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RESEARCH ARTICLE

Effects of Governmental Policies in Banking Industry by using Fuzzy DEMATEL

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Abstract

The aim of this study is to evaluate the effects of the governmental policies in the banking industry. For this purpose, a detailed literature review is conducted, and 5 different governmental policies are identified. Furthermore, these policies are weighted by using fuzzy DEMATEL approach. The findings indicate that the most important government implementation regarding the banking industry is related to the risk policy. This shows that governments should make necessary regulations related to the management of different risk types of the banks, such as credit, market and operational risks. Therefore, it is recommended that governments should make necessary regulations for risk management activities of the banks and follow the banks to understand whether they take these actions or not. Hence, it becomes possible to improve the performance of the banking industry.

Keywords: Governmental Policies; Banking Industry; Fuzzy DEMATEL

JEL Classification: E50, G28, C65

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Öz

Bu çalışmanın amacı, bankacılık sektöründeki devlet politikalarının etkilerini değerlendirmektir. Bu amaçla, ayrıntılı bir literatür taraması yapılmış ve 5 farklı devlet politikası belirlenmiştir. Ayrıca bu politikalar bulanık DEMATEL yaklaşımı kullanılarak ağırlıklandırılmıştır. Ortaya çıkan bulgular, bankacılık sektörüne ilişkin en önemli devlet uygulamasının risk politikası ile ilgili olduğunu göstermektedir. Bu durum, hükümetlerin, kredi, piyasa ve operasyonel riskler gibi bankaların farklı risk türlerinin yönetimi ile ilgili gerekli düzenlemeleri yapması gerektiğini göstermektedir. Bu nedenle, hükümetlerin bankaların risk yönetimi faaliyetleri için gerekli düzenlemeleri yapmaları ve bu önlemleri alıp almadıklarını anlamak için bankaları takip etmeleri önerilmektedir. Böylelikle bankacılık sektörünün performansını artırmak mümkün hale gelecektir.

Anahtar Kelimeler: Devlet politikaları; Bankacılık Sektörü; Fuzzy DEMATEL

JEL Sınıflandırması: E50, G28, C65

Introduction

The banking sector is the lifeblood for national economies. There are many reasons behind this issue. Some people and companies living in a country have more money in comparison with the others. Banks borrow this extra amount from these persons for a certain period of time. When the due date comes, banks pay extra to these borrowers. In other words, with the help of the banks, these people have the chance to earn interest income by using their savings. On the other hand, a significant majority of the companies in the country need money for new investments (Buil et al., 2016; Kosmidouet et al., 2017). However, since this amount can be very high, it is often difficult to obtain (Yüksel & Kavak, 2019). For this purpose, banks provide credit to these companies as much as they need and contribute to the solution of this problem.

Due to these important issues, the high performance of banks is also important for the national economy. On the other hand, there are certain risks that banks face in their operations. For example, banks may not be able to take back loans from customers. This is referred to as credit risk in the literature. Banks should take some precautions to prevent this risk. A detailed analysis of the financial situation of the customers to be loaned will prevent banks from lending to the wrong customers. On the other hand, market risk is another issue that may affect the performance of banks. This risk mainly consists of problems arising from interest rate, stock exchange index and exchange rate volatility (Karimalis & Nomikos, 2018; Cegarra-Navarro et al., 2019). In addition to the aforementioned issues, there is another type of risk in the literature under the name of operational risk. Natural disasters, theft, terrorist attacks and personnel-related problems are examples of this topic.

In addition to these issues, government policies are also considered to affect the performance of banks. Depending on the types of policies they implement, this effect can be either negative or positive. In

this context, if the policies implemented by the governments are narrowing the trade volume in the country, these policies will naturally affect the performance of the banks negatively (Schimmelfennig, 2016). For example, the increase in tax rates will reduce the profitability of firms. As a result, these companies will be reluctant to make new investments. In this process, the performance of the banks with decreasing loan amount will go down (Zayernyuk et al., 2015). On the other hand, if governments reduce their tax rates, trade volume in the country will increase. This will affect the profitability of banks positively.

In addition to tax rates, governments may influence the performance of banks through other practices. In this context, legal regulations may have an impact on banks. In some cases, governments may impose restrictions on certain activities of banks by enacting new laws. For example, governments can impose an upper limit on banks' consumer loans with a new law. In this case, the profitability of banks will be significantly reduced as banks will not be able to extend new loans to retail customers. Moreover, a new law may also prohibit certain fees charged by banks (Verhoest et al., 2015). Since this will eliminate the banks' important source of income, the profit margin of banks may be significantly reduced.

Furthermore, governments can increase the supervision of the banking sector with new laws. Within this framework, as a result of a new law, it may become necessary for banks to have both internal audit and internal control departments at the same time (Al-Janadi et al., 2016). In this case, the staff of two different departments will periodically check the activities of the other departments of the banks. Additionally, this new law may require banks to be subject to external audit. The controls to be carried out by another audit firm will contribute to the detection of the problems in banks in advance. Besides, a new law can increase the control power of state institutions. All these issues will ensure periodic audits of banks' activities (Naushad & Malik, 2015). As a result of this, it will be possible to identify the important problems that banks may experience early and to take necessary measures for this.

In this study, the impact of government policies on the banking sector will be analyzed. In this context, the question of what kind of government policies affect the banking sector more will be sought. In the first phase of the analysis process, a broad literature review will be conducted and the types of government policies that may affect the banking sector will be identified. Then, in the second stage of the analysis process, the importance weights of these identified types of government policies will be calculated. In this process, fuzzy DEMATEL method will be considered. The results of the analysis will allow us to understand what kind of government policies affect the banking sector more.

It is possible to mention two important contributions of this study to the literature. First, the types of government policy that may have an impact on the banking sector are identified in this study. In this process, the studies searched in numerous international indices in the literature were examined. These factors, which are determined as a result of this extensive examination, are considered to be guiding both for academics and market employees. In addition to this, another specificity of this study is related to the method used. The fuzzy DEMATEL method is first taken into consideration in a study examining the impact of government policies on the banking sector.

This study consists of five different sections. In this first part of the study, general information about the research topic is shared. In this context, issues such as the importance of banking, risks in banking and the types of policies of governments that affect banks are discussed. In the second part of the study, literature review was made. Within this framework, the studies examining the impact of government policies on the banking sector are summarized. In this process, a selection was made among the studies which were scanned in important indexes and published between 2015-2019. In the third part of the study, fuzzy DEMATEL method used in the analysis process is explained. The purpose of this method, the calculation steps and some studies using this method are mentioned under the related title. On the other hand, the fourth part of the study includes the results of the analysis. In other words, it is shared which government policies are more important for the banking sector than others. In the last part of the study, the strategies produced depending on the analysis results are explained. In addition, this section also provides recommendations for future studies.

1. Literature Review

In the literature, the effect of government regulations on the performance of the banking sector has been discussed by many authors. In a significant part of the studies, the effect of the regulations made by the state towards the banking sector on the performance of the sector was emphasized (García-Meca et al., 2015; Psillaki & Mamatzakis, 2017). In this context, the most widely accepted issue in the literature is that this situation decreases the profitability of the banks if it restricts the activities of banks by the regulations of the state. In other words, the size of banks decreases if the government forbids or imposes an upper limit on certain types of loans (Abdrahamane et al., 2017; Ly, 2015). This situation will adversely affect the banking sector.

On the other hand, if these regulations by the state reduce the restrictions on the banking sector, then the generally accepted view is that the performance of the banking sector will increase (Sun et al., 2017; Mergaerts & Vander Vennet, 2016). The main reason behind this is the fact that banks can operate more freely in the market with the reduction of restrictions (Ayadi et al., 2016; Hussein, 2016). For example, if there is no obstacle for banks to use a certain type of credit to customers or to collect certain types of fees and commissions, this will significantly increase the income of banks. On the other hand, some researchers believe that a serious regulation for the banking sector should be made by the state, especially immediately after the financial crisis (Casu et al., 2017; Saerang et al., 2018). According to the aforementioned authors, this situation will play an important role in the rapid recovery of the country's macroeconomic structure.

Some researchers have also examined the relationship between governmental corporate governance practices and banking performance. Corporate governance can be defined as rules of relations between the board of directors, shareholders and other shareholders involved in the management of a company (Kusuma & Ayumardani, 2016; Bhagat & Bolton, 2019). In this context, effective corporate governance should include factors such as effectiveness, consistency, transparency, fairness, accountability and responsibility. When this issue is considered within the framework of the banking sector, corporate governance is directly related to the fair management and transparency of banks (Love &

Rachinsky, 2015). In a more just-managed bank, the motivation of the employees will be high. This will increase the profitability of banks. In this context, De Haan and Vlahu (2016) and Salim et al. (2016) indicated that governments should make some regulations for the fair management of the banks to improve the performance of the industry.

Another important issue for the banking sector within the scope of corporate governance principles is the transparency of banks. Banks are defined as a trust institution where both customers and investors evaluate their savings in the bank (Naushad & Malik, 2015). However, if there is any doubt in the bank, this will cause insecurity to investors. Therefore, it is important for banks to display an honest attitude and to share all necessary information with the public in both their practices and financial statements (Orazalin et al., 2016; Mollah & Zaman, 2015). In this case, a significant number of researchers argue that the state plays an important role. For instance, Chazi et al. (2018) and Tunay and Yüksel (2017) defined that when governments prepare a rule regarding the transparency of the banks, it will attract the attention of the foreign banks to enter the country. Srivastav and Hagendorff (2016) also underlined the importance of this issue by using different methodology.

It is stated in many studies that the tax policies implemented by the government have an impact on the banking sector. Some of the studies have addressed this effect through companies (Olamide et al., 2019; Köster & Pelster, 2017). In other words, companies' profitability will decrease as the state increases corporate tax. In this case, these companies will be reluctant to make new investments (Aiyar et al., 2015; Fijałkowska et al., 2018). Therefore, the amount of credit used by banks to companies will decrease. Ahmed et al. (2018) and Idowu (2018) made a similar analysis for this situation and reached the same conclusion. Within this framework, a second perspective is aimed at increasing the tax on the direct banking activities of the state (Arora, 2017). For example, if the government imposes an additional tax on a type of loan granted by a bank, the banks will not want to extend it (D'Anselmi, 2018). This will lead to a significant decrease in the profit volume of banks. In this context, Eta and Anabori (2015) tried to analyze the financial sector reforms in Nigeria. They determined that governments should decrease the tax on the banking activities in order to improve this industry.

In addition to the aforementioned studies, in some of the studies, the applications of the governments towards the risk management processes in banking were included in the scope of the study. Banks face many different types of risks, such as credit risk, market risk and operational risk. Banks need to be able to manage these risks effectively in order to have sustainable performance (Fajembola et al., 2018; Bharati & Jia, 2018). However, these risk management measures may adversely affect the sales volume of banks in the short term (Olabamiji & Michael, 2018; Elamer & Benyazid, 2018). Therefore, in some cases, banks may decide not to implement these measures. In this framework, the majority of the studies emphasized that the state should address this issue. For instance, Sheedy and Griffin (2018), Namutenda and Muturi (2017), and Aldayel and Fragouli (2018) identified that government should make necessary regulations related to the risk management of the banks so that it can be possible to improve the performance of the banking industry. Parallel to these studies, Mercylynne and Omagwa (2017), García-Sánchez et al. (2017), and Thabet and Alaeddin (2018) are other studies which underlined the importance of this situation.

As a result of the detailed literature review, it was concluded that the effect of state policies on the banking sector was handled by many researchers. Another result obtained is to emphasize different issues in these studies. For example, while some studies deal with tax rates, risk management regulations have come to the fore in other studies. On the other hand, in some studies, some regulations of the state regarding the banking sector have been examined. In these studies, methods such as questionnaire and regression analysis were generally taken into consideration. As can be understood from this, it is thought that a new study that takes the effect of state policies on the banking sector with a new approach will contribute to the literature.

2.Methodology

The Geneva Research Centre of the Battelle Memorial is introduced the method of decision-making trial and evaluation laboratory entitled DEMATEL. The method deals with the complex decision-making problems of real world includes the mutual relation among the factors. It is also employed to measure both the hierarchical and interdependence conditions (Baykasoğlu et al., 2013; Dincer, 2018). The technique is illustrated in the following steps (Uygun et al., 2015; Najafinasab et al., 2015; Yeh & Huang, 2014). Initially, the linguistic evaluations and fuzzy numbers into the scales are defined to evaluate the criteria. The evaluation scales are presented in Table 1.

Table 1: Linguistic variables for the criteria

Linguistic Scales	Triangular Fuzzy Numbers		
No (N)	0	0	0.25
Low (L)	0	0.25	0.5
Medium (M)	0.25	0.5	0.75
High (H)	0.5	0.75	1
Very High (VH))	0.75	1	1

Source: Uygun et al. 2015; Uygun and Dede, 2016

Secondly, the fuzzy matrix is defined to construct the initial direct-relation among the criteria. The matrix is defined as the term of $\tilde{Z}$ and it is constructed as in the equation (1).

$$\tilde{Z}=\begin{bmatrix} 0 & \tilde{z}_{12} & \cdots & \cdots & \tilde{z}_{1n} \\ \tilde{z}_{21} & 0 & \cdots & \cdots & \tilde{z}_{2n} \\ \vdots & \vdots & \ddots & \cdots & \cdots \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ \tilde{z}_{n1} & \tilde{z}_{n2} & \cdots & \cdots & 0 \end{bmatrix} \quad (1)$$

where $\tilde{Z}_{ij} = (l_{ij}, m_{ij}, u_{ij})$ and l_{ij} is the lowest degree, m_{ij} is the middle degree, and u_{ij} defines the upper value of the triangular fuzzy sets. However, averaged values of decision makers are used for developing the initial direct-relation matrix as seen in the equation (2).

$$\tilde{Z} = \frac{\tilde{Z}^1 + \tilde{Z}^2 + \tilde{Z}^3 + \cdots \tilde{Z}^n}{n} \tag{2}$$

Third step is the normalization process of the direct-relation matrix. Normalized values are provided with the equations (3) and (4).

$$\tilde{X} = \begin{bmatrix} \tilde{x}_{11} & \tilde{x}_{12} & \cdots & \cdots & \tilde{x}_{1n} \\ \tilde{x}_{21} & \tilde{x}_{22} & \cdots & \cdots & \tilde{x}_{2n} \\ \vdots & \vdots & \ddots & \cdots & \cdots \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ \tilde{x}_{n1} & \tilde{x}_{n2} & \cdots & \cdots & \tilde{x}_{nn} \end{bmatrix} \tag{3}$$

$$\tilde{x}_{ij} = \frac{\tilde{z}_{ij}}{r} = \left(\frac{l_{ij}}{r}, \frac{m_{ij}}{r}, \frac{u_{ij}}{r}\right) \text{ and } r = max_{1 \le i \le n}\left(\sum_{j=1}^{n} u_{ij}\right) \tag{4}$$

Following step is to calculate total influence values of fuzzy matrix. For that, total influence fuzzy matrix is computed and the matrices $\tilde{x}_{ij} = (l'_{ij}, m'_{ij}, u'_{ij})$ are defined as the equations (5)-(11).

$$X_l = \begin{bmatrix} 0 & l'_{12} & \cdots & \cdots & l'_{1n} \\ l'_{21} & 0 & \cdots & \cdots & l'_{2n} \\ \vdots & \vdots & \ddots & \cdots & \cdots \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ l'_{n1} & l'_{n2} & \cdots & \cdots & 0 \end{bmatrix} X_m = \begin{bmatrix} 0 & m'_{12} & \cdots & \cdots & m'_{1n} \\ m'_{21} & 0 & \cdots & \cdots & m'_{2n} \\ \vdots & \vdots & \ddots & \cdots & \cdots \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ m'_{n1} & m'_{n2} & \cdots & \cdots & 0 \end{bmatrix} X_u = \begin{bmatrix} 0 & u'_{12} & \cdots & \cdots & u'_{1n} \\ u'_{21} & 0 & \cdots & \cdots & u'_{2n} \\ \vdots & \vdots & \ddots & \cdots & \cdots \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ u'_{n1} & u'_{n2} & \cdots & \cdots & 0 \end{bmatrix} \tag{5}$$

$$\tilde{T} = \lim_{k \to \infty} \tilde{X} + \tilde{X}^2 + \cdots + \tilde{X}^k \tag{6}$$

$$\tilde{T} = \begin{bmatrix} \tilde{t}_{11} & \tilde{t}_{12} & \cdots & \cdots & \tilde{t}_{1n} \\ \tilde{t}_{21} & \tilde{t}_{22} & \cdots & \cdots & \tilde{t}_{2n} \\ \vdots & \vdots & \ddots & \cdots & \cdots \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ \tilde{t}_{n1} & \tilde{t}_{n2} & \cdots & \cdots & \tilde{t}_{nn} \end{bmatrix} \tag{7}$$

$$\tilde{t}_{ij} = (l''_{ij}, m''_{ij}, u''_{ij}) \tag{8}$$

$$[l''_{ij}] = X_l \times (I - X_l)^{-1} \tag{9}$$

$$[m''_{ij}] = X_m \times (I - X_m)^{-1} \tag{10}$$

$$[u''_{ij}] = X_u \times (I - X_u)^{-1} \tag{11}$$

The final step of the fuzzy DEMATEL is to apply the defuzzification process to obtain the impact-relation map of the criteria. For this purpose, converting fuzzy data into crisp scores deffuzzification method is considered for the triangular fuzzy numbers $\tilde{f}_{ij} = (l_{ij}, m_{ij}, u_{ij})$, $j = 1, \ldots, J$, the crisp value of the i-th criterion. The deffuzzification procedure is used for all criteria $\tilde{f}_i, i \in \tilde{n}$, where $\tilde{n}$ is the set of criteria evaluated with fuzzy numbers. The process is detailed by the equations (12)-(20) (Opricovic & Tzeng, 2003).

$$u_i^{max} = max u_i, l_i^{min} = \min_j l_i \quad (12)$$

$$\Delta_{min}^{max} = u_i^{max} - l_i^{min} \quad (13)$$

$$x_{lj} = \left(l_{ij} - l_i^{min}\right)/\Delta_{min}^{max} \quad (14)$$

$$x_{mj} = \left(l_{ij} - l_i^{min}\right)/\Delta_{min}^{max} \quad (15)$$

$$x_{uj} = \left(u_{ij} - l_i^{min}\right)/\Delta_{min}^{max} \quad (16)$$

$$x_j^{ls} = x_{mj}/\left(1 + x_{mj} - x_{lj}\right) \quad (17)$$

$$x_j^{rs} = x_{uj}/\left(1 + x_{uj} - x_{mj}\right) \quad (18)$$

$$x_j^{crisp} = \left[x_j^{ls}\left(1 - x_j^{ls}\right) + x_j^{rs} x_j^{rs}\right]/\left[1 - x_j^{ls} + x_j^{rs}\right] \quad (19)$$

$$f_{ij} = l_i^{min} + x_j^{crisp} \Delta_{min}^{max} \quad (20)$$

After the defuzzification procedure, the value of $\left(\tilde{D}_i + \tilde{R}_i\right)^{def}$ and $\left(\tilde{D}_i - \tilde{R}_i\right)^{def}$ are employed to construct the weights of criteria and the influencing degrees among them. $\tilde{D}_i^{def}$ is the sum of all vector rows and $\tilde{R}_i^{def}$ is the sum of all vector columns. However, $\left(\tilde{D}_i + \tilde{R}_i\right)^{def}$ defines the total degree of the factors. $\left(\tilde{D}_i - \tilde{R}_i\right)^{def}$ denotes the influencing degree for each criterion. If the value of $\left(\tilde{D}_i - \tilde{R}_i\right)^{def}$ is illustrated in the positive degree, it is concluded that related factor has an influence among the criterion set. Oppositely, the negative value means that the factor has no influence and influenced by other criteria.

Fuzzy DEMATEL approach was used by many researchers in different studies. Abdullah and Zulkifli (2015), Pandey and Kumar (2017) and Tooranloo et al. (2017) evaluated human resource management performance with this approach. On the other side, Dinçer et al. (2019a,b,c,d,e), Dong and Huo (2017) and Addae et al. (2019) used this model for the analysis in the financial market. Dinçer et al. (2018), Dinçer et al. (2017), Yüksel et al. (2017) and Dinçer and Yüksel (2018) are other studies that used fuzzy DEMATEL methodology in their studies.

3. Analysis Results

A fuzzy-based multicriteria decision making approach is proposed for evaluating the governmental policies in the banking industry. For this purpose, fuzzy DEMATEL is applied for weighting the criteria of governmental policies for the banking sector. Additionally, the impact and relation map of the criteria is also computed by considering this method. First, the making problem for the governmental policies in the banking industry is defined and selected factors are determined with the supported literature. Table 2 represents the selected determinants for the banking governmental policies.

Table 2: Selected Factors for the Governmental Policies in Banking Industry

Criteria	Definition	Supported Literature
Banking regulations (criterion 1)	Legislations for money and capital market as well as banking law	(Méró & Piroska, 2016; García-Palacios *et al.*, 2014)
Corporate governance (criterion 2)	Essentials covering the corporate strategies and commitments for the board of directors, management, and shareholders	(Ibáñez-Hernández *et al.*, 2018; Calomiris *et al.*, 2016)
Tax policies (criterion 3)	Regulations that effect the financial supply and demand	(Hasman *et al.*, 2011; Asimakopoulos & Asimakopoulos, 2017)
Market competition (criterion 4)	Governmental strategies for obtaining the competitive advantage in the market environment	(Cable, 2014; Phan *et al.*, 2016)
Risk policies (criterion 5)	Factors that include the internal risk evaluations and systematic government policy reactions	(Kupiec & Ramirez, 2013; Gertler *et al.*, 2012)

Méró and Piroska (2016) explain the tendency of banking union and banking nationalism in the east European countries and discuss the results according to the governmental policy preferences of banking nationalism that could be any conflict of banking nation. García-Palacios et al. (2014) analyse the interaction between the regulation in the banking system, policies, and behaviours of financial actors. They compare the policies to develop the financial system with the efficient regulations.

Ibáñez-Hernández et al. (2018) explore that the trends of rapid credit growth eventually cause to the solvency problems for the Spanish deposit institutions when they are managed with the political criteria and have some issues regarding the characteristic of the corporate governance. Calomiris et al. (2016) focus on the bank governance and risk priorities according to the types of ownership and risk appetite. Their results show that there is a negative relation between formal corporate governance and high manager ownership for the banking industry.

Hasman et al. (2011) examine the effects of different government policies against the banking crises and they concluded that it could be a relationship between the policies and their implications by illustrating the impact on welfare of taxpayers to recapitalize the banking industry. Asimakopoulos and Asimakopoulos (2017) define an importance of banks in the fiscal policy applications. They conclude that banks have a prominent role for increasing the demand even if the consumption taxes are high in the financial frictions.

Cable (2014) defines that the government policies with the globalization force to the financial markets for being more competitive and diversified than the conventional market conditions. Thus, strategic choices of the market can be uncovered with the information of the weakness and threats for the financial institutions requested by the banking authorities. Phan et al. (2016) find out the competitive effects of market concentration in the banking industry. Accordingly, it is highlighted that policymakers should encourage the merger and acquisition for relatively weak banks to develop the financial stability.

Kupiec and Ramirez (2013) study on the reasons of bank failures in case of not considering the modern government reaction function on the economic environment. The results represent that bank disasters have a fewer impact on large firms. Gertler et al. (2012) assess the fundamental risk and government credit policy in the period of the risky financial system for understanding the perceptions of the financial markets.

After the constructing the criteria set for the governmental policies in the banking industry, the linguistic evaluations are obtained by the decision makers. For that, 5 decision makers are appointed for giving their priorities for the criterion set. Experts are well experienced in the field of international finance and banking with at least ten years. They give linguistic choices by using table 1 and the results are given for each decision maker in Table 3.

Table 3: Linguistic Choices of Decision Makers for Direct Relation Matrix

	C1					C2					C3					C4					C5				
	DM1	DM2	DM3	DM4	DM5	DM1	DM2	DM3	DM4	DM5	DM1	DM2	DM3	DM4	DM5	DM1	DM2	DM3	DM4	DM5	DM1	DM2	DM3	DM4	DM5
C1	-	-	-	-	-	H	H	H	H	VH	M	M	H	H	M	H	H	VH	H	H	M	L	M	H	M
C2	M	M	M	H	M	-	-	-	-	-	M	M	L	M	M	M	L	M	M	H	M	M	M	M	H
C3	M	M	M	M	M	H	H	VH	M	H	-	-	-	-	-	M	M	M	M	H	M	L	L	M	M
C4	M	L	M	H	H	H	H	H	H	H	M	M	M	M	M	-	-	-	-	-	H	H	H	M	VH
C5	H	H	H	H	H	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	H	H	H	H	H	-	-	-	-	-

Linguistic values of each decision maker are converted into the triangular fuzzy numbers and the results are given in appendix A-E. Overall fuzzy evaluations from the decision makers are used for the initial direct-relation fuzzy matrix and the results are computed in Table 4.

Table 4: Initial Direct-Relation Fuzzy Matrix

	C1			C2			C3			C4			C5		
C1	0.000	0.000	0.000	0.550	0.800	1.000	0.350	0.600	0.850	0.550	0.800	1.000	0.250	0.500	0.750
C2	0.300	0.550	0.800	0.000	0.000	0.000	0.200	0.450	0.700	0.250	0.500	0.750	0.300	0.550	0.800
C3	0.250	0.500	0.750	0.500	0.750	0.950	0.000	0.000	0.000	0.300	0.550	0.800	0.150	0.400	0.650
C4	0.300	0.550	0.800	0.500	0.750	1.000	0.250	0.500	0.750	0.000	0.000	0.000	0.500	0.750	0.950
C5	0.500	0.750	1.000	0.750	1.000	1.000	0.750	1.000	1.000	0.500	0.750	1.000	0.000	0.000	0.000

The normalization procedure is applied for the normalized direct-relation fuzzy matrix as seen in Table 5.

Table 5: Normalized Direct-Relation Fuzzy Matrix

	C1			C2			C3			C4			C5		
C1	0.000	0.000	0.000	0.138	0.200	0.250	0.088	0.150	0.213	0.138	0.200	0.250	0.063	0.125	0.188
C2	0.075	0.138	0.200	0.000	0.000	0.000	0.050	0.113	0.175	0.063	0.125	0.188	0.075	0.138	0.200
C3	0.063	0.125	0.188	0.125	0.188	0.238	0.000	0.000	0.000	0.075	0.138	0.200	0.038	0.100	0.163
C4	0.075	0.138	0.200	0.125	0.188	0.250	0.063	0.125	0.188	0.000	0.000	0.000	0.125	0.188	0.238
C5	0.125	0.188	0.250	0.188	0.250	0.250	0.188	0.250	0.250	0.125	0.188	0.250	0.000	0.000	0.000

The crisp matrices of the normalized direct-relation fuzzy matrix are illustrated in Table 6-8.

Table 6: Normalized Direct-Relation Fuzzy Matrix (X_l)

	C1	C2	C3	C4	C5
C1	0.000	0.138	0.088	0.138	0.063
C2	0.075	0.000	0.050	0.063	0.075
C3	0.063	0.125	0.000	0.075	0.038
C4	0.075	0.125	0.063	0.000	0.125
C5	0.125	0.188	0.188	0.125	0.000

Table 7: Normalized Direct-Relation Fuzzy Matrix (X_m)

	C1	C2	C3	C4	C5
C1	0.000	0.200	0.150	0.200	0.125
C2	0.138	0.000	0.113	0.125	0.138
C3	0.125	0.188	0.000	0.138	0.100
C4	0.138	0.188	0.125	0.000	0.188
C5	0.188	0.250	0.250	0.188	0.000

Table 8: Normalized Direct-Relation Fuzzy Matrix (X_u)

	C1	C2	C3	C4	C5
C1	0.000	0.250	0.213	0.250	0.188
C2	0.200	0.000	0.175	0.188	0.200
C3	0.188	0.238	0.000	0.200	0.163
C4	0.200	0.250	0.188	0.000	0.238
C5	0.250	0.250	0.250	0.250	0.000

To compute the difference matrix for each crisp value, identity matrix is defined in Table 9.

Table 9: Identity Matrix (I)

	C1	C2	C3	C4	C5
C1	1	0	0	0	0
C2	0	1	0	0	0
C3	0	0	1	0	0
C4	0	0	0	1	0
C5	0	0	0	0	1

The results of difference and inverse matrices are presented in appendix F-K. In the following process, total influence matrices for X_l, X_m, and X_u are constructed to obtain the final matrix for the total influences. Total influences matrices are given in appendix L-N. The total-relation fuzzy matrix is calculated in Table 10.

Table 10: Total-Relation Fuzzy Matrix

	C1			C2			C3			C4			C5		
C1	0.051	0.234	1.109	0.204	0.481	1.473	0.134	0.376	1.266	0.181	0.422	1.361	0.109	0.337	1.219
C2	0.105	0.310	1.142	0.057	0.253	1.118	0.087	0.302	1.109	0.100	0.317	1.179	0.102	0.301	1.098
C3	0.095	0.306	1.148	0.170	0.419	1.328	0.037	0.204	0.974	0.110	0.331	1.203	0.071	0.278	1.087
C4	0.121	0.351	1.258	0.193	0.465	1.451	0.116	0.355	1.232	0.057	0.248	1.142	0.159	0.377	1.235
C5	0.184	0.451	1.414	0.280	0.595	1.593	0.242	0.514	1.395	0.194	0.475	1.471	0.066	0.279	1.160

The procedure of converting fuzzy data into crisp scores deffuzzification method is considered for the defuzzified values of relation matrix. In this procedure, triangular fuzzy values of the matrix are used to calculate the values of x_{lj}, x_{mj},and x_{uj}. The values are represented in Table 11.

Table 11: The values of x_{lj}, x_{mj},and x_{uj}

	x_{lj}	x_{mj}	x_{uj}	x_{lj}	x_{mj}	x_{uj}	x_{lj}	x_{mj}	x_{uj}	x_{lj}	x_{mj}	x_{uj}	x_{lj}	x_{mj}	x_{uj}
C1	0.000	0.129	0.744	0.108	0.302	1.000	0.058	0.229	0.854	0.091	0.261	0.922	0.041	0.201	0.821
C2	0.043	0.226	0.967	0.000	0.175	0.946	0.027	0.219	0.938	0.038	0.232	1.000	0.040	0.217	0.928
C3	0.045	0.208	0.860	0.103	0.295	1.000	0.000	0.129	0.725	0.057	0.228	0.903	0.027	0.187	0.813
C4	0.046	0.210	0.862	0.097	0.293	1.000	0.042	0.214	0.842	0.000	0.137	0.778	0.073	0.230	0.845
C5	0.077	0.252	0.883	0.140	0.347	1.000	0.115	0.293	0.871	0.084	0.268	0.920	0.000	0.139	0.717

After that, the values of $x_j^{ls}, x_j^{rs}, x_j^{crisp}$, and f_{ij} are employed to obtain the final defuzzified values of each criterion. The calculations are given in appendix O-Q. In the final process of fuzzy DEMATEL method, the values of $(\tilde{D}_i + \tilde{R}_i)^{def}$ and $(\tilde{D}_i - \tilde{R}_i)^{def}$ are calculated to construct the influence degrees of each criterion and the weights of criteria. The defuzzified total relation matrix and the values for the influences and weights are defined in Table 12.

Table 12: The defuzzified values of total relation matrix and impact-relation degrees

	C1	C2	C3	C4	C5	$(\tilde{D}_i + \tilde{R}_i)^{def}$	$(\tilde{D}_i - \tilde{R}_i)^{def}$	Weights
C1	0.382	0.621	0.514	0.565	0.478	4.911	0.210	0.198
C2	0.437	0.391	0.425	0.446	0.424	5.017	-0.770	0.202
C3	0.439	0.549	0.334	0.467	0.408	4.605	-0.211	0.186
C4	0.494	0.606	0.492	0.398	0.513	5.001	0.005	0.202
C5	0.597	0.727	0.642	0.623	0.426	5.263	0.766	0.212

The influence degrees and weights of the criteria are determined by using the total values of rows and columns. The values of $(\tilde{D}_i + \tilde{R}_i)^{def}$ give the relative importance results of the criteria. By normalizing the results, weights of each criterion are computed. The analysis results demonstrate that corporate governance (criterion 2) and market competition (criterion 4) have a great importance in the governance policies of banking industry. However, tax policies (criterion 3) is the weakest factor among the criterion set.

Regarding the impact and relation map for the governance policies, risk policies (criterion 5) have the highest influences in the criteria while corporate governance (criterion 2) has the most influenced criterion. Additionally, a threshold value is determined by using the average value of the defuzzified matrix. Higher values than the threshold are selected as there is an influence on the criteria. Accordingly, banking regulations (criterion 1) has the influence on the other criteria except risk policies (criterion 5). Criterion 2 has no influence on the other criteria while criterion 5 has a great influence by having the impact on all of governance policy factors.

Conclusion

In this study, the effect of government policies on the banking sector is examined. In this context, first, the kinds of government policies in question have been tried to be determined. For this purpose, the studies published in the literature between 2015-2019 were examined. As a result of this analysis, it was concluded that five different government policies could have an impact on the banking sector. Then, the importance of these five different government policies (banking regulations, corporate governance, tax policies, market competition, risk policies) was determined by the fuzzy DEMATEL method.

According to the results of the analysis, the most important government implementation is the risk policy regarding the banking industry. In addition to the criterion mentioned, corporate governance and market competition are other criteria that have an impact on the banking sector. On the other hand, tax policies and bank regulations are the least important government practices. With respect to the impact and relation map for the governance policies, risk policies have the highest influences in the criteria while corporate governance has the most influenced criterion.

It is identified that the applications of the governments towards the risk management processes are the most important policy type regarding banking industry. Because banking has many different risks, such as credit, market and operational risk, they should be managed effectively in order to have better performance in the industry. In this framework, it is recommended that governments should make necessary regulations for risk management activities of the banks and follow the banks to understand whether they take these actions or not. With the help of this situation, these risks can be managed more effectively. This situation has a positive influence on the performance of the banking industry.

In this study, the impact of government policies on the banking sector is evaluated. By using fuzzy DEMATEL approach, five different government policies related to the banking industry are weighted. In the future studies, according to these weighted government policies, the success of the E7 countries' governments regarding banking industry can be measured. For this purpose, different methods can be taken into consideration, such as fuzzy TOPSIS and fuzzy MOORA.

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APPENDIX

Appendix A: Direct relation fuzzy matrix for Decision Maker 1

Criteria	C1			C2			C3			C4			C5		
C1	0	0	0	0.5	0.75	1	0.25	0.5	0.75	0.5	0.75	1	0.25	0.5	0.75
C2	0.25	0.5	0.75	0	0	0	0.25	0.5	0.75	0.25	0.5	0.75	0.25	0.5	0.75
C3	0.25	0.5	0.75	0.5	0.75	1	0	0	0	0.25	0.5	0.75	0.25	0.5	0.75
C4	0.25	0.5	0.75	0.5	0.75	1	0.25	0.5	0.75	0	0	0	0.5	0.75	1
C5	0.5	0.75	1	0.75	1	1	0.75	1	1	0.5	0.75	1	0	0	0

Appendix B: Direct relation fuzzy matrix for Decision Maker 2

Criteria	C1			C2			C3			C4			C5		
C1	0	0	0	0.5	0.75	1	0.25	0.5	0.75	0.5	0.75	1	0	0.25	0.5
C2	0.25	0.5	0.75	0	0	0	0.25	0.5	0.75	0	0.25	0.5	0.25	0.5	0.75
C3	0.25	0.5	0.75	0.5	0.75	1	0	0	0	0.25	0.5	0.75	0	0.25	0.5
C4	0	0.25	0.5	0.5	0.75	1	0.25	0.5	0.75	0	0	0	0.5	0.75	1
C5	0.5	0.75	1	0.75	1	1	0.75	1	1	0.5	0.75	1	0	0	0

Appendix C: Direct relation fuzzy matrix for Decision Maker 3

Criteria	C1			C2			C3			C4			C5		
C1	0	0	0	0.5	0.75	1	0.5	0.75	1	0.75	1	1	0.25	0.5	0.75
C2	0.25	0.5	0.75	0	0	0	0	0.25	0.5	0.25	0.5	0.75	0.25	0.5	0.75
C3	0.25	0.5	0.75	0.75	1	1	0	0	0	0.25	0.5	0.75	0	0.25	0.5
C4	0.25	0.5	0.75	0.5	0.75	1	0.25	0.5	0.75	0	0	0	0.5	0.75	1
C5	0.5	0.75	1	0.75	1	1	0.75	1	1	0.5	0.75	1	0	0	0

Appendix D: Direct relation fuzzy matrix for Decision Maker 4

Criteria	C1			C2			C3			C4			C5		
C1	0	0	0	0.5	0.75	1	0.5	0.75	1	0.5	0.75	1	0.5	0.75	1
C2	0.5	0.75	1	0	0	0	0.25	0.5	0.75	0.25	0.5	0.75	0.25	0.5	0.75
C3	0.25	0.5	0.75	0.25	0.5	0.75	0	0	0	0.25	0.5	0.75	0.25	0.5	0.75
C4	0.5	0.75	1	0.5	0.75	1	0.25	0.5	0.75	0	0	0	0.25	0.5	0.75
C5	0.5	0.75	1	0.75	1	1	0.75	1	1	0.5	0.75	1	0	0	0

Appendix E: Direct relation fuzzy matrix for Decision Maker 5

Criteria	C1			C2			C3			C4			C5		
C1	0	0	0	0.75	1	1	0.25	0.5	0.75	0.5	0.75	1	0.25	0.5	0.75
C2	0.25	0.5	0.75	0	0	0	0.25	0.5	0.75	0.5	0.75	1	0.5	0.75	1
C3	0.25	0.5	0.75	0.5	0.75	1	0	0	0	0.5	0.75	1	0.25	0.5	0.75
C4	0.5	0.75	1	0.5	0.75	1	0.25	0.5	0.75	0	0	0	0.75	1	1
C5	0.5	0.75	1	0.75	1	1	0.75	1	1	0.5	0.75	1	0	0	0

Appendix F: Difference Matrix ($I-X_1$)

	C1	C2	C3	C4	C5
C1	1.000	-0.138	-0.088	-0.138	-0.063
C2	-0.075	1.000	-0.050	-0.063	-0.075
C3	-0.063	-0.125	1.000	-0.075	-0.038
C4	-0.075	-0.125	-0.063	1.000	-0.125
C5	-0.125	-0.188	-0.188	-0.125	1.000

Appendix G: Difference Matrix ($I-X_m$)

	C1	C2	C3	C4	C5
C1	1.000	-0.200	-0.150	-0.200	-0.125
C2	-0.138	1.000	-0.113	-0.125	-0.138
C3	-0.125	-0.188	1.000	-0.138	-0.100
C4	-0.138	-0.188	-0.125	1.000	-0.188
C5	-0.188	-0.250	-0.250	-0.188	1.000

Appendix H: Difference Matrix ($I-X_u$)

	C1	C2	C3	C4	C5
C1	1.000	-0.250	-0.213	-0.250	-0.188
C2	-0.200	1.000	-0.175	-0.188	-0.200
C3	-0.188	-0.238	1.000	-0.200	-0.163
C4	-0.200	-0.250	-0.188	1.000	-0.238
C5	-0.250	-0.250	-0.250	-0.250	1.000

Appendix I: Inverse Matrix of ($I-X_l$)

	C1	C2	C3	C4	C5
C1	1.234	0.481	0.376	0.422	0.337
C2	0.310	1.253	0.302	0.317	0.301
C3	0.306	0.419	1.204	0.331	0.278
C4	0.351	0.465	0.355	1.248	0.377
C5	0.451	0.595	0.514	0.475	1.279

Appendix K: Inverse Matrix of ($I-X_u$)

	C1	C2	C3	C4	C5
C1	2.109	1.473	1.266	1.361	1.219
C2	1.142	2.118	1.109	1.179	1.098
C3	1.148	1.328	1.974	1.203	1.087
C4	1.258	1.451	1.232	2.142	1.235
C5	1.414	1.593	1.395	1.471	2.160

Appendix L: Total Influence Matrix for X_l

	C1	C2	C3	C4	C5
C1	0.051	0.204	0.134	0.181	0.109
C2	0.105	0.057	0.087	0.100	0.102
C3	0.095	0.170	0.037	0.110	0.071
C4	0.121	0.193	0.116	0.057	0.159
C5	0.184	0.280	0.242	0.194	0.066

Appendix M: Total Influence Matrix for X_m

	C1	C2	C3	C4	C5
C1	0.234	0.481	0.376	0.422	0.337
C2	0.310	0.253	0.302	0.317	0.301
C3	0.306	0.419	0.204	0.331	0.278
C4	0.351	0.465	0.355	0.248	0.377
C5	0.451	0.595	0.514	0.475	0.279

Appendix N: Total Influence Matrix for X_u

	C1	C2	C3	C4	C5
C1	1.109	1.473	1.266	1.361	1.219
C2	1.142	1.118	1.109	1.179	1.098
C3	1.148	1.328	0.974	1.203	1.087
C4	1.258	1.451	1.232	1.142	1.235
C5	1.414	1.593	1.395	1.471	1.160

Appendix O: The values of x_j^{ls} and x_j^{rs}

	x_j^{ls}	x_j^{rs}	x_j^{ls}	x_j^{rs}	x_j^{ls}	x_j^{rs}	x_j^{ls}	x_j^{rs}	x_j^{ls}	x_j^{rs}
C1	0.114	0.461	0.253	0.589	0.195	0.526	0.223	0.555	0.173	0.507
C2	0.191	0.555	0.149	0.534	0.184	0.545	0.194	0.565	0.185	0.542
C3	0.179	0.521	0.248	0.587	0.114	0.454	0.195	0.539	0.161	0.500
C4	0.181	0.522	0.245	0.586	0.182	0.517	0.120	0.474	0.198	0.523
C5	0.215	0.542	0.287	0.605	0.249	0.552	0.226	0.557	0.122	0.454

Appendix P: The values of x_j^{crisp}

C1	0.233	0.401	0.326	0.361	0.300
C2	0.339	0.297	0.329	0.347	0.328
C3	0.312	0.396	0.230	0.333	0.288
C4	0.313	0.394	0.312	0.244	0.327
C5	0.348	0.433	0.377	0.365	0.236

Appendix Q: The values of f_{ij}

C1	0.382	0.621	0.514	0.565	0.478
C2	0.437	0.391	0.425	0.446	0.424
C3	0.439	0.549	0.334	0.467	0.408
C4	0.494	0.606	0.492	0.398	0.513
C5	0.597	0.727	0.642	0.623	0.426