



Article

Using Fuzzy Analytic Hierarchy Process and Technique for Order of Preference by Similarity to the Ideal Solution in Performance Evaluation in the Albanian Banking Sector

Arianit Peci ¹, Blerina Dervishaj ² and Adis Puška ^{3,*}

¹ Department of Mathematics and Informatics, Faculty of Economics and Agribusiness, Agricultural University of Tirana, 1025 Tirana, Albania; apeci@ubt.edu.al

² Department of Finance and Accounting, Faculty of Economy, “Ismail Qemali” University of Vlora, 9400 Vlorë, Albania; blerina.dervishaj@univlora.edu.al

³ Department of Public Safety, Government of Brčko District of Bosnia and Herzegovina, 76100 Brčko, Bosnia and Herzegovina

* Correspondence: adispuska@yahoo.com

Abstract: The banking sector plays a key role in the economic, social, and political development of a country. The study of the financial performance of banks is essential for investors, creditors, and other interested parties. The aim of this research was to rank the second-tier banks in Albania by financial performance using a fuzzy multi-criteria decision model (fuzzy MCDM). For the ranking of banks, eight financial criteria were taken into account during the years 2020, 2021, and 2022 for 11 banks in the Albanian banking sector. Based on the selected indicators, a decision-making model was created. The Fuzzy Analytic Hierarchy Process (FAHP) and the Technique for Order of Preference by Similarity to the Ideal Solution (TOPSIS) methods were used in this research. The results of the FAHP method showed that the most important indicators are Equity and EBT. The results of the TOPSIS method showed that Banka Kombëtare Tregtare (BKT) had the best indicators for the observed years. The contribution of this research is in understanding the financial operations of banks in Albania.

Keywords: financial performance; fuzzy AHP; TOPSIS; Albanian banks



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1. Introduction

The banking sector is one of the key financial institutions that actively contribute to a country's economy, particularly in developing nations (Trung et al., 2024). These institutions facilitate financial activities by accepting monetary deposits or other repayable funds from the public and utilizing them to grant loans or engage in other financial operations (Zeneli & Bara, 2015). The banking sector also serves as a major driving force behind economic growth. It plays a fundamental role in promoting a country's sustainable development (Baydaş & Elma, 2021). As a financial intermediary, it influences both the pace and direction of economic progress, shaping outcomes through customer interactions and its business model (Nosratabadi et al., 2020). Banking, as a vital component of the economy, is a powerful catalyst for achieving sustainable development (K. Kumar & Prakash, 2019; Mistrean, 2023). The most pressing sustainability concerns for these financial institutions (Saraçlı et al., 2023) are closely tied to financial inclusion and the education of both employees and customers (K. Kumar & Prakash, 2019).

Assessing the performance of banks annually and comparing them over specific time intervals provide an overview of their overall financial condition and their position

with creditors, investors, and stakeholders (Koziuk et al., 2024; Jakšić et al., 2016). The banking sector is a complex system comprising numerous actors that interact in intricate ways on a continuous basis, playing a crucial role in the economic development of any country (Todorova et al., 2024; Yu et al., 2024). Developing economies, such as Albania, are characterized by a high demand for credit due to increased investment, particularly in real estate (Kola et al., 2019). Since the post-communist period, the number of banks has grown significantly, reflecting progress in the development of the Albanian banking system (Zeneli & Bara, 2015). Currently, 11 banks operate in Albania, funded by both foreign and domestic capital: American Investment Bank, Credins Bank, United Bank of Albania, First Investment Bank of Albania, Intesa Sanpaolo Bank Albania, National Commercial Bank, OTP Bank Albania, ProCredit Bank, Raiffeisen Bank, Tirana Bank, and Union Bank.

In the banking sector, where the primary focus is on financial services, measuring financial performance is essential (Asutay & Ubaidillah, 2024). Evaluating bank performance helps stakeholders make informed investment decisions, obtain credit, and access critical information about banks (Jakšić et al., 2016). The growing uncertainty and competition within the banking system have further increased the need for clear and reliable information (Akkoc & Vatansever, 2013). For this reason, the use of fuzzy techniques in bank performance measurement has become necessary, as these methods provide more precise and dependable insights (Muniz et al., 2024; Farahbakhsh et al., 2024; Zanjaj et al., 2023). A review of the available literature highlights a gap in studies applying MCDM methods within a fuzzy environment to assess the performance and stability of banks in Albania.

The purpose of this study is twofold. First, it aims to provide decision support for policymakers analyzing the performance and effectiveness of banks through the application of MCDM methods. Second, the research seeks to highlight the sustainability of banks' financial performance as a reflection of trust from stakeholders. In this study, a fuzzy financial performance assessment model is proposed, based on eight financial indicators for second-tier banks in Albania during the COVID-19 period. The research addresses this gap by integrating a hybrid methodology that combines the FAHP method, which uses linguistic variables to weight financial criteria, and the TOPSIS method, which ranks banks based on these weights. The model evaluates eight financial criteria—Equity, Portfolio, Sources, Liquid Assets, Cash, Net Interest Income (NII+), Core Business Net Income (CBNI+), and Earnings Before Tax (EBT) (Mastilo et al., 2024; Mandic et al., 2014; Akkoc & Vatansever, 2013; Amile et al., 2012; Ozbek, 2015; Rezaei & Ketabi, 2016)—for 11 second-tier banks during the years 2020, 2021, and 2022. The data for the analysis were obtained from the official reports of the banks published online.

These financial indicators form the foundation of the research model used to assess the performance of banks. Therefore, the research aims to provide decision-making support to those studying the performance and effectiveness of banks by applying MCDM methods and to highlight the sustainability of banks' financial performance as a reflection of trust from stakeholders. The significance of this research lies in introducing a systematic approach to evaluating bank performance, addressing both financial and methodological gaps. Furthermore, the research provides a blueprint for improving operational efficiency and fostering confidence in the financial system. It also contributes to the broader discourse on banking sector development in developing economies.

The research has several key objectives. First, it aims to assess the financial condition of banks by combining fuzzy methods with a robust, contemporary research methodology suitable for such applications. Second, the research seeks to provide valuable insights to guide the further development of banks in Albania, supporting the sector that provides financial services in the country. Third, it aims to offer appropriate guidance to customers and other stakeholders interested in the financial services provided by banks, based on the

financial criteria considered in the study. Fourth, the ranking of banks according to the methods used aims to guide second-tier banks in improving their services, helping them become the preferred choice for customers or interested parties seeking deposits or loans. Finally, the research aims to assist decision-makers and the central bank in refining policies and decisions within the banking sector to further enhance the services provided, ensuring the sector's sustainability. Ultimately, the research strives to contribute to a sustainable financial system, a cornerstone of economic sustainability. In addition to its importance and objectives, the research addresses several research gaps:

- The research applies a relatively new methodology that, unlike traditional methods for assessing and ranking bank performance, offers an innovative and contemporary approach.
- The integration of the fuzzy approach with financial data provides a comprehensive and innovative framework for assessing the performance of the Albanian banking system.
- Previous research has focused on the performance of individual banks using traditional financial indicators. Moreover, the lack of fuzzy logic integration and the absence of comprehensive frameworks in performance studies represent a gap in this body of research.

From this perspective, the results of this research make a significant contribution to the literature on the assessment of bank performance in developing economies. Additionally, the methodology used in this study provides a robust and nuanced evaluation by integrating the subjective judgments of experts with quantitative data, offering a reliable framework for assessing bank performance.

The literature review follows this section, with Section 3 discussing the methodology employed. Subsections of Section 3 detail the research design, implementation, and methods. Specifically, the FAHP and TOPSIS methods used in the research are outlined in Sections 3.3.1 and 3.3.2, respectively. The case study results and discussions on the financial performance of second-tier banks in Albania are presented after Section 3. The paper concludes with the final section, which provides conclusions and potential recommendations.

2. Literature Review

This section presents recent studies that apply MCDM methods to evaluate the financial performance of the banking sector. MCDM methods have been widely used in financial studies of banks, focusing on specific contexts and purposes. One of the MCDM methods frequently employed in performance evaluation is the AHP method. The AHP method, being suitable for determining the weights of criteria, has been integrated by many researchers with other MCDM techniques.

Marjanović and Popović (2020) applied the CRITIC (CRiteria Importance Through Intercriteria Correlation) and TOPSIS methods to assess the financial performance of banks in Serbia from 2012 to 2017. They demonstrated the effectiveness of these methods in ranking banks based on a comprehensive set of financial criteria. Gupta et al. (2021a) used the hybrid CRITIC–TOPSIS method to evaluate the financial performance of banks in India for the years 2013–2014 and 2017–2018, with a focus on sustainability within the banking sector. Their study emphasized the sustainability of the public banking system. Various researchers have applied different MCDM methods to assess bank financial performance. Alsanousi et al. (2024) used a hybrid of the BWM (Best–Worst Method) and TOPSIS method to analyze stock performance on the Saudi Arabian Stock Exchange. They focused on key financial parameters such as ROE, ROA, net profit margin, and asset turnover, finding profitability ratios as the most important variables. P. Kumar and Sharma (2023) also

applied FAHP and TOPSIS to study the performance of ten Indian banks from 2016 to 2021. Among the criteria they considered, they found that ROE was the most influential.

Many studies have examined the use of fuzzy MCDM methods to address uncertainty in decision-making. [Igbudu et al. \(2018\)](#) investigated the role of sustainable banking practices in customer loyalty. By designing 511 questionnaires, they observed that sustainable banking practices and corporate image had a positive and direct effect on bank loyalty and corporate image. [Quynh \(2024\)](#) applied an extended fuzzy TOPSIS method using integral values to evaluate bank performance. [Palmieri and Ferilli \(2024\)](#) integrated Spherical Fuzzy TOPSIS, Entropy, and ARAS (Additive Ratio Assessment) methods to analyze the increasing importance of alternative financing instruments in the bank–firm relationship. [Ballouk et al. \(2024\)](#) employed qualitative comparative fuzzy set analysis to study the effects of social media on bank performance. [Reyes and Young \(2024\)](#) analyzed the financial performance of 16 banking corporations listed on the Philippine Stock Exchange, comparing their performance before and during the quarantine period. They applied FANP to rank the bank portfolios.

[Antunes et al. \(2024\)](#) applied DEA and TOPSIS methods to evaluate the performance of Japanese banks, proposing a stochastic Entropy analysis based on ideal solutions. [Eftekhari Aliabadi and Momen \(2024\)](#) used fuzzy Delphi, pairwise comparison matrix, and fuzzy TOPSIS methods to assess the performance of private sector banks in Iran based on financial capability indicators. Their study was based on three questionnaires administered at three different stages among 36 people. [Ecer et al. \(2024\)](#) applied the SWARA and WASPAS (Weighted Aggregated Sum Product Assessment) methods to study the key factors in the digital transformation of banks. They analyzed 12 Turkish banks and found that the main factors influencing digital transformation were fast responses to customer needs, the power of social media, and entry into new markets. [Antunes et al. \(2024\)](#) introduced a new model called Trigonometric Envelopment Analysis for Ideal Solutions (TEA-IS). [Yazdi et al. \(2024\)](#) combined the CAMELS, CoCoSo (Combined Compromise Solution), and SWARA methods to rank Iranian banks, emphasizing the importance of integrating both qualitative and quantitative factors for a comprehensive assessment.

[Fazeli et al. \(2023\)](#) applied the fuzzy AHP method to identify and rank indicators that affect the financial performance of private banks. [Sharma and Kumar \(2023\)](#) used FAHP and FTOPSIS methods to evaluate the performance of ten public sector banks in India, using 17 performance indicators. [Gupta et al. \(2023\)](#) applied the FAHP method to explore and prioritize the main factors driving the adoption of Payments Bank in the northern region of India. [Arsu and Aytac \(2023\)](#) employed FAHP and TOPSIS to assess the performance of 19 Turkish banks in terms of customer complaint management. They found that private banks outperformed public and participating banks in complaint management. [Avşarlıgil et al. \(2023\)](#) applied Entropy, ARAS, MOORA (Multi-objective Optimization with Ratio Analysis), and MOOSRA (Multi-objective Optimization on the Basis of Simple Ratio Analysis) methods to study the financial performance of companies. [Reig-Mullor and Brotons-Martinez \(2021\)](#) applied FAHP and TOPSIS methods to evaluate the performance of Spanish commercial banks using intuitionistic fuzzy numbers. [Ünvan and Ergenç \(2022\)](#) used fuzzy COPRAS and Entropy-COPRAS methods to assess the financial performance and profitability of the Turkish banking sector, studying the period 2014–2018.

[Pineda et al. \(2018\)](#) used an MCDM model to extract critical factors for improving airline performance, applying the VIKOR (VIsekriterijumsko KOMpromisno Rangiranje) and DANP methods. [Baydaş and Elma \(2021\)](#) conducted a study on 131 manufacturing companies over 20 quarters between 2014 and 2018. [Aldalou and Perçin \(2020\)](#) applied the FEDAS method to evaluate the financial performance of companies listed on the Istanbul Stock Exchange Food and Beverage Index. They tested the reliability of the

method using sensitivity analysis with the CRITIC method and validated it with the FTOPSIS, FVIKOR, FCOPRAS, FMOORA, and FSAW methods. [Alimohammadlou and Bonyani \(2017\)](#) proposed an integrated model composed of the Best–Worst Method and PROMETHEE II to evaluate and rank the 14 largest food companies in Iran, with NOOSH MAZAN Co. from Tehran, Iran ranking first.

[Baydaş and Pamučar \(2022\)](#) applied several MCDM methods to evaluate the financial performance of companies and compared these methods. [Makki and Alqahtani \(2023\)](#) studied the financial performance of companies in the energy sector post-COVID-19 (2019–2021), focusing on four financial dimensions and 11 performance indicators. They found that the efficiency and profitability of energy companies were the most important dimensions, followed by leverage and liquidity. [Gavalas et al. \(2021\)](#) applied the DEMATEL fuzzy, FANP, and MOORA methods to analyze public policies related to shipbuilding in different countries, considering 25 variables, including finance, customers, internal processes, and learning and growth aspects. [Baydaş et al. \(2023\)](#) proposed two criteria confirming each other in the evaluation of financial performance for 140 manufacturing companies, using nine MCDM methods.

This subsection presents some of the applications of FAHP and TOPSIS methods in different sectors of the economy as well as in the banking sector. The FAHP method has been used to address uncertainties within expert judgments for weighing criteria, and this has created the need to integrate with the TOPSIS method, which is applied in ranking numerical data. In many areas of research, different MCDM methods have been used without applying the hybrid framework approach. Furthermore, in sectors of the economy in general and in the Albanian banking sector, there is a lack of such applications that integrate this methodology, as they use classical approaches or specific MCDM approaches in isolation without the use of fuzzy methods. The research addresses this gap and provides a sound assessment as well as important knowledge for all actors involved in the banking system, increasing the understanding of bank performance assessment in developing countries.

In a study on measuring the performance of banks in India, [Guru and Mahalik \(2021\)](#) applied AHP and TOPSIS as the most suitable methods for this purpose. In the same way, [Gupta et al. \(2021a\)](#) also acted, who ranked Indian banks according to performance by applying the integration of the AHP and TOPSIS methods. They also applied the IV-TOPSIS method to obtain a better assessment of the overall ranking of banks. [Agrawal et al. \(2022\)](#) combined the AHP method with TOPSIS and DEMATEL methods to identify and rank the factors of e-service quality in the comparison of banks. [Abdel-Basset et al. \(2021\)](#) evaluated the performance of ten Egyptian banks by combining AHP with TOPSIS, VIKOR, and COPRAS methods. [Muhammad Ghazali \(2022\)](#) selected several banks in Malaysia to compare and rank them in the period before and during the COVID-19 pandemic. In this study, he selected six financial criteria and applied the AHP method with TOPSIS, VIKOR, and PROMETHEE II methods. [İç et al. \(2021\)](#) integrated the AHP method with the VIKOR method to evaluate the performance of Turkish banks. [İç et al. \(2022\)](#) applied the AHP method by combining it with the DOE method in measuring the performance and ranking 18 Turkish banks.

Other researchers applied the TOPSIS method separately or combined it with other MCDM methods. One such example was [Salur and Cihan \(2020\)](#), who applied the TOPSIS method to analyze the performance of 18 banks in Turkey during the period 2010–2018. They made a comparison between traditional banking and participatory banking. [Özçalıcı et al. \(2022\)](#) applied the ARAS, EDAS, MOORA, OCRA, and TOPSIS methods to evaluate the performance of banks in Turkey in the period 2014–2018. From the calculations they performed, they noted that the two most important criteria were the average return on

assets and the ratio of shareholders' Equity/total assets. Yeşildağ et al. (2020) applied the TOPSIS and GRA methods to the performance of 11 Turkish banks in a period from 2002 to 2018 using 15 financial criteria. Marjanović and Popović (2020) applied the TOPSIS and CRITIC methods to assess the performance of Serbian banks in the period from 2012 to 2017. Nguyen et al. (2022) integrated the TOPSIS method with the CRITIC and DEMATEL methods to the performance of 23 banks in Vietnam during 2019–2020. Gupta et al. (2021b) analyzed the performance of Indian banks during 2013–2014 and 2017–2018. They performed the analysis by combining the CRITIC and TOPSIS methods. Then, to obtain an overall performance of the banking sector, they applied the interval-valued TOPSIS (IV-TOPSIS) method. P. Kumar and Sharma (2024) applied CRITIC and interval-valued TOPSIS (IV-TOPSIS) methods to assess the performance of Indian banks for the years 2015–2021. Ghosh and Saima (2021) studied the performance of 13 banks using TOPSIS and HELLWIG methods. Amiri et al. (2023) applied TOPSIS to identify and rank the factors that influence the growth and development of market share of a single bank. Sharma and Kumar (2024) applied TOPSIS and VIKOR methods to the performance of Indian banks.

Many other studies (No et al., 2021; Ecer & Pamucar, 2022; Kantharaju et al., 2024; Angilella et al., 2024; Othman et al., 2024; Zhao et al., 2024; Lan et al., 2024; Raju & Kesava Rao, 2020; Foglia et al., 2022; Boubaker et al., 2023; Aydın, 2020; Rao et al., 2021; Ünlü et al., 2022; Erdoğan, 2022; Karbassi Yazdi et al., 2022; Marjanović & Popović, 2020; Alsanousi et al., 2024; Nguyen et al., 2022; Antunes et al., 2024; Ecer et al., 2024), applied classical methods as well as MCDM methods in the evaluation and ranking of bank performance.

Meanwhile, since the criteria in many cases are qualitative and subjective in nature, fuzzy logic has been integrated into traditional MCDM methods. Subjective judgments of experts during comparison may be inaccurate and uncertain. For this, the treatment of inaccuracy and uncertainty in AHP is performed by replacing exact numbers with fuzzy variables that represent linguistic variables in FAHP (Liu et al., 2020). Following the traditional MCDM methods that have been used in the performance and ranking of banks by different researchers and in different countries, this section provides some of the applications of the FAHP and TOPSIS methods in the banking sector but also in different sectors of the economy. The FAHP method was used to address the uncertainties within the expert judgments for the weighting criteria, and this has created the need to integrate with the TOPSIS method, which is applied to the ranking of numerical data. In many areas of research, different MCDM methods have been used without applying the hybrid framework approach. Moreover, in the banking sector but also in other sectors of the Albanian economy, there is a lack of such applications that integrate this methodology as studies use classical approaches or specific MCDM approaches isolated without the use of fuzzy logic. The research addresses this gap and provides a sound assessment as well as important knowledge for all actors involved in the Albanian banking system. In the Table 1. below are some applications of the FAHP and TOPSIS methods.

Various researchers have employed other MCDM methods in fuzzy environments to analyze and rank bank performance. These studies help capture the uncertainty and imprecision inherent in financial data and expert judgments. The following researchers have applied such methodologies: Quynh (2024), Palmieri and Ferilli (2024), Ballouk et al. (2024), Reyes and Young (2024), Eftekhari Aliabadi and Momen (2024), Fazeli et al. (2023), Ünvan (2020), Ünvan and Ergenç (2022), Işık et al. (2025), Mastilo et al. (2024), and Osmanovic et al. (2022). They utilized various MCDM techniques like fuzzy TOPSIS and fuzzy AHP to provide a more nuanced and reliable evaluation of bank performance. These approaches offer more flexibility in handling the vagueness often found in financial performance assessments.

Table 1. FAHP and TOPSIS methods with applications in financial analysis.

Authors	Applied Model	Field of Application	Description
Fazeli et al. (2023)	FAHP	Bank	Identified and ranked eight indicators that are effective in assessing the financial performance of private banks.
Sharma and Kumar (2023)	FAHP and FTOPSIS	Bank	Performance assessment of ten public sector banks in India. They used 17 performance indicators.
Gupta et al. (2023)	FAHP	Bank	Explored the key factors responsible for the adoption of Payments Bank in the northern region of India.
Arsu and Aytac (2023)	FAHP and TOPSIS	Bank	They assessed the performance of 19 banks operating in Turkey in terms of customer complaint management.
Reig-Mullor and Brotons-Martinez (2021)	FAHP and TOPSIS	Bank	They assessed the performance of Spanish commercial banks with intuitive fuzzy numbers.
Abdel-Basset et al. (2020)	AHP, VIKOR, and TOPSIS	Manufacturing industry	Evaluated the financial performance of the 10 main steel companies in Egypt.
Safaei Ghadikolaei et al. (2014)	Fuzzy AHP, Fuzzy VIKOR, Fuzzy ARAS, and Fuzzy COPRAS	Automobile company	They assessed the financial performance of automotive companies on the Tehran Stock Exchange.
Moghimini and Anvari (2014)	FAHP and TOPSIS	Manufacturing industry	Analyzed financial reports of Iranian cement production companies.
Farrokh et al. (2016)	FAHP, VIKOR, and TOPSIS	Manufacturing industry	Analyzed financial reports of eight base metal-producing companies in Iran.
Aytekin (2020)	TOPSIS	Tourism	They studied the financial performance of publicly traded tourism companies on BIST for the period 2014–2018.
Türegün (2022)	TOPSIS and VIKOR	Tourism	Evaluated the financial performance of companies operating in the tourism industry in Turkey.

3. Research Methodology

Figure 1 illustrates the processes to be followed in conducting the research for this paper. When determining the ranking of banks based on financial results, a research model is initially developed. This model identifies the criteria, which in this case are financial indicators, as well as the banks that will be observed using these indicators, representing the alternatives. A combination of subjective and objective approaches is employed here.

For determining the weight of the criteria, a subjective approach is used, where the AHP method is applied. In this step, experts assess the importance of these indicators. An objective approach is used in constructing the decision matrix, where the financial indicator values for the banks are incorporated. The ranking of these banks will then be carried out using the TOPSIS method.

To apply this method, the criteria weights must first be determined, as these indicators are needed for one of the steps in the TOPSIS method. The research methodology, results, and methods will be presented in the following sections.

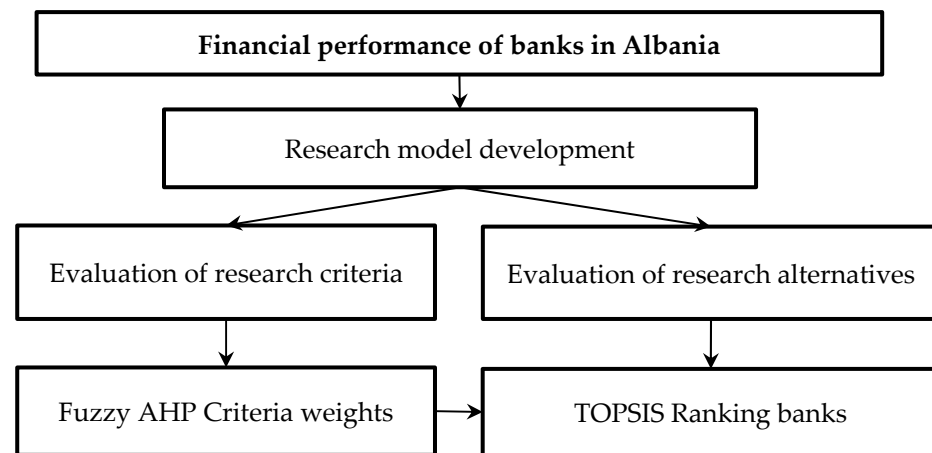


Figure 1. Research methodology.

3.1. Research Model

- To enrich the financial offerings, various additional services are provided, including financial services (Breidbach et al., 2020). However, in some cases, these services are not only complementary but essential to the banking experience. Understanding how these financial services are delivered is crucial, leading to the development of a research model. This model is designed with sustainability in mind, aiming to meet current demands while preserving the environment for future generations. Drawing from previous studies and financial experts, the eight most important financial criteria/parameters selected for this research to measure the financial performance of banks are the following: Equity, Portfolio, Sources, Liquid Assets, Cash, Net Interest Income (NII+), Core Business Net Income (CBNI+), and Earnings Before Tax (EBT) (Mastilo et al., 2024; Mandic et al., 2014; Akkoc & Vatansever, 2013; Amile et al., 2012; Ozbek, 2015; Rezaei & Ketabi, 2016). The selection of these criteria is organized in this way because in the financial services provided by banks the relationship with the client comes first. Brief descriptions of the eight criteria are as follows:
- Equity: In evaluating bank performance, capital is considered a fundamental criterion. Often, capital in a business refers to the ownership interest of shareholders or the owner. Net capital also refers to the combination of liabilities and the owner's capital (Mastilo et al., 2024; Mandic et al., 2014; Akkoc & Vatansever, 2013; Amile et al., 2012; Ozbek, 2015; Rezaei & Ketabi, 2016).
- Portfolio: The Portfolio criterion includes deposits and loans, stocks, bonds, cash equivalents, interests and fees, securities, and other investments. In this case study, the Portfolio is considered one of the parameters and is significant because Net Interest Income is generated from its use (Mastilo et al., 2024; Mandic et al., 2014; Rezaei & Ketabi, 2016; Yang et al., 2024).
- Sources: The Sources criterion includes average Sources such as transaction deposits, deposits, and other loans, liabilities under securities, interest liabilities, fees, and the valuation of derivatives. Proper management of these Sources of financing directly impacts the profitability of banks (Mandic et al., 2014; Rezaei & Ketabi, 2016; Batta et al., 2022).
- Liquid Assets: Assets are considered liquid if they can be easily converted into cash without a loss in value. Liquid Assets typically include banknotes and current accounts. Given that banks often take risks in their business transactions, considering Liquid Assets is important when analyzing the efficiency of banks (Mastilo et al., 2024; Mandic et al., 2014; Akkoc & Vatansever, 2013; Rezaei & Ketabi, 2016).

- Cash: Cash and its equivalents, also known as Cash in banks, are the most Liquid Assets a bank holds. Cash is also a reflection of the bank's business activities and impacts the Cash flow statement (Mastilo et al., 2024; Mandic et al., 2014; Rezaei & Ketabi, 2016; Tan et al., 2024).
- Net Interest Income (NII+): Net Interest Income is one of the most critical criteria for evaluating bank performance (Mandic et al., 2014; Akkoc & Vatansever, 2013; Amile et al., 2012; Ozbek, 2015; Rezaei & Ketabi, 2016).
- Core Business Net Income (CBNI+): Core Business Net Income is an essential criterion, encompassing Net Interest Income and income from fees and commissions, excluding indirect write-offs (Mandic et al., 2014; Rezaei & Ketabi, 2016).
- Earnings Before Tax (EBT): EBT is an important criterion for assessing bank performance and serves as a key indicator for measuring productivity (Mandic et al., 2014; Rezaei & Ketabi, 2016).

3.2. Research Conduction

For the financial analysis and ranking of second-tier banks in Albania, a fuzzy MCDM model was developed by integrating the FAHP and TOPSIS methods. The model was constructed based on the selected criteria, and the FAHP method was subsequently applied to determine the weights. In this process, the respective weights are derived using a linguistic scale, which allows financial experts to easily compare them. The linguistic scale used in this study is based on the works of Mandic et al. (2014) and Kilincci and Onal (2011). In the FAHP method, linguistic variables—whose values are represented as words rather than numbers—are employed, and these variables are considered fuzzy numbers. The linguistic variables used in this study follow a scale with five linguistic terms, as shown in Table 2. Financial experts, when comparing linguistic criteria, select the linguistic variable that best corresponds to a given criterion, with each variable represented as a triangular fuzzy number (TFN) (Zadeh, 1965).

Table 2. Linguistic and fuzzy scale for importance.

Linguistic Scale of Importance	TFN	TFN Reciprocal Value
Equal	(1, 1, 1)	(1, 1, 1)
Weakly	(1/2, 1, 3/2)	(2/3, 1, 2)
Fairly strongly	(3/2, 2, 5/2)	(1/2, 1, 3/2)
Very strongly	(5/2, 3, 7/2)	(2/7, 1/3, 2/5)
Absolutely	(7/2, 4, 9/2)	(2/9, 1/4, 2/7)

After determining the criteria weights, the banks were ranked using the TOPSIS method. The “Results and Discussion” section presents both the steps followed in the applied methodology and the results obtained from these methods.

3.3. Research Methods

This section outlines the methodology applied in this research, providing fundamental concepts of the MCDM approach, specifically the FAHP–TOPSIS method.

3.3.1. Fuzzy AHP Method

In many real-life problems, we often face complex decision-making. MCDM approaches are widely used to select the best alternative based on several, usually conflicting, criteria (Božanić et al., 2022). The AHP method introduced by Saaty (1980) as one of the MCDM methods often has limitations in use. The uncertainty and ambiguity of the data led Chang (1996) to introduce the combination of AHP with fuzzy set theory (Zadeh, 1965).

First, by taking the opinion of experts, the pairwise comparison matrix $\tilde{A}_{ij}$ consisting of fuzzy numbers is constructed (Hwang & Masud, 2012).

$$\tilde{A}_{ij} = \begin{cases} 1, & i = j \\ 1, 3, 5, 7, 9 \text{ or } 1^{-1}, 3^{-1}, 5^{-1}, 7^{-1}, 9^{-1} & i \neq j \end{cases} \quad (1)$$

In the next step, the values of the fuzzy synthetic extension are found:

$$S_i = \sum_{j=1}^m M_{gi}^j \otimes \left[\sum_{i=1}^n \sum_{j=1}^m M_{gi}^j \right]^{-1} \quad (2)$$

$$\sum_{j=1}^m M_{gi}^j = \left(\sum_{j=1}^m l_i \sum_{j=1}^m m_i \sum_{j=1}^m u_i \right) \quad (3)$$

$$\sum_{i=1}^n \sum_{j=1}^m M_{gi}^j = \left(\sum_{j=1}^m l_i \sum_{j=1}^n m_i \sum_{j=1}^n u_i \right) \quad (4)$$

$$\left[\sum_{i=1}^n \sum_{j=1}^m M_{gi}^j \right]^{-1} = \left(\frac{1}{\sum_{i=1}^n u_i}, \frac{1}{\sum_{i=1}^n m_i}, \frac{1}{\sum_{i=1}^n l_i} \right) \quad (5)$$

After comparing the values of S_i , the degree of possibility is calculated $S_2 = (l_2, m_2, u_2)$ he $S_1 = (l_1, m_1, u_1)$

$$V(S_2 \geq S_1) = y \geq x[\min(\mu_{S1}(x), \mu_{S2}(y))] \quad (6)$$

$$V(S_2 \geq S_1) = hgt(S_1 \cap S_2) = \mu_{S2}(d) = \begin{cases} 1, & \text{if } m_2 \geq m_1 \\ 0, & \text{if } l_1 \geq u_2 \\ \frac{l_1 - u_2}{(m_2 - u_2) - (m_1 - l_1)}, & \text{otherwise} \end{cases} \quad (7)$$

The intersection of μ_{S1} and μ_{S2} is ordinate d .

The minimum degree of possibility S_i ($i = 1, 2, \dots, k$) is calculated

$$\begin{aligned} V(S \geq S_1, S_2, \dots, S_k) &= \\ &= V[(S \geq S_1) \text{ and } (S \geq S_2) \text{ and } (S \geq S_k)] \\ &= \min V(S \geq S_i), i = 1, 2, \dots, k \end{aligned} \quad (8)$$

If

$$d'(A_i) = \min V(S_i \geq S_k) \quad (9)$$

for $k = 1, 2, \dots, n; k \neq i$, then as a result the weight vector is obtained:

$$W' = (d'(A_1), d'(A_1), \dots, d'(A_n))^T \quad (10)$$

where $A_i (i = 1, 2, \dots, n)$

Finally, the normalized criterion weight vector is

$$W = (W_1, W_2, \dots, W_n)^T \quad (11)$$

and it is a non-fuzzy number (Büyüközkan et al., 2008; Kahraman et al., 2006).

3.3.2. TOPSIS Method

The TOPSIS method introduced by Hwang and Yoon (1981) is one of the methods that finds wide use in different real-life fields and does not require complicated calculations (Alaoui et al., 2019). The TOPSIS method is based on PIS and NIS, where PIS is used to

maximize the benefit criterion and minimize the cost, while NIS does the opposite (Benítez et al., 2007).

The following are the steps of the TOPSIS method (El Alaoui, 2021):

- The decision matrix R , which is normalized, is constructed in this initial step for alternative and criterion j :

$$R_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^m x_{ij}^2}} \quad (12)$$

- The weighted matrix, which is normalized, is constructed in this second step of the method using the weights of the criterion w_j :

$$V_{ij} = w_j \times R_{ij} \quad (13)$$

- As a third step, the ideal positive solution A^+ and the negative one A^- are determined:

$$A^+ = \{v_1^*, \dots, v_n^*\} = \{v_{ij}|j \in \rho_b), v_{ij}|j \in \rho_c), \quad (14)$$

$$A^- = \{v_1^-, \dots, v_n^-\} = \{v_{ij}|j \in \rho_b), v_{ij}|j \in \rho_c), \quad (15)$$

where ρ_b and ρ_c are the set of benefit and cost criteria, respectively.

The next step is to calculate the distance D^+ and D^- from the solutions A^+ and A^- :

$$d_i^+ = \sqrt{\sum_{j=1}^m (v_{ij} - v_j^*)^2}, i = 1, \dots, m \quad (16)$$

$$d_i^- = \sqrt{\sum_{j=1}^m (v_{ij} - v_j^-)^2}, i = 1, \dots, m \quad (17)$$

Calculating the proximity with A^+ and A^- ,

$$CC_i = \frac{d_i^-}{d_i^- + d_i^+}, i = 1, \dots, m \quad (18)$$

where CC_i — calculate closeness.

And the last step is to rank the alternatives depending on the values of CC_i .

4. Results

To derive the results of this research, the first necessary step is to calculate the weights for the main criteria of the model. This calculation is performed using the fuzzy AHP method. The initial step in this method involves the fuzzy comparison matrix for the eight selected financial criteria, as shown in Table 3. The fuzzy comparison matrix is an upper triangular matrix, with the elements in the lower part representing inverse ratings. The “Equal” rating is placed along the main diagonal of Table 3, as each criterion cannot be compared with itself.

For comparing the eight basic criteria, the ratings of five financial experts were considered, including three university professors and two financial experts from the Central Bank of Albania. These experts were initially provided with a questionnaire to assess the importance of these criteria. After collecting the completed questionnaires, the responses were processed and returned to the experts for harmonization of the weights assigned to the criteria. In addition to the ratings, the experts explained their reasoning, and based on these explanations, they adjusted their evaluations and returned the questionnaires. This procedure was repeated three times until consensus was reached on the evaluation criteria. Furthermore, the ratings for the comparison of the eight criteria were also informed by the

existing literature and scientific articles (Mandic et al., 2014; Rezaei & Ketabi, 2016; Fazeli et al., 2023; Sharma & Kumar, 2023; Gupta et al., 2023).

Table 3. Fuzzy comparison matrix of the eight basic criteria in relation to the goal and their priority vectors.

Criteria	Equity	Portfolio	Sources	Liquid Assets	Cash	NII+	CBNI+	EBT
Equity	Equal	Very strong	Fairly strong	Very strong	Fairly strong	Absolute	Fairly strong	Equal
Portfolio		Equal	1/Fairly strong	Equal	1/Fairly strong	Absolute	Equal	1/Very strong
Sources			Equal	Fairly strong	Equal	Absolute	Fairly strong	1/Fairly strong
Liquid Assets				Equal	1/Fairly strong	Absolute	Equal	1/Very strong
Cash					Equal	Absolute	Fairly strong	1/Fairly strong
NII+						Equal	1/Very strong	1/Very strong
CBNI+							Equal	1/Fairly strong
EBT								Equal

Then, the linguistic values are transformed into fuzzy numbers by applying the membership function to the fuzzy numbers, as shown in Table 1. This transformation is carried out by assigning the defined fuzzy numbers to the appropriate importance scale. For example, the value “equally” will be transformed into the fuzzy number (1, 1, 1), while the value “very strong” will be transformed into (2.5, 3, 3.5). The other value scales are transformed in the same manner.

It is important to note that in Table 2 only the values on the main diagonal of the matrix are shown. The values below the diagonal are not shown but represent the reciprocal values of the corresponding main diagonal values. For instance, if the “capital” criterion in relation to the “portfolio” is rated as “very strong”, then the ratio of the Portfolio to capital will be 1/“very strong”. This procedure is applied to all values below the main diagonal, ultimately forming a complete decision matrix for the criteria. Based on this matrix, the values for the FAHP method are further calculated, and the weights for each criterion are determined, as shown in Table 4.

Table 4. Weights calculated for the eight criteria using the FAHP method.

Criteria	Weights
Equity	0.2300
Portfolio	0.0864
Sources	0.1482
Liquid Assets	0.0864
Cash	0.1482
NII+	0.0430
CBNI+	0.0961
EBT	0.2300

By following all the steps of the FAHP method algorithm, we can conclude that in the process of evaluating the eight financial criteria in the Albanian banking sector, the “Equity” criterion was assigned the highest weight of 0.23. The “EBT” criterion was also assessed with the same weight. The “Sources” and “Cash” criteria were evaluated with a weight of 0.1482, followed by the “CBNI+” criterion with a weight of 0.0961. The “Portfolio” and “Liquid Assets” criteria were assessed with the same weight of 0.0846, and the final

criterion, “NII+”, had the lowest weight at 0.0430. The weights calculated using the FAHP method, along with the financial data for the eight basic criteria for the year 2020, are presented in Table 5 as follows:

Table 5. Eight financial criteria (in thousands of ALL) of banks and their weights for the year 2020.

	Equity (0.23)	Portfolio (0.086)	Sources (0.148)	Liquid Assets (0.086)	Cash (0.148)	NII+ (0.043)	CBNI+ (0.096)	EBT (0.23)
American Bank of Investments SH.A. (ABI Bank)	10,312,413	35,496,321	76,752,316	14,599,110	11,098,410	2,500,592	3,112,658	1,266,289
Credins Bank (Credins)	18,535,243	105,695,118	228,438,723	29,859,112	27,073,989	6,632,352	9,413,481	1,086,515
The United Bank of Albania (UBA Bank)	1,164,834	5,904,902	8,581,867	2,138,574	3,214,129	43,372	322,456	356,654
First Investment Bank Albania Sha (FiBank)	3,646,590	19,520,932	30,597,248	2,089,676	931,524	997,704	1,392,877	447,315
Intesa Sanpaolo Bank Albania (Intesa)	23,198,471	149,544,971	164,308,146	861,767	32,432,194	3,231,565	8,142,434	1,508,990
Banka Kombëtare Tregtare (BKT)	543,258,884	1,619,998,506	4,408,288,939	1,021,966,079	465,266,853	133,660,998	154,612,644	88,474,283
OTP Bank Albania (OTP Bank)	9,456,255	58,849,505	87,024,528	5,535,926	12,771,021	3,796,468	3,852,886	830,199
ProCredit Bank Albania (ProCredit)	3,187,389	28,355,158	32,259,457	4,515,050	4,515,050	1,086,984	481,256	−398,452
Raiffeisen Bank Albania (Raiffeisen)	30,426,372	115,538,754	207,128,002	56,327,181	42,269,288	6,583,069	8,565,978	2,076,356
Tirana Bank	9,984,782	37,991,132	74,406,112	12,789,996	6,972,818	2,604,232	3,325,088	824,889
Union Bank	5,809,574	31,661,639	66,046,962	12,635,500	8,421,761	2,230,838	2,490,530	573,590

The next step in the financial analysis of banks, after determining their criteria weights, is the ranking of the banks using the TOPSIS method. We selected the TOPSIS method because it is an efficient tool for ranking banks based on financial data (Erdoğan, 2023; Hassanzadeh & Valmohammadi, 2021; Ünvan, 2020). The TOPSIS method is one of the most widely used multi-criteria decision-making methods (Anwar et al., 2025).

The TOPSIS method first normalizes the decision matrix (Table 5) using Formula (12). The second step is to multiply the weights, obtained through the FAHP method, with the normalized matrix, resulting in a normalized weighted matrix. Following this, the next step in the TOPSIS method is to calculate the PIS (Positive Ideal Solution) and NIS (Negative Ideal Solution). Subsequently, the shortest distance from the PIS and the furthest distance from the NIS are calculated, followed by the computation of the CC_i proximity coefficient for each alternative (bank).

The final step involves ranking the banks from the highest to the lowest CC_i value. The procedure, as outlined above, is shown in Table 6, which provides a complete overview of the PIS, NIS, CC_i parameters, and the ranking of second-tier banks in Albania for the year 2020. The same procedure was applied for the years 2021 and 2022, and the results for all three years are presented in Table 7.

From the results obtained using the FAHP and TOPSIS methods, it is evident that BKT ranked first in all three years. This is because all the selected financial indicators favor this bank. Raiffeisen Bank consistently ranked second across all three years, while Credins Bank, initially ranked fourth in 2020, moved up to third place in the following two years. Conversely, Intesa Bank followed the opposite trend.

OTP Bank, ABI Bank, Tirana Bank, Union Bank, and FiBank maintained their rankings in fifth, sixth, seventh, eighth, and ninth place, respectively, throughout all three years. Finally, UBA Bank and ProCredit Bank consistently occupied the last positions.

In this study, it was deemed unnecessary to apply additional MCDM methods for ranking Albania's second-tier banks based on financial performance, as BKT was clearly the top-ranked bank in all three years. Regarding the methodology used, we recommend its application in other financial sectors and across various industries to assess performance based on multiple criteria.

Table 6. Ranking of banks for the year 2020 based on PIS, NIS, and CC_i.

Banks	d ⁺	d [−]	CC _i	Rank
American Bank of Investments SH.A. (ABI Bank)	0.4117	0.0075	0.0180	6
Credins Bank (Credins)	0.4045	0.0162	0.0386	4
The United Bank of Albania (UBA Bank)	0.4179	0.0021	0.0050	10
First Investment Bank Albania Sha (FiBank)	0.4168	0.0028	0.0066	9
Intesa Sanpaolo Bank Albania (Intesa)	0.4033	0.0180	0.0427	3
Banka Kombëtare Tregtare (BKT)	0.0000	0.4192	1.0000	1
OTP Bank Albania (OTP Bank)	0.4120	0.0076	0.0182	5
ProCredit Bank Albania (ProCredit)	0.4177	0.0021	0.0050	11
Raiffeisen Bank Albania (Raiffeisen)	0.3984	0.0224	0.0531	2
Tirana Bank	0.4129	0.0064	0.0152	7
Union Bank	0.4143	0.0050	0.0119	8

Table 7. Ranking of banks for 2020, 2021, and 2022 based on CC_i.

Year	2020		2021		2022	
Name of Banks	Q	Rank	Q	Rank	Q	Rank
American Bank of Investments SH.A. (ABI Bank)	0.0180	6	0.0175	6	0.0186	6
Credins Bank (Credins)	0.0386	4	0.0420	3	0.0452	3
The United Bank of Albania (UBA Bank)	0.0050	10	0.0022	11	0.0007	11
First Investment Bank Albania Sha (FiBank)	0.0066	9	0.0083	9	0.0090	9
Intesa Sanpaolo Bank Albania (Intesa)	0.0427	3	0.0392	4	0.0375	4
Banka Kombëtare Tregtare (BKT)	1.0000	1	1.0000	1	1.0000	1
OTP Bank Albania (OTP Bank)	0.0182	5	0.0239	5	0.0361	5
ProCredit Bank Albania (ProCredit)	0.0050	11	0.0060	10	0.0061	10
Raiffeisen Bank Albania (Raiffeisen)	0.0531	2	0.0631	2	0.0600	2
Tirana Bank	0.0152	7	0.0163	7	0.0176	7
Union Bank	0.0119	8	0.0141	8	0.0142	8

5. Discussions

The banking sector is a cornerstone of a country's economic activity (Siagian, 2023). The stability and efficiency of banks are crucial, as financial issues in a single bank can disrupt the operations of businesses and individuals relying on it. Therefore, continuous monitoring of banking operations is essential (Yakymchuk et al., 2023).

This study aimed to rank second-tier banks in Albania based on financial performance, identifying those with the strongest indicators. Eight key financial indicators were selected, consistent with previous research (Mandic et al., 2014; Rezaei & Ketabi, 2016; Fazeli et al., 2023; Sharma & Kumar, 2023; Gupta et al., 2023). These indicators have been widely recognized as fundamental metrics for assessing bank performance.

While the FAHP and TOPSIS methods applied in this research are well-established in multi-criteria decision-making (MCDM), the study's novelty lies in its contribution to enhancing banking operations in Albania. Expert opinions were used to determine the relative importance of each criterion. Experts emphasized that Earnings Before Tax (EBT) and Equity were the most critical indicators. However, to ensure objectivity, the Analytic Hierarchy Process (AHP) was employed to calculate the weight of each criterion.

AHP, originally developed by Saaty (1980), has been extensively applied in decision-making studies. Like all MCDM methods, AHP has strengths and limitations (Komazec et al., 2024). A key advantage is its structured pairwise comparison approach, which quantifies how much more important one criterion is relative to another (Ahmed et al., 2024). However, maintaining consistency in expert judgments is a challenge. For example, if Criterion 1 is more important than Criterion 2, and Criterion 2 is more important than Criterion 3, then Criterion 1 should logically be more important than Criterion 3—and by an appropriate proportion (Bobar et al., 2020). This requirement for logical transitivity is a fundamental limitation of the AHP method (Genç et al., 2024).

As the number of criteria increase, the likelihood of inconsistencies in expert evaluations grows (Sangaré-Oumar et al., 2025). To mitigate this, the Consistency Index (CI) must be calculated, adding complexity to the method (Radovanović et al., 2025). Despite this challenge, AHP remains one of the most widely used tools in multi-criteria decision-making due to its systematic and rational approach to prioritization.

Since the AHP method has limitations regarding the consistency of criteria evaluation, alternative methods have been developed that do not require direct comparisons between criteria. For example, in the SWARA method, criteria are first ranked by importance, and then the extent to which a criterion is more significant than a lower-ranked criterion is determined (Mehdiabadi et al., 2025). In contrast, the FUCOM method ranks the criteria but assigns importance numerically, with the most important criterion receiving a score of one and others ranging up to nine. This method relies on numerical comparisons rather than pairwise evaluation. The BMW method, on the other hand, identifies the best and worst criteria and compares the remaining criteria against these two benchmarks (Bouraima et al., 2024). Due to these considerations, the AHP method must be applied with caution, ensuring consistency in the evaluation process.

The TOPSIS method was first introduced by Hwang and Yoon in 1981. This approach determines results by calculating the squared deviation from both the best and worst alternative values for a given criterion (Çalikoğlu & Łuczak, 2024). It is widely used because it facilitates a straightforward ranking of alternatives (Kousar et al., 2025). The method is applicable to all multi-criteria decision-making problems (Kizielewicz & Sałabun, 2024), which is why it was chosen for ranking banks. However, it also has some drawbacks, primarily due to its relatively complex methodology and procedural steps (Mishra & Rani, 2025). The method requires calculating cumulative squared deviations from ideal and anti-ideal alternatives, necessitating a compromise-based ranking determination (Đukić et al., 2022). Nonetheless, regardless of the method applied, BKT Bank would still emerge as the top-ranked institution.

Examining Table 1, which presents financial indicators for 2020, it is evident that BKT Bank consistently achieves the best values across all indicators. A similar study conducted by Mandić et al. (2014) found that no single bank had superior values for all indicators, though some banks demonstrated strong performance over time. Rezaei and Ketabi (2016) used the same set of criteria in their study of Iranian banks, ranking private banks and concluding that none excelled across all indicators. Sharma and Kumar (2023) also utilized the same indicators in their research. What distinguishes the present study from similar research is that, in Albania, one bank—BKT—outperformed all others across all selected financial indicators.

The financial performance of BKT Bank is so superior to that of other banks that additional analyses, such as sensitivity or comparative analysis, were deemed unnecessary. Conducting these analyses would still confirm BKT as the top-performing bank. Consequently, BKT's operational model should serve as a benchmark for other banks seeking to enhance their performance. Across all financial indicators, BKT consistently ranks highest.

Other banks should analyze BKT's strategies to understand the key factors contributing to its success. A primary factor is that BKT holds the largest deposit reserves and enjoys the highest market coverage. To remain competitive, other banks must enhance their liquidity. The banks ranked lowest in this study are not necessarily at risk of bankruptcy (Heralová, 2024), but they must refine their operations to achieve optimal financial performance, with BKT serving as a model for improvement.

5.1. Research Limitations

This study provides valuable insights into the financial performance of second-tier banks in Albania. However, future research can address certain limitations to further refine this type of analysis. One limitation lies in the selection of financial indicators, as it is challenging to incorporate all possible financial metrics within a single study. Another limitation is the exclusion of non-financial indicators, such as employee count, customer satisfaction, loyalty, service efficiency, and service quality. Including these qualitative indicators would provide a more comprehensive assessment of bank performance. If such criteria were applied, experts would need to evaluate banks using linguistic variables rather than numerical metrics alone.

Another limitation relates to the number of experts involved in the evaluation process. However, regardless of how experts rated the criteria, BKT Bank would still have emerged as the top performer. This is because, based on the selected indicators, BKT consistently demonstrates the best results, securing its position as the highest-ranked bank regardless of the weight assigned to different criteria.

Additionally, this study utilized a combination of fuzzy and traditional decision-making methods. The fuzzy AHP method was used to determine criteria weights, while the conventional TOPSIS method was employed for ranking. This approach was chosen to simplify expert evaluations by allowing linguistic terms to be used in the weighting process. Once fuzzy weight values were obtained, they were converted into crisp values to enable the application of the standard TOPSIS method. The decision to use the traditional TOPSIS method was based on the fact that the selected financial indicators yielded crisp numerical values, making the fuzzy TOPSIS method unnecessary.

5.2. Directions for Future Research

Based on the limitations of the research, guidelines for future research have been set that will attempt to address the limitations of this research. First, in future research, banks should be observed using a broader range of criteria that would include other indicators that are not exclusively financial, and qualitative criteria should be included in the research. Including these criteria would encompass the broader operations of banks, not just financial operations. This would provide more complete information about the operations of the bank. In future research, it is possible to use qualitative criteria that would use linguistic terms and appropriate fuzzy methods. However, in these studies, it is necessary to take into account who the experts are and how they evaluate banks. Therefore, it is necessary to ensure that expert assessments are as realistic as possible. More experts should be included in future research because the weight of the criteria can sometimes decide the ranking of banks. In this research, this was not important at all, because one bank had the best of all indicators. In future research, it is necessary to use methods other than the AHP and TOPSIS methods because the ranking of banks is often influenced by the method used. In these studies, it is necessary to compare multiple methods and determine how these methods rank banks. In addition, it is necessary to conduct a sensitivity analysis to examine how the weights of the criteria affect the ranking of banks. In this study, these two analyses

were not performed due to the specific values of the indicators, as one bank was the best in all.

6. Conclusions

The stability of the banking system is increasingly becoming one of the most important issues in recent studies. The assessment of bank performance is one of the most important issues in a country's economy. Performance measurement analyses often face major obstacles such as the uncertainty and complexity of the global market. Mainly, traditional techniques for assessing financial performance in many cases fail to produce satisfactory results. For this, the use of multi-criteria decision-making models in a fuzzy environment has been used successfully and has achieved satisfactory results. In order to assess financial performance within the Albanian banking sector, a hybrid model of multi-criteria decision-making methods was built by combining the fuzzy AHP and TOPSIS methods.

Initially, eight financial criteria were selected and their weights were determined using the FAHP method. Following all the steps of the FAHP algorithm, it resulted that the Equity criterion was evaluated with a weight of 0.23 and was the criterion with the highest weight, the EBT criterion was also evaluated with the same weight, followed by the Sources and Cash criteria, which were evaluated with the same weight of 0.148, the CBNI+ criterion had a weight of 0.096, the Portfolio and Liquid Assets criteria were evaluated with the same weight of 0.086, and the last criterion in terms of weight was NII+ with a weight of 0.043. Then, the use of the TOPSIS method made it possible to rank the banks from the bank with the best performance to the one with the least best performance.

Through TOPSIS method calculations performed for the ranking of second-tier banks in Albania, it resulted that the BKT was ranked first in all three years. This is because all the indicators considered favored this bank, and it was the most successful bank in fulfilling the research objectives and achieving the best overall results in all financial indicators. Raiffeisen Bank was ranked second, where it was clear that this bank was also ranked second in the three years. UBA Bank and ProCredit Bank ranked last. Even though these two banks were ranked last, this does not necessarily mean that these banks should cease their financial activity and be on the verge of bankruptcy. This shows that these two banks have relatively weaker results than other banks in the financial indicators considered, and this shows that they should take proactive measures to improve their financial performance.

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Abbreviations

The following abbreviations are used in this manuscript:

AHP	Analytic Hierarchy Process
ARAS	Additive Ratio Assessment
BKT	Banka Kombëtare Tregtare
BWM	Best–Worst Method
CBNI+	Core Business Net Income
CoCoSo	Combined Compromise Solution
COPRAS	complex proportional assessment
CRITIC	CRiteria Importance Through Intercriteria Correlation
DEA	Data envelopment analysis
DEMATEL	Decision-Making Trial and Evaluation Laboratory
DER	debt-to-equity ratio
EBT	Earnings Before Tax
HDI	Human Development Index
MCDM	multi-criteria decision-making
MOORA	Multi-objective Optimization with Ratio Analysis
MOOSRA	Multi-objective Optimization on the Basis of Simple Ratio Analysis
NBC	National Business Center
NII+	Net Interest Income
ROA	return on assets
SADC	Southern African Development Community
SAW	Simple Additive Weighting
SMEs	small- and medium-sized enterprises
SWARA	Stepwise Weight Assessment Ratio Analysis
TEA-IS	Trigonometric Envelopment Analysis for Ideal Solutions
TOPSIS	Technique for Order of Preference by Similarity to the Ideal Solution
WASPAS	Weighted Aggregated Sum Product Assessment

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