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Economic Investment Location Identification in Turkey Using the TOPSIS Method

Şenol Çelik
Agricultural Faculty, Department of Animal Science, Biometry and Genetic Bingöl University, Bingöl, Turkey
E-mail: senolcelik@bingol.edu.tr

Abstract: *In this study, it was aimed to rank the 14 most populous provinces in Turkey based on certain socio-economic indicators. Therefore, the data of the provinces related to variables such as population, housing sales, exports, number of motor vehicles, number of tourists, and stadium seating capacity in the year 2018 have been used. To enable a comprehensive evaluation, the TOPSIS method, which is one of the multi-criteria decision-making methods, was utilized. All criteria were included in the analysis, and a single score was obtained as a result. The performance scores were used to rank the provinces. Provinces that are ranked at the top can be considered as preferred choices for entrepreneurs who are looking to make investments.*
Keywords: *TOPSIS, multi-criteria decision-making, investment*

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I. Introduction

Multi-criteria decision-making methods have a wide range of applications. Because decision-makers constantly encounter various multi-criteria problems and they need to find solutions to these problems as quickly as possible. Multi-criteria decision-making methods support business management in selecting and evaluating the most suitable alternative among a finite number of alternatives characterized by multiple criteria.[1]

The rapid increase in the number of motor vehicles, both globally and in Turkey, has subjected roadways to a significant traffic flow. The movement of motor vehicles on Turkey's highways, especially in major cities and those connected to international routes, has become highly congested. Urban population has increased in Turkey, and those who migrate and settle in these areas often struggle to complete their integration process. Along with the increase in population, the number of motor vehicles has also continuously risen, leading to not only challenges in urban life but also contributing to economic vitality. This has become an important factor for entrepreneurs to invest in such places.

Turkey's increasing population has predominantly occurred in urban areas, especially after 1950. In 1927, only 24.2% of the total population lived in urban areas. However, this percentage increased to 25% in 1950, 43.9% in 1980, and reached 75.5% in 2010. As a result, Turkey has joined the ranks of leading countries in terms of urban population and the rate of urban population growth. [2]

In addition to socio-economic suitability, housing sector can bear investment opportunities that can stimulate sustainable economic growth and development. The housing sector can support poverty reduction and support an inclusive growth across the country through its contribution to economic output, employment, creating demand for materials and related services, and improving the living standards of residents. [3]

According to Tunç (2020) [4], the short-term price elasticity of housing supply is low, and the short-run housing supply curve has a steep positive slope, close to vertical. The housing production process, when considered including housing construction plans, building permits, and sales and marketing processes, takes more than a year, and therefore, in the short term, housing production cannot respond to price changes effectively. Therefore, a demand increase that occurs in the short term results in a larger price increase compared to a potential increase that may occur in the long term. These increasing prices also stimulate the supply.

In Turkey, the tourism sector has shown significant development since 1980 and has contributed to economic growth. In Turkey, the import substitution policy has been replaced by an export-oriented industrialization strategy. In this context, the tourism sector has been considered as an easy, effective, efficient, and relatively inexpensive tool in achieving export-oriented industrialization, which is considered the fundamental principle of the free-market economy in Turkey. [5]

In a study, taking the information entropy as an indicator for measuring the diversity of attribute data, the effects of some frequently used normalization methods on the entropy-based TOPSIS method were analyzed with a sample and relevant data. On this basis, the combinability between the entropy method and TOPSIS method is discussed as well as the applicability of different normalization methods in TOPSIS method. [6]

In another study, it had been worked out an approach to avoid rank reversal in the TOPSIS method. It had been looked at rank reversal and pointed out that it is caused by two factors. These factors were Positive Ideal Solution and Negative Ideal Solution. [7]

The purpose of this study is to determine the preference ranking using the TOPSIS method based on criteria such as the number of housing units, number of motor vehicles, exports, number of tourists, and stadium seating capacity for those who want to invest in densely populated and socioeconomically developed provinces in Turkey.

II. Materials and Method

People who want to invest in major cities in Turkey can consider factors such as the city's population, number of housing units sold, export value, number of motor vehicles, number of tourists visiting the city, and stadium seating capacity as their basis. It is possible to increase the number of these variables. However, since they are the primary factors that will increase the investor's income and bring vibrancy to the city, these variables can initially be worked on. The data is from the year 2018.

Table 1. Demographic and socio-economic indicators by provinces in Turkey

Provinces	X1	X2	X3	X4	X5	X6
İstanbul	15067724	234055	85060133	4173312	20892537	244810
Ankara	5503985	131161	7613121	1974577	1177305	123700
İzmir	4320519	75672	10235718	1395159	1610619	88005
Bursa	2994521	51362	11149895	880670	17347	49975
Antalya	2426356	62940	1362405	1060419	13009107	43000
Adana	2220125	30638	1997661	650638	360236	18595
Konya	2205609	37198	1785166	724139	63598	42000
Şanlıurfa	2035809	20696	157000	258085	10450	30000
Gaziantep	2028563	29240	6864702	506980	204448	35219
Kocaeli	1906391	35783	8904222	392561	64418	33000
Mersin	1814468	37189	1706663	608628	157774	25534
Diyarbakır	1732396	17749	210998	124456	27309	33000
Hatay	1609856	22835	2857484	485904	323799	25000
Kayseri	1389680	29041	2087316	374889	171927	32824

X1: Population, X2: Number of house sales, X3: Export ($), X4: Number of motor vehicles, X5: Number of tourists, X6: Stadium spectator capacity

References: https://biruni.tuik.gov.tr/ilgosterge/?locale=tr. [8]
http://www.gazeteilksayfa.com/ankarada-kac-tane-stadyum-var-isimleri-ve-kapasiteleri-23869h.htm. [9]

Among the many compensatory approaches of Multiple Criteria Decision Making, it is contemplated a subgroup that implicates costs and benefits directions. One of there is the Technique for Order Performance by Similarity to Ideal Solution (TOPSIS) method which was presented in [10] with reference to. [11]

TOPSIS logic is rational and understandable. The computation processes are straightforward in TOPSIS method. The concept of TOPSIS consents the pursuit of the best choices for each criterion depicted in a simple mathematical form. Besides, the importance weights are incorporated into the comparison procedures. [12]

The TOPSIS process is carried out with the following steps. [13]

Step 1. A decision matrix is formed. The construction of the matrix can be expressed as follows:

$$D = \begin{bmatrix} & X_1 & X_2 & \dots & X_j & X_n \\ A_1 & X_{11} & X_{12} & \dots & X_{1j} & X_{1n} \\ A_2 & X_{21} & X_{22} & \dots & X_{2j} & X_{2n} \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ A_i & X_{i1} & X_{i2} & \dots & X_{ij} & X_{in} \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ A_m & X_{m1} & X_{m2} & \dots & X_{mj} & X_{mn} \end{bmatrix}$$

Here, A_i: ith alternative projects, X_{ij}: the numerical outcome of the ith alternative projects with respect to jth criteria.

Step 2. The decision matrix D is normalized by using the following formula.

$$r_{ij} = \frac{X_{ij}}{\sqrt{\sum_{i=1}^{n} X_{ij}^2}}$$

Step 3. The weighted normalized decision matrix is constructed by multiplying the normalized decision matrix by its associated weights. The weighted normalized value v_{ij} is calculated as:

$$v_{ij} = w_{ij} r_{ij}$$

Step 4. The positive ideal solution and negative ideal solution is determined.

$$A^* = \{(\max v_{ij} \mid j \epsilon J), (\min v_{ij} \mid j \epsilon J')\}$$
$$A^- = \{(\min v_{ij} \mid j \epsilon J), (\max v_{ij} \mid j \epsilon J')\}$$

J=1, 2, 3, …, n
where J is associated with the benefit criteria
J'=1, 2, 3, …, n
where J' is associated with the benefit criteria
Step 5. The separation measure is calculated. The separation of each alternative from the positive ideal one is given by:

$$S_i^* = \sqrt{\sum_{i=1}^{n} (v_{ij} - v_{ij}^*)^2}$$

Similarly, the separation of each alternative from the negative ideal one is presented by:

$$S_i^- = \sqrt{\sum_{i=1}^{n} (v_{ij} - v_{ij}^-)^2}$$

where i = 1,2,…,m.
Step 6. The relative closeness to the ideal solution is calculated. The relative closeness of A_i with respect to A* is described as follow.

$$C_i^* = \frac{S_i^-}{S_i^* + S_i^-}$$
$$0 \leq C_i^* \leq 1$$

The larger the C_i^* value, the better the performance of the alternatives.
Step 7. The preference order is ranked.

III. Results and Discussion

The decision matrix is created based on the data in Table 1, and it is written as it is in the decision matrix. Therefore, the initial data forms the decision matrix. A normalized matrix is created. Each value in the matrix is squared, then the squared values in each column are summed up, and the square root is taken. It is shown as follows (Table 2).

Table 2. Normalization of the decision matrix

Provinces	**X1**	**X2**	**X3**	**X4**	**X5**	**X6**
İstanbul	227036306540176	54781743025	7235226164053910	17416533049344	436498102296369	59931936100
Ankara	30293850880225	17203207921	57959610507971,50	3898954328929	1386047063025	15301690000
İzmir	18666884429361	5726251584	104769915605807	1946468635281	2594093563161	7744880025
Bursa	8967156019441	2638055044	124320147762526	775579648900	300918409	2497500625
Antalya	5887203438736	3961443600	1856148547519,05	1124488455561	169236864937449	1849000000
Adana	4928955015625	938687044	3990651065054,64	423329807044	129769975696	345774025
Konya	4864711060881	1383691204	3186818400896,1	524377291321	4044705604	1764000000
Şanlıurfa	4144518284481	428324416	24649021352,0046	66607867225	109202500	900000000
Gaziantep	4115067844969	854977600	47124132285698,8	257028720400	41798984704	1240377961
Kocaeli	3634326644881	1280423089	79285174304797,7	154104138721	4149678724	1089000000
Mersin	3292294123024	1383021721	2912700288578,94	370428042384	24892635076	651985156

Diyarbakır	3001195900816	315027001	44520309188,6798	15489295936	745781481	1089000000
Hatay	2591636340736	521437225	8165216696195,55	236102697216	104845792401	625000000
Kayseri	1931210502400	843379681	4356887482709,01	140541762321	29558893329	1077414976
$\sqrt{\sum_{i=1}^{n} X_{ij}^2}$	**17982083.22**	**303742.7697**	**87596933.37**	**5229725.972**	**24699298.06**	**310012.1915**

Afterwards, each cell is divided by the corresponding square root value obtained. So, the calculation of,

$$r_{ij} = \frac{X_{ij}}{\sqrt{\sum_{i=1}^{n} X_{ij}^2}}$$

is performed, and with this calculation, the normalized matrix is obtained (Table 3).

Table 3. Normalized matrix

Provinces	**X1**	**X2**	**X3**	**X4**	**X5**	**X6**
İstanbul	0.8379	0.7706	0.9710	0.7980	0.8459	0.7897
Ankara	0.3061	0.4318	0.0869	0.3776	0.0477	0.3990
İzmir	0.2403	0.2491	0.1169	0.2668	0.0652	0.2839
Bursa	0.1665	0.1691	0.1273	0.1684	0.0007	0.1612
Antalya	0.1349	0.2072	0.0156	0.2028	0.5267	0.1387
Adana	0.1235	0.1009	0.0228	0.1244	0.0146	0.0600
Konya	0.1227	0.1225	0.0204	0.1385	0.0026	0.1355
Şanlıurfa	0.1132	0.0681	0.0018	0.0493	0.0004	0.0968
Gaziantep	0.1128	0.0963	0.0784	0.0969	0.0083	0.1136
Kocaeli	0.1060	0.1178	0.1016	0.0751	0.0026	0.1064
Mersin	0.1009	0.1224	0.0195	0.1164	0.0064	0.0824
Diyarbakır	0.0963	0.0584	0.0024	0.0238	0.0011	0.1064
Hatay	0.0895	0.0752	0.0326	0.0929	0.0131	0.0806
Kayseri	0.0773	0.0956	0.0238	0.0717	0.0070	0.1059

Obtaining the weighted normalized matrix

The normalized values (Table 3) are multiplied by 1/6 for each variable in each column, resulting in the weighted normalized matrix (Table 4). Because the selected variables for investment have equal importance and there are 6 variables in total, we have taken 1/6 as the weighting factor. So, the weights for each variable in the data are equal and can be given as 1/6.

Table 4. Obtaining the weighted normalized matrix

Weighted	**1/6**	**1/6**	**1/6**	**1/6**	**1/6**	**1/6**
Provinces	**X1**	**X2**	**X3**	**X4**	**X5**	**X6**
İstanbul	0.1397	0.1284	0.1618	0.1330	0.1410	0.1316
Ankara	0.0510	0.0720	0.0145	0.0629	0.0079	0.0665
İzmir	0.0400	0.0415	0.0195	0.0445	0.0109	0.0473
Bursa	0.0278	0.0282	0.0212	0.0281	0.0001	0.0269
Antalya	0.0225	0.0345	0.0026	0.0338	0.0878	0.0231
Adana	0.0206	0.0168	0.0038	0.0207	0.0024	0.0100
Konya	0.0204	0.0204	0.0034	0.0231	0.0004	0.0226
Şanlıurfa	0.0189	0.0114	0.0003	0.0082	0.0001	0.0161
Gaziantep	0.0188	0.0160	0.0131	0.0162	0.0014	0.0189

Kocaeli	0.0177	0.0196	0.0169	0.0125	0.0004	0.0177
Mersin	0.0168	0.0204	0.0032	0.0194	0.0011	0.0137
Diyarbakır	0.0161	0.0097	0.0004	0.0040	0.0002	0.0177
Hatay	0.0149	0.0125	0.0054	0.0155	0.0022	0.0134
Kayseri	0.0129	0.0159	0.0040	0.0119	0.0012	0.0176

Obtaining the ideal and negative ideal solution values

To obtain the ideal solution values, we consider the maximum values for each criterion in the columns, and to find the negative ideal solution values, we consider the minimum values for each criterion in the columns.

Table 5. Ideal solution values

	X1	**X2**	**X3**	**X4**	**X5**	**X6**
Ideal solution values	0.1397	0.1284	0.1618	0.1330	0.1410	0.1316

The ideal solution values are A*=(0.1397, 0.1284, 0.1618, 0.1330, 0.1410, 0.1316).

Table 6. Negative ideal solution values

	X1	**X2**	**X3**	**X4**	**X5**	**X6**
Negative ideal solution values	0.0129	0.0097	0.0003	0.0040	0.0001	0.0100

The negative ideal solution values are A**=(0.0129, 0.0097, 0.0003, 0.0040, 0.0001, 0.0100)

The calculation of the distances to the ideal and non-ideal points

To find the distances to the ideal point, the ideal values given in Table 5 are subtracted from the ideal solution value corresponding to that column in the weighted normalized matrix (Table 4). The square of this value is taken. Thus, an ideal distances table is created.

Table 7. Ideal distances table

Provinces	**X1**	**X2**	**X3**	**X4**	**X5**	**X6**
İstanbul	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Ankara	0.0079	0.0032	0.0217	0.0049	0.0177	0.0042
İzmir	0.0099	0.0075	0.0203	0.0078	0.0169	0.0071
Bursa	0.0125	0.0100	0.0198	0.0110	0.0198	0.0110
Antalya	0.0137	0.0088	0.0253	0.0098	0.0028	0.0118
Adana	0.0142	0.0125	0.0250	0.0126	0.0192	0.0148
Konya	0.0142	0.0117	0.0251	0.0121	0.0198	0.0119
Şanlıurfa	0.0146	0.0137	0.0261	0.0156	0.0199	0.0133
Gaziantep	0.0146	0.0126	0.0221	0.0137	0.0195	0.0127
Kocaeli	0.0149	0.0118	0.0210	0.0145	0.0198	0.0130
Mersin	0.0151	0.0117	0.0251	0.0129	0.0196	0.0139
Diyarbakır	0.0153	0.0141	0.0260	0.0166	0.0198	0.0130
Hatay	0.0156	0.0134	0.0244	0.0138	0.0193	0.0140
Kayseri	0.0161	0.0126	0.0249	0.0147	0.0196	0.0130

Ideal distance is calculated using the $S_i^* = \sqrt{\sum_{i=1}^{n}\left(v_{ij} - v*_{ij}\right)^2}$ formula. According to this, the ideal distances for each decision criterion are calculated as follows.

Table 8. Calculation of ideal distances

Provinces	X1	X2	X3	X4	X5	X6	Total	S*i
İstanbul	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
Ankara	0.0079	0.0032	0.0217	0.0049	0.0177	0.0042	0.0596	0.2441
İzmir	0.0099	0.0075	0.0203	0.0078	0.0169	0.0071	0.0696	0.2638
Bursa	0.0125	0.0100	0.0198	0.0110	0.0198	0.0110	0.0842	0.2901
Antalya	0.0137	0.0088	0.0253	0.0098	0.0028	0.0118	0.0723	0.2690
Adana	0.0142	0.0125	0.0250	0.0126	0.0192	0.0148	0.0982	0.3134
Konya	0.0142	0.0117	0.0251	0.0121	0.0198	0.0119	0.0947	0.3077
Şanlıurfa	0.0146	0.0137	0.0261	0.0156	0.0199	0.0133	0.1031	0.3212
Gaziantep	0.0146	0.0126	0.0221	0.0137	0.0195	0.0127	0.0952	0.3086
Kocaeli	0.0149	0.0118	0.0210	0.0145	0.0198	0.0130	0.0949	0.3081
Mersin	0.0151	0.0117	0.0251	0.0129	0.0196	0.0139	0.0983	0.3135
Diyarbakır	0.0153	0.0141	0.0260	0.0166	0.0198	0.0130	0.1049	0.3238
Hatay	0.0156	0.0134	0.0244	0.0138	0.0193	0.0140	0.1005	0.3170
Kayseri	0.0161	0.0126	0.0249	0.0147	0.0196	0.0130	0.1008	0.3175

Here, in order to calculate S*i, the values in other columns are summed. The square root of the sum values gives the S*i value (Table 8).

Negative ideal distances

To find the negative ideal distances, the values below each column in the weighted normalized matrix (Table 4) are subtracted from the negative ideal solution value corresponding to that column (obtained from the ideal values given in Table 6) respectively. The square of this value is taken. Thus, an ideal distances table is created.

Table 9. Negative ideal distances table

Provinces	X1	X2	X3	X4	X5	X6
İstanbul	0.016067	0.01410	0.02610	0.01664	0.01985	0.01479
Ankara	0.001453	0.00388	0.00020	0.00347	0.00006	0.00319
İzmir	0.000737	0.00101	0.00037	0.00164	0.00012	0.00139
Bursa	0.000221	0.00034	0.00044	0.00058	0.00000	0.00028
Antalya	0.000092	0.00062	0.00001	0.00089	0.00769	0.00017
Adana	0.000059	0.00005	0.00001	0.00028	0.00001	0.00000
Konya	0.000057	0.00011	0.00001	0.00036	0.00000	0.00016
Şanlıurfa	0.000036	0.00000	0.00000	0.00002	0.00000	0.00004
Gaziantep	0.000035	0.00004	0.00016	0.00015	0.00000	0.00008
Kocaeli	0.000023	0.00010	0.00028	0.00007	0.00000	0.00006
Mersin	0.000015	0.00011	0.00001	0.00024	0.00000	0.00001
Diyarbakır	0.000010	0.00000	0.00000	0.00000	0.00000	0.00006
Hatay	0.000004	0.00001	0.00003	0.00013	0.00000	0.00001
Kayseri	0.000000	0.00004	0.00001	0.00006	0.00000	0.00006

Negative distance is calculated using the $S_i^- = \sqrt{\sum_{i=1}^{n}\left(v_{ij} - v_j^-\right)^2}$ formula. According to this, negative distances for each decision criterion are calculated as shown in Table 10.

Table 10. Calculation of negative ideal distances

Provinces	X1	X2	X3	X4	X5	X6	Total	S*-
İstanbul	0.016067	0.014096	0.026095	0.016641	0.019847	0.014790	0.107536	0.32793
Ankara	0.001453	0.003877	0.000201	0.003473	0.000062	0.003193	0.012258	0.11072
İzmir	0.000737	0.001013	0.000368	0.001637	0.000116	0.001392	0.005263	0.07254
Bursa	0.000221	0.000342	0.000437	0.000579	0.000000	0.000285	0.001863	0.04317
Antalya	0.000092	0.000617	0.000005	0.000888	0.007688	0.000172	0.009462	0.09727
Adana	0.000059	0.000051	0.000012	0.000280	0.000005	0.000000	0.000407	0.02018
Konya	0.000057	0.000115	0.000010	0.000364	0.000000	0.000158	0.000704	0.02652
Şanlıurfa	0.000036	0.000003	0.000000	0.000018	0.000000	0.000038	0.000094	0.00968
Gaziantep	0.000035	0.000040	0.000163	0.000148	0.000002	0.000080	0.000467	0.02161
Kocaeli	0.000023	0.000099	0.000277	0.000072	0.000000	0.000060	0.000531	0.02304
Mersin	0.000015	0.000115	0.000009	0.000237	0.000001	0.000014	0.000391	0.01976
Diyarbakır	0.000010	0.000000	0.000000	0.000000	0.000000	0.000060	0.000070	0.00836
Hatay	0.000004	0.000008	0.000026	0.000132	0.000004	0.000012	0.000187	0.01366
Kayseri	0.000000	0.000039	0.000013	0.000063	0.000001	0.000058	0.000175	0.01323

Here, the calculated negative ideal distances for each column are summed up, and the total values are given under the "total" variable in the new column. The values of Si^- were calculated by taking the square root of these total values.

Calculation of Relative Closeness to the Ideal Solution

Ideal and negative ideal solution values are given in Table 11.

Table 11. Table of ideal and negative ideal solution values

S*i	S*-
0.0001	0.3279
0.2441	0.1107
0.2638	0.0725
0.2901	0.0432
0.2690	0.0973
0.3134	0.0202
0.3077	0.0265
0.3212	0.0097
0.3086	0.0216
0.3081	0.0230
0.3135	0.0198
0.3238	0.0084
0.3170	0.0137
0.3175	0.0132

At this point, the previously calculated Si* and Si^- values are given in Table 11.
The formula of

$$\mathbf{Ci} *= \frac{\mathbf{S} * -}{\mathbf{S} * \mathbf{i} + \mathbf{S} * -}$$

is used for the calculation of relative closeness to the ideal solution. The results obtained are given in Table 12.

Table 12. Table of results

Provinces	S*i	S*-	Ci*
İstanbul	0.0001	0.3279	0.9998
Ankara	0.2441	0.1107	0.3120
İzmir	0.2638	0.0725	0.2157
Bursa	0.2901	0.0432	0.1295
Antalya	0.2690	0.0973	0.2656
Adana	0.3134	0.0202	0.0605
Konya	0.3077	0.0265	0.0794
Şanlıurfa	0.3212	0.0097	0.0293
Gaziantep	0.3086	0.0216	0.0655
Kocaeli	0.3081	0.0230	0.0696
Mersin	0.3135	0.0198	0.0593
Diyarbakır	0.3238	0.0084	0.0252
Hatay	0.3170	0.0137	0.0413
Kayseri	0.3175	0.0132	0.0400

When the criteria for investment is considered, Istanbul is the province with the highest Ci* value. In other words, the first preference of the investor is Istanbul, the second preference is Ankara and the third preference is Antalya. İzmir is ranked fourth, Bursa is ranked fifth and Konya is ranked sixth. Following those cities, Kocaeli, Gaziantep, Adana, and Mersin respectively, took their positions in the top 10. Among the major cities, Diyarbakır is the investor's last preference. The investor's preference ranking is provided in Table 13.

Table 13. Preference ranking

No	İller	Ci*
1	**İstanbul**	0.9998
2	**Ankara**	0.3120
3	**Antalya**	0.2656
4	**İzmir**	0.2157
5	**Bursa**	0.1295
6	**Konya**	0.0794
7	**Kocaeli**	0.0696
8	**Gaziantep**	0.0655
9	**Adana**	0.0605
10	**Mersin**	0.0593
11	**Hatay**	0.0413
12	**Kayseri**	0.0400
13	**Şanlıurfa**	0.0293
14	**Diyarbakır**	0.0252

In a using TOPSIS method performed by [14], four coal mines were as ranked coal mine B > coal mine A > coal mine D > coal mine C. In the study of [15], financial performances of technology companies traded in Stock Exchange Istanbul (BIST) were analyzed using TOPSIS method. As a result of the analysis, the most successful companies in terms of performance between 2010-2015 were ASELS, LINK, ARMDA, LINK, INDES and DGATE respectively.

IV. Conclusion

In the conducted research, the rates of specific variables based on demographic and socioeconomic factors in different provinces of Turkey have been calculated using the ratio analysis method. The values obtained through the calculation have been ranked according to their performance using the TOPSIS method. In the year 2018, the success status of the investor was evaluated based on the ranking position of 14 provinces. According to the evaluation result, Istanbul, Ankara, and Antalya ranked in the top three positions. In the last three positions, Kayseri, Şanlıurfa, and Diyarbakır are found. The ranking is of great significance in terms of the investment preferences of the investors.

References

[1]. Yoon K., Hwang C.L. 1985. Manufacturing Plant Location Analysis by Multiple Attribute Decision Making: Part I-Single Plant Strategy, Int. J. Prod. Pres., 23(2): 345-359.
[2]. Demir K., Çabuk S. 2010. Türkiye'de Metropoliten Kentlerin Nüfus Gelişimi. Sosyal Bilimler Enstitüsü Dergisi, 28(1): 193-215.
[3]. Doling J., Vandenberg P., Tolentino J. 2013. Housing and housing finance-A review of the links to economic development and poverty reduction. Asian Development Bank Economics Working Paper Series, (362).
[4]. Tunç C. 2020. Konut Piyasası, Finansmanı ve Göstergeleri. İstanbul: Literatür Yayıncılık.
[5]. Tosun C. 2001. Challenges of Sustainable Tourism Development in the Developing World: The Case of Turkey. Tourism Management, 22: 289-303.
[6]. Chen P. 2019. Effects of normalization on the entropy-based TOPSIS method. Expert Systems With Applications 136: 33–41.
[7]. García-Cascales M.S., Lamata M.T. 2012. On rank reversal and TOPSIS method. Mathematical and Computer Modelling, 56: 123-132.
[8]. TSI, 2018. Turkish Statistical Institute. https://biruni.tuik.gov.tr/ilgosterge/?locale=tr
[9]. Anonymous, 2018. http://www.gazeteilksayfa.com/ankarada-kac-tane-stadyum-var-isimleri-ve-kapasiteleri-23869h.htm
[10]. Chen S.J., Hwang C.L. 1992. Fuzzy Multiple Attribute Decision Making: Methods and Applications, Springer-Verlang, Berlin.
[11]. Hwang C.L., Yoon K. 1981. Multiple Attibute Decision Methods and Applications, Springer, Berlin, Heidelberg.
[12]. Zeleny M. 1982. Multiple Criteria Decision Making, McGraw-Hill, New York.
[13]. Bhutia P.W., Phipon R. 2012. Application of ahp and topsis method for supplier selection problem. IOSR Journal of Engineering (IOSRJEN), 2(10):43-50.
[14]. Li X., Wang K., Liu L., Xin J., Yang H., Gao C. 2011. Application of the Entropy Weight and TOPSIS Method in Safety Evaluation of Coal Mines. Procedia Engineering, 2085-2091.
[15]. Orçun Ç., Eren B.S. 2017. TOPSIS Yöntemi ile Finansal Performans Değerlendirmesi: XUTEK Üzerinde Bir Uygulama. Muhasebe ve Finansman Dergisi, 75: 139-154.