Finansal Araştırmalar ve Çalışmalar Dergisi • Cilt: 6 • Sayı: 11 • Temmuz 2014, ISSN 1309-1123, ss. 1-13
DOI: 10.14784/JFRS.2014117324

PERFORMANCE RANKING OF TURKISH INSURANCE COMPANIES: THE ANP APPLICATION

Ilyas Akhisar*

Abstract

Decision making concept can be defined as selection process choosing one of the options, if the outcomes are not certain. In practice it is not sufficient to evaluate the options according to the simplest form of decision making only based on a criterion. In such cases, we must consider all the variety of different information to decide to best option. It arise the requirement of multi-criteria decision making methods.

AHP (Analytical Hierarch Process) is a technique that models the relations which are different stage. On the other hand that technique is insufficient to evaluate interdependency relations. The ANP (Analytic Network Process) has the ability to add all the criteria related with the issue. The method of the ANP can be described as follows. The first phase of the ANP is to compare the criteria in whole system to form the supermatrix. This is done through pairwise comparisons by asking experts.

The first step of the ANP is to compare the importance between each criterion. The next step is to calculate the influence of the elements (criteria) in each component (matrix) using the eigenvalue method.

In this research, financial performans ranking of Turkish Insurance companies, which large-scaled business in non-life branches, are obtained for the period 2006-2010 using financial ratios of companies and applying the ANP model which was developed with the superdecision software.

Keywords: ANP, performance ranking, Turkish insurance sector, financial ratios

Jel Codes: C52, G22 and L25

TÜRK SİGORTA ŞİRKETLERİNİN PERFORMANS SIRALAMASI: ANP UYGULAMASI

Öz

Karar verme kavramı, eğer sonuçlar kesin değilse opsiyonlardan bir tanesinin seçimi süreci olarak tanımlanabilir. Karar vermenin en basit şekli olan bir kritere dayalı olarak karar verme pratikte opsiyonların

* Dr., Marmara University, Istanbul, Turkey, akhisar@marmara.edu.tr

değerlendirilmesi için yeterli değildir. Böyle hallerde en iyi opsiyonu seçmek için farklı bilgilerin tamamını gözönüne almalıyız ki bu durum çok kriterli karar verme metotlarının gerekliliğini ortaya çıkarmıştır.

AHP (Analitik Hiyerarşi Süreci) farklı mertebeden ilişkileri modelleyen bir tekniktir. Diğer taraftan bu teknik karşılıklı ilişkilerin değerlendirilmesinde yetersiz kalmaktadır. ANP(Analitik Ağ Süreci) konu ile ilgili bütün kriterlerin kullanılmasına olanak sağlar. ANP'nin ilk aşaması bütün sistemdeki kriterleri karşılaştıran süper matrisi oluşturmaktır ki burada ikili karşılaştırmalar uzmanlara sorularak oluşturulur.

ANP'nin ilk adımı her bir kriter arasındaki önemin karşılaştırılmasıdır. Sonraki adımı özdeğer metodunu kullanarak her bileşendeki kriterlerin etkisinin hesaplanmasıdır.

Bu çalışmada, süper karar yazılımı ile ANP modeli uygulanarak 2006 - 2010 yılları arasında Türk sigorta sektöründe hayat dışı branşında faaliyet gösteren büyük ölçekli şirketlerin finansal finansal performans sıralaması yapılmıştır.

Anahtar Kelimeler: ANP, performans sıralaması, Turk sigorta sektörü, finansal rasyolar

Jel Kodları: C52, G22 and L25

Introduction

Performance measurement has great deal of attention from researchers in the past decades (Kagioglou et al. , 2001, 85-95; Bassioni etal., 2004, 42-50).

The globalization and the intensification of the competition in the environment of the matters of the necessity for the measure of performance and determination of the factors criticize for the success. Traditionally, the different sectors have their performance measured in financial terms: returned, the sales, etc, and the financial measures, performances were the only ones of the success of a business. Nevertheless, the measure of based performance on financial measures cannot do facing the recent changes in the industry, in particular because of the emergence of new technologies and increase of the intensity of the competition (Kaplan and Norton, 1992, 75-79).

The measure of the performance can equally be defined as the process to quantify the efficiency and the effectiveness of an action (Amaratunga and Baldry, 2000a, 1-16). Measure performance is therefore the process of determination of the manner of which the performance organizations or individuals were in the attained of their objectives and of their strategies of implement (Evangelidizs, 1992, 45-47).

The goal of this item is to present a framework of measure of the yield for the industry of Turkish assurance that takes account of the factors at the level of the businesses (objectives, resources) and at the level of the market of the factors (competition, the request), then to define the determining performance as well as their interrelations in order to determine the effects of these parameters on performances.

To this purpose, in the frame of this study, Analytic network Process (ANP), a Multi criterion of the decision-making method rank is selected as the best suitable instrument to the Turkish insurance companies.

Meterials and Methodogy

Turkish Insurance Sector

Turkish insurance sectors, one of the leading finance sector is very sensitive on the economic development. In general, if the GDP are awake, exceeds insurance premium growth rate of the GDP, but the GDP declines leads also to a higher shrinkage in the insurance market.

In Turkey, non-life insurance premiums written traditionally exceeds the total life insurance premiums, with non-life business accounting for approximately 85% of total business.

Parallel to global insurance market, there are two main insurance groups, life and non-life according to Turkish Insurance Regulation. Since 1998, insurance companies have been obliged to act either in the life or non-life insurance groups.

In the view of premium production by distribution channel, private insurance agencies generates approximately 70% of total premium in non-life branches. Banking agencies and brokers follow private agencies with the share of 14% and 10%, respectively. The share of premium generated directly by insurance companies is approximately 6%.

In Turkish insurance market, 16.029 people have been employed by active insurance, reinsurance and pension companies, as of December 31, 2010. On the other hand, Premium per capita increased to $125 in 2010 in Turkey while it was $113 in 2009. This amount is $627 in the world. Premium volume to GDP is 1.28% in Turkey in 2010. It is 6.9% as globally.

Low penetration rate and the growth potential continue to draw attention of foreign insurance companies to the Turkish insurance market. While there were only 15 foreign shared insurance companies in 2001, with increase foreign capital incoming since 2004, this number increased to 20 in 2005. During the following three years, it nearly doubled and reached to 41 in 2008, 43 in 2009 and 44 in 2010. As of 2010 year-end, 25 of 38 non-life insurance companies and 19 of 24 life and pension companies were foreign owned directly or indirectly. Share of foreign partners is above 50% in 37 of these companies.

As a consequence of the increase of the foreign investments into the Turkish insurance market, lay the share of the foreign businesses 50% in equity and Premium in 2008: At the end of the year 2010 share of reached the foreign investments on 59% altogether deposited capital, during it no large variation in shares for premium volume.

In non-life branches, land vehicles, land vehicles liability, health/sickness and fire and natural disasters, accounted for approximately 75% of total premium and 58% of total policies issued in non-life branches (www.treasury.gov.tr)

The Analytic Network Process

The Analytic Network Process (ANP) is a generalization of the Analytic Hierarchy Process (AHP)), by considering the dependence between the elements of the hierarchy.

The basic structure is an influence network of clusters and nodes contained within the clusters. Priorities are established in the same way they are in the AHP using pair-wise comparisons and judgment.

The Analytic Hierarchy Process (AHP) is a theory of relative measurement with absolute scales of both tangible and intangible criteria based on the judgment of knowledgeable and expert people.

Although it is a powerful and flexible decision-making technique that helps decision-makers to set priorities and choose the best alternative, a remarkable weakness of AHP is that it cannot deal with interconnections between decision factors at the same level because the decision-making framework in an AHP model assumes a one-way hierarchical relationship among decision levels.

In many problems where there are interactions between decision variables, AHP may not be an effective method to implement. Many decision problems cannot be structured hierarchically because they involve the interaction and dependence of higher-level elements in a hierarchy on lower-level elements. The Analytical Network Process (ANP) has been developed to remove this bottleneck. It generalizes AHP by replacing hierarchies with networks. Therefore, ANP is represented by a network, rather than a hierarchy.

ANP is powerful in designing complex decision environments than AHP, because it can be used to design decisions, the various interactions and dependencies (Saaty, 1996, 5-19) involve. ANP in the importance of the criteria makes determines the importance of the alternatives as a hierarchy, but the importance of the alternatives, the importance of the criteria not only determined.

The ANP feedback approach replaces hierarchies with networks, in which the relationships between levels are not easily represented as higher or lower, dominated, or being dominated, directly or indirectly (Meade & Sarkis, 1999, 241-261).

Determine the weight of criteria by ANP

In ANP, like AHP, decision elements at each component are compared pair-wise with respect to their importance towards their control criterion, and the components themselves are also compared pair-wise with respect to their contribution to the goal. The questionnaire is created in accordance with associated evaluation framework criteria. The geometric mean of all assessments will also be used to obtain the required pair-wise comparison matrix to (Lin et al., 2009, 5613–5619).

In addition, if there are interdependencies among elements of a component, pair-wise comparisons also need to be created, and an eigenvector can be obtained for each element to show the influence of other elements on it.

The Fundamental Scale used for the judgments is given in Table 1. The relative importance values are determined with a scale of from 1 to 9, where a score of 1 represents equal importance between the two elements and a score of 9 indicates the extreme importance of one element (row component in the matrix) compared to the other one (column component in the matrix) (Meade & Sarkis, 1999, 241-261; Saaty, 2006).

Judgments are first given verbally as indicated in the scale and then a corresponding number is associated with that judgment.

Table 1: Fundamental Scale

1	equal importance
3	moderate importance of one over another
5	strong or essential importance
7	very strong or demonstrated importance
9	extreme importance
2, 4, 6, 8	intermediate values
Use reciprocals for inverse comparisons	

A reciprocal value is assigned to the inverse comparison; that is, $a_{ij} = 1/a_{ji}$; where aij (aij) denotes the importance of the i^{th} (j^{th}) element compared to the j^{th} (i^{th}) element. Like AHP, pair-wise comparison in ANP is made in the framework of a matrix, and a local priority vector can be derived as an estimate of relative importance associated with the elements (or components) being compared by solving the following formulae:

$A.w = \lambda_{max}.w$ where A is the matrix of pair-wise comparison, w is the eigenvector, and λ_{max} is the largest Eigenvalue of A. If A is a consistency matrix, eigenvector X can be calculated by $(A - \lambda_{max} I)X = 0$ (Saaty, 1990, 9-26) proposed utilizing consistency index (C.I.) and consistency ratio (C.R.) to verify the consistency of the comparison matrix. C.I. and R.I. are defined as follows $C.I. = (\lambda_{max} - n)/(n-1)$, $C.R. = C.I./R.I.$ where R.I. represents the average consistency index over numerous random entries of same order reciprocal matrices. If $C.R. \leq 0.1$, the estimate is accepted; otherwise, a new comparison matrix is solicited until $C.R. \leq 0.1$.

The consistency ratio provides a numerical assessment of how inconsistent these evaluations might be. If the calculated ratio is less than 0.10, consistency is considered to be satisfactory (Meade, 1996, 267-273).

Inconsistency may be thought of as an adjustment needed to improve the consistency of the comparisons. But inconsistency itself is important because without it, new knowledge that changes preference cannot be admitted (Saaty, T.L. & Ozdemir, M., 2005, 73-82).

To obtain global priorities in a system with interdependent influences, the local priority vectors are entered in the appropriate columns of a matrix, known as a supermatrix. As a result, a supermatrix is actually a partitioned matrix, where each matrix segment represents a relationship between two nodes (components or clusters) in a system (Meade and Sarkis, 1999, 241-261). Let the components of a decision system be C_k , $k = 1, 2, ..., n$, and each component k has m_k elements, denoted $e_{k1}, e_k, ..., e_{km_k}$ A standard form of a supermatrix is as in formulae (Saaty, 1996, 5-19).

$$W = \begin{array}{c} \\ e_{11} \\ e_{12} \\ C_1 \\ e_{1m_1} \\ e_{k2} \\ C_k \\ e_{km_k} \\ e_{n1} \\ C_n \\ e_{n2} \\ e_{nm_n} \end{array} \begin{array}{c} \begin{array}{cccccc} C_1 & \cdots & C_k & \cdots & C_n \\ e_{11}\cdots e_{1m_1} & & e_{k1}\cdots e_{km_k} & \cdots & e_{n1}\cdots e_{nm_n} \end{array} \\ \begin{bmatrix} W_{11} & \cdots & W_{1k} & \cdots & W_{1n} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ W_{k1} & \cdots & W_{kk} & \cdots & W_{kn} \\ \vdots & & \vdots & \vdots & \vdots \\ W_{n1} & \cdots & W_{nk} & \cdots & W_{nn} \end{bmatrix} \end{array}.$$

As an example, the supermatrix representation of a hierarchy with three levels is as follows (Saaty, 1996, 5-19):

$$W_h = \begin{bmatrix} 0 & 0 & 0 \\ w_{21} & 0 & 0 \\ 0 & w_{32} & 0 \end{bmatrix} \qquad W_n = \begin{bmatrix} 0 & 0 & 0 \\ w_{21} & w_{22} & 0 \\ 0 & w_{32} & w_{33} \end{bmatrix}$$

where w_{21} is a vector that represents the impact of the goal on the criteria, w_{32} is a matrix that represents the impact of sub-criteria on each of the criteria , and entries of zeros corresponding to those elements that have no influence. For the above example, if the criteria are interrelated among themselves, a network replaces the hierarchy. The w_{22} and w_{33} would indicate the interdependency, and the supermatrix would be in W_n form (Saaty, 1996, 5-19)

Using ANP for Performance Measurement in Construction supermatrix is calculated by multiplying the values of the unweighted supermatrix with their affiliated cluster weights. In the ANP we look for steady state priorities from a limit super matrix. To obtain the limit we must raise the matrix to powers. Each power of the matrix captures all transitivities of an order that is equal to that power.

The limit may not converge unless the matrix is column stochastic, that is each of its columns sums to one. If the columns sum to one then from the fact that the principal eigenvalue of

a matrix lies between its largest and smallest column sums, we know that the principal eigenvalue of a stochastic matrix is equal to one.

The last step is composition of a limiting supermatrix, which is created by raising the weighted supermatrix to powers until it stabilizes. Stabilization is achieved when all the columns in the supermatrix corresponding to any node have the same values.

The final priority weights—which account for element interactions—are derived by multiplying the supermatrix by itself until the columns stabilize, which occurs when the supermatrix entries become identical across each row or cycles in blocks in which case one uses what is known as Cesaro summability, and the result is known as the limiting matrix. The final priority weights are extracted from this limiting matrix.

These steps are performed in Super Decisions, which is a software package developed for ANP applications. The overall priority of each alternative is computed through the synthesizing process. The results derived from each sub-network are synthesized to obtain the overall priorities of the alternatives and so alternatives are ranked.

Proposed Model

This study aims to present a ANP model and apply it to insurance companies in Turkey to obtain a performance score per period.

In this study, ten large scale insurance companies which had been operating in non-life insurance branches in Turkish insurance sector between 2006-2010 have been studied and ANP method has been applied to them.

The relative advantages of the companies have been obtained by using the results of the applications that were done separately for each year between 2006-2010. And company rankings for each year were determined **(Appendix).**

Criteria's which are going to be used on the ANP model were identified as a result of literature reviewing and interviewing with the industry's leading experts. The designated criteria that were determined to be used in the ANP model were included in the study as three components (Capital Adequacy Ratios, Asset Quality Ratios, Profitability Ratios) and total ten unit under these three groups.

Capital Adequacy

- Premiums Received / Shareholders' Equity
- Shareholders' Equity / Technical Provisions
- Shareholders' Equity / Total Assets

Profitability

- Financial Profit-Loses / Premiums Received
- Loss ratios

- Technical Profit-Loses/ Financial Profit-Loses
- Technical Profit-Loses / Premiums Received
- Total Income / Premiums Received

Asset Quality

- Cash and Cash Equivalents / Total Assets
- Retention Rate

Super Decisions software developed by Saaty has been used for implementation of the method. All components, elements and interactions between them have been transmitted to the Super Decisions program and models in between 2006-2010 has been constituted. Network structure which belongs to the created model can be seen in the following figure (Fig.1).

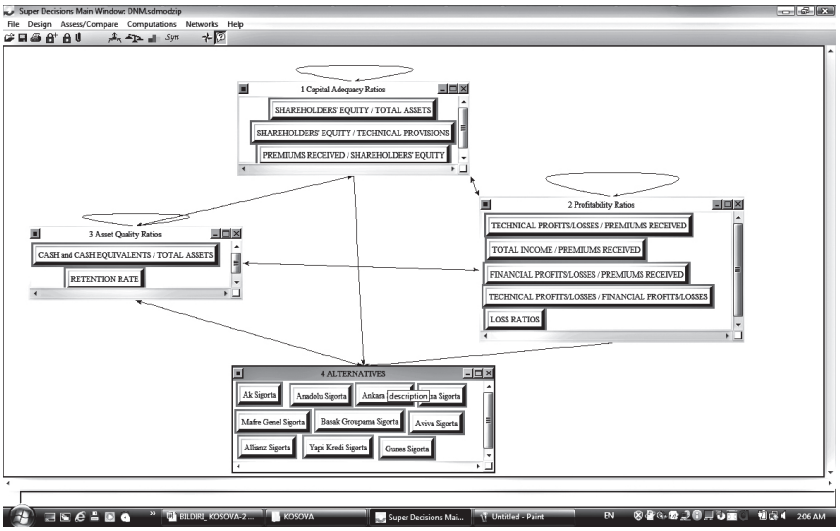

Figure 1: the ANP model

Result

The weights of level 2 criteria and level 3 sub-criteria are then determined by experts evaluating the above characteristics, with each expert making a pair-wise comparison of the decision elements and assigning them relative scores. The eigenvectors for level 2 to level 3 are shown in Table 2. The priorities for the criteria, W_{21}; can be obtained by the procedure stated in the previous. W_{32}; that represents the relative importance of sub-criteria with respect to their upper level criteria.

Table 2 : Eigenvectors (weights) for Level 2 and Level 3

Criteria	Weights of Criteria (W_{21})	Sub-Criteria	Weights of Sub-Criteria (W_{32})
Capital Adequacy	0.32748	Premiums Received / Shareholders' Equity	0.389060
		Shareholders' Equity / Technical Provisions	0.247510
		Shareholders' Equity / Total Assets	0.363430
Profitability	0.41259	Financial Profit-Loses / Premiums Received	0.065878
		Loss ratios	0.121180
		Technical Profit-Loses/ Financial Profit-Loses	0.063953
		Technical Profit-Loses / Premiums Received	0.319370
		Total Income / Premiums Received	0.121180
Asset Quality	0.25992	Cash and Cash Equivalents / Total Assets	0.527300
		Retention Rate	0.472700

The ANP model has respective weights of the three evaluative criteria are Capital Adequacy (0.32748), Profitability (0.41259) and Asset Quality (0.25992) and the model's Inconsistency = 0.08141.

Conclusions

Measuring performance in industries and determining the key drivers of performance have been an important research topic in recent years.

The ANP technique is a very handy tool for the situations where several attributes exist and the decision needs to be taken while counting for all these elements and their complex interrelated nature.

ANP was selected as the most appropriate technique for a multi-criteria decision model due to its ability to deal with interdependent relationships.

In this study, the model aims to determine the effects of the parameters associated with the company performance. The pair-wise comparisons between the model parameters are based on the subjective judgment of a group of experts. To find the importance weights of each parameter based on the limiting supermatrix that is computed by the ANP software.

The ANP approach allows us to use quantitative and qualitative information making this methodology flexible.

Furthermore, concerning the non-financial factor can in joy discussion thing, agree, for example: service quality insurance companies, the satisfaction of customers, etc. Second, continued research in the same way be but can during various studies assume, to evaluate the stability of the study results, and the present approach can be for other industries, for example: Life Insurance Industry, electronics industry etc.

References

Amaratunga, D. & Baldry, D. 2000a, Performance Evaluation in Facilities Management: Using the Balanced Scorecard Approach. In the proceedings of COBRA 2000 RICS (Construction and Building Research Conference). Royal Naval College, University of Greenwich, UK., 1-16.

Bassioni, H.A., Price, A.D.F. and Hassan, T.M., 2004, Performance Measurement in Construction Firms. Journal of Management in Engineering, 20(2), 42–50.

Evangelidizs, K., 1992, Performance measured is performance gained. The Treasurer, February, 45–47.

Kagioglou, M., Cooper, R. and Aouad, G., 2001, Performance management in construction: A conceptual framework Construction Management and Economics, 19(1), 85–95.

Kaplan, R. S., and Norton, D. P., 1992, The Balanced ScorecardMeasures That Drive Performance. Harvard Business Review, 70(1), 71–79.

Lin ,C.T., Lee, C. and Wu, C.S., 2009, Optimizing a Marketing Expert Decision Process for the Private Hotel' , Expert Systems with Applications,36 5613–5619.

Meade, L.M., 1996, A Methodology for the Formulation of Agile Critical Business Process, PhD Thesis, The University of Texas at Arlington.

Meade, L. M. & Sarkis, J., 1999, Analyzing Organizational Project Alternatives for Agile Manufacturing Processes-An Analytical Network Approach. International Journal of Production Research 37, 241-261.

Saaty, T.L., 1990, How to Make a Decision: The Analytical Hierarchy Process. European Journal of Operational Research, 48 (1) 9-26

Saaty, T.L., 1996, Decision Making with Dependence and Feedback: The Analytic Network Process, Pittsburgh, Pennsylvania: RWS Publications.

Saaty, T.L & Ozdemir, M.S., 2005, The Encyclical: A Dictionary of Decision with Dependence and Feedback Based the Analytical Network Process, RWS Publication, Pittsburg,.

APPENDIX:

Performans Ranking Of Turkish Insurance Companies (2006 -2010)

Table 1: Insurance Companies Rank (2006)

Rank	Name	Ideals	Normals
1	Türkiye Genel Sigorta	1.000000	0.156991
2	Aviva Sigorta	0.866757	0.136073
3	Aksigorta	0.734313	0.115281
4	Axa-Oyak Sigorta	0.720675	0.113140
5	Koç-Allianz Sigorta	0.628205	0.098623
6	Güneş Sigorta	0.570723	0.089598
7	Ankara Sigorta	0.549492	0.086344
8	Anadolu Sigorta	0.519533	0.081562
9	Yapı Kredi Sigorta	0.463594	0.072780
10	Başak Groupama Sigorta	0.315993	0.049608

Table 1: Insurance Companies Rank (2007)

Rank	Name	Ideals	Normals
1	Türkiye Genel Sigorta	1.000000	0.182922
2	Aviva Sigorta	0.815458	0.149165
3	Aksigorta	0.742688	0.135654
4	Axa-Oyak Sigorta	0.630335	0.115332
5	Ankara Sigorta	0.454495	0.083503
6	Koç-Allianz Sigorta	0.443581	0.081141
7	Anadolu Sigorta	0.426323	0.077984
8	Yapı Kredi Sigorta	0.397293	0.072674
9	Güneş Sigorta	0.319941	0.058524
10	Başak Groupama Sigorta	0.234703	0.042932

Table 1: Insurance Companies Rank (2008)

Rank	Name	Ideals	Normals
1	Mafre Genel Sigorta	1.000000	0.155448
2	Ankara Sigorta	0.985315	0.153165
3	Aksigorta	0.860969	0.133836
4	Axa Sigorta	0.727112	0.113028
5	Aviva Sigorta	0.702782	0.109246
6	Başak Groupama Sigorta	0.648528	0.100812
7	Yapı Kredi Sigorta	0.442362	0.068764
8	Anadolu Sigorta	0.371297	0.057717
9	Güneş Sigorta	0.362261	0.056313
10	Allianz Sigorta	0.332399	0.051671

Table 1: Insurance Companies Rank (2009)

Rank	Name	Ideals	Normals
1	Mafre Genel Sigorta	1.000000	0.164236
2	Aksigorta	0.843771	0.138578
3	Aviva Sigorta	0.688912	0.113144
4	Groupama Sigorta	0.676473	0.111101
5	Yapı Kredi Sigorta	0.592569	0.097321
6	Ankara Sigorta	0.526202	0.086421
7	Güneş Sigorta	0.512464	0.084165
8	Axa Sigorta	0.506978	0.083264
9	Allianz Sigorta	0.415151	0.068183
10	Anadolu Sigorta	0.326270	0.053585

Table 1: Insurance Companies Rank (2010)

Rank	Name	Ideals	Normals
1	Mafre Genel Sigorta	1.000000	0.166097
2	Ankara Sigorta	0.828453	0.137604
3	Axa Sigorta	0.634220	0.105342
4	Aksigorta	0.618027	0.102653
5	Aviva Sigorta	0.576912	0.095824
6	Anadolu Sigorta	0.569076	0.094522
7	Yapı Kredi Sigorta	0.540794	0.089824
8	Güneş Sigorta	0.512629	0.085146
9	Groupama Sigorta	0.387310	0.064331
10	Allianz Sigorta	0.353145	0.058656