages of the employees and/or government support for the social security expenditures made within a certain period. This model is called distribution system and explained by the social state principle because the deductions made from the active members in the working life is distributed to the pension payments of the passive members who are mostly retired after working for a period of time having same deductions (İlhan, 2016). The premium-based distribution model, which constitutes the financing technique of the social security system in many countries today, is based on the Bismarckian compulsory insurance system. This system is the comprehensive plan on a national scale for the social security systems in most of the countries where it is based on the direct transfer of resources, at a predetermined income level, by the active insured who are working and paying premiums, to the passive insured and/or their dependent family members whose working life has ended due to old age and disability (Ergenekon, 2001).

The funding model, on the other hand, is an individual savings system based on the principle of accumulating the savings obtained during the active working period in order to compensate to some extent the income loss that individuals will experience in their old age. Bringing the savings into the economy by using them in the funds created, in other words, transferring resources to the country's investments, thus making a significant contribution to production, employment, the deepening and development of capital markets, and the increase of productivity through capital accumulation are also included in the objectives of economic policy (İlhan, 2016).

The pension plans can be divided into two from the insurance perspective. The first one is defined contribution (DC) and the other one is defined benefit (DB). The DC plan is a contribution plan where the employer and the employee invest recurrently into the employer's account. The final values of the plans determined by how much is invested in the accounts and how much is earned over investments (Bodie, 1990). A DB plan guarantees a payout based on a formula, often taking into account job history and income history. The amount that goes into a worker's retirement account is specified by a defined contribution DC plan, but the employee is given more control about whether to participate, and invest (Wang et al, 2014). Participants in DC plans might benefit from several appealing characteristics like portability and flexibility, but these benefits also come with a greater need to make informed decisions. Additionally, the programs give economists a desirable area to research saving behavior (Benartzi et al., 2007).

The pension funds have a significant impact on the financial markets globally with their investment strategies. They have an impact on the growth of financial innovation, the security prices and even return rates. Moreover, as the number of retired people increases in the last two decades, the performance of the pension funds and their investment strategies has become more important (Chang, 2010). Especially with the COVID-19 shock on the economies, the regulators now have to think more on the structural reforms to increase the strength of these security systems and improve their sustainability and resilience (OECD, 2020).

It is interesting that the history of the Turkish social state conventions backs to the Ottoman period where social assistance and social security services were provided with the understanding of the social state closely. The state was expected to provide services to its people and ensure their welfare and security in all respects. In the Ottoman Empire, social assistance and social security services were carried out through the state treasury, aids made in accordance with religious obligations (voluntary charity, zakat, fitre), guild organization or foundation institutions (Türkoğlu, 2013).

The social security system was very dispersed in the Ottoman Empire as there was not a workers class and usually based on the agricultural applications like guild organizations (lonca). The family care was the main source of health care and traditional charities were to care the poor people who needed care. In the last years of the Empire some charities like Darülaceze, Darüleytam and Hilal-i Ahmer (Kızılay - Red Crescent) were the active organizations in the social security system. In the last years of the Empire, like in Europe, the social security institutions in the professions and regions where wage labor developed began to emerge and mature in the modern sense. In the first years of the Republic of Türkiye although there has been no direct regulations in the social security laws some regulations like Law of Obligations (Borçlar Kanunu) which was enacted in 1926, has regulated the social security system indirectly. Later during 1930s some narrow-scoped regulations for the establishment of retirement and charity funds had been legislated. It was till 1945 from the proclamation of the Republic of Türkiye that a proper social security system laws had been activated. After this date successive laws about social security system followed each other till the end of the decade and social security institutions activated. In the following years especially in 1960s and 1970s new legislation had underlie the social security system of today (Güvercin, 2004).

When we reach 1990s, imbalance between the income and expenditures has been observed in the Turkish social security system. The asset/liability ratio of the social security institutions has fallen below 2 which are considered as a critical limit for the system (Yaşarlar, 2016). Balsızan (2016) suggest that the wrong economic activities and the populist politics about the retirement age has a very large effect on this actuary problems. To solve this issue the retirement age has changes twice in 1999 and 2008 and the whole system has been gathered up under one single social security system.

After the changes in the social security system regulations, a three-pronged pension system has been developed in Turkey, as in many other nations, when we examine the social security system's organizational structure. The public pension system, which is run by the Social Security Institution and in which working people must participate on a distribution basis under the management and control of the state, is the system's first leg. The second leg of the system consists of occupational pension programs used by a small number of employees, and the third leg consists of individual pension plans based on a voluntary basis (Kara et al., 2016).

In Türkiye, the individual pension system (BES) has been regulated by the "Personal Pension Savings and Investment System Law" dated 7 October 2001 and numbered 4632, considering it as a part of the reform made in the social security system with the law numbered 4447 in 1999 and as a complement to the public social security system. According to this law, the individual pension system, as a complement to the public social security system, is based on voluntary participation, in order to increase the welfare level by providing an additional income during the retirement period by directing the retirement savings of individuals to investment, to increase employment by creating long-term resources in the economy and to contribute to economic development. It is a system created on a determined contribution basis (Sezgin, 2015). Private Pension System (BES) is designed a special funding system which is introduced as a complement to the existing public social security system. Thus, the sharing of social risks by the private pension system has alleviated the financial burden of the public pension system (Erol, 2019). The micro purpose of this system, which is based

on voluntary participation; to enable individuals to make savings during their active working period and to allow these savings to be used when the need for additional income is felt during the retirement period. The purpose on the macro level; is to create long-term resources for the economy (Can, 2010).

The BES has been changed from a voluntary contribution to the automated contribution with a new law named “Law Amending the Law on the Private Pension Savings and Investment System” (Bireysel Emeklilik Tasarruf ve Yatırım Sistemi Kanunu’nda Değişiklik Yapılmasına Dair Kanun) which dates 10.08.2016 and numbered 6740. With this law, employees will be automatically included in a pension plan, if they wish, they can exit BES within two months. So in reality the contribution was automated but the pension investors would amend the pension system voluntarily in two months’ time without any payment or deduction (Uluçay et al., 2020). The last figures about the voluntary contribution and automatic participation as of July 2022 are presented in Table 1. As can be seen from the figures the number of the investors with automated contribution is more than two times of the investors in the voluntary system. However the total fund amount in the system is vice versa where voluntary contribution is more than the double of automated participation.

Table 1
Contribution based retirement data as of 31.07.2022

	Number of Only Contribution Fund Owners	Number of Agreements that Contains Only Contribution Retirement Fund	Total Fund Amount (TL) of Only Contribution Retirement Fund Investors
Voluntary Contribution System	1.508.484	2.252.754	34.650.565.019
Automatic Participation System	3.294.857	5.109.298	12.048.349.792
Total	4.366.542	7.362.052	44.087.981.350

Türkiye has a very young generation. According to the OECD Data the young generation percentage which is accepted as population under the age of 15 in the total population is highest in Türkiye amongst European Union (EU) with 22.6 % in 2021. The average of 27 countries in EU is 15% (OECD, 2022). This gives a huge responsibility to the governments and the regulators. Apart from the general aging or other demographic and economic reasons, there are several additional specific reasons for the Pension Funds should be introduced in Türkiye according to Insurance Association of Türkiye. One of the reasons is the insufficient income of the retired people. According to the sufficiency of the retirement wages Türkiye is 42nd among the 50 countries in year 2019. Only half of the people are taking retirement salary. Under these circumstances about 30% of the retired people continue to work because they need more income. These retired but working people mostly occupy the jobs available for the young generation in turn increasing the unemployed young people. The unemployment rate would be increased as well because the working retired people but unemployed young people. Another important reason is that the working population cannot save because of the low income levels. Therefore pension fund system especially with the automated participation helps to save in better conditions (Türkiye Sigorta Birliği, 2022).

Measuring the Performance of the Pension Portfolios

The performance of the pension portfolios is very important due to several reasons. The most important of all is to understand the need for government intervention with regulations. Governments should have a responsibility to guarantee that the earnings of the pension system are sufficient and satisfactory. Sometimes governments put some restrictions or rules in the asset allocation like limitations in minimum quantities or maximum quantities for some asset classes like equities or bonds. For example some Latin American countries put restrictions on foreign investment and interestingly limits on public bonds for not to give the opportunity to governments to finance budget deficits of the country through pension systems. Another example is the OECD Countries where some of them restrict equity investing while some other put minimum investment obligations on the contrary to Latin Americans on the government debt securities (World Bank, 2000).

Another important point for the regulators and pension administrators is that the pension funds should guarantee a satisfactory level of income for the potential retired working people which is the majority of the total population and this is getting harder every day because of the negative demographic developments and other reasons. Therefore, the effectively functioning and high performance of these funds becomes more important every day (Chovancova et al., 2000). Consequently to ensure adequacy, the study of pension compensation performance represents a basis for a thorough analysis and a review of the current pension systems (Yao, 2014). Moreover the economic importance of the pension systems for a country is not limited with the level of welfare of the retired generations. Through national social protection programs, governments redistribute up to one third of their Gross Domestic Product (GDP). Therefore as part of the social protection programs, the performance of the pension funds indirectly affects the budget of the government, cost and productivity of labor and the development and performance of the economy in general. To achieve these goals governments should create quantitative models that provide accurate assessment of the anticipated financial development and performance (Cichon et al., 1998).

Worldwide, for the pension regulatory bodies, governance and risk management matters are also becoming more and more important in pension rules. Regulators have been adopting a risk-based approach to pension supervision, following other financial sectors. This may be seen as a structured procedure intended to identify the most significant risks that each pension fund must manage as well as to evaluate the pension fund's management of those risks and the pension fund's financial sensitivity to future unfavorable experiences. International Organization of Pension Supervisors (IOPS)⁸ and the OECD suggest that fundamental good practices regarding pension fund risk management should be developed. It would be beneficial to members in the supervision of their pension systems, notwithstanding country-specific issues and supervisory methodologies. The subject of how to implement these good practices should consider country-specific variables and circumstances, even if they serve as a standard reference for all nations or jurisdictions. Investment with altering assets which is diversification, to measure performance with fair and efficient benchmarking, managing risks of markets plus liquidity are among defined investment and market risk control good practices of IOPS (OECD/IOPS, 2011) The pension funds also have some positive effects on the stock market volatility. Some studies report a significant negative correlation between pension funds' equity holdings and stock market volatility in OECD economies (Thomas et al., 2013).

Data

We make use of a novel and extraordinarily detailed administrative data collection that contains over 11 million observations and spans the entire universe of all defined contribution individual pension accounts. The

⁸ Organization of Pension Supervisors (IOPS) is established in July 2004 by Organisation for Economic Co-operation and Development (OECD) and the International Network of Pension Regulators and Supervisors (INPRS) to increase level of quality and effectivity of the private pension systems worldwide.

relevant administrative data set is supplied by the Borsa Istanbul Group and contains details on account balances, portfolio details with fund types, pension funds and their numbers, the composition of each pension fund by financial asset classes, the rate of return of each fund over time, and trades as of the month-end snapshot of December 2019. The dataset is free of any misreporting or mismeasurement since it encompasses the whole population of pension investors with defined contribution pension plans. As a result, in our context, selection bias is not a problem. Investors born in the sample, which includes both years, between 1930 and 2001.

The first outcome of interest is the beta coefficients of pension portfolios. To calculate beta coefficients, we use monthly returns of pension portfolios and exploit the domestic equity benchmark index which is the Borsa Istanbul 100 Index (BIST 100). We subsequently focus on risk measures which are total risk, its decomposition by systematic and idiosyncratic risk. Following Calvet et al. (2007), we compute total risk through the standard deviation of monthly excess return of portfolios and denote the total risk by σ_i for investor i . Then, we decompose the total risk into systematic risk $|\beta_i| \sigma_B$ where σ_B is the total risk of BIST 100 and idiosyncratic risk $\sigma_{i,i}$. The relevant decomposition relies on the following formula:

$$\sigma_i^2 = \beta_i^2 \sigma_B^2 + \sigma_{i,i}^2 \dots \dots \dots (1)$$

Moreover, dividing idiosyncratic risk by total risk provides us the last measure of risk which is the share of idiosyncratic risk with the total risk.

We next consider the Sharpe Ratio which measures the performance of the pension investment compared to the risk free interest after adjusting for its risk. Sharpe Ratio describes the additional amount of return that a pension investor receives per unit of increase in risk (Sharpe, 1966). To calculate the Sharpe Ratios we utilize monthly excess returns of pension portfolios in which the risk-free rate is the monthly returns of BISTKYD 91 Indices which represents the most liquid risk-free assets. The final variable we are interested in is the loss from under diversification. To quantify the losses arising from inadequate diversification, we adapt the strategy proposed by Calvet et al. (2007, 2009). The related strategy compares the Sharpe Ratio of pension portfolios with the Sharpe Ratio of BIST100 Portfolio and we use the monthly excess returns of both portfolios. The formula describing the loss from under-diversification is as follows:

$$RSRL_i = 1 - \frac{S_i}{S_B} \dots \dots \dots (2)$$

where S_i is the Sharpe Ratio of investor i and S_B is the Sharpe Ratio of BIST100 Portfolio. Negative values mean that an investor is diversified enough relative to the benchmark equity index.

Methodology and Results

We examine the risk behavior of pension investors, the efficiency of investment as measured by Sharpe Ratio, and the loss from insufficient diversification by dividing the population into percentiles. To do this, for each outcome of interest we focus on 25th, 50th, 75th, 95th, and 99th percentiles. In addition, we present the average and Gini coefficient of each outcome to unfold how much inequality takes place in the corresponding outcomes. As a result, this exercise allows us to demonstrate for the first time in the literature the variation in risk behavior of pension investors, their level of investment efficiency, and their own level of diversification in Türkiye. Finally, we estimate Kernel distribution of each variable we are studying, which provides us an opportunity to plot distribution of concerning outcomes to explore the heterogeneity of investor's portfolios. We proceed our analysis with displaying the distributional features of portfolio beta coefficients. That we present the volatility of pension portfolios compared to the systematic risk of the entire market. We also note that the benchmark for the entire market is Borsa Istanbul 100 Index (BIST100) which is the domestic benchmark equity index in Türkiye. Figure 1 implies that almost all investors have less volatile portfolios than the market portfolio. Nevertheless, the pension portfolios have substantial variation in the distribution of the beta coefficients.

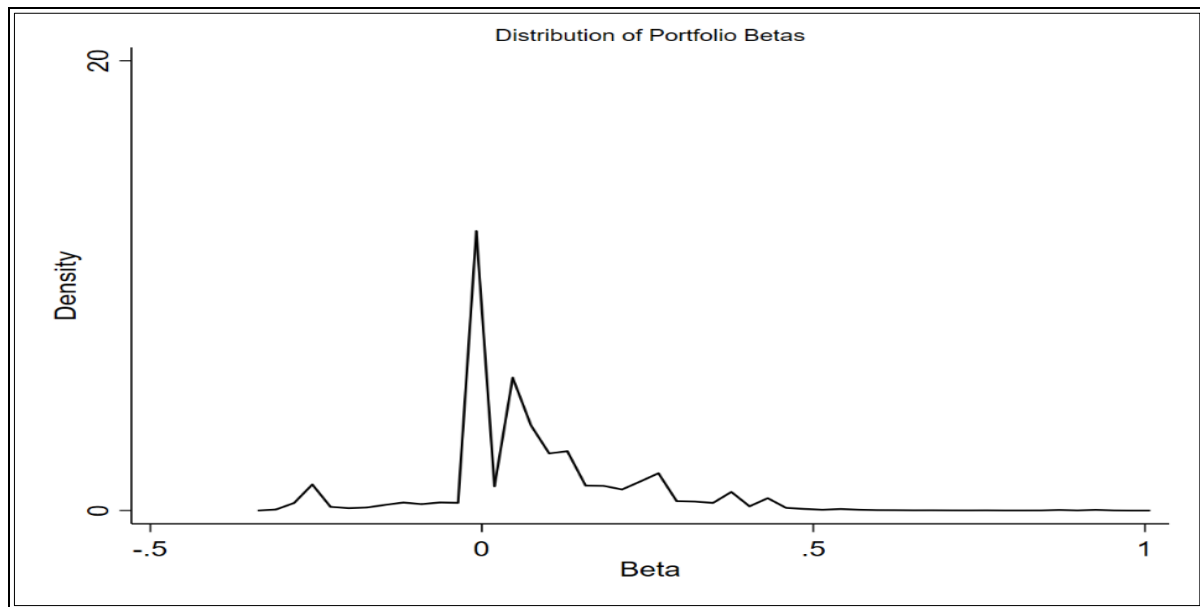


Figure1. Distribution of Portfolio Betas

In Figure 2, we illustrate the distribution of the total risk as computed by using the monthly excess returns of individual pension portfolios. It might be the fact that most of the investors have moderate level of total risk. Moreover, we decompose the total risk into systematic and idiosyncratic risks. Systematic risk and idiosyncratic risk also experience strong dispersion as depicted in Figure 3 and 4. Overall, the risk of individual pension portfolios vary to a considerable extent.

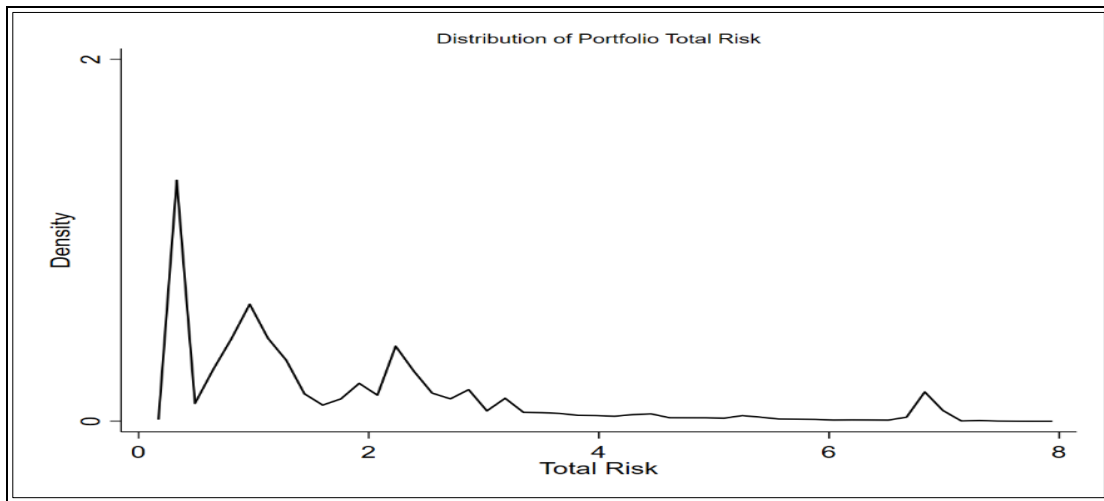


Figure 2. Distribution of Portfolio Total Risk

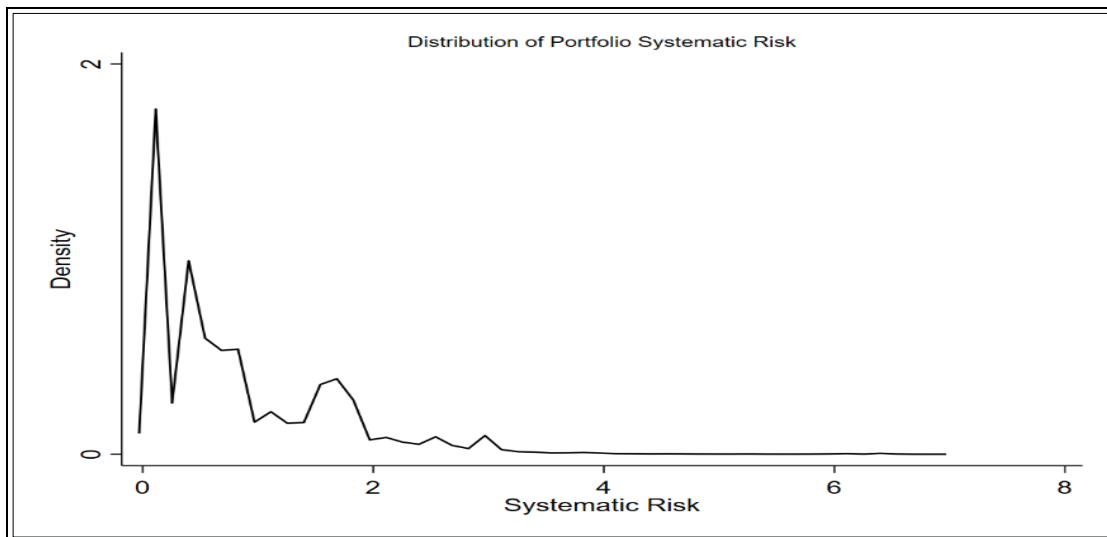


Figure 3. Distribution of Portfolio Systematic Risk

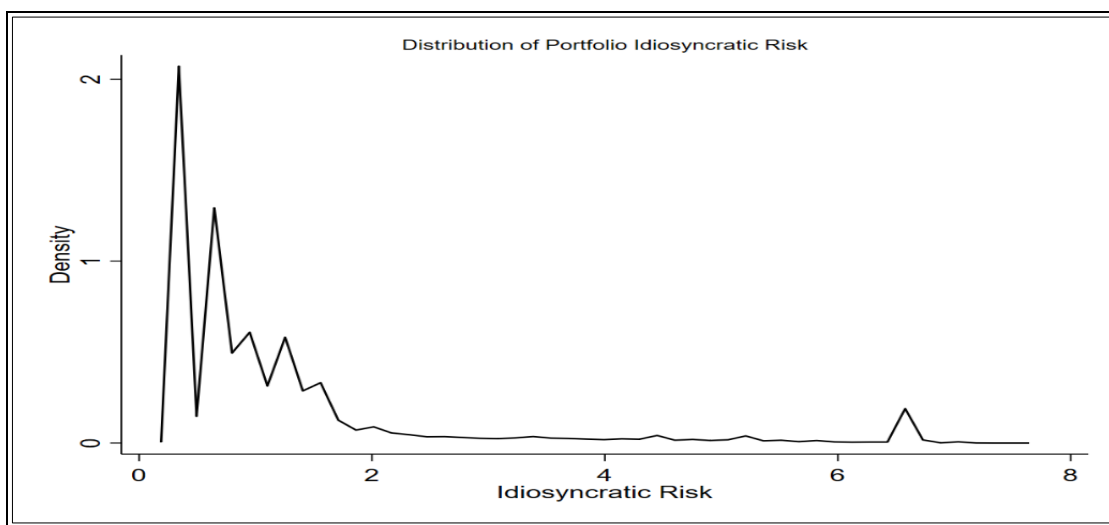


Figure 4. Distribution of Portfolio Idiosyncratic Risk

We subsequently measure the efficiency of investment using Sharpe Ratios of individual pension portfolios. In Figure 5, we estimate the Kernel Density of Sharpe Ratios and also plot the Sharpe Ratio of the domestic equity benchmark index BIST 100 with the maroon color dashed vertical line. Considering the figure, a substantial variation is evident. Broadly, estimates show that half of the investors have lower Sharpe Ratio than the domestic equity benchmark index BIST 100 has.

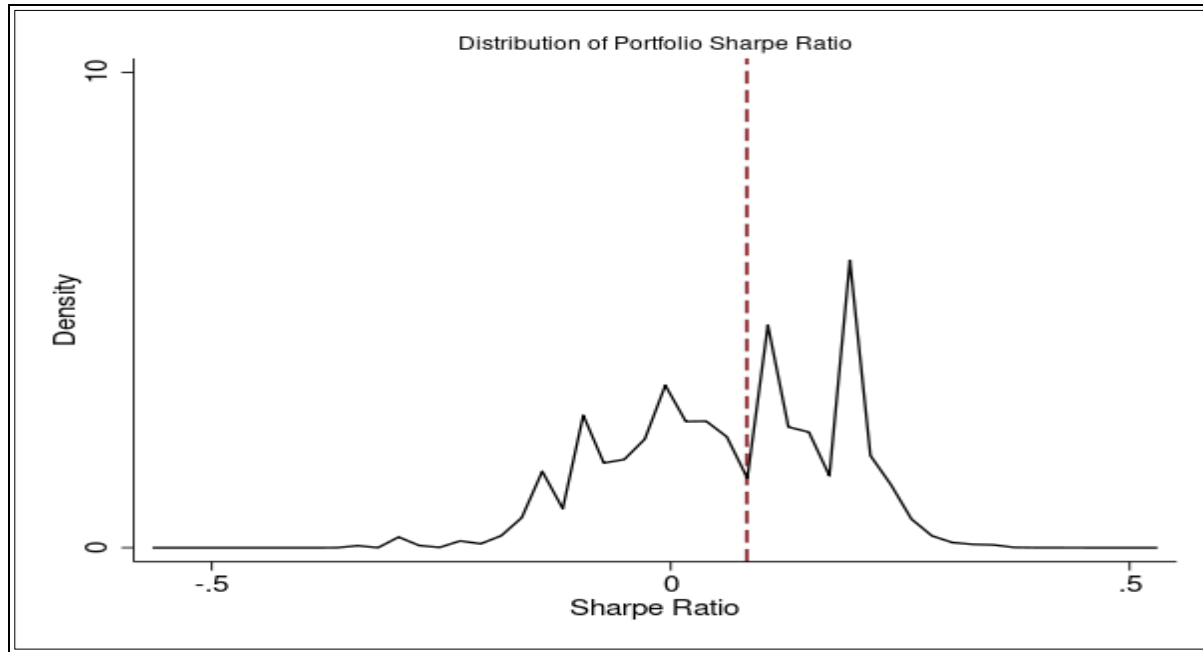


Figure 5. Distribution of Portfolio Sharpe Ratio

We further illustrate the losses arising from under-diversification. To quantify the relevant loss, following Calvet et al. (2007, 2009) we compare the Sharpe Ratio of individual pension portfolios with the Sharpe Ratio of domestic equity portfolio BIST 100. Figure 6 indicates extreme variation in the losses from under-diversification. Half of the investors are diversified enough relative to the benchmark index. Altogether, the level of diversification experiences vast amount of heterogeneity.

In order for our analysis to be rigorous, we present the percentile values of the variables we are interested in. Table 2 provides the mean, percentiles and the Gini Coefficients for the corresponding variables. In Row 1 we document the details for the portfolio beta coefficients which show that the average beta is 0.09. This implies that average investor's portfolio has almost zero correlation with the benchmark equity portfolio as well as the median investor's portfolio. Moreover, our results indicate that 99% of the investors have beta lower than 1, emphasizing concerning portfolios are less volatile than benchmark equity index BIST 100. The distribution of the beta coefficient is unevenly distributed as the Gini Coefficient value of 0.42 shows.

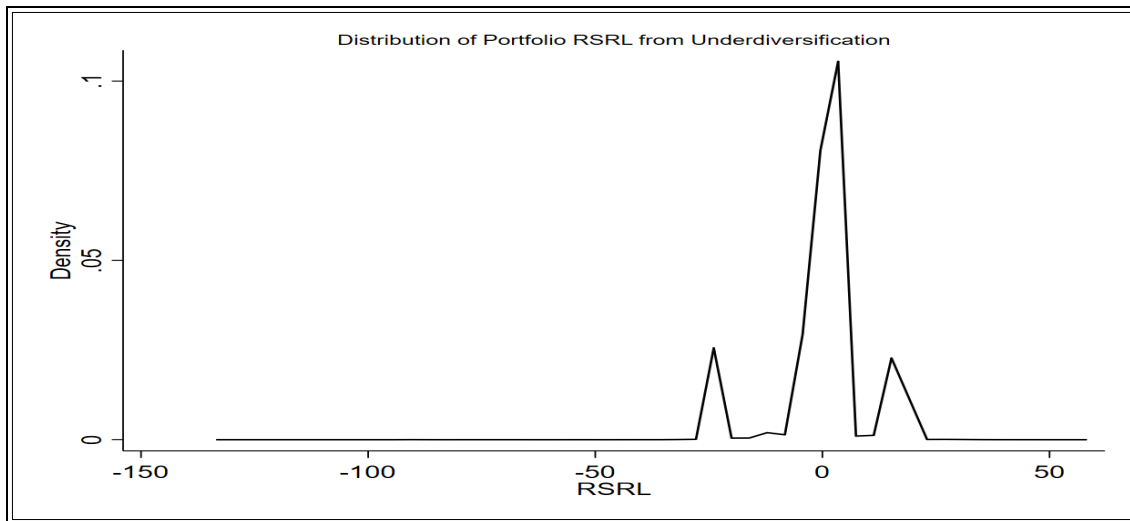


Figure 6. Distribution of Portfolio Sharpe Ratio

In Row 2, 3, 4 and 5, we present total risk, idiosyncratic risk, the systematic risk and the percentage of the idiosyncratic risk in total risk, respectively. Results show that there is substantial variation in total risk and the mean investor portfolio has the total risk of 1.72%. Also the total risk has the Gini Coefficient of 0.45%, which is strong inequality. We subsequently investigate components of total risk in Row 3 and Row 4. Computations show that the contribution of the idiosyncratic factors are more dominant than systematic elements. To quantify that fact, we report the share of the idiosyncratic risk in Row 5 showing indeed higher share of total risk comes from the idiosyncrasy. All in all, despite the variation in total risk we find evidence that the idiosyncratic risks weigh more.

Table 2

Cross Sectional Distribution

Variable	Mean	Percentile						Gini Coefficient
		25th	50th	75th	90th	95th	99th	
Portfolio Beta Coefficient	0.09	-0.01	0.07	0.17	0.27	0.36	0.47	0.42
Total Risk	1.72	0.72	1.17	2.33	3.53	5.26	6.86	0.45
Idiosyncratic Risk	1.36	0.58	0.88	1.44	3.02	5.09	6.64	0.46
Systematic Risk	0.87	0.23	0.60	1.38	1.90	2.53	3.29	0.50
Share of Idiosyncratic Risk (%)	69.17	52.67	73.41	93.88	97.14	99.03	99.96	0.21
Sharpe Ratio	0.06	-0.03	0.06	0.16	0.21	0.23	0.28	0.34
Loss from Under-diversification	0.21	-2.20	0.87	2.81	4.67	11.92	20.74	0.55

The efficiency of investment might be considered low as presented in the Row 6. The mean Sharpe Ratio of portfolios is extremely small, implying that for every one unit of risk taken results in only 0.06 unit of return. Nearly all investors have portfolios with Sharpe Ratios lower than 1. Thus, investment inefficiency is a common problem. Lastly, the Sharpe Ratios experience unequal distribution with the Gini Coefficient of 0.34.

As we point out that the risks substantially vary, we further examine whether investors are prone to losses from inadequate diversification. Accordingly, last row of Table 2 suggests that the mean loss from under-diversification is 21%. The upper 25th percentile investors are diversified enough to outperform significantly the equity benchmark portfolio whereas either median or higher percentiles experience losses from under-diversification. The losses are extremely unequal as shown in the last column of Table 2. Overall, investors bear heterogeneous losses from under-diversification.

Conclusion

This study is an empirical examination of pension investors' risk taking behavior, investment efficiency and the losses arising from under-diversification in DC pension plans in Türkiye. To quantify the concerning measures, we employ a comprehensive and unusually detailed administrative data set covering the entire universe of individual retirement accounts and enabling us to study rigorously the risk profiles and under-diversification. Our results show that the risk taking of investors have substantial variation, investment inefficiency is a common problem, and under-diversification is spread in pension portfolios.

We find evidence that the way pension portfolios move with the market varies considerably as the Gini Coefficient of portfolio's beta coefficient is 0.42. Furthermore, the former finding is expressed in the total risk. The decomposition of the total risk into the idiosyncratic and systematic risk implies that idiosyncratic risk is the primary source of the total risk. After revealing the risk measures of pension portfolios, we find significant evidence on the inefficiency of investment as measured by Sharpe Ratios common among Turkish investors. Lastly, most of the Turkish pension investors tend to be under-diversified, which leads to substantial welfare losses. Thus, our results emphasize a vital role for policy which might address the challenge stemming from inadequate chronic diversification in pension portfolios.

Our results suggest that a simple solution to under-diversification might be to design pension funds that replicate the domestic equity index BIST 100. This sort of a newly designed pension fund is perhaps able to avoid the losses from the under-diversification and offers better investment efficiency. Finally, policy makers can lower the risks borne by the investors through newly designed funds therefore increasing the number of funds taking into account of those corresponding considerations might be a policy implication of our findings.

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Genişletilmiş Özet

Amaç

Birçok ülkedeki sosyal güvenlik sistemleri, emeklilik dönemindeki emekli maaşları ile engellilik ve sağlık yardımı dâhil olmak üzere üyelerine farklı hizmetler sunmaktadır. Belirli koşullar sağlandığında bu emeklilik maaşları, üyelerine işten ayrıldıktan sonra genellikle tatmin edici bir maaş ödemektedirler. Bazı ülkeler daha yüksek doğum oranları, daha genç nüfus ve sürekli ve sistematik göçler ile diğerlerine göre görece avantajlı olsa da genel olarak düşen doğum oranları, yaşlanan nüfus ve artan sağlık harcamaları bu hizmetlerin sürdürülebilirliğini her yıl daha da zorlaştırmaktadır. Bu nedenle düzenleyiciler, sosyal güvenlik sistemlerini iyileştirmek için mevzuatlarda önemli değişiklikler yapmakta ve bu sistemleri geliştirerek emeklilikte yeterliliği ve sürdürülebilirliği güvence altına alabilmek için çeşitli önlemler almaktadır. Klasik sosyal güvenlik sistemlerine destek olarak bireysel emeklilik sistemleri ise gelecekteki ödemeleri destekleyecek ve emeklilik planlarını güçlendirecektir. Emeklilik fonları, emeklilik planlarını desteklemek için emeklilik sözleşmelerinin şartlarına uygun olarak emeklilik şirketleri tarafından oluşturulan ve yönetilen varlıklardır. Bu varlıklar oluşturulurken, üreticiler, katkıları yönetmek amacıyla her bir katılımcının bireysel risk dağılımını ve güvene dayalı mülkiyeti dikkate almalıdır.

Tasarım ve Yöntem

Yapılan çalışmada emeklilik yatırımcılarının genel olarak risk davranışları, yatırım verimlilikleri ve yetersiz çeşitlendirmeden kaynaklanan kayıpları incelenmiştir. Bu analizlerde tüm piyasa için karşılaştırmalı ölçüt olarak Türkiye'deki yurtiçi gösterge hisse senedi endeksi olan Borsa İstanbul 100 Endeksi - BİST100 kabul edilmiştir. Portföylerin her birinin beta katsayısı hesaplanmış ve böylece gösterge endeks ölçütüne göre nasıl bir hareket gerçekleştirdikleri belirlenmiştir. Bu çerçevede yapılan analizlere göre neredeyse tüm yatırımcı portföylerinin piyasa göstergesi endekse göre daha az bir volatiliteye sahip olduğu anlaşılmaktadır. Yapılan bir diğer analizde ise bireysel emeklilik fonlarının aylık bazda getiri fazlalıklarını ölçülerek toplam risk dağılımı belirlenmiştir. Genel olarak tüm yatırımcıların orta seviyede risk aldıkları anlaşılmaktadır. Bu analizlere ek olarak toplam risk, sistematik ve özel durum riskleri olarak da ikiye ayrılmıştır.

Emeklilik fonları, yatırım stratejileriyle küresel ölçekte finansal piyasalar üzerinde önemli bir etkiye sahiptir. Finansal inovasyonun büyümesi, güvenlik fiyatları ve hatta getiri oranları üzerinde etkileri vardır. Ayrıca son yirmi yılda emekli sayısı arttıkça emeklilik fonlarının performansı ve yatırım stratejileri daha da önemli hale gelmiştir. Özellikle ekonomiler üzerindeki COVID-19 şokuyla birlikte, düzenleyiciler artık bu güvenlik sistemlerinin gücünü artırmak ve sürdürülebilirliklerini ve dayanıklılıklarını geliştirmek için yapısal reformlar üzerinde daha fazla düşünmek zorundalar.

Literatürde bir ilk olan bu çalışma, Türkiye'de bireysel emeklilik portföylerinin tanımlı katkılı emeklilik planlarında risk alma davranışı, yatırım verimliliği ve eksik çeşitlendirmeden kaynaklanan kayıpları analiz etmektedir. Bu analizleri gerçekleştirebilmek amacıyla Borsa İstanbul Grubu Şirketleri arasında bulunan Takasbank'tan alınan ve Türkiye'deki tüm bireysel emeklilik hesaplarının evrenini kapsayan çok özel bir veri seti kullanılmaktadır. Bu veri setinde yatırımcıların portföy detayları, fon seçenekleri ve fon türleri hakkında bilgiler bulunmaktadır. Ayrıca, incelediğimiz sonuçların istatistiksel dağılımını göstermek için bir çekirdek yoğunluğu tahmini aracı olan Kernel yoğunluk analizi yaklaşımından yararlanılmıştır. Daha titiz bir inceleme için popülasyonumuzu çeşitli yüzdelerle bölerek analizlerin çok daha hassas gerçekleştirilmesi amaçlanmıştır. Ayrıca her bir dilimin gelir eşitsizliklerini ölçmek amacıyla da her analiz için Gini Katsayısı hesaplanmış ve yorumlanmıştır.

Bulgular

Bireysel emeklilik yatırım fonlarının yatırım etkinliğinin analizini de Sharpe Oranı kullanılarak gerçekleştirilmiştir. Yapılan hesaplamalarda yatırım verimliliği toplam veri seti yüzdeler dilimlere bölünerek incelenmiştir. Yetersiz çeşitlendirmeden kaynaklanan kayıpları analiz etmek için, ilgili her sonucun 25., 50., 75., 95. ve 99. yüzdeler dilimlere odaklanarak elde edilen sonuçlar ışığında yorumlanmıştır. Bunlara ek olarak, elde edilen sonuçlarda ne kadar eşitsizlik olduğunu ortaya çıkarmak için her sonucun ortalaması ve Gini katsayısı hesaplanmaktadır.

Portföyün beta katsayısının Gini Katsayısı 0,42 olması emeklilik portföylerinin piyasa ile birlikte hareket etme şeklinin önemli ölçüde değiştiğini göstermektedir. Toplam riskin kendine özgü ve sistematik riske ayrıştırılması ile gerçekleştirilen analiz sonrasında; kendine özgü riskin toplam riskin birincil kaynağı olduğu anlaşılmaktadır. Emeklilik portföylerinin risk ölçülerini analiz ettikten sonra, Sharpe Oranlarını hesaplayarak gerçekleştirdiğimiz analizlerde, Türk yatırımcılarının yaptıkları yatırımların anlamlı bir ölçüde verimsiz olduğu belirlenmiştir. Yapılan analizlerde son olarak, Türk emeklilik yatırımcılarının çoğunun yetersiz çeşitlendirme eğiliminde olduğu, bunun da önemli kayıplara yol açtığı belirlenmektedir.

Sonuçlarımız, bireysel emeklilik portföyleri arasında toplam risk açısından önemli bir heterojenliğin ortaya çıktığını göstermektedir. Buna ek olarak, emeklilik yatırımcılarının maruz kaldığı toplam riskin orantısız bir şekilde kendine özgü risklerden kaynaklanmaktadır, bu da portföy riskindeki ana değişkenlik kaynağının sistematik riskten ziyade özel risk olduğunu düşündürmektedir. İlgili risk önlemlerinin sayısallaştırılmasından sonra sonuçlar, Türkiye'de emeklilik portföylerine yapılan yatırımların yüksek düzeyde verimsiz olduğunu göstermektedir. Bu aşamada, Türk emeklilik yatırımcılarının büyük çoğunluğunun yetersiz çeşitlendirme yaptığını ve bunun da büyük refah kayıplarına yol açtığı yorumlanmaktadır.

Sınırlılıklar

Genel olarak verimlilik konusunda yapılan analizlerde yatırımın verimliliğinin düşük olduğu varsayılabilir. Portföylerin ortalama Sharpe Oranları son derece küçük hesaplanmıştır. Bu da alınan her bir risk birimi için yalnızca 0,06 birim getiri ile sonuçlandığını gösterir. Hemen hemen tüm yatırımcıların Sharpe Oranları 1'den düşük olan portföyleri vardır. Bu nedenle, yatırım verimsizliği yaygın bir sorundur. Son olarak, Sharpe Oranları, 0,34'lük Gini Katsayısı ile eşit olmayan bir dağılım gerçekleştirmekteydi.

Risklerin önemli ölçüde farklılık gösterdiğine işaret ettiğimizden, yatırımcıların yetersiz çeşitlendirmeden kaynaklanan kayıplara eğilimli olup olmadığını ayrıca inceliyoruz. Buna göre, eksik çeşitlendirmeden kaynaklanan ortalama kaybın %21 olduğunu hesaplanmıştır. Üst yüzde 25'lik yatırımcılar, öz sermaye kıyaslama portföyünden önemli ölçüde daha iyi performans gösterecek kadar çeşitlendirilirken, medyan veya daha yüksek yüzdeler dilimler, yetersiz çeşitlendirmeden zarar görür. Gösterildiği gibi kayıplar son derece eşitsizdir. Genel olarak, yatırımcılar eksik çeşitlendirmeden kaynaklanan heterojen kayıplara maruz kalmaktadır.

Öneriler (Teorik, Uygulama ve Sosyal)

Sonuçlarımız, yetersiz çeşitlendirmeye basit bir çözümün, BIST 100 yerli sermaye endeksini kopyalayan emeklilik fonları tasarlamak olabileceğini göstermektedir. Bu şekilde yeniden tasarlanmış emeklilik fonlarının yetersiz çeşitlendirmeden kaynaklanan kayıpları önleyebileceği ve daha iyi yatırım verimliliğine imkan sağlayacağı düşünülmektedir. Son olarak, elde edilen sonuçlardan yola çıkarak yukarıdaki bulgular ışığında fonların yeniden tasarlanarak yatırımcıların üstlendiği riskleri azaltabilmesinin mümkün olduğu düşünülmektedir.

Emeklilik portföylerinin performansı birçok nedenden dolayı çok önemlidir. Hepsinden önemlisi, düzenlemelere devlet müdahalesinin gerekliliğini anlamaktır. Hükümetler, emeklilik sisteminin kazançlarının yeterli ve tatmin edici olduğunu garanti etme sorumluluğuna sahip olmalıdır. Bazen hükümetler, hisse senetleri veya tahviller gibi bazı varlık sınıfları için minimum miktarlarda veya maksimum miktarlarda sınırlamalar gibi varlık tahsisine bazı kısıtlamalar veya kurallar koyar. Örneğin bazı Latin Amerika ülkeleri, hükümetlere ülkenin bütçe açıklarını emeklilik sistemleri aracılığıyla finanse etme fırsatı vermemek için yabancı yatırımlara kısıtlamalar ve ilginç bir şekilde kamu tahvillerine sınırlamalar getiriyor. Diğer bir örnek ise, devlet iç borçlanma senetlerine Latin Amerikalıların aksine, bir kısmının hisse senedi yatırımını kısıtlarken bir kısmının asgari yatırım yükümlülüğü koyduğu OECD Ülkeleridir.

Düzenleyiciler ve emeklilik yöneticileri için önemli olan bir diğer nokta da, emeklilik fonlarının, toplam nüfusun çoğunluğunu oluşturan potansiyel emekli çalışanlar için tatmin edici bir gelir düzeyini garanti etmesi gerektiğidir. Bu gelir düzeyinin olumsuz demografik gelişmeler ve diğer nedenlerle her geçen gün daha da zorlaşmaktadır. Bu nedenle, bu fonların etkin bir şekilde çalışması ve yüksek performansı her geçen gün daha da önem kazanmaktadır.

Sonuç olarak, yeterliliği sağlamak için, emeklilik tazminat performansı çalışması, mevcut emeklilik sistemlerinin kapsamlı bir analizi ve gözden geçirilmesi için bir temel oluşturacaktır. Ayrıca emeklilik sistemlerinin bir ülke için ekonomik önemi, emekli olan nesillerin refah düzeyi ile sınırlı değildir. Ulusal sosyal koruma programları aracılığıyla, hükümetler Gayri Safi Yurtiçi Hasıllarının (GSYİH) üçte birine kadar yeniden dağıtırlar. Bu nedenle, sosyal koruma programları kapsamında emeklilik fonlarının performansı dolaylı olarak devlet bütçesini, emeğin maliyet ve verimliliğini ve genel olarak ekonominin gelişimini ve performansını etkiler. Bu hedeflere ulaşmak için hükümetler, beklenen finansal gelişme ve performansın doğru bir şekilde değerlendirilmesini sağlayan nicel modeller oluşturmalıdır.

Özgün Değer

Bu çalışmada, Türkiye'de emeklilik yatırımcılarının risk davranışlarındaki değişimi, yatırım verimlilik düzeylerini ve kendi çeşitlendirme düzeylerini literatürde ilk kez ortaya koymamıza olanak sağlamaktadır. Aynı zamanda yatırımcı portföylerinin heterojenliğini keşfetmek için ilgili sonuçların dağılımını çizme fırsatı veren, üzerinde çalıştığımız her değişkenin Çekirdek dağılımını tahmin ediyoruz.

Bu makale literatürün çeşitli dallarına katkıda bulunmaktadır. Önceki araştırmalar, doğrudan hisse senedi veya hisse senedi fon sahipliği eğilimi gibi hisse katılımı üzerindeki çeşitli faktörlerin rolünü vurgulamaktadır. Son dönemde artan bir literatür ise hisse senedi piyasası portföylerinde hisse sahipliğinin demografik faktörlere, zenginlik düzeyine, tercihlere ve inançlara bağlı olarak değiştiğine işaret etmektedir. Çalışmamız, orta gelirli bir ülke olan Türkiye'de emeklilik hesaplarında risk alma konusunda ilk kanıtları sunarak literatüre katkıda bulunmaktadır. Ayrıca bu makale, bireysel emeklilik portföyleri evrenini kapsayan bir idari veri seti kullanarak literatürde Türk emeklilik yatırımcılarının nasıl bir risk alma eğilimine sahip olduğunu açıklayan ilk çalışmadır.

Araştırmacı Katkısı: Güzhan GÜLAY (%35), Korkmaz ERGUN (%35), Yaşar ERSAN (30).