REITs in Turkey: Fundamentals vs. Market

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Abstract **–Financial performance evaluation of real estate investment trusts (REITs) is a kind of multi-criteria decision making (MCDM) problem. It is very important for a firm to monitor a wide range of performance indicators in order to ensure that appropriate and timely decisions and plans can be made. Suitable performance measures can ensure that managers adopt a long-term perspective and allocate the company's resources to the most effective activities. The aim of this study is to evaluate the financial performance model of Turkish Real Estate Investment Trusts (REITs) during 2012-2013 period using multi criteria decision techniques. Analytical Network Process (ANP) and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) methodologies are used for the outranking of trusts. This model is applied to a case study for the financial performance evaluation of 24 REITs (Akfen, Akiş, Akmerkez, Alarko, Ata, Atakule, Avrasya, Doğuş, Emlak Konut, İdealist, İş, Kiler, Martı, Nurol, Özderici, Pera, Reysaş, Saf, Sinpaş, Torunlar, TSKB, Vakıf, Yapı Kredi Koray and Yeşil) in Turkey. Financial performance indicators namely Asset Growth Rate, Operating Costs / Net Sales, Return on Asset, Net Profit Margin, Return on Equity, Current Ratio, Long Term Assets / Total Assets and Quick Ratio are used for ranking the firms. The findings of this paper would help REIT managers and investors for creating more effective investment strategies. For the management side, rises, falls, and turning points of the fundamental indicators puts into perspective the effects of investment and financing policies created to deal with them. For the investors' side, comparing fundamental and market values provide them to analyze REITs are over or undervalued in the financial market.**

Keywords–*REITs, Financial Performance Evaluation, Analytical Network Process (ANP), TOPSIS Method, Real Estate Sector, Multi Criteria Decision Making, Correlation*

1. Introduction

As a developing country, Turkey has been going through wide-scale urbanization as a result of the rapid industrialization since 1950's. Increase in population and migration from rural to urban areas have triggered development in the cities. Today, based on results of the survey Emerging Trends in Real Estate Europe, prepared jointly by PricewaterhouseCoopers and the Urban Land Institute clearly indicates that Istanbul is ranked as the fourth most attractive real estate investment market among all European Cities in 2013 (PWC and ULI, 2013). The Turkish city was ranked first in the previous two Emerging Trends Europe reports, and is another top pick this year. With half of its 75 million people under the age of 29, there are several factors driving or affecting the infrastructure requirements in Turkey. These factors are increase in population and household income level, continued migration from rural to urban areas, renewal of existing housing, modernization and the development of the retail market, increase in the number of multinational and large national companies, leading to office space requirements in the commercial cities, and the geographical position of Turkey being a bridge between Europe, Central Asia and the Middle East puts emphasis on the development of the logistics sector and related construction (ISPAT, 2010). In addition to them, national and international specialists agree that Turkey will reach even more important positions in future. The role that the real estate sector and its main player real estate investment trusts will assume become more important in this future projection for Turkey. (GYODER, 2012).

In general, real estate investment trusts (REITs) are closed-end investment companies which are managing portfolios composed of real estates, real estate based projects and capital market instruments based on real estates. They serve as financial intermediaries to facilitate the flow of funds from investors to real estate sector of the economy (Corgel et.al, 1995). According to the Turkish Association of Real Estate Investment Companies, real estate investment trusts (REITs) are professional investment companies that will shape the real estate industry of the future in Turkey and they are one of the most important innovations to appear on financial markets in recent years. REITs are important investment vehicles for bringing corporate capital to the financing resource-starved real estate sector as well as developing large and quality projects. REITs have eliminated the problem of liquidity, the most fundamental problem facing investments in real estate. Moreover, by bringing together the savings of individual and corporate investors into a common pool, they are able to realize large profit-generating real estate projects. The main goal of REITs in Turkey is to create a source of financing for the real estate sector, which has been experiencing problems in this area. Permitting public investment and directing the funds collected to the real estate sector are just two new sources. They are also enabling investors with limited savings to benefit from the increased value created by pooling of their resources, which enables them to invest in large, productive real estate investments, which would otherwise be beyond the reach of small-scale investors. Furthermore, REITs want to be able to form a corporate and professional investment base in Turkey. They also have, as one of their goals, the creation of an alternative and transparent model to various inadequate practices that have been going on in the real estate sector. In order to promote the formation and growth of the industry, authorities have provided REITs with some important tax incentives as well as flexibility in managing their portfolios. In Turkey, one another important role of REIT's is to eliminate the unrecorded real estate market and to bring transparency to the real estate sector. This role is achieved by the help of appraisal firms. Transactions and the portfolio valuation of REIT's are based on appraisal reports from independent appraisal firms which are certified by the Capital Markets Board of Turkey (CMB).

A REIT regime exists in Turkey primarily under the administrative supervision of the CMB, a regulatory and supervisory agency. The REIT practices were introduced to the Turkish capital markets for the first time with the legal framework prepared in 1995 and with the first IPO in 1997. Currently, there are 30 REITs registered with the CMB with shares still quoted on the Borsa Istanbul (BIST). In addition, the REIT index consists of stocks of real estate investment trusts traded on the BIST market. REIT index series are also set at 21,180.77 at the last trading day of 1999. Table 1 presents the historical consolidated portfolio structure of REITs in Turkey and Table 2 summarizes general information of REITs as of 2013 third quarter (Capital Markets Board, 2014).

Table 1. Historical Consolidated Portfolio Structure of REITs in Turkey

All Real Estate Investment Trusts					
Year	Number of REITs	Market Capitalization (Thousand TRY)	R (%)	MCMI (%)	GB (%)
2011/09	23	18,742,054	66	11.33	5.19
2011/12	23	20,769,996	63	11.27	5.45
2012/03	24	22,104,329	63	10.70	6.58
2012/06	24	21,771,855	64	9.82	6.53
2012/09	24	22,561,915	67	6.44	8.32
2012/12	25	24,086,877	66	8.18	6.48
2013/03	27	27,232,324	65	5.87	10.47
2013/06	28	29,487,413	66	6.17	12.61
2013/09	30	32,399,777	64	11.91	5.31

Notes: R%: Proportion of Real Estates, Real Estate Projects and Rights in the Portfolio; MCMI%: Proportion of Money and Capital Market Instruments in the Portfolio; GB%: Proportion of Affiliates in the Portfolio
Source: Capital Markets Board of Turkey, www.cmb.gov.tr

Table 2. General Information of REITs in Turkey (2013 3rd Quarter)

	Name of Company	Registered Capital (TRY)	Paid in Capital (TRY)	Number Of Outstanding Shares	Asset Allocation %				Total Assets (TRY)	Stock Price (TRY)	Market Value (TRY)
					Real Estate Investments	Affiliates	Money and Capital Market Instruments	Other			
1	AKFEN REIT	1,000,000,000	184,000,000	184,000,000	53.04	44.14	0.11	2.71	1,211,880,553	1.36	250,240,000
2	AKİŞ REIT	200,000,000	128,200,841	128,200,841	83.21	5.80	1.77	9.22	980,160,476	3.03	388,448,549
3	AKMERKEZ REIT	75,000,000	37,264,000	37,264,000	72.86	0.00	22.56	4.58	183,691,044	14.35	534,738,400
4	ALARKO REIT	20,000,000	10,650,794	10,650,794	47.93	0.00	48.48	3.60	351,584,056	19.30	205,560,324
5	ATA REIT	50,000,000	23,750,000	23,750,000	53.78	0.00	39.75	6.47	28,627,933	1.69	40,137,500
6	ATAKULE REIT	200,000,000	84,000,000	84,000,000	73.66	0.00	25.04	1.30	246,107,529	1.10	92,400,000
7	AVRASYA REIT	480,000,000	72,000,000	72,000,000	74.46	0.00	24.72	0.20	81,336,047	0.56	40,320,000
8	DOĞUŞ REIT	500,000,000	93,780,000	93,780,000	82.24	0.00	17.29	0.47	236,478,371	3.50	328,230,000
9	EGS REIT	75,000,000	50,000,000	50,000,000	33.63	0.00	0.00	66.31	54,626,138	-	-
10	EMLAK KONUT REIT	4,000,000,000	2,500,000,000	2,500,000,000	52.76	0.00	18.07	29.16	10,573,606,000	2.73	6,825,000,000
11	HALK REIT	1,500,000,000	673,638,704	673,638,704	75.84	0.00	18.88	5.28	867,935,912	1.25	842,048,380
12	İDEALİST REIT	200,000,000	10,000,000	10,000,000	83.51	0.00	8.71	7.78	8,980,436	1.81	18,100,000
13	İŞ REIT	2,000,000,000	630,000,000	630,000,000	77.40	0.02	15.46	7.13	1,459,105,092	1.33	837,900,000
14	KİLER REIT	1,400,000,000	124,000,000	124,000,000	69.50	14.17	0.79	15.54	499,851,709	1.34	166,160,000
15	MARTI REIT	200,000,000	110,000,000	110,000,000	57.31	0.00	0.47	23.10	240,868,087	0.44	48,400,000
16	NUROL REIT	40,000,000	40,000,000	40,000,000	79.88	0.00	0.82	19.30	769,135,052	5.76	230,400,000
17	ÖZAK REIT	300,000,000	157,000,000	157,000,000	61.91	35.21	0.47	2.41	1,073,236,521	2.23	350,110,000
18	ÖZDERİCİ REIT	250,000,000	100,000,000	100,000,000	77.36	0.00	9.11	13.53	179,716,411	0.94	94,000,000
19	PANORA REIT	90,000,000	87,000,000	87,000,000	97.39	0.02	2.05	0.55	609,974,103	4.00	348,000,000
20	PERA REIT	250,000,000	89,100,000	89,100,000	87.88	1.87	0.85	9.40	215,173,884	0.47	41,877,000
21	REYSAŞ REIT	500,000,000	217,000,000	217,000,000	73.52	4.25	9.17	13.05	502,625,998	0.47	101,990,000
22	SERVET REIT	1,000,000,000	52,000,000	52,000,000	84.45	0.00	15.03	0.52	202,894,264	2.68	139,360,000
23	SAF REIT	2,000,000,000	886,601,669	886,601,669	70.56	0.79	10.22	17.67	933,099,256	0.86	762,477,435
24	SİNPAŞ REIT	1,000,000,000	600,000,000	600,000,000	54.43	5.34	2.02	38.21	2,144,437,707	1.06	636,000,000
25	TORUNLAR REIT	1,000,000,000	500,000,000	500,000,000	62.08	8.46	15.19	14.27	5,660,905,000	3.39	1,695,000,000
26	TSKB REIT	200,000,000	150,000,000	150,000,000	93.54	0.00	2.94	3.52	360,969,421	0.92	138,000,000
27	VAKIF REIT	300,000,000	106,200,000	106,200,000	71.40	0.00	28.37	0.24	198,186,135	9.28	985,536,000
28	YAPI KREDİ KORAY REIT	100,000,000	40,000,000	40,000,000	52.62	34.07	8.79	4.53	117,724,243	1.39	55,600,000
29	YENİ GİMAT REIT	250,000,000	53,760,000	53,760,000	97.21	0.25	0.00	2.54	1,303,061,475	14.30	768,768,000
30	YEŞİL REIT	1,000,000,000	235,115,706	235,115,706	59.74	0.00	0.06	40.20	1,103,798,443	0.51	119,909,010

Source: Capital Markets Board of Turkey, www.cmb.gov.tr

2. Literature Review

Firm-specific fundamental variables of real estate investment trusts including Asset Growth Rate, Operating Costs / Net Sales, Return on Asset, Net Profit Margin, Return on Equity, Current Ratio, Long Term Assets / Total Assets and Quick Ratio that may affect their stock return. The first study to investigate the REIT performance in literature was written by Smith and Shulman (1976). This study compared the performance (quarterly returns) of sixteen REITs to the S&P index, savings accounts, and fifteen closed-end funds over the 1963–1974 periods by using the Jensen measure. They found that equity REITs outperformed savings accounts and the S&P index for the 1963–1973 periods. However, the performance of REIT stocks was so bad in 1974 that their REIT sample underperformed the S&P index for the entire 1963–1974 period if the recession year of 1974 was included. In addition to this, the well-known study related to REIT performances belong to Redman and Manakyan (1995). They examined the risk-adjusted performance of REITs from 1986 to 1990 in relation to financial and property characteristics of their portfolios. The Sharpe measure of risk-adjusted rate of return was regressed against financial ratios (gross cash flow, leverage, asset size) and property investment ratios for a sample of equity and mortgage REITs. The result of their study is financial ratios, location of properties (more specifically, in the western United States) and types of real estate investment determine the risk-adjusted performance. Cannon and Vogt (1995) examined possible agency problems in Real Estate Investment Trusts (REITs) by contrasting the performance, structure and compensation of the two REIT forms ("self-administered REITs" and "advisor REITs") from 1987 through 1992. The market performance of the two REIT forms was analyzed by using the Jensen measure and the Sharpe measure. Results show that "self-administered REITs" outperformed "advisor REITs" over the sample period. On the other hand, some papers focus on risk and return characteristics of REITs. Chan, Hendershott and Senders (1990) analyzed monthly returns on an equally weighted index of eighteen to twenty-three equity REITs that were traded on major stock exchanges over the 1973-1978 period. They employed a three-factor Arbitrage Pricing Model (APM) as well as Capital Asset Pricing Model (CAPM). They found that with CAPM there was an evidence of excess real estate returns, especially in the 1980s; but with APM, this evidence disappeared. Kuble, Walther and Wurtzebach (1986) investigated the risk-adjusted return performances of 102 REITs whose shares traded on various stock exchanges over the period 1973-1985. Share performance was measured through a comparative analysis with the S&P 500 Index, using the Jensen measure for excess returns. The results of the research indicated that significant Jensen alpha or excess returns occurred during ten years of the thirteen-year period analyzed. Kim, Mattila and Gu (2002) investigated the performance of hotel real estate investment trusts (REITs) over the 1993–1999 period in comparison with the overall market and six other REIT sectors (office, industrial, residential, health care, retail and diversified). The Jensen Index was employed to measure the performance of each REIT sector relative to the market portfolio. A one-way analysis of variance (ANOVA) was conducted and the Tukey multiple comparison method was used to enable performance comparisons across the REIT sectors.

The results indicate that hotel REITs carried the highest market risk as compared to other REIT sectors. The risk-adjusted return of hotel REITs was in line with that of the overall market.

Financial performance evaluation using multi criteria decision making methods is a popular research area in literature. Chen, Hsu and Tzeng (2011) developed a performance evaluation and interrelation model for hot spring hotels in their study. They selected 30 hot spring hotels for use with the optimum performance evaluation model and used DEMATEL to draw a relationship diagram for hot spring hotel performance evaluation. Then ANP was utilized to determine the weights of the evaluation criteria and prioritize them accordingly. They have defined the top six criteria that can enhance the performance of hot spring hotels.

Yu and Hu (2010) developed an integrated multi criteria decision making approach that combines the voting method and the fuzzy TOPSIS method to evaluate the performance of multiple manufacturing plants in a fuzzy environment. They used voting to determine the appropriate criteria weights and used proposed approach to evaluate the performance of five chosen manufacturing plants.

Nili, Ardakani and Schekarchizadeh (2012) offered a new method for evaluating performance in production industries. Five large plants were selected as a sample and a method based on the Balance Score Card (BSC) system and TOPSIS technique was implemented in them. They found which indexes should be considered when evaluating performance in the chosen plants.

Pal and Choudhury (2009) suggested that customers distinguish four dimensions of service quality in the case of the retail banking industry in India, namely, customer-orientedness, competence, tangibles and convenience. They used TOPSIS to evaluate and ranking the relative performance of the banks across the service quality dimensions.

Büyüközkan and Çifçi (2012) proposed a novel hybrid MCDM approach based on the fuzzy DEMATEL, fuzzy ANP, and fuzzy TOPSIS methodologies to evaluate green suppliers for the need of improving green supply chain management (GSCM) initiatives. They formulated a new evaluation model by defining possible green supplier evaluation criteria Based on the literature survey and with the validation of industrial experts.

Shyur (2006) modeled the commercial-off-the-self (COTS) evaluation problem as an MCDM problem and proposed a five-phase COTS selection model, combining the technique of ANP and modified TOPSIS. The results showed that the proposed method is practical for ranking competing COTS products in terms of their overall performance with respect to multiple interdependence criteria.

Tsai, Huang and Wang (2008) proposed combining the concepts of the ANP and TOPSIS models to evaluate and rank property-liability insurance company performance. Their study used limited financial data for the performance evaluation and The Tokio Marznrzue Newa (0.8767) insurance company is identified as the optimal insurance company by applying ANP in obtaining criteria weight and TOPSIS in ranking on those results.

Saen (2010) suggested a model for evaluating the best power plants in the presence of weight restrictions by using a data envelopment analysis (DEA) model. The proposed model does not demand exact weights from the decision maker (DM).

3. Overview of Data

The aim of this study is to evaluate the financial performance model of Turkish Real Estate Investment Trusts (REITs) using multi criteria decision techniques. To achieve this objective, below financial ratios of 24 REITs are employed for the period from 2012 3rd quarter to 2013 3rd quarter. For Turkish REIT market, this study gathers firm-specific fundamental variables of 24 REITs (Akfen, Akiş, Akmerkez, Alarko, Ata, Atakule, Avrasya, Doğuş, EmlakKonut, İdealist, İş, Kiler, Martı, Nurol, Özderici, Pera, Reysaş, Saf, Sinpaş, Torunlar, TSKB, Vakıf, YapıKrediKoray and Yeşil). Table 3 shows the details of variables in the decision model.

Table 3. Variables in the Decision Model and Their Terminology

Firm-Specific Variables	Terminology
C1: Asset Growth Rate %	(Total Assets$_t$ – Total Assets$_{t-1}$)/Total Assets$_{t-1}$
C2: Operating Costs / Net Sales %	(Operating Costs) / (Net Sales)
C3: Return on Asset %	(Net Income)/(Total Assets)
C4: Net Profit Margin %	(Net Income)/(Net Sales)
C5: Return on Equity %	(Net Income)/(Shareholders' Equity)
C6: Current Ratio	(Current Assets)/(Short-term Liabilities)
C7: Long-term Assets / Total Assets %	Long-term Assets) / (Total Assets)
C8: Quick Ratio	(Current Assets-Inventories)/(Short-term Liabilities)

4. Methodology

In this part of the study, the Analytic Network Process, TOPSIS method and proposed converting scale method will be given.

4.1. Analytical Network Process

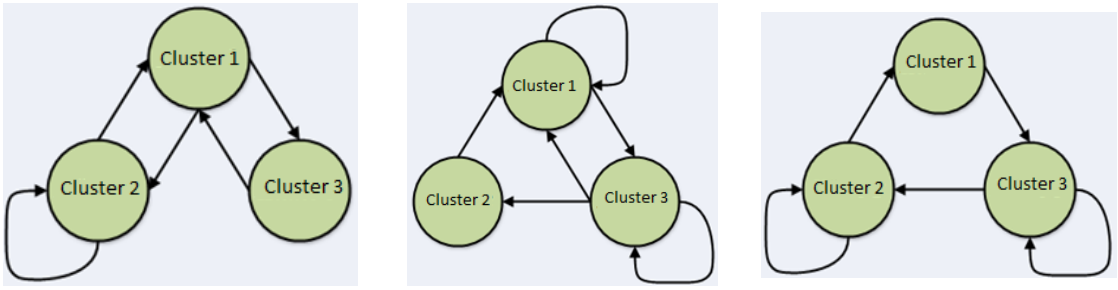
ANP proposed by T. L. Saaty (1996) is a general form of the Analytic Hierarchy Process (AHP). ANP is one of the multi criteria decision making techniques which consider the dependence among criteria and alternative. Therefore it offers several advantages over other MCDM techniques. There are mainly six steps in ANP.

Step 1. Define decision problem
Step 2. Determine dependencies among clusters (outer dependence) and elements of the clusters (inner dependence)
Step 3. Pairwise comparisons of the elements and clusters
Step 4. Determine the supermatrix and weighted supermatrix
Step 5. Calculate the limit supermatrix.
Step 6. Select the best alternative.

The general form of the supermatrix can be described as follows:

$$W = \begin{array}{c} \\ C_1 \\ \\ \\ \\ C_2 \\ \\ \\ \\ C_m \\ \\ \end{array} \begin{array}{c} \begin{array}{cccccccccccc} C_1 & & & & C_2 & & & & C_m & & & \end{array} \\ \begin{array}{cccccccccccc} e_{11} & e_{12} & \cdots & e_{1n_1} & e_{21} & e_{22} & \cdots & e_{2n_2} & \cdots & e_{m1} & e_{m2} & \cdots & e_{mn_m} \end{array} \\ \begin{bmatrix} W_{11} & & & W_{12} & & & \cdots & & W_{1m} \\ & & & & & & & & \\ & & & & & & & & \\ & & & & & & & & \\ W_{21} & & & W_{22} & & & \cdots & & W_{2m} \\ & & & & & & & & \\ \vdots & & & \vdots & & & \ddots & & \vdots \\ & & & & & & & & \\ & & & & & & & & \\ W_{m1} & & & W_{m2} & & & \cdots & & W_{mm} \end{bmatrix} \end{array} \quad (1)$$

Where C_m denotes the mth cluster, e_{mn} denotes the *n*th element in the mth cluster and W_{ij} is the principal eigenvector of the influence of the elements compared in jth cluster to the ith cluster. If the jthcluster has no influence on the ith cluster, then $W_{ij}=0$ (Tzeng and Huang, 2011). Three cases are shown in Figure 1 to demonstrate how to form the supermatrix based on the specific network structures.



$$W = \begin{array}{c} \\ C_1 \\ C_2 \\ C_3 \end{array} \begin{array}{c} \begin{array}{ccc} C_1 & C_2 & C_3 \end{array} \\ \begin{bmatrix} 0 & W_{12} & W_{13} \\ W_{21} & W_{22} & 0 \\ W_{31} & 0 & 0 \end{bmatrix} \end{array} \qquad W = \begin{array}{c} \\ C_1 \\ C_2 \\ C_3 \end{array} \begin{array}{c} \begin{array}{ccc} C_1 & C_2 & C_3 \end{array} \\ \begin{bmatrix} W_{11} & W_{12} & W_{13} \\ 0 & 0 & W_{23} \\ W_{31} & 0 & W_{33} \end{bmatrix} \end{array} \qquad W = \begin{array}{c} \\ C_1 \\ C_2 \\ C_3 \end{array} \begin{array}{c} \begin{array}{ccc} C_1 & C_2 & C_3 \end{array} \\ \begin{bmatrix} 0 & W_{12} & 0 \\ 0 & W_{22} & W_{23} \\ W_{31} & 0 & W_{33} \end{bmatrix} \end{array}$$

Figure 1. Structure of three cases and their supermatrices respectively.

After forming the supermatrix, the weighted supermatrix is derived by transforming all column sums to unity exactly. This step is very similar to the concept of a Markov chain for ensuring the sum of

these probabilities of all states is equal to 1(Ishizaka, and Nemery, 2013). Next, we raise the weighted supermatrix to limiting power such as equation below to get the global priority vectors.

$$\lim_{k\to\infty} W^k \tag{2}$$

4.2. Using Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) to rank the alternatives

Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) was first presented by Yoon (1980) and Hwang and Yoon (1981), for solving multiple criteria decision making (MCDM) problems based upon the concept that the chosen alternative should have the shortest Euclidian distance from the positive ideal solution (PIS) and the farthest from the negative ideal solution (NIS). For instance, PIS maximizes the benefit and minimizes the cost, whereas the NIS maximizes the cost and minimizes the benefit. It assumes that each criterion require to be maximized or minimized. TOPSIS is a simple and useful technique for ranking a number of possible alternatives according to closeness to the ideal solution. Expanded developments of TOPSIS were done by Chen and Hwang in 1992, Lai, Liu and Hwang (1994). This MCDM technique is widely used in many fields, including financial performance evaluation, supplier selection, tourism destination evaluation, location selection, company evaluation, selecting the most suitable machine, ranking the carrier alternatives (Behzadian, 2012). One of the advantages of TOPSIS is that pair-wise comparisons are avoided. TOPSIS is conducted as follows (Tsaur, 2011).

Step 1. Establish a decision matrix for the ranking. TOPSIS uses all outcomes (x_{ij}) in a decision matrix to develop a compromise rank. The viable alternatives of the decision process are A_1, A_2,..., A_n. The structure of the decision matrix denoted by $X = (x_{ij})_{n\times m}$ can be expressed as follows:

$$X = \begin{array}{c} \\ A_1 \\ A_2 \\ \vdots \\ A_i \\ \vdots \\ A_n \end{array} \begin{array}{c} \overset{m \quad Criteria}{\begin{array}{cccccc} C_1 & C_2 & \cdots & C_j & \cdots & C_m \end{array}} \\ \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1j} & \cdots & x_{1m} \\ x_{21} & x_{22} & \cdots & x_{2j} & \cdots & x_{2m} \\ \vdots & \vdots & \cdots & \vdots & \cdots & \vdots \\ x_{i1} & x_{i2} & \cdots & x_{ij} & \cdots & x_{im} \\ \vdots & \vdots & \cdots & \vdots & \cdots & \\ x_{n1} & x_{n2} & \cdots & x_{nj} & \cdots & x_{nm} \end{bmatrix} \end{array} \} n \quad Alternatives \tag{3}$$

x_{ij} is the outcome of ith alternative with respect to jth criteria. $W = (w_1, w_2, \ldots, w_j, \ldots, w_m)$ is the relative weight vector about the criteria, and w_j represents the weight of the jth attribute and $\sum_{j=1}^{m} w_j = 1$.

Step 2. Normalize the decision matrix using the following equation:

$$r_{ij} = \frac{w_{ij}}{\sqrt{\sum_{k=1}^{n} w_{ij}^2}} \quad \text{i=1,2,3,...,n} \quad \text{j=1,2,3,...,m} \tag{4}$$

Step 3. Weighted normalized decision matrix is calculated by multiplying the normalized decision matrix by its associated weights as:

$$v_{ij} = w_j r_{ij} \quad \text{i=1,2,3,...,n} \quad \text{j=1,2,3,...,m} \tag{5}$$

Step 4. Identify the positive ideal solution (PIS) and negative ideal solution (NIS), respectively, as follows:

$$PIS = A^* = \left\{ v_1^*, v_2^*, \ldots, v_m^* \right\} \tag{6}$$

$$= \left\{ \left(\max_i v_{ij} \mid j \in \Omega_b \right), \left(\min_i v_{ij} \mid j \in \Omega_c \right) \right\}$$

$$NIS = A^- = \left\{v_1^-, v_2^-, ..., v_m^-\right\} \quad (7)$$

$$= \left\{\left(\min_i v_{ij} \mid j \in \Omega_b\right), \left(\max_i v_{ij} \mid j \in \Omega_c\right)\right\}$$

Ω_b is associated with benefit criteria, and Ω_c is associated with cost criteria.

Step 5. Determine the Euclidean distance (separation measures) of each alternative from the ideal and negative-ideal solution as below respectively:

$$d_i^* = \sqrt{\sum_{j=1}^{m}\left(v_{ij} - v_j^*\right)^2}\ ,\ \text{i=1,2,3,…,n} \quad (8)$$

$$d_i^- = \sqrt{\sum_{j=1}^{m}\left(v_{ij} - v_j^-\right)^2}\ ,\ \text{i=1,2,3,…,n} \quad (9)$$

Step 6 Calculate the relative closeness of the i[th] alternative to ideal solution using the following equation:

$$RC_i = \frac{d_i^-}{d_i^* + d_i^-} \qquad \text{i=1,2,3,…,n} \quad (10)$$
$$RC_i \in [0,1]$$

Step 7. By comparing RC_i values, the ranking of alternatives are determined. The higher the closeness means the better the rank. Ranked the alternatives starting from the value that closest to 1 and in decreasing order.

4.3. Converting Simple Correlation Matrix into Saaty's 1-9 Scale

Operations shown below are made to generate n score matrix from simple correlation matrix as an alternative to financial expert's scores.

For each of n criteria $x_1, x_2, ..., x_n$,

Step 1. Get simple correlation matrix.

$$R = \left[r_{ij}\right]_{n\times n} \quad (11)$$

Step 2. Define scaling multiplier:

$$\text{Scaling Multiplier} = SM = \frac{n}{\left|r_{\max}\right| - \left|r_{\min}\right|} \quad (12)$$

Step 3. $\forall k = 1, 2, ..., n$, get upper triangular score matrix UN_k for x_k:

$$UN_k = \left[n_{ij}\right]_{(n-1)\times(n-1)} \quad (13)$$

and

for $\{i \neq k,\ \ j \neq k \text{ and } i < j\}$

$\forall \{i = 1, 2, ..., n \text{ ve } j = 2, 3, ..., n\}$,

$$score_{ij} = n_{ij} = \begin{cases} RS_{ij}, & \text{if } RS_{ij} > 0 \\ \dfrac{1}{\left|RS_{ij}\right|}, & \text{if } RS_{ij} < 0 \end{cases} \quad (14)$$

where

$$RawScore_{ij} = RS_{ij}$$

$$= \begin{cases} SM.AD_{ij} + \operatorname{sgn}\left(AD_{ij}\right), & \text{if } AD_{ij} \neq 0 \\ 1, & \text{if } AD_{ij} = 0 \end{cases} \quad (15)$$

and

$$AbsoluteDifference_{ij} = AD_{ij} = \left|r_{ki}\right| - \left|r_{kj}\right| \quad (16)$$

$\operatorname{sgn}(\ )$: Sign (or signum) function that extracts the sign of a real number. For any real number c, it is defined as

$$\operatorname{sgn}(c) = \begin{cases} \dfrac{|c|}{c}, & c \neq 0 \\ 0, & c = 0 \end{cases} \quad (17)$$

Step 4. Get lower triangular score matrix $LN_k = \left[l_{ji}\right]_{(n-1)\times(n-1)}$ for x_k: (18)

$$l_{ji} = \frac{1}{n_{ij}} \quad (19)$$

Step 5. Get score matrix M:

$$M = \left[LN + UN + I_{(n-1)\times(n-1)}\right]_{(n-1)\times(n-1)} \quad (20)$$

5. Combining ANP and TOPSIS to Determine the Rank of Alternatives

The proposed model of this paper uses an combined method of correlation analyze, Analytical Network Process (ANP) and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) for ranking the REITs in Turkey depends on their financial performances. Figure 2 shows the steps of the proposed method. In this financial performance evaluation there are 8 criteria. An interview was performed with the financial expert in order to identify weight coefficients. Past

experience and the back-ground of the financial expert are utilized in the determination of the criteria and 8 criteria to be used for REITs evaluation are established. The outputs of the ANP are determined as the input of TOPSIS method. Data are used for the period September 2012 to September 2013 (5 quarters). The sample period is dependent on quarterly data availability. The sample includes 24 REITs (Akfen, Akiş, Akmerkez, Alarko, Ata, Atakule, Avrasya, Doğuş, EmlakKonut, İdealist, İş, Kiler, Martı, Nurol, Özderici, Pera, Reysaş, Saf, Sinpaş, Torunlar, TSKB, Vakıf, Yapı Kredi Koray and Yeşil). Financial ratios have been grouped as Asset Growth Rate, Operating Costs / Net Sales, Return on Asset, Net Profit Margin, Return on Equity, Current Ratio, Long Term Assets / Total Assets and Quick Ratio.

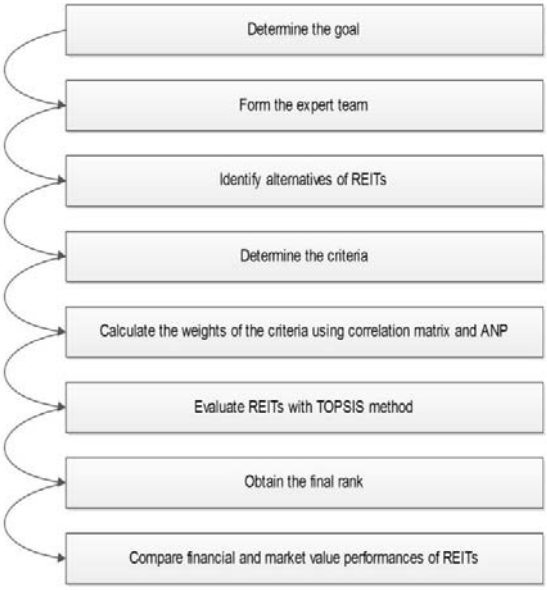


Figure 2. Steps of proposed method

As a result, 8 criteria were used in evaluation and decision model is established accordingly. Decision model structured with the determined firms and criteria is provided in Figure 3. After forming the ANP diagram for the problem, the weights of the criteria to be used in evaluation process are calculated by using ANP method. In this phase, supermatrix is obtained by converting correlation matrix data into Saaty's 1-9 scale. This transformation is possible, because all criteria data was quantitative. Also the financial expert is given the task of forming individual pairwise comparison matrix by using the Saaty's 1-9 scale. Both output of the ANP method and expert judgments were used to calculate final weight values (average of two outputs) of criteria.The limit supermatrix is derived by raising the supermatrix to powers.

The results obtained from the calculations based on the pairwise comparison matrix of financial expert's choice values are presented in Table 4.

Table4. Results of criteria by expert judgments

Criteria	Weights	CR
C1: Asset Growth Rate %	0.1042	0.0052
C2: Operating Costs / Net Sales %	0.0430	
C3: Return on Asset %	0.2055	
C4: Net Profit Margin %	0.2199	
C5: Return on Equity %	0.2389	
C6: Current Ratio	0.0272	
C7: Long Term Assets / Total Assets %	0.1420	
C8: Quick Ratio	0.0194	

Consistency ratios of the expert's pairwise comparison matrixes are calculated as 0.0052. It is less than 0.1. So the weights are shown to be consistent and they are used in the financial performance evaluation.

The ANP structure is modelled in the following network.

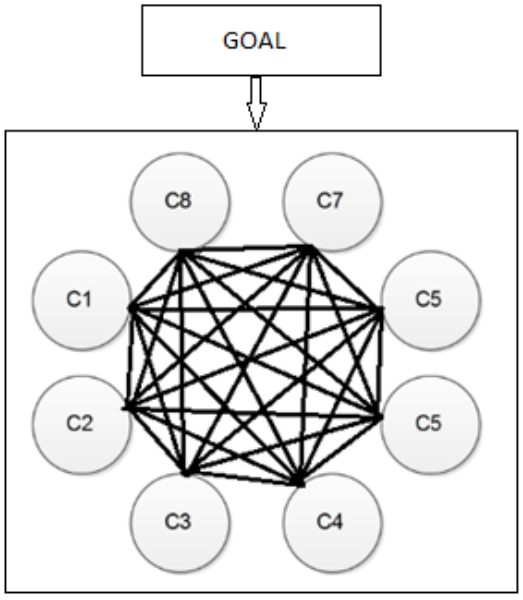


Figure 3. Criteria relationships as an ANP diagram

Table5. Correlation Matrix

	C1	C2	C3	C4	C5	C6	C7	C8
C1	1							
C2	-0.02621	1						
C3	-0.11505	-0.11114	1					
C4	0.010931	-0.86219	0.1270652	1				
C5	-0.06622	-0.07192	0.850795	0.0934032	1			
C6	-0.04407	-0.03736	0.129331	0.0309897	0.08470287	1		
C6	0.056756	-0.31257	0.1222486	0.2588015	0.12787279	-0.45721	1	
C8	-0.02578	-0.07448	0.1734237	0.0576245	0.10678744	0.93416	-0.34225	1

Table6. Supermatrix obtained from simple correlation matrices

		Criteria							
		C1	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**
Criteria	**C1**	0.0000	0.0485	0.0683	0.0466	0.0622	0.0482	0.0521	0.0424
	C2	0.1187	0.0000	0.0666	0.5351	0.0645	0.0464	0.1687	0.0545
	C3	0.2148	0.0779	0.0000	0.0862	0.5552	0.0754	0.0698	0.0891
	C4	0.1067	0.5268	0.0742	0.0000	0.0743	0.0448	0.1309	0.0497
	C5	0.1582	0.0626	0.5444	0.0724	0.0000	0.0601	0.0718	0.0647
	C6	0.1351	0.0515	0.0754	0.0516	0.0701	0.0000	0.3123	0.5355
	C7	0.1480	0.1692	0.0718	0.1485	0.0926	0.2080	0.0000	0.1641
	C8	0.1184	0.0635	0.0993	0.0596	0.0811	0.5173	0.1943	0.0000

Table7. Limit Supermatrix

		Criteria							
		C1	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**
Criteria	**C1**	0.0498	0.0498	0.0498	0.0498	0.0498	0.0498	0.0498	0.0498
	C2	0.1257	0.1257	0.1257	0.1257	0.1257	0.1257	0.1257	0.1257
	C3	0.1362	0.1362	0.1362	0.1362	0.1362	0.1362	0.1362	0.1362
	C4	0.1224	0.1224	0.1224	0.1224	0.1224	0.1224	0.1224	0.1224
	C5	0.1273	0.1273	0.1273	0.1273	0.1273	0.1273	0.1273	0.1273
	C6	0.1598	0.1598	0.1598	0.1598	0.1598	0.1598	0.1598	0.1598
	C7	0.1266	0.1266	0.1266	0.1266	0.1266	0.1266	0.1266	0.1266
	C8	0.1523	0.1523	0.1523	0.1523	0.1523	0.1523	0.1523	0.1523

Table 8. Results of criteria by ANP used correlation matrix data as input

Criteria	Weights
C1: Asset Growth Rate %	0.050
C2: Operating Costs / Net Sales %	0.126
C3: Return on Asset %	0.136
C4: Net Profit Margin %	0.122
C5: Return on Equity %	0.127
C6: Current Ratio	0.160
C7: Long Term Assets / Total Assets %	0.127
C8: Quick Ratio	0.152

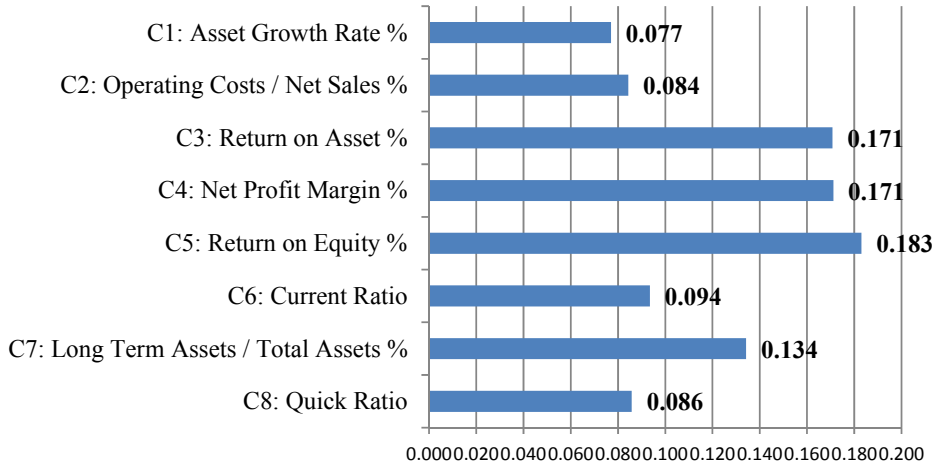


Figure 4. Resulting weights of criteria obtained with correlation matrix based ANP and expert judgments

Return on Equity (0.183), Return on Asset (0.171), Net Profit Margin (0.171) and Long Term Assets / Total Assets (0.134) are determined as the four most important financial ratios for the performance of the REITs. Asset Growth Rate (0.077), Operating Costs / Net Sales (0.084), Quick Ratio (0.086) and Current Ratio (0.094) are determined as the four least important financial ratios for the performance of the REITs.

Table 9. Input values of the TOPSIS analysis for Sep 2013

Weights	***0.077***	***0.084***	***0.171***	***0.171***	***0.183***	***0.094***	***0.134***	***0.086***
Criteria / REITs	C1	C2	C3	C4	C5	C6	C7	C8
Akfen REIT	0.1302	0.1901	-0.0256	-1.065	-0.0442	1.07	0.9569	1.11
Akiş REIT	6.4411	0.2836	-0.0285	-0.5234	-0.0425	1.16	0.9309	1.26
Akmerkez REIT	0.0899	0.0709	0.2467	0.7485	0.2527	8.51	0.7673	8.51
Alarko REIT	0.5312	0.1321	0.1327	1.485	0.1335	119.37	0.434	102.62
Ata REIT	1.562	1.1829	0.004	0.2137	0.0041	142.38	0.5379	122.42
Atakule REIT	0.0848	0.4497	-0.0052	-0.2418	-0.0053	111.11	0.7472	111.1
Avrasya REIT	0.0127	0.016	0.0293	0.0175	0.0293	135.59	0.7452	135.58
Doğuş REIT	0.189	0.2257	0.0408	0.8375	0.041	35.95	0.8253	35.89
EmlakKonut REIT	0.3828	0.0482	0.0838	0.4517	0.1745	0.65	0.6092	0.78
İdealist REIT	-0.0329	6.5022	-0.0265	-5.5077	-0.0266	173.23	0.0006	14.28
İş REIT	0.1195	0.0246	0.0629	0.2847	0.0812	0.47	0.7881	0.1
Kiler REIT	0.0513	0.0879	0.0009	0.0085	0.0014	0.24	0.6183	1.15
Martı REIT	0.121	0.3621	-0.05	-1.2999	-0.0946	0.4	0.7099	0.06
Nurol REIT	0.5519	2.2605	-0.0095	-1.1443	-0.1171	0.25	0.1379	1.32
Özderici REIT	0.376	9.988	-0.0358	-58.328	-0.0661	5.88	0.0344	0.46
Pera REIT	-0.0191	0.2385	-0.021	-0.4202	-0.029	0.14	0.9308	0.7
Reysaş REIT	0.1852	0.1042	0.0153	0.2986	0.0224	0.1	0.8457	0.17
Saf REIT	0.2921	1.7049	0.005	0.708	0.0208	0.92	0.7379	1.17
Sinpaş REIT	0.1205	0.1915	0.0098	0.0628	0.02	0.6	0.4698	0.63
Torunlar REIT	0.297	0.106	-0.0028	-0.0987	-0.0057	0.3	0.6888	0.3
TSKB REIT	0.0384	0.1835	-0.032	-0.883	-0.0517	0.44	0.9584	0.5
Vakıf REIT	0.0277	0.2857	0.0165	0.6568	0.0167	60.04	0.7152	59.8
YapıKrediKoray REIT	0.0594	0.2073	-0.2313	-0.9845	-0.8769	0.45	0.2587	1.14
Yeşil REIT	-0.0058	0.0685	0.0098	0.0406	0.0479	0.99	0.2385	0.26

Finally, TOPSIS method is applied to rank the REITs. The priority weights of REITs with respect to criteria, calculated by using pairwise comparison of experts, correlation matrix and ANP shown in Figure 4, can be used as input of TOPSIS (Table 9). The weighted normalized decision matrix can be seen from Table 10.

Table 10. Weighted REIT evaluation for Sep 2013

REITs \ Criteria	C1	C2	C3	C4	C5	C6	C7	C8
Akfen REIT	0.00149	0.00130	-0.01115	-0.00311	-0.00839	0.00032	0.03889	0.00038
Akiş REIT	0.07383	0.00194	-0.01242	-0.00153	-0.00807	0.00034	0.03783	0.00044
Akmerkez REIT	0.00103	0.00048	0.10748	0.00218	0.04799	0.00251	0.03118	0.00295
Alarko REIT	0.00609	0.00090	0.05781	0.00433	0.02535	0.03525	0.01764	0.03554
Ata REIT	0.01790	0.00809	0.00174	0.00062	0.00078	0.04205	0.02186	0.04240
Atakule REIT	0.00097	0.00307	-0.00227	-0.00071	-0.00101	0.03281	0.03036	0.03848
Avrasya REIT	0.00015	0.00011	0.01277	0.00005	0.00556	0.04004	0.03028	0.04696
Doğuş REIT	0.00217	0.00154	0.01778	0.00244	0.00779	0.01062	0.03354	0.01243
EmlakKonut REIT	0.00439	0.00033	0.03651	0.00132	0.03314	0.00019	0.02476	0.00027
İdealist REIT	-0.00038	0.04444	-0.01155	-0.01606	-0.00505	0.05116	0.00002	0.00495
İş REIT	0.00137	0.00017	0.02740	0.00083	0.01542	0.00014	0.03203	0.00003
Kiler REIT	0.00059	0.00060	0.00039	0.00002	0.00027	0.00007	0.02513	0.00040
Martı REIT	0.00139	0.00247	-0.02178	-0.00379	-0.01797	0.00012	0.02885	0.00002
Nurol REIT	0.00633	0.01545	-0.00414	-0.00334	-0.02224	0.00007	0.00560	0.00046
Özderici REIT	0.00431	0.06827	-0.01560	-0.17013	-0.01255	0.00174	0.00140	0.00016
Pera REIT	-0.00022	0.00163	-0.00915	-0.00123	-0.00551	0.00004	0.03782	0.00024
Reysaş REIT	0.00212	0.00071	0.00667	0.00087	0.00425	0.00003	0.03437	0.00006
Saf REIT	0.00335	0.01165	0.00218	0.00207	0.00395	0.00027	0.02999	0.00041
Sinpaş REIT	0.00138	0.00131	0.00427	0.00018	0.00380	0.00018	0.01909	0.00022
Torunlar REIT	0.00340	0.00072	-0.00122	-0.00029	-0.00108	0.00009	0.02799	0.00010
TSKB REIT	0.00044	0.00125	-0.01394	-0.00258	-0.00982	0.00013	0.03895	0.00017
Vakıf REIT	0.00032	0.00195	0.00719	0.00192	0.00317	0.01773	0.02906	0.02071
YapıKrediKoray REIT	0.00068	0.00142	-0.10077	-0.00287	-0.16653	0.00013	0.01051	0.00039
Yeşil REIT	-0.00007	0.00047	0.00427	0.00012	0.00910	0.00029	0.00969	0.00009
Min or Max	+	-	+	+	+	-	+	-
A^*	0.07383	0.00011	0.10748	0.00433	0.04799	0.00003	0.03895	0.00002
A^-	-0.00038	0.06827	-0.10077	-0.17013	-0.16653	0.05116	0.00002	0.04696

By using TOPSIS method, the ranking of REITs are calculated. Table 11 shows the evaluation results and final ranking of REITs.

Table 11. TOPSIS results for Sep 2013

REITs	d_i^*	d_i^-	**RC**$_i$
Akfen REIT	0.150	0.268	**0.641**
Akiş REIT	0.133	0.278	**0.677**
Akmerkez REIT	0.073	0.359	**0.830**
Alarko REIT	0.103	0.313	**0.753**
Ata REIT	0.143	0.269	**0.653**
Atakule REIT	0.150	0.267	**0.641**
Avrasya REIT	0.142	0.278	**0.662**
Doğuş REIT	0.123	0.287	**0.701**
EmlakKonut REIT	0.101	0.313	**0.755**
İdealist REIT	0.170	0.245	**0.590**
İş REIT	0.113	0.299	**0.725**
Kiler REIT	0.139	0.277	**0.666**
Martı REIT	0.163	0.257	**0.612**
Nurol REIT	0.153	0.256	**0.626**
Özderici REIT	0.245	0.189	**0.435**
Pera REIT	0.148	0.271	**0.646**
Reysaş REIT	0.131	0.284	**0.684**
Saf REIT	0.135	0.280	**0.674**
Sinpaş REIT	0.135	0.281	**0.675**
Torunlar REIT	0.139	0.276	**0.665**
TSKB REIT	0.153	0.266	**0.635**
Vakıf REIT	0.135	0.278	**0.672**
YapıKrediKoray REIT	0.309	0.193	**0.385**
Yeşil REIT	0.136	0.283	**0.676**

Depends on the RCj values, the rankings of the alternatives for the years 2012-2013 are shown in Table 12. Last column shows the overall financial performance of REITs for the 5 quarters.

Table 12. Performance ranking for the quarters (Sep 2012-Sep 2013)

REITs	12-Sep	12-Dec	13-Mar	13-Jun	13-Sep	***Overall***
Akmerkez REIT	1	2	1	1	1	***1***
EmlakKonut REIT	9	8	3	2	2	***2***
Doğuş REIT	8	3	7	5	5	***3***
İş REIT	12	10	6	4	4	***4***
Akiş REIT	3	11	9	6	7	***5***
Kiler REIT	5	6	5	11	12	***6***
Torunlar REIT	7	4	8	9	13	***7***
Reysaş REIT	10	7	12	7	6	***8***
Alarko REIT	18	15	10	3	3	***9***
Nurol REIT	4	5	2	19	20	***10***
Atakule REIT	2	1	19	20	17	***11***
Sinpaş REIT	13	13	16	8	9	***12***
Vakıf REIT	15	12	15	10	11	***13***
Avrasya REIT	16	20	4	15	14	***14***
TSKB REIT	11	9	13	17	19	***15***
Ata REIT	6	18	22	12	15	***16***
Akfen REIT	14	14	14	16	18	***17***
Yeşil REIT	23	16	23	14	8	***18***
Saf REIT	22	23	17	13	10	***19***
Martı REIT	17	17	11	21	21	***20***
Pera REIT	19	19	18	18	16	***21***
İdealist REIT	21	21	20	22	22	***22***
Yapı Kredi Koray REIT	20	22	21	24	24	***23***
Özderici REIT	24	24	24	23	23	***24***

Table 13. Financial Performance vs. Market Value Performance of REITs in Turkey (Between +3 or-3 is Fair)

REITs	Financial Performance	Market Value Performance	Position
Akmerkez REIT	1	15	Undervalued
EmlakKonut REIT	2	6	Undervalued
Doğuş REIT	3	4	Fair
İş REIT	4	10	Undervalued
Akiş REIT	5	1	Overvalued
Kiler REIT	6	21	Undervalued
Torunlar REIT	7	13	Undervalued
Reysaş REIT	8	19	Undervalued
Alarko REIT	9	12	Fair
Nurol REIT	10	24	Undervalued
Atakule REIT	11	8	Fair
Sinpaş REIT	12	20	Undervalued
Vakıf REIT	13	2	Overvalued
Avrasya REIT	14	5	Overvalued
TSKB REIT	15	11	Overvalued
Ata REIT	16	3	Overvalued
Akfen REIT	17	16	Fair
Yeşil REIT	18	22	Undervalued
Saf REIT	19	7	Overvalued
Martı REIT	20	18	Fair
Pera REIT	21	17	Overvalued
İdealist REIT	22	23	Fair
Yapı Kredi Koray REIT	23	14	Overvalued
Özderici REIT	24	9	Overvalued

6. Concluding Remarks

Overvalued describes that the market value of a firm is considered too high for its fundamentals. That is to experience a market value decline and return to a level which better reflects its financial status and fundamentals. It is also the opposite of undervalued. Undervalued describes that the market value of a firm is considered too low for its fundamentals. That is to experience a market value rise and return to a level which better reflects its financial status and fundamentals. This research proposes an analytic tool for comparing financial and market value performance for 24 REITs(Akfen, Akiş, Akmerkez, Alarko, Ata, Atakule, Avrasya, Doğuş, EmlakKonut, İdealist, İş, Kiler, Martı, Nurol, Özderici, Pera, Reysaş, Saf, Sinpaş, Torunlar, TSKB, Vakıf, Yapı Kredi Koray and Yeşil) in Turkey that includes the consideration of financial ratios. Total financial performance of firms is divided into eight groups including Asset Growth Rate, Operating Costs / Net Sales, Return on Asset, Net Profit Margin, Return on Equity, Current Ratio, Long Term Assets / Total Assets and Quick Ratio. Market performance is percentage difference between market values of each REITs during selected period. The proposed method takes advantage of ANP to determine weights using dependencies. Supermatrix is obtained by converting correlation matrix data into Saaty's 1-9 scale. After ANP and correlation analysis most important ratios are found. Return on Equity (0.183), Return on Asset (0.171), Net Profit Margin (0.171) and Long Term Assets / Total Assets (0.134) are determined as the four most important financial ratios for the performance of the REITs. Finally, TOPSIS method is applied to rank the REITs. Our model shows that although Akmerkez REIT is the best financial performing REIT during Sep 2012- Sep 2013, its market value is relatively low. Therefore its market value is expected to rise

and return to a level which better reflects its financial status and fundamentals. On the other hand, Özderici REIT is one of the worst financial performing REITs during Sep 2012- Sep 2013; its market value is relatively high. Therefore its market value is expected to decline and return to a level which better reflects its financial status and fundamentals. The findings of this paper would help REIT managers and investors for creating more effective investment strategies. For the management side, rises, falls, and turning points of the fundamental indicators puts into perspective the effects of investment and financing policies created to deal with them. For the investors' side, comparing fundamental and market values provide them to analyse REITs are over or undervalued in the financial market.

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