Iran University of Science and Technology

International Journal of

Railway Research

ISSN: 2423-3838

Evaluation and Prioritization of the Value of Stocks of Rail Transportation Companies in the Stock Market Using the Analytic Hierarchy Process Method

Parisa Sarmadi[1], Hamidreza Ahadi[2*]

[1] Bachelor Student, School of Railway Engineering, Iran University of Science and Technology, Tehran, Iran

[2] Assistant Professor, School of Railway Engineering, Iran University of Science and Technology, Tehran, Iran

ARTICLE INFO

Article history:
Received: 15.07.2025
Accepted: 12.11.2025
Published: 28.11.2025

Keywords:
Rail Transportation Companies
Stock Evaluation Indices
AHP Method
Expert Choice Software

A B S T R A C T

The stock market in Iran is one of the most profitable markets for investment. However, identifying and selecting valuable and suitable stocks for investment remains a significant challenge for investors. The aim of this paper is to identify the best investment alternatives among rail transportation companies listed on the stock market. In this research, after examining rail transportation companies as potential investment alternatives, key indicators favored by investors for stock purchasing—including Price-to-Earnings Ratio (P/E), Net Profit Margin, Return on Assets (ROA), Market Value, and Dividends Per Share (DPS)—were analyzed. Next, using the Analytic Hierarchy Process (AHP) method, the selected alternatives were prioritized. In this study, criteria were weighted based on the Analytic Hierarchy Process, and indices were calculated using stock market data. The data were analyzed using Expert Choice software, and investment alternatives were ranked. Additionally, sensitivity analysis of the indices was employed to evaluate the final ranking of the alternatives. The results of this research demonstrate that the Analytic Hierarchy Process can significantly assist investors in selecting the best stocks among rail transportation companies and reducing investment risk. The findings are also applicable for investors and economic decision-makers.

1. Introduction

The stock market is one of the most critical economic pillars in today's world, serving as a platform for trading securities, company shares, and other financial instruments. It plays a vital role in attracting capital and allocating resources. Beyond providing financing for companies, the stock market offers investors an opportunity to generate profits through the buying and selling of stocks and other financial instruments, thereby contributing to national economic growth. A properly functioning and transparent stock market fosters sustainable economic development, more equitable wealth distribution, and the creation of investment opportunities. [1]

One of the effective methods for stock market analysis is the use of multi-criteria decision-making tools, such as the Analytic Hierarchy Process (AHP), which facilitates the evaluation and comparison of various criteria and alternatives.

This method has been employed in the present project to optimally select stocks in the railway transportation industry. The selection of the railway transportation industry is deliberate, due to its vital role in economic development and high growth potential. This paper examines the advantages of investing in the stock market and

*Corresponding author
Email address: ahdai@iust.ac.ir

analyzes key financial indicators including P/E ratio, Net Profit Margin, ROA, Market Value, and DPS. Subsequently, using the AHP method and software tools like Expert Choice, different stock options are evaluated and ranked in terms of financial performance and return .[2]

The primary goal of this study is to offer a comprehensive model for decision-making in the stock market and for selecting the most optimal investment options. The results of this study can serve as a valuable guide for investors, financial managers, and researchers in the field of financial management and investment.

2. Theoretical Background

2.1. Capital Market and Financial Indicators

The stock market, as a platform for trading shares and securities, is influenced by various internal and external factors. To conduct a more precise analysis and optimal selection of stocks, financial indicators serve as key tools. These indicators quantitatively measure the performance and profitability of companies, aiding investors in assessing risk and return. The most important financial indicators used in this research are:

1. Price-to-Earnings Ratio (P/E): This indicator reflects the amount an investor pays for each unit of the company's earnings. Higher values typically indicate greater market expectations for the company's future earnings growth.
2. Return on Assets (ROA): This metric evaluates the company's efficiency in utilizing its assets to generate profit.
3. Net Profit Margin: This indicator represents the ratio of net profit to total sales, measuring the company's efficiency in converting revenue into profit.
4. Market Value: Calculated as the product of the number of outstanding shares and the price per share, this metric serves as a measure of the company's size and significance in the capital market.
5. Dividends Per Share (DPS): This indicator represents the portion of the company's profit distributed to shareholders, signaling the stability and attractiveness of the stock to investors. [3]

2.2. Analytic Hierarchy Process (AHP)

The Analytic Hierarchy Process (AHP) is a multi-criteria decision-making method. The term "AHP" is an acronym for "Analytic Hierarchy Process," which involves a structured approach to decision-making. The first step in AHP is selecting criteria, followed by evaluating alternatives based on these criteria. The term "options" or "candidates" is synonymous with "alternatives." The hierarchical nature of this method stems from its top-down structure, starting with organizational goals and strategies at the top of the hierarchy and expanding to identify criteria and sub-criteria. AHP is widely used for ranking and determining the importance of factors through pairwise comparisons. When the number of alternatives is large, creating a pairwise comparison matrix can be challenging. The goal of AHP is to select the best option based on various criteria through pairwise comparisons. This technique is also used for weighting criteria. To simplify comparisons, decision-making criteria are often divided into sub-criteria.

Key components of AHP models include:

- Goal – Criteria
- Goal – Criteria – Sub-criteria
- Goal – Criteria – Alternatives
- Goal – Criteria – Sub-criteria – Alternatives

In an AHP model, the objective may be to determine the weights of criteria or sub-criteria. The Analytic Hierarchy Process was developed by Thomas L. Saaty [5] and is based on three key principles:

1. Hierarchical Structure: Organizing the decision problem into a hierarchical framework.
2. Priority Setting: Establishing priorities through pairwise comparisons.
3. Consistency Analysis: Ensuring logical consistency in judgments.

Key Features of AHP:

1. Pairwise Comparisons: This feature enables precise evaluation of the priorities of criteria and alternatives.

2. Criteria Weighting: AHP determines the weight of each criterion based on expert judgments, reflecting its relative importance.
3. Consistency Analysis: This step verifies the logical consistency of the comparisons made. Applying AHP in stock selection enhances decision-making accuracy and reduces the influence of subjective judgments. [4]

2.3. Previous Research on Investment

Numerous studies have explored the application of the Analytic Hierarchy Process (AHP) in investment decision-making, demonstrating its effectiveness in prioritizing investment alternatives. For instance, a study focused on selecting the best stocks for investment revealed that AHP is not only useful for stock selection but also efficient in analyzing risks and returns. In recent years, there has been a significant increase in multi-criteria analysis research in the stock market domain. One notable example is a 2019 study by Alizadeh et al., who employed AHP to evaluate petrochemical companies. Their research highlighted the method's utility in assessing complex investment scenarios by considering multiple criteria simultaneously.

In 2020, Rahmani and Safari utilized criteria such as ROA and P/E, which are also employed in this research, to examine the impact of financial indicators. Additionally, in 2021, Mohammadi et al. applied this method to compare the automotive industry, and their study demonstrated that the pairwise comparison of criteria and alternatives can assist investors in selecting the best choices.

The distinction of this research from previous studies lies in the fact that most prior investigations have focused on specific industries such as petrochemicals or automobiles, with less attention given to transportation sectors, particularly rail transportation. Furthermore, while previous studies have primarily concentrated on the AHP method, the use of analytical software like Expert Choice has been less prevalent.

2.4 Relationships Between Variables

The Price-to-Earnings Ratio (P/E) is one of the key variables in stock analysis. This indicator is a negative metric but should not be zero or negative, as it would signify that the stock is unprofitable. Typically, the P/E ratio holds a higher rank and weight compared to other evaluated indicators.

$$\frac{P}{E} = \frac{Current\ Share\ Price}{EPS}$$

Fama and French, in their research comparing this index with others, observed that companies with higher P/E ratios often also have higher net profit margins. This is because investors are willing to pay more for stocks and companies with higher profit margins. Additionally, companies with high Return on Assets (ROA) tend to have higher P/E ratios, as the company's profitability boosts investors' positive expectations.

In a 2020 study, Zhang compared the P/E ratio with Dividends Per Share (DPS) and found that companies with high DPS often have lower P/E ratios. This is because a portion of their profits is distributed to shareholders as dividends rather than being reinvested.

Net Profit Margin is one of the ratios that reflects a company's profitability. It is calculated by dividing net profit by the total sales of a company and is expressed as a percentage. This indicates the profit earned per unit of sales revenue. This metric is considered positive because a higher percentage suggests that the company has effectively managed its costs and converted a larger portion of its revenue into profit.

$$Net\ Profit\ Margin = \frac{Net\ Profit}{Total\ Sales} * 100$$

In a 2013 study, Ishizaka and Nemery [6] found a positive relationship between Net Profit Margin and Return on Assets (ROA). This means that when a company generates adequate profit from its operations, the return on its assets increases. Companies with high Net Profit Margins typically also have higher market values. This is because such companies attract investor attention due to their higher profitability.

Return on Assets (ROA) is a financial ratio that indicates how profitable a company is relative to its total assets. This ratio helps investors and financial analysts assess how efficiently a company is utilizing its assets to generate profit. ROA is considered a positive indicator, as a higher ROA signifies that the company is effectively using its resources to produce earnings.

$$Return\ on\ Assets = \frac{Net\ Income}{Average\ \ Assets} * 100$$

Kumar and Gupta (2022) found that companies with higher ROA typically also have higher market value, as their strong ability to generate profits from assets enhances their investment appeal. The relationship between ROA and DPS depends on the company's internal policy. Generally, firms with higher ROA tend to have lower P/E ratios, since their superior profitability relative to assets reduces the need for excessive stock valuation.

Market value refers to the total value of a company in the stock market and is commonly used as a measure of a company's size and worth. It helps investors assess the scale and standing of a company compared to others in the same industry or the broader market. A higher market value indicates the company's strong ability to attract capital, grow, and gain market confidence. For this reason, it is considered a positive indicator.

DPS (Dividend Per Share) refers to the portion of EPS (Earnings Per Share) that is distributed to shareholders as cash dividends. In other words, it represents the actual cash profit allocated to each shareholder. The DPS value is always less than or equal to EPS. This indicator is considered positive, as a higher DPS reflects the company's ability to generate more profit and distribute it to shareholders.

$$Return\ on\ Assets = \frac{Total\ Dividends}{Total\ Dividends}$$

Triantaphyllou and Mann (1995) concluded that companies with higher DPS generally tend to have lower P/E ratios, as their profits are largely distributed as dividends rather than retained for business expansion.

The P/E ratio, as a valuation metric, is influenced by profitability, return on assets (ROA), and dividend payouts (DPS). While net profit margin and ROA have a direct impact on market value and the attractiveness of a stock, DPS reflects a company's dividend distribution policy [5].

3. Literature Review of the Research

The application of multi-criteria decision-making (MCDM) methods for analyzing and selecting optimal investment options in the stock market has attracted significant attention from researchers. Among these methods, the Analytic Hierarchy Process (AHP) is considered one of the most widely used techniques in financial and investment-related decision-making. By employing pairwise comparisons and determining the weights of various criteria, AHP enables investors to make optimal choices. The goal of AHP is to select the best option based on multiple criteria by systematically comparing alternatives in pairs. Numerous studies have explored the use of AHP in selecting suitable stocks for investment. [6]

In another study, Kumar (2017) used AHP to prioritize stocks in the Indian stock market and showed that combining this method with fundamental and technical analysis could lead to more effective decision-making. [7]

Several other studies have also investigated key financial indicators affecting stock selection. A prominent example is the study by Fama and French (1992), published under the title "The Cross-Section of Expected Stock Returns", which demonstrated that the P/E ratio is one of the most important criteria in stock selection due to its influence on investment returns. [8]

Another relevant study was conducted by Chen et al. (2010), which investigated the impact of the debt-to-asset ratio on stock performance in financial markets. The study concluded that this ratio can be a significant determinant of investment risk [9].

The study by Tran and Nguyen (2021), titled "AHP for Stock Market Prediction", showed that the ROA and DPS indicators play a significant role in stock selection. Furthermore, in an article titled "AHP-Based Decision Support System for Stock Market Analysis", Sharma and Singh proposed an intelligent system that recommends optimal investment options based on investor inputs and market data [10].

One of the critical components of the decision-making process is sensitivity analysis. A study by Sanchez and Triantaphyllou (1997) demonstrated that sensitivity analysis plays a key role in evaluating the robustness of AHP results and assists decision-makers in managing financial risks more effectively [11].

Hussain and Kabir (2011) also showed, through the application of sensitivity analysis, that changes in the weights of financial criteria can have a direct impact on the final ranking of alternatives [12].

4. Research Methodology

The present study is categorized as a descriptive-analytical research. Moreover, considering that its findings can be practically applied by investors and stock market analysts, it qualifies as an applied research. The steps undertaken in conducting this study are detailed in the following sections.

4.1. Identifying Companies

To better understand the business landscape, a comprehensive list of transportation companies (rail, road, and marine) listed on the stock exchange was compiled. Railway companies were then selected and filtered based on criteria such as P/E ratio, market value, and DPS, resulting in a final shortlist. All company names were obtained from the official stock exchange website [13].

Table 1. Initial List of Companies (Long List)

Company Name	Stock Symbol
Islamic Republic of Iran Shipping Lines	Hakashti
Sina Marine and Port Services Development Co.	Hasina
Rail Pardaz Seir	Harail
Tokaril	Torail
Parsian Railway Transport Development Co.	Haparsa
Gohar Tarabar Sirjan Transport Co.	Hagohar
Iranian Rail Tourism Co.	Hagardesh
Petrochemical Transportation Co.	Haparto
Khaleej Fars International Transport Co.	Hafars
Khat Darya Bandar Shipping Co	Habandar
Parto Bar Khalij-e-Fars	Haparto
Rail Pardaz Noafarin	Hafarin
Asia Seir Aras	Hasa
Tuka Transportation Co.	Hatoka
Rail Seir Kosar	Hasir
Rahshad Sepahan	Harhsha
Delijan Talaei Shokouh Pars	Hashokoh

The selected railway companies from the above list are as follows:

Table 2. Final List of Railway Companies

Company Name	Stock Symbol
Rail Pardaz Seir	Harail
Tokaril	Torail
Parsian Rail Transport Development	Haparsa
Gohar Tarabar Sirjan	Hagohar
Parto Bar Khalij-e-Fars	Haparto
Rail Pardaz Noafarin	Hafarin
Rail Seir Kosar	Hasir

After evaluating the financial indicators, the final shortlist (based on complete and reliable stock data from Codal and other official sources) is presented below

Table 3: Final Shortlist of Companies

Company Name	Stock Symbol
Rail Seir Kosar	Hasir
Tokaril	Torail
Parto Bar Khalij-e-Fars	Haparto
Gohar Tarabar Sirjan	Hagohar

Company Profiles:

- Parto Bar Khalij-e-Fars: A private joint-stock company operating in domestic and international freight rail and combined transport services. It primarily transports mineral and steel products and containers for public and private companies [14].
- Rail Seir Kosar: An established company initially focused on passenger transport. It currently transports

minerals and petroleum and can serve 2,000 passengers daily [15].

- Gohar Tarabar Sirjan: Founded to fulfill Golgohar Mining and Industrial Company's transportation needs. It has since merged with Namad Rail Gostar and is now one of the largest combined transportation companies in the country [16].
- Tokaril: Specializes in rail freight transportation. It transports concentrate and pellets from mines to steel complexes and is responsible for approximately 30% of the country's mineral freight. It also produces wagons, wheels, and metal components [17].

4.2. Identifying Financial Indicators

In selecting financial indicators, several criteria were considered to ensure the inclusion of practical and impactful metrics. The main objective was to evaluate the financial status and performance of companies based on standard and reliable analytical benchmarks. The selection was guided by factors such as:

- widespread use in financial analysis,
- interpretability and comparability,
- adherence to accounting and financial standards,
- coverage of various aspects of financial performance, and
- relevance in survey-based evaluations.

These indicators were then used to analyze the companies' financial conditions and trends. Each indicator has a specific interpretation that aids in better understanding the company's status. The table below presents the initial list of selected indicators [18].

Table 4: Initial List of Indicators (Long List)

NO.	Indicator
1	P/E
2	P/B
3	Current Liquidity
4	Debt-to-Asset Ratio
5	ROA
6	Market Value
7	DPS
8	Net Profit Margin

After reviewing the selected indicators, collecting data for each indicator across all companies, and eliminating those with inconsistent or unreliable data, 5 out of the original 8 indicators were selected. These final indicators are as follows:

Table 5: Final List of Indicators (Short List)

No.	Indicator
1	P/E
2	Net Profit Margin
3	ROA
4	Market Value
5	DPS

Definitions and relationships among these indicators were fully discussed in Section 2 (Theoretical Background).

4.3. Data on Selected Alternatives [19]

All data was extracted from the official sources including the Tehran Stock Exchange website, Codal, and Mofid Brokerage.

4.3.1. Parto Bar Khalij-e-Fars

Table 6: Financial Indicators for Parto Bar Khalij-e-Fars

Indicator	Value
P/E	28.34
Net Profit Margin	10%
ROA	6%
Market Value	14,325
DPS	40

4.3.2. Rail Seir Kosar

Table 7: Financial Indicators for Rail Seir Kosar

Indicator	Value
P/E	6.73
Net Profit Margin	59%
ROA	23%
Market Value	18,148
DPS	200

4.3.3. Gohar Tarabar Sirjan

Table 8: Financial Indicators for Gohar Tarabar Sirjan

Indicator	Value
P/E	6.21
Net Profit Margin	17%
ROA	23%
Market Value	56,407
DPS	70

4.3.4. Tokaril

Table 9: Financial Indicators for Tokaril

Indicator	Value
P/E	5.79
Net Profit Margin	17%
ROA	28%
Market Value	41,860
DPS	250

4.4. Pairwise Comparison of Criteria

After identifying and selecting the key financial indicators for stock evaluation, the next step in the decision-making process was to determine the relative importance of each indicator. To do this, pairwise comparisons were conducted—an essential step in the Analytic Hierarchy Process (AHP). In this method, each criterion is compared with others two by two, based on expert judgment and analytical data. The comparisons were made using Saaty's standard 1–9 scale, where:

- 1 = Equal importance
- 3 = Moderate importance of one over another
- 5 = Strong importance
- 7 = Very strong importance
- 9 = Extreme importance
- 2, 4, 6, 8 = Intermediate values

Table 10: Pairwise Comparison of Criteria

	P/E	Net Profit Margin	ROA	Market Value	DPS
P/E	1	3	5	7	8
Net Profit Margin	1/3	1	4	5	7
ROA	1/5	1/4	1	4	6
Market Value	1/7	1/5	1/4	1	3
DPS	1/8	1/7	1/6	1/3	1

After performing the pairwise comparisons of the criteria, it is necessary to calculate the Consistency Ratio (CR) to ensure the accuracy and reliability of the judgments.

$$\mathrm{CI}/\mathrm{RI} = \mathrm{CR}$$

The CR value indicates how logically consistent the pairwise comparisons are.

- If CR < 0.10, the comparisons are considered consistent and acceptable.
- If CR ≥ 0.10, the comparisons are inconsistent and should be revised.

4.5. Pairwise Comparison of Alternatives

In multi-criteria decision-making, pairwise comparison is a common method for ranking investment options. Companies are compared in pairs across five financial criteria (P/E, Net Profit Margin, ROA, Market Value, DPS) to assess relative performance, and the results are used to calculate final priority weights.

Table 11: Financial Data of the Four Companies

	P/E	Net Profit Margin	ROA	Market Value	DPS
Tokaril	5.79	17%	28%	41,860	250
Gohar Tarabar	6.21	17%	23%	56,407	70
Rail Seir Kosar	6.73	59%	23%	18,148	200
Parto Bar Khalij Farsa	28.34	10%	6%	14,325	40

The tables provide input data for calculating final AHP weights based on financial criteria comparisons.

Table 12: Pairwise Comparison Based on P/E

	Parto Bar	Rail Seir Kosar	Gohar Tarabar	Tokaril
Parto Bar Khalij Farsa	1	1/6	1/6	1/7
Rail Seir Kosar	6	1	1/2	1/2
Gohar Tarabar	6	2	1	1/2
Tokaril	7	2	2	1

CR = 0.04

Table 13: Pairwise Comparison Based on Net Profit

	Parto Bar	Rail Seir Kosar	Gohar Tarabar	Tokaril
Parto Bar Khalij Farsa	1	1/9	1/4	1/4
Rail Seir Kosar	9	1	7	7
Gohar Tarabar	4	1/7	1	1
Tokaril	4	1/7	1	1

CR = 0.06

Table 14: Pairwise Comparison Based on ROA

	Parto Bar	Rail Seir Kosar	Gohar Tarabar	Tokaril
Parto Bar Khalij Farsa	1	1/4	1/4	1/5
Rail Seir Kosar	4	1	1	1/3
Gohar Tarabar	4	1	1	1/3
Tokaril	5	3	3	1

CR = 0.03

Table 15: Pairwise Comparison Based on Market value

	Parto Bar	Rail Seir Kosar	Gohar Tarabar	Tokaril
Parto Bar	1	1/3	1/9	1/7
Rail Seir Kosar	3	1	1/8	1/7
Gohar Tarabar	9	8	1	2
Tokaril	7	7	1/2	1

CR = 0.06

Table 16: Pairwise Comparison Based on DPS

	Parto Bar	Rail Seir Kosar	Gohar Tarabar	Tokaril
Parto Bar Khalij Farsa	1	1/5	1/3	1/7
Rail Seir Kosar	5	1	4	1/2
Gohar Tarabar	3	1/4	1	1/5
Tokaril	7	2	5	1

CR = 0.04

4.6. Pairwise Comparison of Alternatives

Expert Choice is a widely used software for multi-criteria decision-making (MCDM), based on the Analytic Hierarchy Process (AHP). It supports building decision hierarchies, performing pairwise comparisons, calculating weights, checking consistency, conducting sensitivity analysis, and ranking alternatives. The software simplifies complex decisions, enhances result accuracy, and is commonly applied in both academic and practical fields for structured decision-making.

Based on these comparisons: P/E > Net Profit Margin > ROA > Market Value > DPS

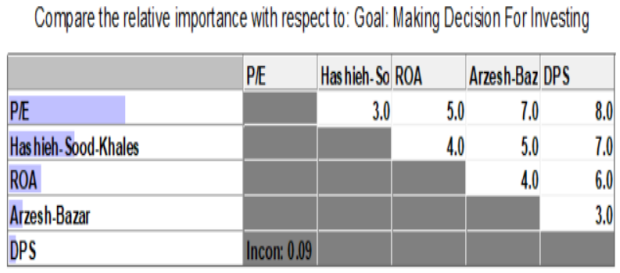

Figure 1. Pairwise Comparison of Criteria

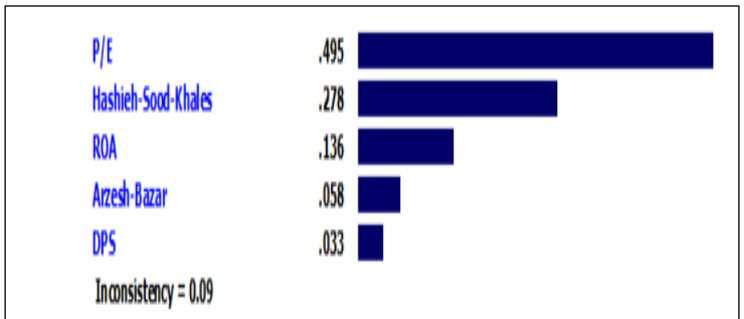

Figure 2. Final Weights of Criteria and Consistency Ratio

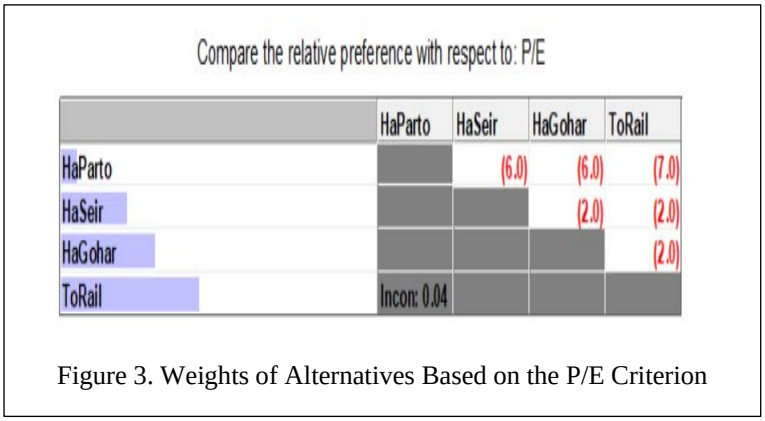

Figure 3. Weights of Alternatives Based on the P/E Criterion

According to this criterion, the ranking of the alternatives is as follows: Tokaril > Gohar Tarabar Sirjan > Rail Seir Kosar > Parto Bar Khalij-e-Fars

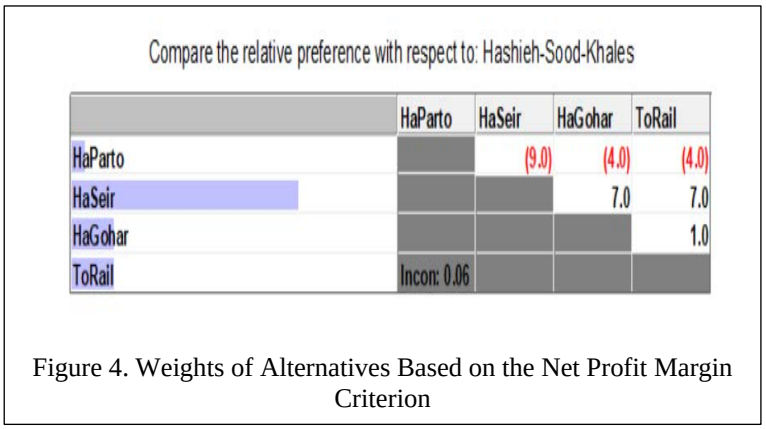

Figure 4. Weights of Alternatives Based on the Net Profit Margin Criterion

According to this criterion, the ranking of the alternatives is as follows: Rail Seir Kosar > Gohar Tarabar Sirjan = Tokaril > Parto Bar Khalij-e-Fars

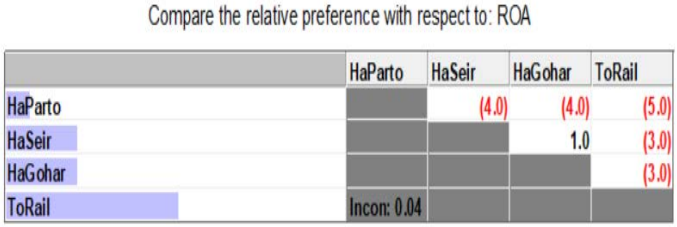

Figure 5. Weights of Alternatives Based on the ROA Criterion

According to this criterion, the alternatives are ranked as follows: Tokaril > Gohar Tarabar Sirjan = Rail Seir Kosar > Parto Bar Khalij-e-Fars

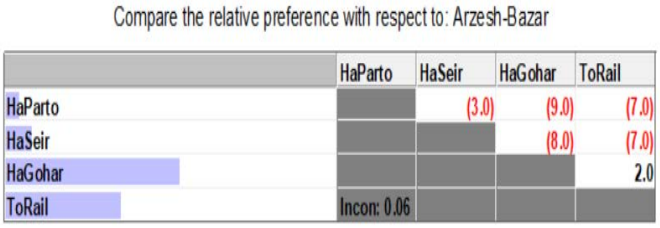

Figure 6. Weights of Alternatives Based on the Market Value Criterion

According to this criterion, the alternatives are ranked as follows: Gohar Tarabar Sirjan > Tokaril > Rail Seir Kosar > Parto Bar Khalij-e-Fars

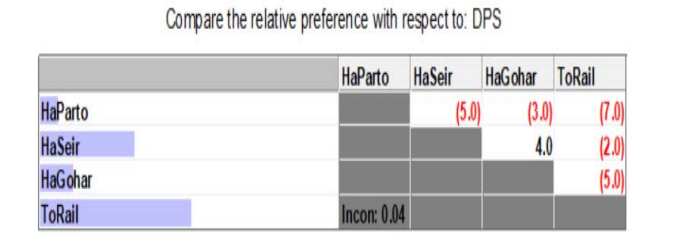

Figure ۷. Weights of Alternatives Based on the DPS Criterion

According to this criterion, the ranking of the alternatives is as follows: Tokaril > Rail Seir Kosar > Gohar Tarabar Sirjan > Parto Bar Khalij-e-Fars

Figure 8. Final Ranking of Alternatives

The overall ranking of the alternatives is presented in the next figure.

Based on the overall results, the priority ranking of the alternatives is as follows: Tokarail > Rail Seir Kosar > Gohar Tarabar Sirjan > Parto Bar Khalij-e-Fars

4.7. Sensitivity Analysis

In the decision-making process, initial data may involve uncertainty, or minor changes in the weights of criteria may occur. Sensitivity analysis is conducted to examine the stability of the alternatives' rankings. This type of analysis reveals how much the final rankings are influenced by the weight assigned to each criterion. Understanding the degree to which changes in criterion weights can affect the rankings is known as criterion weight sensitivity analysis.

4.7.1 Performance Sensitivity Analysis

This chart illustrates how the alternatives are ranked relative to one another based on the selected criteria as well as their overall performance. The first part of the chart is a bar graph, commonly used to represent and compare the frequency, proportions, or percentages of different values. This type of visualization enables the comparison of various groups and provides a general overview of the data. In this chart, the criteria are displayed along the horizontal axis, and the height of each bar represents the weight assigned to that specific criterion. As shown, the Net Profit Margin carries the greatest weight, followed by Return on Assets (ROA), Market Value, Dividend Per Share (DPS), and finally Price-to-Earnings Ratio (P/E).

In the second part of the chart, the ranking of the alternatives under each individual criterion is displayed, allowing a detailed comparison of how each option performs with respect to each indicator.

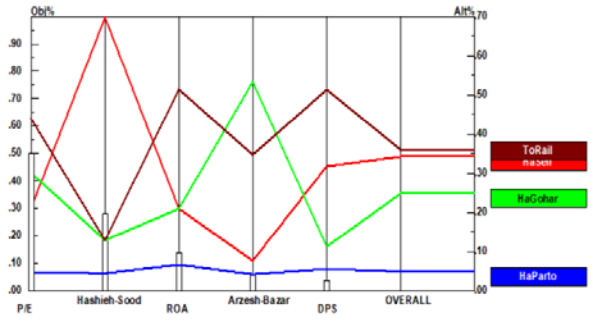

Figure 9. Performance Sensitivity Analysis

The results derived from the performance sensitivity chart, as shown above, can be summarized as follows:

1.According to the P/E criterion, the ranking of the alternatives is as follows: Tokaril ranks first, Rail Seir Kosar second, Gohar Tarabar Sirjan third, and Parto Bar Khalij-e-Fars last.

2.Rail Seir Kosar and Tokaril hold the top positions across most of the evaluated criteria, indicating their consistently strong performance.

4.7.2 Dynamic Sensitivity Analysis

Dynamic sensitivity analysis examines how gradual changes in criterion weights affect the ranking of alternatives over time or under different conditions. It helps identify trends and critical points by dynamically adjusting the importance of criteria and observing the resulting effects.

To conduct the analysis, two criteria are adjusted: first, the most significant criterion is reduced, and after observing the resulting changes, the weights are returned to their original state; then, the least significant criterion is increased to observe the changes in rankings.

Adjustment of Criterion Weights:

First, the weight of the P/E criterion is reduced by 10% in order to observe the resulting changes in the rankings and assess the system's sensitivity to variations in the most influential criterion.

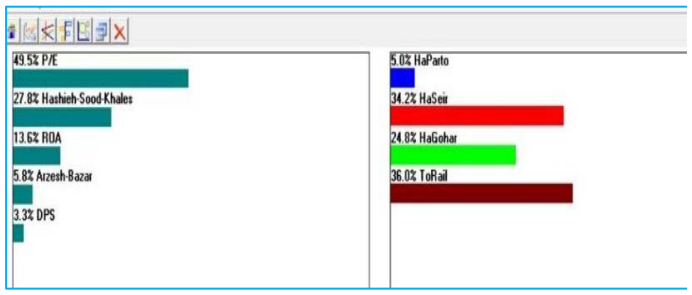

Figure 10. Initial Dynamic Analysis

By reducing the weight of the most influential criterion (P/E) by 10%, we observe that the rankings of Rail Seir Kosar (Hesir) and Tokaril improve, while the other two alternatives experience a decline in their rankings.

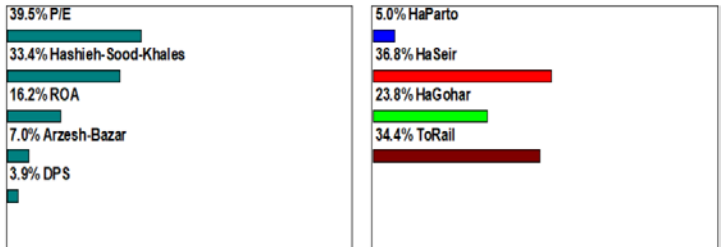

Figure 11. Reduction of the P/E Criterion

Now, we proceed to increase the weight of the DPS criterion, which holds the lowest rank, by 10%, in order to observe the corresponding changes in the ranking outcomes.

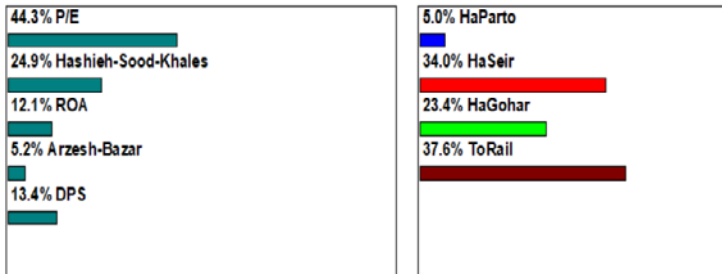

Figure 1۲. Increase in the DPS Criterion

We observe that, similar to the previous adjustment, increasing the weight of the least influential criterion (DPS) results in an improvement in the rankings of Rail Seir Kosar

(Hesir) and Tokaril, while the other two alternatives decline.

5. Conclusions

This study aimed to identify the best investment option in the rail transportation industry using the Analytic Hierarchy Process (AHP) and analytical tools such as Expert Choice software. Given the importance of making smart investment decisions in the stock market, five key financial indicators were selected for evaluation: P/E ratio, Net Profit Margin, Return on Assets (ROA), Market Value, and Dividend Per Share (DPS).

Initially, from among the listed companies active in the rail transportation sector, four companies were selected as the final alternatives: Parto Bar Khalij-e-Fars (Haparto), Rail Seir Kosar (Hesir), Gohar Tarabar Sirjan (Hagehar), and Tokaril. Pairwise comparisons were then performed among both the criteria and the alternatives, leading to the calculation of criterion weights and the ranking of the companies.

The results of the analysis indicated that Rail Seir Kosar (Hesir) and Tokaril were the most favorable investment options, while Parto Bar Khalij-e-Fars (Haparto) received the lowest score. Furthermore, sensitivity analysis confirmed the stability of the results under varying conditions and showed that changes in the weights of the criteria did not significantly affect the final rankings.

References

[1] Raei, R., & Pouyanfar, A. (2020). Advanced Investment Management in the Stock Exchange. Tehran: Bourse Publications. (In Persian)

[2] "Identification and Ranking of Factors Influencing Optimal Portfolio Selection Using AHP Method." (n.d.). Retrieved from https://civilica.com/doc/۱۱۱۴۳۲۰ (In Persian)

[3] Tehrani, R. (2019). Fundamental Analysis in the Capital Market. Tehran. (In Persian)

[4] Mohammadmoradi, A., & Akhtarkavan, M. (2009). "Methodology of Multi-Criteria Decision-Making Models." Armanshahr Architecture & Urban Development, https://sid.ir/paper/۲۰۲۵۲۷/fa (In Persian)

[5] Chen, Y.,& Lee,C. F.(2021). The Impact of Financial Ratios on Stock Returns: Evidence from the US Market. Journal of Financial Research, 44(2),345-367.

[6] Saaty, T. L. (1980). The Analytic Hierarchy Process: Planning, Priority Setting, Resource Allocation. McGraw-Hill

[7] Kumar, M. (2017). Application of AHP for Stock Selection in Indian Stock Market. International Journal of Financial Studies.

[8] Fama, E. F., & French, K. R. (1992). The Cross-Section of Expected Stock Returns. The Journal of Finance, 47(2), 427-465

[9] Chen, L., Novy-Marx, R., & Zhang, L. (2010). An Alternative Three-Factor Model. Working paper

[10] Tran, Q., & Nguyen, P. (2021). AHP for Stock Market Prediction.

[11] Sanchez, A., & Triantaphyllou, E. (1997). Some Sensitivity Analysis Results for Two Well-Known Multi-Criteria Decision Making Methods.

[12] Kabir, G., & Hasin, M. A. (2011). Comparative Analysis of AHP and Sensitivity Analysis in MCDM Problems

[13] https://ketabehamlonaghl.ir./

[14] https://parto-bf.com/

[15] https://railseir.blog/

[16] https://gttmco.com/

[17] https://www.tukarail.com/

[18] Bodie, Z., Kane, A., & Marcus, A. J. (2021). Investments (12th Edition)

[19] https://www.tsetmc.com/

[19] https://www.codal.ir/

[19] https://rahavard365.com/

[19] https://www.emofid.com/