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# The Role of Financial Engineering in Stock Risk, An Analytical Study for Trade Bank of Iraq

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***Abstract***

*Through financial engineering and its methods and tools, risks can be controlled and accurately identified and we are able to monitor important changes in the risk situation. Financial engineering can give us a comprehensive idea of how to hedge the risks to which commercial banks or financial institutions in general may be exposed and prevent losses from occurring. Ensuring that banks and financial institutions obtain an appropriate return as a result of the risks they may face. The research aims to determine the type of risks facing the Trade Bank of Iraq (research sample) and attempt to address them using a simulation method, and to determine the extent to which the Monte Carlo simulation technique can be applied in financial engineering related to risk management in the Trade Bank of Iraq. The research hypothesis is that it is possible to rely on quantitative methods used in financial engineering to build and engineer a model to measure risks in commercial banks based on a Monte Carlo simulation model related to the guiding principles of risk management in commercial banks. The model has proven its predictive ability through its success in screening tests for the purpose of examining the model and proving its ability to simulate.*

***Keywords***: *Financial Engineering, Stock Risk, Trade Bank of Iraq.*

## Introduction

Financial engineering is an important tool for finding innovative solutions and new financial tools for the purposes of hedging available risks and is consistent with considerations of economic efficiency. Financial engineering may seem necessary with the huge radical changes represented by the change in the method of managing economic resources to the free economic model, as well as the aspect of interconnection of international financial markets due to the revolution of Communications and information technology.

As for financial risk, it is potential losses as a result of a financial transaction or an economic transaction that has a financial impact as a result of transactions that may involve various financial risks, such as the risks themselves in nature and category, or they are the risks of the unit being unable to fulfill its obligations to pay its debts, and this in turn may mean that potential investors lose their money. Those invested in that unit will lose, meaning the higher the company's debts, the greater the potential financial risks. Financial risks refer to your business's ability to manage your debts and fulfill your financial obligations. This type of risk usually arises due to instability or losses in the financial market or movements in stock and currency prices Interest etc.

The research hypothesis was that it is possible to rely on quantitative methods used in financial engineering to build and engineer a model to measure risks in commercial banks, based on the Monte

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Carlo simulation model related to the guiding principles of risk management in commercial banks.

The research population consists of the Commercial Bank of Iraq, and this sample was chosen according to the criteria of the largest volume of shares traded in the market, the largest value traded, and the largest number of transactions for the year 2021.

The research reached a set of conclusions, the most important of which is that as a result of the continuous risks to which investors may be exposed in large numbers, there must be mechanisms that work to reduce or avoid these risks. The most important of these risks are the risks of commodity prices, interest rates, currencies, and securities prices. Finance, as financial engineering with its tools has been able to redistribute financial risks according to investors' preferences.

## First. A Theoretical Review of Financial Engineering

Financial engineering is an interdisciplinary field that includes financial theory, engineering methods, mathematical tools, and programming practice. It is also dedicated to trading tools and their use in modeling financial markets and instruments.

Most definitions of financial engineering express the point of view of researchers who deal with models and theories or who design financial products in financial institutions. Therefore, we find that there is a difference in these definitions and terms depending on the angle from which the researcher can approach them and among these definitions are the following:

- From the point of view of the financial and capital management of this institution: It is an approach to understanding the nature of institutions and their environment, then developing them to serve capital in its broadest sense. It also refers to all operations on capital related to its creation, detention, distribution, organization and transfer.
- From the point of view of the financial markets: Financial engineering is the most widely used and common in the financial market, for pricing options and futures, as well as buying and selling currencies, as it allows the use of these tools and techniques of financial engineering for financial engineers because they give them a better understanding of the financial market, and thus a better understanding of the parties. Traders in the market and this are important for dealers because the accuracy and speed of information are essential in making decisions.
- (MARSHALL. F JOHN) defines financial engineering as the use of financial instruments, such as financial derivatives, in order to obtain desired advantages of financial return and risk. In the broadest sense, it is the application of financial technology to solve some financial problems and seize financial opportunities, as it is sometimes used on a small scale. It is a management of financial risks, and two reasons (MARSHALL. F JOHN) The most important feature of financial engineering is the use of innovation and technology to engineer financial structures, including finding solutions to problems[3].
- Finnerty defines it as "the design and development of innovative financial tools and mechanisms, and the formulation of creative solutions to financing problems"[4].
- According to the definition of the International Association of Financial Engineers (IAFE), financial engineering is the application of some mathematical operations to find new solutions to financing problems[5].

[3] . John F، Marshall، Dictionary of Financial Engineering، Wiley series in financial engineering، New York، John Wiley and sons، 2000، P79.
[4] . Noureddine Boumediene, The financial engineering industry and its impact on the development of Arab financial markets, a dissertation submitted to obtain a doctoral degree in economic sciences, Faculty of Economic, Commercial and Management Sciences, Hasiba Ben Bouali University of Chlef, Algeria, 2014/2015, p. 11.
[5] . Nazir Taroubia, Islamic financial engineering as a strategy for healing the fractures in the international financial system (an analytical vision of what is and what should be), the Second National Forum on the reality of financial engineering and the prospects for its application in Algeria, Adrar University, Algeria, October 28-29, 2010, p. 5.

## Second. A Theoretical Review of Risks

Many banking risks arise from the common cause of mismatch, that is, if banks do not exactly match assets and liabilities (i.e. maturity dates, terms of interest rates and currencies), then the only risk that the bank faces will be credit risk, and this would severely limit the banks' profit opportunities. Mismatch is a fundamental feature of banking business. If the maturities of assets exceed the maturities of liabilities, then liquidity risk arises. When interest rate conditions differ on the items on both sides of the balance sheet, interest rate risks will arise. Sovereign risks appear if the international nature is not each aspect of the balance sheet is identical across countries, and many of these risks are interconnected[6].

The concept of risk varies according to the environment that each researcher focuses on studying. It differs from one place to another according to the aspect that the researcher focuses on and also according to the aspect that he looks at, as well as according to the goal to be achieved from this study. In general, banking risks can be defined as the possibility of exposure to losses.

Unexpected and unplanned by the bank, which leads to fluctuation in the expected return on investment. There are three types of sources through which banking risks arise, which are[7]:

- Lack of diversity.
- Lack of liquidity.
- The bank's willingness to be exposed to risks.

The sources through which the above risks are created are connected to each other and also influence each other, and exposure to these risks is a fundamental reason for obtaining the expected benefits. The greater the risks, the greater the expected return, and therefore the exposure of banks to risks aims to maximize returns.

## Third. Commercial Bank of Iraq

The Commercial Bank of Iraq, which is one of the first private sector banks established in Iraq, was established in the year (1992) after amending local laws to allow the establishment of private banks in Iraq, with a capital of (250) billion Iraqi dinars, and the work of the Commercial Bank of Iraq witnessed tremendous developments. After opening a network of branches throughout the capital and its surrounding areas, it was officially listed on the Iraq Stock Exchange in 2004. In 2005, the Commercial Bank of Iraq entered into a partnership with the Ahli United Bank Group, which recently won, for the second time, the Best Bank Award. Bank in the Middle East in 2016 by the British magazine (The Banker).

The Commercial Bank of Iraq provides a wide and selected range of retail banking services, money transfer services and trade financing for local companies and contracting companies. The Bank also provides financing services for international companies operating in Iraq[8].

Fourth. Measuring the role of financial engineering techniques in risk management using the simulation method, the Commercial Bank of Iraq as a case study

We relied on the time series of the Iraqi Trade Bank by taking the variables (number of shares, trading volume, number of contracts, interest rate) as independent variables, which fall within the variables of

[6] . Saunders، A. and M.M. Cornett Financial Institutions Management: A Risk Management Approach. (New York: McGraw Hill، 2006) page 34.

[7] . Hayat Al-Najjar, Banking Risk Management According to the Basel Accords, Study of the Reality of Algerian Public Commercial Banks, a thesis submitted to obtain a doctorate in economic sciences, Farhat Abbas Setif University 1, 2014, p. 49.

[8] . The official website of the Iraqi Trade Bank on the International Information Network, https://cbiq.com.iq/about-us/ Access date: 3/2023.

financial engineering, and the variable (company capital) was added as a governing variable for the necessities of working the simulation model and organizing Simultaneous equations. The dependent variable was (share price), which falls within external risks.

The simulation model was built on the basis of a change in the interest rate of (0.05) for each time period starting from 2006 until 2021. The increase in the interest rate was (0.05) in 2006, and by (0.10) in 2007, and so on until it reached (0.50) in 2021, and the purpose is to know the impact of increasing the interest rate on stock prices for the research period (2006-2021) according to the simulation model.

**Table (1)** Variables Model.

| Variable | Symbol | Type |
|---|---|---|
| Share price | **PS** | Dependent |
| Number of Shares | **NS** | Independent |
| Trading volume | **TV** | Independent |
| Number of contracts | **NC** | Independent |
| interest rate | **IR** | Independent |
| The company's capital | **CC** | Control variable |

## Stationary of Time Series

We find that the variables (NC, IR, TV) stabilized at their level, whether with a secant, with a secant and direction, or without a secant and direction, at significant levels ranging between (1%-5%), while the variables (PS, NS, CC) stabilized at the first difference, whether With a secant, with a secant and a direction, or without a secant and a direction, at significant levels ranging between (1%-5%) as well.

**Table (2)** Testing the **Stationary o**f Time Series of The Iraqi Trade Bank Model.

| **UNIT ROOT TEST RESULTS TABLE (ADF)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Null Hypothesis: the variable has a unit root | | | | | | | |
| | **At Level** | | | | | | |
| | | PS | NS | NC | IR | CC | TV |
| With Constant | t-Statistic | -0.9908 | -2.6966 | -3.8878 | -4.6505 | -0.9908 | -5.4437 |
| | ***Prob.*** | ***0.7278*** | ***0.0990*** | ***0.0114*** | ***0.0037*** | ***0.7278*** | ***0.0007*** |
| | | n0 | * | ** | *** | n0 | *** |
| With Constant & Trend | t-Statistic | -1.5182 | -2.5992 | -3.8217 | -8.4410 | -1.5182 | -2.7140 |
| | ***Prob.*** | ***0.7758*** | ***0.2853*** | ***0.0452*** | ***0.0001*** | ***0.7758*** | ***0.2462*** |
| | | n0 | n0 | ** | *** | n0 | n0 |
| Without Constant & Trend | t-Statistic | -1.2889 | -1.6918 | -0.4038 | -4.8080 | -1.2889 | -3.0964 |
| | ***Prob.*** | ***0.1733*** | ***0.0851*** | ***0.5194*** | ***0.0001*** | ***0.1733*** | ***0.0049*** |
| | | n0 | * | n0 | *** | n0 | *** |
| | **At First Difference** | | | | | | |
| | | d(PS) | d(NS) | d(NC) | d(IR) | d(CC) | d(TV) |
| With Constant | t-Statistic | -3.6424 | -4.0644 | -6.8095 | -5.3780 | -3.6424 | -1.9312 |
| | ***Prob.*** | ***0.0191*** | ***0.0090*** | ***0.0001*** | ***0.0009*** | ***0.0191*** | ***0.3095*** |
| | | ** | *** | *** | *** | ** | n0 |
| With Constant & Trend | t-Statistic | -3.5017 | -3.9268 | -4.4255 | -6.4585 | -3.5017 | -2.2480 |
| | ***Prob.*** | ***0.0786*** | ***0.0404*** | ***0.0201*** | ***0.0008*** | ***0.0786*** | ***0.4287*** |
| | | * | ** | ** | *** | * | n0 |
| Without Constant & Trend | t-Statistic | -3.4956 | -4.2499 | -7.1120 | -4.7950 | -3.4956 | -2.1101 |
| | ***Prob.*** | ***0.0019*** | ***0.0004*** | ***0.0000*** | ***0.0001*** | ***0.0019*** | ***0.0379*** |
| | | *** | *** | *** | *** | *** | ** |
| **Notes:** | | | | | | | |
| a: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1% and (no) Not Significant | | | | | | | |
| b: Lag Length based on SIC | | | | | | | |
| C: Probability based on MacKinnon (1996) one-sided p-values. | | | | | | | |

Source: Output of Eviews 12 programming package.

## Diagnostic Tests

1. **Autocorrelation test:** Through the Breusch-Godfrey Serial Correlation LM Test, it becomes clear that the probability ratio is greater than (0.05), reaching (0.0703), so the model does not suffer from the problem of autocorrelation.

**Table (3)** Autocorrelation Test for The Iraqi Trade Bank Model.

| **Breusch-Godfrey Serial Correlation LM Test:** | | | |
|---|---|---|---|
| Null hypothesis: No serial correlation at up to 2 lags | | | |
| F-statistic | 7.930234 | Prob. F (2،9) | 0.0703 |
| Obs*R-squared | 9.569692 | Prob. Chi-Square (2) | 0.0884 |

Source: Output of Eviews 12 programming package.

2. **Heteroscedasticity** Test: Through the (Breusch-Pagan-Godfrey) test, it becomes clear that the likelihood ratio is less than (0.05), so the model does not suffer from the problem of non-stationarity of variance.

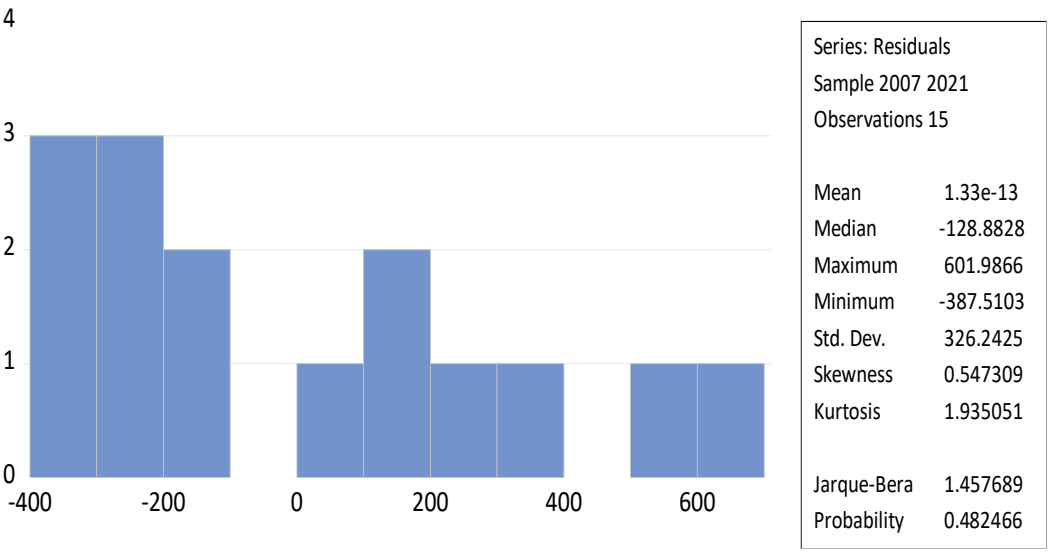
**Table (4)** Heteroscedasticity Test: For the Iraqi Trade Bank Model.

| **Heteroscedasticity Test: Breusch-Pagan-Godfrey** | | | |
|---|---|---|---|
| Null hypothesis: Homoscedasticity | | | |
| F-statistic | 2.275245 | Prob. F (4،10) | 0.0330 |
| Obs*R-squared | 7.146999 | Prob. Chi-Square (4) | 0.0283 |
| Scaled explained SS | 1.796933 | Prob. Chi-Square (4) | 0.0730 |

Source: Output of Eviews 12 programming package.

3. **Normal distribution test**: It is clear from Table (23) that the data follow a normal distribution, as the likelihood ratio of the Jarque-Bera test is greater than (0.05).

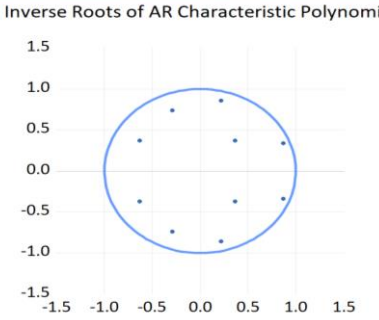
**Chart (1)** Testing the Normal Distribution of The Residuals of the Iraqi Trade Bank Model.




Source: Output of Eviews 12 programming package.

4. **Testing the stability of the model as a whole**: We notice from the graph (14) that all the inverse roots lie within the unit circle that is, all the roots with a coefficient less than one are located within the unit circle, and this indicates that the model as a whole is stable.

**Chart (2)** Testing the Stability of The Model As A Whole for The Iraqi Trade Bank Model




Source: Output of Eviews 12 programming package.

**Estimating the Standard Model of the Iraqi Trade Bank**

We have the following identity equation:
CC = NS + PS + IR……..(1)
CC: Company capital
NS: number of shares
PS: Stock prices
IR: interest rate
Now we will form stochastic equations from the definitional equation above according to economic theory as follows:

PS=f(CC، TV، NS)……..…..(1A)

TV=f(NS، NC)……....(1B)

whereas:
TV: trading volume
NC: number of contracts

**Estimating regression equations using the OLS method:** Estimating regression equations using the OLS method is an input to solving the model using the simulation method. The results of Table (24) show that only the stock price variable is significant, as the probability value reached (0.0200).

**Table (5)** Estimation Results Using Ordinary Least Squares (OLS) Method.

| **Dependent Variable: CC** | | | | |
|---|---|---|---|---|
| Method: Least Squares | | | | |
| Date: 05/03/23 Time: 10:58 | | | | |
| Sample: 2006 2021 | | | | |
| Included observations: 16 | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| IR | 1.39E-08 | 2.17E-08 | 0.636988 | 0.5384 |
| NC | -4.56E-11 | 6.40E-11 | -0.712487 | 0.4925 |
| NS | 1.55E-11 | 7.82E-12 | 1.988445 | 0.0748 |
| PS | 250000.0 | 2.05E-10 | 6.221115 | 0.0200 |
| TV | -7.37E-12 | 3.72E-12 | -1.982420 | 0.0756 |
| C | 0.238123 | 2.37E-07 | 5.030067 | 0.0300 |
| R-squared | 0.973456 | Mean dependent var | | 2.22E+08 |
| Adjusted R-squared | 0.963214 | S.D. dependent var | | 1.05E+08 |
| S.E. of regression | 2.33E-07 | Akaike info criterion | | -27.42806 |
| Sum squared resid | 5.42E-13 | Schwarz criterion | | -27.13834 |
| Log likelihood | 225.4245 | Hannan-Quinn criter. | | -27.41322 |
| F-statistic | 61.16295 | Durbin-Watson stat | | 1.247045 |
| Prob(F-statistic) | 0.000000 | | | |

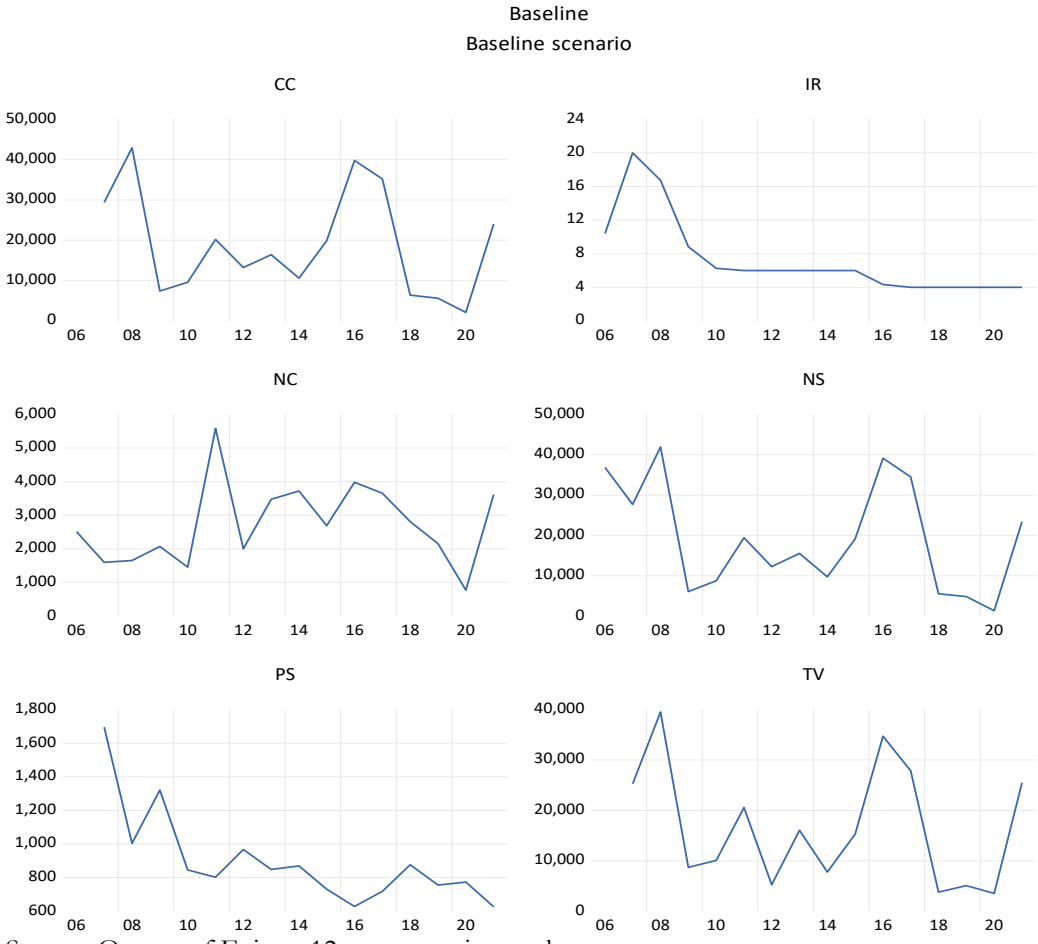
Source: Output of Eviews 12 programming package.

**Draw The Original Chains**

Typically, we will first analyze a model using deterministic simulation, and later move to stochastic simulation to get an idea of the sensitivity of the results to different types of error. In general, we should first make sure that the model can be solved specifically and that it behaves as expected before trying a random simulation, since a random simulation can take a long time, so we will draw the original series first, and then move to the model checking stage before making the prediction. .

Figure (3) shows us the original chains before prediction. This is useful in examining the model's ability to predict what the simulation situation will lead to. If the original chains include the part that is being examined, then the simulation will be valid for work, but if it does not include the examined part, then it is not valid. For work, this will be confirmed in the later stage.

**Figure (3)** Original Series of Variables of The Iraqi Trade Bank Model.

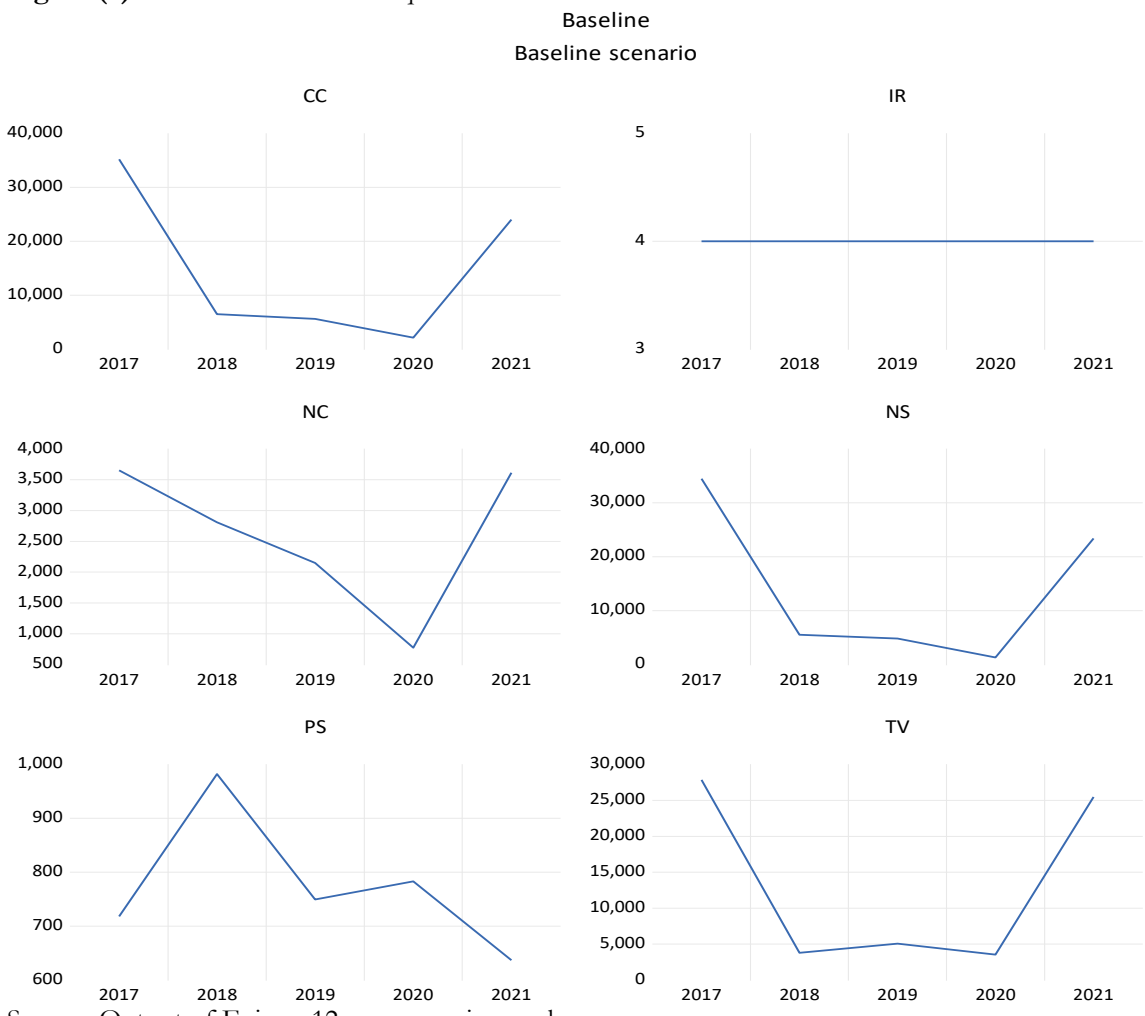



Source: Output of Eviews 12 programming package.

**Evaluate The Model and Examine its Performance When Used in Forecasting.**

For the purpose of examining the model and proving its ability to simulate, a quarter of the time period (2017-2021) was chosen to draw the time series, and it was noted that this shape matches the last quarter of the original time series, and through Figure (17), which shows that the last quarter of the research period is similar to the special graph. For the period (2017-2021), this confirms the model's predictive ability.

**Figure (4)** Examination of the Iraqi Trade Bank Model.




Source: Output of Eviews 12 programming package.

Prediction: Through Chart (5) and Table (6) of the results of simulating the impact of a change in interest rates on stock prices as follows:

1. In the first time period, there is no significant change in the share price of the Iraqi Trade Bank when interest rates change by (5%). The reason is not due to the slight change in interest rates, but rather to the time slowdown that does not lead to a quick (immediate) response, but rather takes time to the dependent variable changes as a result of the slow transmission of the effects of economic policies to the market.

2. The actual change begins with the beginning of the second time period, and we find that the increase in the interest rate by (10%) led to a decrease in stock prices from (1,150) dinars per share to (741) dinars, and this is consistent with the logic of economic theory, as High interest rates lead to a decrease in investment, which leads to a decrease in demand for stocks and thus a decrease in their prices.

3. After the third period, we notice an increase in the difference between the simulation scenario (i.e. interest rates rising again) and stock prices. This is due to the fact that in addition to the fact that rising interest rates lead to damage to the performance of stocks, since if interest rates rise, this means that individuals will find a higher return. On their savings in dealing with limited-risk assets such as (bonds

or certificates of deposit), this would weaken the risk appetite for investing in stocks, leading to a decrease in demand for stocks and a decline in their prices, but also with the transmission of the effects of high interest on credit cards and mortgages. This will lead to a decrease in consumers' ability to pay, as the amount of money they can spend will decrease, and thus companies' revenues and profits will decrease, and this adds another negative impact on stocks as a result of the decline in consumer demand.

**Figure (5)** Time Series Forecasting for the Najjarat Bank of Iraq.


Source: Output of Eviews 12 programming package.

**Table (6)**: Forecasting Results in The Time Series of the Iraqi Trade Bank.

| | **2006** | **2007** | **2008** | **2009** | **2010** |
|---|---|---|---|---|---|
| | | | CC | | |
| Actuals | 3.E+08 | 3.E+08 | 3.E+08 | 4.E+08 | 3.E+08 |
| Scenario 2 | -- | 29،398.9 | 42،642.0 | 7،159.90 | 9،509.21 |
| Baseline | 3.E+08 | 3.E+08 | 3.E+08 | 4.E+08 | 3.E+08 |
| | | | IR | | |
| Actuals | 10.4 | 20.0 | 16.8 | 8.8 | 6.3 |
| Scenario 2 | 10.4 | 20.0 | 16.8 | 8.8 | 6.3 |
| Baseline | 10.4 | 20.0 | 16.8 | 8.8 | 6.3 |
| | | | NC | | |
| Actuals | 2،511.00 | 1،596.00 | 1،654.00 | 2،067.00 | 1،452.00 |
| Scenario 2 | 2،511.00 | 1،596.00 | 1،654.00 | 2،067.00 | 1،452.00 |
| Baseline | 2،511.00 | 1،596.00 | 1،654.00 | 2،067.00 | 1،452.00 |
| | | | NS | | |
| Actuals | 36،796.0 | 27،684.0 | 41،884.0 | 6،058.00 | 8،728.50 |
| Scenario 2 | 36،796.0 | 27،684.0 | 41،884.0 | 6،058.00 | 8،728.50 |
| Baseline | 36،796.0 | 27،684.0 | 41،884.0 | 6،058.00 | 8،728.50 |
| | | | PS | | |
| Actuals | 1،300.00 | 1،350.00 | 1،150.00 | 1،550.00 | 1،390.00 |
| Scenario 2 | -- | 1،694.9 | 741.3 | 1،093.1 | 774.5 |
| Baseline | 1،300.0 | 1،350.0 | 1،150.0 | 1،550.0 | 1،390.0 |
| | | | TV | | |
| Actuals | 108،313 | 46،401.0 | 57،785.0 | 9،389.60 | 12،112.5 |
| Scenario 2 | -- | 25،297.5 | 39،487.9 | 8،681.52 | 10،051.5 |
| Baseline | 108،313 | 46،401.0 | 57،785.0 | 9،389.60 | 12،112.5 |
| | 2011 | 2012 | 2013 | 2014 | 2015 |
| | | | CC | | |
| Actuals | 3.E+08 | 3.E+08 | 2.E+08 | 2.E+08 | 1.E+08 |
| Scenario 2 | 20،134.3 | 13،131.0 | 16،263.2 | 10،573.3 | 19،862.2 |
| Baseline | 3.E+08 | 3.E+08 | 2.E+08 | 2.E+08 | 1.E+08 |
| | | | IR | | |
| Actuals | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Scenario 2 | 6.0 | 6.1 | 6.1 | 6.2 | 6.2 |
| Baseline | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| | | | NC | | |
| Actuals | 5،582.00 | 2،001.00 | 3،476.00 | 3،722.00 | 2،689.00 |
| Scenario 2 | 5،582.00 | 2،001.00 | 3،476.00 | 3،722.00 | 2،689.00 |
| Baseline | 5،582.00 | 2،001.00 | 3،476.00 | 3،722.00 | 2،689.00 |
| | | | NS | | |
| Actuals | 19،403.6 | 12،254.7 | 15،556.6 | 9،726.20 | 19،152.2 |
| Scenario 2 | 19،403.6 | 12،254.7 | 15،556.6 | 9،726.20 | 19،152.2 |
| Baseline | 19،403.6 | 12،254.7 | 15،556.6 | 9،726.20 | 19،152.2 |
| PS | | | | | |
| Actuals | 1،270.00 | 1،270.00 | 920.0000 | 660.0000 | 410.0000 |
| Scenario 2 | 724.7 | 870.3 | 700.4 | 840.9 | 703.8 |
| Baseline | 1،270.0 | 1،270.0 | 920.0 | 660.0 | 410.0 |
| | | | TV | | |
| Actuals | 25،138.5 | 15،003.1 | 15،099.4 | 7،805.00 | 10،465.3 |
| Scenario 2 | 20،557.7 | 5،268.73 | 16،044.9 | 7،778.28 | 15،303.7 |
| Baseline | 25،138.5 | 15،003.1 | 15،099.4 | 7،805.00 | 10،465.3 |

| | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|
| | | | CC | | |
| Actuals | 1.E+08 | 1.E+08 | 1.E+08 | 1.E+08 | 1.E+08 |
| Scenario 2 | 39،800.1 | 35،378.3 | 6،494.43 | 5،587.78 | 2،109.39 |
| Baseline | 1.E+08 | 35،218 | 6،494 | 5،587 | 2،109 |
| | | | IR | | |
| Actuals | 4.3 | 4.0 | 4.0 | 4.0 | 4.0 |
| Scenario 2 | 4.6 | 4.3 | 4.3 | 4.4 | 4.5 |
| Baseline | 4.3 | 4.0 | 4.0 | 4.0 | 4.0 |
| | | | NC | | |
| Actuals | 3،983.00 | 3،654.00 | 2،810.00 | 2،150.00 | 774.0000 |
| Scenario 2 | 3،983.00 | 3،654.00 | 2،810.00 | 2،150.00 | 774.0000 |
| Baseline | 3،983.00 | 3،654.00 | 2،810.00 | 2،150.00 | 774.0000 |
| | | | NS | | |
| Actuals | 39،136.2 | 34،496.5 | 5،508.00 | 4،834.10 | 1،322.10 |
| Scenario 2 | 39،136.2 | 34،496.5 | 5،508.00 | 4،834.10 | 1،322.10 |
| Baseline | 39،136.2 | 34،496.5 | 5،508.00 | 4،834.10 | 1،322.10 |
| | | | PS | | |
| Actuals | 480.0000 | 490.0000 | 470.0000 | 460.0000 | 440.0000 |
| Scenario 2 | 659.3 | 877.5 | 982.1 | 749.3 | 782.8 |
| Baseline | 480.0 | 718.0 | 982.1 | 749.3 | 782.8 |
| | | | TV | | |
| Actuals | 16،460.4 | 15،105.8 | 2،487.40 | 2،151.10 | 602.3000 |
| Scenario 2 | 34،708.8 | 27،863.6 | 3،771.16 | 5،067.53 | 3،525.23 |
| Baseline | 16،460.4 | 27،863.6 | 3،771.16 | 5،067.53 | 3،525.23 |
| | | | 2021 | | |
| | | | CC | | |
| Actuals | 2.E+08 | | | | |
| Scenario 2 | 24،027.0 | | | | |
| Baseline | 24،027 | | | | |
| | | | IR | | |
| Actuals | 4.0 | | | | |
| Scenario 2 | 4.5 | | | | |
| Baseline | 4.0 | | | | |
| | | | NC | | |
| Actuals | 3،614.00 | | | | |
| Scenario 2 | 3،614.00 | | | | |
| Baseline | 3،614.00 | | | | |
| | | | NS | | |
| Actuals | 23،385.6 | | | | |
| Scenario 2 | 23،385.6 | | | | |
| Baseline | 23،385.6 | | | | |
| | | | PS | | |
| Actuals | 620.0000 | | | | |
| Scenario 2 | 636.9 | | | | |
| Baseline | 636.9 | | | | |
| | | | TV | | |
| Actuals | 12،873.8 | | | | |
| Scenario 2 | 25،472.4 | | | | |
| Baseline | 25،472.4 | | | | |

Source: Output of Eviews 12 programming package.

## Conclusions

1- As a result of the continuous risks to which investors may be exposed in large numbers, it was necessary to have mechanisms that work to reduce or avoid these risks. The most important of these risks are the risks of commodity prices, interest rates, currencies, and securities prices, as financial engineering with its tools it was able to redistribute financial risks according to investors' preferences.

2- Due to the tremendous development of information and communication technology, which has led to a significant increase in the volume of financial data and information, and the financial manager is now facing difficult challenges, this has increased the need for financial engineering, whether immediate or short-term and long-term, and the necessity of using new tools in the face of rapid and continuous changes. In interest rates and financial indicators, as well as price fluctuations in commodity markets, as well as credit conditions, all of this requires continuous treatment and support for decision makers.

3- Several modern financial engineering techniques have emerged that have helped reduce the risk rate by creating and developing a large group of new financial instruments and by organizing or engineering them with specific combinations that can determine the centers of risk exposure. The most important of these is the simulation method as a method that is considered one of the most widely used techniques in financial engineering. Operations research, management sciences, financial and banking sciences.

4- The model passed the diagnostic tests (autocorrelation, variance stability, model stability, normal distribution), thus proving the model's ability to estimate without fear of spurious regression.

5- The model proved its predictive ability through its success in screening tests for the purpose of examining the model and proving its ability to simulate.

6- Through the results of simulating the impact of the change in the interest rate on the stock prices of the Iraqi Trade Bank, the following conclusions were reached:

- At the beginning of the research period, there was no significant change in the share price of the Iraqi Trade Bank when interest rates changed by (5%). The reason is not due to the slight change in interest rates, but rather to the time slowdown that does not lead to a quick (immediate) response, but rather takes its time. Until the dependent variable changes as a result of the slow transmission of the effects of economic policies to the market.
- The actual change began at the beginning of the second time period, as a rise in interest rates of (10%) led to a decline in stock prices. This is consistent with the logic of economic theory, as a rise in interest rates leads to a decline in investment, which leads to a decline in demand for stocks. And then their prices fall.

## Resources

John F، Marshall، Dictionary of Financial Engineering، Wiley series in financial engineering، New York، John Wiley and sons، 2000.

Noureddine Boumediene, The financial engineering industry and its impact on the development of Arab financial markets, a dissertation submitted to obtain a doctoral degree in economic sciences, Faculty of Economic, Commercial and Management Sciences, Hasiba Ben Bouali University of Chlef, Algeria, 2014/2015.

Nazir Taroubia, Islamic financial engineering as a strategy for healing the fractures in the international financial system (an analytical vision of what is and what should be), the Second National Forum on the reality of financial engineering and the prospects for its application in Algeria, Adrar University, Algeria, October 28-29, 2010.

Saunders، A. and M.M. Cornett Financial Institutions Management: A Risk Management Approach. (New York: McGraw Hill، 2006) page 34.

Hayat Al-Najjar, Banking Risk Management According to the Basel Accords, Study of the Reality of Algerian Public Commercial Banks, a thesis submitted to obtain a doctorate in economic sciences, Farhat Abbas Setif University 1, 2014.

The official website of the Iraqi Trade Bank on the International Information Network, https://cbiq.com.iq/about-us/ Access date: 3/2023.