Determination of the Criteria Preferred in Entering Private Pension System by Analytical Hierarchy Process

Bireysel Emeklilik Sistemine Girişte Önem Verilen Kriterlerin Tercih Sıralamasının Analitik Hiyerarşi Süreci ile Belirlenmesi

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Abstract

Private pension system companies do significant work to gain more customers. One part of the significant work is to uncover customers' reasons for choosing other companies and to review the services they offer with the effect of competition. At this point, determining the order of importance of criteria that customers consider upon entrance to private pension system is important for companies. In this study, a survey was conducted to identify the variables and their importance levels that academics from Anadolu University Faculty of Science consider to be important upon entrance to private pension system, and was assessed with Analytic Hierarchy Process.

Keywords: *Analytic Hierarcy Process, Marketing Research, Individual Retirement Account*

Öz

Bireysel emeklilik şirketleri sistemlerine daha çok müşteri kazandırmak için önemli çalışmalarda bulunmaktadırlar. Bu önemli çalışmalardan biri de tüketicilerin diğer şirketlere olan tercih sebeplerini ortaya çıkarmak ve rekabetin de etkisiyle sundukları hizmeti gözden geçirme yoluna gitmektir. Bu noktada tüketicilerin bireysel emeklilik sistemine girerken göz önünde bulundurdukları kriterlerin önem sırasının belirlenmesi şirketleri için önemlidir. Bu çalışmada Anadolu Üniversitesi Fen Fakültesindeki akademisyenlerin bireysel emeklilik sistemine girişte önem verdikleri değişkenleri ve düzeylerini belirlemek için bir anket çalışması yapılmış ve Analitik Hiyerarşi Süreci ile değerlendirilmiştir.

Anahtar Kelimeler: *Analitik Hiyerarşi Süreci, Pazarlama Araştırması, Bireysel Emeklilik*

Introduction

Private pension system, individuals, pension period more comfortable to spend, and in this period the standard of living to protect their regular savings to encourage this savings, individuals' preferences in line with investments to be redirected to provide is a system. Public social security reform in Turkey as part of the Effective came out on 07.October.2001. Participation in the pension system depends on individuals' voluntary choices. There are basically two objectives:

- Individuals to use their retirement savings in a safe way to redirect these savings, to organize and to encourage,

- Again, consisting of savings in a secure pension and / or in the form of a lump sum is to be refunded to individuals (Hacıköylü, 2006; Kuruüzüm and Atsan, 2001, p. 83-105).

Private pension company itself to do significant work to bring more customers and consumers to consider other companies as their preferred with the impact of competition on the road continued to develop the services they offer. One of these studies, the company offers to consumers when they enter the private pension system and levels of variables to determine what degree of importance they are given.

In this study, academics from Anadolu University Faculty of Science at the entrance of the private pension system variables and their importance levels, a survey was conducted to identify and Hierarcy Analytic Process (AHP) were assessed.

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Private Pension System

Private pension system was started as complementary to the current public social security system. The main purpose is to ensure that individuals' level of wealth during work years is sustained in retirement period thanks to savings that are formed by ensuring the re-direction of regular savings in work years to invest-ment. The system is based on voluntary basis.

People who are qualified to use civil rights can parti-cipate in the private pension system. In order to enter the system, it is enough to sign a pension contract with a pension company.

After the individual consults a pension company, risk and income profile are determined. Accordingly, a suitable pension plan and fund distribution offer is presented to the individual. The person who wishes to have the pension contract duly fills in and signs the entrance information form and the offer form which includes pension plan, funds presented included in the plan, cuts that are made, contribution share sum and information about sides of the contract. The pen-sion contract comes into effect on the 30th day fol-lowing the signing of the contract. The participant is entitled to withdraw before the contract comes into effect. In case of withdrawal, no cuts including the entrance fee are made, and Money is returned to the customer adding fund incomes if there is any.

Participants determine the contribution share sum considering their present income level and their ex-pectations about retirement period on condition that it is not less than the minimum contribution share determined by the bank .minimum contribution sha-re cannot be less than 5% of gross minimum wage.

If a participant joins the private pension system for the first time or s/he opens a new private pension ac-count, an entrance feeless than half of monthly mi-nimum wage that is valid for the date when the offer form is signed can be taken from the customer or the sponsor firm.

Pension company can withhold maximum 8% mana-gement cuts costs out of contribution shares paid into participant's pension account and maximum 10 per a hundred thousand operating expense cut out of fund net worth value.

Contribution fees collected by the pension company are evaluated in pension investment funds after cuts-if any- are made. Participant decides him/herself in

which fund or funds the saving will be evaluated ac-cording to his/her risk and expectation preference. The funds are managed by expert portfolio managers. No income guarantee is given to participants in the system.

Assets in fund portfolio are maintained by ISE Sett-lement and Custody Bank, Inc, seperately from com-pany assets. The number of shares owned by customers is monitored by ISE Settlement and Custody Bank, Inc on participant basis and within participant Access.

So as to ensure transparency and security of the system, detailed control and supervision mechanisms were founded to control pension companies. The system under supervision, monitoring and control of associations and organizations such as Turkish tre-asury, Capital Markets Board (CMB), Pension Mo-nitoring Center , ISE Settlement and Custody Bank, Inc, and independent auditing companies. Activities of funds and portfolio managers are audited at least once a year by Capital Markets Board. Account and transactions of funds are subject to independent ex-ternal auditing in 3 month periods.

Participant;

- Can change the contribution share sum on con-dition that it is not less than the minimum cont-ribution share defined in the pension plan, wit-hin period of the contract.

- Can transfer his savings in the private pension account to another pension company on condi-tion that he stays with the original company for at least one year.

- Can demand his private pension accounts ope-ned in the same company or different companies to be joint together.

- Can suspend contribution share payments wit-hin period of the contract. However, the period during which payments are suspended is ignored in the calculation of the time that is needed to gain the right for pension.

- Can change the fund distribution ratio maxi-mum 6 times a year, and can change the pension plan maximum 4 times a year.

In private pension system, tax advantages have been presented for participants and employers who pay contribution shares for their employees. Wage ear-

ners and taxpayers subject to declaration are able to deduct 10%of contribution share sum (that they pay for themselves or their spouses), monthly gross wage or annual income and part of the minimum wage that does not exceed the annual sum off the income tax base. Employers can directly write off the contribution shares they pay for their employees.

In order to earn a pension from private pension system, the participant has to remain in the system for ten years starting from the entrance date, pay contribution shares, and turn 56 years. If he wishes, the participant can use his right for pension at a later date.

If the participant has more than one pension contracts, in order for him to earn pension over all contracts, it is enough for him to earn this right over at least one contract and claim right for pension over all contracts.

Participant who earns pension can request that some or all of his savings be paid at once. Alternatively, participant can demand being waged for a certain period of time or for life within the terms of the contract by requiring some or all of his savings to be transferred to yearly income insurance. Also, he can choose to receive his savings part by part from the company according to pre-arranged payment schedule.

Participant can take all of his savings and leave the system at any time he wishes within period of the contract. Nevertheless, while retention tax at a rate of 3.75 is taken from savings of participants who earn a pension and then leave the company, a 15% cut is made on savings of those who leave without paying contribution shares for 10 years, and 10% of savings is deducted from those who pay the contribution share for 10 years but leave before earning a pension (http://www.egm.org.tr/?sid=69).

Analytic Hierarcy Process (AHP)

AHP is a decision making technique for dealing with complex decisions, it was developed by Proffessor Thomas L. Saaty in 1970s, and includes more than one criterion. AHP is used for selecting among a set of alternatives under certanty or uncertainty in case of many decision makers with multiple criteria and multipurpose decision making goal (Harker and Vargas, 1987, p. 1383-1403). Morover, AHP is an assisting tool for coping with intuitions, logical and illogical decisions, risks and uncertainty in complex cases. The most notable quality of this method is that it also includes the subjective factors in the decision making process. AHP depends on the principle of paying attention to information and experiences in addition to the data.

There are many studies on the applications of AHP in different disciplines in real life. For example, AHP was used effectively in (Taylor, et al., 1998, p. 679-685) evaluating the personel, (Liberatore, et al., 1992, p. 92-100) evaluating the research articles submitted to universities, (Sonjay and Dharom, 1995, p. 21-43) choosing the most appropriate pilot project for a company having decided to practice total quality management, (Tadisina, et al., 1991, p. 631-640) choosing the most appropriate Ph.D. program, (Yoo and Choi, 2006, p. 135-142) developing the security precautions of the passenger controls in the airports, (Chin, et al., 1999, p. 341-349) evaluating strategy development and success factors in order to get ISO 14001 certificate, (Thapa and Murayama, 2010, p. 70-83) determining the priorities of the factors affecting urban development, (Blair, et al., 2010, p. 114-121) forecasting the resurgence of the U.S. economy in 2010, (Zhang, et al., 2010, p. 1428-1432) determining the factors affecting e-learning adaptation behaviors in China, (Zammori, 2009) the applications of presidential election in the U.S.A., (Aytaç and Bayram, 2006) job and spouse choices of the university youth, and (Xu and Zhang, 2009, p. 3031-3036) selecting reliable online credit evaluation methods in e-trade.

In AHP, there are three principles for solving the problem identified: Decomposition, comparative the judgements and the synthesis of priorities. These basic principles also stand for the steps of AHP.

The decomposition principle requires building a hierarchical structure for identifying the main elements of the problem (Saaty and Vargas, 1998, p. 491-502) while the comparison of the judgements requires establishing matrix to reveal the pairwise comparisons of the relative importance of interrelated elements.

As for the principle of the synthesis of priorities, after the pairwise comparison matrixes are formed, the relative importances of the elements compared are calculated at this step. Finally, the weights found are combined to get the general weights of the alternatives.

The first step in AHP is to construct a hierarchcy which shows the relationship among the main goal, subcriteria and alternatives of the problem. The goal

of the problem stands at the top of the hierarchy, and then come the criteria which will affect the quality of the decision. If these criteria have qualities which can affect the main goal, they can be further broken down into subcriteria. The alternatives are at the bottom of the hierarchy . The purpose of the hierarchy is to predict the effect of the elements at the top on the elements at the bottom (Saaty, 2000).

Pairwise comparison matrixes are set to determine the relative importances of all the elements on one another. Comparing covers the questions which two criteria are more important and to what extent they are important. A ratio scale is used in determining the weights of the criteria through pairwise comparisons (Scholl, et al., 2005, p. 760-777). This scale was developed by Saaty for using in AHP. You can see it in Table 1 (Saaty, 1994, p. 19-43). It is the ratio scale that distinguishes AHP from the traditional decision analysis methods (Wind and Saaty, 1980, p. 644).

Table 1. The Fundamental Scale

Intensity of Importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective.
3	Moderate importance	Experience and judgment slightly favor one activity over another.
5	Strong importance	Experience and judgment strongly favor one activity over another.
7	Very strong or demonstrated importance	An activity is favored very strongly over another, its dominance demonstrated in practise.
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation.
2,4,6,8	For compromise between the above values	Sometimes one needs to interpolate a compromise judgment numerically because there is no good word to describe it.

The fundamental scale shows the meaning of numbers from 1 to 9. These numbers indicate the density of the relationships between the elements. The researches conducted maintain that the short term memory of the human brain and its ability to internalize can evaluate approximately 7±2 situations.

The experiences proving that 1-9 scale clearly reveals the personal choices have been stated by Saaty and many AHP users. Further, the fundamental scale can be altered to suit an individual's needs, and it can deal with great amounts of information.

The psychologic arguments show that while two attributes are compared, one cannot be preferred over another in infinite level. The preferences should be formed with the grant of a limited scale. The mathematical structure of AHP can handle this problem. The solution lies in building pairwise comparisons matrix (Saaty, 1986, p. 841-855). This matrix is called evaluation matrix. Each comparison shows the supremacy of an element at the very left column over an element in the top row. The comparison of the factors is made one-to-one and reciprocally according to the relative importance values they hold (Saaty, 1994, p. 19-43).

In a decision making process with the criteria number equal to n, there can be *n(n-1)/2* pairwise comparisons at total. In this case, the dimension of the matrix would be nxn. A comparison matrix showing n criteria number, W_i / W_j term and the importance level of i_{th} criterion over j_{th} criterion (i, j = 1,2,…n) is established as presented in Table 2 (Özdemir, 2002, p. 2-10).

Table 2. The Comparison Matrix for the Criteria

	Criteria 1	Criteria 2	……….	Criteria n
Criteria 1	W_1 / W_1	W_1 / W_2	……….	W_1 / W_n
Criteria 2	W_2 / W_1	W_2 / W_2	……….	W_2 / W_n
……….	……….	……….	……….	……….
Criteria n	W_n / W_1	W_n / W_2		W_n / W_n

The elements of pairwise comparisons matrix are always positive and square matrix since 1-9 basic scale is employed. As the criteria are compared with themselves in the matrix diagonal, the values of relative importance are 1. It is sufficient to make comparisons as much as the numbers of the elements at the top of the diagonal matrix since the values at the bottom are the reverse of the ones at the top, and the diagonal values are equal to 1.

The data of pairwise comparisons can be analyzed by using eigenvalue technique. The calculation of the relative importance of the criteria depends on finding out and normalizing (the process of normalization is made through dividing each row by the total number of columns) the eigenvector with the biggest eigenvalue. Eigenvector is used to determine importance rank while eigenvalue is used to measure the consistency of the judgement.

The geometric mean of each row is calculated and a column vector is formed in order to calculate the relative importance of the criteria. This vector is normalized and the vector of relative importances is obtained. This way, priority values are found for each criterion.

In AHP, the consistency level of decision making process and hierarchy can be calculated. If there is no inconsistency in the pairwise comparison matrix, the maximum eigenvalue (λ_{max}) is equal to matrix dimension n. Each row in evaluation matrix is multiplied with relative importances vector, and a column ma-

trix is obtained. Each element of this vector is divided by the element corresponding to the element in the relative importances vector, and the arithmetic mean of the vector obtained gives the maximum eigenvalue.

As the consistency in the matrix increases, λ_{max} gets close to n. This way, the devience amount of λ_{max} from n can be measured, and the consistency index is expressed as follows:

$$\text{Consistency Index} = \frac{\lambda_{max} - n}{n - 1}$$

The consistency ratio is shown as follows:

$$\text{Consistency Ratio} = \frac{\text{Consistency Index}}{\text{Random Index}}$$

The consistency ratio is obtained by proportioning the consistency index with the random index corresponding to the matrix in the same dimension. The random index for 15 dimensioned matrixes developed by Saaty et al. is given in Table 3.

Table 3. Random Consistency Index

n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Random Index	0	0	0.52	0.89	1.11	1.25	1.35	1.40	1.45	1.49	1.51	1.54	1.56	1.57	1.59

If the consistency ratio is under 0,10, the matrix is accepted to be consistent. As the ratio gets close to 1, it is asserted that the matrix based on the judgements of the decision maker was determined randomly. Since the judgements based on a rate over 0,10 will be accepted to be inconsistent, the judgements should be gone through (Peters and Zelewski, 2002).

Methodology

Sample: The study was conducted with the academics employed in Anadolu University, Faculty of Science through questionnaires. In the study, 30 academics were chosen via proportional distribution method in stratified sampling.

Measure: Based on the basic scale of 1-9 according to objective criteria to determine the order of importance, a survey was made. Questionnaire prepared by Anadolu University Faculty of Science has not yet entered into individual retirement system was carried out with 30 academics and technical questionnaires.

Survey to evaluate academics, consider separately each criterion, and criteria were assigned a score between 1-9. For each main and sub criterion, questions similar to the following were wanted to be answered:

"*For each criterion below, assign a number between 1 and 9, 1 showing the least importance, and 9 showing the most importance.*

Company Name	( )
Minimum Contribution	( )
Annual Fund Operating Expenses	( )
Management Cuts Costs	( )
Entrance Fee	( )
Risk Level	( )"

*Method and Findings:* Analytic Hierarchy Process in accordance with the criteria set by the hierarchical model of the problem is established. People who intend to enter into a private pension system in the company name, the minimum contributions, annual

fund operating expenses, management fee expenses, entrance fees and risk levels are taken into consideration (Saraçlı, 2004). In addition, individual companies' pension system for people who want to participate in the full flowing form, considering the criteria mentioned above were prominent. Users during the imp-

lementation of the survey answer the research question clearly stated the company name. However, this study did not obtain permission from the company as the name of the company is identified by a symbol.

This study addressed the criteria and subcriteria, where the hierarchical model shown in Figure 1.

Figure 1. Criteria and Sub-Criteria, Which Take Place in The Hierarchical Model
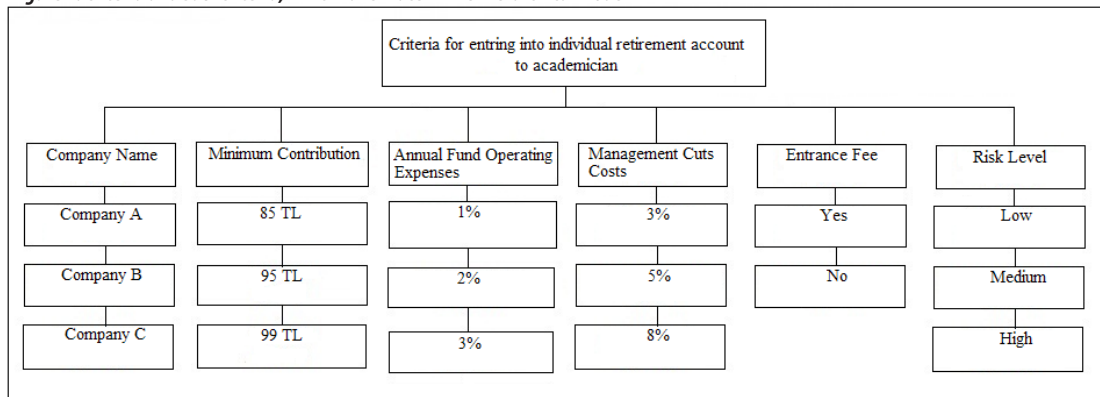
After creating a hierarchical model of the problem is created binary comparisons. In hierarchical models based on objective criteria, among the bilateral comparisons have been made. Based on the basic scale of 1-9 according to objective criteria to determine the order of importance, a survey was made. Questionnaire prepared by Anadolu University Faculty of Science has not yet entered into individual retirement system was

carried out with 30 academics and technical questionnaires. Survey to evaluate academics, consider separately each criterion, and criteria were assigned a score between 1-9. A criterion score points compared to the other criteria mentioned by many fold compared to the other criteria are important in the bilateral comparison matrix was constructed. Pairwise comparison matrix of the main criteria are given in Table 4.

Table 4. Pairwise Comparison Matrix of The Main Criteria

	Company Name	Minimum Contribution	Annual Fund Operating Expenses	Management Cuts Costs	Entrance Fee	Risk Level
Company Name	1.000	0.706	0.918	0.944	0.808	0.897
Minimum Contribution	1.415	1,000	1.366	1.336	1.051	1.270
Annual Fund Operating Expenses	1.035	0.731	1,000	1.052	0.837	0.929
Management Cuts Costs	1.090	0.748	1.022	1.000	0.855	0.950
Entrance Fee	1.237	0.857	1.194	1.168	1.000	1.088
Risk Level	1.123	0.780	1.092	1.088	0.926	1.000

The main criteria for pairwise comparison matrix is consistent with the main criteria to check whether the matrix of pairwise comparison of the relative importance of vector (W_i) is multiplied by. Derived vectors of the vector corresponds to the relative importance of each element is divided into components to obtain a new vector. This vector by taking the mean largest eigenvalue which is calculated as $\lambda_{max} = 6.002$. Matrix size n = 6 with the largest eigenvalue of the matrix $\lambda_{max} = 6.002$ for close to each other as the main criteria is consistent pairwise comparison matrix can be concluded.

Moreover, the main criteria is consistent pairwise comparison matrix can be controlled if the following.

$$\text{Consistency Index} = \frac{6.002 - 6}{5} = 0.00054$$

Because of the size of the matrix n = 6, random index is at 1.25 (from random consistency index table).

The consistency ratio is calculated as follows:

$$\text{Consistency Ratio} = \frac{0.00054}{1.25} = 0.00043$$

Because consistency ratio calculated for less than 0.1, pairwise comparison matrix is consistent.

After creating the matrix of pairwise comparison of the relative importance of each criterion with a geometric mean of the row is calculated as follows, column vector and w_i is created.

$$w_1 = \sqrt[6]{1.000 * 0.706 * 0.918 * 0.944 * 0.808 * 0.897} = 0.873$$

$$w_2 = \sqrt[6]{1.415 * 1.000 * 1.366 * 1.336 * 1.051 * 1.270} = 1.229$$

$$w_3 = \sqrt[6]{1.035 * 0.731 * 1.000 * 1.052 * 0.837 * 0.929} = 0.923$$

$$w_4 = \sqrt[6]{1.090 * 0.748 * 1.022 * 1.000 * 0.855 * 0.950} = 0.937$$

$$w_5 = \sqrt[6]{1.237 * 0.857 * 1.194 * 1.168 * 1.000 * 1.088} = 1.082$$

$$w_6 = \sqrt[6]{1.123 * 0.780 * 1.092 * 1.088 * 0.926 * 1.000} = 0.994$$

$$w_i = \begin{vmatrix} 0.873 \\ 1.229 \\ 0.923 \\ 0.937 \\ 1.082 \\ 0.994 \end{vmatrix}$$

Vector gives the relative importance of these values. w_i column, each row vector is normalized by dividing the sum of the column. These values gives relative importance vector W_i. These values also gives impotance weights of main criteria. Vector of relative importance are shown below.

$$W_i = \begin{vmatrix} 0.144 \\ 0.203 \\ 0.152 \\ 0.155 \\ 0.179 \\ 0.164 \end{vmatrix}$$

Vector according to the relative importance weights of criteria in all, company name, maximum contribution, anuual fund operating expenses, management costs cuts, the entrance fee and risk level respectively 0.144, 0.203, 0.152, 0.155, 0.179, 0.164 are calculated.

Pairwise comparison matrix of the sub-criteria are given in Table 5-10.

Table 5. Pairwise Comparison Matrix of The Sub-Criteria of Company Name

	Company A	Company B	Company C
Company A	1.000	1.139	1.265
Company B	0.877	1.000	1.110
Company C	0.819	0.933	1.000

Table 6. Pairwise Comparison Matrix of The Sub-Criteria of Minimum Contribution

	85 TL	95 TL	99 TL
85 TL	1.000	1.009	0.184
95 TL	0.990	1.000	1.173
99 TL	0.844	0.852	1.000

Table 7. Pairwise Comparison Matrix of The Sub-Criteria of Annual Fund Operating Expences

	1%	2%	3%
1%	1.000	0.686	0.580
2%	1.456	1.000	0.939
3%	1.699	1.167	1.000

Table 8. Pairwise Comparison Matrix of The Sub-Criteria of Management Cuts Costs

	3%	5%	8%
3%	1.000	0.604	0.539
5%	1.508	1.000	0.844
8%	1.854	1.228	1.000

Table 9. Pairwise Comparison Matrix of The Sub-Criteria of Entrance Fee

	Yes	No
Yes	1.000	2.611
No	0.382	1.000

Table 10. Pairwise Comparison Matrix of The Sub-Criteria of Risk Level

	Low	Medium	High
Low	1.000	0.921	0.438
Medium	1.085	1.000	0.551
High	2.118	1.951	1.000

The same operations in the above sub-criteria can be applied to calculate importance. As a result of this calculation, the weight of the main criteria and sub criteria are shown in Figure 2, where the hierarchical model.

According to Figure 2, minimum contribution (0.203) is the largest value. Academics in the first place emphasis on private pension choice criteria, the main criterion is adopted as the minimum criteria for contribution. With these criteria during the entrance fee (0179), risk level (0164), management cuts costs (0155), anuual fund operating expenses (0152) and the company name (0144) is followed.

Figure 2. The Main Criteria and Sub-Criteria, Where The Weight of The Hierarchical Model
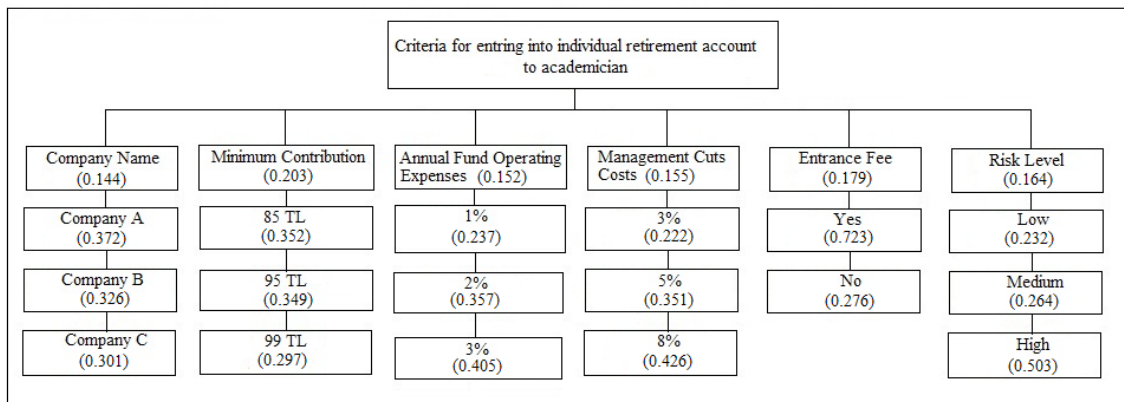
Result and Conclusion

In this study, access to pension system is considered to determine the severity criteria Anadolu University Faculty of Science, 30 academicians of the questionnaire was administered face to face interview technique. AHP is applied to the survey were evaluated.

In conclusion, the importance of these criteria is presented, starting from the most important were: minimum contribution, entrance fee, risk level, management costs cuts, annual fund operating expenses and company name.

The sub-criteria of minimum contribution main criteria as the "85 TL". The sub-criteria of entrance fee the main criteria as the "Yes". The sub-criteria of the risk level the main criteria as the "High". The sub-

criteria of management cuts costs as the "8%". The sub-criteria of annual fund operating expenses as the "3%". The sub-criteria of company name as the "Company A" was determined.

Academics who participated in the study chose 'minimum contribution as the most important criterion when they want to enter private pension system, and they chose 85 liras, which is the relevant subcriterion. Accordingly, it can be said that academics who participated in the study prefer the lowest level for monthly payment amount for private pension system.

Entrance fee is the second most important criterion, its sub criterion is 'yes'. This situation shows that academics who participated in the study want to enter the private pension system by paying a fee.

The reason why academics who participated in the study want High Risk Level in 3rd most important place can be interpreted as high risk level brings more income.

The forth important criterion is Management Cuts Cost, whose subcriterion is 8% and the fifth is annual fund operating expenses, the subcriterion of which is 3%. In this respect, academics who participated in the study can be said to want their profit from high risk level to be managed better.

As in all scientific work on this study, the reliability of the findings, the surveyed academics is directly proportional to their actual answers.

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