

# Ranking Insurance Companies in Turkey Based on Their Financial Performance Indicators Using VIKOR Method

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**Abstract** Financial performance evaluation of firms is a kind of multi-criteria decision making (MCDM) problem which has multiple and conflicting criteria (financial ratios). Companies should monitor their performance indicators in order to ensure appropriate and timely decisions and plans. The aim of this study is to evaluate the financial performance of five listed insurance companies in the Istanbul Stock Exchange (Borsa Istanbul-BIST) during 2010–2015 (quarterly) periods. VIKOR method is used for the ranking of firms. Our model shows that Avivasa Emeklilik and Hayat A.S. (AVISA) is the best performing insurance company in these five companies during the years 2010–2015.

**Key words** Financial performance, Turkish insurance sector, Multi Criteria Decision Making (MCDM), VIKOR method, ranking

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## 1. Introduction

The history of insurance sector in Turkey dates back to 1870's. The first developments regarding insurance activities in Turkey were seen following the big fire occurred in İstanbul in 1870. In Turkey, the first insurance activities were carried out by English insurance companies as a branch in 1872. The first Turkish capitalized insurance company was established in 1918.

Gross Domestic Product (GDP) of Turkey has amounted to 1.7 trillion Turkish Lira (TRY) for 2014 according to data released by Turkish Statistical Institution (TUIK). At the same term, national income per capita has amounted to 22,753 TRY which increased by 10.4% over the previous year (RTPMUTISB, 2014).

According to figures released by the Banking Regulation and Supervision Agency (BRSA), Capital Markets Board (CMB) and Association of Turkish Capital Markets (ATCM), total assets of Turkish financial sectors excluding Istanbul Stock Exchange Market (BIST), experienced a 15.52% growth in 2014 and reached to 2.23 trillion TRY. Total assets of insurance, reinsurance and pension companies experienced a 26.07% growth. As a result, the share of insurance and pension sectors in the financial system increased to 3.64% in 2014. Insurance and individual pension system is the second biggest sector following banks among financial sectors by its asset size (RTPMUTISB, 2014).

Insurance sector in Turkey, which grows at higher rate when the economy expands, experienced a decline in terms of real written premium in 2014 for the first time after a long period, although the GDP growth. The Turkish insurance market produced 26 billion TRY gross premium in 2014. The volume increased by 7% and 22.7 billion TRY of which was produced in non-life and 3.3 billion TRY in life insurance branches. Insurance companies generated 25.4 billion TRY of gross premium as a result of direct insurance activity, while 633 million TRY was produced through reinsurance activities. Total coverage given by insurers reached to 76.5 trillion TRY in 2014, including health coverage transferred to Social Security Administration with the Law no:6111 and excluding health/sickness branches in which mostly unlimited coverage is given. Considering 1.7 trillion TRY of GDP in the same term, the rate of gross premium to GDP is 1.45% and the total coverage is nearly 44 times of GDP and indicates the importance of the insurance sector for the Turkish economy and steady growth (RTPMUTISB, 2014).

Insurance sector in Turkey mostly shows similar development pattern with emerging markets for non-life insurance, however there has been a reverse attitude in life insurance since 2011. The real premium volume increased by 0.1% in Turkey in 2014 while life premium volume decreased by 11.2% during the year (RTPMUTISB, 2014).

The premium per capita was \$662 in the world in 2014 while it was \$149 in Turkey. The rate of direct premium over the GDP was 1.45% in Turkey and 6.17% as globally in 2014 (RTPMUTISB, 2014).

In the sector as of 2014, 63 insurance, pension and reinsurance companies have been operating, of which 38 are non-life insurance, 5 are life insurance and 19 are pension and one is reinsurance companies. Other than actively operating companies, there are two non-life insurance, one life insurance and one reinsurance companies with licenses but inactive (stopped their activity by the government or as voluntarily). So, total licensed insurance, reinsurance and pension companies are 67 as of 2014 year end. 26 of 38 non-life insurance companies and 18 of 24 life and pension companies have international capital directly or indirectly. The share of international capital is 50% or above in 39 of the companies (RTPMUTISB, 2014).

Insurance and pension companies issued 70,176,863 policies in 2014. The number of policies increased by 4.72% compared with the previous year. 54,650,431 of the policies issued are in non-life insurance which experienced by a 5.92% increase and 15,526,432 of them are in life insurance by a 0.71% increase (RTPMUTISB, 2014).

In Turkish insurance market, 19,305 people had been hired by 63 active insurance, reinsurance and pension companies as of December 31, 2014. There are 15,587 insurance intermediaries (agency) licensed and registered to the List and also 30,046 pension intermediaries registered to Pension Monitoring Center (EGM). The number of licensed brokers is 119 and 83 of them operate both in insurance and reinsurance activities while 32 solely in insurance and 4 just is reinsurance side. As for loss adjuster, there were 1,305 real persons, of which 593 worked independently and 712 worked under a legal entity at the end of 2014. There were also 1,979 agricultural loss adjusters at the year-end. The number of actuaries having license from the Treasury were 122 and 42 of them worked in the market at the end of 2014 (RTPMUTISB, 2014).

Total assets of insurance, reinsurance and pension companies have reached to 81 billion TRY at the end of 2014. Over the last years, the share of life/pension companies has been increasing. Their share in terms of total assets reached to 62.7% in 2014. December 31, 2014, the share of non-life and reinsurance companies in industry total assets constituted approximately 34.8% and 2.5% of total assets, respectively. The share of liabilities reached to 84% in 2014 and the share of shareholders' equity realized about 16% although there was 16% increase in nominal term (RTPMUTISB, 2014).

By the end of 2014, insurance sector's overall current ratio for non-life companies is 120.14%, life/pension companies 163.09%. Return on Equity ratio for non-life companies is 11.95%, life/pension companies 24.17%. Return on Assets Ratio for non-life companies is 3.36%, life/pension companies 7.15% (RTPMUTISB, 2014).

In BIST there are 7 insurance companies, but this study deals with 5 companies, 2 companies are omitted because of lack of data. The purpose of this study is to rank the Turkish Insurance Companies according to their financial performances during 2010 – 2015 period using VIKOR method which is a multi-criteria decision technique.

## 2. Literature review

Chang (2006) chooses 20 insurance companies in Taiwan and uses them to try to separate 19 items of financial ratios into five operation indicators to be the performance evaluation variables of insurance companies for the years 2000–2002. The five indicators are Capital Structure, Profitability, Solvency, Management Efficiency, and Capital Operational Capability. Grey Relational Analysis is used. According to the results of the analysis both return on assets and sign of profitability influence a heavier financial ratio as well as operating index on performance, and also the overall continuance of performance of insurance companies are significant in the short run during the period 2000–2002.

Tsai, Huang, and Wang (2008) use Modified Delphi Method to summarize the expert opinions in order to construct an evaluation model to assess the property-liability insurance companies. And then, the evaluation weights are determined using Analytic Network Process (ANP). Business Index, Whole Company

Operating Index and Profitability Index are the three evaluation criteria and there are eleven sub-criteria. At last, the technique for ordering preference by similarity to the ideal solution (TOPSIS) is used for performance evaluation model of property-liability insurance companies in Taiwan. Financial statements of property-liability insurance industry calculated efficiency placing and through the positive research are used. 14 renowned property-liability insurance companies in Taiwan are an example for evaluating the performance of property-liability insurance companies. The results indicate that investors and administrators frequently lack objective decision-making procedures and assessment criteria. Moreover, there are simply too many property-liability insurance companies and thus selecting insurance companies with optimal efficiency is extremely difficult. Finally, by applying ANP in obtaining criteria weight and TOPSIS in ranking on those results, the Tokio Marznrzue Newa (0.8767) insurance company is identified as the optimal insurance company.

Doumpos, Gaganis, and Pasiouras (2012) estimate and explain the performance of nonlife (i.e., property and casualty) insurers. The analysis consists of two stages. First, they propose the use of a multi-criteria method to assess the condition of insurers while considering simultaneously a set of conflicting financial criteria. They apply the preference ranking organization method for enrichment evaluations (PROMETHEE) II method which is one of the MCDM analysis method. Then, they use regression analysis to examine the influence of firm-specific and country-specific attributes on the overall measure of performance obtained during the first stage. Their final sample consists of 2,176 property and casualty insurance firms operating in 91 countries, an unbalanced panel of 9,181 observations from the period 2005 – 2009. Equity to assets, solvency ratio, technical reserves ratio, operating expense ratio, loss ratio, and return on assets were used in this study. They find that macroeconomic indicators such as real GDP growth, inflation, and income inequality influence the overall performance of firms. Stock market development also has a positive effect on performance. In contrast, other indicators of the banking and capital market development are not significant. Similarly, the institutional development and the overall freedom in the financial services industry do not exercise a statistically significant effect on overall performance.

Akhter and Zia-ur-Rehman (2011) analyze the financial performance of Pakistan insurance industry during the period 2001–2005 in an attempt to assess future growth and potential. Performance of Pakistan insurance industry has been analyzed from two perspectives. Insurance comparison with advanced as well as under-developed countries and comparing Pakistan's share to the world insurance market and through Regional comparison showing insurance density and penetration of selected Asian countries. Asset growth, net profit growth, growth in insurance premium, and Return on Asset ratios are examined. The paper identifies some key economic indicators that are essential to create demand for insurance and contribute towards achieving long-term prosperity and sustainable economic development of the country. The results of the study indicate that average premium growth rate for life insurance business has been 28% per annum as compared to 22% for general insurance. The average net profit growth rate for life insurance business has been about 14% per annum as compared to 52% for general insurance. The average asset growth rate for life insurance business has been 16% per annum as compared to 18% for general insurance. The average ROA for life insurance business has been 0.36% per annum as compared to 8.1% for general insurance. Hence overall performance of general insurance has been better than life insurance sector.

Iseveroglu and Sezer (2015) analyze the financial performances of pension companies operating in Turkey by TOPSIS method via using financial tables of the sixteen pension and life-pension companies. Liquid Assets Ratio, Equity Profit Ratio, Profitability of Pension Business Technical Income, Profitability of Life Insurance Premium Revenues, Combined Ratio (Expense Ratio + Net Loss Ratio), Returns of Investments, Asset Profitability, and Claims paid, ceded/Net written premiums are the financial ratios used in their study. Financial ratios are converted to demonstrate of company performance unique point by using TOPSIS method. Companies have sorted according to their calculated performance scores. Financial performance assessment is performed for five terms included in 2008 – 2012 period and obtained results are compared. They find that, performance scores of the pension companies generally aren't changed during analyze period.

Akhisar and Tunay (2015) make a framework for measurement taking into account the factors of the Turkish life insurance sector and determine the effects of parameters on the performance. In order to find the performance rank of the life insurance companies in Turkey according to financial ratios weights for each company, they use AHP and TOPSIS methods which are MCDM methods. Performance scores of life

insurance companies are obtained by TOPSIS related with companies' weighted financial ratios. They use three criteria (Capital Adequacy Ratios, Asset Quality Ratios, and Profitability Ratios) and total ten units (sub-criteria) under the three main criteria for finding out the AHP weights. And then they rank the pension and life insurance companies of Turkish insurance sector for the period of 2009–2013 years by using TOPSIS method based on AHP weights they calculate. They find that company's performance rank is affected by capital adequacy with respect to premium received, total assets and shareholders' equity respectively. Moreover, it is observed that the performance ranks of the companies are highly correlated with profitability ratios of companies whose row data. They could not get appropriate result, row data belonging to companies according to asset quality variables, in accordance with performance ranks of the companies.

Ertugrul and Ozcil (2016) use the financial charts of seven insurance companies, trade on Turkey-Istanbul Stock Exchange and financial performance of companies are analyzed with two integrated Multi-Criteria Decision Making (MCDM) methods. In this study, firstly the weights of performance ratios are determined by Fuzzy Decision Making Trial and Evaluation Laboratory (Fuzzy DEMATEL) method. Secondly, while applying Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) and Fuzzy Technique for Order Preference by Similarity to Ideal Solution (Fuzzy TOPSIS) together with Fuzzy DEMATEL, two different integrated methods are applied to MCDM process. Performance order scores from both methods are used for the rates of companies by 2008 – 2014 and for a comparison of two different methods. Current ratio, liquidity ratio, cash ratio, leverage ratio, financial ratio, asset turnover, equity capital rate, net profit margin, and return on equity are used. In conclusion, it is observed that the results obtained are consistent with TOPSIS and DEMATEL methods. Criteria related to the stability and profitability is found to be higher weights in terms of finance. Fuzzy TOPSIS and TOPSIS methods has been found to have different results from each other. Ak Insurance has the best financial structure in the between 2010–2012 years and has the lowest financial structure in the year 2009. Yapı Kredi Insurance has a more stable and more positive financial structure compared to other companies. Aviva Insurance is seen to have a declining financial structure in the sector for the first three years and just last two years started to rise. Anadolu Insurance has the best financial structure for the first three years, but showed a continuous decline in the past three years. Ray Insurance stands as a company that has a steady rise except last two years and has exhibited a decline in the last two years. At last, Gunes Insurance and Anadolu Hayat Insurance has attracted attention in the sector every year as the lowest financial structured company except the years 2009 and 2014.

Peker and Baki (2011) rank the financial performance of three leading companies operating in the insurance sector in Istanbul Stock Exchange. Grey Relationship Analysis (GRA) is used to measure performance by liquidity, financial leverage and profitability ratios of the companies. Ten ratios are examined for the year 2008. It is concluded that a firm which has high liquidity ratios may have high performance.

Akın and Ece (2013) analyzes the financial performances for seven insurance companies which are traded at ISE by using their financial statements. The financial statements of seven insurance companies for four periods included in the period of 2006–2010 are addressed by the methods of ratio analysis and analysis of comparative financial statements. Current ratio, earnings per share ratio, return on equity ratio, return on assets, and market value/book value are used for financial performance analysis. They find that the average of earnings per share ratio is gradually decreasing except the year 2008. Earnings per share ratio are negatively affected from 2007 crisis. They also state that return on assets (ROA), and return on equity ratios aren't affected by the crisis period 2007–2008.

### 3. Methodology of research

Evaluating the financial performance of companies in Turkish insurance sector using multi-criteria decision technique is the main objective of this study. To achieve this, 4 financial ratios are used for 2010–2015 (quarterly) periods. 5 insurance companies are; Aksigorta A.S. (AKGRT), Anadolu Hayat Emeklilik Anonim Sirketi (ANHYT), Anadolu Anonim Turk Sigorta Sirketi (ANSGR), Gunes Sigorta A.S. (GUSGR) and Avivasa Emeklilik & Hayat A.S. (AVISA). The data was taken from Istanbul University School of Business SERPAM Lab Financial Information News Network (FINNET) Finnet Analysis Software. Table 1 shows the details of variables in the decision model.

Table 1. Variables and Their Terminology

Variables	Terminology
C1: Current Ratio	(Current Assets)/(Short-term Liabilities)
C2: Asset Growth Rate	(Total Assets <sub>t</sub> – Total Assets <sub>t-1</sub> )/Total
C3: Return on Asset %	(Net Income)/(Total Assets)
C4: Return on Equity %	(Net Income)/(Shareholders' Equity)

#### 4. VIKOR Method

VIKOR was first presented by Opricovic (1998) and Opricovic and Tzeng (2002), for solving multiple criteria decision making (MCDM) problems based upon the adoption of  $L_p$ -metric concept. VIKOR method focuses on ranking and selection from a set of alternatives in cases of conflicting criteria (Chiu, Tzeng, and Li, 2013). It is a technique for multi-criteria optimization of complex systems (Opricovic and Tzeng, 2004). Assuming that each alternative is evaluated according to each criterion function, the compromise ranking could be performed by comparing the measure of closeness to the ideal alternative (Zhang and Wei, 2013). The various  $J$  alternatives are denoted as  $a_1, a_2, \dots, a_J$ . For alternative  $a_j$ , the rating of the  $i_{th}$  aspect is denoted by  $f_{ij}$ , i.e.  $f_{ij}$  is the value of  $i_{th}$  criteria function for the alternative  $a_j$ ;  $n$  is the number of criteria (Sanayei, Mousavi and Yazdankhah, 2010).

Developing of the VIKOR method started with the following form of  $L_p$ -metric (Opricovic and Tzeng, 2004; Opricovic and Tzeng, 2007; Tzeng, Lin, and Opricovic, 2005):

$$L_{p,j} = \left\{ \sum_{i=1}^n \left[ w_i \frac{(f_i^* - f_{ij})}{(f_i^* - f_i^-)} \right]^p \right\}^{\frac{1}{p}} \quad 1 \leq p \leq \infty; \quad j = 1, 2, \dots, J. \quad (1)$$

Within the VIKOR method  $L_{1,j}$  are used to formulate ranking measure. The solution obtained by  $\min_j S_j$  is a maximum group utility, and the solution obtained by  $\min_j R_j$  is with minimum individual regret of the “opponent”.

The compromise solution  $F_c$  is a feasible solution that is the “closest” to the ideal  $F^*$ , and compromise means an agreement established by mutual concessions, by  $\Delta f_1 = f_1^* - f_1^c$  and  $\Delta f_2 = f_2^* - f_2^c$ .

The compromise ranking algorithm VIKOR is conducted as follows:

**Step 1.** Determine the ideal  $f_i^*$  and the nadir  $f_i^-$  values of all criteria functions ( $i=1,2,\dots,n$ ) according to benefit or cost functions. If the  $i_{th}$  function represents a benefit then:

$$f_i^* = \max_j f_{ij}, \quad f_i^- = \min_j f_{ij} \quad (2)$$

If the  $i_{th}$  function represents a cost then:

$$f_i^* = \min_j f_{ij}, \quad f_i^- = \max_j f_{ij} \quad (3)$$

**Step 2.** Compute the values  $S_j$  and  $R_j$ ,  $j=1,2,\dots,J$ , by the relations

$$S_j = \sum_{i=1}^n w_i \frac{(f_i^* - f_{ij})}{(f_i^* - f_i^-)} \quad (4)$$

$$R_j = \max_i \left[ w_i \frac{(f_i^* - f_{ij})}{(f_i^* - f_i^-)} \right] \quad (5)$$

Where  $w_i$  are the weights of criteria, expressing their relative importance.

**Step 3.** Compute the values  $Q_j, j=1,2,\dots,J$ , by the relation

$$Q_j = v \frac{(S_j - S^*)}{(S^- - S^*)} + (1-v) \frac{(R_j - R^*)}{(R^- - R^*)} \quad (6)$$

Where

$$S^* = \min_j S_j, \quad S^- = \max_j S_j \quad (7)$$

$$R^* = \min_j R_j, \quad R^- = \max_j R_j \quad (8)$$

and  $v$  is introduced as weight for the strategy of the maximum group utility, whereas  $1-v$  is the weight of the individual regret. Usually the value of  $v$  is taken as 0.5 (Liu, Mao, Zhang, & Li, 2013).

**Step 4.** Rank the alternatives, sorting by the values  $S, R$  and  $Q$ , in decreasing order. The results are three ranking lists.

**Step 5.** Propose as a compromise solution the alternative ( $a'$ ) which is ranked the best by the measure  $Q$  (minimum) if the following two conditions are satisfied:

**C1. Acceptable Advantage:**

$$Q(a'') - Q(a') \geq DQ \quad (9)$$

Where  $a''$  is the alternative with second position in the ranking list by  $Q$ ;  $DQ = 1/(J-1)$ ;  $J$  is the number of alternatives.

**C2. Acceptable stability in decision making:**

Alternative  $a'$  must also be the best ranked by  $S$  or/and  $R$ . This compromise solution is stable within a decision making process, which could be “voting by majority rule” (when  $v > 0.5$  is needed), or “by consensus”  $v \approx 0.5$ , or “with veto” ( $v < 0.5$ ). Here,  $v$  is the weight of the decision making strategy “the majority of criteria” (or “the maximum group utility”).

If one of the conditions is not satisfied, then a set of compromise solutions is proposed, which consists of:

- Alternatives  $a'$  and  $a''$  if only condition C2 is not satisfied, or
- Alternatives  $a', a'', \dots, a^{(M)}$  if condition C1 is not satisfied; and  $a^{(M)}$  is determined by the

relation  $Q(a^{(M)}) - Q(a') < DQ$  for maximum  $M$  (the positions of these alternatives are “in closeness”).

The best alternative, ranked by  $Q$ , is the one with the minimum value of  $Q$ . The main ranking result is the compromise ranking list of alternatives and the compromise solution with the “advantage rate”. Ranking by VIKOR may be performed with different values of criteria weights on proposed compromise solution. VIKOR is effective tool in multi criteria decision making, particularly in a situation where the decision maker is not able, or does not know to express his/her preference at the beginning of system design. The obtained compromise solution could be accepted by the decision makers because it provides a

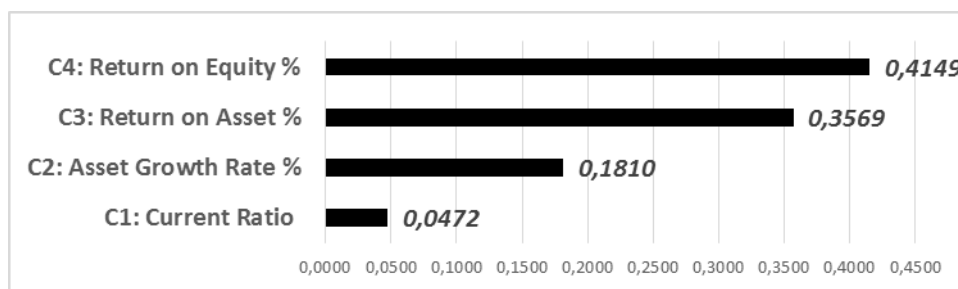
maximum “group utility”. The compromise solutions could be the basis for the negotiations, involving the decision makers’ preference by criteria weights.

VIKOR technique is widely used in many fields including marketing, material selection, vendor/supplier selection, project selection, company selection, service quality evaluation, financial performance evaluation, tourism policy improvement, location selection etc. One of the advantages of VIKOR is that VIKOR method proposes a compromise solution with an advantage rate (Opricovic and Tzeng, 2004). Also pair-wise comparisons are avoided.

### 5. Results

Financial performance evaluation problem is solved by applying VIKOR method. In this ranking problem there are 4 criteria (financial ratios) and 5 alternatives (insurance companies) including AKGRT, ANHYT, ANSGR, GUSGR AVISA. Financial ratios to be considered in the financial performance evaluation problem are determined by literature review. 4 important financial ratios to be used for financial performance evaluation are established. In this study, priority weights of financial ratios taken from Onder, Tas, and Hepsen (2014)’s paper. In that paper, researchers use Analytical Network Process (ANP) to determine the weights of 8 financial ratios. Because of data availability constraint in this paper 4 financial ratios are used for ranking the insurance companies. Therefore the weights of 4 ratios are calculated using normalization process. According to experts’ judgments based ANP analysis, “C4: Return on Equity” (0.4149) was the most important financial ratio influencing companies’ financial performance followed by “C3: Return on Asset” (0.3568) and “C2: Asset Growth Rate” (0.1809). The least important financial ratio is “C1: Current Ratio” (0.0472). Resulting weights obtained with expert judgments based ANP are shown on Figure 1.

Figure 1. Resulting weights obtained with expert judgments



VIKOR method is applied to rank the insurance companies. There are 23 periods (from 2010/1 to 2015/3) in this study. The calculations of last period (2015/3<sup>rd</sup> Quarter) will be shown for illustrative example. The priority weights of financial ratios calculated by ANP shown in Figure 1, can be used as input of VIKOR method as shown in Table 2.

Table 2. Input values of the VIKOR analysis

Weights		<b>0.0472</b>	<b>0.1809</b>	<b>0.3568</b>	<b>0.4149</b>
Criteria ID		C1	C2	C3	C4
Criteria Name		Current Ratio*	Asset Growth Rate	Return on Asset	Return on Equity
Alternatives (Insurance Companies)	AKGRT	4.9416	4.4449	0.1018	0.2729
	ANHYT	1.1063	14.4918	-7.4065	-103.6243
	ANSGR	7.5691	2.8600	5.1331	12.1971
	GUSGR	1.8202	20.3936	0.2050	1.4471
	AVISA	8.6563	3.2119	11.1522	20.1253

\*Optimum value is 1.5 for current ratio. C1 values above are the difference from optimum value. Less value is better for C1. High value is better for C2, C3 and C4.

The best  $f_i^*$  and the worst  $f_i^-$  values of all criterion functions are shown in Table 3.

Table 3. The best and the worst values of all criterion functions

	Criteria	Effect	$f_i^*$ (Best)	$f_i^-$ (Worst Value)
C1	Current Ratio*	-	1.1063	8.6563
C2	Asset Growth	+	20.3936	2.8600
C3	Return on Asset	+	11.1522	-7.4065
C4	Return on Equity	+	20.1253	-103.6243

Table 4. Calculation of  $S_i$  for criteria

	C1	C2	C3	C4
S1	0.0240	0.1646	0.2125	0.0666
S2	0.0000	0.0609	0.3569	0.4149
S3	0.0404	0.1810	0.1158	0.0266
S4	0.0045	0.0000	0.2105	0.0626
S5	0.0472	0.1773	0.0000	0.0000

By using VIKOR method, the ranking of alternatives are calculated. With using Eq. 7 and Eq. 8, we can obtain  $S^* = 0.225$ ,  $S^- = 0.833$ ,  $R^* = 0.177$ ,  $R^- = 0.415$ . Table 5 shows  $S_j$ ,  $R_j$  and  $Q_j$  values of alternatives.

Table 5. Calculation of  $S_j$ ,  $R_j$  and  $Q_j$  for criteria

Companies	$S_j$	Rank	$R_j$	Rank	$Q_j$ (v=0,5)	Rank
AKGRT	0.4677	4	0.2125	4	0.2739	4
ANHYT	0.8327	5	0.4149	5	1.0000	5
ANSGR	0.3637	3	0.1810	2	0.1221	3*
GUSGR	0.2776	2	0.2105	3	0.1135	2*
AVISA	0.2246	1	0.1773	1	0.0000	1*

C1. Acceptable Advantage:  $DQ = 1/(5-1) = 0.25$ .

$$Q(a^{II}) - Q(a^I) \geq DQ \rightarrow 0.1135 - 0 < 0.25$$

but  $Q(a^{IV}) - Q(a^I) \geq DQ \rightarrow 0.2739 - 0 \geq 0.25$  therefore the positions of AVISA, GUSGR and ANSGR companies are "in closeness".

C2. Acceptable stability in decision making:

Alternative AVISA is in the best ranked by Q, S and R. This compromise solution is stable within a decision making process, by consensus.

Depends on the  $RC_j$  values for the third quarter of 2015, the ranking of the companies from top to bottom order are AVISA, GUSGR, ANSGR, AKGRT and ANHYT (Table 6). Proposed model results show that AVISA had best financial performance in 2015/3. Financial analysts can also be investigating the top three companies, because their financial performance positions are "in closeness".



Table 6. VIKOR ranking for the period 2015/3

Rank	Q <sub>j</sub>	Companies
1	0.0000	AVISA
2	0.1135	GUSGR
3	0.1221	ANSGR
4	0.2739	AKGRT
5	1.0000	ANHYT

Table 7 shows the evaluation results and final rankings of insurance firms during 2010-2015. Also quarterly period financial ratios are converted to single data set by using arithmetic mean and standard deviation. The results of the analyses emphasize that AVISA and ANHYT ranked as first and second in terms of the arithmetic mean.

Table 7. VIKOR rankings of the firms during 2010/1 - 2015/3

	2010/1	2010/2	2010/3	2010/4	2011/1	2011/2	2011/3	2011/4	2012/1	2012/2	2012/3	2012/4	2013/1	2013/2	2013/3	2013/4	2014/1	2014/2	2014/3	2014/4	2015/1	2015/2	2015/3	Average	Std Dev
AKGRT	4*	4*	4	4	4	4	4*	2*	3*	3	3*	3*	4*	1*	1	1	1	4*	4*	4	4	4	4	3.22	1.17
ANHYT	1*	2*	2*	2*	1*	1	2*	4*	2*	2*	2*	1*	1*	3*	4	4	4	3*	1*	1*	2*	2*	5	2.26	1.21
ANSGR	3*	3*	3	3*	3	5	5	5	4	5	5	5	3*	4*	3	2	3	2*	3*	3*	3*	3*	3*	3.52	0.99
GUSGR	5	5	5	5	5	3	3*	1*	5	4	4	4	5	5	5	5	5	5	5	5	5	5	2*	4.39	1.12
AVISA	2*	1*	1*	1*	2*	2	1*	3*	1*	1*	1*	2*	2*	2*	2	3	2	1*	2*	2*	1*	1*	1*	1.61	0.66

\* The positions of alternatives are "in closeness". Compromise solutions are stable.

## 6. Conclusions

In this study VIKOR method is used to evaluate the financial performance of five listed insurance companies in BIST. Ranking problem based on firms financial performance involves multiple and conflicting financial ratios (criteria). Investors, financial analysts and academicians use financial ratios often in their analysis, because financial ratios are important quantitative financial information. Financial performance evaluation can also be done using other MCDM techniques for comparing the ranking results. In future research industry specific ratios such as "Technical Income Growth" and "Technical Expense Growth" can be used for evaluating financial performance.

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