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Adopting the Simultaneous Equations System to Determine the Interaction of Financial Health Components and how they Ipmact Value-Based Performance Index
An Analytical Study of a Sample of Banks Listed in the Iraq Stock Exchange for the Period (2014-2023)

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Abstract:
The current study aims at exploring the importance of financial health in the banking sector and its impact on achieving value-based performance by using instantaneous equations to determine the interaction of financial health components for a sample of banks listed on the Iraq Stock Exchange for the period 2014-2023. Accordingly, three indicators can be adopted to measure financial health: capital adequacy index, financial solvency index, and indebtedness index, then relying on the simple linear regression method to know the effect of each financial health indicator on the value-based performance indicator. To achieve the study objectives, the study adopted a main hypothesis "There is no effect of financial health components in achieving value-based performance - market added value - for the banks in the study sample." The study reached several results, the most important of which is the use of the instantaneous equations system solution method to know the interaction between financial health indicators. The study gave relatively accurate results, and the experimental results of the study varied between the three indicators. The study also recommended the necessity of conducting a continuous assessment of the level of financial health by the Central Bank to encourage banks to pay attention to financial health indicators and publish the results of the assessment to maximize the market value added of banks, as banking disturbances are considered a major threat that can affect the national economy and customer confidence. So, banks must take the necessary preventive measures and digital transformations to maintain the health of their banking systems.

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اعتماد نظام المعادلات الانية في تحديد تفاعل مكونات الصحة المالية وأثرها في مؤشر الأداء المستند على القيمة
دراسة تحليلية لعينة من المصارف المدرجة في سوق العراق للأوراق المالية للمدة 2014-2023

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المستخلص

تهدف الدراسة إلى معرفة أهمية الصحة المالية في القطاع المصرفي واثرها في تحقيق الأداء المستند على القيمة من خلال استخدام المعادلات الأنية في تحديد تفاعل مكونات الصحة المالية للعينة من المصارف المدرجة في سوق العراق للأوراق المالية للمدة 2014-2023، وتم ذلك من خلال اعتماد ثلاث مؤشرات (مؤشر كفاية رأس المال، مؤشر الملاءة المالية، مؤشر المديونية) لقياس الصحة المالية، ومن ثم الاعتماد على أسلوب الانحدار الخطي البسيط لمعرفة أثر كل مؤشر من مؤشرات الصحة المالية في مؤشر الأداء المستند على القيمة، ولتحقيق هدف الدراسة تبنت الدراسة فرضية رئيسية ((لا يوجد أثر لمكونات الصحة المالية في تحقيق الأداء المستند على القيمة (القيمة السوقية المضافة) للمصارف عينة الدراسة))، وقد توصلت الدراسة إلى عدة نتائج أهمها استخدام أسلوب حل منظومة المعادلات الانية في معرفة التفاعل بين مؤشرات الصحة المالية، وقد أعطت الدراسة نتائج دقيقة نسبيًا، وتباينت النتائج التجريبية للدراسة بين المؤشرات الثلاث، كما أوصت الدراسة بضرورة اجراء تقييم مستمر لمستوى الصحة المالية من قبل البنك المركزي لتشجيع المصارف على الاهتمام بمؤشرات الصحة المالية ونشر نتائج التقييم لتعظيم القيمة السوقية المضافة للمصارف، اذ تعتبر الاضطرابات المصرفية تهديداً كبيراً يمكن أن يؤثر في الاقتصاد الوطني وثقة العملاء، ويتعين على المصارف اتخاذ التدابير الوقائية والتحولات الرقمية اللازمة للحفاظ على صحة أنظمتها المصرفية.

الكلمات المفتاحية: الصحة المالية، كفاية رأس المال، الملاءة المالية، المديونية، مؤشر الأداء المستند الى القيمة.

I. Introduction

One of the significant issues in banking literature is the relationship between financial stability and the soundness of the banking sector. The soundness of the banking sector is one of the vital requirements for supporting the health of the financial system in any country. Bank soundness refers to the ability of a bank to manage its operations under certain events, such as policy changes in the era of financial industry liberalization. Thus, it reflects the bank's ability to meet its obligations under unfavorable economic conditions through its capital and reserve accounts. Hence, bank soundness measures the health of the financial system in a given country and is one of the main duties of regulatory bodies in any economy.

Therefore, through reviewing the literature on financial safety, we did not find a study that adopted the system of simultaneous equations to detect the

interaction in financial safety indicators or components. Moreover, previous experimental studies, to the best of the authors' knowledge, did not witness a study that relied on adopting two types of analysis, namely simple linear regression and the system of simultaneous equations, which made it a research gap that deserved to be researched and tested, especially in light of adopting what is the effect of this interaction in the modern performance indicator.

II. Literature Review

1. Financial Health

Financial health is considered vital topic in several fields, as its concepts have varied among researchers and writers. Financial health has been defined as the financial strength of a bank, meaning the bank's ability to meet the requirements of creditors under current and future economic conditions, as well as maintaining market share. Weakness in the financial health of banks leads to the loss of suppliers and customers (Hughes,2020:2). Financial health is also defined as the ability of banks to withstand shocks and recover quickly from them by improving supervision to achieve financial stability (Karpac & Bartosova,2020:2). So, a bank that enjoys financial health is able to fulfill its obligations on time. However, sometimes a bank may suffer losses and is unable to fulfill its obligations due to internal or external circumstances. As a result, the bank faces financial difficulties and may go bankrupt (Azam & Ahmad,2023:1438). Financial health is a comprehensive assessment of the ability of banks to meet basic needs. It also means a description of the condition of banks in terms of how they deal with their financial resources and how to make payments on time.

The financial health of the bank represents nothing but the economic and financial conditions that are exploited using the latest high-quality equipment and advertising in marketing its goods and services to ensure maximizing profits (Al-Shammari,2022:26).

Financial health includes five elements: stable macroeconomic conditions, upervision and control of financial institutions, sound financial institutions and markets, roviding a safe and strong infrastructure, and active financial safety nets (Ahmed &Abbas,2021: 207).

The importance of financial health is represented by the ability to deal with financial crises that occur abroad, as well as the ability to accomplish financial tasks and functions smoothly. This, in turn, leads to building trust among stakeholders, increasing the ability of financial institutions and other banks to deal with risks and mitigate structural imbalances, increasing the quality of services, and benefiting from global expertise in the field of banking services. It also enhances the integration of the financial sector into the global financial system, which leads to increased availability of

resources and the introduction of modern technology, which increases the degree of reliance in global financial markets. It is also considered a crucial element in attracting international business by enhancing foreign capital flows (Sarih& Abdul Hadi, 2024:204).

Countries are striving to maintain the health of their banking systems because the banking environment is constantly changing, and all disturbances that affect banks may lead to a financial crisis. If banks do not find appropriate ways to confront these disturbances, they may be forced to bear the costs of restoring their banking systems. Banks are a link between depositors and lenders, and any crisis that banks are exposed to will affect the confidence of current and future customers (Al-Khafaji,2023:57). Also, evaluating good financial performance is a reflection of the financial health of the bank, as it is represented in achieving a good balance between debts and assets.

On the other hand, evaluating the financial performance of banks is an important matter that must be done, because financial performance will affect the confidence of customers and shareholders to deal and invest in the bank (Masri,2020:291). In addition, there are many challenges facing banks in the field of achieving banking stability, such as the increasing openness and financial liberalization processes, the increasing risks associated with banking operations as a result of the diversity of banking activities, the lack of transparency regarding the presentation of data that would help in making the right investment decision, the tremendous technological development with the increasing intensity of competition, which greatly affects the financial stability of banks in small countries or banks in developing countries compared to developed countries (Youssef,2021:164). There are also many factors affecting financial health, namely the economic factor, the industrial factor, the technological factor, and the systems and laws of countries. These factors complement each other and affect the performance of the bank, whether directly or indirectly, which has a greater impact on the financial health of the bank (Al-Atwi & Saiba,2022).

A. Components of Financial Health

- *Capital Adequacy Ratio*

capital is considered one of the important measures of the bank's efficiency, The capital adequacy ratio (CA) is a key measure of a bank's financial health, indicating the bank's ability to absorb potential losses and meet its financial obligations.(Al Abdullah et al.,2023:378). Much attention has been paid to the importance of maintaining an adequate capital ratio in recent years, especially with the implementation of Basel III regulations that

require banks to maintain a capital ratio of at least 8% (Naoaj,2023:108). The capital adequacy ratio shows the extent to which the bank's assets can be covered through the available bank equity, the higher the capital adequacy ratio, the better the bank's condition (Syafrizal et al.,2023:312). The capital adequacy ratio is calculated using the following equation (Mohammed, 2022:607):

Capital adequacy = (capital owned ratio/ deposits) * 100

The capital adequacy ratio is the safety valve that prevents banks from falling into financial crises, and the capital adequacy ratio also helps in achieving a kind of balance between the risks expected by the bank and the size of the capital, as it is a source of confidence for current and potential depositors. For current depositors, the greater the capital adequacy, the more security and reassurance they have regarding the funds deposited in the bank, while for potential depositors, the greater the capital adequacy, the more it encourages them to deposit their money with the bank (Binsaddig et al. 2023:594). From the above, researchers believe that Capital adequacy is the amount of capital sufficient to deal with the pressures associated with banking and the financial loss resulting from lending, investing and other banking activities. As a result, the importance of capital for banks can be considered as a means of attracting investors and depositors, while the importance of capital for depositors is understood as a means of protecting their deposits. As for the central bank, it means the amount of capital sufficient to maintain the bank's ability to pay its debts while preserving the money of depositors and shareholders.

- ***Financial Solvency***

The financial position of any commercial bank does not depend on its available self-resources (bank capital), which is often characterized by being inflexible due to its subjection to the decisions and policies of the monetary authorities in the country, but rather depends on its ability to provide financial resources whose sources are diverse, as the bank has the ability to invest them in order to achieve its goals (Al-Janabi and Abdul,2022:216). The importance of these resources for banks is evident through several concepts of financial solvency, which means the bank’s ability to meet its financial obligations in the event of the bank’s liquidation in the short and long term, i.e., bank solvency is the bank’s ability to pay all its debts (Isa & Mahardika,2021:44). From another point of view, bank solvency measures the amount of debt, obligations and other expenses used in the bank's business that are related to the amount of equity invested in the bank. Bank solvency ratios provide an indicator to measure the bank's ability to pay all its financial obligations by selling all its financial assets in addition to being an indicator of its ability to continue its business. Therefore, bank solvency

is necessary to continue its work in the long and short term (Raj & Putri,2021:6). Khan supported this by saying that bank solvency is the bank's ability to pay all its bills in the long term (Khan & Niazi,2021:18). Financial solvency determines the financial health of banks through the capital adequacy ratio, liquidity and its ability to bear losses. Monitoring these variables helps protect depositors and borrowers (Hussein, 2024: 189). To prove financial solvency, financial institutions are required to maintain a percentage of capital in relation to their risk-weighted assets, and financial solvency can be expressed through the following equation (Chasanah & Sucipto,2019:58):

Financial solvency = Current assets / Current liabilities

Financial solvency is considered one of the most important issues in financial analysis at the level of banks from a theoretical and practical point of view, as it indicates the financial health of banks and provides important information about whether the bank will be able to pay debts when there is a loss or decline in the value of assets and the required cash flow does not occur. It also indicates the financial viability of the bank in the long term and its ability to cover long-term liabilities. The bank is considered solvent if the total assets exceed the total liabilities. If the total assets are less than the total liabilities, the bank faces the risk of bankruptcy and is said to be financially insolvent (Alsubaihi & Alweisy,2024:38).

The importance of financial solvency in banks cannot be overstated. A strong bank builds trust among depositors, investors and regulators, which enhances financial stability. When a bank is able to repay its debts, it can meet consumer withdrawals, loan obligations and potential losses without bankruptcy or external assistance. The importance of financial solvency ensures the success of banks and their continued survival in terms of activity and effectiveness due to their social and economic importance and the mental status they leave with their customers (Hamid & Mohammed,2023:95). The literature differs on the concept of bank solvency and capital adequacy. Some see that bank solvency as capital adequacy and others find a difference between them. There is a difference between bank solvency and capital adequacy: bank solvency means the bank’s ability to pay long-term obligations on the due date, as shareholders, creditors and bondholders are interested in the issue of bank solvency, specifically in the term, while capital adequacy means providing sufficient capital to prevent the bank from failing by absorbing potential losses and preventing their occurrence (Al-Janabi and Abd,2022:218).

Among the mechanisms used for enhancing the solvency of commercial banks: The higher the ratio of equity in the bank to total risky assets, the better it reflects the bank's ability to withstand losses, because the bank will not impose restrictions on its activities beyond those stipulated in general

banking regulations. However, banks with low capital ratios must adhere to some restrictions on their activities and take the necessary measures to increase their capital ratios to meet capital requirements as soon as possible. Otherwise, the Central Bank will take action against them, which may include closing the bank. Since the purpose of applying capital requirements is to enhance the stability of the commercial banking system, when banks face financial risks, they will incur losses and will not have sufficient capital to cover these losses. Therefore, banks have two options to improve financial solvency and meet capital requirements, which are increasing capital or shifting the use of funds from risky assets to less risky assets (Abdul Hamid& Kadhum, 2020:354).

- **Indebtedness**

Financial institutions often face some difficulties when determining the optimal financing mix for their investment operations, as they work to balance returns and risks, as the financial management of a commercial bank does not rely on proprietary financing sources only, in financing its investment and operational processes. Rather, it also relies on loans that represent debt financing that the bank must repay at a specific later date (Alwan & Radi,2022:53). The debt ratio is measured by the following equation (Sarih & Abdul Hadi, 2024:206):

Debt ratio = (Total liabilities / Total assets) × 100

This ratio is called in some sources "the ratio of financing by relying on others" or "the ratio of external financing". It measures whether the bank has sufficient assets to repay all its debts, as a safety indicator for the bank, and measures the part of the asset that was financed by debt. The lower the result, the better it is for the bank, and the lower the debt ratio, the lower the risks associated with debts and obligations in the bank. There are two types of components of the debt financing structure: Long-term financing refers to sources that are determined by a 10-year recovery period, which financial institutions usually obtain from financial markets and can represent long-term loans and bonds with a term of more than 5 years (Jarah, 2022:3). Short-term financing is one of the sources that the financial institution relies on for financing and is limited to a period of time not exceeding one fiscal year (Hantoush,2021:438), and is divided into: commercial credit, bank credit, commercial papers and receivables (Abbas, 2024: 893)

The bank's debt position refers to the amount of money used by the bank that does not come from shareholders, but from lenders, while liquidity ratios focus on the bank's ability to meet short-term obligations. While debt ratios focus on long-term debt, the more debt, the greater the risk of the bank's inability to pay obligations. Since banks must meet creditors' claims before they can pay any dividend to shareholders, current and potential

shareholders pay close attention to the bank's ability to repay debts (Zutter & Smart, 2022: 147).

2. Market Value Added

In general, the indicator is known as is defined as a numerical value by which changes in financial markets are measured،An example of this is the market return index. (Hussein& Mohammed,2023: 1545)

Market Value Added (MVA) is one of the criteria marketed by the American investment company Stern & Steward Co. with economic value added as a criterion for evaluating performance, the market value added is generally referred to as the difference between the current market value of the company and the capital contributed by investors (Mohmmed,2024:314). It is also a measure of external performance, which is considered the best indicator of creating value for shareholders. When investors want to look at how a company performs for its shareholders, they first look at the market value added, as the market value added of a company is an indicator of its ability to increase shareholder value over time. The high market value added represents evidence of effective management and strong operational capabilities and expresses administrative efficiency, as it is used to compensate managers if they succeed in achieving this value (Jawan& FarisThe,2021:36). MVA index also represents an important tool for measuring the value added by the bank, which helps increase the welfare of shareholders. Since the primary goal of the bank is to create as much wealth as possible for its shareholders, increasing the MVA represents a measure of the increase or creation of wealth by the bank. It also shows how the bank maximizes the level of value for its investors. The MVA index not only reflects the wealth of shareholders, but also shows the financial market's assessment of the net present value of the bank, as it is the final measure of the value that has been wasted or generated by the bank (Al-Zubaidi & Hassan,2022:10). Market value added is the difference between the market value of a company's shares and the amount of shares the investor has invested in (Udiyana et al.,2022:18). The market value added can be calculated according to the following equation (Shiaa et al.,2023:168):

MVA=Market value added = Market Value of Shares – Book Value of Shareholders' Equity

Market Value of Shares =(total no of shares * market share price)

It is thus similar to the market to book value ratio, with the only difference being that the market value added is a fixed measure, while the market to book value ratio is a relative measure on which the market value added is calculated in monetary units. While the market to book value ratio appears

as a percentage, if (MVA) is positive, this means that the market to book value ratio is less than one (Al-Jubouri& Al-Anbaki, 2023:282). Then it can be said that the management was able to increase the wealth of shareholders. And if the market value added (MVA) is negative, this indicates a decrease in the value of shareholders' capital (Masyiyan & Isynuwardhana, 2020:118). The market value added is also linked to the bank's financial performance indicator. The higher the bank achieves a rate of return greater than the rate of cost of invested capital, the higher the market value of the bank, and vice versa, the lower the rate of return on invested funds than the rate of cost of these funds, the lower the market value of the bank. Through this indicator, owners can know whether their wealth is increasing or not by knowing the market value of the share and comparing it with the book value. This cannot be identified using other performance indicators, as it reduces the burden on the shareholder instead of waiting until the lists are prepared to know the amount of increase or decrease in his wealth (Sundari et al., 2023:44) (Saad & Ibrahim,2023:145).

The market value is affected by a number of factors, including estimates of future profit, the mechanism for distributing profits in relation to determining retained earnings, the size and nature of investments in the investment structure and associated risks, the relationship between profits and market risks and the ability to achieve balance, operating costs and financial costs, exchange rates and political conditions (Rashwan & Abu Nasser, 2021:122).

III. Data and Study Methodology

1. Study Data

10 commercial banks listed on the Iraq Stock Exchange were selected due to the availability of the required data for the period (2014-2023) with the aim of reaching proof or deny of the study hypotheses. The first hypothesis: "There is no effect of financial health components in achieving value-based performance (market value added) for the banks in the study sample", while the second hypothesis: "Financial health components[1] do not interact with each other for the banks in the study sample".

2. The Model Used

In order to test the two hypotheses of the study, two measurement methods were adopted. The first method was for the purpose of testing the first hypothesis, which included three standard models consisting of three simple

[1] Both financial health components and financial health indicators will be adopted respectively in the body of the study and are intended for financial health components.

linear regression equations that included financial health components as an independent variable and the market value added index as dependent variables. The model was applied according to Panel Data method and the random effect method after it was determined as the best model. One of the most important features of the model is the adoption of single indicators to know the amount and direction of the influential force of the independent variable on the dependent variable as indicators, because most indicators, when dealt with collectively, give results that may differ. Accordingly, the statistical formula for the three models is:

$$MVAIND = \alpha_0 + \alpha_1 CAIND + e_{it}$$

$$MVAIND = \alpha_0 + \alpha_1 FSIND + e_{it}$$

$$MVAIND = \alpha_0 + \alpha_1 FLIND + e_{it}$$

where:

MVAIND: The dependent variable is the market value added index.
FSIND: The first independent variable is the capital adequacy index
CREIND: The second independent variable is the financial solvency index
FLIND: The third independent variable is the indebtedness index.

The second method is to use the simultaneous equations system to prove the second hypothesis of the study. Although the estimation of the individual equation is the preferred method in empirical analyses to determine the impact of financial health on achieving value-based performance (market value added), the use of the simultaneous equation system helps in determining the interaction of financial health components as well as avoiding any false attribution between the three indicators that actually arise from false correlations (Jensen et al.,1992:252). Therefore, the model adopted in this study to prove or deny the second hypothesis is the simultaneous equations model (simultaneous) as follows:

A. Capital adequacy component equation

Capital adequacy represents a function of a set of variables or indicators, which our study saw fit to determine with a set of indicators according to the components of financial health, which are the financial solvency index in the year as well as (time lagged), and the other indicator was adopted, which is financial indebtedness in the year as well as (time lagged), because capital adequacy depends and takes into account what was achieved in the past (time lagged) and what is the level currently achieved, in addition to capital adequacy In the past year (time-lag). However, the nature of this relationship varies in financial thought and the nature of the results of some studies, which are expected to have a positive impact, and then the behavioral equation for capital adequacy is as follows: -

$$CAIND = \alpha_0 + \alpha_1 FSIND + \alpha_2 FLIND + \alpha_3 FSIND_{t-1} + \alpha_4 FLIND_{t-1} + \alpha_5 CAIND_{t-1} + e_{it}$$

B. Equation of financial solvency component

Financial solvency represents a function of a set of variables or indicators, which our study identified as a set of indicators according to the components of financial health, which are the capital adequacy index in the same year and the capital adequacy in the previous year (time lagged), based on the fact that financial solvency is not achieved unless there is a sufficient level of capital in the previous year. The other indicator adopted is the debt component in the year (time lagged), because financial solvency depends on debt as long-term solvency, and is also taken based on what was achieved from financial solvency in the past (time lagged). In addition, the basis of the banks' work depends on the available financial solvency. However, the nature of this relationship varies in financial thought and the nature of the results of some studies, which are expected to have a positive impact. Then, the behavioral equation for the solvency component is as follows:

$$FSIND = \alpha_0 + \alpha_1 CAIND + \alpha_2 FLIND + \alpha_3 CAIND_{t-1} + \alpha_4 FLIND_{t-1} + \alpha_5 FSIND_{t-1} + €_{it}$$

C. Equation of debt component

Debt represents a function of a set of variables or indicators, which our study identified with a set of indicators according to the components of financial health, which are the capital adequacy index in the same year, in addition to capital adequacy in the previous year (time lagged), and the financial solvency index in the year as well (time lagged), and debt (time lagged) was adopted. These indicators represent the determinants and the main driver of the debt ratio. Thus, the behavioral equation for indebtedness is as follows:

$$FLIND = \alpha_0 + \alpha_1 CAIND + \alpha_2 FSIND + \alpha_3 CAIND_{t-1} + \alpha_4 FSIND_{t-1} + \alpha_5 FLIND_{t-1} + £_{it}$$

where:

The standard error of the model in each equation according to the order of the equations in year t (£, €, e). The estimation of the system of equations (the simultaneous "simultaneous" system of equations) mentioned above is carried out using 3SLS techniques that not only allow the interaction in the indicators but also allow the correlation between the error components. The simultaneous equation model of the study model consists of the internal variables (CAIND, FSIND, FLIND) and the pre-specified variables $(EPSIND_{t-1}, MVAIND_{t-1}, CREIND_{t-1})$ and the random error was determined for each equation as shown as follows:

$$CAIND = \alpha_0 + \alpha_1 FSIND + \alpha_2 FLIND + \alpha_3 FSIND_{t-1} + \alpha_4 FLIND_{t-1} + \alpha_5 CAIND_{t-1} + e_{it}$$

$$FSIND = \alpha_0 + \alpha_1 CAIND + \alpha_2 FLIND + \alpha_3 CAIND_{t-1} + \alpha_4 FLIND_{t-1} + \alpha_5 FSIND_{t-1} + €_{it}$$

$$FLIND = \alpha_0 + \alpha_1 CAIND + \alpha_2 FSIND + \alpha_3 CAIND_{t-1} + \alpha_4 FSIND_{t-1} + \alpha_5 FLIND_{t-1} + £_{it}$$

To solve the simultaneous equations model and to obtain estimates of the model parameters, it was confirmed that the model is specified according to the degree condition and the rank condition.

IV. Results

As previously explained within the study methodology, which included two hypotheses, and each hypothesis has a special method or model to prove or deny the hypothesis, so the two hypotheses will be addressed as follows:

1. The effect hypothesis

The simple linear regression model was used to test the study variables, and thus we have three simple regression models divided according to the three components of financial health as an independent variable and the market value added index as a dependent variable, the results of the simple linear regression analysis show the following:

The results of Table (1) show the analysis of the simple linear regression model between the capital adequacy index and the market value added index for the banks of the study sample.

Table (1): The relationship of the effect of CAIND in MVAIND

Independent variable/ Dependent variable	Constant	*CAIND*	Calculated value for F	Sig	R^2
	B_0	B_1			
MVAIND	3.225	0.875	61.579	0.000	0.440

***Source**: Prepared by researchers using SPSS based on variable indicator data*

The results of the regression analysis according to the first indicator model indicate the relationship of the impact of CAIND on the MVAIND index, shown in Table (2), as follows:

a- The value of B_0=3.225, which means that the MVAIND index for banks (Y) equals 3.225 if the CAIND financial health index for banks (X) equals zero.

b- The value of B_1=0.875, which means that changing the CAIND financial health index for banks (X) by one leads to changing the market value added index for banks (Y) by %875 of the CAIND financial health.

c- The calculated value for F for the linear regression model=61.579, and sig. value =(0.000), which is less than the significance level of (0.05), which means that the relationship of impact between the variables is statistically significant.

d- The value of the interpretation coefficient R^2=0.440, which means that 44% of the changes that occur in the market value added (Y) can be explained by the financial health ratio CAIND (X), while the remaining 56% is due to other variables not included in the model.

Table (2): The relationship between the impact of FSIND on MVAIND

Independent variable/ Dependent variable	Constant	*CAIND*	Calculated value for F	Sig	R^2
	B_0	B_1			
MVAIND	2.150	0.571	34.455	0.000	0.310

***Source**: Prepared by researchers using SPSS based on variable indicator data*

The results of the regression analysis according to the second indicator model refer the relationship of the impact of FSIND on the MVAIND index, shown in Table (2), as follows:
a- The value of B_0=2.150, which means that the MVAIND index for banks (Y) equals 2.150 if the FSIND index for banks (X) equals zero.
b- The value of B_1=0.571, which means that a change in the FSIND index for banks (X) by one leads to a change in the MVAIND index for banks (Y) by 0.571 of the financial health FSIND.
c- The calculated value for F for the linear regression model=34.455, and the sig. value reached (0.000), which is less than the significance level of (0.05), which means that the relationship of impact between the variables is statistically significant.
d- The value of the explanation coefficient R^2=0.310, which means that 31% of the changes that occur in MVAIND (Y) can be explained by the ratio of the financial health index FSIND (X), while the remaining percentage, which is 69%, is due to other variables not included in the model.

Table (3): Relationship of FLIND Impact on MVAIND

Independent variable/ Dependent variable	Constant	*CAIND*	Calculated value for F	Sig	R^2
	B_0	B_1			
MVAIND	3.450	(0.610)	19.780	0.000	0.520

***Source**: Prepared by researchers using SPSS based on variable indicator data*

The following explains the results of the regression analysis according to the third indicator model indicating the relationship of the impact of FLIND on the MVAIND index in Table (3):
a- The value of B_0=3.450, which means that the MVAIND index for banks (Y)=3.450 if the FINGEA financial health index for banks (X) equals zero.
b- The value of B_1= 0.610, which means that changing the FINGEA financial health index for banks (X) by one leads to changing the MVAIND index for banks (Y) by (0.610) of the FINGEA financial health.
c- The calculated value for F for the linear regression model is 19.780, and the sig value reached (0.000), which is less than the significance level of

(0.05), which means that the relationship of impact between the variables is statistically significant.

d- The value of the interpretation coefficient R2=0.520, which means that 52% of the changes that occur in MVAIND (Y) can be explained by the financial health ratio FINGEA (X), while the remaining percentage of 48% is due to other variables not included in the model.

Based on the results of the analysis of the three indicators and as shown in Tables (2) (3) and (4), the first hypothesis is rejected, which states that there is no effect of the components of financial health in achieving the value-based performance MVAIND, and the alternative hypothesis is accepted, and thus there is a statistically significant effect relationship of financial health in achieving the value-based performance MVAIND through the three components of financial health.

2. The second hypothesis is the interaction hypothesis

To test the validity of the second main hypothesis, which states that there is no interaction between the components of financial health expressed by the three indicators (capital adequacy ratio, financial solvency, and indebtedness), the system of simultaneous equations was relied upon, using the three-stage least squares method (3SLS) and using the statistical program and Stata SE v.11.2 to find accurate estimates of the parameters of the simultaneous equations. The results of the 3SLS estimates of the simultaneous equation system for the banks of the study sample are shown in Table (4) and considering the components and according to the following:

A. Capital adequacy

Most of the variables in the capital adequacy index equation achieved a positive and significant impact. The financial solvency index achieved a positive impact of 0.340, and the time lag in both the financial solvency index and capital efficiency also had a significant and positive impact. However, the degree of impact and the power of interpretation is somewhat different, as the indicators achieved an impact of 0.612 and 0.460, respectively, and the debt, whether current or time-lagged, had an inverse significant impact of 0.530 and 0.560, respectively. It is clear that the time lag has a somewhat greater impact and explanatory power, which is consistent with the economic and financial theory that confirms that the capital adequacy index is a reflection of the indicators in the present and past time. The corrected coefficient of determination (Adj R^2) for the capital adequacy index reached 0.420, which indicates the importance of the variables adopted in the study as explanatory variables for the capital adequacy index, as this percentage indicates that 42% of the change in the capital adequacy index was explained by these variables, while the

remaining percentage of 58% indicates variables that were not included in the model. In addition, the value of the DW test indicates that the model is free from the problem of autocorrelation, as we note that the correlation coefficients for the capital adequacy index equation are slightly more than 2.

B. Financial solvency

All variables in the financial solvency index equation had a positive and significant impact. The capital adequacy index and debt had an impact of 0.230 and 0.345, respectively, and the time lag in each of the capital adequacy index, financial solvency and debt had a significant and positive impact as mentioned above. However, the degree of impact and explanatory power is somewhat different, as the indicators had an impact of 0.500, 0.540 and 0.440, respectively. It is clear that the time lag has a somewhat greater impact and explanatory power, and this is also consistent with both the results of experimental studies and with economic and financial theory, which confirms that financial solvency is a product and reflection of the above indicators at present and in the past. The corrected coefficient of determination (Adj R^2) for the solvency component was 0.540, which indicates the importance of the variables adopted in the study as explanatory variables for the solvency index, as this percentage indicates that 54% of the change in the solvency index was explained by these variables. While the remaining percentage of 46% indicates variables that were not included in the model. In addition, the value of the DW test indicates that the model is free from the problem of autocorrelation, as we note that the correlation coefficients for the solvency index equation are slightly more than 2 correct.

C. Indebtedness

Most of the variables in the indebtedness index equation had a positive and significant impact, as the financial solvency index had a positive and significant impact of 0.415, and the time lag in both the financial solvency index and indebtedness had a positive and significant impact. However, the degree of impact and explanatory power were somewhat different, as the indicators had an impact of 0.615 and 0.710, respectively, as it is clear that the time lag has a somewhat greater impact and explanatory power, and this is also consistent with both the results of experimental studies and economic and financial theory, which confirm that indebtedness is an accumulation of the size of previous indebtedness and what the impact of variables, whether time lag or instant, produced. The corrected coefficient of determination (Adj R^2) for the debt index was 0.425, which indicates the importance of the variables adopted in the study as explanatory variables for the debt index, as this percentage indicates that 42.5% of the change in the debt index was explained by these variables, while the remaining percentage of 57.5%

indicates variables that were not included in the model. In addition, the value of the DW test indicates that the model is free from the problem of autocorrelation, as we note that the correlation coefficients for the debt index equation are slightly more than 2. Through the aforementioned results, which were consistent with what was expected according to the theory and the results of some studies, which indicate the existence of a mutual influence and interaction of the components of financial health. Therefore, the second hypothesis (there is no interaction between the components of financial health, the capital adequacy index, the financial solvency index, and the debt index) is rejected for the banks in the study sample, and the alternative hypothesis is accepted, i.e. the three components of financial health interact with each other, but the strength of this interaction varies from one indicator to another.

Table 4: Results of interaction of financial health components

Variable	CAIND	FSIND	FLIND
	Value and moral	Value and moral	Value and moral
CAIND		0.230**	(0.318**)
FSIND	0.340**		0.415**
FLIND	(0.530***)	0.345**	
CAIND t-1	0.612***	0.500***	(0.508**)
FSIND t-1	0.460***	0.540***	0.615*
FLIND t-1	(0.560***)	0.440*	0.710**
B01	0.420**		
B02		0.513***	
B03			0.610**
Observations	100	100	100
Adjusted R^2	0.42	0.425	0.425
Durbin-Watson stat	2.1	2.2	2.2

***Source**: Prepared by the researchers based on the results of the Stata SE v.11.2 program*

V. Conclusions and Recommendations

The financial sector has witnessed the emergence of many models and programming methods that have succeeded in reducing the huge diversity in measurement methods. Based on the analysis results reached by the study, it was found that using the simple linear regression method was more accurate in identifying the impact of the relationship between the components of financial health and achieving value-based performance. Also, the debt index is the most influential in value-based performance, then the capital adequacy index. As for the financial solvency index, it was the least influential in value-based performance. Also, through the results, the researchers concluded that investors in the stock market should use the

method of solving the system of simultaneous equations to identify the interaction between variables because it resulted in relatively accurate results in identifying the interaction between the components of financial health (capital adequacy index, financial solvency index, debt index). The researchers recommend the necessity of conducting a continuous assessment of the level of financial health by the Central Bank to encourage banks to pay attention to financial health indicators and publish the evaluation results to maximize the added market value of banks, and thus maintain financial safety, as well as the bank's management guiding investors when choosing shares in using the value-based performance index. Since investors can interpret positive market value added as information about the increase in the bank's wealth resulting from the market price exceeding the book value, market value added should be the basis when designing and setting the banks' strategy.

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