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The Role of Corporate Governance on the Efficiency of Banks Considering the Mediating Role of Financial Health

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Abstract

This study aimed to examine the financial health of the corporate governance-bank efficiency relationship. The statistical population encompasses all commercial, non-commercial, and specialised banks during 2011-2019. Since its statistical value is low, the sample size equals the statistical population. According to previous studies and various sources, the efficiency of banks was calculated using a nonparametric data envelopment analysis (DEA) method. Corporate governance was computed using the associated dummy variables. The index of financial health determinants was also estimated using the CAMELS system and ranked by Technique For Order Preference By Similarity To Ideal Solution (TOPSIS) method. Findings showed that corporate governance has a significant effect on the efficiency of banks and the financial health of banks. In addition, financial health has a significant effect on the efficiency of banks. Since the study's first hypothesis was not rejected, financial health with an incomplete mediating role significantly affected the relationship between corporate governance and bank efficiency.

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1. Introduction

As money market operators in economics and due to the speed of reflection of the policies of this market in society, banks have an effective role in creating and maintaining sustainable economic growth in society. Banks allow the efficient management of funds and financial investments, strengthening the financial and economic system (Claessens and Laeven, 2005; Ayadi et al., 2015). Therefore, banks need to continuously evaluate their units and reorganisation according to the measurement results to provide more diverse, faster, and more modern services and offer the possibility of competition and survival in special banking services globally. In this regard, due to the serviceability of banks and the variety of services provided, it is essential to examine the performance of banks (Menor and Roth, 2008; Wonglimpiyarat, 2014). The concept of bank performance is defined by efficiency, effectiveness, and profitability (Berger et al., 1993; Paradi and Zhu, 2013; Sharma Sharma and Barua., 2013; Bhatia et al., 2018; De Abreu, Kimura and Sobreiro., 2018). There are two approaches to measure the performance of banks:

1- The production approach assumes that financial institutions serve as producers of services for account holders. This means they should perform transactions on deposit accounts and process documents, such as loans.

2- The intermediation approach or the asset approach believes that banks act as financial intermediaries whose primary role is to obtain funds from savers in exchange for their liabilities. The banks, in turn, will provide loans to others for profit-making (Chu & Lim, 1998).

Berger and Humphrey (1997) argue that the production approach is better for evaluating the efficiency of banks, and the intermediation approach may be more appropriate for evaluating financial banks as a whole. The concept of efficiency as a general performance indicator for all types of businesses was first formulated by Edgeworth (1881) and Pareto (1927), and its empirical implementation was recorded in a book by Shephard (1953). Efficiency in economics is interpreted as the maximum potential ratio between the output and the input of the product development process, which shows the optimal distribution of available resources that would allow achieving the maximum potential (Cvilikas & Jurkonyte Dumbliauskiene 2016). Efficiency indicates how economic resources are used to achieve the goals, and effectiveness indicates the extent to which objectives are achieved. Banks have the most contact with the macroeconomic sector, so any fluctuations and instability can negatively affect the country's macroeconomic (Creel, Hubert and Labondance, 2015). Therefore, the necessary corrections should be made, potential banking losses should be eliminated to ensure the health and stability of the bank, and banks should be analysed and evaluated (Vilen, 2010). Banking health also means the favourable financial and operational situations of a bank. The government should identify the vulnerabilities of the banking system and design regulatory mechanisms using appropriate indicators so that the rights of depositors are realised and ensure stakeholders through the ability of banks to meet their obligations and deal with potential breaches (Hoenig, 2010). Another critical business issue is corporate governance at the beginning of the 21st century. The concept of corporate governance is a tool taken to manage or direct a company. Corporate governance is one of the main factors in improving economic efficiency, which includes a set of relationships between the company management, board of directors, shareholders, and other stakeholders. Corporate governance provides a structure by which firm goals are set, a tool to achieve goals, and determine performance oversight. This system creates the necessary motivation to achieve the firm's goals in management and provides the basis for effective supervision. In this way, companies use resources more effectively (Basel Committee, 2015).

Corporate governance of banks and financial institutions in developing countries, such as Iran, is essential since these countries do not have a strong, long-established financial institution

infrastructure to deal with corporate governance issues. Good corporate governance helps increase the share price and makes it easier to obtain capital (Emad, 2012). Mc Gee (2009) expresses some of the most important benefits of good corporate governance, including risk reduction, performance stimulation, improved access to capital markets, enhanced marketability of goods and services, improved leadership, and demonstration of transparency and social accountability. Corporate governance principles summarise the board's objectives and provide a framework to show how it functions and discharges its responsibilities (Kimberly, 2015). Considering the necessity of effective corporate governance methods to attract and preserve public trust in the banking system, significant progress has been made in establishing the corporate governance system through law. Banks' banking, supervisory, and voluntary actions have also been done in this regard.

On the other hand, depositors and other stakeholders of banks have become more aware of the necessity and importance of the corporate governance system. They are interested in pursuing the establishment of this system. Therefore, it is natural that establishing a comprehensive and effective corporate governance system can affect the development and efficiency of monetary and financial markets, the optimal allocation of resources, the financial health of banks, and prevent banks from facing a liquidity crisis, even the bankruptcy. The banking sector is different from other sectors and industries in many ways. Unlike ordinary commercial institutions, these differences have made bank corporate governance more important than other industries and sectors. When their capital is financed through shareholders' funds, the banks' activities include funds that consist mainly of deposits, making the banks and their managers more responsible for the trust because depositors' funds must be allocated to the most appropriate investment options. However, the lack of corporate governance can destabilise the financial system because the banks determine which end-users receive financial resources and provide the relevant payment tools. Therefore, given the rising level of financial standards and the importance of commercial and specialised banks in the country, it seems necessary to study the effect of corporate governance on the efficiency of banks considering the mediating variable of financial health.

2. Literature Review and Background Review

The term "efficiency" refers to the peak level of performance, which uses the least inputs to achieve the highest output. Efficiency requires reducing the number of unnecessary resources used to produce a given output, including personal time and energy. It is a measurable concept that can be determined using the ratio of useful output to total input. Output (work output) is the total useful work completed without accounting for any waste and spoilage (Banton and Boyle, 2021).

The term "corporate governance" is a Greek word meaning to guide or manage a company (Kahndl, 2011). The International Federation of Accountants (IAEA) defined corporate governance in 2004 as follows: "It ensures the achievement of goals, the control of risks and the responsible use of resources. Hasas Yeganeh (2005) reviewed the views of experts, stating that corporate governance has laws, regulations, structures, processes, cultures, and systems to achieve the goals of accountability, transparency, justice, and respect for the rights of stakeholders. Financial health means being profitable and continuing the economic unit's activity. The financial health of companies, especially banks, is a topic related to the discussion of continuity of activities, bankruptcy, financial helplessness, and the qualitative characteristics of accounting information (relevance and reliability). Therefore, it is necessary to evaluate the performance of companies in the fields of operations, marketing, finance, and accounting (Kristonis, 2005). In 2006, in a paper on a model for financial health, Naidu found that a company has financial health when its profit after tax is positive and real profit growth is positive. A company is helpless when its profit after tax is negative. Helpless companies will not improve their situation in the coming years and thus will be

financially helpless and unable to fulfil their obligations. The loss will encounter all stakeholders. In his view, this stage relates to the conditions of inability to pay debts or pay all debts against the power of liquidity. The Kamel rating system was first approved in 1979 by the Board of Supervisors of Federal Financial Institutions in the United States. This rating system is used by the regulators of the US banking industry, namely the Federal Deposit Insurance Company, the Federal Reserve, and the Monetary Control Agency (Deng, 2013). Large organisations also use this ranking system (Ginevicius and Podvizko, 2011). In terms of performance appraisal, bank ranking can provide all stakeholders and decision-makers with a clear view of the banks' position compared to organisations with similar activities (Islami et al., 2011).

Abdelbadi and Salam(2019) found that interconnected banks drastically reduce their credit risks. The banks whose investment is low must fully play the role of professional communicators to achieve their goals.

Aline Marius et al. (2018) examined banks' corporate governance and efficiency. Their findings showed that the implementation of rigid corporate governance structures is associated with higher costs for banks and lower levels of efficiency. However, during the crisis, the government mechanism significantly increased banks' costs and technical efficiency. They also showed that prudent risk management for higher capital banks is associated with higher costs and technical efficiency.

In 2021, Guindos, Vice-President of the European Central Bank, assessed financial stability vulnerabilities and their implications for financial market functioning, debt sustainability, bank profitability, and non-bank financial sector in Financial Stability Review(FRS). The FSR (Financial Stability Review) exists to promote the awareness of systemic risks among policymakers, the financial industry, and the public, with the ultimate goal being the promotion of financial stability. The FSR focused on addressing some long-standing challenges that affect euro area banks' strength. There is evidence that strengthening the regulatory framework for banks and non-banks and managing climate risks will enhance the long-term resilience of the financial system. Improved economic conditions have reduced near-term tail risks to financial stability; however, supply disruptions and rising energy prices pose inflation and economic recovery risks.

Blatter and Fuster (2021) find strong evidence for scale economies: efficiency and profitability increase with bank size for most banks in the sample. A subset of geographically restrained banks used an instrumental variables strategy that showed that size on efficiency and profitability is likely causal. Scale economies have been more pronounced since 2010 than in the years before the global financial crisis. There is little evidence for scale economies for the largest (systemically important) banks; their relatively lower efficiency and profitability appear driven by certain business model aspects. Their results further indicate that good capitalisation, efficiency, and profitability are compatible.

3. Research Hypotheses

The conceptual model of the research, i.e. examining the role of corporate governance on the efficiency of banks considering the mediating variable of financial health, is as follows:

Research hypotheses are as follows:

H_1: Corporate governance has a significant effect on the efficiency of banks.

$$EFF_{it} = \beta_{\circ} + \beta_1 CG_{it} + BR_{it} + \varepsilon_{it}$$

H_2: Corporate governance has a significant effect on financial health.

$$FH_{it} = \beta_{\circ} + \beta_1 G_{it} + \varepsilon_{it}$$

H_3: Financial health has a significant effect on the efficiency of banks.

$$EFF_{it} = \beta_{\circ} + \beta_1 FH_{it} + BR_{it} + \varepsilon_{it}$$

where FH_{it} is the financial health of the ith bank in time t,
G_{it} is the corporate governance of the ith bank in time t,
BR_{it} is the number of the ith bank branches in time t,
and EFF_{it} is the efficiency of the ith bank in time t.

H_4: Financial health as a mediating variable significantly affects the relationship between corporate governance and bank efficiency.

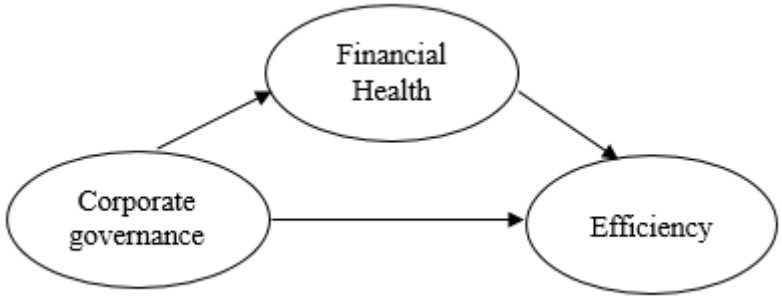

Figure 1. Conceptual model of research

4. Research Methodology

The findings in Table 2 indicate that the data are not normally distributed. The Jark-Bra test was used to confirm the results. The probability of statistics for the variables of efficiency, financial health, corporate governance, and the number of branches is less than 5%. They follow an abnormal distribution. The Spearman test was used because the data were abnormal in this study. In this study, because the performance reporting form of all banks has changed due to the compliance with international financial reporting standards in 2016, the findings were gained regarding how to collect data according to how they are reported. Data envelopment analysis and DEA software were used to calculate efficiency in this research. Inputs used to calculate the efficiency include the number of labour, fixed asset cost, loans, deposit cost, and labour cost; outputs also include the total volume of deposits, investments, net assets, loan cost, and investment cost.

The inputs or inputs are summarised as follows:

Number of Labor: Bank employees are a source of human capital (input) for output production.

Fixed Asset Price: The fixed asset price is obtained through the following formula:

Fixed Assets Cost = (Depreciation Cost + Administrative Expenses)/(Fixed Assets)

In this study, to calculate the total administrative costs and depreciation costs during the years 2011-2015, the sum of administrative costs and another general as well as administrative costs was used. From 2016 to 2019, general costs and administrative and depreciation costs are used.

Loans: This variable is obtained by changing the balance of public sector debt and non-government sector debt variables. In this study, to calculate the changes in 2011, government and non-public sector debts at the end of 2010 up to the beginning of 2011 were used, where public sector debt means debt to the central bank, and non-government sector debt means debt to banks and other institutions, obtained as follows:

Loans = (Government Debt Finish Period - Government Debt Sector First Period) + (Non-Government Debt Finish Period - Non-Government Debt Finish Period)

Deposit Cost: The value of deposits is measured by the average interest paid per Rial of the deposit. In this study, deposits are divided into long-term and short-term investments. The deposit amount is multiplied by the interest rate of each bank for each year. This has been notified to all

banks by the central bank, which is obtained as follows:

Deposit Cost= (Short-term deposit amount in interest rate multiplier + long-term deposit amount in interest rate multiplier)/(Short-term interest rate deposit + Long-term interest rate deposit)

Labour cost: Labor cost is obtained through personnel costs divided by the average number of employees.

Labor cost= (personnel costs)/(average number of employees)

The outputs are also summarised as follows:

The total volume of deposits: Through deposits, it is possible to produce outputs, such as interest and loans. In this study, to calculate the total volume of deposits, the sum of sight deposits, savings and similar deposits, long-term and short-term investment deposits, and other deposits during 2011-2015 was used. However, from 2016 to 2019, the sum of customer and long-term investment deposits was used.

Investments: Investments are the same as direct investment and legal partnership. In this study, from 2011 to 2015, investments include the total legal participation account of the public and non-governmental sector, direct investment account, stock account and foreign partnerships, and other investments and partnerships. During the years 2016 to 2019, it includes the total investment in stocks and other securities, direct investment, and the legal participation account of the non-governmental sector.

Net Assets: In this study, the equity proxy was used instead of the net assets.

Loan cost: Loan cost is obtained as follows:

Loan cost = (Receivables and facilities from income)/(Receivables and facilities) Average

In this study, the sum of profits from granted facilities in common incomes and non-shared incomes was used to calculate the income from facilities and receivables. From 2016 to 2019, it is obtained through income from granted facilities and deposits.

The average facilities and receivables through the average total receivables from the Central Bank - from banks and institutions and public and non-governmental sector facilities were used from 2011 to 2015. So that the sum of these figures for the end of each year First, the next year's period was calculated. Therefore, for the beginning of the 2011 period, the total figures for the end of the 2010 period were used, and then the average was obtained. However, from 2016 to 2019, the average total claims on banks and other credit institutions, claims on the government, granted facilities, and governmental and non-governmental entities were used.

Investment cost: Investment cost is obtained as follows:

Investment cost = (investment from income)/(average investments)

In this study, to calculate the average investments from 2011 to 2015, the total average of direct investment account and stock accounts foreign partnerships and other investments and partnerships were used. The average investment was obtained from 2010 to the beginning of 2011. From 2016 to 2019, the average investment account in stocks and other securities was used. To calculate the income from investments during the years 2011 to 2015. The sum of common and non-common income, which is explicitly stated in the performance of banks, was used. During the years 2016 to 2019, the sum of the income of the granted facilities and the deposit and the commission income was used. The data envelopment analysis method and DEA software were used to calculate the efficiency of this research. The data envelopment analysis method is based on a series of linear programming optimisations, called the nonparametric method. The boundary curve is created from a series of points determined by linear programming in the method. Two assumptions of fixed and variable returns to scale can determine the mentioned points. The data envelopment analysis method is nonparametric because it does not presuppose the basic form of the production function. The data envelopment analysis technique covers all data, and that is why it is called data envelopment

analysis (Abbasian & Mehregan, 2007). Each input or decision-making unit examines the resources to generate outputs in data envelopment analysis. Indeed, decision-makers perform the same activities and have common goals. The corporate governance variable also includes six dummy variables, i.e., their size is determined as zero and one, including optional corporate governance disclosure, profitability, size, financial leverage, dummy company age, and dummy ownership concentration. The focus is on ownership (Meshki Miavaghi and Sarfehjoo, 2017). In this study, the dummy variable of corporate governance disclosure is calculated as follows, according to Meshki Miavaghi and Sarfehjoo (2017). First, a checklist of voluntary disclosure cases in the financial statements and other reports related to the performance of banks is prepared. After reviewing the annual financial statements, explanatory notes, and general assembly reports, each item on the checklist disclosed by the companies is assigned number 1, otherwise 0. Finally, the optional index of corporate governance disclosure is calculated by dividing the sum of disclosed items by the total number of disclosed items:

$$DScore(V)_i = \sum_{i=1} \frac{\mathrm{d}_i}{n}$$

If the item is disclosed, i equals 1; it is 0. The number of cases in corporate governance disclosure in this study is considered as12 cases. These calculations are done for each bank annually. Subsequently, the mean is derived, and finally, if the index number is greater than the mean, it is given 1, and if the index number is less than the mean, it is given 0.

Table 1. Elements in a corporate governance disclosure checklist

Row	Optional index of corporate governance disclosure
1	Details about the Chairman of the Board (background, level of education, specialisation, business experience)
2	Details about other board members (background, level of education, specialisation, business experience)
3	Details about the CEO (background, level of education, specialisation, business experience)
4	List of senior managers (other than board members and CEO)
5	Pictures of board members and CEO
6	Percent of ownership of managers in the company
7	Number of board meetings held and their dates
8	Number of permanent and non-permanent members
9	Change in the ownership structure of the company without changing the way the company is controlled
10	Percent of ownership of institutional shareholders
11	Types of shareholder ownership (real or legal)
12	Existence of an audit committee

Dummy profitability variable: If the company is profitable, i.e., the return on its assets is positive, it equals 1; otherwise, it is considered zero.

Dummy size: To calculate this variable, first, the natural logarithm of the market value of all banks is calculated, and then using the average, the sample companies are divided into two categories, small and large. The big ones are numbered 1, and the other companies are 0.

Dummy financial leverage: If the company's financial leverage is greater than the average financial leverage of all sample companies, it will be equal to 1; otherwise, it will be equal to 0.

Dummy company age: Older banks and institutions are those older than the average age of the sample companies. In this research, the company's age was calculated according to the natural logarithm of the company's life from the date of establishment to the research period. Then, their

logarithmic mean was calculated. 1 is given to old institutions, and 0 is given to other institutions.

Dummy variable ownership concentration: Ownership concentration means how shares are distributed among the shareholders of different companies. In other words, ownership concentration means how much of a company's total stock is owned by a limited number of owners. The smaller the number of shareholders, the more concentrated the ownership. Ownership concentration is calculated using the major shareholder ownership percentage above 5% and the Herfindahl-Hirschman index. This index is obtained from the total square of the percentage of shares owned by the shareholders. This index increases in parallel with the increase in the ownership concentration. If the entire stock belongs to one person, it has the highest value and is calculated equal to 10,000 units. If the ownership structure is dispersed and all shareholders have equal ratios, the index finds the lowest value and is calculated equal to $\frac{10000}{N}$:

$$HHI=\sum_{i=1}^{n}\left(\frac{p_i}{p}*100\right)^2$$

In this research, the average of this index is used. The obtained average is compared with the index number, and finally, if the index number is smaller than the average, the number is 0, and if it is greater than one, number 1 will be given.

The word "perfection" is derived from the first letters of the words: capital adequacy, asset quality, quality management, profitability, and liquidity. In 1996, to establish a risk-focused rating system, the US Federal Reserve changed it to Kamels by adding S to the above index, in which the letter S stands for Market Risk Sensitivity (Roman & Sargu, 2013). These factors identify the health of financial institutions. In this study, financial health is calculated through the research indicators proposed in (Ghafrolahi et al., 2017) as follows:

Capital adequacy: This ratio is obtained by dividing the base capital by risk-weighted assets. This ratio is at least 8% according to the Central Bank regulations for all banks.

Capital adequacy ratio = (capital base)/(risk-weighted asset)

In this study, due to the limitation of full access to the required information according to the instructions of the Central Bank to calculate the capital adequacy ratio, only the capital adequacy ratio disclosed by the banks is sufficient.

Asset quality: Asset quality indicators measure potential credit risk associated with the lending facilities, portfolios, fixed assets, and other assets. It indicates management's ability to identify, measure, monitor, and control this risk. Asset quality includes the following ratios: The ratio of total liabilities to total assets, the ratio of non-current receivables to total facilities, and the ratio of non-current receivables to fixed capital (Ahmadian, 2013). The ratio of income-generating assets includes three other ratios: the ratio of income-generating assets to assets, facilities to total assets, and investments to assets. Revenue-generating assets are those created to earn profit and commission. This ratio shows what percentage of the bank's resources is devoted to profitable activities. In this study, income-generating assets include lending facilities, investments, partnerships, receivables from other banks, partnership bonds (Ahmadian, 2013), and the ratio of facilities to assets (Ghafrolahi et al., 2017).

Quality management: Quality management is measured from two perspectives of efficiency and productivity as follows:

Efficiency includes a ratio of deposits to branches, deposits to assets, a ratio of facilities to branches and the ratio of total facilities to total deposits. Productivity is estimated based on the ratio of the personnel costs to the number of employees personnel, the ratio of administrative costs per number of branches, the ratio of questionable access costs per number of branches, the ratio of profit per staff (Ghafrolahi et al., 2017). Profit is estimated by the number of branches the ratio of the total cost to total revenue, which shows the bank's capacity to cover operating costs with

operating income (Roman and Sargo, 2013; Aspal & Davan, 2014), and the ratio of operating profit to operating expenses, which is the result of dividing the interest received for granted facilities by the interest paid to depositors (Saghafi & Seif, 2005).

Profitability: It is obtained through the following ratios, namely, the return on assets ratio, the ratio of net profit to total assets, the ratio of shared income to non-shared income (Ahmadian, 2013). Also, the ratio of the granted facilities to the bank's total income, the ratio of return on capital, the ratio of net profit to total capital, the ratio of net profit to basic capital, operating profit margin to income ratio and profit margin ratio. Non-shared income refers to incomes that the bank does not share with depositors, and the total income belongs to the bank and its shareholders. The total income from lending, deposit facilities, and net profit (loss) from capital deposits are common income, total commission income, and net profit (loss) from foreign exchange transactions. Other income is considered non-common. (Ahmadian, 2013).

Liquidity: Liquidity includes the following ratios: the ratio of cash assets to total deposits (Ahmadian, 2013), which shows the ability of liquidity to meet liabilities to customers. The ratio of deposit maturity means investment deposit to liquid deposits (i.e., total savings deposit, good loan deposit, and current deposit), fluctuation coverage ratio, cash to cash ratio, short-term debt coverage ratio, including cash to short-term debt, and the ratio of volatile debt is the liquid deposit to the total deposit (Ahmadian, 2013).

Bank size: This index is calculated through the ratio of bank assets to the total assets of 19 study banks.

One of the multi-criteria decision models, namely the TOPSIS method, is used to rank the financial health indicators. Huang and Eun proposed the TOPSIS model in 1981. In this study, individual judgment was not used to calculate the weight of micro-variables related to financial health. The fourth step's findings were considered the final weight of the indicators by the entropy method.

In this research, the number of branches is considered the control variable of the research and another affecting efficiency factor. The variable, namely the number of branches, is used as an indicator to show the level of customer access to the bank, the ability of banks to attract deposits and payment of facilities, and finally earning income and profits of the bank. There is a positive relationship between the number of branches and the efficiency of banks.

This research is a descriptive study of the applied purpose and falls into post-event studies. The library study method was used to review the literature. Information about the research variables was obtained by referring to the performance of banks, the report of the board of directors of banks, and explanatory notes. Kadal site was used for listed banks, and Central Bank Monetary and Banking Research Institute site was used for other non-listed banks. The information available from the Higher Banking Education Institute of Iran was also used. The Monetary and Banking Research Institute of the Central Bank located in Tehran was also referred in person to receive the performance report of the banks. The thematic scope of this study includes examining the role of financial health as a mediating variable on the relationship between corporate governance and bank efficiency. Spatial territory includes private banks (Eghtesade Novin, Ansar, Parsian, Saman, Sina, Karafarin, Iran Zamin, Hekmate Iranian, Gardeshgari), government banks (Tejarat, Saderat, Refahe Kargaran, Mellat), specialised banks (San'at O Ma'dan, Keshavarzi, Maskan, Tose'eh Saderat, Tose'eh Ta'von) and state-owned banks, such as Post Bank.

5. Research Findings

The present study focused on the interval from 2011 to 2019. In this study, the Jark test was used to evaluate the normality or abnormality of the data set. Levin et al. (2002) test were used to assess

research variables' reliability. The Durbin–Watson statistic test was used to determine the correlation. Also, to investigate the absence of autocorrelation between the explanatory variables, the Wi-Fi test, and due to the abnormality of the variables (Jark Bra test finding), the Spearman correlation test was used. The data collection from 19 banks from 2011 to 2019 was done using Excel, Eviews, and Stata software to test the hypotheses.

Table 2-1. Results from descriptive statistics of data

Variable	Observations	Middle	Mean	Σ	Min	Max
Financial Health	171	0.17	0.19	0.11	0.04	0.40
Corporate Governance	171	3.00	2.93	1.17	1.00	5.00
Efficiency	171	1.00	0.95	0.11	0.57	1.00
Branches	171	330.00	676	701	40.0	2257

Table 2-2. Results from descriptive statistics of data

Variable	Skewness	Courtois	Jark-Bera	Prob.
Financial Health	0.43	2.00	12.56	0.001
Corporate Governance	0.04	2.08	6.03	0.49
Efficiency	-2.32	7.21	279.7	0.001
Branches	0.99	2.54	29.9	0.001

The results of the correlation between the variables are presented in Table 3. The null hypothesis of the Spearman test indicates that there is no correlation between the variables. Findings emphasise that efficiency is not correlated with corporate governance and financial health and that the number of branches and financial health is not correlated with the number of branches at a 95% confidence level; showing that an increase or a decrease of corporate governance affects the increase or decrease of the predicted performance decline. The corporate governance variable has a positive and significant correlation with the number of branches at a 95% confidence level, representing that an increase or a decrease in one variable is in the same direction as an increase or a decrease of other variables. The corporate governance and financial health variables have a negative and significant correlation. At a 95% confidence level, it seems that an increase or a decrease in each of them is in the opposite direction of the increase or decrease of other variables.

F-test or Chow test was used to determine the data type (pooled or panel). According to Table 4, since P-value = 0.0001, the data are that of the panel. The Hausman test deals with determining whether the fixed effect estimation algorithm or the random effects is used in the panel data method Since the probability value of the chi-square statistic for the first hypothesis is less than 0.05, the fixed effects algorithm is suitable for the first hypothesis; however, the findings in the table are suitable for the second and third hypotheses of the random-effects model.

The modified parental variance heterogeneity test is used only if the effects model is fixed, and for random effects, only the Woldrich autocorrelation test is used.

The Woldrich autocorrelation test was used to examine the presence or absence of autocorrelation between error terms.

Table 3. Results of correlation between variables

Correlation (probability)	Efficiency	Corporate governance	Financial health	Branches
Efficiency	1			
Corporate governance	0.25 0.74	1		
Financial health	0.06 0.41	-0.41 0.000	1	
Branches	-0.11 0.14	0.22 0.003	-0.06 0.38	1

Table 4. Results of Hausman and F. Limer test

Hypothesis	Test type	Statistics test	Test statistic value	Freedom intensity	P-value
H_1	F limer	F	3.67	(18.5)	0.000
	Hausman	X^2	7.88	2	0029
H_2	F limer	F	4.44	(18.15)	0.000
	Hausman	X^2	0.005	1	0.94
H_3	F limer	F	3.29	(18.15)	0.000
	Hausman	X^2	3.64	2	0.16

Table 5. Results of variance heterogeneity and autocorrelation of error terms

Hypothesis	Adj. variance	Heterogeneity test	Autocorrelation	Woodrich test
	Statistics	Chi^2 test	Statistics	F-probability
H_1	84422	0.0001	17.1	0.000
H_2	-	-	1.94	0.18
H_3	-	-	8.18	0.01

According to Table 5the probability value for the first and third hypotheses is less than 5%, so the null hypothesis is rejected, i.e., there is a correlation between the error terms; however, for the second hypothesis between the terms, there is no correlation.

Table 6. Variance inflation factor (VIF) test results to examine the alignment relationship

Hypothesis	Variables	Coefficient of variation	Uncentered VIF	Centered VIF
1th: Dependent variable efficiency	Corporate governance	-05e6	7.67	1.05
	Branches	-1e1	2.03	1.05
	C	0.0005	7.47	NA
2th: Dependent variable financial health	Corporate governance	035e3	7.29	1.00
	RES1(-1)	-33e5	1.00	1.00
	C	-34e3	7.29	NA
3th: Dependent variable efficiency	Financial health	-32e8	3.97	1.01
	Branches	-39e2	1.94	1.00
	RES1	-32e7	1.00	1.00
	C	-33e5	5.13	NA

According to Table 6, there is no high correlation between the model's independent variables (more than 85%), so there is no alignment problem between the independent variables in any hypothesis, and the variance inflation factor is below 10, so there is no alignment problem.

The Jark-Bra statistic test was used to check the normality of the error terms. According to Figures 1, 2, and 3, since the value of the Jark-Bara statistic is less than 0.05, the error terms of the

distribution are not normal; however, due to a large number of research samples and the central limit theorem, it can be ignored. The hypotheses in the test of normality of error terms are as follows.

H_0 = Error terms are of normal distribution.

H_1 = Error terms are of abnormal distribution.

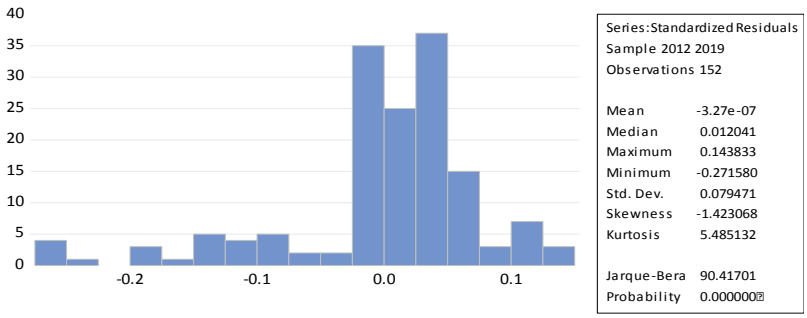

Figure 2. The normality of error terms in the first hypothesis.

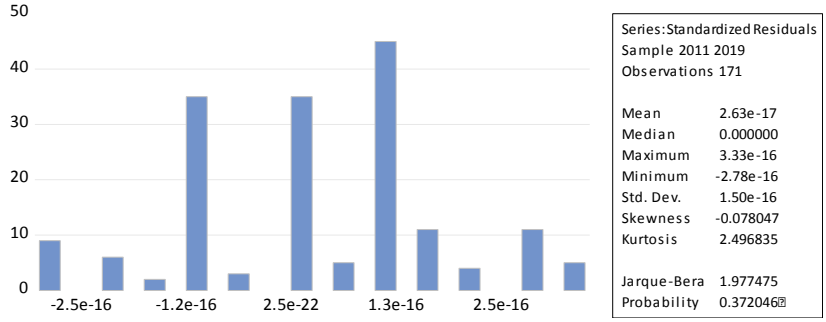

Figure 3. The normality of the error terms in the second hypothesis.

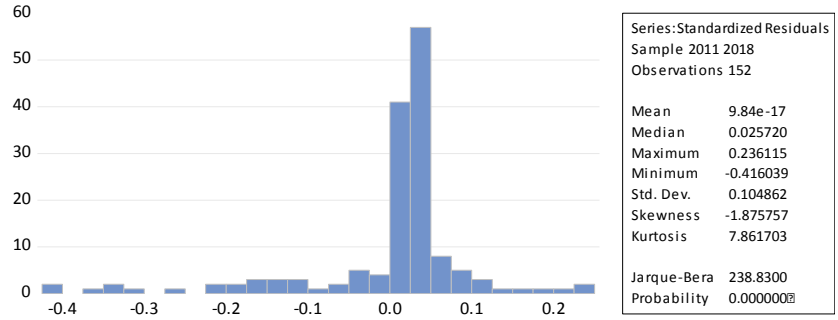

Figure 4. Test of normality of error terms in the third hypothesis

Findings derived from testing Hypothesis 1 show that statistical probability is less than 5%. 95% confidence level shows that the null hypothesis of the model is rejected, i.e., there is a significant correlation between corporate governance and bank efficiency. Also, there is no significant correlation between the number of branches and efficiency. The second hypothesis test shows that

the probability of statistics is less than 5%, so the null hypothesis of the research model is rejected at a 95% confidence level, and corporate governance has a significant effect on the financial health of banks. The probability of statistics in the third model is less than 5%, so the null hypothesis of the model at 95% confidence level is rejected, manifesting that financial health has a significant effect on the efficiency of banks.

Table 7. Final estimate of the statistical model of hypotheses

Hypothesis	**Regression by**	**EGLS method**			
H_1	Variable	Coefficient	T-statistics	Σ	Probability
	Corporate Governance	0.004	0.97	0.004	0.33
	Branch	-05e-9.4	-0.44	0.0002	0.65
	C	0.99	6.92	0.14	0.000
	AR(1)	0.28	0.03	0.09	0.003
	Coefficient	0.38			
	Adj. Coefficient	0.28	F statistic	3.82	
	DW statistics	1.77	F probability	0.0001	
H_2	Corporate Governance	-0.04	+14e-4.6	-17e-7.4	0.000
	RES1(-1)	0.30	1.2e+15	-16e9.7	0.000
	C		1.14e+15	-16e2.7	0.000
	Coefficient	1.00			
	Adj. Coefficient	1.00	F statistic	+31e4.49	
	DW statistics	0.31	F probability	0.0001	
H_3	Financial Health	0.15	2.036479	0.07	0.043
	Branch	-0,05e-1.4	-1.25	-05e1.1	0.21
	RES1(-1)	0.49	7.18	0.06	0.000
	C	0.92	48.55	0.02	0.000
	Coefficient	0.24			
	Adj. coefficient	0.23	F statistic	15.99	
	DW statistics	2.02	F probability	0.000	

6. Discussion and Conclusion

According to the obtained empirical evidence, in this study, at a 95% confidence level, the corporate governance variable significantly affected bank efficiency. Implementation of corporate governance increases the efficiency and profitability of banks. A positive relationship was found between efficiency and the number of branches. According to the results of the second hypothesis, it was found that corporate governance has a significant effect on the financial health of banks, i.e., the establishment of a comprehensive and effective corporate governance system can develop optimal allocation of resources as well as financial health in financial and monetary markets, and it is also effective in preventing bankruptcy derived by the liquidity crisis in the context of banks.

To improve the efficiency of banks, the grounds for establishing proper corporate governance through a sound banking system should be provided to meet the information needs of investors, shareholders, and other users to improve the country's economy. The present study's findings can provide the necessary knowledge of the inefficiencies in banks to the managers of banks and financial institutions to improve and increase their efficiency and eliminate the existing shortcomings in banks.

The importance of corporate governance mechanism as a security system is essential when it comes to the health of banking. A review of the third hypothesis showed that financial health has a

significant effect on the efficiency of banks and confirms that their poor performance can cause financial and economic crises. According to the experimental findings of this study, if the role of banks' financial health is considered as a mediating variable in the correlation between corporate governance and the efficiency of banks, the fourth hypothesis of the research is realised, and corporate governance has a significant effect on the efficiency of banks, considering the mediating role of financial health. In this study, since the first hypothesis was rejected at a 95% confidence level, financial health as a mediating variable and the role of mediation are incomplete. This means that corporate governance has a significant effect on the efficiency of banks concerning the role of imperfect financial health mediation.

Corporate governance may stabilise the banking system, improving the performance of the banking system. A stable banking system creates an efficient financial intermediary and enables it to be more successful in allocating resources to investments, thus improving economic growth and investment. Having a stable banking system increases the efficiency of the banking system and improves the distribution of resources in the economy.

High efficiency, corporate governance, and financial health attract more customers and increase their market share and profitability.

As stated in the research topic, efficiency, corporate governance, and financial health of banks are very important and should be considered by bank managers. Certainly, a bank can emphasise economic areas and development plans that meet its users' needs. This will attract institutional investors and the entry of stray capital into society and improve the efficiency of banks. Maximising the interests of shareholders, paying attention to the interests of stakeholders and other beneficiaries, increasing efficiency, corporate governance, and financial health of enterprises are the main goals of the economy of any society.

As a result, to achieve the above goals and improve the efficiency of banks, the grounds for establishing proper corporate governance through a sound banking system should be provided to meet the information needs of investors, shareholders, and other users to improve the country's economy. Given that the general public is not able to analyse the situation of banks and assess corporate governance, efficiency, and financial health of banks, one of the main concerns of investors and lenders is to invest in banks that reveal the loss of capital and expected profit due to poor performance, lack of sound financial situation, lack of proper corporate governance, bankruptcy. Therefore, examining corporate governance over the efficiency of banks, despite the role of their financial health, can provide the necessary information to stakeholders to analyse the performance of banks and choose the best option for investment. When it comes to better allocation of the financial resources, bank executives are among those interested in learning about the future state of the bank under their management and the risks that threaten them and eliminate them in competition with other banks. The present study's findings can provide the necessary knowledge of the inefficiencies in banks to the managers of banks and financial institutions to improve and increase their efficiency and eliminate the existing shortcomings in banks. High efficiency, corporate governance, and financial health attract more customers and increase their market share and profitability.

7. Practical Implications and Limitations:

Limitations derived from lack of access to all data and information of banks, limitations governing economic models and statistical analysis, sampling and generalisation of results, are one of the limitations of research; the financial and economic situation of banks is strongly influenced by the economic and political situation of the country, as a result of which investors react to these changes. Changes in economic conditions in the years under review may have affected the study

results, and the data are historical; as a result, the effect of the inflation rate has not been taken into account due to the country's economic conditions.

Future direction: It is suggested that corporate governance's role on banks' efficiency is examined when the financial soundness of banks is weak or strong. This means that the moderating role of financial health should be discussed. Parametric methods can be used to evaluate the efficiency of banks, structural equations method can be used for financial health, and special vector method can be used for weighting them. Qualitative components can also be used for corporate governance. These models can be re-evaluated and examined with the findings of this study to achieve more accurate analysis and judgment.

Given that the general public can not analyse the situation of banks and assess their financial health, one of the concerns of investors and creditors is to invest in banks that eventually went bankrupt due to poor performance. As a result, the capital and their expected profits are lost. Therefore, it is suggested that in addition to the Kamels model, other models are also used and analysed for financial health to providing users with more accurate information about banks.

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