

# Analytical study of stock price movement in the Iraq Stock Exchange (Study of a sample of banks)

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## **Abstract**

*The research discussed analysis of stock prices in the Iraq Stock Exchange, an applied sample of Iraqi banks listed on the Iraq Stock Exchange, by the commercial bank, from 2018 to 2019. Daily share prices were used, the main purpose was to analyze the sectors whose shares are listed in the financial market, use of Box-Jenkins, methodology to forecast stock prices on a daily basis, the study found that raising bank capital, according to the instructions of the Central Bank of Iraq, it provides greater protection for depositors, by the expense of the bank's profitability, raising capital requires injecting new shares into the financial market, in the economic point, oversupply negatively affects stock prices, at the limited private banking activity, the increase in the number of companies listed on the market has nothing to do with the number of shares, and not even its value in terms of high and low, the increase in the number of companies whose shares are traded in 2019, however, the number and value of shares traded were low compared to the same year. The study also concluded that the Box-Jenkins methodology should be used, as the future prices forecasting of stock prices can be Forecasted objectively, approximating reality, the most appropriate model through which to make a forecasting was 2,1,1 for the commercial bank.*

**Keywords:** analytical study, stock price movement, Iraq Stock Exchange

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## **1. Introduction**

Financial markets were a legal framework based on trading the shares of many companies or organizations, the financial market was in a continuous rise, it can be reflected in the performance of the economy as a whole, it has an increased growth and is often considered a major indicator of a country's economic strength and development, economic growth can affect the financial market, meaning that there was a reciprocal relationship, the economy grows, reflects on the financial markets to an upward trend in prices, in contrast when the economy is slowing down, stock prices tend to be low and the markets may take some time to form a decline or make a rise, sometimes for two years or more, makes it difficult to determine when the market is up or down, also, stock market patterns were non-linear in nature, it is difficult to Forecast the future directions of its behavior, the rise in stock prices is usually associated with an increase in commercial investment, affects household wealth and consumption, therefore, it is necessary for the central bank in any country to monitor the behavior of the stock market, follow up the functioning of the financial system functions, stock prices change every day as a result of market forces, which were the forces of supply and demand, according to supply and demand, the share price will either rise or fall, equity traders always want to buy stocks at lower prices and sell them at a higher price, therefore, it is difficult to determine the best time to buy or sell and to carry out the process, investments can also generate significant returns or losses, because of the cyclical fluctuations in prices, it is useful to come up with statistical models to obtain approximate estimates, to forecasting the movement of stock prices, a forecasting method has been developed to Forecast the future trends of the stock market, hidden or invisible situations, determine the behavior of equity value, which was usually invisible to the investor.

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## **2. Research Methodology**

### **First: Research problem:**

For investors to rationalize their decisions regarding buying or selling shares, it takes forecasting their prices in the future, and usually it was subject to fluctuations due to market forces, the research problem was the ability of the Box-Jenkins model to explain these oscillations, and Forecast the future prices of stocks.

**Second: Research objectives:** The research objectives are summarized as follows:

- A. Analyzing the reality of the Iraq Stock Exchange according to the number of shares, trading volume and companies traded in the market.
- B. The behavior of the share price value (the case to be estimated or Forecasted using the Box-Jenkins model) for the commercial bank is determined the rise and fall for the purpose of Forecasting it in the future.

### **Third: Research importance:**

Most of the investors in the stock market seek to take the right decisions, to achieve profits by expecting prices in the future, these decisions cannot be close to reality, without being based on an accurate scientific method, in implementing the Box-Jenkins model in the organizations shares listed on the Iraq Stock Exchange, to expand its vision on stock prices in the future and make its decisions as close to practical reality.

### **Fourth: Research hypothesis:**

The research starts from the hypothesis that the statistical program was able to explain the behavior of stock prices from high and low, includes the following:

- A. Description and structure of the model:
- B. Estimation of the model parameters.
- C. Choose the best model.
- D. Use the best model to conduct the forecasting process.

### **Fifth: Temporal and Spatial limits of research:**

The research sample was the commercial bank, it is one of the banks whose shares were listed in the Iraq Stock Exchange, from 2018 to 2019, as banks' share prices were taken on a daily basis to conduct the forecasting process.

### **The first topic: Iraq Stock Exchange, a theoretical framing**

#### **First: The emergence of the Iraq Stock Exchange:**

The history of the establishment of the Iraq Stock Exchange goes back to the thirties of the last century, the law that permitted trading in shares and bonds was issued in 1939, then the number of companies increased until it reached 40 companies in 1950, shares trading in an unofficial market, then Law No. 31 of 1975 was issued authorizing the general public to invest in the shares of these companies. In the 1960s, and after the political events that occurred in the first half of them, Law No. 100 of 1964 was issued, which resulted in the nationalization of companies and commercial banks, resulted in a significant drop in stock circulation, economic activity became managed by the government until the first half of the eighties decade. (Abdel Hamid and Hamza, 2012: 264). At the beginning of 1987, the Iraqi economy tended to shift towards engaging the private sector, by privatizing some state-owned enterprises, the establishment of joint stock and mixed companies, the need for the necessity of establishing an organized market in which companies' shares were traded, the Baghdad Stock Exchange was established in accordance with Law (24) of 1991, the market has an independent moral personality, because it is an institution of public benefit, it does not aim to achieve profit, but rather to regulate and monitor securities and their circulation, to provide ease and protection for dealing and serving the interest of the national economy, the development of savings and investment awareness (Jaseb

and Tayeb, 2019: 51). The market was a governmental market, 113 Iraqi joint stock and mixed companies were included, able to attract annual trading rates in his last year that exceeded seventeen million dollars and a half. At April 18, 2004, Temporary Law No. 74 was issued establishing two institutions, namely the Iraq Stock Exchange and the Iraq Stock Exchange Authority, the Iraq Stock Exchange was an economic market with financial and administrative independence, not linked to any party, it was administered by its council of members representing the economic sectors of the investment sector called the Board of Governors. (Al-Shendi, 2013: 62). As for the Iraq Stock Exchange, it is a regulating body for the capital market, it was established under Law No. (74) of 2004, enjoys financial and administrative independence, the aim of establishment to protect investors in securities in the stock market, regulating and developing the capital market, to ensure fairness, efficiency, and transparency, and to protect the market from the risks it may be exposed, based on managing the authority and supervising its affairs, the board, which consists of five commissioners, including the president, his deputy and the remaining members with experience and competence, the council is entrusted with many tasks to achieve its goals, includes preparing draft laws and regulations, issue instructions, to approve the instructions and internal regulations of the capital markets and the depository center, licensing markets and brokerage firms, approval of listing the securities in the market.

(The official website of the Securities Commission, visited on 3/22/2019).The market sought to achieve a set of goals, including organizing and training its members and companies listed on the market, as well as promoting the interests of investors with a free, secure, efficient, competitive and transparent market, organizing and simplifying securities transactions in a fair, efficient and orderly manner, includes clearing and settlement operations for these transactions, organizing the dealings that its members undertake in everything related to the purchase or sale of securities, determine the rights and obligations of the parties, serving the national economy by developing the money market in Iraq and helping companies build the capital needed for investment, educating investors, whether Iraqi or foreign, about investment opportunities in the market, as well as communicating with Arab and international markets in order to develop the market(Annual Report of the Iraq Stock Exchange, 2018: 10).At the beginning of its opening, the market was operating in the manner of manual trading and recording on plastic panels, each company has its own plate, and its shares are traded in the manner of written public auction, the most important market achievements are the following:

- A. training and development.
- B. Buying a permanent building.
- C. Complete all market operation requirements.

The most important advantages of trading is that the prices of traded shares are free, depends on the supply and demand factors, the available information and data from the joint stock companies, and their financial position, the most important micro and macro-economic developments in the Iraqi economy and future expectations. The Iraq Stock Exchange approved brokers' licenses issued by the dissolved Baghdad Stock Exchange and allowed them to carry out trading operations, previously, trading was done by pen and paper, buyers call or yell at brokers who stand next to whiteboards on which the buy and sell price of their company's shares appears. (Alayalah, 2014, 190).

Continued in this state until April 19, 2009, after the completion of the work and the requirements for working with the mechanisms of the electronic system, the first session of the market was held electronically on Sunday 19/4/2009(Annual Report of the Iraq Stock Exchange, 2016: 9).

The framework of the rules and instructions governing electronic trading, two sessions were held each day, which is the pre-opening session, and it takes place between 9.5 to 10 am, to enter orders and to determine the opening price and the second session called the continuous trading session for a period between the hours 10 to 12, in it, transactions are executed on orders that fulfill the trading conditions, as for the market to close at 12.30, after the end of the continuous trading session, as the electronic system calculates the closing price on the basis of the weighted average and for all traded deals, reports are also printed on the entered orders and the transactions that have been completed, and it is not possible to enter any order or change prior orders, and this process takes place from 12 to 12:30 hours

(Samari, 2015, 535). The calculation of the opening price, article 5 of the instructions for the Iraq Stock Exchange specified the method in which the opening price is to be made, a company's share has only one opening price, the orders that were traded at the market's opening are described, trade at this price and the price was calculated based on the conditions available in the Register of Regular Conditions, there is a set of criteria used to determine the opening price, which is the amount of shares available at each price, the remaining amount of shares after potential matches, the net change in the closing price from the previous continuous trading session, the share price, as for presenting price data, Article (6) of the Market Instructions has indicated that the price of the order that was entered in the pre-opening session is considered private information, for this reason, the market resort to displaying some orders at prices that differ from their actual prices (the opening price that was calculated).

The purpose is not to reveal the actual price of the order in the pre-opening session, for the purpose of verifying the opening of trading on the company's shares at the fairest possible price based on the supply and demand conditions determined by the market, taking some considerations, including the calculated opening price may change during the pre-opening session with the introduction of new orders to the system, during the pre-opening session, orders are described whose prices are better or equal to the opening price that the system calculated, the actual prices can only be found by market supervision, also, orders whose prices are lower than the opening price are described at their actual prices during the pre-opening session and after the market opening.

There are two types of markets in the Iraq Stock Exchange, it is the statutory market that the instructions (15) in Article No. (1) define as the market in which the issued securities are dealt with, in accordance with the provisions of the laws and Instructions No. (6) issued by the Market, as these instructions are represented by the conditions for listing securities in the regular market, perhaps one of the most prominent of these instructions is for the company to submit an application to be listed on the market and accompany it with the incorporation contract certified by the Companies Registration Department, the company must also obtain the approval of the General Assembly, it was established for a period of no less than two years, issued two audited budgets, and the General Assembly can list the company that was established one year ago and issued at least one financial statements audited by an independent auditor. The number of shareholders must not be less than 100 shareholders, the financial data provided by the company must include the annual data that includes the balance sheet, profit and loss statement, cash flow statement, and the necessary clarifications on the data, as well as the quarterly financial statements that include the general budget, profit and loss account, cash flow statement, the equity of the shareholders in the company must not be less than 100% of its paid-up capital, the company has achieved actual distributable profits.

As for the second market, it is that part of the market through which securities are traded that are governed by instructions and special listing conditions, article 15 defined a set of instructions governing the conditions for listing companies in the second market, including, submitting a listing application to the Iraq market and a memorandum of incorporation certified by the Companies Incorporation Department, the company has been in business for a period of not less than one year, the financial statements must include annual data that includes the general budget and profit and loss account, the cash flow statement, accompanied by a report from the Board of Directors and the auditor, and a quarterly statement containing the statements mentioned in the annual financial statements, equity is not less than (50%) of the capital, the companies listed on the second market have their own trading instructions, including the closing price or opening price of any security is not calculated, rather, the rate of shares is calculated for each company separately in each trading session, the price was free for three actual trading sessions after the company is listed, and the market instructions have set the minimum and maximum price within (20%) of the average price of the previous session. The instructions of the secondary market also specified how to go from the regular market to the primary market, and it is in special cases from us as follows:

1. Failure of the company to implement the listing in the regular market as specified in article 6 of the regulatory market instructions

2. The decrease in the number of executed contracts on the company's share price from 25 annual contracts, or the decrease in the annual trading volume below its capital by 1%, as well as the decrease in the number of trading days for 25 days during the year.
3. The decision issued by the Board of Governors after submitting a recommendation from the authorized director of the Market and with the approval of the Authority.

As for ascending from the second market to the regular, it is represented by submitting a request by the company's board of directors in the event that the listing conditions mentioned in Instructions No. 6 were met, likewise, the market has its own disclosure instructions, including instructions to submit annual statements audited by a legally authorized auditor, to the Market Authority and publish it within a period of 150 days from the end of the year, and submit quarterly financial bulletins, i.e. every three months, disclosure of material events that affect the company's activity, in the order on the stock market No. (13/204) on 3/9/2010 that specifies the requirements of disclosure, imposing a monthly fine of (250,000) thousand dinars in case of exceeding the (150) days specified by the annual disclosure instructions, the fine was only imposed for a period of (60) days, in the event that more than (60) days are exceeded and the company does not disclose the company's shares, trading in the market shall be suspended. The company whose shares have been suspended cannot return to the market except after fulfilling the requirements for disclosure and paying the monthly fine plus two million dinars in return for re-trading, the decision imposed a fine of (50,000) thousand dinars for every month for every company that does not make quarterly disclosure, outside the specified period and its period of (60) days from the end of the semester, provided that the amount of the fine does not exceed (100,000) one thousand dinars for each semester.

#### **Second: The mechanism followed by the Iraq Stock Exchange when buying shares:**

The Iraq Stock Exchange has identified five mechanisms that can be followed when buying shares in the market, and they are as follows:

1. Opening an account on the electronic system at the Depository Center and obtaining the investor number electronically based on the official identification documents of the Iraqi and foreigner.
2. Whoever owns the shares, deposit the share certificate, in the depository center for the purpose of dealing with it.
3. Contacting a licensed brokerage company, or more than one brokerage firm, for the purpose of executing buy and sell orders. Note that the same order cannot be given on the same security in the same session through more than one broker.
4. Signing the investor-broker agreement and authorizing the purchase or sale and the daily accounting for each order execution.
5. Monitor stock prices, monitor the company's financial position, disclose, and follow up market reports and bulletins before making a decision to buy or sell.

#### **Third: the role of the Iraq Stock Exchange in the Iraqi economy and the challenges it faces:**

The stock market represents, in one way, the investment climate for the movement of capital, other side also reflects the activities and volume of production, its development and the activity of private and mixed projects, it is one of the important savings and investment devices, funds of individuals, banks, companies, investment, insurance, and intermediary financial companies are invested. The securities that represent shares in the capital of the establishments are traded, the market provides the borrower with medium and long-term credit to invest his money easily, conveniently and with an appropriate return, despite the profits achieved by the joint-stock companies, they are exposed to a deterioration that led to the decline of most of their shares in the market (Al-Shendi, 2013: 65).

The Iraqi market for securities has been greatly affected by the economic recession and the financial crisis that the Iraqi economy has been experiencing since 2014, due to the continuous drop in global oil prices, the costs of the war on terror, and other economic accumulations that led to a decline in the growth rate in the gross domestic product to

(0.5%), an increase in unemployment rates to 50%, poverty to 25%, inflation to 2%, and a decrease in the saving rate of the Central Bank of Iraq to the limits of 20%. The hoarding percentage of the total cash mass of citizens also increased, and this was reflected in the business market, all this led to a drop in the share prices of the banking sector and other sectors in the trading market, at rates ranging between 50-85%, contributed to limiting the role of the Iraq Stock Exchange in attracting investment and supporting the national economy. (Al-Nasiri, Iraqi Economists Network, 2016). (Abdul Nabi, 2013, 2) believes that the Iraq Stock Exchange is characterized by a set of characteristics, as follows:

1. The failure of some legislations issued and regulating the work of companies, which requires updating them to keep pace with the Iraqi economy's orientation towards a market economy on the one hand, and the existing legislation in the financial markets of Arab countries on the other hand.
2. Lack of adequate legal protection to gain the confidence of investors, whether by Iraqi or foreign investors.
3. Weakness of the database or it can be described as limited, which does not help the investor in making quick or safe decisions.
4. Weak interest rate flexibility for short and medium term loans offered by banks and insurance companies for real estate purposes.
5. The market's lack of financial intermediation institutions compared to the actual need for them.
6. Lack of institutions specialized in evaluating the performance of companies that are lending or borrowing or whose shares are listed in the market.
7. Weak control methods and procedures that ensure the provision of a minimum level of disclosure.

Therefore, the market to overcome the current situation, it requires securing the following: (Al-Nasiri, Iraqi Economists Network, 2016):

1. The sectoral bodies supervising the joint-stock companies to treat and not strictly enforce some of the instructions issued by them, for example, the Central Bank of Iraq, the Companies Registration Department at the Ministry of Trade and the General Tax Authority, which focused on increasing the minimum capital and the effect of this on the decline in stock prices below their nominal prices. (Al-Nasiri, The Iraqi Economists Network, 2016).
2. Establishing a system of control, follow-up, and evaluation of the performance of joint-stock companies, identifying points of defects, negligence, and violating the laws and instructions in force.
3. Emphasizing that the joint-stock companies will provide monthly, quarterly and annual disclosure and transparency reports, provided that they present their annual business results within a period not exceeding 60 days from the end of the fiscal year.

**Forth: Financial treatments to activate the work of the market Means of activating the Iraq Stock Exchange:**

(Al-Nasiri, 2016) proposes a set of measures and means that are outrageous to activate the market movement and increase its ability to attract investments, as follows:

1. Establishing the Deposit Insurance Corporation and issuing its legislation for the purpose of protecting depositors' deposits, encouraging citizens to go to banks and benefit from all the services they provide, achieving the central goal of raising the savings rate at the expense of the hoarding ratio, addressing the lack of liquidity in banks and its reflection on cash circulation in the market.
2. Encouraging and activating the initiative of the Central Bank of Iraq to lend to banks to finance small and medium enterprises and allocate (6.5) trillion dinars for this purpose, to achieve the economic and social goal, as well as the banks and the Iraq Stock Exchange to benefit from the central bank's launch of government bonds at an interest rate of 8% for a period of two years in order to pay the contractors' dues and consider them as guarantee bonds to give them banking facilities of all kinds by banks in addition to encouraging citizens to acquire them in order to withdraw liquidity for the purposes of internal cash circulation.

3. Using electronic publishing techniques to increase investment in the Iraq Stock Exchange.
4. Granting financial investment companies the freedom to trade their shares or the shares of the portfolios they directly manage.
5. Reconsidering the Companies Law and the Iraq Stock Exchange Law in accordance with what is applied in the Arab and international stock exchanges and markets.
6. Activating the role of corporate governance by all relevant parties listed in the market, and protecting the rights of investors to oblige companies that make profits to distribute at least 50% of the net profits realized in cash to shareholders.
7. Spreading the culture of trading and the duties of the Iraq Stock Exchange and educating the public about financial markets and their role in sustainable development.

Some of the problems that the Iraqi market for securities suffers from is the limited capital, according to what he sees (Idi, 2013), while (Al-Nasiri, 2016) sees any of the main reasons behind the decline in stocks, especially (banks) whose prices have fallen below the real level, because the banks raised their capital in response to the instructions of the Central Bank issued in 2010, which require them to increase their capital to (250) billion dinars, and that increase will be within three years as of 06/30/2010, the Central Bank believes that this increase is one of the positive indicators in enhancing banking stability because it guarantees the safety and durability of banks in a manner that provides greater protection for depositors, this increase in capital is minimal, given the requirements of the development process in Iraq, as the large development projects need large loans and cash facilities, in order to enter strongly in the Iraqi market to contribute effectively to building the national economy. (Central Bank of Iraq, 2010, 20).

## **The second topic: Box-Jenkins methodology, a theoretical framework**

### **First: Forecasting:**

A successful forecasting of stock price development in the future can bring great profit to investors, the efficient market hypothesis indicates that stock prices reflect all information currently available, that price changes that are not based on newly discovered information cannot be forecasted. The basic characteristics of stock prices were sensitivity, stability, and asymmetric fluctuations. Investors naturally want to be able to forecast the movement of a share's price, despite the fact that it is a random process, the evolution of stock prices is a non-linear and dynamic process. They are related to a number of macroeconomic factors, industry and companies that may have an impact on stock prices, include, for example, global indices of stock prices, general economic activity, exchange rate, interest rate, etc. Thus forecasts are very useful to attract the interest of researchers and investors, who implement self-investment judgments on the basis of objective technical indicators, the expected share price is an important issue for stock market research, perhaps an accurate forecast of stock prices, it is the basis for a financial investment decision, which is the greatest challenge to capital investment (Groda, & Vrbka 2017: 1).

### **Second: Box-Jenkins Methodology Overview:**

A time series is a time series of observations on a given variable, it can be thought of as having four components: (1) trend, (2) cycle, (3) seasonal changes and (4) irregular fluctuations, trend refers to the upward or downward movement that characterizes the time series during a given period, the trend reflects long-term growth or decline in the time series. The cycle refers to the repetition of movements up and down around trend levels, cyclical fluctuations can last between two and ten years or more measured from peak to peak, seasonal variations are cyclical patterns in a time series that complete themselves within a calendar year and then repeat on an annual basis, it usually occurs due to factors such as weather and customs, the component of irregular fluctuations in the time series refers to the irregular

movements that do not follow a recognizable or regular pattern. Many irregular fluctuations occur in the time series, because of unforecastable events such as earthquakes, wars and hurricanes. (4: 1995 Tharoor).

Statisticians George Box and Guillem Jenkins developed a practical approach to building the ARIMA model, which fits better into a certain time series and also fulfills the stinginess principle, their concept is of fundamental importance in the field of time series analysis and Forecasting. Box-Jenkins' methodology does not assume any particular pattern in the historical data for the series to be anticipated, instead it uses a three-step iterative approach of defining the model, parameter estimation, examination and prognosis to determine the best ARIMA model is very scarce, this process represents three steps that are repeated several times until a pathological model is finally determined, this model can be used to Forecast future values of the time series. The approach proposed by Box and Jenkins became known as the (Box-Jenkins) methodology for ARIMA models, where the letter "I", between AR and MA, is "combined" and reflects the need for the difference to make the string constant (Susruth, 2017: 115). (Autoregressive) (AR) represents the autoregressive models that illustrate the relationship between the current value of the time series and some of its past values. The Moving Average (MA) is represented by the moving average. Below is an overview of the ARIMA model (p, d, q):

**Autoregressive (AR): written according to the following equation:**

Where  $(\delta)$  is the mean of  $(y)$ , and  $(u_t)$  is the magnitude of the random error, uncorrelated and has a Forecasting equal to zero and a constant variance, that is, it is purely and subtle, and the value of  $(y_t)$  depends on its value in the previous time period (AR1) and the amount of random error, it is expressed by deviating from its arithmetic mean, the Forecasted value of  $y$  at time  $t$  is the ratio of  $(a_1)$ , from its value at time  $(t-1)$  in addition to the random amount at time  $(t)$ , and again, the value of  $y$  is expressed around its mean values,  $Y_t$  can follow a self-regression of the second degree, or the (AR2) process, meaning that the value of  $(y)$  at time  $t$  depends on its value in the previous period by two time periods, as follows (Gujarat, 2015: 1080).

It could be  $(y_1)$  following a self-regression of degree  $(p)$  or a process (AR  $(p)$ ), as follows:

**Third: Moving averages process: It is written according to the following equation:**

Where  $\mu$  is constant and  $u$  is the amount of pure random error,  $(Y)$  in time  $t$  is constant in addition to an average of the current and previous error quantities, that  $y$  follows first-order moving averages, or it can be called  $((1 MA)$ , but if  $(Y)$  follows the following form:

It can be called  $(2) MA$ , meaning that it is of the second degree, and in general it is written as follows:

It is a process  $(qMA)$ . In short, moving averages are a linear combination of pure error quantities, it is possible to know that  $(Y)$  in both (AR) and (MA), from here we come with the model  $(\odot ARMA)$ , meaning that  $(Y)$  follows  $(1,1) ARMA$ , and it can be written as follows:

Where there is one subjective regression and one moving averages as well, representing the constant, the process can be called  $(p, q) ARMA$ . (Gujarat, 2015: 1080).

**Fourth: methodological steps: (Box-Jenkins.) Includes four stages as follows:**

**The first step: Defining the Model Identification:**

The first step involves testing tests (tests for stationarity), the seasonality of the time series and determining values for ((d) and AR (p), MA (q). (Rubasheuski 19: 2011).

**The second step: Model Estimation:**

This step is to estimate the parameters of the autoregressive quantities and the moving averages in the model by using the Least Squares (OLS) method.

**The third step: the model validation:**

The model validation phase includes residual analysis, they must satisfy the assumptions of a univariate constant operation, the remainder must be independent of each other, they are normally distributed and have constant mean and contrast. (Rubasheuski, 192011).

**Fourth step: Forecasting:**

One of the reasons for the popularity of the ARIMA model is its success in Forecasting, in many cases, the forecast obtained from this model is more correct than that obtained from other traditional economic models, especially related to forecasting in the short term, taking into account the need to test each case separately.

The following diagram shows the steps of The Box-Jenkins methodology:

**The first step** to building ARIMA models is to define the model, based on tests of stationarity and seasonality of data patterns, and determining the time series based on the analysis of the graphs and the unit root test. Graphic analysis can be useful as an initial procedure for determining time-series stability, to perform this analysis, the data set must be plotted on a time-based axis, the deviation of the demand corresponding to the changes in the average value of the demand changes, this indicates that time series are unstable, to give a more accurate error evaluation the unit root test can be used. This type of stability test has become widely popular over the past years, the augmented Dicke Fuller test (ADF) will be used, the ADF test enables time series testing that includes trend and seasonality. The general equation for the ADF test is the following:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^m a_i \Delta Y_{t-i} + \varepsilon_t$$

Where:  $\varepsilon_t$  is the amount of pure random error,

$$\Delta Y_{t-2} = (Y_{t-2} - Y_{t-3}) \text{ and } \Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$$

Represents the number of variance magnitudes of later time periods that must be contained in the regression, at the same time, the t value (Dickie - Fuller statistics) of the coefficient of in the absolute range is less than the critical value not statistically ((t is said that time series are unstable and vice versa (Gujarat, 2015: 1050) Seasonality in the time series will be determined according to For graphic analysis.

**The second stage:** The next stage of defining the model is determining the ranks of the average duration of the self-regression and the moving averages. The initial phase will include autocorrelation analysis (ACF) and partial autocorrelation functions (PACF). The rules for determining AR (p) and MA (q) commands are described in Table (1). In practice, it can be difficult to define self-correlation orders and moving average averages, especially if the models include seasonality, the quality of the model depends on the experience of the Forecaster. ARIMA models based on the same data pattern can vary greatly depending on the experience of the model creator (: Rubasheuski: 202011). In theory, it can be shown that the automatic regression (AR) process of the p-command has the function of autocorrelation of infinite range, dominated by the lighter foundations, and the partial autocorrelation function that is

zero after the lag. On the contrary, the partial autocorrelation function of the moving average (MA) process of any q order is not limited in range and its autocorrelation function is equal to zero after the lag, for ARMA operations, determining the process order becomes somewhat complicated by the fact that both the self-correlating function and the partial self-correlating function are infinite in range.

**Table (1) Theoretical Characteristics of ACF and PACF**

Sample type	Special to form ACF	Special to form PACF
AR(p)	Reducing or wavy or both	Significant jumps during the late period p
MA(q)	Significant jumps in the late q	Decrease exponentially
ARMA	Partial decrease	Exponential decline

Paretkar, Piyush S. *Short-Term Forecasting of Power Flows over Major Pacific Northwestern Interties: Using Box and Jenkins ARIMA Methodology*. Diss. Virginia Tech, 2008 p28

As in our case, the models are expected to be mixed, the inclusion of both components AR (p) and (MA (q), we'll use Akaike Information Criterion (AIC) to determine the lag. The AIC standard is defined as:

Where k is the number of regressions (n) is the number of observations, RSS is the regression of the sum of squares. This standard is used to compare several different models. AIC's lower value model is better, meaning it will give the most accurate Forecastings.

The second step involves estimating the model. The main approach to fitting Box- Jenkins models is to use the least squares method.

**The third step** is validation of the model, diagnosis includes to see if residues follow the normal distribution of the data, it is distributed naturally. By testing the autocorrelation function of the rest of the model (Paretkar, 2008: 29).

**The forth step:** Forecasting ARIMA Models Once a satisfactory fit model is fitted with the appropriate series, forecasting can be generated using the model. Theoretical model of the general ARIMA equation:

The Forecasting one step forward  $t + 1$  is given by:

Except for  $a_{t+1}$ , the random shock at time  $t + 1$ , all other parameters are known, and so, defining,  $a_{t+1} = 0$  the true expected value, the forecast can be created one step in advance. Likewise, future projections can be "stopped" by using these obtained projections and setting unrealized random shocks to 0 for each condition. Also, 95% confidence interval can be calculated for the Forecastings. (Makridakas, 1983,95).

**The third topic: The Financial Reality of the Iraq Stock Exchange and Forecasting Stock Prices**

**First - The reality of market action during the years 2018-2019:**

During the year 2019 (241) stock trading sessions were held, in the Iraq Stock Exchange, it was identical to the official working days in Iraq, while the number of sessions held during the year 2018 was (238) sessions, an average of five sessions per day, during the two years the shares traded diversified according to the sector to which they belong, as the

number of times the shares are traded during the year depends on the company's commitment to financial and informational disclosure, the essential events in their legal time, as well as their success in approving and distributing the dividend of profits and on the demand and supply that comes from the side of investors, which shows a summary of the number of sessions, listed companies and traded shares as well as some other indicators (Table 2):

**Table (2) some important indicators about the Iraq Stock Exchange.**

<b>Characters</b>	<b>2019</b>	<b>2018</b>	<b>Percentage rise or fall (%)</b>
<b>Number of sessions</b>	241	238	1.3
<b>Number of listed companies</b>	102	104	(2)
<b>Number of companies traded</b>	80	78	2.6
<b>Number of shares traded (million shares)</b>	460	832	(44.7)
<b>Value of traded shares (million dinars)</b>	284	466	(39)
<b>The number of executed contracts</b>	81973	91067	(10)
<b>60ISX Market Index (pips)</b>	493.76	510.12	(3.2)
<b>Number of shares deposited (million shares)</b>	9263	9182	9
<b>Market value of shares (million dinars)</b>	11662	11350	2.8

Source: Iraq Stock Exchange Annual Report for 2018 and 2019

Note from the previous table the high number of sessions in the market, as the number of formal sessions in 2019 reached (241), an increase of (1.3%) compared to 2018, likewise, the number of companies listed in the market decreased by (2%) compared to 2018, as in 2019 their number reached (102) companies, the listing process for companies takes place through the listing committee in the governing committee, which studies the documents submitted to it by the Listing Division, in the market for the purpose of submitting its final report to the companies' listings. At the year 2019, five companies were listed in the market, which are Al-Qurtas Islamic Bank, Al-Taif Islamic Bank, the Islamic Consultant, the Middle East Creativity Contracting Company, and the Amin Islamic Iraq Bank, while the listing of a group of companies has been canceled, as the delisting process takes place through the listing committee also, after submitting the necessary documents by the listing committee for the purpose of delisting the listing of companies from which the listing requirements are dropped by the Board of Governors.

The listing of the Association for Financial Transfer Company, and the Al-Harir Financial Transfer Company, Al-Nour Financial Transfer Company, were canceled, despite the decrease in the number of companies listed in the market by 2%, the number of companies whose shares were traded increased during the year 2019 to 80, i.e. a rise 2.6% compared to 2018, the number of sessions of traded companies reached 78, the increase in the number of companies traded in 2019, however, the shares that were traded appear to be low, as the number reached 460 million shares, compared to 2018, when the number of shares traded reached 832 million shares, the decrease in the traded shares for the year 2019 amounted to 44.7%, the decrease in the number of shares traded also entails a decrease in their establishment, so the value of the shares traded reached in 2019, 284 million dinars, in contrast to the year 2018, when the value of traded shares amounted to 466 million dinars, i.e. a decrease of 39%.

As for contracts, they decreased by 10% compared to 2018, reached 81,973 million dinars, the market index (60ISX) also decreased by 3.2%, as the year 2019 reached 493.76 points, while the index in 2018 reached 510.12, the Iraq Stock Exchange Index (60ISX) is an index that depends mainly on selecting 60 companies with the highest stock turnover for the participating companies, it was not better than the year 2018, as a result of being affected by a set of negative factors, including the holding of 76 joint stock companies meeting their public bodies in 2019 and did not invite 25 companies to their annual meeting, the Securities Commission issued a decision to arrest some companies as a

result of not submitting the quarterly or annual disclosure, the number of companies that did not disclose reached 27 companies out of 102 companies whose shares are traded in the Iraq market for the year 2019, failure to provide disclosure, whether annual or quarterly, leads to a weak relationship for those companies with their shareholders and potential investors to attract new investments and preserve existing investments, also, 24 companies approved the annual dividend distribution for shareholders only out of 102, while the number of companies that distributed the dividend in 2019 reached 33 companies.

According to the annual report of the Iraq Stock Exchange, the decline in market performance is not only due to the internal factors that have been mentioned, macroeconomic factors also have a strong impact on market performance, as it is still dependent on oil extraction and export, which in turn constitutes the largest proportion of the gross domestic product (GDP), like the oil-exporting countries in the AUC, likewise, government spending is affected by the rise or fall of global oil prices, so the deficit or surplus in the budget is realized based on estimates of oil prices and the size of current obligations, these effects extend to the volume of investment and trading in the private sector and the size of the business sector, depending on the per capita income and the size of unemployment, as well as the economic cycles and the culture of investment prevailing in the country.

**Second: The structure of the Iraq Stock Exchange during the year 2018-2019.**

The Iraq Stock Exchange consists of different sectors, each sector has its own companies whose shares are traded either in the regular market or the second market, as the banking sector was one of the largest sectors listed in the market due to its huge capitals, according to the report of the Iraqi Depository Center in December at the end of 2019, the capital of the banking sector amounted to 941500 trillion Iraqi dinars, the banking sector consists of 39 banks, the proportion of capital constitutes 77.2% of the total capital of companies listed in the market, which amounts to 12176949 trillion dinars, then comes the telecommunications sector with a total of 2,139,782 trillion Iraqi dinars, and the number of companies listed in this sector amounts to 2 companies, with the importance of 17.5% of total market capital, and in many sectors with low capital compared to the banking and telecommunications sector, the industrial sector occupies the third place according to the order of sectors in terms of the magnitude of capital, as its capital reaches 308,163 billion dinars, with a significance ratio 2.5%, the number of listed companies that belong to this sector was 21 companies, and next to the financial transfer sector, with a capital of 180,000 billion dinars, with a significance of 1.4%, as the financial transfer sector owns 4 companies listed in the market, then the hotel and tourism sector with a capital of 32,842 million dinars, and the sector owns 10 companies listed in the market and distributed between the regular market and the second, then the service sector, whose capital was 54,705 billion dinars, with a significance rate 0.4%, as for a sector 9 companies listed in the market, then in several sectors that constitute a significant percentage of 0.1%, such as the agricultural sector, whose capital was 23,986 billion dinars and the number of 6 companies, and the insurance sector, with a capital of 22,319 billion dinars, and the number of its 5 companies, the investment sector with a capital of 13,650 billion dinars, and the number of 6 companies (Table3):

**Table (3) the size of the sectors' capital and the number of its companies (trillion) dinars**

Sectors	Capital	Number of companies	Relative importance (%)
Banker	9,401,500,000,000	39	77.2
Agriculture	23,986,300,000	6	0.1
Hotel and tourism	32,842,143,551	10	0.2
Industrial	308,163,266,705	21	2.5
Money transfer	180,000,000,000	4	1.4

<b>Insurance</b>	22,319,312,000	5	0.1
<b>Serviceable</b>	54,705,519,330	9	0.4
<b>Telecommunications</b>	2,139,782,653,400	2	17.5
<b>Investment</b>	13,650,000,000	6	0.1
<b>Total</b>	12,176,949,194,986	102	100%

Source: Prepared by the researcher based on the report of the Iraqi Depository Center for companies listed on the market, 2019.

According to Table (3), noticed that the banking sector has the largest number of listed shares among the various sectors in the market, perhaps the main reason behind the capital inflation of the banking sector is in implementation of the Central Bank's decision on 7/13/2010, which requires raising the capital of private banks to 250 billion dinars during the three years ending on February 18 2013, provided that the capital on February 18 2011 becomes 100 billion dinars, in the event that the capital does not complete the required limit within the specified periods, the license granted to the bank shall be revoked based on the provisions of the Banking Law in force.

**Third: Analysis of the number of shares traded, their size, and the contracts executed in the regular and second market:**

The banking sector is one of the largest listed in the market in terms of the number of shares traded, as the traded shares of this sector in the regular market in 2019 reached 173224.4 million shares, the number of shares traded for the sector decreased by 48% compared to 2018, when it reached 333579.8 million shares, the reason behind this increase in 2018 is due to the listing of five banks that were transferred from the second market to the regular market, after fulfilling the conditions for trading in the regular market, which are the Iraqi Credit Bank, Dar Al Salam, the Economy Bank, the Iraqi Union, the Dijlah and the Furat, as the number of the banking sector in that year reached 22 banks, while the number decreased in 2019 to 19 banks in the regular market, there were two banks whose shares have not been traded, such as the North Bank and across Iraq, as for the sector's circulation volume, which represents the number of shares traded multiplied by their price, the volume of shares traded in the system reached, belongs to the banking sector in 2019, its value 58142.2 million dinars, while the trading volume of the sector in 2018 amounted to (127372.8) million dinars, a decrease of 54.3%, a decrease in the number of shares traded leads to a decrease in their values, likewise, what is most important to note on the trading volume of the banking sector was the decrease in the value of the traded shares from their actual values. As the Iraqi Companies Law in 1997 and the amendment in 2004 set the value of one share, issued by the company at the beginning of its establishment, it is one dinar per share, neither more nor less than this amount, the real value of the shares traded requires that the number of shares traded be equal to their trading volume, the number of sector contracts, it decreased by 35.1% compared to 2018, reaching 21619 contracts, after it was 33346 contracts, the main reason behind the decline in the volume of shares traded for the banking sector in 2019, it was after submitting the dividend of profits by some banks, the number of banks that distributed the dividend of profits reached 12 only, while the number of banks that distributed the dividend in 2018 reached 16 banks, given the great importance that the dividend represents to investors, not adopting it at the end of the year will affect the trading volume on the one hand and on the other hand the share price.

The insurance sector has achieved an increase in the number of shares traded during the year 2019, as the number of traded shares reached 1845.0 million shares, an increase of 360% over the year 2018, when the number of shares traded reached 400.3 million shares, and the volume of trading for the sector in 2019 amounted to 876.8 million dinars, also, the volume of sector contracts in 2019 increased by 657%, as it reached 2250 contracts, after it was 297 contracts, the insurance sector consists of two companies: Al Amin Insurance and Al Khaleej Insurance.

As for the service sector, it is similar to the insurance sector, which witnessed a slight increase of 3.11%, the number of shares traded for the sector in 2019 reached 3847.3 million shares, after the number of shares traded in 2019 was estimated at 3731.1 million shares, an increase of 116.2 shares, the volume of trading for the sector reached in 2019 was 7041.6 million dinars, despite the increase in the number of shares traded for the sector, the volume of trading is low, as it reached in 2019, a value of 7041.6 million dinars, after the year 2018 was estimated at 9046.0 million dinars, and thus, the sector increased in terms of the number of shares traded, as for the traded value of it, it decreased by 22.1%, considered the main reason behind the increase in trading volume compared to 2018 despite the decrease in the number of shares traded, due to the high prices of some companies belonging to the sector and listed in the market, As the Al-Nokhba Company for General Contracting, in which the share price rose in 2018 was 0.320 dinars per share, as it rose in 2018 to 0.420 dinars per share, the Iraqi Land Transport Company, whose share price reached 1,490 dinars per share, after it was in 2018 was 0.710 dinars per share, the Baghdad Public Transport Company is the other, its share price increased to reach 18,050 dinars per share, after it was 15,810 dinars per share in 2018, sector contracts increased by 10.8% compared to 2018 (Table 4).

**Table (4) Number of shares traded, their size, and contracts executed in the regular market (million dinars).**

Sector	Number of shares traded (million)		Change percentage from 2018 (%)	Trade volume (million)		Change percentage from 2018 (%)	Number of traded contracts (contract)		Change percentage from 2018 (%)
	2018	2019		2018	2019		2018	2019	
Banker	333579.8	173224.4	-48.	127372.8	58142.2	-54.3	33346	21619	-35.1
Insurance	400.3	1845.0	360.9	193.3	876.8	353.5	297	2250	657.5
Serviceable	3731.1	3847.3	3.11	9046.0	7041.6	-.22.1	7563	8382	10.8
Industrial	34296.8	24220.8	-29.3	54852.6	38825.7	-29.2	30742	27970	-9
Hotel and tourist	785.8	559.2	-28.8	12731.6	8957.1	-29.6	5923	7039	18.8
Agricultural	1618.0	1600.5	-1.0	8109.8	6881.0	-15.1	7006	7323	4.5
Telecommunications	2394.5	5543.6	131.5	20375.0	43867.9	115.3	2635	3231	22.6
Total	376806.4	210840.9	-44.3	232681.2	164592.4	-29.2	87512	77814	-11
Session rate	1583.2	874.9	-44.7	977.7	683.0	-30.1	367.7	322.9	-12.1

Table: Prepared by the researcher based on the annual report of the Iraq Stock Exchange.

As for the industrial sector, it has a decline, similar to the banking, insurance and service sectors, the number of shares traded in 2019 reached 24,220.8 million shares, a decrease of 29.3% (Table 4), while the trading volume for the sector in 2019 amounted to 38825.7 million dinars, the number of listed companies affiliated to the industrial sector in 2019 reached 12 companies, while the number of companies whose shares were traded in 2018 reached 15 companies, explains the size of the decline in stock circulation and its value for the sector, contracts also decreased by 9%, reaching 27970 contracts in 2019.

The hotel and tourism sector, maintained the number of companies that traded its shares during 2019, the number reached 9 companies, while the volume of shares traded decreased in 2019 by 28.8%, reached 559.2 million shares, compared to the number of shares traded in 2018, (785.8 million shares), the trading volume, decreased by 29.6 compared to 2018, reached 8957.1 million dinars in 2019, after the year 2018 was 12731.6 billion dinars, the sector also witnessed a remarkable increase in the number of contracts, as it increased by 18.8% compared to 2018. The most important thing to notice about the hotel and tourism sector was the volume of circulation of the sector exceeded the

number of traded shares, i.e. greater than one dinar per share, which is similar to the industrial and service sector, in contrast to the insurance and banking sector, the highest price per share was achieved by Babylon Bank with 75 dinars per share in 2019, while the Karbala Hotel below achieved a price of 0.85 dinars per share.

While the sectors were significant declines in the number of shares traded as well as the volume of trading, the banking sector achieved a kind of stability, as the number of shares traded in it in 2019 reached 1600.5 million shares, shares represent a slight decrease compared to 2018, when the traded shares of the sector reached 1618.0, as the decrease reached 1%, while the traded contracts witnessed a remarkable increase by 4.5%, they reached 7323 in 2019, which means an increase, while their volume in 2018 reached 7006 contracts, an increase of 317 contracts.

The telecommunications sector is one of the sectors that is characterized by a high volume of trading in it compared to other sectors, by the number of shares that trade, in addition, the telecommunications sector is traded in the shares of one company, namely, Asiacell, and Al-Khadem Telecom, but in 2018, the El Khadem Telecom Company was moved to the second market. During the year 2019, the telecom sector, along with the insurance sector, was distinguished by the increase in the number and volume of traded shares, as the number of traded shares of Asiacell in 2019 reached 5543.6 million shares, an increase of 131.5%, compared to 2018, when the volume of trading was 2394.5 million shares. The company's share price increased in 2019 by 12.3, which reached 8,650 dinars per share, while in 2018 it reached 7,700, and with an increase in the number of shares traded in 2019 and the company's share price, the trading volume of the company increased to 43867.9 million dinars, an increase of 115.3% over the year 2018, which amounted to 20375.0 million dinars, as well as the sector contracts amounted to 3231 contracts, an increase of 22% compared to 2018, explains the increase in the number of shares traded in the telecommunications sector was Asiacell's decision on 4/15/2019 to distribute the dividend to shareholders, as the company distributed annual profits at a rate of 100% of its capital of 310,000 million dinars, due to the sensitivity of investors' profits, the decisions of the profit dividend are closely related, with the volume of trading as well as the number of shares traded in the market. The regular market of the Iraq market was a significant decrease in the number and size of shares traded, except for the insurance and telecommunications sector, which showed a significant increase, due to the success of the activities carried out by the companies affiliated with these sectors and their ability to attract investors by making successful decisions that will maximize their shares in the financial market.

#### **Fourth: Application of (Box-Jenkins) methodology:**

We will discuss choosing the appropriate model for forecasting stock prices for the research sample represented by (the commercial bank), for the period from 1/1/2018 to 31/12/2019, using the Box-Jenkins, as the methods used in this model will be applied, which was previously covered in the second topic for the purpose of achieving the research goal, and testing its hypotheses and then calculating the forecast values of share prices according to the model that will be chosen.

#### **A. Identifying the Model Identification**

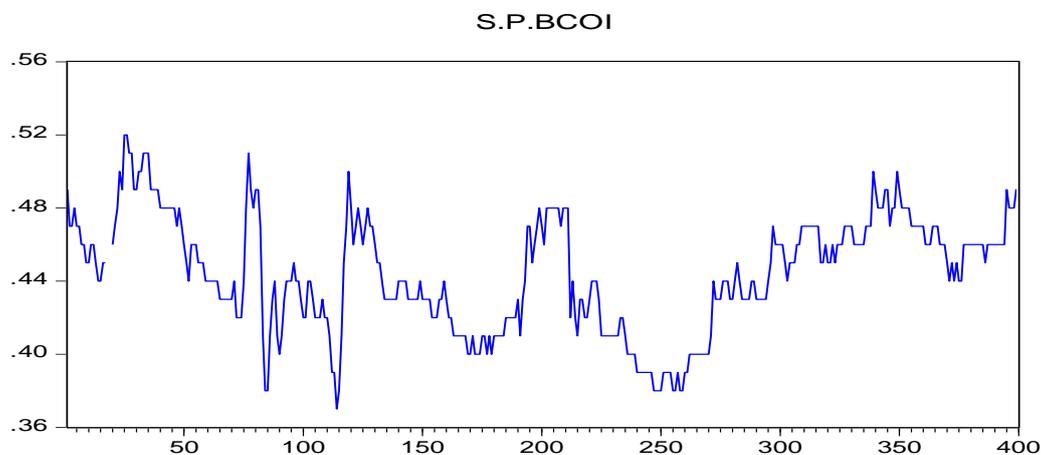
The first step involves testing tests for stationary and determining values for d), AR (p) and MA (q). Before starting a description of the data used to build the model should be presented, Table (5) shows the lower and upper limits of the data used in the study, as well as displaying the arithmetic averages and the standard deviation of the data.

**Table (5) a description of the data for the selected banks**

<b>Bank</b>	<b>Symbol</b>	<b>Number</b>	<b>Low value</b>	<b>High value</b>	<b>Mean</b>	<b>Deviation</b>
<b>Commercial bank</b>	S-P-BCOI	398	0.37	0.52	0.44	0.031297

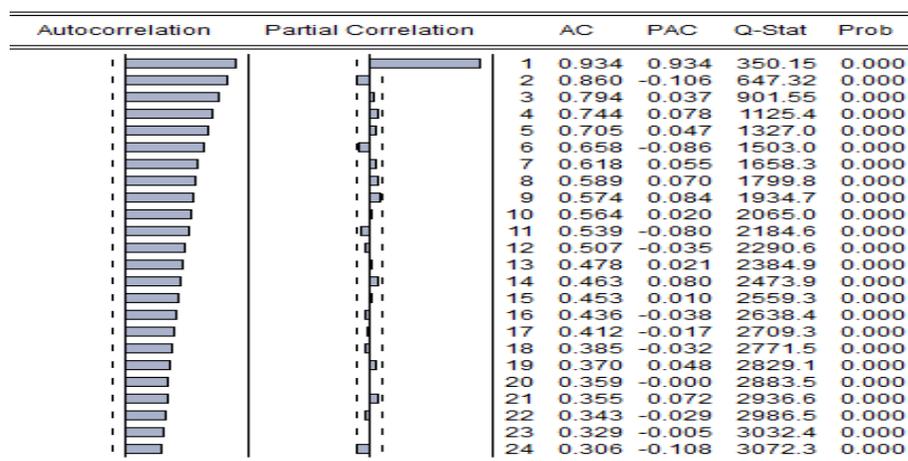
Source: Prepared by the researcher based on the E-views10 statistical program.

The same table show that the mean share price of the commercial bank, for the period from 1/1/2018 to 31/12/2019, was 0.44, and a standard deviation, respectively, was (0.031297), and the lowest closing price for the share It reached - 0.37 and the highest value of the share price was 0.52 respectively. Figure (1) shows the time series for Commercial Bank share prices.



**Figure (1) Time Series of Commercial Bank Shares.**

The same table also shows that the time series for the share prices of the commercial bank are unstable and for the purpose of making sure that the time series of the data used in the research is stable, the self-correlation function and the partial self-correlation function were used for the stock price variable of the Iraqi Commercial Bank for the period from 1/1/2018 to 12/31/2019, as shown in Figure (2).



**Figure (2) the self-correlation function and the partial correlation function of the commercial bank.**

The previous figure shows that the time series of data (the daily closing prices of the commercial bank's shares) are unstable as most of the values of the self-correlation transactions fall outside the confidence limits, result was consistent with the results of (Dickie Fuller) test, as Table (6) shows that the calculated t value is greater than the tabular value at the level (1%, 5%, 10%), the sig. value of the Dicki Fuller test is greater than 5% which states that the time series has a unit root and was unstable.

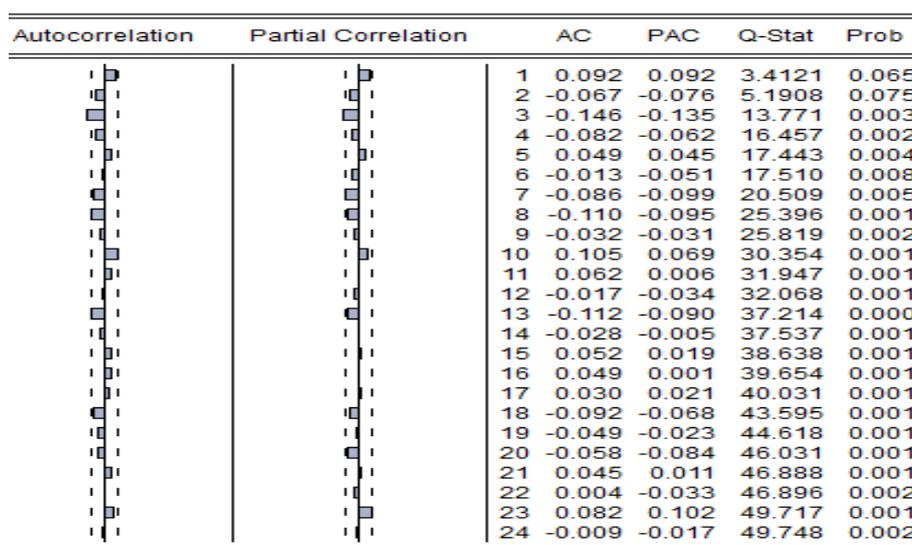
Table (6) Dicki Fuller test for the commercial bank.

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.289297	0.5813

Test critical values:	1% level		-2.570815
	5% level		-1.941625
	10% level		-1.616163
*MacKinnon (1996) one-sided p-values.			

Source: Prepared by the researcher based on the E-views10 statistical program.

The results of the Dicki Fuller test were indicated in Table (6), based on the above, take the first-degree differences for the purpose of making the time series of data stable, for the purpose of ensuring a stable time series after taking the first-degree differences, the self-correlation function and the partial self-correlation function for the stock price variable of the commercial bank were used for the period from 1/1/2018 to 12/31/2019, as in Figure (3) below:



**Figure (3) the self-correlation function and the partial correlation function of the commercial bank after taking the first difference.**

The previous figure shows that the time series of data (the daily closing prices of the shares of the commercial bank) are stable as the values of the self-correlation transactions are within the confidence limits, the result was consistent with the results of Dicki Fuller test, as Table (7) shows that the calculated value of t was less than the tabular value of (t) at the level of 1, 5 and 10%, the sig. value of the Dicki Fuller test was greater than 5% which states that the time series has a unit root and is therefore unstable.

**Table (7) Dicki Fuller test for the commercial bank after taking the first difference.**

			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-18.16722	0.0000
Test critical values:	1% level		-2.570844	
	5% level		-1.941630	
	10% level		-1.616160	

Source: Prepared by the researcher based on the E-views10 statistical program.

From the above, it was clear that the time series of commercial bank data is stable, so we reject the null hypothesis and accept the alternative hypothesis that states that the time series does not have a unit root.

**B. Model Estimation:**

This step was to estimate the parameters of the autoregressive quantities and the moving averages in the model by using the Least Squares (OLS) method, depending on the autocorrelation function and the partial autocorrelation function, appropriate models have been determined, for the purpose of differentiating between the selected models and determining the appropriate model, a set of criteria was used, as (SIC, AIC) was used, where the smaller the values of these criteria, the better, likewise, a criterion of maximizing the spatial logarithm was relied on (Likelihood Log), which the greater its value, the more appropriate the model, in addition to the criterion of the interpretive ability of the model (squared-R), which the higher its value, the greater the explanatory power of the model.

**Table (8) Criteria for differentiation between models for forecasting stock prices for the commercial bank.**

Model	SIGMASQ	squared -R	AIC	SIC	log likelihood	
ARMA (0,1,1)	0.000116	009770.	-6.206457	-6.176295	1231.8	1
ARMA (1,1,0)	0.000116	0.008644	-6.205332	-6.175170	1231.656	1
ARMA (0,1,2)	0.000116	0.011933	-6.203577	-6.163361	1232.308	1
ARMA (0,1,3)	0.000114	0.030389	-6.16681	-6.197164	1235.98	1
ARMA (1,1,1)	0.000116	0.010281	-6.20192	-6.161707	1231.9	-
ARMA (1,1,2)	0.000113	0.040725	-6.22691	-6.176644	1237.92	3
ARMA (1,1,3)	0.000112	0.043853	-6.225516	-6.165192	1238.65	4
ARMA (2,1,0)	0.000116	0.014438	-6.206084	-6.165868	1232.805	2
ARMA (2,1,2)	0.000112	0.047003	-6.22897	-6.168652	1239.337	4
ARMA (2,1,3)	0.000112	0.043930	-6.22052	-6.15015	1238.665	-
ARMA (3,1,0)	0.000114	0.033022	-6.21978	-6.169515	1236.518	2
ARMA (3,1,1)	0.000113	0.041141	-6.222663	-6.162338	1238.087	3
ARMA (3,1,2)	0.000112	0.047265	-6.224184	-6.153805	1239.38	4
ARMA (3,1,3)	0.000110	0.067193	-6.239149	-6.158716	1243.35	6
ARMA (2,1,1)	0.000113	0.041192	-6.22768	-6.177419	1238.082	3

Source: Prepared by the researcher based on the E-views10 statistical program.

Table (8) show that the criteria for the specific comparison between models vary and that they differ within the same model, also, the explanatory ability of the models was weak for all models and it was uneven, as note that the model that obtained the best standards and contains the meaning of all its parameters as well as having the highest explanatory ability is ARMA (2,1,1).

Table No. (9) explain the characteristics of the chosen model to represent the time series of data for the commercial bank, the significance of each parameter of the model's parameters, the model's significance in general, and its explanatory capacity.

**Table (9) the model chosen for the commercial bank.**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.96E-05	0.000270	-0.146477	0.8836
AR(1)	0.982924	0.049834	19.72390	0.0000
AR(2)	-0.161011	0.034999	-4.600501	0.0000
MA(1)	-0.913530	0.047777	-19.12078	0.0000
SIGMASQ	0.000113	5.02E-06	22.44669	0.0000
R-squared	0.041192	Mean dependent var		-2.53E-05
Adjusted R-squared	0.031384	S.D. dependent var		0.010850
S.E. of regression	0.010678	Akaike info criterion		-6.227689
Sum squared resid	0.044584	Schwarz criterion		-6.177419
Log likelihood	1238.082	Hannan-Quinn criter.		-6.207774
F-statistic	4.199538	Durbin-Watson stat		1.994208
Prob(F-statistic)	0.002428			

Source: Prepared by the researcher based on the E-views10 statistical program.

The previous table shows the significance of the model parameters, except for the fixed limit. We also note that the standard (Durbin-Watson stat) is within the permissible range, indicates that there is no self-correlation between the variables, in addition to the significant of the model in general, as its significance was less than 5%.

**C. The model validation:**

To verify the validity of the estimated model, must make sure that it is not self-related, by testing the self-correlation function of the residual of the model shown in Figure (4).

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob	
		1	0.000	0.000	2.E-06	
		2	0.015	0.015	0.0920	
		3	-0.056	-0.056	1.3555	
		4	-0.016	-0.016	1.4571	0.227
		5	0.100	0.102	5.4988	0.064
		6	0.021	0.019	5.6814	0.128
		7	-0.038	-0.044	6.2629	0.180
		8	-0.065	-0.056	8.0024	0.156
		9	-0.015	-0.008	8.0976	0.231
		10	0.107	0.098	12.800	0.077
		11	0.054	0.044	13.974	0.082
		12	0.001	-0.001	13.975	0.123
		13	-0.092	-0.074	17.493	0.064
		14	-0.012	-0.002	17.556	0.092
		15	0.048	0.033	18.504	0.101
		16	0.033	0.009	18.945	0.125
		17	0.034	0.034	19.440	0.149
		18	-0.088	-0.058	22.684	0.091
		19	-0.024	-0.012	22.925	0.116
		20	-0.059	-0.075	24.374	0.110
		21	0.049	0.022	25.384	0.115
		22	-0.022	-0.031	25.581	0.142
		23	0.076	0.106	28.032	0.109
		24	-0.030	-0.009	28.413	0.129

**Figure (4) Residual test for a commercial bank.**

The previous figure that the autocorrelation function and the partial correlation function of the proposed model for forecasting stock prices, according to the commercial bank data, refers to the count of rejecting the null hypothesis, which states that there is no self-correlation for the rest of the model at a significance level of 5%, the model can be relied upon to forecast stock prices.

**D. Forecasting the use of commercial bank share price data:**

Using the specified model to forecast stock prices based on stock price data for the Iraqi Commercial Bank, make a forecasting from 1/1/2018 to 12/31/2019, by finding forecast values for stock prices, Table (10) displays the Forecastive values and actual values for a part of the time series, while Fig. (5) shows the distribution of the Forecastive values during a period.

**Table (10) Forecast and Actual Values of Commercial Bank Shares.**

Forecast	Actual value	Date
0.47	0.48	01/07/2018
0.48	0.47	01/08/2018
0.47	0.47	01/09/2018
0.47	0.46	01/10/2018
0.46	0.46	01/11/2018
0.46	0.45	01/14/2018
0.45	0.45	01/15/2018
0.45	0.46	01/16/2018

0.46	0.46	01/17/2018
0.46	0.45	01/18/2018
0.45	0.44	01/21/2018
0.44	0.44	01/22/2018

Source: Prepared by the researcher based on the E-views10 statistical program.

The previous table that the actual values of the daily share prices, Commercial Bank, with the Forecasted values, we notice that these values are close to the actual values, Figure (5), shows that the distribution of data that were Forecasted throughout the study period, that they took the same distribution of actual data, thus, it is possible to rely on the data Forecasted through this model.

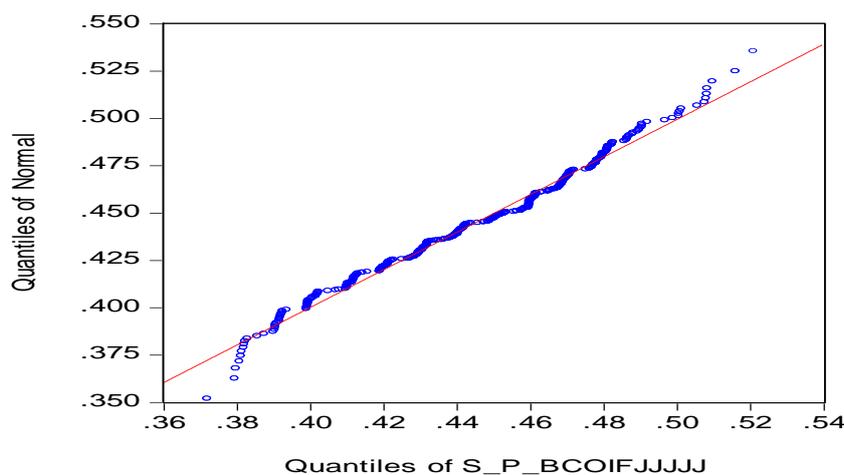


Figure (5) the forecasted share prices of the commercial bank.

Figure (6) presents the forecast power of the chosen model for commercial bank stock data.

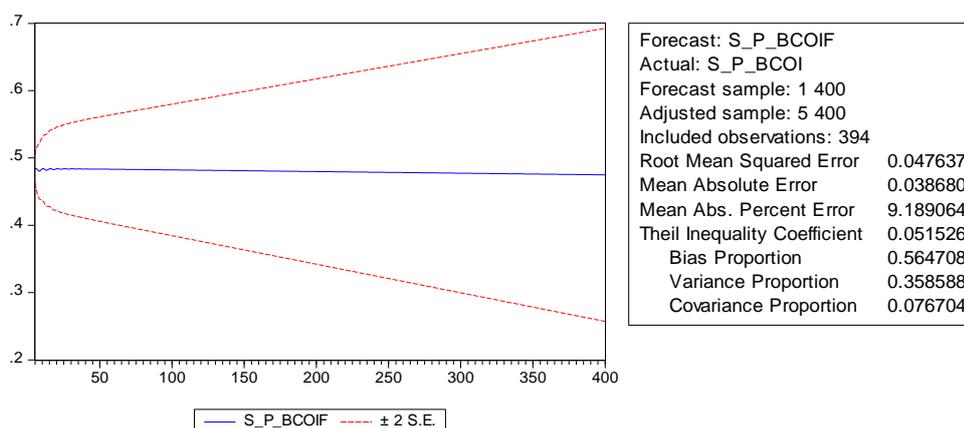


Figure (6) the model's forecast power.

The previous figure show that the predictive power of the chosen model of commercial bank share price data is statistically acceptable, as confirming this result was the value of (Theil) coefficient estimated at (0.0515), which is close to zero, which indicates the quality of the model and its ability to predict stock prices in the Iraq Stock Exchange.

### 3. Conclusions

The limited capitals owned by companies operating in the Iraq Stock Exchange, With the exception of the banks, whose capital has been set by the Central Bank at no less than 250 billion dinars, compared to 15 billion dinars for

money transfer companies, and 500 million for banking companies, and from one to two billion dinars for small and medium loan companies and one billion for investment companies.

The raising of bank capital in accordance with the instructions of the Central Bank of Iraq provides greater protection for depositors, and this is at the expense of the bank's profitability, because raising capital requires injecting new shares into the financial market, and it is known from an economic point of view that an increase in supply negatively affects stock prices in light of the limited private banking activity, according to the financial stability report in Iraq, the capital adequacy ratio according to the Basel II agreement, may It reached 323%, which is higher than the standard percentage set by the committee of 8%, in other words, the private banks maintain huge capital that exceeds their risky good, and this indicates the weakness of their activity.

The increase in the number of companies listed in the market has nothing to do with the number of shares, nor even their value in terms of rise and fall. Despite the increase in the number of companies whose shares are traded at 2019, the number and value of shares traded are low compared to the year 2018.

The increase in the volume of traded shares for the insurance sector by 360% for the year 2019, as well as the increase in the volume of contracts traded by 657%, compared to 2018, as this increase in the volume of circulation of the sector came as a result of the approval of the General Assembly of Al-Amin Insurance Company to increase its capital by 930%, as that percentage constitutes 5 billion shares.

It was found that the price of one share for the bank in the field of research is less than the value of its issuance, which was determined by the Iraqi Companies Law for the year 1997 and modified in the year 2004 with one dinar per share. Box-Jenkins methodology has proven its accuracy in forecasting, as all the predicted values have been very close to reality, and the most appropriate model through which the prediction can be made is 2,1,1 for the commercial bank.

#### **4. Recommendations**

The need for the Central Bank of Iraq to reduce the capital of banks in a manner that is commensurate with their activities and to avoid wasting their financial resources, or to set higher limits for the proportion of capital adequacy and forcing banks not to exceed them

The process of increasing the capital must be done gradually to prevent large quantities of shares from being pumped into the financial market and so that their offer does not outweigh the demand for them.

The necessity of adopting the Box Genghis methodology as it has proven its ability to accurately predict, this is if the banks want to know the prices of their shares in the future in order to rationalize their decisions taken.

The process of raising the prices of bank shares for the research sample to the specified price according to the Iraqi Companies Law, which amounts to one dinar at the beginning of incorporation, requires it to attract the largest number of investors by increasing its activity and its ability to achieve high profits as well as distributing annual profits.

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