

Ranking Economic Fragility in the Fragile Five Countries: A Multi-Criteria Analysis Using TOPSIS and VIKOR

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Abstract

The integration of the global economy and increasing capital mobility has significantly impacted emerging markets, especially following the 2008 global financial crisis. This study evaluates the economic performances of the countries identified as the "Fragile Five" -Turkey, Brazil, India, Indonesia, and South Africa- using Multi-Criteria Decision Making (MCDM) methods such as TOPSIS and VIKOR. The analysis incorporates six macroeconomic indicators as criteria: current account balance (as a percentage of GDP), inflation rate (consumer prices), GDP growth rate (annual percentage), unemployment rate (as a percentage of total labor force), external debt-to-GDP ratio, and total reserves (including gold, in current US dollars). Through this evaluation, the fragility rankings of the Fragile Five countries are determined. The findings are assessed in terms of strategies that these countries could implement to reduce economic vulnerability and provide guidance for investors.

Keywords: Fragile Five, Economic Performance, Decision Making, TOPSIS, VIKOR

1. Introduction

The integration of the global economy and increased capital mobility have had a significant impact on emerging markets. Particularly after the 2008 global financial crisis, many developing countries have been profoundly affected by global financial fluctuations and have become more vulnerable to external shocks. The "Fragile Five" countries -Turkey, Brazil, India, Indonesia, and South Africa- were first identified in 2013 by James K. Lord, an analyst from the U.S.-based bank Morgan Stanley. These countries drew attention from investors due to the high-risk factors embedded in their economic structures. Macroeconomic imbalances in indicators such as current account deficits,

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inflation, unemployment rates, and external debt have led to the depreciation of their local currencies (Dinçsoy and Çan, 2016; Sezal, 2023).

The main aim of this study is to conduct a comparative analysis of the macroeconomic vulnerability levels of the countries referred to as the Fragile Five -Turkey, Brazil, India, Indonesia, and South Africa-. In this context, the economic performances of the mentioned countries were evaluated using annual data, and a comparative ranking among them was established. Thus, the study seeks to contribute to the concept of vulnerability both theoretically and practically.

The Fragile Five countries have increased their dependency on foreign capital to sustain economic growth and have faced challenges in maintaining macroeconomic stability. Rising external financing needs and sensitivity to global market fluctuations are the primary factors contributing to their economic vulnerabilities. Among the most commonly used indicators to measure the fragility of emerging market economies are the current account deficit, inflation rate, unemployment rate, external debt-to-GDP ratio, and total reserves (Akkuş and Topuz, 2019).

This study provides two main contributions to the literature. First, it presents a detailed analysis of the economic vulnerabilities of the Fragile Five between the years 2014 and 2022 using multi-criteria decision-making (MCDM) methods. Second, by applying both the TOPSIS and VIKOR methods to the same dataset, it enables a comparison between the analytical perspectives of these two techniques.

The aim of this study is to comparatively analyze the economic performances of the Fragile Five countries: Turkey, Brazil, India, Indonesia, and South Africa. To achieve this objective, the economic vulnerabilities of these countries will be ranked using Multi-Criteria Decision-Making (MCDM) methods, specifically TOPSIS and VIKOR. The TOPSIS method enables ranking by normalizing criteria in the dataset based on positive ideal and negative ideal values and calculating the distances of decision points from these values. VIKOR, on the other hand, offers compromise solutions for solving multi-criteria problems and is used to rank alternatives by balancing the conflicts between various criteria. In this study, macroeconomic indicators such as the current account balance, inflation rate, unemployment rate, external debt-to-GDP ratio, and total reserves provided in the dataset will be used to calculate TOPSIS and VIKOR values for each country, thereby enabling a comparison of their levels of vulnerability. These indicators were selected because they reflect both the internal economic dynamics and the resilience of countries against global shocks. Previous studies (e.g., Akkuş & Topuz, 2019; Dinçsoy & Çan, 2016) have also employed these indicators as measures of vulnerability.

The TOPSIS method defines positive ideal (best) and negative ideal (worst) values for each criterion, calculates the distances of analyzed countries to these values, and ranks their performances accordingly.

In evaluating a problem, the best outcome is sought for each criterion. However, maximizing all criteria simultaneously is usually impossible. For instance, when assessing a country's economic performance, different goals such as low unemployment rates, controlled inflation, and a strong current account balance might arise. However, in some cases, reducing unemployment might lead to higher inflation. The VIKOR method addresses such conflicts by balancing these trade-offs, considering the distances of each criterion to its best and worst values. It provides a compromise-based ranking by weighing all criteria and establishing a balance between conflicting objectives to identify the most appropriate solution.

The selected methods, TOPSIS (Hwang & Yoon, 1981) and VIKOR (Opricovic & Tzeng, 2004) are widely used in multi-criteria decision-making approaches. While TOPSIS is based on the distance of an alternative from ideal and anti-ideal solutions, VIKOR offers a more flexible evaluation by proposing a compromise-based ranking. Using both methods together allows for a more holistic approach to the multidimensional nature of economic vulnerability.

However, limiting economic vulnerability solely to macroeconomic indicators is not sufficient. Structural factors such as a country's level of technological development, quality of human capital, infrastructure capacity, political stability, dependency on natural resources, and sensitivity to commodity price fluctuations also directly affect vulnerability. Therefore, while the indicators used in this study provide a framework, more comprehensive analyses should also consider structural elements.

This study's contribution to the literature lies in being one of the few studies that analyze the economic performances of the Fragile Five countries using annual data and multi-criteria decision-making methods. By focusing on the indicators used to determine the economic vulnerabilities of these countries and employing the TOPSIS and VIKOR methods, the study aims to shed light on Turkey's position within the Fragile Five classification. This analysis reveals how the economic vulnerabilities of the Fragile Five countries are influenced by the selected factors and lays a foundation for potential recommendations to reduce these vulnerabilities. Moreover, such analyses serve as an example of how macroeconomic indicators can be utilized for cross-country comparisons. It is particularly intended to provide a valuable roadmap for emerging countries that are sensitive to economic fragility.

2. Literature Review

In 2015, Önder, Taş, and Hepşen evaluated the economic performances of the Fragile Five countries following the 2008–2009 Global Financial Crisis using the Analytic Network Process and TOPSIS methods. Their study ranked the economic performances of the Fragile Five countries by considering macroeconomic indicators such as current account deficit and unemployment rate (Önder, Taş, & Hepşen, 2015).

In 2016, Dinçsoy and Çan examined the effects of the U.S. Federal Reserve's (FED) quantitative easing policies and bond purchasing programs on these countries. Their study assessed the financial vulnerability of the Fragile Five based on macroeconomic indicators (Dinçsoy and Çan, 2016).

In 2019, Chadwick investigated the dependence of the Fragile Five and other emerging markets on U.S. monetary policies. Using time-varying copula models, the study analyzed the Fragile Five's reliance on U.S. monetary policies and the effects of this dependence on their economic vulnerabilities (Chadwick, 2019). The same year, Akkuş and Topuz analyzed the trends in unemployment rates in the Fragile Five countries, finding that unemployment did not fall below its natural rate in these countries and that economic shocks had lasting impacts on unemployment (Akkuş and Topuz, 2019).

In 2020, Demirkale and Özarı used the TOPSIS method to compare the economic and financial performances of the Fragile Five countries with the MINT (Mexico, Indonesia, Nigeria, and Turkey) countries. Their evaluation included criteria such as inflation, interest rates, and exchange rates (Demirkale and Özarı, 2020).

In 2022, Baykal and Turgan analyzed the impact of foreign direct investment (FDI) on the exports and GDP of the Fragile Five countries. Their study assessed how FDI influenced economic growth and foreign trade, shedding light on the Fragile Five's vulnerability to global financial fluctuations (Baykal and Turgan, 2022). In the same year, Yiğiter and Sarı conducted a study focused on financial vulnerability and key economic indicators specific to Turkey. Their analysis examined financial fragility using indicators such as the BIST 100 Index and exchange rates (Yiğiter and Sarı, 2022).

In their 2022 study, Kovacı and Şen evaluated the monetary policies implemented by central banks in the Fragile Five countries during the post-COVID-19 period. In particular, the policy responses of Turkey and India were analyzed comparatively. The study concluded that Turkey's aggressive interest rate cuts and loss of reserves increased its vulnerability. In this context, the pandemic's impact on macroeconomic indicators contributed a timely update to the literature.

In 2023, Sezal conducted a study on the credit volumes of the Fragile Five countries. The research analyzed the Credit-to-GDP ratios of Brazil, India, Indonesia, South Africa, and Turkey, providing insights into their economic vulnerabilities (Sezal, 2023).

In a 2024 study, İltaş and Güzel examined the relationship between Turkey's CDS premiums and exchange rate volatility. Their findings showed that rising CDS premiums exerted pressure on the Turkish Lira and deepened financial fragility. These results provide a contemporary perspective on why Turkey is considered among the more vulnerable economies.

The studies summarized above have addressed the economic vulnerabilities of the Fragile Five countries using different indicators and methods. However, most of these

studies employed only a single multi-criteria decision-making method or were limited to specific years. In this context, the present study makes a significant contribution to the literature in terms of both the analysis period (2014–2022) and the methodological diversity (using both TOPSIS and VIKOR).

Furthermore, while many existing studies predominantly focus on Turkey, this study stands out by analyzing all five countries in a comprehensive and comparative manner. In this respect, it helps fill a gap in the research and emphasizes the need for more comparative analyses at the international level.

Additionally, to better reflect the recent literature, future versions of this study could consider more recent works related to vulnerability indicators. Especially due to the structural changes in macroeconomic indicators triggered by the pandemic, there is now a foundation for identifying new indicators of vulnerability.

3. Data and Method

This study employs a range of macroeconomic indicators to evaluate the economic performance of the Fragile Five countries: Turkey, Brazil, India, Indonesia, and South Africa. The dataset is based on annual data and includes critical indicators of economic fragility, such as current account balance, inflation rate, unemployment rate, external debt ratio, and total reserves. These indicators were selected to analyze the macroeconomic fragility levels of these countries and to rank their vulnerabilities using the TOPSIS method. Additionally, an alternative performance analysis was conducted using the VIKOR method.

The six selected indicators reflect both financial and real-sector dimensions and provide insights into critical areas of economic stability such as external financing dependency, internal demand stability, price level control, labor market health, and resilience to external shocks. Therefore, indicators like current account balance (% of GDP), inflation rate, unemployment rate, external debt-to-GDP ratio, GDP growth rate, and total reserves are among the most frequently used measures in the literature to assess economic vulnerability in developing countries (Akkuş & Topuz, 2019; Demirkale & Özarı, 2020).

The selection of indicators in this study was guided by their ability to reflect each country's level of external dependence, financial stability, and overall economic resilience. While indicators like current account balance and external debt ratio are considered factors that may increase a country's economic fragility, total reserves are regarded as a safeguard representing resilience against external shocks. The influence of each criterion on economic performance is outlined as follows:

Current Account Balance (% of GDP): The current account balance reflects the sum of a country's trade surplus or deficit, along with service and transfer payments. Expressed

as a percentage of GDP, it indicates the country's dependence on external financing. A negative current account balance (deficit) suggests increased external dependence, which heightens vulnerability, while positive values imply greater economic strength. Therefore, a higher current account balance is considered a factor reducing fragility.

Inflation Rate: Inflation measures the annual rate of increase in price levels within a country. High inflation rates lead to macroeconomic instability and erosion of purchasing power. In this study, high inflation rates are treated as a negative economic indicator, while lower inflation rates signify a more stable economy.

Unemployment Rate: The unemployment rate reflects economic stagnation or the inability of the labor market to generate adequate employment opportunities. High unemployment rates indicate the presence of economic issues and the risk of social instability. For this reason, the unemployment rate is included as a critical indicator of economic fragility.

External Debt-to-GDP Ratio: The ratio of external debt to GDP shows a country's level of borrowing in foreign currencies. Higher ratios imply increasing debt burdens, making the country more sensitive to global market fluctuations. Thus, a high external debt ratio is considered a factor contributing to economic fragility.

Total Reserves (billion USD): Total reserves, which include foreign exchange and gold reserves, are seen as a safeguard that enhances a country's ability to service external debt and withstand external shocks. A high level of reserves reduces vulnerability during crises and is, therefore, regarded as having a positive impact.

These data were evaluated using both the TOPSIS and VIKOR methods to determine the position of each country, with a particular focus on Turkey, within the Fragile Five classification. TOPSIS is one of the Multi-Criteria Decision-Making (MCDM) methods, and its analysis involves steps such as normalizing the criteria, identifying ideal solutions, and measuring the proximity to the ideal solution. VIKOR, on the other hand, is a method developed to solve decision-making problems and evaluates the differences between the best solution and other alternatives.

TOPSIS, developed by Hwang and Yoon (1981), ranks alternatives based on their proximity to the ideal solution. The VIKOR method, introduced by Opricovic and Tzeng (2004), is notable for offering compromise solutions and balancing conflicting objectives in the decision-making process. These methods are widely used in disciplines ranging from engineering to social sciences due to their applicability in comparative analyses of multidimensional decision problems.

The combined use of TOPSIS and VIKOR enhances the robustness of the analysis and allows the vulnerability levels to be tested from different decision-making perspectives. This contributes to a more in-depth methodological analysis within the study.

3.1. TOPSIS Method

TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) method enables ranking of alternatives based on their proximity to the ideal solution in decision analysis processes. This method's goal, each criterion's best (positive ideal) and worst (negative ideal) values determining and alternatives' these values to distances by calculating final ranking to make TOPSIS analysis in followed steps are as follows:

1- Criteria Normalization Process: Data set's criteria different units in measured being due, comparable to make normalization process is done. Normalization, each criterion's specific range in value taking provides, and calculations unit differences from unaffected state becomes. Normalization process for below formula is used:

$$N_{ij} = \frac{X_{ij}}{\sqrt{\sum_{i=1}^m X_{ij}^2}}$$

Here, X_{ij} , each country's related criterion's value, N_{ij} represents normalized value.

2- Positive Ideal and Negative Ideal Solution Values Determined: This process, each criterion for positive ideal and negative ideal reference points determined becomes. Ideal solution (A^+) best value represents, while negative ideal solution (A^-) worst value represents. For example, current account deficit like negative impact creating criteria in, low values ideal accepted being, total reserves in high values ideal as determined is done.

3- Each Alternative's Ideal Solution Proximity Measuring and Final Ranking Done: Ideal solution's distance calculated by, each country's economic performance ranking done becomes.

$$D_i^+ = \sqrt{\sum_{j=1}^n (N_{ij} - A_j^+)^2}$$

$$D_i^- = \sqrt{\sum_{j=1}^n (N_{ij} - A_j^-)^2}$$

Here, D_i^+ represents the distance to the positive ideal solution, and D_i^- represents the distance to the negative ideal solution. Finally, the TOPSIS score (C_i) for each country is calculated using the following formula:

$$C_i = \frac{D_i^-}{D_i^+ + D_i^-}$$

This score indicates the degree of closeness of a country to the ideal solution. Countries with higher TOPSIS scores are closer to the ideal solution and are considered to carry lower risk in terms of fragility (Tsou, 2008).

3.2. VIKOR Method

The VIKOR (Multi-criteria Optimization and Compromise Solution) method is a decision-making technique developed to find the best alternative solution among multiple criteria. This method allows for minimizing the differences among alternatives and providing a solution based on the decision-maker's preferences. Within the scope of this study, the VIKOR method was evaluated in addition to the TOPSIS method, and the rankings obtained from both methods were compared. The following steps were followed in the VIKOR method:

- 1- Decision Matrix: For a multi-criteria decision-making (MCDM) problem with m alternatives and n criteria, the scores of the alternatives for each criterion are structured into a decision matrix, denoted as $[f_{ij}]_{m \times n}$.

$$[f_{ij}]_{m \times n} = \begin{matrix} & \text{Criteria} \\ \text{Alternatives} & \begin{bmatrix} f_{11} & f_{12} & \cdots & f_{1n} \\ f_{21} & f_{22} & \cdots & f_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ f_{m1} & f_{m2} & \cdots & f_{mn} \end{bmatrix} \end{matrix}$$

- 2- Best and Worst Criterion Values: Let $i = 1, 2, \dots, m$ ve $j = 1, 2, \dots, n$, for each criterion, the best (f_j^*) and worst (f_j^-) values are calculated. These calculations depend on whether the criterion is benefit-oriented or cost-oriented:

$$f_j^* = \begin{cases} \max_i f_{ij}, & \text{if } j \text{ is a benefit-oriented criterion} \\ \min_i f_{ij}, & \text{if } j \text{ is a cost-oriented criterion} \end{cases}$$

$$f_j^- = \begin{cases} \min_i f_{ij}, & \text{if } j \text{ is a benefit-oriented criterion} \\ \max_i f_{ij}, & \text{if } j \text{ is a cost-oriented criterion} \end{cases}$$

- 3- Normalized Decision Matrix: Since the scores in the decision matrix may be in different units, the decision matrix is normalized to allow for proper evaluation. The normalized decision matrix is represented as $[r_{ij}]_{m \times n}$.

$$r_{ij} = \frac{f_j^* - f_{ij}}{f_j^* - f_j^-}$$

- 4- Weight Vector: The importance of the criteria is represented by the weight vector $[w_j]_{1 \times n}$. If all criteria are of equal importance, the weights can be evenly distributed as $1/n$.

- 5- Weighted Normalized Decision Matrix: The weighted normalized decision matrix $[v_{ij}]_{m \times n}$ is calculated by incorporating the criterion weights into the normalized decision matrix using the formula:

$$v_{ij} = r_{ij} \cdot w_j$$

6- Group Scores: The average group score S_i and the worst group score R_i are calculated for each alternative.

$$S_i = \sum_{j=1}^n v_{ij}$$

$$R_i = \max_j v_{ij}$$

7- Compromise Solution: First, the best S^*, R^* and worst S^-, R^- values for the average group score and the worst group score are calculated.

$$S^* = \min_i S_i$$

$$S^- = \max_i S_i$$

$$R^* = \min_i R_i$$

$$R^- = \max_i R_i$$

The scores Q_i for the compromise solution are combined using a parameter $0 \leq q \leq 1$. Calculations related to the average group score are performed with the coefficient q , which represents maximum group utility, while calculations related to the worst group score are performed with the coefficient $1 - q$, which represents minimum regret.

$$Q_i = q \cdot \frac{S_i - S^*}{S^- - S^*} + (1 - q) \cdot \frac{R_i - R^*}{R^- - R^*}$$

The calculated values S_i, R_i, Q_i are ranked in ascending order, and solutions are determined based on two conditions:

Condition 1 (Acceptable Advantage): If the difference between the scores of the first two alternatives A^1, A^2 in the ranked Q_i values satisfies $Q(A^2) - Q(A^1) \geq 1/(m - 1)$ then the alternative A^1 is acceptable.

Condition 2 (Acceptable Stability): If the lowest scores in the ranked S_i ve R_i values correspond to the first-ranked Q_i value for alternative A^1 , then this alternative is a stable solution for reaching the compromise decision (Opricovic & Tzeng, 2004).

4. Findings and Discussion

The analysis conducted using the TOPSIS method on the economic performances of the Fragile Five countries has allowed for the annual ranking of their economic performances during the 2014-2022 period. Table 1 shows the TOPSIS analysis values obtained from the data of the five countries for the years 2014-2022, sourced from the World Bank.

	<i>Brazil</i>	<i>India</i>	<i>Indonesia</i>	<i>South Africa</i>	<i>Turkiye</i>
2014	0,5368	0,8725	0,5934	0,1469	0,4913
2015	0,4246	0,9198	0,6372	0,3077	0,5912
2016	0,3933	0,9070	0,6299	0,2360	0,4484
2017	0,6304	0,8959	0,6507	0,3233	0,4039
2018	0,6261	0,8956	0,6517	0,3763	0,3181
2019	0,4527	0,7091	0,5570	0,3143	0,4612
2020	0,4908	0,6248	0,5849	0,5032	0,3587
2021	0,3503	0,5725	0,5408	0,5656	0,3460
2022	0,6053	0,7418	0,7069	0,4842	0,2968

Table 1: Annual TOPSIS Values for the Economic Performances of the Fragile Five Countries

Source: The World Bank - 08.11.2024

The overall ranking and performance changes graph obtained from the analysis using the TOPSIS method are presented in Table 2.

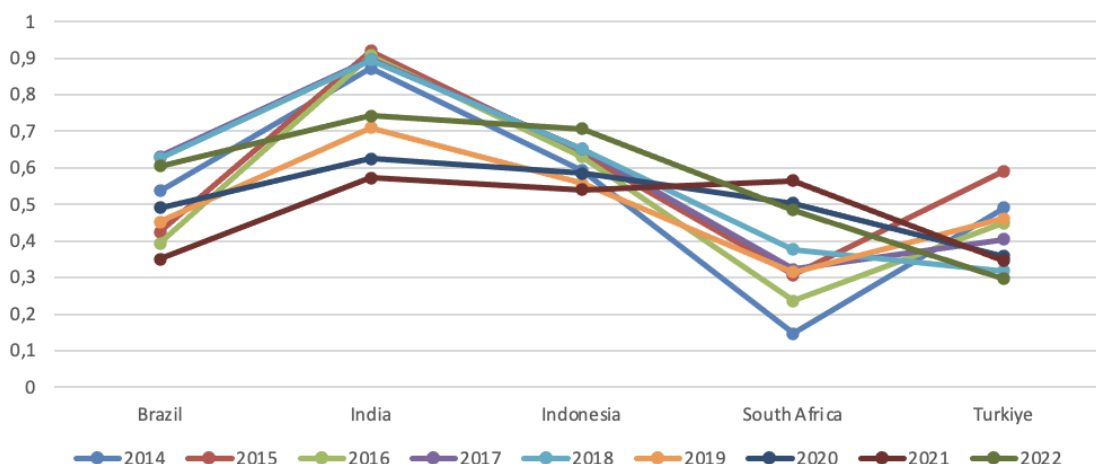


Table 2: Annual Changes in the Economic Performances of the Fragile Five Countries (TOPSIS)

According to these results, India has generally been the best-performing country throughout the analysis period. It has shown a more advantageous position compared to other countries in terms of current account balance, inflation, and unemployment rate.

India's consistently high rankings in the analyses conducted using the TOPSIS and VIKOR methods can be explained by its low current account deficit rates (2-3%), high growth rates (5-7%), and low unemployment levels (5-6%). Additionally, the strong structure of its reserves has made the country more resilient to external shocks. These findings are similarly reflected in the studies conducted by Demirkale and Özarı (2020) and Önder, Taş, and Hepşen (2015).

South Africa and Turkey have typically had lower TOPSIS scores in the analysis, standing out as the more vulnerable countries in terms of fragility. Indonesia has usually ranked in the middle, occasionally showing performance close to India. Brazil, despite showing recoveries in certain years, has not achieved consistent improvement throughout the analysis.

In 2014, India had by far the highest TOPSIS score, while Turkey and South Africa scored significantly lower. This indicates that India's macroeconomic fragility was relatively lower compared to the other countries. In 2020 and 2021, significant differences were observed among the countries. Particularly, Turkey and Brazil experienced notable declines in performance. In 2022, India once again ranked at the top, while Turkey's performance fell to one of its lowest levels during the analysis period.

Considering the influence of the criteria on performance, countries with high current account deficits tended to have lower performance in the TOPSIS rankings. This was especially evident in Turkey and South Africa. High inflation rates significantly reduced the rankings of the countries, with Turkey exhibiting poor performance in this regard.

Turkey's low performance in the analysis can be explained by unfavorable macroeconomic indicators observed after 2018, such as rising inflation (over 20%), declining reserves, and increasing external debt ratios. İltaş and Güzel (2024) demonstrated a positive relationship between Turkey's CDS premium and exchange rate, showing that this dynamic has heightened financial fragility. This provides empirical support for Turkey's consistently high vulnerability scores in the VIKOR analysis.

Additionally, the study conducted by Kovacı and Şen (2022) revealed the impact of Turkey's central bank policies on economic vulnerability in the post-COVID-19 period. Policy actions such as aggressive interest rate cuts and reserve losses were particularly reflected in the VIKOR analysis as high vulnerability scores during 2020-2021. In this context, the findings of the study align with the literature emphasizing the negative effects of the pandemic on economic performance.

The unemployment rate was a critical factor for South Africa, as this criterion was decisive in its consistently low performance.

India's overall strong performance can be attributed to its more stable economic policies compared to the other Fragile Five countries. Maintaining relatively low levels of current account deficits and keeping unemployment rates under control distinguished India from the others. Turkey, due to sharp increases in inflation rates, typically ranked lower in the economic performance rankings. Similarly, South Africa remained among the more fragile countries due to its high unemployment rates. The rankings of Brazil and Indonesia were often influenced by the sustainability of their economic policies and the magnitude of their external financing needs.

This study also focuses on the differences that arise from applying the TOPSIS and VIKOR methods. Table 3 shows the VIKOR analysis values obtained from the data of the five countries for the years 2014–2022, sourced from the World Bank.

	<i>Brazil</i>	<i>India</i>	<i>Indonesia</i>	<i>South Africa</i>	<i>Turkiye</i>
2014	0,6952	0	0,5830	1	0,9218
2015	0,8856	0	0,6485	1	0,8988
2016	0,8025	0	0,5391	1	0,9095
2017	0,6527	0	0,5431	1	0,9662
2018	0,6867	0	0,6648	1	0,8889
2019	0,7429	0	0,4744	1	0,9283
2020	0,1900	0,4655	0,3730	0,9163	1
2021	0,9290	0	0,7955	0,9495	1
2022	0,5031	0	0,4508	0,9489	1

Table 3: Annual VIKOR Values for the Economic Performances of the Fragile Five Countries

Source: The World Bank - 08.11.2024

Considering the values obtained through the VIKOR method, the overall ranking and performance changes graph for each country is presented in Table 4.

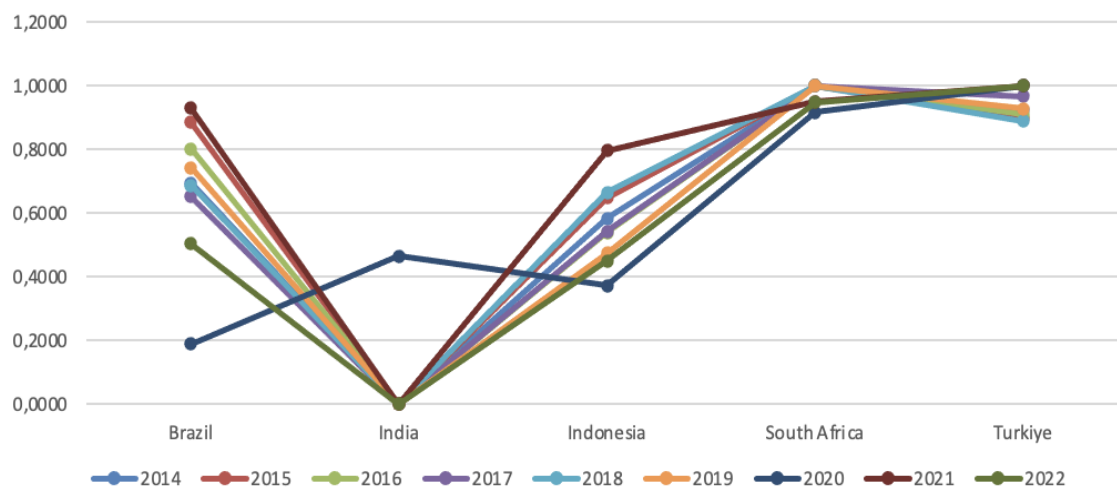


Table 4: Annual Changes in the Economic Performances of the Fragile Five Countries (VIKOR)

According to the data in the table, India's scores were recorded as 0 for all years (except 2020). This suggests that India was selected as the ideal reference country in the VIKOR analysis or had the best values. Under the VIKOR criteria, India demonstrated the best overall economic performance throughout the analysis period.

The findings obtained within the scope of this study also support the emphasis on dependency on U.S. monetary policies highlighted by Chadwick (2019). According to Chadwick, countries like Turkey that are highly dependent on these policies experience increased volatility in macroeconomic indicators and higher levels of vulnerability.

Brazil's VIKOR scores fluctuated over the years, reflecting inconsistent performance in its economic indicators. Indonesia's VIKOR scores ranged between 0.3730 and 0.7955. While Indonesia showed its best performance in 2021, its scores were lower in 2020 and 2022. Compared to other countries, Indonesia's economic performance exhibited a more stable improvement trend.

South Africa's scores were generally 1 or very close to 1. This indicates that South Africa was frequently in a disadvantaged position in the VIKOR analysis and was among the worst-performing countries. Specifically, the scores ranging from 0.9163 to 0.9495 from 2020 onward suggest difficulties in improving performance, likely due to the impact of the pandemic.

Turkey's scores were generally high, reaching the maximum value of 1, especially from 2020 onward. This highlights Turkey as the most fragile and weakest-performing country under the VIKOR assessment. Even during the 2014–2019 period, Turkey's high scores reflect the fragile structure of its economy.

From 2020 onward, notable differences emerged in the performances of the countries. These results indicate that the stable economic policies implemented by India to reduce economic fragility could serve as a model for other countries. For Turkey and South Africa, however, more comprehensive and sustainable policies are needed to mitigate economic vulnerabilities.

Overall, the rankings obtained through both the TOPSIS and VIKOR methods clearly reveal not only the general differences in performance but also which specific indicators each country performs poorly in. In this regard, the analysis results contribute to identifying priority areas for policymakers.

5. Conclusion and Recommendations

In the study, the economic performances of the Fragile Five countries were analyzed in detail using the TOPSIS and VIKOR methods.

TOPSIS considers each country's proximity to the positive ideal solution while simultaneously evaluating its distance from the negative ideal solution. This method provides a comprehensive assessment of each country's economic performance. With this method, the performance rankings between countries appear relatively more balanced and consistent across the years. As a result of these analyses, India's superiority has consistently been evident, while Turkey and South Africa have generally remained at the bottom of the rankings.

This result is also consistent with studies in the literature, such as those by Önder, Taş, and Hepşen (2015) and Demirkale and Özari (2020). These studies indicate that India has maintained economic stability, while Turkey has shown weak performance, particularly in indicators such as inflation and current account balance. Chadwick (2019) emphasizes that Turkey's high dependence on U.S. monetary policies increases its financial vulnerability.

VIKOR focuses specifically on the worst criteria, providing decision-makers the ability to identify the most fragile country and which criteria contribute the most to weaknesses. With this method, more pronounced fluctuations in the fragility levels of countries such as Brazil and Indonesia have been observed.

Turkey and South Africa have consistently ranked among the most fragile countries in both the TOPSIS and VIKOR methods. High inflation rates and a persistent current account deficit in Turkey have increased economic fragility, while the consistently high unemployment rate in South Africa has negatively affected its economic performance. In 2020 and 2021, according to TOPSIS results, South Africa's performance showed slight improvement, while the VIKOR analysis during the same period indicated that South Africa maintained its high fragility score. This demonstrates that VIKOR focuses more on the worst values and is more sensitive to the criteria in which countries perform poorly.

During the 2020–2021 period, the impact of the COVID-19 pandemic led to significant deterioration in economic indicators across all Fragile Five countries. In Turkey, the inflation rate exceeding 20% loss of reserves, and the increase in external debt heightened the level of vulnerability. In South Africa, a sharp decline in economic growth and high unemployment became more apparent in the VIKOR scores. These findings are supported by the study of post-pandemic central bank policies conducted by Kovacı & Şen (2022).

Brazil and Indonesia generally ranked at moderate levels in both methods. However, Brazil achieved lower fragility scores in some years (e.g., 2020) in the VIKOR analysis, which can be attributed to the method's emphasis on worse conditions.

For the Fragile Five countries, especially Turkey and South Africa, sustainable and effective macroeconomic policies can be developed to reduce economic fragility. Controlling inflation and reducing unemployment rates should be prioritized. South Africa has been one of the most fragile countries due to its persistently high unemployment rates. Similarly, a high current account deficit has caused Turkey's fragility score to rise, and a similar effect has been observed in South Africa. For countries with high current account deficits, policies supporting exports can be implemented to reduce the need for external financing and to increase foreign exchange reserves.

In this context, it is critically important for Turkey to strengthen its reserve structure, enhance predictability in monetary policy, and improve the investment climate. The study conducted by Baykal & Turgan (2022) also demonstrates the positive effects of foreign direct investment inflows on GDP and exports.

Foreign direct investments (FDI) can play a critical role in reducing economic fragility. Legal and economic reforms can be made to improve the investment environment and enhance investor confidence.

Relying on only a few sectors for exports and economic growth makes these countries more vulnerable to global fluctuations. Transitioning to a more diverse economic structure can help reduce fragility. Long-term development strategies can be developed to ensure economic stability and mitigate vulnerabilities. Investments in education, infrastructure, and technology can be particularly increased.

Among the limitations of this study is the reliance on only six macroeconomic indicators. The exclusion of more structural factors -such as political stability, institutional quality, financial system depth, and environmental risks- from the vulnerability analysis restricts the scope of the study. Additionally, the use of annual data limits the ability to analyze the effects of short-term shocks."

Future studies could incorporate financial vulnerability indicators such as CDS spreads, portfolio investments, and exchange rate volatility. Moreover, it is recommended to conduct comparative analyses using additional methods like Grey Relational Analysis, AHP, and Entropy alongside TOPSIS and VIKOR. Such analyses would be beneficial in testing the robustness of cross-country rankings.

These recommendations can help the Fragile Five countries create a sustainable growth model to reduce their current levels of economic fragility and build a more resilient structure against global financial fluctuations.

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