Selecting the Optimal Industrial Investment by Multi-Criteria Decision-Making Methods with Emphasis on, TOPSIS, VIKOR and COPRAS (Case Study of Guilan Province)

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A B S T R A C T

The expansion of production and development in the industrial sector, it is necessary to increase the investment in that. But limits of the financial resources to the investment and high risk for investments in industrial and production activities on the one hand, and the frequency of necessities and goals of the other hand, is inevitable to planning and priorities of investment. This study to follow, in condition of risk and uncertainty and the exist fluctuations in supply and demand market of industry, optimization of model to determine priorities and economic feasibility to the investment in this sector. This study, in three approach (TOPSIS, VIKOR, and COPRAS), will examine its purpose. This research has been made for Guilan Province from 2012 to 2015. The results of this research involve the investment criteria and specify the priority of these sectors. The final results of this study indicate based on TOPSIS, VIKOR and COPRAS, the current pattern of investment in the industrial sector was not optimal and needs to be adjusted in the percentages and amounts of investment.

Keywords: TOPSIS, VIKOR, COPRAS.

1. Introduction

Many papers have proposed analytical models as aids in conflict management situations. Among the numerous approaches available for conflict management, one of the most prevalent is multicriteria decision making. Multicriteria Decision Making (MCDM) may be considered as a complex and dynamic process including one managerial level and one engineering level [4].

The managerial level defines the goals, and chooses the final ''optimal'' alternative. The multicriteria nature of decisions is emphasized at this managerial level, at which public officials called ''decision makers'' have the power to accept or reject the solution proposed by the

engineering level. These decision makers, who provide the preference structure, are ''off line'' from the optimization procedure done at the engineering level. Very often, the preference structure is based on political rather than only technical criteria. In such cases, a system analyst can aid the decision-making process by making a comprehensive analysis and by listing the important properties of noninferior and/or compromise solutions [11]. The engineering level of the MCDM process defines alternatives and points out the consequences of choosing any one of them from the standpoint of various criteria. This level also performs the multicriteria ranking of alternatives. The main steps of multicriteria decision making are the following: (a) Establishing system evaluation criteria that relate system capabilities to goals; (b) Developing alternative systems for attaining the goals (generating alternatives); (c) Evaluating alternatives in terms of criteria (the values of the criterion functions); (d) Applying a normative multicriteria analysis method; (e) Accepting one alternative as ''optimal'' (preferred); (g) If the final solution is not accepted, gather new information and go into the next iteration of multicriteria optimization.

A compromise solution for a problem with conflicting criteria can help the decision makers to reach a final decision. The foundation for compromise solution was established by C. The compromise solution is a feasible solution, which is the closest to the ideal, and a compromise means an agreement established by mutual concessions. The VIKOR method was introduced as one applicable technique to implement within MCDM [8].

In this paper by three MCDM methods, TOPSIS, VIKOR and COPRAS, selecting the optimal industrial investment and prioritizing industrial investment in Guilan province. We hope that the results of paper can provide a suitable tool for the policymakers to determine and compare the allocation amount of under-construction projects according to development plans in the provincial level.

The rest of this paper is organized as follows: Section 2 considers some important investment criteria for priority evaluation and optimization. In Section 3, TOPSIS, VIKOR and COPRAS method is presented. In Section 4, a numerical example is presented to illustrate the applicability and efficiency of the proposed methodology. Finally, the concluding remarks are given in Section 5.

2. Literature and Background

Nowadays that economy is a very important and vital issue therefore from the perspective of macroeconomic, industrial rising and finally economic success of a country is affected by many factors. The first factor is government macro strategy how effectively it will be influential in interesting investment in different sectors. One of these cases have been small industries that particularly in this cases after the Islamic Revolution in our country has provided a positive context for growth and achieve to self-sufficiency and alongside regard to industry's infrastructure and main such as industry of oil, steel, gas, nuclear energy etc. is considering by officials. The second factor that has been referred to as the internal factor facilities and

capabilities of the region and can be as lever for guiding and optimal use of capital considered by examining and identifying relative advantages of each region. Therefore, for understand this facilities and capabilities of the region, we need to identify and monitor key indicators to measure the amount Facilities and capabilities on region various fields (industrial). Exporting constitutes the most popular, quickest and easiest way for industrial.

Danaei et al. have done the research to prioritize the investment in accepted industries in securities exchange and the used pattern is TOPSIS [3]. The results of this study indicate that in both years 2009 and 2010, the priority of investment is for telecommunications industrial group and it means the investment in this section has more success because of a partial advantage.

Lotfi et al. did the research to identify the industrial development and industrial sectors of the technique (Fuzzy Topsis) West Azerbaijan industrial development priorities are identified and ranked [7]. The results this paper suggest that it is The West Azerbaijan Province of good potential for its proper role within the regional planning and national industrial development in order to achieve the objectives of Vision is a country.

Akbari et al. have done a study entitled "economic evaluation and to determine the industrial investment priorities in Kurdistan" in 2004, based on ISIC Code and a regional analysis methods such as factor analysis and numerical taxonomy and data base [1]. The result of this research is that Industrial minerals, metallic craft and related grains, plastic, stone cutting and weaving of have the highest priorities of industrial investment in Kurdistan.

3. Criteria for Determining Investment Priority

The priority indicators of investment are obtained by the combination of some indexes that they come in *Table 1*. Priorities for investment indices or combinations are named.

Table 1. Investment priority indicators.

Index title	Index relation	Comment
A1: Productivity Indicator	$L_j = \left[(v_j/N_J)/(v_T/N_T) \right]$	
A2: share of value-added output	$VQ_i = V_i/Q_i$	
A3: Independence on Foreign Resources	$IOF_i = In_{fi}/In_{ti}$	
A4: Profitability Index	$I\pi = (Y_i - C_i)/L_i$	
A5: Capital intensive index	$I_i = (V_i - W_i)/L_i$	
A6: Export orientation	$XM = X_i/V_i$	
A7: Revealed comparative advantage Balassa	$RCA_{ij} = \dfrac{X_{ij}/\sum_i X_{ij}}{\sum_j X_{ij}/\sum_i \sum_j X_{ij}}$	
A8: Location quotient in terms of value-added	$LQv_{ij} = \dfrac{V_{ij}/\sum_i X_{ij}}{\sum_j V_{ij}/\sum_i \sum_j V_{ij}}$	
A9: Location quotient in terms of employment	$LQl_{ij} = \dfrac{L_{ij}/\sum_i L_{ij}}{\sum_j L_{ij}/\sum_i \sum_j L_{ij}}$	

4. Methodology

This study is the applied. In this research, to determine the industrial investment priorities, the library method is used in Guilan province, the studied Population, all staff manufacturing factories with more than ten workers in Guilan province are based on ISIC two-digit codes for the years 2012 to 2015. Authorities also include statistical yearbooks, provincial Statistics, census results and data from large industrial workshops of the Iran Statistics Center. Three groups in terms of profitability indicators, employment, profitability and employment as a combination of selected priority industrial investment and industries to identify and rank are based on 3 criteria above mentioned. The theoretical basis for analysis is based on statistical methods TOPSIS, VIKOR and COPRAS.

4.1. TOPSIS Method

Alinezhad et al. proposed an extension of classical TOPSIS method [2]. This approach may be described as follows. Let $[X_{ij}]$ be a value of jth criterion for ith alter- native, W= (w_1, w_2, . . . , wn) be the weight vector satisfying $\sum_{j=1}^{n} w_j = 1$. Then $D[X_{ij}]_{m \times n}$ is the decision matrix. The method proposed in [2], consists of the following steps:

Step 1. Normalizing the decision matrix using the following expressions:

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m}(x_{ij})^2}} \quad i = 1,2, ..., m; j = 1,2, ..., n. \tag{1}$$

Step 2. Taking into account the importance of criteria, the weighted normalized decision matrix is obtained using the following expressions:

$$v_{ij} = W_j r_{ij} \quad i = 1,2, ..., m; j = 1,2, ..., n. \tag{2}$$

Step 3. The positive and negative ideal solutions are obtained as follows:

$$A^+ = \{v_1^+, v_2^+, ..., v_n^+\} = \left\{ \left(\max_i v_{ij} \left| j \in J^+ \right. \right), \left(\min_i v_{ij} \left| j \in J^- \right. \right) | i = 1,2, ..., m \right\}. \tag{3}$$

$$A^- = \{v_1^-, v_2^-, ..., v_n^-\} = \left\{ \left(\min_i v_{ij} \left| j \in J^+ \right. \right), \left(\max_i v_{ij} \left| j \in J^- \right. \right) | i = 1,2, ..., m \right\}. \tag{4}$$

Step 4. The separation of each alternative from the positive ideal solution is calculated using the n-dimensional Euclidean distance:

$$d_i^+ = \left\{ \sum_{j \in J}(v_{ij} - v_j^+)^2 + \sum_{j \in J}(v_{ij} - v_j^+)^2 \right\}^{\frac{1}{2}} \rightarrow i = 1,2, ..., m. \tag{5}$$

Similarly, the separation from the negative ideal solution is calculated as follows:

$$d_i^- = \left\{ \sum_{j \in J}(v_{ij} - v_j^+)^2 + \sum_{j \in J}(v_{ij} - v_j^-)^2 \right\}^{\frac{1}{2}} \rightarrow i = 1,2, ..., m. \tag{6}$$

Step 5. Calculate the relative closeness to the ideal alternatives:

$$\overline{R}_i = \frac{d_i^-}{d_i^- + d_i^+}, i = 1,2,\dots,m. \tag{7}$$

Step 6. Rank the alternatives according to the relative closeness to the ideal alternatives: the bigger is the R_i, the better is the alternative d_i.

4.2. VIKOR Method

VIKOR is a multi-criteria decision-making in solving discrete decision-making problems with conflicting and non-commensurable criteria (various measurement units). This method innovated by [9] focused on the ranking and selecting from a set of alternatives and determine the compromise solutions for a problem with conflicting criteria. The compromise solution is a feasible solution that is the nearest solution to the ideal solution. The compromise solution means it is based on mutual agreement between criteria. VIKOR method has been developed based on Lp-metric (see [5]):

$$L_{P,i} = \left\{ \sum_{j=1}^{n} \left[\mu_j \left(f_i^* - f_{ij} \right) / \left(f_i^* - f_i^- \right) \right]^P \right\}^{\frac{1}{P}} \rightarrow i = 1,2,\dots,m \ \ 1 \le P \le \infty. \tag{8}$$

Where μ_j is the weight of the jth criterion, f_{ij} is the rating ()core) of the jth criterion for ith alternative and f_i^* and f_i^- denote the best (positive ideal) and the worst (negative ideal) value of the scores, respectively. This method can provide a maximum group utility for the majority and a minimum of an individual regret for the opponent. If p is small, the group utility is concerned and if p increases, the individual regrets receive more weight. The advantage of this method over other methods, mainly TOPSIS, is that VIKOR method uses the linear normalization. So the normalized values in VIKOR are independent of criteria measurement unit. On the other hand, in VIKOR method ,always compromise solution is the closest alternative to ideal solution, while TOPSIS does not consider the distance relative importance from positive and negative ideal solutions, that is why the best solution in TOPSIS is not necessarily the closest alternative to positive ideal solution .The steps of this method are as follows:

Step 1. Construct comparison matrix: this matrix is constructed with regard to the evaluation of all alternatives based on various criteria. Assume that having a multi-criteria decision-making problem with m alternatives and n criteria, x ij denotes the performance of ith alternative based on jth criteria.

Step 2. determination of criteria weight vector: According to the importance and rate of various criteria in decision-making the criteria weight vector is calculated using different methods. Here Shannon's Entropy method has been used for determining the weight of criteria.

$$X = \begin{bmatrix} x_{11} & \cdots & x_{1n} \\ \vdots & \ddots & \vdots \\ x_{m1} & \cdots & x_{mn} \end{bmatrix}. \tag{9}$$

Step 3. Determining the best (positive ideal) and the worst)negative ideal) values: For each criterion, the best and worst alternatives were detected and were called them f_i^* and f_i^- respectively. Assuming that the criteria are profit type, then:

$$f_i^- = \min_j f_{ij} \quad f_i^* = \max_j f_{ij} \qquad i = 1,2, \dots, m, j = 1,2, \dots, n. \tag{10}$$

With associates all f_i^* , we would obtain an optimal combination with the highest score (positive ideal solution). Similarly, for f_i^- a negative ideal solution is obtained.

Step 4. Computing the distance of alternatives to ideal solution:

$$S_i = \sum_{i=1}^n w_j \frac{(f_i^* - f_{ij})}{(f_i^* - f_i^-)}. \tag{11}$$

$$R_i = \max \left[w_j \frac{\left(f_i^* - f_{ij}\right)}{\left(f_i^* - f_i^-\right)} \right]. \tag{12}$$

Where S_i represents the relative distance of the ith alternative to the positive ideal solution and R_i represents the relative distance of the ith alternative to the negative ideal solution.

Step 5. VIKOR index calculation:

$$Q_i = v \left(\frac{S_i - S^*}{S^- - S^*} \right) + (1 - v) \left(\frac{R_i - R^*}{R^- - R^*} \right) \qquad v \in [0,1]. \tag{13}$$

When the v is bigger than 0.5, the Q_i index will lead to majority agreement, and when v is less than 0.5 the Q I index will indicate majority negative attitude, generally when v is equal to 0.5, this shows the compromise attitude of evaluation experts.

Step 6. Ranking the alternatives by sorting out each S, R and Q values in a decreasing order. Alternative a' proposed as a compromise solution if it has first rank based on Q value and the following two conditions are satisfied:

Condition 1. Acceptable advantage

$$Q(a'') - Q(a') \geq 1/_{i-1}. \tag{14}$$

Where a'' is the alternative with second position in the ranking list by *Q* and i is the number of alternatives.

Condition 2. Acceptable stability in decision-making:

Alternative a' must also be the best ranked based on S or R value or both of them.

If one of the above conditions is not satisfied, then a set of compromise solutions are suggested:

▪ If only condition 2 is not satisfied then alternatives a' and a'' are suggested.

▪ If condition 1 is not satisfied then alternatives a′, a″,…,a^m are suggested. And a m is determined by the following relation for the maximum of m:

$$Q(a^m) - Q(a') < {}^1\!/_{i-1}. \qquad (15)$$

4.3. COPRAS Method

Ranking alternatives by the COPRAS method assumes direct and proportional dependence of significance and priority of investigated alternatives on a system of criteria. The determination of significance and priority of alternatives, by using COPRAS method, can be expressed concisely using four stages [10]:

Step 1. The normalized decision-making matrix D is constructed. In MCDM process, criteria usually have different units of measure. In order to transform performances of considered alternatives into comparable dimensionless values, normalization procedure is used. An overview of some of the most important multi-criteria methods, and their normalization procedures, is shown in [6]. A detailed overview of the most important normalization procedures are also discussed in [12].

For normalization in COPRAS method the following formula is used:

$$\tilde{x}_{ij} = \frac{x_{ij}}{\sum\limits_{i=1}^{m} x_{ij}}. \qquad (16)$$

where x_{ij} is the performance of the ith alternative with respect to the jth criterion, $\tilde{x}_{ij}$ is its normalized value, and m is number of alternatives.

Step 2. The sums of weighed normalized criteria describing the ith alternative are calculated. In COPRAS method, each alternative is described with its sums of maximizing attributes S_{+i}, i.e. optimization direction is maximization, and minimizing criteria S_{-i}, i.e. optimization direction is minimization.

In order to simplify calculation of S_{+i} and S_{-i} in the decision-making matrix columns first of all are placed maximizing criteria and then minimizing criteria. In such cases, S_{+i} and S_{-i} is calculated as follows:

$$S_{+i} = \sum_{j=1}^{k} \tilde{x}_{ij} \cdot q_j. \qquad (17)$$

$$S_{-i} = \sum_{j=k+1}^{n} \tilde{x}_{ij} \cdot q_j. \qquad (18)$$

In *Eqs.* *(8)* and *(9)*, k is number of maximizing criteria; n is total number of criteria; and q_j is significance of the *j*th criterion.

Step 3. Calculation of the relative weight of each alternative. The relative weight Q_i of *i*th alternative is calculated as follows:

$$Q_i = S_{+i} + \frac{\min_i S_{-i} \sum_{i=1}^{m} S_{-i}}{S_{-i} \sum_{i=1}^{m} \frac{\min_i S_{-i}}{S_{-i}}}. \tag{19}$$

Eq. *(10)* can also be written in simplified form as follows:

$$Q_i = S_{+i} + \frac{\sum_{i=1}^{m} S_{-i}}{S_{-i} \sum_{i=1}^{m} \frac{1}{S_{-i}}}. \tag{20}$$

Step 4. Determine the priority order of alternatives. The priority order of compared alternatives is determined on the basis of their relative weight. The alternative with higher relative weight has higher priority (rank), and the alternative with the highest relative weight is the most acceptable alternative.

$$A^* = \left\{ A_i \middle| \max_i Q_i \right\}. \tag{21}$$

The presented procedure of COPRAS method indicates that it can be easily applied for evaluating the alternatives and selecting the most efficient one, with decision maker being completely aware of the physical meaning of the process [9].

However, many decisions are made in real-world situations where criterion values are not precisely known. Then criterion values can be expressed in the form of intervals. For this reason a new method of multiple-criteria complex proportional assessment with values determined in intervals – COPRAS-G is developed [12].

4.4. Shannon's Entropy Method

Shannon's entropy is a well-known method in obtaining the weights for an MADM problem especially when obtaining a suitable weight based on the preferences and DM experiments are not possible. The original procedure of Shannon's entropy can be expressed in a series of steps:

S1. Normalize the decision matrix. Set

$$p_{ij} = \frac{x_{ij}}{\sum_{j=1}^{m} x_{ij}} \quad j = 1, \dots, m, \quad i = 1, \dots, n. \tag{22}$$

The raw data are normalized to eliminate anomalies with different measurement units and scales. This process transforms different scales and units among various criteria into common measurable units to allow for comparisons of different criteria.

S2. Compute entropy h_i as $h_i = -h_0 \sum_{j=1}^{m} p_{ij}. \ln p_{ij}$, $i = 1, \dots, n$, where h_0 is the entropy constant and is equal to $(\text{Lnm})^1$, and $p_{ij}. \ln p_{ij}$ is defined as 0 if $p_{ij} = 0$.

S3. Set $d_i = 1 - h_i$, $i = 1, \dots, n$ as the degree of diversification.

S4. Set $w_i = \frac{d_i}{\sum_{s=1}^{n} d_s}$, $i = 1, \dots, n$ as the degree of importance of attribute i.

4.4.1. Findings

For the 9 criteria, the weight of each criterion has been calculated using Shannon's entropy.

Table 2. Determine the weights of the criteria.

	A1	A2	A3	A4	A5	A6	A7	A8	A9
E	0.9552	0.9592	0.6088	0.7274	0.7764	0.4312	0.8676	0.9646	0.9778
d	0.0448	0.0408	0.3912	0.2726	0.2236	0.5688	0.1324	0.0354	0.0222
w	0.0259	0.0236	0.2259	0.1574	0.1291	0.3284	0.0765	0.0205	0.0128

In the following, these values are used in TOPSIS, VICKOR and COPRAS methods to determine the best alternative. At first, we construct the decision matrix, which has 36 rows or alternative (equal to number of sections) and 9 columns (equal to number of criteria).

With the TOPSIS method and according to the 9 criteria, eventually a number is achieved which shows industry investment decision indicator in the industry of Guilan Province. *Table 3* shows, the investment priorities, with mathematics look obtained in 18,23,20,21,15,36,25,27,17,35 industrials sectors rating from 1 to 10, respectively.

Table 3. Proposed projects priority for performing with TOPSIS.

		d_i^-	d_i^+	$\overline{R}_i = \dfrac{d_i^-}{d_i^- + d_i^+}$	Priority
15	Manufacture of food products and beverages	0.371	0.061	0.141	5
17	Manufacture of textiles	0.410	0.028	0.063	9
18	Manufacture of wearing apparel; dressing and	0.247	0.324	0.568	1
20	Manufacture of wood and of products of wood	0.370	0.182	0.330	3
21	Manufacture of paper and paper products	0.375	0.071	0.159	4
22	Publishing, printing and reproduction of	0.423	0.019	0.043	14
23	Manufacture of coke, refined petroleum	0.373	0.210	0.360	2
24	Manufacture of chemicals and chemical	0.416	0.023	0.052	13
25	Manufacture of rubber and plastics products	0.389	0.039	0.091	7
26	Manufacture of other non-metallic mineral	0.417	0.015	0.035	16
27	Manufacture of basic metals	0.412	0.028	0.064	8
28	Manufacture of fabricated metal products,	0.409	0.023	0.052	12
29	Manufacture of machinery and equipment	0.423	0.009	0.021	18
31	Manufacture of electrical machinery and	0.414	0.023	0.052	11
33	Manufacture of medical, precision and optical	0.430	0.011	0.025	17
34	Manufacture of motor vehicles, trailers and	0.425	0.016	0.036	15
35	Manufacture of other transport equipment	0.420	0.025	0.056	10
36	Manufacture of furniture; manufacturing n.e.c.	0.411	0.060	0.127	6

In VICKOR approach for each criterion, we choose the best and worst alternatives.

Table 4. Best and worst alternative for criterions.

	A1	A2	A3	A4	A5	A6	A7	A8	A9
F*	0.47	0.48	0.94	0.89	0.90	0.98	0.66	0.40	0.50
F-	0.07	0.08	0.00	0.00	0.00	0.00	0.00	0.05	0.13

Then we calculate the Si and Ri values for all alternatives. After determining the maximum and minimum values of Si and Ri, we calculate the VICKOR index. In *Table 6* the Si, Ri, and Qi indexes are shown for some alternatives. *Table 5* shows, the investment priorities, with VICKOR approach in 18,20,21,15,23,25,36,17,28,35 industrials sectors rating from 1 to 10, respectively.

Table 5. Ranking the alternatives according to Qi, Si, and R_i values.

		S_i	R_i	Q_i	Priority
15	Manufacture of food products and beverages	0.80	0.30	0.68	4
17	Manufacture of textiles	0.88	0.32	0.87	8
18	Manufacture of wearing apparel; dressing and	0.56	0.19	0.00	1
20	Manufacture of wood and of products of wood	0.65	0.31	0.52	2
21	Manufacture of paper and paper products	0.79	0.29	0.64	3
22	Publishing, printing and reproduction of	0.92	0.33	0.94	14
23	Manufacture of coke, refined petroleum	0.74	0.33	0.72	5
24	Manufacture of chemicals and chemical	0.92	0.33	0.94	15
25	Manufacture of rubber and plastics products	0.87	0.30	0.78	6
26	Manufacture of other non-metallic mineral	0.93	0.32	0.93	12
27	Manufacture of basic metals	0.92	0.33	0.93	13
28	Manufacture of fabricated metal products,	0.91	0.32	0.89	9
29	Manufacture of machinery and equipment	0.95	0.33	0.97	16
31	Manufacture of electrical machinery and	0.92	0.33	0.93	11
33	Manufacture of medical, precision and optical	0.97	0.33	1.00	18
34	Manufacture of motor vehicles, trailers and	0.95	0.33	0.97	17
35	Manufacture of other transport equipment	0.91	0.33	0.92	10
36	Manufacture of furniture; manufacturing .	0.83	0.33	0.82	7

S - = 0.97   R - = 0.33

S * = 0.56   R + += 0.19

V =   0.5

For the COPRAS method firstly the decision matrix is normalized using ***Eq. (16)***. Then the corresponding weighted normalized decision matrix is developed using ***Eq. (17)***.

Based on ***Eq. (17)*** and ***Eq. (18)***, the sums of the weighted normalized values are calculated for both the beneficial criteria (S_{+i}) and non-beneficial criteria (S_{-i}). Then, applying ***Eq. (19)*** and ***Eq. (20)***, the relative significance or priority value (Qi) for each alternative are computed, as given in ***Table 6***.

According to the calculation results, the complete ranking of the alternatives is obtained as 18,20,23,36,21,15,17,35,25,22 industrials sectors rating from 1 to 10, respectively.

Table 6. Investment index with COPRAS.

		P	R	1/R	Q	N	Priority
15	Manufacture of food products and beverages	0.031	0.002	647	0.031	0.095	6
17	Manufacture of textiles	0.012	0.000	4116	0.015	0.046	7
18	Manufacture of wearing apparel; dressing and	0.327	0.000	3156	0.329	1	1
20	Manufacture of wood and of products of wood	0.233	0.001	704	0.233	0.708	2
21	Manufacture of paper and paper products	0.038	0.000	2671	0.040	0.121	5
22	Publishing, printing and reproduction of	0.010	0.001	1382	0.011	0.032	10
23	Manufacture of coke, refined petroleum	0.206	0.001	1210	0.207	0.628	3
24	Manufacture of chemicals and chemical	0.009	0.001	985	0.010	0.030	12
25	Manufacture of rubber and plastics products	0.011	0.001	1510	0.013	0.038	9
26	Manufacture of other non-metallic mineral	0.006	0.005	208	0.006	0.018	16
27	Manufacture of basic metals	0.009	0.002	514	0.009	0.028	13
28	Manufacture of fabricated metal products,	0.006	0.001	1070	0.007	0.022	15
29	Manufacture of machinery and equipment	0.003	0.001	689	0.004	0.011	18
31	Manufacture of electrical machinery and	0.005	0.000	7563	0.010	0.031	11
33	Manufacture of medical, precision and optical	0.004	0.001	698	0.004	0.012	17
34	Manufacture of motor vehicles, trailers and	0.007	0.004	259	0.007	0.022	14
35	Manufacture of other transport equipment	0.009	0.000	4957	0.013	0.039	8
36	Manufacture of furniture; manufacturing	0.050	0.002	602	0.050	0.152	4

5. Conclusion

According to the studies, based on the selective measures, final result can be presented in the following about industries in the province. The result of this paper shows that, based on the investment index based on statistical methods TOPSIS, VIKOR and COPRAS, "18,20,23,36,21,15,17,35,25,22 " sectors rank from 1 to 9 for the investment priority. Also, the current allocation model of facilities to investors is different from the optima model. Therefore, we should adjust the amounts and percentages of these facilities to each sector of industry based on investment index.

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