International Journal of Financial Management and Economics

P-ISSN: 2617-9210
E-ISSN: 2617-9229
IJFME 2025; 8(1): 49-56
www.theeconomicsjournal.com
Received: 02-11-2024
Accepted: 07-12-2024

Adel Mansour Fadhel
Researcher, Assistant Professor, Department of Financial and Banking Sciences, College of Administration and Economics, University of Iraq, Iraq

Corresponding Author:
Adel Mansour Fadhel
Researcher, Assistant Professor, Department of Financial and Banking Sciences, College of Administration and Economics, University of Iraq, Iraq

A comparative study of risk-adjusted performance measures: Applied to the Iraq stock exchange

Adel Mansour Fadhel

DOI: https://doi.org/10.33545/26179210.2025.v8.i1.449

Abstract
The form of analysis and evaluation of the performance of investment portfolios, by applying risk-adjusted performance measures (Treynor, Sharpe, Jensen, and Sortino) and specifying the most accurate of them in the Iraqi environment, the main objective of this research, taking from a sample of the shares of listed companies, companies listed in the Iraq Stock Exchange for the period April 2022 To December 2022 weekly data as a model to prove this, reviewing the most important theoretical frameworks and applied studies that were presented for these indicators, and using economic measurement tools based on ready-made software Excel 10 and Eviews 10, and accordingly the research concluded that the results of evaluating the performance of investment portfolios differ in terms of the different measures that Its adoption leads to a variation in its order of preference, and thus a difference in the priority of the investor or financial analyst in adopting it, and in the same regard and in terms of the specificity of the Iraqi environment, and the random fluctuations that characterize the shares of the sample portfolios, which are reflected in more concern about downward fluctuations. The Sortino index shows superiority over other indicators, in that it only focuses on the negative deviation of portfolio returns from the mean, positive volatility is an advantage and can therefore considering this indicator is the most accurate and effective in evaluating the performance of investment portfolios in the Iraqi environment.

Keywords: Evaluation of investment portfolio performance, risk-adjusted performance measures, Treynor, Sharpe, Jensen and Sortino index

Introduction
The concepts on which risk-adjusted performance measures are based vary, depending on the context in which they are used, but all measures share a comparison of the return on capital with the risks that are exposed to earn this return - i.e. the type of risk adjustment adopted, which is generally done by measuring the risk-adjusted return either by absolute returns or by relative returns (i.e. excess returns). In contrast, there is disagreement in the literature about how to measure these risks, which led to the development of a large number of alternative risk-adjusted performance measures, which can take several forms of risk-adjusted performance measures, which emerged in response to the emergence of investment funds as an important investment category, which necessitated the existence of an effective tool to evaluate the performance of each of the different funds compared to the risks to which the managers of these funds are exposed to choose the right option for allocating capital, in addition to what the Basel II regulatory framework requires of financial institutions to retain a certain amount of shareholders' rights as a hedge against unexpected losses for each risky investment,

However, by taking all available evaluation measures, in terms of their diversity and variety, as well as Regarding the specificity of the Iraqi business environment, conflicting, incorrect or inaccurate results can be reached in ranking companies according to their performance, according to the diversity of standards and the variation of their results, leaving a source of confusion and error, which makes the issue of relying on the most accurate standards in evaluating the performance of financial sector companies in a manner that suits the Iraqi business environment, and moving away from classical methods of evaluation an important and effective tool to rely on when practicing investment business, and relying on modern and advanced methods in conducting analysis and evaluation.

1. Research problem

Despite the fact that many studies have proven the possibility of relying on risk-adjusted stock evaluation measures in many financial markets and their superiority in terms of including relative risks and market conditions, they have not been spared from criticism that casts doubt on their accuracy, in addition to the fact that most of these studies have tested these measures in developed markets with limited application in developing markets, especially the Iraq Stock Exchange, hence the research problem that was formulated in the form of the following main question:

Does the difference in the measurement index lead to a difference in the results of evaluating the performance of investment portfolios?

Is it better to evaluate the performance of investment portfolios in the Iraq Stock Exchange based on portfolio returns, portfolio risk measures, or those that rely on risk adjustment?

What are the most accurate risk-adjusted performance measures in evaluating the performance of investment portfolios in the Iraq Stock Exchange, as a field of application?

2. Research objective

The research sought to present and summarize the theoretical and experimental frameworks that defined the risk-adjusted performance measures, in addition to experimentally investigating the identification of the most accurate performance measures in evaluating investment portfolios in the Iraqi Stock Exchange by comparing them and identifying similarities and differences.

3. Study community and sample

The study sample consists of the banking sector, the insurance sector, the industrial sector, and the service sector, in the Iraq Stock Exchange, with 5 banks for the banking sector, two insurance companies for the insurance sector, four companies for the industrial sector, and four companies for the service sector, provided that the following requirements are met:

- The shares of these companies are listed on the Iraq Stock Exchange regulations during the period from April 2022 to December 2022.
- The shares of these companies have not been removed from trading (whether by a decision of the market management or due to the lack of trading at all) during the study period, which covered approximately 28 weeks.
- There has been no merger of the company or any other unusual event that has an impact on the calculation of the study variables in a consistent manner during the study period.

4. Research Limits

A. Spatial Limits

To cover the research gap represented by the scarcity of experimental research concerned with studying this topic in the Iraqi environment, the research took the Iraq Stock Exchange as a sample for its applications, to provide its data and for a period appropriate to the research requirements.

B. Temporal Limits

The research covered the period from April 2022 to December 2022 (weekly data).

C- Data Collection Sources

The data published on the official website of the Iraq Stock Exchange were relied upon, as the aforementioned database contains data on (152) companies belonging to different sectors.

Second: Reference studies

The study (2009) Grau-Carles, *et al*. [8, 9] presented a comparison of risk-adjusted performance measures such as: (Sharpe ratio, Trino index, and Jensen alpha) based on a mean-variance framework, and performance measures that take into account risks by considering losses only, such as value at risk (VaR) for a sample of British equity mutual funds that invest exclusively in the United Kingdom and actively managed internal funds, in a way that ensures homogeneity in country exposure to risks, with monthly returns for 239 mutual funds over 11 years, from January 1995 to December 2005, and the results showed the superiority and appropriateness of value at risk. Al-Hamduni's study (2011) [2] focused on evaluating the performance of investment portfolios using risk-adjusted evaluation indicators (Sharpe, Treynor, and Jensen) on a sample of company shares listed on the Amman Stock Exchange for the year 2009. The research reached a conclusion indicating the superiority of using risk-adjusted performance evaluation measures compared to using return and risk separately, in addition to the variation in the results of evaluating the indicators according to the indicator used. Anitasaria, Nuzula and Darmawan (2019) [3] compared risk-adjusted portfolio performance indicators (Sharpe, Treynor and Jensen) to see if the difference in the measurement index leads to different results, as well as to know the most appropriate indicator in measuring the performance of investment portfolios in the Indonesian Stock Exchange. The sample consists of 22 stocks in the LQ-45 index, for the period 2013-2018. The results showed that the portfolio performance evaluation based on the three measures (Sharpe, Treynor and Jensen) faces similar and volatile movement, but the Sharpe index is the most appropriate to use in evaluating the performance of the portfolio in the study sample.

Third: The theoretical and conceptual framework for risk-adjusted performance evaluation measures

The scientific principles of investment practice require that investment decisions and the achievements made therefrom, especially when evaluating the performance of the investment portfolio, be subject to a continuous evaluation process based on balancing the achieved returns and the corresponding risks, meaning that the evaluation process is carried out within the framework of taking into account the elements of return and risk together (Matar and Taym, 2005, 185) [11]:

In this regard, measuring the performance of investment portfolios requires the existence of two dimensions that fall on the specialists (analysts) of securities, the first of which focuses on the analysts' ability to adopt the fundamental analysis method by achieving successful predictions of securities prices, which increases the size of returns, while the second dimension focuses on their ability to reduce the size of investment portfolio risks through efficient diversification and then arranging them according to their investment performance, and thus these two dimensions (the duality of return and risk) represent the main source of the

difficulty of evaluating the performance of the investment portfolio (Al-Amri, 2013, 434) [1]. Portfolio theory pioneers have proposed several composite performance indicators to measure returns on a risk-adjusted basis to evaluate the performance of an investment portfolio as follows:

1. Jensen Index

The Jensen Index stems from the theory on which the CAPM model is based in calculating the required return, which the Jensen Index considers as the basis for the minimum return that an investor seeks when evaluating a single stock or a portfolio of stocks adjusted for market fluctuations, as the CAPM acts as a first guideline, providing the minimum return required before making an investment decision, and any additional return above the return calculated by the CAPM is considered that the investment has exceeded the minimum return and this will support moving forward with the investment. In this regard, this excess is called Jensen's alpha (Droussiotis, 2020, 71) [7] (Schmid, 2010, 19) [13], which represents a formula that determines the average return above (positive alpha)/or below (negative alpha) the expectations calculated by the CAPM.

According to Jensen's alpha (α), the formula for the additional return on the CAPM will be as follows:

$$\alpha = R_i - [R_f + \beta(R_m - R_f] \; or \alpha = R_i - CAPM$$

Where

R_i: The return achieved on the portfolio investment.

R_f: The risk-free return

Beta:

R_m: The return of the market index

Jensen's alpha ratio, which is a formula that determines the average return above or below the expectations calculated by the CAPM (Droussiotis, 2020, 64) [7].

2. Sharpe Index

William Sharpe builds his index based on the concept of the capital market line as a standard value through which the portfolio risk premium or stock risk premium is divided by its standard deviation (reward-to-variability ratio (RVAR), which enables the Sharpe index to be used to measure the difference between the portfolio return and the risk-free return, relative to the volatility of the investment portfolio returns expressed by the standard deviation of the portfolio returns (Grau *et al*, 2019, 1-33) [8, 9], and it is calculated according to the following equation:

$$S = \frac{TR_P - R_F}{\delta_P}$$

Where S: Sharpe measure, ⟦TR⟧_P: the achieved return on portfolio investment, R_F: the risk-free rate, δ_P: the portfolio risk measured by standard deviation, (TR)_P-R_F: the portfolio risk premium, and thus the Sharpe measure measures the portfolio risk premium to the total risk, and the higher the ratio indicates better performance, and this ratio is used when comparing similar portfolios in terms of their objectives and restrictions, such as stock or bond portfolios (Anitasaria, Nuzula & Darmawan, 2019, 89-104) [3], in addition to the fact that quoting this ratio from the capital market line, and not from the capital asset pricing model (CAPM), makes it not refer to the market index in its content, and thus is not subject to the criticisms of Roll (1977) [18] regarding the difficulty of observing the market portfolio, since this procedure depends on the total risks of the portfolio, consisting of market risks and unsystematic risks borne by the investor, so this measure allows evaluating the performance of non- Diversified and represents the total investment per capita (Sourd, 2007, 13) [15].

3. Treynor Index

The Treynor ratio measures the relationship between risk and return, as the Treynor ratio focuses on the relationship between the portfolio risk premium return and the portfolio beta (β) expressed in factors (positive or negative) or multiples of the market premium risk, thus, this index measures the relationship between the portfolio return (which exceeds the risk-free rate) for each unit of systematic risk to which the portfolio is exposed, and calculating this index requires choosing a benchmark to estimate the portfolio beta (Hubner, 2005, 416-417) [10], which makes the measurement results based on the good choice of the benchmark, which may make the index subject to criticism by Roll (1977) [18] regarding the fact that the market portfolio cannot be observed, which results in the impossibility of measuring the truemarket portfolio, which casts doubt on the performance measurement models on which it is based, moreover, the Treynor index is limited in particular to estimating the performance of a well-diversified portfolio, as it only takes into account the systematic risks of the portfolio (Sourd, 2007, 13) [15], Any risks that cannot be eliminated by diversification, and accordingly, this indicator is the most appropriate for evaluating the performance of the portfolio in terms of the ability and efficiency of management to diversify investments in a way that can eliminate unsystematic risks to a large extent, and it divides the additional returns of the portfolio (the rate of return of the portfolio - the rate of return free of risk) by the beta coefficient (Shabir, 2015, 85) [14], and the formula is as follows:

$$T = \frac{R_P - R_F}{\beta_P}$$

Where

R_P: Return on portfolio investment, R_F: Risk-free rate, β: Beta

This ratio aims to measure the performance ratio that can be applied to all investors regardless of their personal risk orientations, which includes two types of volatility risks measured by beta (β), which are:-

1-Stock market risks

2-Individual risks of the portfolio or specific stocks

Beta (β) expresses the volatility or regression line of the portfolio to the market, the higher or steeper the regression line, the better the trade-off between risk and return, which made the Treynor ratio, also called the reward-to-volatility ratio, evaluate the quality of the portfolio's performance in the market, as it evaluates the portfolio's performance against a specific standard, instead of evaluating the portfolio's return against the risk-free rate only (Droussiotis, 2020, 72) [7].

4. Sortino ratio

Sortino ratios focus on downward volatility, which is more important than overall volatility, because the former measures the amount of risk an investor will be exposed to and the amount of money he will lose if he fails to achieve his long-term investment goals. Accordingly, the return level on the risk-free asset is subtracted from the average return on the riskier asset. However, unlike the "sharp" ratio, the "Sortino" ratio divides the previous result by the negative deviation rate (towards the downside) of the riskier assets, which shows the amount of acceptable decline in return for the investor.

$$\text{Sortino Ratio} = \frac{R_P - R_F}{\sigma_d}$$

Whereas

R_P: the return achieved on the portfolio investment, R_F: the risk-free rate, σ_d: the standard deviation of the downside, and the higher Sortino ratio expresses better performance, as it means that the investment earns a greater return for each unit of negative risk it bears.

Based on the above, and by highlighting the most important points of similarity and difference between the measures, the comparison between them is evident through the basic idea of the measures (Catherine & Robiyanto, 2020, 37-44) [6]

(https://www.investopedia.com/):

1. Jensen's alpha measures the amount of a portfolio's return rate that is attributable to the manager's ability to deliver above-average returns, adjusted for market risk, which represents the difference in the amount of the portfolio's return versus the market as a whole, which helps investors determine how much the portfolio's achieved return differs from the return it should have achieved, which leads to the preference to use Jensen when the value of positive alpha is high, indicating that all portfolio returns are strongly correlated.
2. Treynor index: which is essentially an adjusted measure of return volatility risk based on systematic risk, and that the underlying assumption behind this index is that investors must be compensated for the risks inherent in the portfolio, since this index is limited to systematic risk, it assumes that the investor already has a sufficiently diversified portfolio, and therefore, unsystematic (diversifiable) risks are not taken into account, as a result, this performance measure is more applicable to investors with diversified portfolios, as evidenced by the emergence of positive alpha, and the strong correlation it represents between all returns and the market.
3. Sharp Ratio: The difference between the Treynor and Sharp ratios is that Treynor relies on the portfolio beta or systematic risk to measure volatility, instead of what the Sharp ratio came with by adjusting the portfolio returns using the standard deviation of those returns. In this, the Sharp ratio is more suitable for well-diversified portfolios whose returns are characterized by high volatility, as it takes into account the risks of the portfolio more accurately.
4. Sortino Ratio, which differs from the Sharp ratio in that it only takes into account the standard deviation of the downside risk, not the standard deviation of the risk (upside + downside). Since the Sortino Ratio focuses only on the negative deviation of the portfolio returns from the average, it is believed that it gives a better view of the portfolio's performance adjusted for risk because positive volatility is an advantage, and therefore this ratio can be applied effectively to high-volatility investments, as there is more concern about downside risks.

Fourth: The applied framework of the research

For the purpose of determining the variables for evaluating the performance of investment portfolios (rates of return, alpha, and beta), and using the EVIEWS program, a simple linear regression was conducted for the market portfolio return rate as an independent variable on the weekly stock return rates as dependent variables, in addition to calculating the average standard deviation S.D. for investment portfolios, and the coefficient of determination R2 to show the extent of the ability of the independent variable (market portfolio) to explain the changes in stock return rates, and the coefficient of variation C.V. was also calculated to show the extent to which each unit of return can bear the risk measured by the standard deviation.

A Description of the variables for evaluating the performance of investment portfolios

Table 1: Description of the variables for evaluating the performance of the banking sector portfolio for the period from 4/1/2022 - 12/31/2022

C.V	S.D	β	α	R^2	RI	Company	
-0.14893	0.029835	-0.000530	0.514558	22	-0.00444	Sumer Bank	1.
-0.07026	0.063842	0.011689	-6.588760	15	-0.00449	Economy Bank	2.
4.296161	0.060783	-0.001937	2.095221	5	0.014148	Across Iraq Bank	3.
5.384606	0.034516	0.240005	0.203425	24	0.00641	Mosul Bank for Development and Investment	4.
-9.59915	0.03629	.4600051	0.091351	12	-0.00378	Middle East Bank	5.
-0.0275	0.04505	0.14185	-0.7368	15.6	0.00157	Average	6.

Source: Eviews 10 output

From Table (1), it is clear that the market portfolio, through the average value of the coefficient of determination, was able to explain 15.6% of the changes in the banking sector stock returns index, which indicates a weak ability to explain, and the presence of other factors that can explain the fluctuations in stock returns, such as economic and financial environment variables or unorthodox speculation that may occur in the market. The positive sign of the α sector for all banks except the Economy Bank, which represents the irregular return, shows that all returns achieved by banks are significantly linked to the market. The value of β in the Middle East Bank was at its highest

value, which amounted to .4600051, indicating that the returns of this bank are among the most volatile bank returns among the sample banks, as a 1% fluctuation in market returns will lead to a 1.46 fluctuation in the bank returns. The total risk measured by the standard deviation varies greatly among the sample banks, in a manner that indicates the variance in return values. The positive sign of the secant indicates that the rate of return on the financial asset is greater than the risk-free rate of return, which makes it an acceptable asset.

Table 2: Description of the variables for evaluating the performance of the insurance sector portfolio

C.V	S.D	β	α	R^2	RI	Company	
-18.1522542	0.054936981	0.001092	-0.121448	3	-0.00302646	Al-Amin Insurance	1.
5.1592974	0.082694	0.005742	-2.772090	15	0.0160281	Dar Al-Salam	2.
-6.49648	0.068815	0.003417	-1.44677	9	0.0065008	Average	3.

Source: Eviews 10 output

From Table (2), it is clear that the market portfolio, through the average value of the coefficient of determination, was able to explain 9% of the changes in the insurance sector stock returns index, which indicates a weak ability to explain, and the presence of other factors that caused the fluctuations in stock returns, can explain the fluctuations in stock returns, such as economic and financial environment variables or unorthodox speculation that may occur in the market, and the negative sign of the α sector for the two insurance sector companies, which represents the irregular return, shows that all the returns achieved by the companies are weakly linked to the market, and the value of beta and the total risk measured by the standard deviation vary slightly between the sample companies, which indicates the convergence of the values of the returns achieved for them, which is consistent with the coefficient of variation in the sample.

Table 3: Description of the variables for evaluating the performance of the industrial sector portfolio

C.V	S.D	β	α	R2	RI	The company	
12.66143265	0.019540959	0.001810	-0.383877	7	0.001543345	Canadian	1.
5.599126342	0.010542194	-0.003361	-5.697462	10	0.001882828	Baghdad for soft drinks	2.
-5.91823701	0.038558486	0.000518	-5.697462	6	-0.0065152	Al-Mansour for pharmaceutical industries	3.
-3.67446548	0.032099613	0.002919	-0.827126	6	-0.00873586	Iraqi for manufacturing and marketing dates	4.
2.166964	0.025185	0.000472	-3.1514818	7.25	-0.00295622	Average	

Source: Eviews 10 output

From Table (3), it is clear that the market portfolio, through the average value of the coefficient of determination, was able to explain 7.25% of the changes in the industrial sector stock returns index, which indicates a weak ability to explain, and the presence of other factors that can explain the fluctuations in stock returns, such as economic and financial environment variables or unorthodox speculation that may occur in the market, and the negative sign of the α sector for all companies, which represents the irregular return, shows that all the returns achieved by companies are weakly linked to the market, and the value of beta varies slightly between the sample companies, with the exception of Baghdad Soft Drinks Company, where the value of beta came at the lowest value and with a negative sign, which amounted to -0.003361, indicating that the returns of this company are inversely related to the market returns, and that a 1% fluctuation in market returns will lead to a fluctuation in the returns of this company by -0.003361 in the opposite direction, and the total risk measured by the standard deviation varies between the sample companies Simply put, this indicates that the values of the returns achieved are close, which is consistent with the coefficient of variation in the sample.

Table 4: Description of the variables for evaluating the performance of the services sector portfolio

C.V	S.D	β	α	R2	RI	The company	
-0.00112245	0.002653061	-0.011512	18.25436-	2	-0.00489796	Elite Contracting	1.
-7.62802884	0.06446486	-0.189565	144.0321-	5	-0.00845105	Mosul for amusement parks	2.
-6.7799224	0.166910619	0.048620	-24.88427	7	-0.02461837	Baghdad Iraq for public transportation	3.
1.3247548	0.0777858	0.000497	-0.295318	3	0.0587171	Karkh amusement park	4.
-3.27108	0.077954	-0.03799	-12.5898	4.25	0.0051874	Average	

Source: Eviews 10 output

From Table (4), it is clear that the market portfolio, through the value of the coefficient of determination, was able to explain 4.25% of the changes in the service sector stock returns index, which indicates a weak ability to explain, and the presence of other factors that can explain the fluctuations in stock returns, such as economic and financial environment variables or unorthodox speculation that may occur in the market, and the negative sign of the α sector for all companies, which represents the irregular return, shows that all the returns achieved by companies are weakly linked to the market, and the value of beta β varies between the sample companies between positive and negative, with the exception of the negative values of which are interpreted as the returns of Al-Nukhba Contracting Company and Mosul Games City Company are inversely related to market returns, and that a fluctuation in market returns of 1% will lead to a fluctuation in the returns of these two companies of -0.011512, -0.189565 respectively, in the opposite direction,

and the positive values of which are interpreted as the returns of Baghdad Companies Iraq Public Transport and Karkh Amusement City are directly related to market returns, and a 1% fluctuation in market returns will lead to a fluctuation in the returns of these two companies by 0.048620 and 0.000497 respectively, in the same direction. The total risk measured by the standard deviation varies slightly between the sample companies, indicating that the values of the returns achieved for them are close, which is consistent with the coefficient of variation in the sample.

Table 5: Evaluation of investment portfolio performance

Services sector	Industrial sector	Insurance sector	Banking sector	Sector
-0.00296	0.0237	0.006501	0.00157	Rate of return RI
-0.03799	0.000472	0.003417	0.141846	Systematic risk β
0.025185	0.034437	0.068815	0.045053	Standard deviation S.D

Source: Eviews 10 output

The data in Table (5) indicate, when comparing the performance of investment portfolios in light of return rates, that return rates vary, as it was found that the industrial sector portfolio came first with an average return of (0.0237), followed by the insurance sector portfolio (0.006501), then the banking sector (0.00157), and finally the services sector portfolio, which incurred losses of (-0.00296). When comparing according to risk measures (beta and standard deviation), we find that the best portfolio according to the beta measure is the industrial sector and services sector portfolios because their systematic risk is the lowest among the other portfolios, as it reached (0.000472), followed in second place by the insurance sector portfolio (0.003417), then the banking sector portfolio (0.141846). When comparing according to the standard deviation scale, we find that the best portfolio is the industrial sector portfolio, then the services, then the banking sector, where the standard deviation of these portfolios reached (0.025185, 0.034437, 0.045053) respectively, and the insurance sector portfolio came in last place (0.068815), but this comparison is illogical due to the difference in results according to the difference in performance measures. Therefore, we conclude from the above that the evaluation results differ according to the difference in measurement method, as a result of each method focusing on a specific variable of the performance evaluation variables, and at the same time, focusing on one variable and neglecting another does not give an accurate picture of the reality of the portfolio's performance, which requires taking into account the risk-adjusted performance measures, as they include all performance variables, and give a unified result, which is that the best portfolio is the portfolio with the highest return compared to other portfolios.

B. Evaluating the performance of investment portfolios according to risk-adjusted performance measures

In order to analyze and evaluate the performance of investment portfolios, by applying risk-adjusted performance indicators and models and determining the most accurate ones in the Iraqi environment, a set of risk-adjusted performance measures were used, which are the latest and most common: such as Treynor, Sharpe, Jensen, and Sortino, whose indicators were presented within their theoretical framework, and to avoid repetition, we limit ourselves to presenting the portfolio construction formula within its applied framework:

It requires calculating the portfolio beta (β_P), which represents an indicator of market risk, by applying the mathematical equation that expresses the weighted arithmetic mean of the beta of the portfolio components, which can be expressed in the following formula: (Brigham, 2011, 221) [4]

$$\beta_P = w_1.\beta_1 + w_2.\beta_2 + w_3.\beta_3 + \cdots\cdots + w_n.\beta_n$$

Or

$$\beta_P = \sum_{i=1}^{n} w_i.\beta_i$$

Where

(w_i): the weight of the stock within the investment portfolio

(β_i) the stock beta, which is calculated by dividing the standard deviation of the stock return (σ_i) by the standard deviation of the market portfolio returns (σ_M) and multiplying the result by the correlation coefficient between the stock return and the market portfolio return (r_iM) according to the following formula: (Brigham and Daves, 2007, 52) [5]

$$\beta_i = \left[\frac{\sigma_i}{\sigma_M}\right].r_{iM}$$

In order to calculate the standard deviation of the market portfolio return (σ_M), the returns of the Iraq Stock Exchange index were relied upon, by applying the following formula: (Al-Amiri, 2013, 27) [1]

Where

R_mt = return of the Iraq Stock Exchange index for period t.

p_t = closing price of the Iraq Stock Exchange index for period t.

p_(t-1) = closing price of the Iraq Stock Exchange index for period t-1

The following is a brief presentation of the results of the evaluation of the risk-adjusted performance measurement models adopted by the study:

Table 6: Evaluation of investment portfolio performance according to risk-adjusted performance measures

Services sector	Industrial sector	Insurance sector	Banking sector	sector
-0.058465	-0.02376	-0.00594	-0.02083	Jensen
-19.38381	-33.5028	-4.19942	-0.13332	Sharpe
0.0412829	-0.10088	-0.03279	-0.23992	Treynor
0.1104754	-1.3746	0.367451	-0.17928	Sortino

Source: Eviews 10 output

Based on the results of evaluating the performance of investment portfolios according to the risk-adjusted performance measures listed in Table (6) and in terms of expressing the risk-free rate of return, with the average interest rate on savings deposits for a period of six months, which amounted to 4.31, the following can be diagnosed:

1. It is noted when comparing the performance of the sample portfolios according to the four indicators that the majority of the portfolios have incurred losses, due to the weak monthly return rates of the portfolio companies.
2. It is noted when comparing the performance of the sample portfolios according to the Jensen index that the best portfolio is the insurance sector portfolio, as it has incurred the lowest losses, which amounted to (-0.00594), followed by the banking sector portfolio, then the industrial sector, then the services sector, with losses amounting to about (-0.02083, -0.02376, -0.058465) respectively.
3. It is also noted when comparing the performance of the sample portfolios according to the Sharpe index, that the banking sector portfolio comes first with the lowest loss, which amounted to (-0.13332), followed by the insurance sector portfolio, then the services sector, then the industrial sector with a loss amounting to about (-4.19942, -19.38381, -33.5028) respectively.
4. The results of the Treynor index also show when comparing the performance of the sample portfolios, that the best performing portfolio is the services sector portfolio, which achieved a return of (0.0412829), while the rest of the portfolios achieved losses, and the lowest was for the insurance sector portfolio, then the industrial sector, then the banking sector, which reached (-0.03279, -0.10088, -0.23992) respectively.
5. The results of evaluating the portfolios according to the Sortino index also showed that two portfolios achieved returns, the highest of which was the insurance sector portfolio, followed by the services sector portfolio with a return of (0.367451, 0.1104754) respectively, while the banking sector and industrial sector portfolios achieved the lowest performance through losses of (-0.17928, -1.3746) respectively.

First: Conclusions

1. The low values of the coefficient of determination for the averages of the sample sector portfolios indicate a weak correlation between the returns of the Iraqi Stock Exchange and the returns of its stocks, and that most of the fluctuations in stock prices are caused by economic and financial environmental factors, and unorthodox speculation that may occur in the market.
2. Taking risk-adjusted performance measures is the most logical, as they include all performance variables from return and risk together, which enables them to give an accurate picture of the reality of the portfolio's performance, which is consistent with what the evaluation results based on the return showed in terms of most portfolios achieving positive results, most of which were reflected in the negative when evaluated by risk-adjusted performance measures, as in the first they represented unreal nominal returns due to their lack of adjustment according to risks, which indicates the failure of traditional measures based on financial data (returns and their fluctuations) because they showed a large gap between the accounting reality and the economic reality, as they did not include the correct management of the many risks that investment portfolios may be exposed to in the Iraqi environment.
3. The difference in the investment portfolio performance evaluation criteria leads to a difference in the order of their preference, and thus the difference in the priority of the investor or financial analyst in adopting them, which is consistent with the research hypothesis in the part of the imbalance in investment portfolio performance evaluation criteria leading to a difference in the evaluation results of the sample companies' portfolios.
4. The decrease in the monthly return rates of the sample companies was reflected in the results of the risk-adjusted performance evaluation criteria to appear at a negative value, in addition to the absence of irregular returns (specific to the company) which lost the achieved return rates support and reinforcement.
5. The weak correlation of stock return fluctuations with the market led to the exclusion of the Jensen index from its preference for evaluating the performance of investment portfolios, as a result of its reliance in risk adjustment on the assumption of the correlation of returns with the market through the positive alpha value, and this is in contrast to what the experimental aspect of the research proved about the weak correlation of stock return fluctuations with the market.
6. The performance of the investment portfolios that were formed faces a similar and volatile movement, which made the Treynor and Sharp indicators in the same rank in terms of the quality of evaluating the performance of investment portfolios, but the Sharp indicator is superior in this, as a result of the difference between the two indicators, in that Treynor relies on the portfolio beta or systematic risks to measure volatility, instead of what the Sharp indicator came with in terms of adjusting the portfolio returns using the standard deviation of those returns, and in this the Sharp ratio is more suitable for portfolios that are characterized by a weak correlation of their returns volatility with the market, which is consistent with what the results of the experimental aspect of the research showed. 7. In the same context, and in terms of the specificity of the Iraqi environment, and the random fluctuations that characterize the sample portfolios' shares, which are reflected in more concern about downward fluctuations, the Sortino index shows superiority over other indicators, in that it focuses only on the negative deviation of portfolio returns from the average, since positive fluctuation is an advantage, and therefore this index can be considered the most accurate and effective in evaluating the performance of investment portfolios in the Iraqi environment.

Second: Recommendations

1. Activate the use of globally approved performance evaluation measures, and move away from classical methods in practicing investment business, including evaluation.
2. Specialists and investors should study and analyze the companies in which they want to invest, and resort to using the Sortino index due to its great ability to evaluate the performance of investment portfolios in the Iraqi environment.
3. Guidance of investors towards good diversification of their investment portfolios, to avoid losses that may result from the weak correlation of stock return fluctuations with the market.
4. It is important to take into account the level of risk and

not just calculate the returns achieved, when evaluating the performance of investment portfolios. This type of analysis can be conducted using risk-adjusted performance measures. 5. Financial specialists and researchers should study and analyze more risk-adjusted performance measures due to their modernity and superiority in evaluating the performance of investment portfolios, such as the Modigliani-Modigliani Index (M2) and the Information Ratio (RI).

References

1. Al-Amri MAI. Investment Portfolio Management. 1st ed. Jordan: Ithraa Publishing and Distribution; 2013.
2. Al-Hamduni EK. Evaluating the Performance of Investment Portfolios by Application in the Amman Stock Exchange. Anbar Univ J Econ Adm Sci. 2011;4(7):310-334.
3. Anitasari Q, Qur' N, Firdausi N, Darmawan A. Critical Analysis of Sharpe, Treynor and Jensen Methods in Analyzing Stock Portfolio Performance LQ-45 Stock Studies. Asia Pac Manag Bus Appl. 2019;8(2):89-104.
4. Brigham EF. Financial Management Theory and Practice. 13th ed. South Western; 2011.
5. Brigham EF, Daves PR. Intermediate Financial Management. 9th ed. Thomson/South-Western; 2007.
6. Happy C, Robiyanto R. Performance evaluation of LQ45 stocks in the Indonesia Stock Exchange during period of 2016-2018. J Manag Entrepren Res. 2020;1(1):37-44.
7. Droussiotis C. An Analytical Approach to Investments, Finance, and Credit. 1st ed. Cognella Academic Publishing; 2020.
8. Grau PC, Sainz J, Otamendi J, Doncel LM. Different Risk-Adjusted Fund Performance Measures: A Comparison. Econ Discussion Paper. 2009;2009-54:1-33.
9. Grau PC, Sainz J, Otamendi J, Doncel LM. Different Risk-Adjusted Fund Performance Measures: A Comparison. Econ Open Assess E-Journal. 2009;2009-54.
10. Hubner G. The Generalized Treynor Ratio. Rev Finance. 2005;39:415-435.
11. Matar M, Fayez T. Investment Portfolio Management. 1st ed. Jordan: Wael Publishing House; 2005.
12. Sahi A, Pahuja A, Balram D. Different Risk Adjusted Performance Measures for Equity Mutual Funds: A Comparative Study of VaR and Traditional Measures. Proc Int Conf Manag Mark Bank. 2015;95-105.
13. Schmid P. Risk Adjusted Performance Measures-State of the Art. Master's Thesis. Graduate School of Business, University of St. Gallen; 2010.
14. Shabir TA. Building Investment Portfolios Using Stock Performance Evaluation Models: A Comparative Analytical Applied Study on the Shares of Companies Listed on the Palestine Stock Exchange. Master's Thesis in Accounting and Finance, Faculty of Commerce, Islamic University, Gaza; 2015.
15. Sourd VL. Performance Measurement for Traditional Investment: Literature Survey. EDHEC Risk and Asset Management Research Center; 2007.
16. Wiesinger A. Risk-Adjusted Performance Measurement – State of the Art. Bachelor's Thesis. University of St. Gallen School of Business Administration, Economics, Law and Social Sciences (HSG); 2010.
17. Investopedia. Available from: https://www.investopedia.com
18. Roll R. A critique of the asset pricing theory's tests Part I: On past and potential testability of the theory. Journal of financial economics. 1977 Mar 1;4(2):129-176.