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Predicting the behavior of common stock prices using the Fast Fourier Transform and Radial Base Function

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Abstract*:* The research aims to predict the behavior of ordinary stock prices using the vector basis function model and the hybrid model consisting of (the vector basis function + the fast Fourier transform). The research was based on a purposive sample, which is the Bank of Baghdad from the banking sector, for the period from 1/1/2006 to 12/31/2025, with (235) monthly observations of the bank's closing prices. The data was divided into two parts: 80% for training (188 views) and 20% for testing (47 views). Three main statistical criteria were used for comparison: the mean squared error (MSE), the root mean squared error (RMSE), and the mean absolute error (MAE) The results showed that the hybrid model (RBF+FFT) outperformed the radial basis function (RBF) model alone, achieving the lowest values across all error criteria. The study reached several important conclusions, most notably the superiority of the hybrid model (RBF+FFT) over the RBF model alone. Based on these findings, the study offered several recommendations, the most important being the adoption of the hybrid (RBF+FFT) as a tool to support investment decisions, given its accuracy in predicting price trends compared to traditional .This confirms that incorporating the cyclical components derived from Fourier analysis significantly improves the model's ability to understand and predict actual price behavior with greater accuracy..

Keywords : forecasting, common stocks, advanced financial analysis, fast Fourier transform model, radial basis function model,

1. Introduction:

Financial markets reflect the health of the economy and are a key indicator for directing savings towards productive investments. the modern investment model, the importance of common stocks as primary investment tool has appeared, which are related with high levels of risk and Instability. This made stock price prediction a complex challenge for researchers and analysts seeking capital gains and growth. to the sharp and irregular fluctuations in Iraqi stock market caused by various factors (economic,& political, & psychological), traditional financial analysis, such as fundamental & technical analysis and classical statistical models, has proven limited in its ability for provide accurate predictions. This has generated high risks that negatively impact investor decisions. To keep pace with technological advancements and overcome these challenges, there is a pressing need to develop advanced financial analysis models based on machine learning and artificial intelligence techniques.

Therefore, the study concept is embodied in adopting two advanced tools: the Fast Fourier Transform model, which transforms data from the time domain to the frequency domain to detect price cycles and underlying trends, and the second is the Vector Basis Function Network model, which is characterized by its high capacity to processing nonlinear relationships. Thus, the study was launched to fill an important knowledge gap, as it is one of the first studies that sought to build & test a hybrid model (RBF+FFT) in Iraqi market.

It aims to provide a robust & highly efficient quantitative tool that improves precision of forecasting future price trends & enables investors and analysts to identify optimal entry & exit points, thus maximizing profits and minimizing capital losses.

2. Section One: Methodological Framework for Research and Previous Studies

2.1.Research Methodology:

- **The research problem** lies in the inability to accurately predict and therefore the difficulty in making decisions due to the continuous and irregular fluctuations in stock prices. Therefore, the main problem addressed by the study lies in a key question: (Is it possible to predict the behavior of ordinary stock prices for the study sample, the Iraq Stock Exchange, through the use of advanced financial analysis models (the vector basis function and the hybrid model represented: the vector basis function based on the fast Fourier transform model)?

- The importance of the research lies in providing an advanced financial predictive model (the RBF+FFT hybrid model) that is tested with accurate statistical standards, to be an effective tool that enables investors and decision-makers to unravel the complexities of stock prices and accurately predict their trends, thus helping them to identify optimal entry and exit points to maximize profits and avoid capital losses.

-**The research aimed** to achieve a main objective, which is to identify advanced financial analysis models represented by (RBF+FFT) and evaluate the efficiency of the single vector basis function (RBF) model in predicting monthly closing prices of stocks, then present a hybrid model that helps to accurately predict the returns of ordinary stocks in a timely manner to help in making the optimal investment decision and verifying its effectiveness and the accuracy of its results, comparing the performance of the two models (RBF) and (RBF+FFT) to show which is more accurate based on the approved statistical criteria, in addition to a set of sub-objectives.

- The research hypothesis is that it is not possible to predict the behavior of ordinary stock prices using advanced financial analysis models represented in the study by the {Road Basis Function+ model and the hybrid model (RBF+FFT)} as advanced models of advanced financial analysis models, in addition to the sub-hypotheses that there are statistically significant differences in the accuracy of predicting ordinary stock prices in favor of the hybrid model (RBF+FFT) compared to the single model (RBF).

- The spatial and temporal limits of the research were represented by the selection of a purposive sample from the Iraq Stock Exchange consisting of (5) joint-stock companies, representing five vital economic sectors: Bank of Baghdad (Bbob) for the banking sector, Baghdad Iraq for Public Transport (Sbpt) for the services sector, Al-Amin Insurance (Name) for the insurance sector, Al-Mansour Pharmaceutical Industries (Imap) for the industrial sector, and Middle East Fish for the agricultural sector. The study period extended to twenty years, based on the monthly closing prices for the period from (1/1/2006) to (31/12/2025), with (235) monthly observations for each company.

2.2.Some previous studies:

1. The Triparty & Japura study (2020), titled (Forecasting Stock Market using Discrete DWT and ANN Models) the stock market price for nineteen years from (1997) to (2018) hybrid model "(DWT-ANN)" was constructed the Discrete Wavelet Transform analyzes and deconstructs time series to capturer price patterns. These patterns are then used as input to an Artificial Neural Network (ANN) for training and prediction. The model was evaluated using the mean absolute error, and the study found that its accuracy in predicting the stock market price was

92.85%. The research indicated that the proposed DWT-ANN model is one of the suitable models for predicting the stock market price in India. Therefore, it recommends that investors and professional traders exercise greater prudence when making speculative decisions in the stock market to achieve a good return**.**

2. A study by (Al-Badiri, 2023) entitled (Predicting the returns of common stocks using time series models and neural networks). This study aimed to predict the returns of common stocks to improve investment decisions in common stocks through a series of historical data for a sample of companies listed on the Iraq Stock Exchange. The proposed prediction models were selected (Box and Jenkins models and Perstron multi-layer network models), and then the best and most accurate model that could be used to make sound investment decisions was chosen.The study tested the aforementioned time series models and neural network models in light of the data obtained for a sample of companies listed on the Iraq Stock Exchange, totaling (31) companies, for the period from (30/6/2006) to (31/1/2023), using several financial, statistical, and mathematical methods. The study reached a number of conclusions, perhaps the most important of which is the superiority of the multi-layered perceptron network models in reaching accurate prediction values over the Box and Jenkins models, as the perceptron network achieved superiority at the level of (30) companies out of (31) companies, with a percentage of 97%

3. A study (Huang et al., 2025) entitled (A combined Adaptive Gaussian Short-Term Fourier Transform and Mamba framework for stock price prediction) This study aimed to address the forecasting problem in non-stationary and non-linear financial data by modifying the frequency window size and developing a dual (time-frequency) framework. It proposed an advanced hybrid architecture called AGSMNet, which integrates the Fourier Transform (AG-STFT) with the Mamba framework. This method transforms price data (open, close, high, low) into spectral charts to handle both time and frequency sensitivity. Traditional methods typically use the Fourier Transform (FT) to analyze financial time series, transforming the time-domain signal into its constituent frequencies. Using time-domain data, which handles end-to-end dual-domain (time + frequency) modeling, the results generated robust sequence modeling with temporal and spectral sensitivity. The AG-STFT indicator analyzed the temporal and spectral features of stock price movements, capturing dynamics overlooked by traditional models, while Mamba identifies complex patterns.

3. Section Two: Theoretical Framework

3.1. Forecasting is the use of past data and its analysis using mathematical and statistical methods used to predict the future and deal with different future conditions (Bakheet, 2007). The goal of stock forecasting specifically is to identify recurring patterns in financial data and use these patterns to predict price trends and rationalize investment decisions accurately. In addition, when we want to predict stock price fluctuations, the difficulty of forecasting is manifested in several factors that would complicate the forecasting process, such as data availability, time period, speed, cost, and the impact of random events (Malkiel Burton Gordon, 2011).

3.2. common stock Ordinary shares are equal-value securities offered to the public. They are indivisible but tradable, representing an ownership stake in the company's capital. They are issued by companies for expansion purposes or to settle financial obligations and represent the shareholder's right in the company. The holder of an ordinary share is a partner in the company's management to the extent of the number of shares he owns and receives an annual return in return for investing his capital. This return varies according to the company's profits and decisions at that time (Abdul Halim, 2013). As for the returns on shares, they are defined as: the change in the share price during the financial period in addition to cash distributions divided by the share price at the beginning of the financial period (Andini et al., 2020:). The price trend represents the direction of the market and the path it moves in. However, it's important to note that markets generally don't move in a straight line in any direction. Market movements are characterized by a series of zigzag patterns. These patterns consist of a series of waves with distinct peaks and troughs. The market trend is formed from the direction of these peaks and troughs. Whether these peaks and troughs are moving upwards, downwards, or sideways, they indicate the market's direction. Therefore, an upward trend can be defined as a series of rising peaks and troughs, and a downward trend as a series of falling peaks and troughs. Horizontal peaks and troughs can be defined as a sideways trend, although people believe that markets move in an upward and downward direction, but in reality they also move sideways, which represents a period of equilibrium in the price level due to the forces of

supply and demand, which Dow Theory indicated by the line. Investor decisions depend on these trends. In the case of an upward trend, the buying decision is the preferred strategy, in the case of a downward trend, the selling decision is the best, and in the sideways trend, it is wise to stand aside and not make any investment decisions. (Murphy, 2023)

Common stock differs from stock cancellation in several key aspects. While common shareholders advocate for voting rights and participation in the company's strategic decisions, stock cancellation upholds this right. In return, common shareholders compensated with guaranteed interest payments on dividends, which paid to them as priority before any dividends are allocated to common shareholders, who receive varying distributions depending on the company's success and profitability. While common stock offers higher long-term growth potential, it also carries greater risk. In the event of company bankruptcy and liquidation, common stockholders are among the last to receive their funds. Preferred stock, on the other hand, is a more stable and less risky investment, as its holders have priority in recovering their financial rights before common stockholders. (Abdul Halim, 2013)

3.3 **Financial Analysis of Stocks:** Financial analysis of stocks refers to the method used by investors or traders to evaluate a specific stock or the stock market as a whole. This analysis provides traders with an overview of the securities market, enabling them to make buy or sell decisions based on this information. Investors make buy or sell decisions based on this information. They study past and present market data and then create a methodology to select suitable stocks for trading as well determine the optimal entry and exit methods. (Nahla, 2023) Traditional financial analysis model include fundamental & technical analysis. (Al-Shabib, 2009) Advanced financial analysis is the innovative and sophisticated application of quantitative and qualitative tools, going beyond traditional financial analysis by using mathematical and statistical models, as well as machine learning and deep learning models. In recent years, long-term memory networks, a type of recurrent neural network (RNN), have gained prominence for their ability to effectively model continuous data. (Paul & Tanwar, 2025) Advanced financial analysis models include profit-generating strategies, loss-minimizing strategies, balanced strategies, and several considerations that must be taken into account when applying advanced financial analysis strategies (Shanouf, 2014). These include time series analysis and time-domain forecasting, which represent a sequential tracking of data (such as stock prices) over regular time periods to understand historical trends and predict future trends (Baghza & Al-Akrouf, 2022). This allows analysts to deduce how economic variables affect each other over time (ADAM, 2025).

Artificial neural networks: Artificial neural networks are an information system that attempts to perform the tasks of the biological neural network (the brain), which consists of billions of neurons connected to each other via synapses. The function of the biological neural network is to collect signals from neighboring cells, and then send its signals to other neighboring neurons. In contrast, the artificial neuron collects the input sent from other neurons and then applies an activity function to it, which produces the output of the artificial neuron and sends it to other cells Artificial neural networks are computing models inspired by the human brain and are part of the field of artificial intelligence. These networks are used to process data, learn from it, discover patterns, and make intelligent decisions. They consist of multiple layers of computational units known as nodes and rely on precise calculations to achieve the desired goals (Al-Maslati & Juha, 2019) (Ibrahim et al., 2021).

In frequency prediction, the time signal is converted into its frequency and periodic components to detect hidden cycles, which is represented by **the Fourier Transform (FT) model:** developed by Gauss and Fourier to decompose signals into (sine and cosine) waves, thus providing accurate information about the fundamental frequencies in the data**.** It is a mathematical formula that transforms periodic and non-periodic signals from the time domain to the frequency domain, then analyzes the signal's frequency content. This contributes to analyzing and understanding the response of linear systems that do not change with time in the frequency domain. It is calculated in two ways: the first is the time domain differential, and the second is the frequency domain differential, where a portion of the time domain is projected onto the frequency domain. (Saqib, 2022) (Kanaskar2023) (Raikar, 2025). It is divided into three categories: Fourier series, discrete Fourier, and fast Fourier. It is used to analyze frequencies and understand the response of systems by converting data from the time domain to the frequency domain (Mathword, 2, 2025).

4. Section Three: The Applied Framework of the Research

The predictive power of the proposed models was tested on the Baghdad Bank time series data for the period (2006-2025)

1. Statistical description of Baghdad Bank stock price data:

Some descriptive statistics were found for the monthly closing prices of Baghdad Bank, with the aim of identifying the general characteristics of the time series in terms of price level, its fluctuations and the nature of its statistical distribution before moving on to analysis and prediction.

Table (1) shows the general statistics for monthly closing prices

Descriptive Statistics							
	N	Minimum	Maximum	Mean	Std. Deviation	Jarque Bera	p-value
Bank of Baghdad	235	.240	4.480	1.80004	1.104521	12.508	0.001923

Source: Prepared by the researcher using SPSS software and the R programming language.

The results in the table above show that the lowest price value was 0.240 and the highest was 4.480, indicating a fluctuation in price levels during the study period. The wide price range between the highest and lowest stock price points to significant fluctuation in stock performance over time, a common phenomenon in financial markets affected by internal and external economic and financial factors. The arithmetic mean was 1.800, representing the price level around which values were concentrated during the study period. From financial perspective signifies the average market value of the comma stock during the Investigated period it's also can be regarded a benchmark for assessing. The standard deviation "1.104521". This indicates a relatively high degree, the higher the standard aberration, the greater the risk related to the stock, reflecting larger fluctuations in monthly prices., the Jark-Pera test yielded a value of "12.508" with probability value of "0.001923" which is less than the researcher's target significance level of "0.05" This indicates the refusal of the null hypothesis. This means the monthly closing prices do not follow a normal distribution.

1. Forecasting stock prices of Bank of Baghdad with hybrid model "RBF+FFT"

that combines "FFT" with "RBF" network is an advanced approach time series analysis It aims to leverage FFT ability to identify the cyclical & oscillatory components of the price time series and then input them into the RBF network & predict complex price relationships and fluctuations. This combination allows us to improve forecasting accuracy, particularly for volatile irregular financial data.

2. Forecasting the stock price of Bank of Baghdad with "FFT" model

To identify the cyclical characteristics inherent in the price time series, the detrending trend was first removed to isolate the true fluctuations around the mean. Then, the Fast Fourier Transform (FFT) was applied to extract the frequency components. This procedure helps determine whether the series contains dominant cyclical patterns that can be used to improve the performance of forecasting models when combined with a radial basis function (RBF) model. The following figure shows the data plot after detrending (top figure) and the estimated frequency spectrum function (bottom figure):

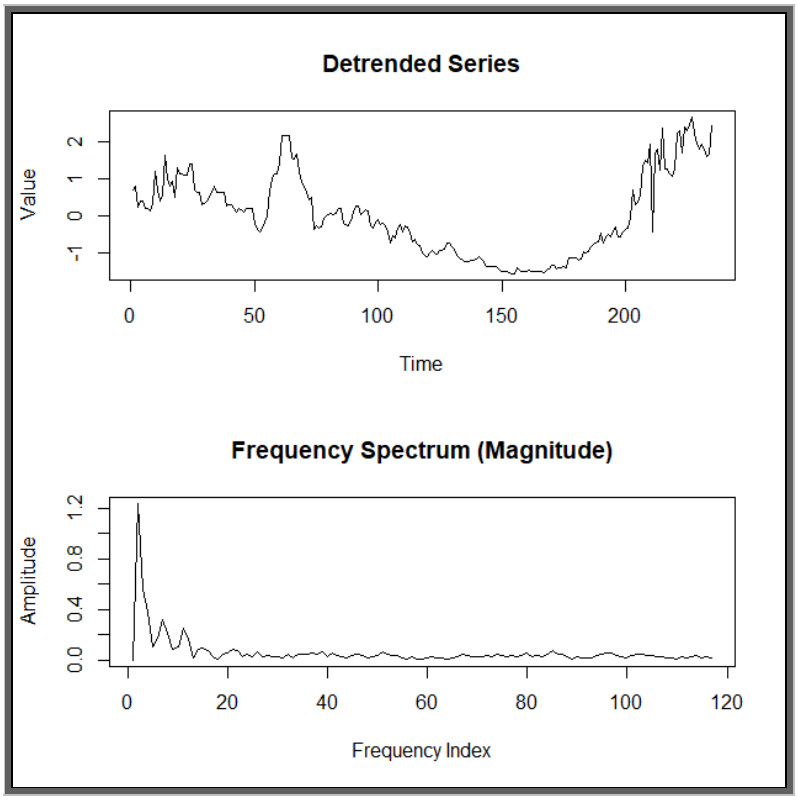

Figure (1) the data after removing the overall trend & estimating the frequency spectrum function

Source: "Prepared by the researcher using SPSS software and the R programming language"

.

The top graph detruded time series, obtained after removing the average or trend component for isolate fluctuations around zero. We observe that] values fluctuate irregularly between as rises & falls, with periods of high volatility, particularly in latter part of the data. This suggests possibility of cyclical components or recurring patterns within data after trend removal.This confirmed by lower graph, which is the frequency spectrum of series "Frequency Spectrum – Magnitude".

"Financially, when we say that the energy is concentrated at lower frequencies, it means that slow movements or long-term cycles have the greatest impact on price changes, while rapid, short-term fluctuations are relatively less significant." This suggests that there is a somewhat dominant cyclical component to the series. On the other hand, the amplitudes decrease significantly at higher frequencies, indicating that rapid or random fluctuations had a lesser impact compared to the main cyclical component.From the above, we note the suitability of using Fourier Transform (FFT) analysis to extract the important periodic components in preparation for using them in modeling and in building a hybrid model (RBF+FFT) to improve the accuracy of the prediction. The researcher found the results of the Fast Fourier Transform (FFT) and extracted the most important frequency components with the greatest impact and represented the periodic patterns inherent in the data and used them to predict the future behavior of the price time series for this bank, as shown in the following figure:

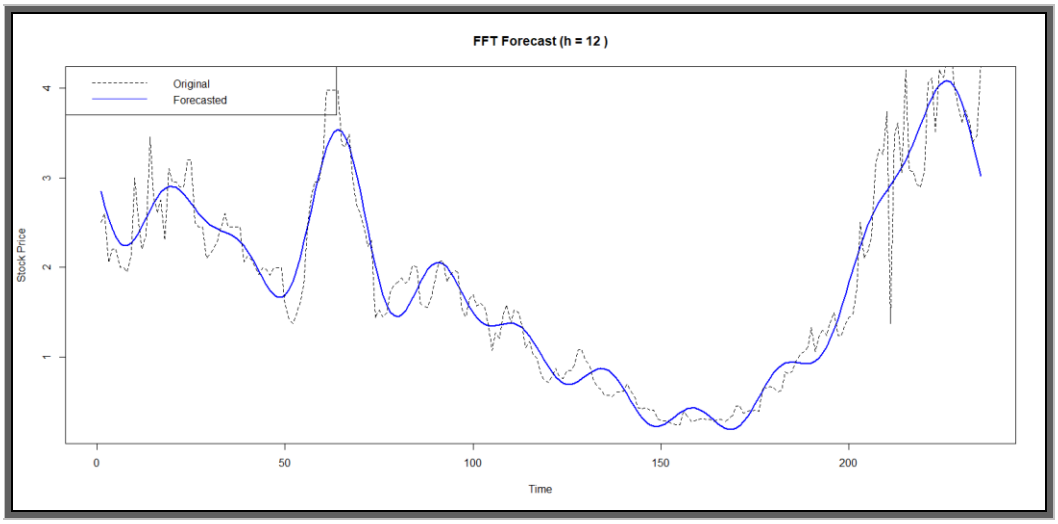

Figure (2) illustrates the frequency components and periodic patterns inherent in the data according to the Fourier Transform

The figure above illustrates that the Fast Fourier (FFT) model successfully identified key price cycles in the price data. The predicted line (blue line) demonstrates its ability to track the general upward and downward trends of price movement. In other words, the market exhibits clear cyclical components, such as recurring upward and downward waves, which can be used for short- to medium-term forecasting and achieving the intended message. Furthermore, the predicted values indicate that the model focused on long-term fundamental movements and disregarded sharp random fluctuations. This financially demonstrates the model's ability to represent general market trends and cycles . However, it may not identify sudden shocks or unexpected changes that cause sharp short-term fluctuations, which prompted the researcher to integrate these results with the RBF network to predict price values by adopting FFT outputs as one of the RBF network inputs to increase prediction accuracy.

3. Predicting the share prices of Bank of Baghdad using the "RBF+FFT" model (hybrid model)

The network information table shows that the (RBF+FFT) model was constructed using two input variables: the time-delayed price and the frequency component extracted from Fourier analysis (FFT1). The hidden layer of the network comprised 10 hidden nodes, the number of which was determined by achieving the lowest predictive error. The activation function (Softmax) was used in the hidden layer to highlight the relative importance of the nodes, while the activation function (Identity) was used in the output layer to suit the nature of the continuous dependent variable representing the prices.

Table (2) shows the general network information according to the RBF+FFT method.

Source: Prepared by the researcher using SPSS software and the R programming language.

Network Information			
Input Layer	Covariates	1	price1
		2	FFT1
	Number of Units		2

	Rescaling Method for Covariates		Standardized
Hidden Layer	Number of Units		10[a]
	Activation Function		Softmax
Output Layer	Dependent Variables	1	Price
	Number of Units		1
	Rescaling Method for Scale Dependents		Standardized
	Activation Function		Identity
	Error Function		Sum of Squares
a. Determined by the testing data criterion: The "best" number of hidden units is the one that yields the smallest error in the testing data.			

The following diagram includes the RBF network architecture supported by Fourier Transform (FFT) analysis used in bank data analysis:

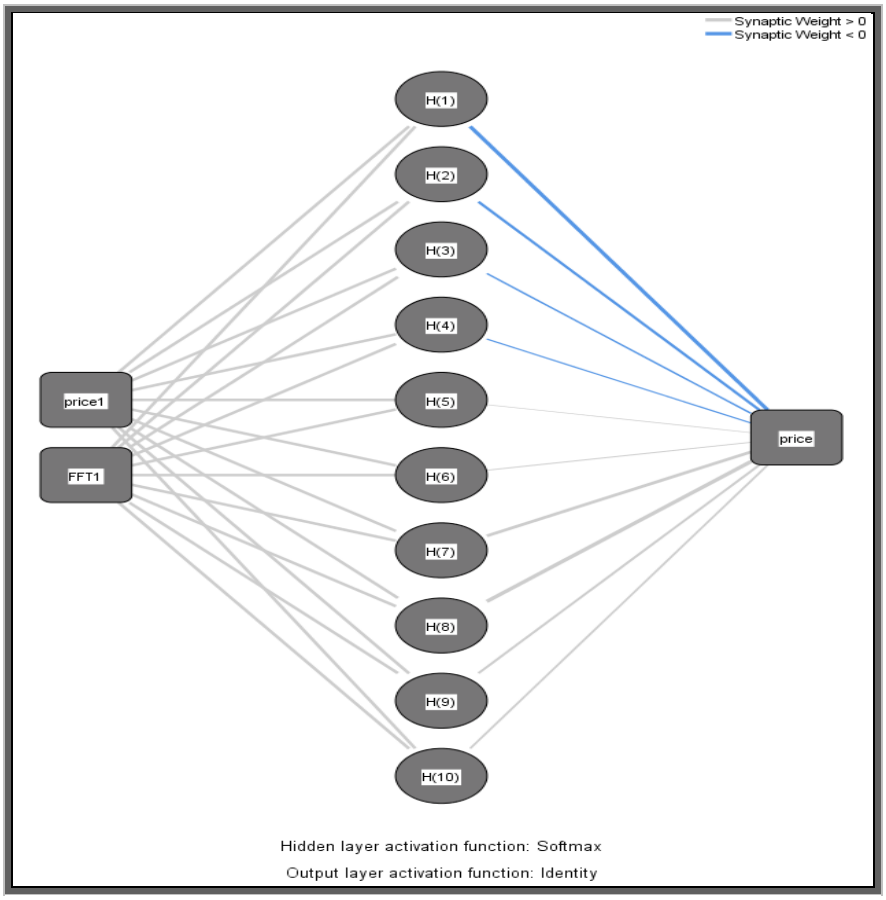

Figure (3) illustrates the network architecture according to the RBF+FFT method. Source: Prepared by the researcher using SPSS software and the R programming language.

The figure describes the structural representation of a vector basis function network (RBF+FFT). We note that the network consists of three main layers. The first is the input layer, which includes two variables: the price variable and the frequency variable resulting from the FFT. Then, the signals are transferred from this layer to the hidden layer and from there to the third layer, which is the output layer, which includes a single node representing the price variable, which is the predicted variable.

The following table includes Fourier analysis-assigned vector basis function (RBF+FFT) network parameter estimates, containing the center vectors for each hidden unit, the width of each RBF, and the binding weights between the hidden and output layers.

Table (3) shows the estimates of the parameters of the vector basis function network according to the RBF+FFT method

Parameter Estimates												
Predictor		Predicted										
		Hidden Layer										Output Layer
		H(1)	H(2)	H(3)	H(4)	H(5)	H(6)	H(7)	H(8)	H(9)	H(10)	Price
Input Layer	price1	-1.374-	-.995-	-.436-	-.262-	.149	.497	1.366	2.170	1.077	.292	
	FFT1	-1.449-	-.971-	-.497-	.083	.024	.603	1.465	1.942	.956	.855	
Hidden Unit Width		.097	.153	.187	.172	.214	.200	.261	.232	.252	.366	
Hidden Layer	H(1)											-1.382-
	H(2)											-.998-
	H(3)											-.422-
	H(4)											-.338-
	H(5)											.014
	H(6)											.173
	H(7)											1.374
	H(8)											2.023
	H(9)											.968

	H(10)											.880

a. Displays the center vector for each hidden unit.

Source: Prepared by the researcher using SPSS software and the R programming language.

The parameter estimation table in the RBF+FFT model shows the hidden unit centers and the interlayer correlation weights, reflecting how the two input variables—the time-lag price (price1) and the frequency component (FFT1)—interact to interpret future price behavior. It is evident that both the time-lag price (price1) and the frequency component (FFT1) have different values and signals across the ten hidden units. In output layer, the weights of hidden units associated with price are shown, such as H (7) and H (8), have relatively large positive weights.

Units with negative weights, such as H(1) and H(2), represent market patterns that exert downward pressure on the price. Therefore, the final forecast is the result of a non-linear interaction between the previous price trend and the cyclical frequency components extracted from the FFT, where each hidden pattern determines its contribution to shaping the expected price according to the prevailing market conditions. The following figure illustrates the plotting of true and forecast values using the RBF method and the RBF method enhanced with the prevailing frequency pattern in prices (RBF+FFT):

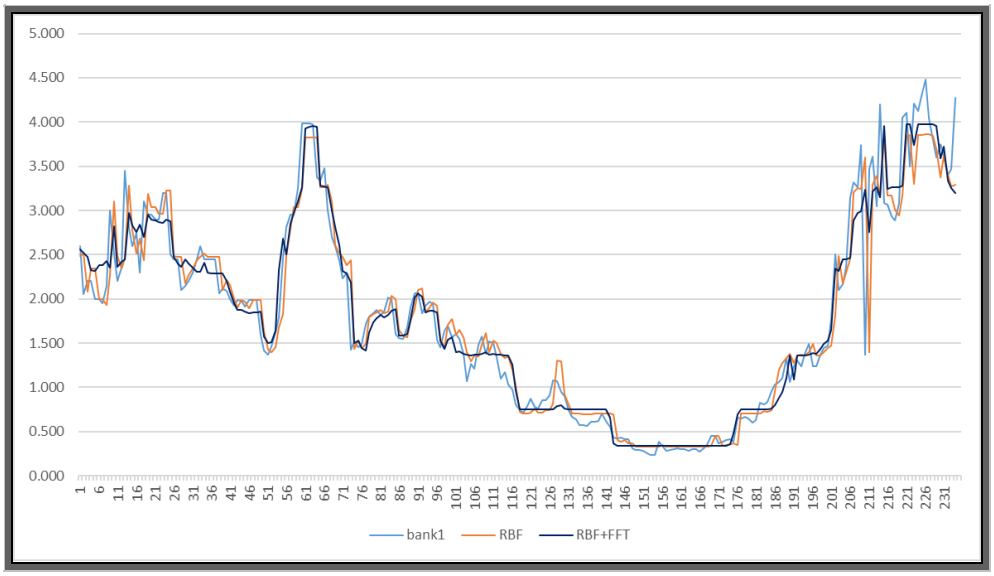

Figure (4) illustrates the actual and predictive values according to the RBF and RBF+FFT methods.

Prediction Accuracy Test:

Finally, the researcher found the values of the comparison criteria between the two methods in order to judge the superiority of the appropriate method in future prediction. The study was based on three criteria: the mean squared error (MSE), the root mean squared error (RMSE), and the mean absolute error (MAE), as shown in the following table

:

Table (4) shows the values of the comparison criteria according to the RBF and RBF+FFT methods.

Preference	MAE	RMSE	MSE	Method
RBF+FFT	0.19001	0.334232	0.11171	RBF
	0.18593	0.2854709	0.08149	RBF+FFT

Source: Prepared by the researcher using SPSS software and the R programming language.

The results of the comparison table show that the (RBF+FFT) model achieved lower values across all comparison criteria. This indicates an improved ability of the hybrid model for reduce the gap between as. This demonstrates that incorporating frequency components from Fourier analysis enabled the model to identify price cycles more accurately. Therefore, (RBF+FFT) can be considered the best-performing model compared to the (RBF) model alone. Finally, the researcher calculated the future predictive values for a 12-month period and presented the results in the following table:

.Table (5) shows the future predictive values for one year according to the RBF and RBF+FFT methods

Actual values for 4 months of 2026	RBF+FFT	RBF	Time
3.130	3.230	3.300	Jan-26
3.110	3.190	3.857	Feb-26
3.410	3.310	3.852	Mar-26
3.310	3.400	3.860	Apr-26
	3.478	3.862	May-26
	3.477	3.841	Jun-26
	3.451	3.691	Jul-26
	3.591	3.377	Aug-26
	3.419	3.615	Sep-26
	3.333	3.402	Oct-26
	3.249	3.270	Nov-26
	3.199	3.288	Dec-26

.Source: Prepared by the researcher using SPSS software and the R programming language

6. The fourth section: Conclusions and Recommendations

In view of the results of the statistical analysis, a set of conclusions and recommendations were attained, as follows:

First: Conclusions

1. The results presented that the hybrid model (RBF+FFT) attained the highest predictive accuracy in comparison to the single RBF model for Bank of Baghdad.
2. The frequency spectrum analysis revealed that the stock price time series contains clear cyclical ingredients with long-term effects, which are more dominant in determining price movements, while short-term random Changes are relatively less influential. Using these Ingredients as inputs in the RBF model contributes to improving the prediction accuracy and reducing the gap between actual and expected values.
3. The study demonstrated the feasibility of successfully implementing advanced mathematical models (FFT) and artificial neural networks (RBF) to the Iraqi stock market, paving the way for the evolution of local financial analysis tools.
4. The study Substantiated that the analysis period (2006–2025) witnessed exceptional events (post-2003, the 2014 liquidity crisis, the COVID-19 pandemic, and the coronavirus crisis) that caused sharp and irregular price fluctuations. The hybrid model revealed a better capability to capture the effects of these collisions compared to traditional models.

Second: Recommendations

1. The study recommends that investors, financial analysts, and brokerage firms in the Iraq Stock Exchange adopt the hybrid model (RBF+FFT) as a tool to support investment decisions. Given the model's accuracy in forecasting price trends In comparison to traditional models, it is advised to use its outputs to develop automated trading strategies that provide to identifying optimal entry and exit points.
2. Emphasizing the need to move beyond separate fundamental and technical analysis, and instead integrate the outputs of advanced models to improve the accuracy of investment decisions and reduce risks emerging from abrupt fluctuations, universities and colleges should include artificial intelligence applications and advanced financial analysis models (such as neural networks and machine learning models) into their financial and econometric analysis curricula.
3. The study recommends that market management develop these models accurate and comprehensive computerized databases of stock prices & trading volumes allowing researchers & analysts easy access to use in studies ,research. Thus developing accurate & reliable predictive tools.
4. The study proposes to regulatory bodies & the Securities Authority to invested in these advanced models and in building "early warning system" that contributes and help to monitoring unjustified fluctuations or detecting price bubbles early , thus helping to have preventive measures to maintain market stability.

7. Bibliography:

A. Arabic sources

1. Ibrahim, Ibrahim Ahmed, Saleh, Al-Amin Mustafa, Raja, and Abbas, Magdi Abdel-Ilah Mohamed. (2021). Using Artificial Neural Network Models in Regression Analysis to Study Factors Affecting Inflation in Sudan during the Period (2018-2020). Journal of Humanities and Natural Sciences, 2.
2. Al-Shabib, Duraid Kamel. (2009). Investment Management (Investment Analysis, Financial Markets, Investment Portfolios). Dar Al-Yazouri Scientific Publishing and Distribution, Amman, Jordan.
3. Bakhit, Hussein Ali, and Fathallah, Sahar. (2007). Econometrics. Dar Al-Yazouri Publishing and Distribution, Amman, Jordan.
4. Baghazza, Adel, and Al-Akrouf, Ali. (2020). Using Time Series Models and Modern Software to Forecast Algeria's Population by 2040. Abaad Journal, 9(2), 50-70.
5. Al-Shanouf, Shuaib. (2014). Modern Financial Analysis. Zahran Publishing and Distribution House, Amman, Jordan.
6. Abdel-Halim, Muhammad Farah. (2013). Financial Markets and Stock Exchanges (Second Edition). University of Science and Technology Center for University Books, Sana'a, Yemen.
7. El-Feky, Nahla Rabie Mahmoud. (2024). The Role of Financial Markets in Development. Al-Shorouk Journal of Business Sciences (Special Issue). Al-Shorouk Academy, Faculty of Commerce, Sadat University, Egypt.
8. Al-Maslati, Abdullah Ali, and Juha, Ahmed Abdel-Qader. (2019, March 4-6). Using Neural Networks for Time Series Prediction Using Backpropagation Training [Research Paper]. International Conference on Technical Sciences, Misrata University, Libya.
9. Murphy, John. (2023). Technical Analysis of Financial Markets (Translated by Shaimaa Suleiman). Jarir Bookstore, Riyadh, Saudi Arabia.

B. Foreign sources

1. Adam, Hayes, A .2025 .Fundamental vs. Technical Analysis: What's the Difference ?Investopedia. Retrieved from
2. Andini, E. N., Mi, C. L., Yanza, F. R & ,.Putri, F. P. (2020). Benefit of accounting information on share return . Egypt Journal of Archaeology of Egypt
3. Kanaskar, S. 2023. Predicting Stock Prices: Using ARIMA, Fourier Transformation and Deep Learning. Medium. Retrieved from https://medium.com
4. Malkiel, B. G. (2011). The efficient market hypothesis and its critics .Journal of Economic Perspectives
5. Paul, S & ,.Tanwar, S. (2025). Stock Forecasting Using LSTM Neural Networks .Intelligent Communication, Control and Devices .Springer
6. Raikar, S. P. (2025, November 13). Three's A Quiz at Amazon, 5Q Daily: The 2024 Collection at Amazon. Britannica. Retrieved from https://www.britannica.com
7. Saqib, M .2022 .Computer-Based Chemistry .EduGorilla Community Pvt Ltd.

Weisstein, E. W.2025. Fast Fourier Transform. MathWorld -A Wolfram Web Resource. Retrieved from https://mathworld.wolfram.com/FastFourierTransform.html