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Testing the Random Movement of Shares in the Supply Chain of Some Sectors Listed In the Iraq Stock Exchange

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Abstract- **The study aimed to identify random movements of shares in the supply chain of some sectors listed in the Iraqi market for securities using the daily data of the market index ISX60 to identify the level of efficiency of the market at the weak level, the study community is the financial market in general, while the study sample consisted of three sectors: the banking sector included 6 companies, the telecommunications sector included 1 company, and the hotel sector, which included 3 companies. To analyze and test the hypotheses of the study, three tests were used: Variance Ratio, Runs, and Serial Correlation, by R statistics program, for the period from 1/1/2015 to 31/12/2017. The study concluded that the returns of the ISX60 index in the Iraqi market for securities do not follow the random behavior in general, which means the inefficiency of the Iraqi market for securities within the weak level of efficiency, except the variable range test. The study recommended the activation of market activities to remove the possibility of extraordinary returns by investors through the disclosure and access of information to all investors to increase the efficiency of the supply chain of Iraqi financial market.**

Keywords: *Random Movement, Variance Ratio Test, Supply Chain, Iraq Stock Exchange, Shares.*

1. Introduction

The theory of random movement comes due to increased interest of economists, financial analysts in the stock market, specialists, statisticians, academics, investment portfolio managers and investors to develop and test stock price behavior patterns. This theory serves as a strategy for interpreting price behavior, taking into account the time factor and then building expectations based on it, As well as to seek the best management of risk and invested capital.

The theory of random movement in supply chain explained the idea that equities take a random and unexpected path, indicating that changes in stock prices have the same probability distribution and are independent of each other. Furthermore, that the current price of the stock gives us the best predictability of its future price, that is, stock prices are moving random movement, which explains the name taken from this meaning.

It is also the theory of random movement considers that the effective market hypothesis is also random, which says that stock prices fully reflect all information and expectations available, so the current prices are the best approximation of the intrinsic value of the company. An effective market is a market where large numbers of profit-seeking institutions compete actively, each trying to predict the future market values of individual securities, where important current information is freely available to all participants.

Therefore, the financial markets must be efficient in order to carry out their active role by collecting savings from individuals and directing them towards deficit units, that is, it reflects all the information available, and the relationship between the prices of securities and financial information is of great importance to all the constituents of the stock market to rationalize The investment decision and the provisions of the control on the performance of the market. So this study came in the analysis of the efficiency of the Iraqi market for securities at a weak level to see if the information reflected on the prices of stocks and different sectors of the market, by testing the random traffic model.

2. The first topic: methodology of research
2.1. Importance of the studying

The importance of the study can be illustrated by the following points:

1. The study of stock prices and the prediction of unstable price volatility in the financial markets is a concern for those interested in this field.

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2. The study of the random movement of financial theories aimed at developing financial and mathematical models to understand the movements of stock prices and affected by the financial and economic factors of their countries as well as the extent to which affected by the movements of markets and the behavior of investors.

3. It is one of the important financial issues in which many researchers have made great efforts to study the fundamentals under which the study of the movement of stock prices in financial markets in addition to their orientation and volatility.

4. Given the importance of the financial markets in the world in general and the Iraqi market for securities in particular and the possibility of exercising the distinctive role through the development and collection of domestic and foreign savings and directing them to investment projects that contribute to economic development, and therefore the efficiency of the Iraqi market is one of the indicators of the efficiency of the national economy.

5. Finally, the importance of this study stems from the importance that lies in the financial indicators and their basic uses, and the possibility of extraordinary profits by some investors when speculating on the market index.

2.2. The study of Problem

The problem of the study lies in the following main question:

"Can the returns of shares of companies distributed sectorally in the Iraqi market for securities follow the hypothesis of random movement"? And from which branch the following questions:

1. Can the returns of shares of companies distributed sectorally in the Iraqi market for securities follow the hypothesis of random movement according to the Variance Ratio Test?

2. Can the returns of shares of companies distributed sectorally in the Iraqi market for securities follow the hypothesis of random movement according to the Runs Test?

3. Can the returns of shares of companies distributed sectorally in the Iraqi market for securities follow the hypothesis of random movement according to the Serial Correlation Test?

2.3. Objectives of the study

This study aims to:
1. Test the random movement of the ISX60 market index to judge the market efficiency at the weak level
2. Test a sample of companies distributed sectorally to know the follow-up random movement

3. Measuring the possibility of achieving extraordinary profits by some investors
4. Finally, Access to results and recommendations can benefit investors and increase market efficiency.

2.4. Hypotheses of the study

Based on the study problem and its objectives, the following hypotheses were formulated:

The main hypothesis: "The returns of shares of companies distributed sectorally in the Iraqi market for securities do not follow the hypothesis of random movement," and the following branches:

H1: Returns of shares of companies distributed sectorally in the Iraqi market for securities do not follow the hypothesis of random movement according to Variance Ratio Test.

H2: Returns of shares of companies distributed sectorally in the Iraqi market for securities do not follow the hypothesis of random movement according to Runs Test.

H3: Returns of shares of companies distributed sectorally in the Iraqi market for securities do not follow the hypothesis of random movement according to Serial Correlation Test.

2.5. Statistical methods used
2.5.1. Variance ratio test

The variance ratio test proposed by [1] is a recent study, therefore, it is widely used. This test is based on the hypothesis that the variation of the random time series increases linearly over time. This test assumes that the random movement of stock prices in the supply chain is $r_1, r_2, ..., r_T$ with mean μ and standard deviation σ and r_t, r_s are not correlated to all $s \neq t$ and then:

$$E(r_t + r_{t-1}) = E(r_t) + E(r_{t-1}) = \mu + \mu = 2\mu \quad (1)$$

As well as:

$$Var(r_t + r_{t-1}) = Var(r_t) + Var(r_{t-1}) = \sigma^2 + \sigma^2$$
$$= 2\sigma^2 \quad (2)$$

In general, the random sequence $(r_t + r_{t-1} + \cdots + r_{t-q+1})$ has the mean μq and the variation $q\sigma^2$ and is observed by ($r_t + r_{t-1} + \cdots r_{t-q+1}$ are simply stock returns for period q in time t). Thus, the random movement of stock returns in the supply chain will have a simple relation between the variance of returns for multiple periods and the variation of yields for a single period.

This fact is used to test the random movement by comparing the estimated value of the yield variance

$$r_t + r_{t-1} + \cdots + r_{t-q+1}, \quad t = q, \ldots \ldots, T \quad (3)$$

In the estimated value of the variance of r_1, r_2... r_T, If the hypothesis of random movement remains unchanged, the ratio of these estimates should approach q.

To have a certain value of q, it is as follows:

$$S_q^2 = \frac{\sum_{t=q}^{T}(r_t + r_{t-1} + \cdots + r_{t-q+1} - q\bar{r})^2}{T - q} \quad (4)$$

Which is basically the simple variance of $(r_t + r_{t-1} + \cdots + r_{t-q+1}, \ t = q, q+1, \ldots, T)$, where the divisor is equal to the sample size minus one, Instead of subtracting the sample mean for these values we subtract qr to be as follows

$$\bar{r} = \frac{1}{T}\sum_{t=1}^{T} r_t \quad (5)$$

S^2 Refers to the variance of the sample r_1, r_2 ....r_T, and the statistics of the variance ratio are given in the following relation:

$$V_q = \frac{T}{T - q + 1}\frac{1}{q}\frac{S_q^2}{S^2} \quad (6)$$

Under random movement we get:

$$\frac{1}{q}\frac{S_q^2}{S^2} = 1 \quad (7)$$

The factor $T/{T - q + 1}$ is an adjustment time that is designed to improve the standard approximation of the Vq distribution in small samples. We note that the contrast test, like the Box-Ljung test, is a test of correlation in stock returns.

Under the null hypothesis that the random movement of stock returns is constant, $\sqrt{T}$ (Vq-1) is almost evenly distributed at zero mean and variance illustrated by 2 (2q-1) (q-1)/ (3q). Thus, the statistical standard test is as follows:

$$\bar{V}_q = \sqrt{T}\sqrt{\frac{3q}{2(2q - 1)(q - 1)}} \ (V_q - 1) \ (8)$$

Thus, we reject the null hypothesis at large$|\bar{V}_q|$ values. The P-value value of the test is as follows:

$$P(|Z| > |\bar{V}_q|) \quad (9)$$

Where Z contains natural distribution and Vq, 0 is the observed value of Vq and therefore we have:

$$P(|Z| > |\bar{V}_{q,0}|) = 2(1 - \emptyset(|\bar{V}_{q,0}|)) \quad (10)$$

Where $\emptyset$ refers to the normal distribution function.

2.5.2.   Runs Test

Is one of the non-parametric tests? A non-parametric test is used to detect the degree of independence between returns that cannot be detected through the parametric test, as non-scientific tests neglect the characteristics of natural distribution, so are used for chains that are not distributed naturally. The frequency test is defined as the successive change of returns in the same direction, ie, the number of iterations is calculated as a sequence of the return changes of the same signal (++, - 00). The actual number of replicates is compared to the expected number of frequencies without looking at the signal [2].
This test is based on the null hypothesis that the number of expected frequencies is equal to the actual number, so the returns are randomized and the efficiency hypothesis is achieved at a low level.
The expected number of repetitions (m) is calculated according to the following equation:

$$m = \frac{(N(N + 1) - \sum_{i=1}^{3} n_i^2)}{N} \quad (11)$$

As:
N: Views.
Number of Share Price Changes n
The Z statistic is used to test whether the actual number of repetitions is consistent with the hypothesis of the independence of returns, and is calculated as follows:

$$Z = \frac{R - m}{\sigma m} \quad (12)$$

As:
R: The number of actual duplicates
m: Number of expected duplicates
σ: Frequency deviation.
If the calculated Z is greater or equal to the table value (± 1.96) at the 5% level of significance, then the null hypothesis is rejected. We conclude that the returns are not independent of each other and do not move randomly, and can be predicted, thus the market will be inefficient at the weak level [3].

2.5.3.   Serial Correlation Test

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This test is the first approach to test the random movement of stock returns in the supply chain and is used to determine the relationship between current and previous observations.

This test aims to determine the independence of the returns of shares from each other, and by testing that the coefficient of self-correlation statistically equal to zero, if the returns of shares are self-linked, the chain of returns does not follow the random walk and thus we can say that the lack of low level of efficiency, and take The hypothesis of self-correlation is as follows:

$H_0 = \rho\_k = 0$
$H_1 = \rho\_k \neq 0$
Q_{LB} A statistic is used Ljung-Box (Chung, 2006:69)

$$Q_{LB} = n(n+2) \sum_{k=1}^{m} \frac{\rho^2_k}{(n-k)} \, , \sim x_m^2 \quad (13)$$

Whereas:
n: Sample size
ρk: Self-correlation coefficients
k: Late period (lag) given
M: The number (lag) that is tested at the H0 hypothesis
If the calculated value of Q_{LB} exceeds the value of $x 2$ with a given freedom, then at least one value of ρk is not equal to zero at a significant level of 5%.

3. The second topic: theoretical framework
3.1. The hypothesis of random movement in supply chain

[4] Was the first to study the random movement of prices in the supply chain by studying the actual price levels of the market for 52 weeks according to the [5] Industrial Average Index. He concluded that the actual. Movement of stock prices is random the phenomenon of random movement was used to describe the behavior of the price of securities in the financial markets, as it was formulated to give the efficient financial market hypothesis testable contents. The hypothesis of the random movement confirms that successive price changes are independent, i.e. that the prices in any period of time on average will reflect the real value of the share. The changes in the future stock prices must be completely independent of the changes in the price in the past. Clearly, illustrate the interrelationship between the concepts of random movement and efficient market and the content of the weak level of efficiency of the

unpredictability of stock prices based on available information on prices and trading volumes in the past. The assumption of random movement assumes that the new information is random and that its entry into the market is random and leads to random changes in prices. The changes in the prices of successive securities are independent and equally distributed in a symmetrical distribution [6]. The hypothesis of the weak level of efficiency is a systematic extension of the hypothesis of the random movement of prices. According to the weak level, historical information about events in the past, whether days, months or years, cannot affect the current share price, cannot be used to predict changes in prices. And the successive changes in share prices are independent of each other and there is no relationship between them. Hence, the weak level of market efficiency is called the random movement of prices, since the change in the share price does not follow one pattern from day to day. The hypothesis of random movement is closely related to the efficiency of financial markets. When information is received on the efficient financial market, it reflects on the prices of stocks quickly and rationally. Prices tend to fluctuate randomly around their real value and reflect the latest available information in the market. Ability to access information that is not available to all, so it is difficult to obtain unusual returns. The investor's ability to predict earnings per share and his inability to obtain information that is not available to all, so it is difficult to obtain unusual returns. The random movement hypothesis is one of the important models studied, as it is a sufficient condition for achieving efficiency in the financial markets. Random movement is the path of the variable over time, which shows the absence of different formulas for predicting stock prices. If the price of P moves in the random motion path, the P price in any period is equal to the price P in the period preceding the plus or minus some random variable. This indicates that the current market prices are the best indicator of future market prices with a deviation that is random in nature, in the efficient markets cannot achieve profits based on past information, and therefore the prediction of future prices conditional on past prices on the average, which must be equal to zero [7].

The hypothesis of random movement can be illustrated mathematically by:

Let Xt be the share price on a given day, such as t. Each unit of the subsequent time in which the price is different in a way that leads to unpredictability because in each unit of time moves the price of the share either up one unit or down in one unit or remain in position as it is. See Figure (1).

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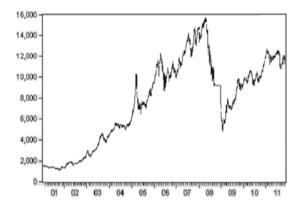

Figure (1) the hypothesis of random movement of prices
Source: [8]

It can be assumed that the price of the stock remains in its state or moves up or down and random and the random trends of all share price transfers are independent of all past transfers.

More clearly, Sn in the equation below shows that the position of stock prices at time t, the general behavior of the Sn sequence represents the form:

Sn =S0+X1+ X2+ Xn (14)

Whereas:

S0: The initial value of the share price

Xn: are independent random variables, and the random variable takes a real value that expresses the results of the sample.

This field includes all possible values. Each value of the variable values has a certain probability. , And finding the value of the independent random variable is based on the probability function p (x = xi) = f (xi). It is possible to form the probability distribution table for the random variable x which consists of two columns, the first representing the possible values of the variable x: x (x1, x2 ......, xn), and the second represents the probability values of the probability function

p (x = xi) = f (xi) .

$S_n = S_o + \sum_{j=1}^{n} xj$ (15)

Whereas:

S0: The initial value of the stock price.

Xj: independent random variables distributed equally and each variable takes either a value of -1 with a probability of q, or takes a +1 with a probability of p, or stays as in value 0 with probability of r. It is clear from the above that the hypothesis of the random movement confirms that the movements of stock prices will not follow the patterns and trends of expectation, and fluctuations in the past prices of shares cannot be used to predict future price changes, and therefore cannot predict changes in prices of securities through previous stock price movements.

$$X_j = \begin{cases} -1 & \text{With probability q} \\ 0 & \text{With probability p} \\ +1 & \text{With probability r} \end{cases}$$

[9] states that the hypothesis of random movement is a financial theory that states that prices in stock markets are unpredictable because they follow unique random formulas, as they cannot be fully analyzed because all the information is available to everyone in the financial markets, and the random price limits the ability of investors to outperform the market and earn extraordinary profits.

4. The third topic: Practical framework
4.1. Supply Chain of Iraq Stock Exchange index

The supply chain Iraqi Stock Exchange started launching the share price index ISX60 as the index of the new electronic trading system X-Stream, which calculates the ISX60 index of a sample of 60 joint stock companies and is listed on the market in each session, and launched this index in 2015 and as of 9/2/2015 The selection of companies shall be based on the following principles [10]:

A. The choice of companies whose turnover rate is more in circulation, and be continuous in trading, as well as not being subject to penalties and suspension .

B. Companies that are newly listed are not listed in the index, and are added when the trading is stable and achieve an appropriate turnover rate.

C. The ratio is calculated to be 1000 points instead of the percentage to calculate the most accurate changes in prices

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D. The 2014 index is recalculated to facilitate comparison for 2015.

The supply chain of the Iraq Stock Exchange uses two formulas to calculate the index [11]:

4.2. Stream Trading System Indicator

The index is calculated according to the following formula

Index Value

$$= \sum_{i=1}^{i=index\ securitys} \frac{index\ security\ WA\ price \times index\ security\ weight}{index \times Divisor}$$

Index Divisor

$$= \sum_{i=1}^{i=index\ securitys} \frac{index\ security\ WA\ price \times index\ security\ weight}{index \times Last\ Price}$$

The index is calculated at 1,000 points, being a record in the new electronic system since the first launch   session.
2. The index according to market value: The index of market value was launched in addition to the index above and as of 11/2/2015. The trading in this index was suspended on 16/4/2015 and was calculated according to the following formula:

$$Index = \frac{The\ market\ value\ of\ the\ comparison\ session\ of\ a\ sample\ of\ (60)\ companies}{The\ market\ value\ of\ the\ base\ session\ of\ a\ sample\ of\ (60)\ companies} \times 100$$

Market Value =   Total Capital of Sample Companies   × Closing Price

4.3. Number of sessions for the years of study

a. Year 2015:
The number of meetings in 2015, organized by the Iraqi market for securities, (233) trading session, the rate of five sessions per week, and by 2014, the number of meetings (227), thereby achieving a rise of (2.64%):
b. Year 2016:
The number of meetings in 2016, organized by the supply chain of the Iraqi Stock Exchange, (234) trading session, five sessions a week, and measured by 2015, the number of meetings (233), thereby increasing by (0.43%).
c. Year 2017:

The number of meetings in 2017 organized by the Iraqi market for securities (239) trading session, the rate of five sessions per week, and measured in 2016, the number of meetings (234), thereby increasing by (2.1%).

4.4. Description of the study sample and hypothesis test

The sample of the study in the Iraqi market for securities from the series of daily prices of the general index of the ISX60 market, which represents the value of shares (60) joint stock companies listed in the Iraqi market for securities, and included the daily closing prices of 10 companies listed in the market from different sectors of the market. The sample of companies is more deliberative than the rest of the companies. The study was limited to these ten companies.
The sample of the study included the daily views of the ISX60 index on 650 views, and the daily observations of (10) companies listed in the Iraqi market for securities, including (6) companies included in the banking sector, one company included in the telecommunications sector, (3) companies included in the hotel sector
The study period is from 1/1/2015 to 31/12/2017, and the ISX60 market data were obtained during the study period from the first trading session from 2015 to the last trading session in 2017. The companies of the study sample took the closing prices Also from the first trading session in 2015 until the last trading session in 2017, and that all of these data were obtained from the website of the supply chain of Iraqi Stock Exchange [12], [13], [14].
The daily returns were calculated through the natural logarithm of the indicators according to the Following equation:

$$R_t = Ln\frac{p_t}{p_{t-1}} \quad (16)$$

Whereas:
R_t : Index returns on day t
p_t :   Stock Prices Today t
p_{t-1} : Stock prices the previous day t-1

5.   Results of the study
5.1. Variance ratio test results

A.   ISX60 Stock Market

Table 2 shows the test result and analysis of the ISX60 general index. The first column represents the test parameter and the second column represents the sum of the weighted self-correlation to the optimal grade of +1. The optimum grades are those that are tested through the R program used for the test, We can say that the test

parameter lies outside ± 1.96 of the tabular value, thus rejecting the null hypothesis and accepting the alternative hypothesis at a significant level of 5% Which states that the ISX60 index in the Iraqi market for securities does not follow the random movement test according to the Variance ratio test. Therefore, the Iraqi market for securities is inefficient within the weak level of efficiency, and therefore some investors can achieve extraordinary returns [15], [16].

Table (2) Results of the Variance ratio test for the daily returns of the ISX60 market index in the supply chain of Iraqi Stock Exchange for the sample of the study

Test parameter	Total weighted self-correlation to + 1
3.27955	1.36718

B. Sectors

Table (3) shows the results of the test for the sector (banks, communications, hotels) with the total weighted self-correlation to the optimum grade of +1. We can conduct the test at a significant level of 5% that "the stock returns in the Iraqi market for securities are distributed sectorally does not follow the hypothesis of random movement according to the variance ratio test to the hypothesis of random movement, according to the variance ratio test," and therefore these banks do not follow the movement of random and is not efficient within the weak level with the possibility of achieving extraordinary returns by some investors, but the Bank of Babylon and the Gulf Bank and Al-Mansour Bank , the test parameter is within ± 1.96. Therefore, we accept the

null hypothesis at a significant level of 5%, Which states that the returns of shares in the Iraqi market for securities distributed sectorally follows the hypothesis of random movement, according to the variance ratio test, and thus these banks follow random behavior and be efficient within the weak level, and cannot achieve unusual returns by some investors .

As for the telecommunications sector, the test parameter for Asia-Cell was within ± 1.96 and therefore we accept the null hypothesis at a significant level of 5%. Therefore, the telecommunications sector of Asia Cell follows a random behavior and is efficient within the weak level of efficiency. Thus, unusual returns cannot be achieved by some investors.

While the hotel sector followed the random behavior and is efficient within the weak level of efficiency. Thus, unusual returns cannot be achieved by some investors.

Table (3) Results of the Variance ratio test for the daily returns of companies listed in the supply chain of Iraqi Stock Exchange for the sample of the study

Type of sector	Test parameter	Total weighted self-correlation to + 1
Banking sector		
Commercial Bank	2.466357	1.246509
Bank of Baghdad	3.122969	1.319973
Bank of Babylon	0.4179854	1.02877
Gulf Bank	1.30232	1.113961
Bank of Mosul	2.966559	1.327924
Al-Mansour Bank	0.03329914-	0.9980886
Telecommunications sector		
Asia Cell	1.675611	1.181162
Hotels sector		
Babylon Hotel	1.727905	1.178595
Tourism Investments	0.3952134-	0.9673401
Al Mansour Hotel	0.3986056-	0.9634514

5.2. Runs test results

A. ISX60 Stock Market

Based on the results of Runs test, Table 4 shows that the Runs test was larger than the tabular value of 1.96 ±, which indicates that the actual number of replicates is less than the expected number, and that the value of p-

value equals 0.00 is smaller than the 5% level of significance, which means rejecting the null hypothesis of the independence hypothesis between ISX60 returns and acceptance of the alternative hypothesis of the existence of independence between the return to the ISX60 market index. Therefore, the returns of the ISX60 index do not move indiscriminately and prices can be predicted and the possibility of extraordinary returns by

some investors, and accordingly, the Iraqi market for securities does not follow random behavior and thus be inefficient at the weak level of efficiency [17].

Table (4) Results of the frequency test for the daily returns of the ISX60 market index in the supply chain of Iraqi Stock Exchange for the sample of the study

Seq.	Indicator	Runs test	p-value
1	The general index of the ISX60 market	**-6.9979**	**0.000**

B. Sectors

Based on the results of Runs test, Table 5 shows that the banking sector is almost the same. In the Runs test, it was within the tabular value of ± 1.96, indicating that the actual number of recurrences was almost equal to the expected number. The ratio of P-value was greater than the level of 5%, thus accepting the null hypothesis for these banks with the existence of independence between returns, and that the returns of these banks follow the random movement and be efficient at the weak level and there is no possibility of achieving extraordinary returns, except Bank of Baghdad, which was Statistical Runs test is larger than the tabular value, and You have a value of P-value of 0.000 at a significant level of 5%, thus rejecting the null hypothesis of independence between returns. Therefore, it does not follow the random movement and is inefficient within the weak level of efficiency with the possibility of achieving extraordinary returns by some investors, thus accepting the alternative hypothesis.

As for the telecommunications sector, represented by Asia Cell, Runs test was larger than the tabular value of ± 1.96, and the value of P-value was smaller than the 5% level, thus rejecting the null hypothesis and accepting the alternative hypothesis that there is no independence between returns for the telecommunications sector. Thus, not to follow the random process with the possibility of extraordinary returns by some investors, and therefore the telecommunications sector is not efficient at the weak level.

The results of the test for the hotel sector and the Runs test were within the scale value of the test ± 1.96, and the value of P-value was greater than the level of 5%, which means acceptance of the null hypothesis of the existence of independence between returns, followed random behavior and there is no possibility to achieve Unusual returns, and therefore, the hotel sector is efficient at the weak level. This result supports the results of the Variance ratio test.

Table (5) Runs test results of the daily returns of companies listed in the Iraqi market for securities of the sample of the study

Seq.	Company	Runs test	p-value	the analysis' results
	Banking sector			
1	Commercial Bank	0.071	0.942	Independent
2	Bank of Baghdad	-4.518	0.000	Not independent
3	Bank of Babylon	0.691	0.489	Independent
4	Gulf Bank	-0.616	0.537	Independent
5	Bank of Mosul	-1.515	0.129	Independent
6	Al-Mansour Bank	0.076	0.938	Independent
	Telecommunications sector			
7	Asia Cell	-1.989	0.046	Not independent
	Hotels sector			
8	Babylon Hotel	0.258	0.796	Independent
9	National Tourism Investments	-0.252	0.800	Independent
10	Al Mansour Hotel	-0.174	0.861	Independent

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5.3. Serial Correlation Test results

A. ISX60 Stock Market

To test random movement in the Iraqi market for securities to judge the efficiency of the market at the weak level, through the Serial correlation of the daily returns of the market index ISX60.

1-12 was taken as a slow period for the daily returns of the supply chain of the Iraq Stock Exchange Index, Table (6) shows the results of the test to reject the null hypothesis because all the self-correlation coefficients are equal to zero of the daily yield chain for the ISX60 market index, and comparing Q_{LB} with x^2 tabular as illustrated in equation (13). And through the results of the program, depending on the value of P-value, therefore, the ISX60 market index does not follow the random movement, and as a result, the Iraqi market for securities is not efficient at the weak level, as well as the possibility of achieving extraordinary returns by some investors.

Thus, the alternative hypothesis is accepted which states that the ISX60 market index in the supply chain of the Iraq Stock Exchange does not follow the random motion hypothesis according to the Serial Correlation Test [18], [19].

Table (6) Results of the Serial Correlation Test of the daily returns of the ISX60 market index in the supply chain of Iraqi Stock Exchange for the sample of the study

Lag	The general index of the ISX60 market	
	Q_{LB}	P-Value
1	26.673	0.000
2	26.678	0.000
3	26.684	0.000
4	28.715	0.000
5	32.957	0.000
6	42.295	0.000
7	45.645	0.000
8	47.006	0.000
9	48.094	0.000
10	49.329	0.000
11	52.761	0.000
12	55.981	0.000

B. Sectors

Using the Serial Correlation Test, , After taking   1-12 a slow period for   the daily returns of the sectors, Table (7) shows the test results shown by the program , That the banking sector was not significant returns (Commercial Bank, Bank of Babylon, Gulf Bank, Mansour Bank) because it was greater than the value of P-value at the level of 5%. Thus, it follows the random movement and be efficient at the weak level and there is no possibility of achieving unusual returns by some investors and thus accept the null hypothesis that all transactions of self-correlation is zero and there is no correlation between returns. Except for the Bank of Baghdad and the Bank of Mosul, the returns do not move randomly because it was less than the value of P-value at the level of 5%, that is to reject the null hypothesis that all the serial correlation coefficients are zero, so it does not follow the hypothesis of random behavior and not efficient at the weak level, there is a possibility of achieving   extraordinary returns by some investors, thus rejecting the null hypothesis and accepting the alternative hypothesis.

As for the telecommunications sector, it was statistically significant at a statistical level of 0.000 according to the Q_{LB} statistical values. The null hypothesis is rejected at a significant level of 5% and acceptance of the alternative hypothesis. Consequently, the telecom sector returns do not follow random behavior and are inefficient at the weak level. There is a possibility of achieving unusual returns from some investors. As for the hotel sector (hotel Babylon, tourism investments) was significant statistical at a significant level of 0.000 according to the statistical values of Q_{LB}, thus reject the null hypothesis at a significant level of 5% that all the serial correlation coefficients are equal to zero, so they do not follow the random movement Are not efficient at the weak level and there is a possibility of   achieving extraordinary returns from some investors. Thus, the alternative hypothesis is accepted, except for Al-Mansour, which was insignificant by the value of P-value, which was greater than the 5%, t, it follows the random movement and is efficient at the weak level of efficiency and there is no possibility of achieving extraordinary returns by some investors, therefore the null hypothesis is accepted [20].

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Table (7) Results of the serial Correlation test of the daily returns of the companies listed in the supply chain of Iraqi Stock Exchange for the sample of the study

Banking Sector											
Lag	Commercial Bank		Bank of Baghdad		Bank of Babylon		Bank Gulf		Bank Mosul		Al-Mansour Bank	
	Q_{LB}	P-Value	Q_{LB}	P-Value	Q_{LB}	P-Value	Q_{LB}	P-Value	Q_{LB}	P-Value	Q_{LB}	P-Value
1	10.859	0.000	16.582	0.000	0.238	0.625	3.748	0.052	18.951	0.000	0.049	0.824
2	11.027	0.004	16.973	0.000	3.881	0.143	4.553	0.102	20.173	0.000	1.143	0.564
3	11.848	0.007	17.228	0.000	4.858	0.182	4.655	0.198	20.98	0.000	1.328	0.722
4	12.594	0.013	18.014	0.001	5.054	0.281	6.968	0.137	25.898	0.000	2.107	0.716
5	15.371	0.008	22.084	0.000	6.614	0.251	7.389	0.193	26.011	0.000	2.109	0.833
6	16.952	0.009	22.133	0.001	6.725	0.347	9.928	0.127	33.881	0.000	2.118	0.908
7	17.029	0.017	22.146	0.002	7.013	0.427	9.930	0.192	37.512	0.000	2.353	0.937
8	17.455	0.025	24.033	0.002	7.528	0.480	10.41	0.237	38.612	0.000	2.436	0.964
9	17.669	0.039	24.363	0.003	8.563	0.478	10.434	0.316	39.167	0.000	3.795	0.924
10	18.486	0.047	27.263	0.002	10.71	0.380	11.427	0.325	39.337	0.000	5.483	0.856
11	18.607	0.068	32.597	0.000	10.842	0.456	12.74	0.310	40.447	0.000	6.879	0.808
12	19.374	0.079	32.597	0.001	11.153	0.515	12.942	0.373	40.449	0.000	7.351	0.833

Hotels sector							Telecommunications sector	
Lag	Al Mansour Hotel		National Tourism Investment		Babylon Hotel		Asia Cell	
	Q_{LB}	P-Value	Q_{LB}	P-Value	Q_{LB}	P-Value	Q_{LB}	P-Value
1	0.504	0.446	0.227	1.456	0.012	6.236	0.000	13.249
2	0.390	1.882	0.110	4.405	0.044	6.238	0.000	15.731
3	0.454	2.62	0.000	17.794	0.100	6.239	0.000	16.787
4	0.430	3.822	0.001	18.039	0.151	6.722	0.001	16.947
5	0.572	3.841	0.001	19.963	0.104	9.110	0.004	17.058
6	0.695	3.862	0.001	21.861	0.084	11.133	0.002	19.903
7	0.115	11.571	0.000	29.362	0.114	11.595	0.002	22.357
8	0.149	12.047	0.000	29.374	0.154	11.925	0.003	22.715
9	0.202	12.193	0.000	41.794	0.033	18.112	0.006	22.902
10	0.272	12.198	0.000	50.076	0.003	25.95	0.000	33.287
11	0.311	12.73	0.000	50.082	0.000	31.756	0.000	36.404
12	0.302	13.971	0.000	60.211	0.000	35.043	0.000	37.653

6. The fourth topic: Conclusions and recommendations

A. Conclusions

1. By using the Variance Ratio test, Runs test and the Serial Correlation Test, the tests parameter is outside the tabular value ± 1.96, so that the returns of the ISX60 index in the Iraqi market for securities do not follow the random behavior and thus the Iraqi market for securities is inefficient at the weak level of efficiency, There is the possibility of achieving extraordinary returns by some investors [21].

2. Using the variance ratio test for the market segments, for the Commercial Bank, Bank of Baghdad and Mosul Bank, the test parameter lies outside ± 1.96, so that the returns of these banks do not follow random behavior and are inefficient at the weak level, with the possibility of achieving extraordinary returns by some investors. In terms of (Babil Bank, Gulf Bank and Al-Mansour Bank), the test parameter is within ± 1.96 as well, so the returns of these banks follow the random behavior and be efficient within the weak level of efficiency In the telecommunications and hotel sectors, the test parameter for them was within ± 1.96, so that their returns would follow the random movement and be efficient within the weak level of efficiency. There is no the possibility of achieving extraordinary returns by some investors.

3. By using the Runs test for the market segments (Commercial bank, Bank of Babylon, Gulf Bank, Mosul Bank, Mansour Bank) and Runs test were within the limits of the scale value ± 1.96, the returns of these banks are random and efficient at the weak level, either (Bank of Baghdad) and through the Runs test was larger than the scale value ± 1.96. So that its returns do not

follow the random behavior and be inefficient within the weak level, while sector Communications were greater than the tabular value ± 1.96. The hotel sector (Babylon Hotel, Tourist Investments, and Al Mansour Hotel) and Runs test were within the limits of the tabular value ± 1.96. The returns are random behavior and are efficient at the weak level [22].

4. Through the use of the Serial Correlation Test for the market sectors (banks, telecommunications, and hotels), the Commercial Bank, Bank of Babylon, Gulf Bank, and Al-Mansour Bank within the banking sector were following random behavior and being efficient within the weak level. There is a possibility of extraordinary returns by some investors, either (Bank of Baghdad, Mosul Bank), their returns were not random behavior and are not efficient at the weak level. As for the telecommunications sector, its revenues were not random and inefficient at the weak level, and the hotel sector of (Babil Hotel, Tourist Investments) had its returns not following random behavior and being inefficient within the weak level of efficiency, His returns have been followed by random behavior that is efficient within the weak level of efficiency.

B. Recommendations

Through the practical side of the study and conclusions, the researchers came up with a set of recommendations:

1. Creating the investment and economic climate by easing the legal and legislative restrictions and opening the way for investors.

2. The need to work seriously to prevent the possibility of achieving extraordinary returns by some investors by activating the role of supervisors in the Iraqi financial market in the access of information to all investors and thus raising the efficiency of the market.

3. Conducting studies that take entire sectors in order to arrive at a precise judgment on the extent to which the sector follows the random movement of its revenues.

4. Subsequent studies are carried out by means of a partial random motion test because it is more than random movement and takes into account the serial effects of the returns in a larger range than normal random movement.

5. The Iraqi market for securities published weekly or monthly data, especially as this study proved that the market index is not efficient through the daily data.

6. Working on closer relations between the Iraqi financial market and the regional markets with a view to benefiting from them in the technical aspects, as well as mergers and integration with foreign companies.

7. Activate the work of the Iraqi financial market through universities and educational institutions in the establishment of educational courses for investors to increase their reliance on financial and non-financial information to rationalize their investment decision and raise the level of the financial market.

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