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Accuracy of Capital Asset Pricing Model and Arbitrage Pricing Theory in Predicting Stock Return

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Abstract

The process of predicting the stock return is considered the main challenge confronting the financial analyst and the investment decision-maker in particular. The objective of the study aims at testing the ability of both CAPM model and APT theory in predicting the stock return. The study investigated a sample of 10 banks listed in the Iraq Stock Exchange for the period (2012-2021). A variety of appropriate statistical and financial means and tools were employed. The study results in many conclusions including the rejection of the study hypotheses and the acceptance of alternative hypotheses based on the analytical results, and then there is a difference in the required rate of return calculated according to each of CAPM model and APT theory as well as the actual return.

Keywords: actual return, required return, CAPM model, APT theory.

1. Introduction

The investor makes his investment decisions based on a careful analysis of scientific foundations, including the foundations of the predicting process related to determining the present value of the cash flows that the shareholders are expected to receive. This is what motivated interested investors, investment managers and financial analysts to seek and search for financial models that predict the required return on investment, establishing a more objective framework for evaluation of financial decisions. According to what has been proposed in the field of specialization, there are quite a few models that were used for predicting, but the experimental reality highlights a specific number of these models, including the capital asset pricing model and the arbitrage

pricing theory, which vary in their experimental results and in the number and type of factors they contain. Therefore, this study put forward the following question: "Is there a difference between the realized rate of return and the required rate of return calculated according to the capital assets pricing model and the arbitrage pricing theory?" Accordingly, the investor must apply one of the financial models in order to reach the required rate of return that is commensurate with the orientations. Accordingly, the idea of choosing the title of the study was performed in order to provide assistance to investors and support the process of making the appropriate investment decision by presenting two models for pricing capital assets that can help investors to predict the required return that is compatible with the realized return when making an investment decision.

2. Previous Studies

2.1. Return

It refers to the realized or unrealized return on investment being one of the vital parts of financial analysis and many other aspects, including decision-making of all kinds. The return is defined as the benefit that the investor obtains by investing in a specific asset (Fabozzi & Peterson, 2003:201).

According to the researchers' point of view, the return is a measure of the quality of the investment's performance compared to other investments. Three types of return rates are frequently addressed, and they are as follows:

2.1.1. Expected rate of return

It is the return that the investor expects to obtain in the future as a result of his investment in a given asset. Since it is just an expectation, the realized return may be higher or lower, which means that the investor’s expectation is the average return for each period a profit was obtained from one of the securities invested in the past (Ross et al, 2019:429). It can be calculated according to the following formula (Chandra, 2019:375):

$$E(R) = \sum_{i=1}^{n} pi(Ri) \quad \ldots\ldots\ldots\ldots\ldots (1)$$

where:

Ri: rate of return per stock i

Pi: probability of occurrence for the share

E(R): expected return

2.1.2. Required rate of return

It is defined as the minimum return that the investor accepts to own the company's shares to compensate a certain level of risk that he may be exposed to, as well as urge the investor to buy the share (AL Abdullah et al, 2023:379). When comparing the required rate of return with the realized rate of return, if the realized rate of return is less than the required rate of return, the investor considers this investment unprofitable because the cash flows received will be less than what is required, but if the opposite is true, the investor considers this investment profitable because the cash flows received will be greater than what is required (Azar, 2008:139). There is a group of models through which the required return is measured, which will be discussed in the section four, bearing in mind that both the capital assets pricing model and the arbitrage pricing theory are among the most widely used models for measuring the required return.

2.1.3 Actual rate of return (realized rate of return)

It is defined as the return that is actually obtained. Therefore, it is a measure of the investor's success in increasing or decreasing the value of the capital investment (Al-Tamimi, 2010: 163). It is also represented as what the investor actually receives which usually does not match the expected return (Pinto et al, 2010:39). It can be calculated through the following formula (Al-Aridi, 164: 2014):

$$R_i = \frac{D_1 + P_1 - P_0}{P_0} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

where

Ri: Realized return

D1: Dividend paid

P1: Selling Price

P0: Purchasing Price

3. Risk

It is a measure of the uncertainty associated with the return earned by an investor (Zutter & Smart, 2022:407). The literature on investment, financing and financial management indicate that investment risk is divided into the following:

3.1. Systemic Risk

It can be called market risk, and it is part of the asset risk that is attributed to market factors. Its impact is on all companies and cannot be eliminated by diversification (Zutter & Smart, 2022: 433). It occurs when there are fluctuations in the market as a whole, for example, the

company's stock prices rise with the general price increase in the market and decrease with the decrease in price (Vernimmen et al, 2019:306). The β coefficient represents an appropriate measure for this type of systemic risk. It can be measured via multiplying the square of β by the variance of return according to the following formula (Singh & Bhatia, 2014: 7):

$$\text{Systematic Risk (SR)} = \beta_i{}^2 \times \delta_m{}^2 \quad \ldots\ldots\ldots (3)$$

where

β: beta coefficient

$\delta_m{}^2$: variance market return or market portfolio

The return variance is the sum of the squares of the deviations of the actual returns from the expected return, weighted by the associated probabilities. It can be calculated according to the following formula (Chandra, 2019: 375):

$$\delta_m^2 = \sum_{i=1}^{n} pi\big(Ri - E(R)\big) \quad \ldots\ldots\ldots\ldots (4)$$

β is influenced by macroeconomic events. β is considered a tool for measuring the rate of change of return per share as a result of the change in market return (Rofiqoh & Mukaffi, 2021:27). Beta coefficient can be measured through the following formula (Damodaran, 2015:68):

$$\beta_i = \frac{\text{cov}(R_{i,\,R_m})}{\delta_m^2} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

where

cov(Ri, Rm): the covariance between the stock return and the market return, and it can be measured according to the following formula

(Brigham & Ehrhardt, 2013: 219):

$$cov\big(R_{i,\,R_m}\big) = \frac{\sum_{t=1}^{n} (r_i - \overline{r})\,(r_m - \overline{r})}{n-1} \ldots\ldots\ldots\ldots\ldots\ldots (6)$$

3.2. Unsystematic Risk

It is known as company risk, and it is a type of asset risk that is specific to one company and not to others, and it may be eliminated through diversification (Zutter & Smart, 2022:72). It occurs as a result of receiving information from a specific company, such as the bankruptcy of a competitor or the emergence of new products in the market that compete with the company's products, etc. (Vernimmen et al, 2019:306). Unsystematic risk can be measured according to the following formula (Singh & Bhatia, 2014: 8):

$$\text{Unsystematic Risk (USR)} = \delta_i{}^2 - \beta_i{}^2 \times \delta_m{}^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots (7)$$

3.3. Total Risk

It is the total investment risk (systematic and unsystematic risk) after measuring each one separately (Al-Mazouri, 51: 2021). This can be explained through the following equation (Ross et al, 2019:441):

Unsystematic Risk (USR) ……(8)+Total Risk (TR)= Systematic Risk (SR)

4. Stock Return predicting models

Financial concept proposes many models that can be used in many fields to discover the relationship between return and risk, reach the real or fair value, calculate the required rate of return, capital budgets, and others; however, a few of these models were the most common and used, including following:

4.1. The Capital Asset Pricing Model (CAPM)

For decades, expertise have debated the best possible way to explain the relationship between stock return and related risk factors. The first attempts in this regard were made in the sixties, which led to the emergence of the Capital Assets Pricing Model (CAPM) by Sharpe (1964) and Lintner (1965), who won the Nobel Prize in 1990 and is based on the previous work of Harry Markowitz (1952) who developed The variance model portfolio or the so-called portfolio selection model (Elbannan, 2015: 216). This model is the cornerstone of finding the required rate of return, and the idea of the model depends on one indicator, which is the market index to calculate the rate of return. The areas of using CAPM are many in decision-making. It is considered a good model for evaluating the return in proportion to the risk, that is, if the share is purchased, for example, at a good price (less than the fair or real value), it will provide positive alpha, i.e., an expected return that exceeds the actual return. CAPM is also useful in capital budgeting decisions. When a company thinks about a new project, the required rate of return can be adopted as a cost rate on the invested funds (Bodie et al, 2012:2022).

The model also makes good predictions, so it not only shows that the expected return increases with beta, but also predicts the extent of the increase. Therefore, an increase in the β coefficient by one unit should increase the expected return by the amount of the risk premium (Brealey et al, 2023:233). It was built on several assumptions that help investors determine this price. These assumptions are different, which made it controversial among financial analysts and investors. In this sense, they have the same expectations about return, standard deviation, and the common variance of all assets. The investor is characterized by rationality or reasonability and, therefore, hate to risk All investors make investment decisions during one investment period where the capital markets are in a state of balance, which means that they are more competitive and less friction. Besides, there are no

transaction costs as well as no taxes and the information being free and available to all (Alhabeeb, 2020:2). Although some of these assumptions are unrealistic, they have been modified by reducing or increasing one or more of these assumptions. Regardless of the additions or modifications made to the model, the basic characteristics have not changed, as it only rewards investors for taking systemic risk, which is market risk. The required rate of return on investment is calculated through the following formula (Melicher & Norton, 2017:375):

$$E(R_i) = R_f + \beta_i[E(R_m) - R_f] \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

where

$E(R_i)$: the expected rate of return per stock.

R_f: the risk-free rate of return.

β_i : measure of the systemic risk (beta) of the stock.

E (Rm): the expected return of the market.

4.2. Arbitrage Pricing Theory (APT)

The arbitrage pricing theory is an extension of the capital asset pricing model due to the many criticisms directed at the unrealistic assumptions of CAPM model and its contradiction with the actual reality and the empirical results. However, arbitrage pricing theory (APT) developed by Ross (1976) does not require the basic assumptions of CAPM. APT states that in a perfectly competitive market, the required return per share is a linear function of sensitivity of multiple undetermined factors (Tulchinsky, 2019:95). It is also a one-term pricing theory that accepts an infinite number of factors to predict return per stock (Rasonyi, 2016:1). Unlike CAPM, which uses market risk as a single factor, APT uses factors more accurately and assumes that earnings per share are linearly related to a group of factors at the sector and market level called common factors or priced factors (Yao et al, 2014:945). Based on the foregoing, the researchers see that it is possible to summarize the areas of application and uses of the arbitrage pricing theory in determining the amount of return offered by the stocks to investors. It is important for investors to know the cost of stocks before investing in them, as reducing the amount of risk to which the investor is exposed leads to an increase in the return that the investor gets. It is also used to build the optimal portfolio and to detect mispricing.

Since the arbitrage pricing theory is a mathematical formula for predicting return per stock through many different economic factors, Masithoh (2017:38) and Szczygielski (2018:14) agree to define the assumptions of the theory according to the following: “Investors have similar expectations about the expected return to be obtained, they avoid the risk, because if they were given a choice between two stocks that have the same expected return, they will choose the one that has a lower standard deviation. The theory is based on assumptions, including:

the efficiency of the capital market, all investors will trade with the intention of maximizing profit, there are no arbitrage and if there is arbitrage then the market participants will intervene to take advantage of it and bring the market back into balance, it also assumes that the markets are friction free i.e. there are no transaction costs and no taxes, short selling is possible and there is an infinite number of available securities. In this sense, predicting stock returns by several coefficients of β for the different factors can affect earnings per stock". The required rate of return on investment is calculated through the following formula (Wahyuny & Gunarsih, 26:2020):

$R_i = R_f + (R_1 - R_f)\ \beta_1 + (R_2 - R_f)\ \beta_2 + (R_3 - R_f)\ \beta_3 + (R_4 - R_f)\ \beta_4 + \ldots\ldots + (R_n - R_f)\ \beta n + e_i$ ……(10)

where

Ri: the required rate of return on the stock i

Rf: the risk-free rate of return

R1,2,3,4,…..,n: the value of each of the pricing factors

β1,2,3,4,…..,n: the degree of risk of each of the factors

ei: random error with a mean of zero and a variance of σ2ei

Ross (1976) suggested that the number and type of factors are not specified. Studies differed in choosing the number and type of variables that affect the return. Our study decided to elect a group of factors, including what represents economic factors, such as market return and inflation rate; including partial factors related to banks, such as the size of the bank. The researchers of the current study proposed employing a significant factor that impacts the partial factors of the bank as well as the macroeconomic factors, which is the factor of oil prices. Since Iraq is a rentier country, then changing in prices can greatly affect all factors as explained in the subsections bellow.

4.2.1. Market Return Index

The market return index is defined as a numerical value by which changes in financial markets are measured. The indicator is expressed as a percentage change at a given point in time compared to a value in the base period or starting point. The index measures the price movement of stocks, bonds or funds, which reflects the direction of the market. The stock index reveals the general trend in the stock market, that is, it leads the investor to know how the market performs in general when making the decision to invest in a specific sector (Al-Hasnawi, 222: 2017).

4.2.2. Inflation rate

Inflation is the increase in the general level of prices. Due the fact that all prices of goods and services in an economy do not rise or fall at the same rate, it is difficult to measure inflation (Case et al, 2017:129). Since

the inflation rate is the percentage change in the consumer price index over a specific period of time (Bernanke et al, 2019:52), economists often calculate the core inflation index by taking the consumer price index and excluding economic variables. Accordingly, economists have a better idea of the structure of basic prices that influence the cost of living (Greenlaw & Shapiro, 2018:225).

4.2.3. Oil prices

Crude oil is a macroeconomic factor that greatly affects the economy. It is also one of the main factors affecting stock returns, because oil prices can cause significant changes in the country's economy and the financial performance of companies that mainly depend or use oil (McSweeney & Worthington, 2008:2). Whether the economy is based on importing or exporting oil, the increase in oil prices benefits oil-exporting countries, while the decrease benefits oil-importing countries. The extreme volatility of oil prices drew the attention of many researchers to study its impact on the economy and the return of the stock market, especially after the bankruptcy of Lehman Brothers bank in September 2008 and the European economic crisis in 2010 (Khan et al, 2017:604).

4.2.4. Bank size

Bank size refers to the classification into small and large banks. There are many indicators to measure the size of the bank, including: total assets, book value, market value of the bank, the number of employees within the bank, and the number of branches (Shamkhi and Hussein, 2019:46). Some studies indicated the tendency of ordinary stocks of small banks to achieve high returns that are greater than the ordinary stocks of large banks (Akkar and Nasih, 2020: 80). Therefore, the risk of the scale factor in small banks is particularly important in the returns of these banks; the smaller the bank, the greater the degree of its sensitivity (Gu, 2015:18).

5. Data and Methodology

The realized return of the study sample banks has been calculated according to Equation No. 2, as well as calculating the required return according to both CAPM model and APT theory. The ability of the two models to predict the return was estimated based on the extracted coefficients of determination, as well as calculating the correlations between variables, beta and alpha coefficients with the aim of proving or denying the hypotheses of the study as follows:

The first hypothesis: There is no difference between the realized rate of return and the required rate of return calculated according to CAPM model.

The second hypothesis: There is no difference between the realized rate of return and the required rate of return calculated according to APT theory.

The third hypothesis: The inability of CAPM model to predict the stock returns.

The fourth hypothesis: he inability of APT theory to predict the stock returns.

In terms of the data of the study, 10 banks listed in the Iraq Stock Exchange were selected due to the availability of their required data during the designated period (2012-2021). Table (1) shows the selected banks as a sample for the study, as well as their code and the date of listing in the Iraq Stock Exchange.

Table (1): List of the study sample banks

No.	Bank Name	Code	Listing Date
1	**Bank of Baghdad**	BBOB	15/6/2004
2	**Investment Bank of Iraq**	BIBI	15/6/2004
3	**National Bank of Iraq**	BNOI	8/7/2004
4	**Credit Bank of Iraq**	BROI	8/7/2004
5	**Babylon Bank**	BBAY	8/7/2004
6	**Commercial Bank of Iraq**	BCOI	25/7/2004
7	**Gulf Commercial Bank**	BGUC	25/7/2004
8	**Sumer Commercial Bank**	BSUC	4/9/2004
9	**Al Mansour Bank for Investment**	BMNS	1/7/2008
10	**United Bank for Investment**	BUND	3/2/2009

Source: Prepared by the researchers based on the data of the Iraq Stock Exchange

6. Results and Discussions

6.1. Realized Return

The numbers indicated in Table (2) make it clear that the average annual realized returns for the study sample banks during the study period was negative for all banks except for the National Bank of Iraq. This does not mean that the banks are not performing well or have not achieved profits, but the financial market has not evaluated this performance in an appropriate manner (interpreting performance into the share price in the market). The largest average return was that of the National Bank of Iraq of 0.03695 and a standard deviation of 0.34041. When making a comparison with the average return of the banks, the study sample as a whole, of 0.13944 with a standard deviation of 0.19767, it became clear that investors were able to evaluate the performance of the bank's shares well, which led to achieving a positive return for the bank. On the

other hand, the lowest average return was that of United Bank for Investment with 0.31968 and a standard deviation of 0.36296. Besides, the average market index reached 0.14314 with a standard deviation of 0.68364. As for the rest of the study sample banks, the average realized return has varied between these two banks.

When checking the annual closing prices for the study sample banks during the same period through which the actual rate of return was calculated, it is obvious that most of the banks had achieved low prices almost gradually, except for the National Bank, which witnessed a fluctuating closing price, which was reflected in achieving a positive actual rate of return compared to the stocks of other banks of the study sample. This, in turn, reflects the performance of banks during the study period because the closing price in the financial market reflected the bank's performance as well as the overall variables.

Table (2): The average actual rate of return for the study sample banks for the period (2012-2021)

Realized rate of return		
Bank Name	**Average Return**	**Standard Deviation**
Bank of Baghdad	-0.12175	0.48882
Investment Bank of Iraq	-0.11527	0.21784
National Bank of Iraq	0.03695	0.34041
Credit Bank of Iraq	-0.22485	0.34344
Babylon Bank	-0.20919	0.31093
Commercial Bank of Iraq	-0.07171	0.24427
Gulf Commercial Bank	-0.19924	0.25880
Sumer Commercial Bank	-0.07691	0.20512
Al Mansour Bank for Investment	-0.09280	0.28464
United Bank for Investment	-0.31968	0.36296
Average	-0.13944	0.19767
Standard Deviation	0.19767	0.05504
Market Return Index	0.14314	0.68364

Source: Prepared by the researchers based on the outputs of the MS-Excel

6.2. Analysis of the beta coefficient of the arbitrage pricing theory factors for the study sample banks

Table (3) shows the beta coefficients for the factors of the arbitrage pricing theory. These coefficients indicate the degree of sensitivity of the actual return's volatility to the rate changes of market return index, inflation rate, oil prices, and the size of the bank for the stocks of the study sample banks. At the level of the beta coefficient of the market return index factor, it is noted from the results of the beta coefficient shown in Table (3) that all the beta coefficients of the sample banks

were negative, and this indicates that the sensitivity of the share return to the market return index factor was negative for all banks of the study sample except for Al-Mansour bank for Investment, i.e., the return on the share increases in the event of a decrease in the market return index. As for the beta coefficient of the inflation rate factor, the results showed that 80% of the beta coefficients of the sample banks are positive and high, with the exception of the National Bank of Iraq, which achieved a positive but low beta coefficient, that is, the average return on shares of the bank increases when inflation rates increase. As for the Credit Bank of Iraq and Al-Mansour bank for Investment, which represent 20% of the sample banks, their beta coefficients appeared to be negative and low. As for the beta coefficient of the oil price factor, the results showed that all the beta coefficients of the sample banks are positive, which means that the average return per share of the bank increases when oil prices increase, with the exception of Al-Mansour Investment Bank, where the beta coefficient was negative. Beta coefficient for the bank size factor was positive for all banks, meaning that the average return per bank stock increases when the size of the bank, represented by the market value, is large.

Table (3): The beta coefficient of the arbitrage pricing theory factors of the study sample banks for the period (2012-2021)

Bank Name	Bi m	Bi INF	Bi OIL	Bi Z
Bank of Baghdad	-0.00606	5.74109	0.26316	0.87654
Investment Bank of Iraq	-0.12067	6.70191	0.22715	0.54670
National Bank of Iraq	-0.23831	0.71988	0.23346	0.75384
Credit Bank of Iraq	-0.14932	-3.21320	0.10185	0.86497
Babylon Bank	-0.01887	7.59151	0.39154	0.82821
Commercial Bank of Iraq	-0.18040	2.97265	0.44430	0.74046
Gulf Commercial Bank	-0.16854	5.46137	0.16934	0.07510
Sumer Commercial Bank	-0.00012	4.80884	0.12417	0.57819
Al Mansour Bank for Investment	0.08221	-0.58393	-0.12360	0.52394
United Bank for Investment	-0.11591	5.00930	0.19152	0.97418
Average	-0.09160	3.52094	0.20229	0.67621
Standard Deviation	0.10071	3.48969	0.15751	0.26006

Source: Prepared by the researchers based on the outputs of the MS-Excel

6.3. Required Rate of Return

6.3.1. Required rate of return calculated according to CAPM model

Table (4) demonstrates an analysis the required rate of return results calculated according to CAPM model and based on equation (9). It can

be seen that 90% of the banks in the study sample, investors demanded the highest rate of return in 2014. This can be attributed to the impact of the market index, the number of stocks traded and their value to varying degrees depending on changes in demand and supply, investors' decisions, and the decision of the Central Bank of Iraq to raise the minimum of the capital to 250 billion dinars. The number of banks that began to increase their capital from the study sample was (8) banks, namely: Bank of Baghdad, Investment Bank of Iraq, National Bank of Iraq, Credit Bank of Iraq, Babylon Bank, Commercial Bank of Iraq, Gulf Commercial Bank, and Sumer Commercial Bank. These banks increased their capital during the year 2014, adding to that the market return recorded its lowest decline during the study period. However, the lowest return demanded by the investors appeared in 90% of the banks of the study sample and that was in 2015. This can be attributed to the rise in the market index compared to 2014 due to the start of trading the shares of 19 new joint-stock companies (banks) in 2015, in addition to the fact that they were listed at the end of 2014; but this did not affect the rise in the market index for the year 2014. However, the security situation in the country affected the work activity of some banks due to the terrorist and criminal aggression of ISIS on a number of governorates, districts and villages of Iraq, besides the drop in global oil prices to the limits of $50 per barrel. This, in turn, affected the economies of the oil-producing and exporting countries, including Iraq, and the reassessment (calculation) of the market index for the year 2014; all these reasons led investors with these banks' shares to demand a low rate of return.

If a comparison is made among the average annual required return for all the banks of the study sample, then it becomes clear that the highest return demanded by the investors of 0.04892, was by Al Mansour Bank for Investment, and this is due to the high degree of risk that the bank is exposed to compared to the rest of the banks of the study sample; it is somehow higher than the duration average of the study sample banks, reaching 0.03107. While the lowest rate of return demanded by the investors was from by National Bank of Iraq with 0.01601, and this is consistent with the low degree of risk to which the investors are exposed compared to the banks of the study sample.

The results of the analysis of the study sample banks shown in Table (5) reveal that the required rate of return for all the study sample banks is higher than the realized rate of return. As this low rate reflects the overall performance of the study sample banks, which was reflected in the share price in the financial market. This contributing in decreasing the rate of return that unifies most of the management decisions, or it may be twice the level of market efficiency that did not give the real value of the share; with the exception of the National Bank of Iraq where the required rate of return for the bank during the study period was less than the actual rate of return. This indicates that the

management of the National Bank of Iraq is characterized by efficiency which makes it achieve an actual rate of return that exceeds the required rate of return, and then the bank's stocks remain within the list of the best investments.

Table (4): Required rate of return calculated according to CAPM model for the study sample banks

banks/years	Baghdad	Investment	National	Credit	Babylon	Commercial	Gulf	Sumer	Al Mansour	United	Average	Standard Deviation
2012	0.05916	0.07552	0.09231	0.07961	0.06099	0.08404	0.08235	0.05832	0.04657	0.07484	0.07137	0.01437
2013	0.03411	0.04936	0.06501	0.05317	0.03581	0.05730	0.05573	0.03332	0.02236	0.04872	0.04549	0.01340
2014	0.06645	0.09759	0.12956	0.10537	0.06993	0.11382	0.11060	0.06483	0.04246	0.09630	0.08969	0.02737
2015	0.01652	-0.21763	-0.45800	-0.27618	-0.00966	-0.33968	-0.31545	0.02865	0.19686	-0.20792	-0.15825	0.20576
2016	0.05373	0.07325	0.09329	0.07814	0.05591	0.08343	0.08141	0.05272	0.03870	0.07244	0.06830	0.01715
2017	0.04495	0.06285	0.08123	0.06733	0.04695	0.07218	0.07033	0.04402	0.03116	0.06211	0.05831	0.01573
2018	0.02996	0.04810	0.06673	0.05264	0.03199	0.05756	0.05568	0.02902	0.01599	0.04735	0.04350	0.01594
2019	0.03008	0.03722	0.04455	0.03900	0.03088	0.04094	0.04020	0.02971	0.02458	0.03692	0.03541	0.00627
2020	0.03001	0.03018	0.03036	0.03023	0.03003	0.03027	0.03025	0.03000	0.02988	0.03017	0.03014	0.00015
2021	0.03359	0.02446	0.01510	0.02218	0.03257	0.01971	0.02065	0.03406	0.04062	0.02484	0.02678	0.00802
Average	0.03985	0.02809	0.01601	0.02515	0.03854	0.02196	0.02317	0.04046	0.04892	0.02858	0.03107	0.03242
Standard Deviation	0.01566	0.08923	0.16984	0.10881	0.02212	0.13010	0.12197	0.01359	0.05288	0.08599	0.06947	0.06134

Source: Prepared by the researchers based on the outputs of the MS-Excel

Table (5): The difference between the average required rate of return according to CAPM model and the average of realized rate of return for the study sample banks

banks/years	Baghdad	Investment	National	Credit	Babylon	Commercial	Gulf	Sumer	Al Mansour	United
Realized return	-0.12175	-0.11527	0.03695	-0.22485	-0.20919	-0.07171	-0.19924	-0.07691	-0.09280	-0.31968
Required return	0.03985	0.02809	0.01601	0.02515	0.03854	0.02196	0.02317	0.04046	0.04892	0.02858
The difference between the required and the Realized return	-0.16160	-0.14336	0.02094	-0.25000	-0.24773	-0.09366	-0.22242	-0.11738	-0.14171	-0.34826

Source: Prepared by the researchers based on the outputs of the MS-Excel

6.3.2. The required rate of return calculated according to APT theory

Table (6) demonstrates the rate of return that was calculated according to APT theory and the equation (10). It is noticed that 60% of the study sample banks, investors demanded the highest rate of return in the year 2021, and this is due to the high rate of inflation owing to the reduction of the exchange rate of the Iraqi dinar against the US dollar to face the double crisis (declining oil revenues and the health crisis) that the country confronted. All of these factors contributed to a rise in the rate of inflation, which led to investors demanding a high return. The lowest return demanded by the investors appeared in 60% of the banks of the study sample in the year 2015, and this is attributed to the rise in the market index compared to 2014 due to the emerging of trading the shares of 19 new joint-stock companies in 2015, in addition to the fact that they were listed at the end of 2014; but this did not affect the rise in the market index for the year 2014. However, the security situation in the country and the activity of some banks were affected because of the terrorist and criminal aggression of ISIS on a number of governorates, districts and villages of Iraq, in addition to the drop in global oil prices to the limits of $50 per barrel, which affected the economies of the oil-exporting and oil-producing countries, Including Iraq, in addition to the reassessment (calculation) of the market index for the year 2014, which led to the demand of investors of these banks for a low rate of return.

When making a comparison between the average required return calculated according to APT theory for all the banks of the study sample, it became clear that the highest return demanded by the investors, amounting to 0.04961, was that of the National Bank of Iraq, which is considered higher than the average period of the study sample banks, which amounted to 0.12861, while the lowest rate of return demanded by the investors was that of the United Bank for Investment with 0.40447. However, the degree of sensitivity of the bank to risk for each of the factors was low compared to the degree of sensitivity of the banks of the study sample to the factors of APT theory. This result indicates that beta coefficients for each of APT theory factors are disproportionate to the required rate of return, as investors must claim a rate of return commensurate with the degree of risk to which they are exposed.

The results of the analysis shown in Table (7) also demonstrate a decrease in the required rate of return in 60% of the study sample banks during the study period at a level lower than the realized rate of return, that is, the banks were able to achieve an actual rate of return that is superior to the required rate of return. This means that the stocks of these banks are characterized by efficiency, which made them achieve a realized rate of return that exceeds the required rate of return, or because of the increase in the benefits accrued from those investments in light of the current value of growth opportunities, or that the market

has valued the stock price higher than the real value and then achieved a greater actual return. As for 40% of the banks, the required rate of return for the bank during the study period was greater than the realized rate of return. This result indicates that the management was unable to achieve an actual rate of return close to the rate of return required by investors. This low rate shows the overall performance of the study sample banks, which was reflected in the stock price in the financial market, which led to a low rate of return that unifies most management decisions, or it may be twice the level of market efficiency that did not give the real value of the stock.

Table (6): Required rate of return according to APT theory for the study sample banks

banks / years	Baghdad	Investment	National	Credit	Babylon	Commercial	Gulf	Sumer	Al Mansour	United	Average	Standard Deviation
2012	-0.56355	0.08723	0.03316	-0.35200	-0.01184	0.03326	-0.04172	0.24523	0.44373	-0.12776	-0.02543	0.28286
2013	0.40946	0.13956	0.31165	0.43502	0.12207	0.03090	0.20805	0.20394	0.23312	-0.32178	0.17720	0.21554
2014	-0.21510	0.01677	0.45761	-0.10633	-0.71036	-0.00855	-0.15997	-0.03147	-0.32817	-0.70692	-0.17925	0.34716
2015	-0.52334	-0.70163	-1.02363	-0.82251	-0.38622	-1.06595	-0.55906	-0.17547	0.29450	-1.07844	-0.60418	0.43701
2016	-0.55707	-0.40624	-0.26037	0.37153	-0.34674	-0.09294	-0.23957	-0.27375	0.13763	-0.44232	-0.21098	0.28123
2017	-0.59053	-0.39084	0.16892	0.10048	-0.30653	0.02164	-0.13818	-0.15778	-0.11110	-0.44243	-0.18463	0.24624
2018	-0.66349	-0.29842	-0.15705	-0.32484	-0.45920	0.04542	-0.08954	-0.07597	-0.13504	-0.97081	-0.31289	0.31053
2019	-0.17888	-0.23780	0.41278	0.16587	-0.73262	-0.14295	-0.18166	-0.48277	0.07418	-0.41793	-0.17218	0.33223
2020	0.01784	-0.33994	0.19210	-0.00698	-0.73271	-0.30199	-0.18151	-0.30074	0.00073	-0.07790	-0.17311	0.26049
2021	1.11100	0.45520	0.36093	-0.09790	0.72124	0.58040	0.26204	0.18064	-0.12157	0.54165	0.39936	0.37312
Average	-0.17537	-0.16761	0.04961	-0.06377	-0.28429	-0.09008	-0.11211	-0.08681	0.04880	-0.40447	-0.12861	0.13944
Standard deviation	0.56409	0.33745	0.44590	0.37284	0.45698	0.41054	0.23012	0.24034	0.23373	0.46604	0.37580	0.11428

Source: Prepared by the researchers based on the outputs of the MS-Excel

Table (7): The difference between the average required rate of return according to APT theory and the average annual realized rate of return for the study sample banks

banks/years	Baghdad	Investment	National	Credit	Babylon	Commercial	Gulf	Sumer	Al Mansour	United
Realized return	-0.12175	-0.11527	0.03695	-0.22485	-0.20919	-0.07171	-0.19924	-0.07691	-0.09280	-0.31968
required return	-0.17537	-0.16761	0.04961	-0.06377	-0.28429	-0.09008	-0.11211	-0.08681	0.04880	-0.40447
The difference between the required and the Realized return	0.05362	0.05234	-0.01266	-0.16108	0.07510	0.01837	-0.08713	0.00990	-0.14160	0.08478

Source: Prepared by the researchers based on the outputs of the MS-Excel

6.3.3. Comparing the results of CAPM model and APT theory with the actual rate of return

Table (8) reveals the results of the required rates of return that were calculated according to CAPM model, APT theory, and the achieved rate of return calculated according to the annual beta of the study sample banks during the study period. So, the results are analyzed to examine which of the two models is closer to the realized rate of return. The results of the analysis of the required rate of return for the study sample banks showed that the highest average required rate of return calculated according to CAPM model appeared in Al-Mansour Investment Bank of 0.04892, which is close to the required rate of return calculated according to APT theory of 0.04880, meaning that there is no difference between the two models; this is confirmed in the section seven. As for the lowest rate of return required according to CAPM model, it was appeared in the National Bank of Iraq of 0.01601. When compared with the required rate of return calculated according to APT theory of 0.04961, it becomes clear that the return on the bank's stock was affected by the factors of APT theory (inflation rate, oil prices, bank size) more than that affected by the market return rate alone.

When comparing the rates of return, for all banks, that were calculated according to CAPM model with the rates of return that were calculated according to APT theory, it is obvious that there is a difference between these rates. For instance, 90% of the study sample banks have achieved required rates of return that are higher when calculated using CAPM model than when calculated using APT theory, while 10% of the banks,

namely the National Bank of Iraq, have achieved required rates of return that are higher when calculated using APT theory than when calculated using CAPM model. This is attributed to the fact that APT theory contains multiple risk factors represented by the priced factors (inflation coefficient, oil prices, bank size) in addition to the market return.

If the required rate of return calculated according to CAPM model and APT theory is compared with the realized rate of return, then the required rate of return calculated according to APT theory in all banks of the study sample is closer than the required rate of return that was calculated according to CAPM model to the realized rate of return. Hence, the investor's adoption of APT theory will provide higher security than that provided by CAPM model, because it takes into account actual risk factors that affect the realized rate of return for bank stocks, and this is what will be confirmed in section seven.

Based on the aforementioned results, the first hypothesis "There is no difference between the realized rate of return and the required rate of return calculated according to CAPM model" and the second hypothesis "There is no difference between the realized rate of return and the required rate of return calculated according to APT theory) are rejected, and the two alternative hypotheses are accepted. In other words, there is a difference between the realized rate of return and the required rate of return calculated according to both CAPM model and APT theory for the study sample banks.

Table (8): Comparing the results of CAPM model and APT theory with the actual rate of return for the study sample banks

Bank Name	Ri	CAPM	APT
Bank of Baghdad	-0.12175	0.03985	-0.17537
Investment Bank of Iraq	-0.11527	0.02809	-0.16761
National Bank of Iraq	0.03695	0.01601	0.04961
Credit Bank of Iraq	-0.22485	0.02515	-0.06377
Babylon Bank	-0.20919	0.03854	-0.28429
Commercial Bank of Iraq	-0.07171	0.02196	-0.09008
Gulf Commercial Bank	-0.19924	0.02317	-0.11211
Sumer Commercial Bank	-0.07691	0.04046	-0.08681
Al Mansour Bank for Investment	-0.09280	0.04892	0.04880
United Bank for Investment	-0.31968	0.02858	-0.40447

Source: Prepared by the researchers based on the outputs of the MS-Excel

7. Testing the predictability power of the two models

7.1 CAPM Model predictability test

In this section, the ability of CAPM model to predict the rate of return per stock will be tested through analyzing the correlation and determination coefficients, as well as the alpha coefficient for the study

sample banks; through which the third hypothesis can be proven or denied, according to the following:

7.1.1. Correlation coefficient

Table (9) presents the correlation coefficient that shows the strength of the relationship between two variables, namely the independent variable (the market rate of return) and the dependent variable (the required rate of return calculated according to CAPM model). The table shows that there are two types of correlations: positive or negative. 90% of the study sample banks achieved correlation coefficients with a negative sign, meaning there is an inverse correlation between the market return rate and the required rate of return calculated according to CAPM model, while the remaining 10% of the study sample banks achieved a correlation coefficient with a positive sign, meaning there is a positive correlation between the two variables. Since the value of the correlation coefficient is confined between one integer and one negative, the results showed that the highest positive correlation coefficient was for Al-Mansour Bank for Investment, which amounted to 0.975, and it is the only bank that achieved a positive correlation coefficient. This, to some extent, agrees with economic and financial theory that the higher the market rate of return, the higher the required rate of return by investors. It also agrees with the results of some empirical studies, which state that whenever the market rate of return increases, this leads to investors asking for an appropriate rate of return compared to the market rate of return. As for the correlation coefficients with a negative sign, it showed that the National Bank of Iraq had achieved the highest inverse correlation coefficient of 0.995. The appearance of a negative correlation coefficient indicates that the change in the required rate of return reflects the change in the market rate of return and is overcome by less than it in the case of a rise or a decrease. That is, a decrease in the market rate of return leads to an increase in the required rate of return according to CAPM model. As for the lowest inverse correlation coefficient, it appeared in the Sumer Commercial Bank with 0.374. As for the rest of the banks of the study sample, the correlation coefficients ranged between the coefficients of these two banks.

7.1.2. Coefficient of Determination

Table (9) presents the coefficient of determination of the study sample banks, which reveals the ability of the independent variable (market return) to explain the dependent variable (the required rate of return calculated according to CAPM model). The results of the table showed that the strongest coefficient of determination appeared in the National Bank of Iraq of 0.991. This means that the model was able to explain 99% of the fluctuation in the required return for the bank's stock, and the remaining 1% is due to other factors that affect the rate of return per stock that were not mentioned in the model. The lowest coefficient

of determination appeared in the Sumer Commercial Bank with 0.140, which is a very weak coefficient indicating the ability of the market rate of return to explain only 14% of the change in the required rate of return on the bank's stock, and the remaining 86% is attributed to other factors that affect the

rate of return per stock that were not mentioned in the model. As for the rest of the banks of the study sample, the coefficients of determination ranged between these two banks.

7.1.3. Alpha coefficient

Table (9) shows alpha coefficient which is considered the required additional (excess) return resulting from non-market factors specific to each bank or due to the bank's exposure to unsystematic risk. Alpha coefficients were negative for all banks except for the National Bank of Iraq, indicating that the change in the returns of the banks' stock is linked to the change in the market's return, which, in turn, led to the pricing of their stocks at a higher price than the fair value, and this is not consistent with the amount of return realized for the banks. As for the National Bank, it achieved a positive alpha coefficient indicating that the bank's stock achieved a rate of return that is independent from the fluctuations in market returns. The highest alpha coefficient in the National Bank of Iraq was 0.071, while the lowest alpha coefficient was -0.303 in the United Bank for Investment. As for the rest of the banks of the study sample, the alpha coefficients ranged between these two percentages, and they are shown in Table (9).

Table (9): Correlation coefficient, coefficient of determination, and alpha coefficient of the study sample banks for the period (2012-2021) according to CAPM model

No.	Bank Name	RM	R^2	Alpha coefficient per share
1	Bank of Baghdad	-0.58666	0.34420	-0.12088
2	Investment Bank of Iraq	-0.98740	0.97500	-0.09800
3	National Bank of Iraq	-0.99577	0.99160	0.07106
4	Credit Bank of Iraq	-0.99110	0.98230	-0.20348
5	Babylon Bank	-0.81423	0.66300	-0.20649
6	Commercial Bank of Iraq	-0.99344	0.98690	-0.04588
7	Gulf Commercial Bank	-0.99268	0.98540	-0.17512
8	Sumer Commercial Bank	-0.37483	0.14050	-0.07690
9	Al Mansour Bank for Investment	0.97578	0.95220	-0.10457
10	United Bank for Investment	-0.98654	0.97330	-0.30309

Source: Prepared by the researchers based on the outputs of the MS-Excel

7.2. APT theory predictability test

The ability of APT theory to predict the stock return of the study sample banks can be tested by analyzing the correlation and determination coefficients as well as alpha coefficient during the study period, through which the fourth hypothesis can be proven or denied as follows:

7.2.1. Correlation coefficient

Table (10) shows the correlation between the independent variables (factors of the model) represented by market return, inflation rate, oil prices, and bank size, and the dependent variable represented by the required rate of return per stock calculated according to APT theory. Based on the table, there is a discrepancy in the correlation coefficients of factors between banks on the one hand, and the correlation relationship according to economic and financial theory and the results of empirical studies on the other hand. This has two indications: the first is that a positive correlation is expected to emerge, meaning that the relationship is direct between the independent and the dependent variable. This implicated that the fluctuations in the required rate of return are similar to the fluctuations of the factors, that is, when a certain factor increases, the required rate of return increase. As for the other indication, when a negative correlation coefficient appears, the fluctuations of the required rate of return are opposite to the fluctuations of factors, meaning that the relationship is inverse between the fluctuations of a specific factor and the fluctuations of the required rate of return, that is, when a certain factor increases, the rate of return required by investors decreases. This relationship has been subjected to many empirical tests with variant results.

According to the results shown in Table (10), it is noted that the required rate of return, calculated according to APT theory, is more correlated, with a positive relationship for 90% of the study sample banks for the bank size factor. As for the remaining 10% of the banks of the study sample, the required rate of return, calculated according to APT theory, was more closely related to the oil price factor. While the required rate of return calculated according to APT theory was less correlated with the market return factor for all the banks of the study sample with an inverse relationship, except for Al-Mansour Bank for Investment, where the required rate of return calculated according to APT theory was less correlated with the oil price factor.

7.2.2. Coefficient of Determination

Table (10) demonstrates the results of the coefficient of determination for the study sample banks during the study period. It reveals the ability of the theory represented by the independent variables (market return, inflation rate, oil prices, and bank size) to explain the dependent variable (the required rate of return calculated according to APT theory). It is obvious from the table that the coefficients of determination were high

for all sample banks, as they exceeded 95%, and this indicates the ability of APT theory factors to explain the rate of return required by investors when investing in the stocks of these banks. While the remainder percentage is related to other factors that are not included in the model. The highest coefficient of determination was 0.999 in the National Bank of Iraq, and the high of this coefficient indicates that APT theory factors adopted in the study succeeded in explaining the required rate of return by 99.9%. The remainder percentage is related to random error or other factors not included in APT theory, which are extremely rare and almost non-existent. On the other hand, the Investment Bank of Iraqi achieved the lowest coefficient of determination of 0.959, which is also a high percentage, but considered the less when compared to what the banks achieved. Accordingly, the factors of APT theory adopted in the study were able to explain 95.9% of the changes in the required rate of return, while the remaining 4.1 % is attributed to other factors affecting the rate of return required by investors that were not included in the model.

7.2.3. Alpha coefficient

Table (10) displays the results of alpha coefficient analysis of bank stocks for the study sample banks over the study period which were clarified by examining the results of alpha coefficients of banks using CAPM model.

Table (10): Correlation coefficient, coefficient of determination, and alpha coefficient of the study sample banks for the period 2012-2021 according to APT theory

No.	Bank Name	RM	R INF	R OIL	R Z	R2	Alpha coefficient per share
1	Bank of Baghdad	-0.12444	0.47391	0.39849	0.95056	0.99043	-0.12088
2	Investment Bank of Iraq	-0.50985	0.74652	0.67507	0.79862	0.95922	-0.09800
3	National Bank of Iraq	-0.82215	0.16037	0.54280	0.89428	0.99988	0.07106
4	Credit Bank of Iraq	-0.71245	-0.26770	0.24754	0.92899	0.99143	-0.20348
5	Babylon Bank	-0.01350	0.74623	0.60375	0.85341	0.96646	-0.20649
6	Commercial Bank of Iraq	-0.79937	0.44135	0.90198	0.92470	0.99403	-0.04588
7	Gulf Commercial Bank	-0.63300	0.51632	0.77170	0.46979	0.96031	-0.17512
8	Sumer	-0.12605	0.80768	0.46146	0.84279	0.96510	-0.07690

	Commercial Bank						
9	**Al Mansour Bank for Investment**	0.37904	0.23559	-0.41734	0.92196	0.99773	-0.10457
10	**United Bank for Investment**	-0.40673	0.60343	0.49269	0.93869	0.98861	-0.30309

Source: Prepared by the researchers based on the outputs of the MS-Excel

7.3. Comparing the results of the two models

This section aims to identify which of the two models is more accurate and better for the investor when predicting the required rate of return by comparing the results of the coefficient of determination analysis according to the two models. As mentioned previously, the coefficient of determination was analyzed according to CAPM model and APT theory; therefore, it was necessary to make a comparison between the two models. Table (11) reveals that there is a discrepancy in the values of the coefficient of determination for most of the study sample banks regarding CAPM model and APT theory by a few percentages that do not exceed 5%, but the others (which represents 30% of the study sample banks) showed a large discrepancy between the two models exceeding 50%. So, for most of the banks of the study sample, APT theory has the ability to predict the required rate of return more than that of CAPM model; therefore, the adoption of APT theory will provide more security for the investor in predicting the required rate of return when investing in the Iraq Stock Exchange. In addition, the attached Figures (1-10) in Appendix (1) of the three returns (actual return and required return according to CAPM model and APT theory) illustrate the similarity or relative matching between the actual realized rate of return and the required rate of return calculated according to APT theory. Hence, it confirms the superiority of APT for predicting stock returns for the study sample banks.

It is clear from the above results that the third hypothesis "The inability of CAPM model to predict the stock returns of the study sample banks" and the fourth hypothesis "The inability of APT theory to predict the stock returns of the study sample banks" are rejected, and the two alternative hypotheses are accepted, and accordingly "CAPM model and APT theory are able to predict stock returns for the study sample banks.

Table (11): Comparing the results of the coefficient of determination according to CAPM model and APT theory

No.	Bank Name	R^2 according to CAPM	R^2 according to APT
1	**Bank of Baghdad**	0.34420	0.99043
2	**Investment Bank of Iraq**	0.97500	0.95922

3	**National Bank of Iraq**	0.99160	0.99988
4	**Credit Bank of Iraq**	0.98230	0.99143
5	**Babylon Bank**	0.66300	0.96646
6	**Commercial Bank of Iraq**	0.98690	0.99403
7	**Gulf Commercial Bank**	0.98540	0.96031
8	**Sumer Commercial Bank**	0.14050	0.96510
9	**Al Mansour Bank for Investment**	0.95220	0.99773
10	**United Bank for Investment**	0.97330	0.98861

Source: Prepared by the researchers based on the data of Table (10) and Table (11).

8. Conclusions

Many sectors, especially the banking sector in the Iraqi market for securities, are facing a continuous decline in stock prices and then their returns, which causes many losses to investors in the market. Therefore, investors need a mechanism to predicting and analyzing stock returns that help rationalize their decisions or reduce losses resulting from the continuous decline in stock prices depending on what was shown by the analytical side of rejecting the hypotheses of the study and accepting alternative ones. Stock returns respond more to the change in inflation than other pricing factors within APT theory, followed by the bank size factor. The relying of risk measurement indicators on the fluctuations of the market return index only cannot reflect the real risk value of investment in the Iraqi market for securities, that is, the difference in risk measurement indicators used in capital asset pricing models leads to a difference in the evaluation or prediction results. This, in turn, causes investor decisions to vary according to investment priorities. Also, the stocks of most banks of the study sample are not a good opportunity for investing according to the Alpha index because the required rate of return calculated according to CAPM is associated with an inverse relationship with the market return for most of the study sample banks. However, the required rate of return calculated according to APT is associated with a positive relationship to the bank size factor for banks according to the correlation coefficient. The researchers concluded the validity of using both CAPM model and APT theory in predicting the required rate of return in the Iraqi stock market; however, APT theory performed better than the CAMP model in predicting the required rate of return for the stocks of the study sample banks, suggesting that the β coefficients are weak indicators for stocks' future risks.

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