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Hedging an Efficient Portfolio against Expected Inflation Risk: An Applied Research in the Iraq Stock Exchange

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Abstract:

This research aims to hedge the efficient portfolio of the investor against the expected inflation risk and to evaluate the extent of improvement in the quality of its performance. It has applied to an intentional sample of companies whose shares traded on the Iraq Stock Exchange, consisting of (37) companies, with (120) monthly observations for each company from 2012 to 2021. The simple ranking model of Elton et al. (1978) has been used to build the nominally efficient portfolio and the inflation-adjusted model of Chen and Moore (1985) to hedge a portfolio against expected inflation risk. The Sharpe, Treynor, Jensen, and M^2 models have been used to evaluate the performance of portfolios. The research has reached several results. The most important of which is the presence of a big difference in the components of the efficient hedged portfolio compared to the nominal unhedged portfolio, in addition to the presence of a big difference in the amounts of investment weights between the two portfolios. The results of the analysis have also shown a significant improvement in the quality of the performance of the efficient portfolio that has hedged against the expected inflation risk compared to the unhedged nominal portfolio. The originality of the research and its scientific value lie in the fact that it is the first to adopt the inflation-adjusted model in hedging the efficient portfolios of investors against the inflation risk. In addition, it is the first knowledge contribution with empirical evidence about the efficient portfolio's hedging against that risk on the Iraq Stock Exchange.

Paper type: Research Paper
Keywords: Efficient Portfolio, Expected Inflation Risk, Efficient Portfolio Hedging, Inflation-Adjusted Model (Two-Factor Model), Efficient Portfolio Evaluation Models

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1.Introduction:

Protecting the investment portfolio against inflation risk is one of the seminal questions in the field of financial investments (Brièrea and Signorid,2013). One of the most basic risks facing investors in financial markets is the erosion of the real returns of their investment portfolios through the effects of inflation (Downing et al, 2012; Yu et al, 2015; Umar et al.,2020). The traditional portfolios of stocks and bonds did not achieve the appropriate protection for investors against the risk of inflation (Crawford et al.,2014). Therefore, inflation risk has become the central preoccupation and concern of portfolio managers in recent years, mainly since the economic consequences of inflation have not only led to investment portfolios losing their values, but even those portfolios that increased in their absolute values during periods of rapid inflation have lost their purchasing power in terms of their real rates of return (Greer,1978).

Because inflation is a reality, it is expected to continue in the future at different rates and tempos, and most economists are fully convinced that the idea of eliminating inflation has become far-fetched and impossible (Al-Barazenchy,2012). In light of the growing and renewed concerns about the escalation of possible inflation rates at the local and global levels, especially in recent years as a result of multiple factors, including the rise in government deficit and public debt levels, volatile international oil prices, weak currency value, macroeconomic fluctuations, expansionary monetary policies, and the rise in primary commodity prices as a result of the increased demand in emerging markets (Downing et al,2012 ; Bampinas and Panagiotidis,2016 ; Krämer,2017). The world is witnessing the highest levels of inflation over the past two years in more than four decades (Stiglitz and Regmi,2022). Under the strong consensus among economists and financial experts that the economy will witness continuous inflation as well as expectations of new increases in price levels in the future driven by higher costs of living and energy (Arnold and Auer,2015). These renewed concerns about inflation raised doubts about the possibility of a continued low and stable inflation environment globally, and this increased the issue of inflation hedging, that is, the question of reconsidering how to build the optimal portfolio that effectively protects investors against inflation risk and achieves excess returns wherever possible (Brièrea and Signorid,2012). Hedging investment portfolios against inflation has become an essential priority for many investors, and studying the characteristics of inflation hedging for various assets, and building inflation hedge portfolios has become an essential issue at the theoretical and practical levels, and a principal focus of attention by many scholars and researchers, and the controversy has become about the direction of future inflation and the damage that it can cause to the investment portfolio has been increasingly fraught recently, which prompted many investors to rethink the extent of their exposure to inflation shocks, and then search for a mechanism to protect their investment portfolios against it in the best way (Ruff and Childers,2011).

The prior studies did not come together clearly on the mechanism of hedging the efficient portfolio against inflation, in addition to focusing most of them on studying one form of the inflation variable, which is realized inflation, to build and hedge the efficient portfolio. In contrast, prior studies have recommended using a multiple-indicator return generation model to construct and hedge an efficient portfolio (Al-Ali,2002). The main conclusion reached by Fama and Gibbons (1984) in their study is that multiple-factor models containing two to five factors produce more accurate predictions than the traditional market model or the single-factor model and can provide a better characterization of securities returns (Singh and Yadav,2021). In this regard, previous studies found that one of the variables affecting the determination of the returns of a security is the expected inflation (Guidolin and Pedio,2017). Based on that, this research has been directed towards investigating an efficient investment portfolio hedging mechanism against the inflation risk in a way that ensures improving its performance by maintaining the stability of its returns and protecting it from potential losses of some or all of its returns due to inflationary shocks resulting from the rise in the general level of prices by taking the risk of expected

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inflation into account as well as the real market risk. This mechanism is summarized by determining the optimum real efficient portfolio weights that maximize the real returns for investors and reduce the risks of their portfolios through the application of the inflation-adjusted model of Chen and Moore (1985), which includes the introduction of inflation risk as well as real market risk in estimating returns

To surround a topic of research. The research included in the first section was the introduction of research; the second section dealt with a group of previous studies in financial thought about portfolio hedging; the third section included the general theoretical and conceptual background of the research; and the fourth section was devoted to presenting the research methodology, its data sources, and measuring its variables. The fifth section dealt with the applied side of the research by discussing the results of the analysis. In contrast, the sixth section was devoted to conclusions that transform the results of quantitative measurement into intellectual content that can be inferred and future research proposals.

1.1 Literature Review :

A review of the previous literature reveals that there are some contributions and knowledge outcomes of previous researchers about portfolio hedging against inflation risk. Biger (1976) sought to examine the effects of inflation on portfolio decisions. He showed that the differences between the variance-covariance relationships of nominal rates of return and those of real rates of return were clear enough to change the composition of investment portfolios, especially during periods of significant inflation.

Bodie (1976) investigated the issue of how to enable the investor to hedge against inflation with a diversified portfolio of ordinary stocks and nominal bonds. The measure of the effectiveness of hedging used by the study is the relative reduction in the variance of the real return on the nominal bond that the investor can achieve by including it in a stock portfolio.

Solink (1978) focused on studying the effect of stochastic, unanticipated inflation on the formation of optimal investment portfolios for investors within the framework of the mean-variance model. The researcher has derived analytical formulas for the nominal and real efficient limits for the investor as he seeks to achieve the best trade-off between return and risk in their real values. He concluded that the different inflation rates require investors to avoid holding similar investment portfolios, regardless of the degree of their aversion to risk.

Chen and Moore (1985) presented a model for selecting the optimal portfolio for the investor in light of inflation based on the process of generating a two-factor return, which includes the introduction of inflation as well as the market risk of the asset in determining the return. By applying the model to a numerical example, the study concluded that a lack of consideration of inflation can lead to decisions that include suboptimal portfolio selection.

Hsieh et al (2002) developed a model that systematically analyzes the expectations of stock returns and then allows investors to choose the optimal long-term investment portfolio for stocks under inflation. The practical test of the model showed that it can achieve investment results that can maintain the purchasing power of the initial investment.

Brièrea and Signorid (2009) investigated the impact of the changing economic environment on the allocation. They examined two systems: the two-regime approach, the first represented by the high macroeconomic volatility as it was during the seventies and eighties, and the second characterized by the low as it was in the nineties and the first decade of the twenty-first century, which was characterized by the "great moderation". The study found that optimal strategic allocation differs strongly across systems and has a more ambitious real return target (from 1% to 4%), whatever the economic system leads to different optimal portfolio composition.

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Munk and Rubtsov (2013) derived a solution in closed form to the problem of choosing a stock-bond-cash portfolio for the risk-averse investor and ambiguity when interest rates and inflation rates are random. Using the robust control approach and a numerical example, they found that the weights of the optimal portfolio increase in the degree of avoidance of ambiguity and are greatly influenced by the knowledge of expected inflation as well as to some extent affected by the aversion to ambiguity, as the process of identifying the expected unnoticed inflation rate showed a significant impact on the optimal portfolio.

Yu et al (2015) analyzed how to build the optimal portfolio under inflation. They compared the efficient limits in three cases: not taking into account the risk of inflation and restricting the short sale of stocks, by taking the risk of inflation and restricting the short sale of stocks, by taking the risk of inflation, and without. By analyzing and comparing the real return and risk in the three cases mentioned above, they found that the portfolio risk decreased and the real return was more stable.

Parikh et al (2021) focused on using stocks in preparing the portfolio to hedge against various types of inflation based on the fact that investors experience different types of inflation in addition to the inflation measured by the Consumer Price Index (CPI). So, they created stock portfolios for three types of inflation indices: US Headline CPI, Forbes Cost of Living Extremely Well Index (CLEWI), and US Medical Care Price Index. The results showed that the portfolio in the sample that was built from stocks with high inflation beta for individual stocks retains inflation sensitivity and that individual stocks are a better hedge against inflation than sector portfolios.

The research problem is that despite the fact that one of the most important contributions of the Markowitz modern portfolio theory is that it dealt with the conflict between two contradictory goals that investors face, which are difficult to achieve at the same time, which is maximizing returns with the least possible amount of risk, as this theory laid the scientific and practical foundations that enable Investors are able to distribute their available financial resources for investment on a number of securities to achieve lower levels of risk without sacrificing returns, through the process of building an efficient portfolio, However, what is shortcoming with this theory is its emphasis on the possibility of avoiding or removing the unsystematic risks of investment without the systemic risks, the most important of which is the risk of inflation or the fluctuation of the general level of prices that threatens the effectiveness of investments in general, and financial ones in particular in achieving the desired goals (Bekaert and Wang,2010; Putra and Sukamulja,2014). It is expected that inflation, regardless of its form, whether expected or unexpected, will lead to the erosion of the purchasing power of the value of efficient portfolio returns, and increase its risk due to the instability of its returns, which leads to investors losing all or part of the returns of their portfolios, depending on its percentage in the economy. This is what constitutes a challenge to the most important propositions of the modern portfolio theory. There is no doubt that this negatively affects the efficient use of the limited financial resources of investors and the goal of maximizing their financial wealth in light of their limited financial resources, and then on the development and stability of the national economy.

Based on the preceding, and given the expected and usually significant impact of inflation risk on the returns and risks of an efficient portfolio, and the dependence of all models for building it on nominal returns and risks, and ignoring the impact of inflation risk. The need to explore the efficient portfolio hedging mechanism in light of inflation has emerged by modifying the classic and modern model of the portfolio to take in account the impact of inflation risk. What increases the need for this amendment is that the majority of financial assets are more susceptible to inflation compared to real assets, and this is what many researchers have concluded in their studies, such as (Sing and Low,2000 ; Gunasekarage et al,2008 ; Ruff and Childers,2011).

The research objectives are embodied in presenting intellectual debates after reviewing the literature in its theoretical and philosophical frameworks related to hedging the efficient portfolio against inflation and discussing and analyzing it in application in an emerging financial market, which is the Iraqi Stock Exchange. in addition to, introducing investors in the Iraqi Stock Exchange and researchers in this field to the procedural steps to hedge efficient portfolios against the risk of inflation. As well as, this research applies the inflation-adjusted model to hedge the efficient portfolio by focusing on the expected and unexpected risk of inflation because this model focuses on the actual inflation risk, and then compares the results of the analysis before and after taking the inflation risk into account to identify the feasibility of employing this model in the process of hedging the efficient portfolio. Moreover, this research focuses on the extent to which the performance of the efficient portfolio is improved by studying the extent to which the optimal weights of the efficient portfolio and its components differ in terms of the number of stocks it includes, the nature of the companies involved, and their level of its expected return and risk depending on whether or not the stock's sensitivity to expected and unexpected inflation is included. In addition, this research seeks to arouse the interest of investors in the Iraqi Stock Exchange and contribute to directing their financial resources in light of the research results in a way that contributes to maximizing their real wealth in the market.

2. Material and Methods:

2.1 Research community and sample :

The research community was embodied in all the companies listed on the Iraq Stock Exchange from its establishment in 2004 until the last trading session of 2021, as the shares of those companies constituted the original research community.

The research sample consisted of (37) companies whose shares are traded on the Iraq Stock Exchange. They were determined by the intentional purposeful sampling method, which constituted (37%) of the research community, and their details are shown in Table No. (1).

Each company in the research community has been subject to several conditions for its selection in the research sample. These conditions are as follows:

1. The trading of the company's shares in the market on a regular and continuous basis.
2. Availability of data related to the monthly stock trading prices of the sample companies and their disclosure in market reports and for the research period.
3. The company should be listed in the financial market during a period suitable for conducting the analysis, and it is not recently listed in it, as several companies were excluded because of the short time series compared to the temporal limits of this research due to their recent listing and trading in the market.

Table 1: Research Sample Companies

Sector	The Number of Selected Companies	The Name of the Selected Company	Company Code
Banking	Banks (14)	Commercial Bank of Iraq	(BCOI)
		Bank of Baghdad	(BBOB)
		Iraqi Islamic Bank	(BIIB)
		Credit Bank of Iraq	(BROI)
		Investment Bank of Iraq	(BIBI)
		National Bank of Iraq	(BNOI)
		Gulf Commercial Bank	(BGUC)
		Ashur International Bank	(BASH)
		Al-Mansour Bank	(BMNS)
		United Bank for Investment	(BUND)
		Elaf Islamic Bank	(BELF)
		Kurdistan International Bank	(BKUI)
		Iraqi Middle East Bank	(BIME)
		Babylon Bank	(BBAY)

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Insurance	Company (2)	Al-Ameen for Insurance AL-Gulf for Insurance	(NAME) (NGIR)
Services	Companies (4)	Kharkh Tour Amuzement City Mamoura Realestate Investment Iraq Baghdad for General Transportation AL-Nukhba for General Construction	(SKTA) (SMRI) (SBPT) (SNUC)
Industry	Companies (9)	Al-Mansour Pharmaceuticals Industries Iraqi for Tufted Carpets Modern Sewing Baghdad Soft Drinks Iraqi for Date Processing and Marketing National Chemical and Plastic Industries Ready Made Clothes AL- Kindi of Veterinary Vaccines Metallic Industries and Bicycles	(IMAP) (IITC) (IMOS) (IBSD) (IIDP) (INCP) (IRMC) (IKLV) (IMIB)
Tourism and Hotels	Companies (5)	Babylon Hotel Baghdad Hotel National for Tourist Investment Karbala Hotels Mansour Hotel	(HBAY) (HBAG) (HNTI) (HKAR) (HMAN)
Agriculture	Companies (3)	Iraqi Products Marketing Meat Iraqi for Agricultural Products Middle East for Production- Fish	(AIPM) (AIRP) (AMEF)

2.2 Research data sources and its Period:

The consumer price indices issued by the Iraqi Ministry of Planning, the Central Statistical Organization were adopted to measure the actual (realized) monthly inflation rates. As for calculating the monthly returns on the shares of the research sample companies, the monthly closing prices of trading the shares for the period under study were used, which were taken from the monthly market reports. As for the risk-free return rate, which represents one of the parameters of models for building, hedging, and evaluating the performance of an efficient hedged and unhedged portfolio, the research has used the interest rates on Treasury bills for three months, included in the annual statistical bulletins issued by the Statistics and Research Department of the Central Bank of Iraq.

The period of the research was determined by ten years that extended from (2012 to2021), which resulted in the adoption of a long time series of observations amounting to 120 observations to obtain accurate results that reflect market conditions and are consistent with the nature of statistical tools and financial models used in the research.

2.3 Quantitative methods and financial models used in the research:

To achieve the objectives of the research and clarify its idea, several financial and statistical methods and models have been used as follows:

2.3.1 Monthly rate of return on share R_{it}:

The research relied on the monthly closing prices of the shares traded in the Iraq Stock Exchange to calculate the realized monthly rates of return on the share. These rates are calculated according to the following equation (Aharanwa et al, 2020; Abd AL-Ameer and Mohammed,2023):

$$R_{it} = \frac{P_t - P_{t-1}}{P_{t-1}} \quad (1)$$

Where :: P_t : The closing price of the share (i) in the current month ; P_{t-1}: The closing price of the share (i) in the previous month

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2.3.2 Monthly rate of return on the market index R_{Mt}:

This rate was calculated according to the following equation (Acma,2014; Ghannawy,2019):

$$R_{Mt} = \frac{MI_t - MI_{t-1}}{MI_{t-1}} \quad (2)$$

Where : MI_t: Market index value in the current month; MI_{t-1}: Market index value in the previous month.

2.3.3 Expected rate of return on the market index portfolio (market portfolio) $\overline{Rm}$:

This rate is calculated by applying the following equation:

$$\overline{Rm} = \frac{\sum_{i=1}^{t} R_{mt}}{\sum_{i=1}^{t} t} \quad (3)$$

Where :: Monthly rate of return on the market index ; t = 1, 2, 3, ……. Number of months

2.3.4 Variance of the market index returns σ^2_{Rm}:

It is a measure of the risk of the market portfolio, and it is calculated as shown in the following equation (Brealey and Myers, 2020; Miller,2019) :

$$\sigma^2_{Rm} = \frac{\sum_{t=1}^{n}(R_{mt} - \bar{R}_{Mt})^2}{n-1} \quad (4)$$

Where : $\bar{R}_{Mt}$: Average monthly rates of return on the market return.

2.3.5 Single Indicator Model:

This model was used to calculate the expected rates of return on corporate shares, as shown in the following model equation (Putra and Sukamulja,2014; Pratiwi and Yunita,2015) :

$$\bar{R}_i = \propto_i + \beta_i \bar{R}_m + e_i \quad (5)$$

Where : $\bar{R}_i$: Expected rate of return on share (i) ; $\propto_i$: Expected value of the stock return component that is independent of market performance, i.e. rate of return on share (i) when the value of the market portfolio is equal to zero ; β_i : Stock's beta coefficient, which measures the systemic risk of a stock ; $\bar{R}_m$: Expected rate of return on a market index (market portfolio) ; e_i : residual error, which is the random variable with a zero expected value, i.e. E(ei) = 0

2.3.6 Simple Ranking Model:

The simple ranking model is one of the models employed by Elton et al. (1978) to arrange the candidate securities for inclusion in the portfolio as a prelude to choosing the optimal portfolio for investors by calculating their weights. This model has been used to build the nominal efficient portfolio according to the following basic steps :

A- Determine the excess return to beta ratio (Treynor ratio) for each share under consideration, And then rank the shares descending from the highest ratio to the lowest (Singh and Yadav, 2021; Elton et al., 2014) according to the following equation : (Elton et al., 2014; Isma'eel and Ghanawi, 2019).

$$\left[\frac{\bar{R}_i - R_f}{\beta_i}\right] \quad (6)$$

Where : $\bar{R}_i$: Expected rate of return on share (i) ; R_f : Risk -free Return rate ; β_i : Stock's beta coefficient, which is a measure of the systemic risk of a stock

B - Determine the candidate securities (shares) to be included in the portfolio

In this step, the cut-off rate for each share is calculated by which it is determined the candidate shares for inclusion in the optimum portfolio by matching the Trenior index value of each share with the cut-off rate (Al-Yara et al.,2021). The optimal portfolio will consist of investing in all shares in which the Trenior ratio ($\frac{\bar{R}_i - R_F}{\beta_i}$) is greater than a particular cutoff rate (C_i) (Singh and Yadav,2021). The cut- off rate is calculated using the following formula (Elton et al.,2014; Guidolin and Pedio,2017; Al-Yara et al.,2021) :

$$C_i = \frac{\sigma^2_{Rm}\left[\sum_{i=1}^{n} \frac{(\bar{R}_i - R_f) * \beta_i}{\sigma^2_{ei}}\right]}{1 + \left[\sigma^2_{Rm}\left[\sum_{i=1}^{n} \frac{\beta_i^2}{\sigma^2_{ei}}\right]\right]} \quad (7)$$

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Where : σ_{ei}^2 : Variance of the share return that is not related to market index return. This is often referred to as the unsystematic risk of a stock

C- Calculating the weights of the securities (Wi) for the portfolio, i.e. the percentage of capital allocated to each security (share) invested in the portfolio, through the following formula (Pratiwi and Yunita, 2015:2526; Nandan and Srivastava,2017: Isma'eel and Ghanawi,2019) :

$$W_i = \frac{Z_i}{\sum_{i=1}^{n} Z_i} \quad (8)$$

The value of Z_i, which is used in calculating the weight of each share in the portfolio, is calculated according to the following equation (Elton et al,2014; Al-Yara et al.,2021) :

$$Z_i = \frac{\beta_i}{\sigma_{ei}^2}\left[\frac{\bar{R}_i - R_f}{\beta_i} - C_i^*\right] \quad (9)$$

Where : C_i^* : Optimal cutoff rate, it is the cut-off rate for the last stock to be included in the efficient portfolio.

2.3.7 The Inflation-Adjusted Model (The two-Factor Model):

Assuming that the investor's objective is to maximize real returns, that is, the investor is concerned with real returns in the optimal portfolio decision, Chen and Moore set a relatively simple portfolio selection model based on a two-factor return-generating process. It includes the inclusion of inflation-related characteristics as well as the market risk of the asset (Chen and Moore,1985). This model is used in hedging an efficient portfolio against expected inflation risk by calculating the optimal real weights of the efficient portfolio. The procedural steps for the process of building and hedging an efficient portfolio against inflation risk, according to the mechanism of this model, are as follows (Chen and Aggarwal,1986) :

Step 1 : Estimating the real investment characteristics of nominated corporation shares (β_{1i}, β_{2i}, σ_{ei}^2)**.** These parameters are estimated using the following regression model :

$$R_{it} = \propto_i + \beta_{1i} R_{mt} + \beta_{2i}\pi_t + e_i \quad (10)$$

Step 2 : Use the inputs (the estimates) above to calculate the common parameters A, B, C, D, E, F, and G for all the candidate Securities. These parameters are calculated according to the following formulas :

$$A = \sum_{i=1}^{k}\left[\frac{(\bar{R}_i - R_f)}{\sigma_{ei}^2}\right] * \beta_{1i} \quad (11)$$

$$B = \sum_{i=1}^{k}\frac{\beta_{1i}^2 * \sigma_{Rm\pi} + \beta_{1i} * \beta_{2i} * \sigma_\pi^2}{\sigma_{ei}^2} \quad (12)$$

$$C = \sum_{i=1}^{k}\frac{\beta_{1i}^2 * \sigma_{Rm}^2 + \beta_{1i} * \beta_{2i} * \sigma_{Rm\pi}}{\sigma_{ei}^2} \quad (13)$$

$$D = \sum_{i=1}^{k}\left[\frac{(\bar{R}_i - R_f)}{\sigma_{ei}^2}\right] * \beta_{2i} \quad (14)$$

$$E = \sum_{i=1}^{k}\frac{\beta_{2i}^2 * \sigma_{Rm\pi} + \beta_{1i} * \beta_{2i} * \sigma_{Rm}^2}{\sigma_{ei}^2} \quad (15)$$

$$F = \sum_{i=1}^{k}\frac{\beta_{2i}^2 * \sigma_\pi^2 + \beta_{1i} * \beta_{2i} * \sigma_{Rm\pi}}{\sigma_{ei}^2} \quad (16)$$

$$G = \frac{D - \frac{AE}{1+C}}{1 + F - \frac{BE}{1+C}} \quad (17)$$

$$H_i = \beta_{1i} * \sigma_{Rm}^2 + \beta_{2i} * \sigma_{Rm\pi} \quad (18)$$

$$I_i = \beta_{2i} * \sigma_\pi^2 + \beta_{1i} * \sigma_{Rm\pi} \quad (19)$$

Step 3 : Compute the Preliminary Values for Z_i. To determine which securities should be included in the optimal portfolio, the preliminary values of Z_i are calculated as :

$$Z_i = \left[\frac{\bar{R}_i - R_f - \phi_i}{\sigma_{ei}^2}\right] \quad (20)$$

The value of ϕ_i, which represents the risk adjustment factor, is calculated according to the following equation:

$$\phi_i = \frac{A-GB}{1+C}(H_i) + G(I_i) \quad (21)$$

Step 4 : Select Securities with Positive Weights.

Each security is next ranked according to the preliminary Z_i values obtained in Step 3. Then, equation Z_i is calculated again to find securities with positive weights (or positive Z_i**)** and to exclude those sold short (i.e., negative Z_i). To check the sign of Z_i for the highest-ranking Security, we use the previous formulas just for this security. All values of the parameters A, B, C, D, E, and F are only for this security. Then we add the values for the two highest-ranked securities only, and so on. The checking process continues for all remaining securities until we encounter a negative Z_i. Then we use the parameter values associated with the test for the last security (share) to compute the optimal weights for Securities (Chen and Aggarwal,1986)

Step 5 : Compute the Optimal Weights

Finally, using the final set of parameter values above to compute the new (or final) values of Zi and the optimal weights **(**W_i**)** for securities included in the optimal portfolio as follows:

$$W_i = \frac{Z_i}{\sum_{j=1}^{k} Z_j} \quad , i = 1,2, \ldots\ldots, k(k \leq N) \quad (22)$$

$\bar{R}_i$: The expected real rate of return on the stock (i) ; R_f : Real Riskless Rate ; R_m : Real rate of return on the market index in the period (t) ; π : Expected inflation rate over the period (t) ; β_{1i} : Share's beta coefficient, which is a measure of the volatility of the real return of a share relative to changes in the real market return; β_{2i} : Beta inflation coefficient, which is a measure of the sensitivity of the real return on the stock to changes in the inflation rate ; σ_{Rm}^2 : Variance of the real market returns ; σ_{π}^2 : Variance of the expected inflation rate ; $\sigma_{Rm\pi}$: the covariance between the real market rate of return and the inflation rate, and was calculated according to the following equation (Miller,2019; Ross et al.,2016) :

$$Cov_{Rm\pi}\ Or\ \sigma_{Rm\pi} = \frac{\sum_{i=1}^{n}(Rm_t - \overline{Rm})(\pi_t - \bar{\pi})}{n-1} \quad (23)$$

σ_{ei}^2 : Residual variance of real return on share (i**)**

2.3.8 Real rate of return RR:

To calculate the monthly real rates of returns on stocks, market index, and treasury bills, the following equation has been applied : (Bodie,1982; Brealey et al.,2020; Titman et al.,2021):

$$RR = \left[\frac{1+NR}{1+IR}\right] - 1 \quad (24)$$

Where : NR: Monthly nominal rate of return ; IR : Monthly inflation rate

2.3.9 Realized Inflation Rate IR_t **:**

The realized inflation rate is calculated using the following formula (Mankiw,2021; Kacapyr et al.,2021) :

$$IR_t = \frac{CPI_t - CPI_{t-1}}{CPI_{t-1}} \times 100 \quad (25)$$

Where : CPI_t : Consumer price index in the current month *;* CPI_{t-1}*:* The consumer price index in the previous month

2.3.10 Return and risk of an efficient portfolio

2.3.10.1 Expected return on the efficient portfolio $\bar{R}_p$

This rate is calculated on the hedged and unhedged efficient portfolio according to the following equation (Brigham and Houston,2020; Reilly et al.,2019) :

$$\bar{R}_p = \sum_{i=1}^{n} \bar{R}_i * W_i \quad (26)$$

Where : W_i : Investment weight or the percentage of the total value of the portfolio invested in each stock (i)

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2.3.10.2 Risk of the total efficient portfolio σ_p^2 :

It is the sum of the systemic risk and the unsystematic risk of a share, and it is measured by the variance, as shown by the following equation (Miller,2019) :

$$\sigma_p^2 = \beta_p^2 * \sigma_{Rm}^2 + \sigma_{ep}^2 \quad (27)$$

Where : $\beta_p^2 * \sigma_{Rm}^2$: Systemic risk of an efficient portfolio ;σ_{ep}^2 : Random error variance of the portfolio, and represents the non-systemic risk of the portfolio. It is calculated as follows: (Elton et al., 2014) :

$$\sigma_{ep}^2 = \sum_{i=1}^{n} W_i^2 * \sigma_{ei}^2 \quad (28)$$

As for the portfolio beta β_p, which measures the systemic risk of a portfolio, it is calculated as follows (Brigham and Ehrhardt, 2020) :

$$\beta_p = \sum_{i=1}^{n} W_i * \beta_i \quad (29)$$

Where : β_i : Systemic risk of the stock, which is a measure of the sensitivity of the stock's return to the change in the return of the market index, has been calculated as shown in the following equation (Abd AL-Ameer and Mohammed, 2023; Singh and Yadav, 2021):

$$\beta_i = \frac{COV(R_i, R_m)}{\sigma_{Rm}^2} \quad (30)$$

Where : $COV(R_i, R_m)$: Covariance between the return on the stock and the return on the market index

2.3.10.3 Efficient portfolio evaluation models:

To evaluate the performance of hedged and unhedged efficient portfolios against the risk of expected inflation, the following models have been used:

1- Sharp Model : This ratio calculated according to the following equation (Putra and Sukamulja, 2014) :

$$SR = \left[\bar{R}_p - Rf\right]/\sigma_p^2 \quad (31)$$

2- Trenyor Model : This ratio is calculated according to the following equation (Guerard,2017; CFA Institute,2021):

$$TR = \left[\bar{R}_p - Rf\right]/\beta_p \quad (32)$$

3- Jensen Model : This ratio is calculated according to the following equation (Back, 2017) :

$$\alpha_{(p)} = \left[\bar{R}_p - Rf\right] - \left[\bar{R}_m - Rf\right] * \beta_p \quad (33)$$

4- Modigliani and Modigliani (M^2) Model : This ratio is calculated according to the following equation (Stewart et al.,2019) **:**

$$M^2 = \left[R_f + \sigma_{RM}\left(\bar{R}_p - R_f\right)/\sigma_P\right] - R_m \quad (34)$$

Where : σ_{RM}: Standard deviation in the return on the market portfolio ; σ_P : Standard deviation in the return on an efficient portfolio

2.4 General theoretical background of research:

2.4.1 The concept and importance of inflation :

Inflation is one of the global economic phenomena that still embodies the dilemma of any economic system in the world, as the global economy is exposed to various problems and phenomena, and perhaps the most dangerous of them is the problem of inflation (Al-Subaihi,2021). The emergence of this phenomenon was the starting point for the emergence of an economic problem that was characterized as an old-new problem at the same time, old in its appearance several centuries ago and new in that all countries of the world are still suffering from it, and it arouses the interest of various segments of society, both specialized and non-specialized in economics and finance until it has become a problem. It coexists with economic life and order (Al-Barazenchy,2012), as it has become difficult, especially at present, to find any country in the world that does not suffer from the specter of inflation, and this has prompted many scholars and researchers to conduct many theoretical and applied studies to address the effects of this phenomenon. (Yousef and Mardan,2015).

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Although inflation is one of the most common economic terms in terms of use, there is no consensus among economists and specialists regarding its concept, and this is due to different points of view in defining this concept (Hamad,2018; Al-Saadi,2015; Al-Dahri,2017) due to the differing opinions of economists about the causes of inflation and its economic and social effects-the development of inflation theories, their differences and multiplicity- which resulted in the lack of agreement on defining an agreed definition (AL-Rubeiey,2010), so there is no fixed definition of inflation. In the economic literature, through the stages of the development of economic thought, instead there are multiple concepts developed for it by thinkers and researchers in the field of economics (Ahmed,2017:7), as this term is used to describe several different cases (Al-Saadi,2015).

Most economic and financial writers and researchers agree on defining inflation as "the continuous rise in the general price level" (Blanchard,2017; Mitchell et al.,2019; Baumol et al.,2020; Thomas,2021; Al-Subaihi,2021; Abd and Abbas,2021; Taha,2021). Inflation risk is one of the most critical economic risks faced by consumers and investors alike (Bampinas and Panagiotidis,2016). Its importance is highlighted by its impact on the foundations of the national economy and people's livelihoods, for example, wages, prices of goods and services, interest rates, investment, and employment, in addition to economic and social stability, as inflation reduces the real purchasing power of assets held by investors, affects investment returns, and reduces real wealth to individuals and investors (Yu et al.,2015). Inflation is considered one of the most essential systemic risks facing investors and threatens the success of investments (Putra and Sukamulja,2014) but rather, its risk has become a major element in making investment decisions (Bekaert and Wang,2010). In addition, Inflation as one of the macroeconomic indicators, is also one of the most significant factors in the host economy's investment environment. (Al-Shakrchy et al.,2023). What confirms the greatness of the importance of inflation is the large and continuously increasing amount of published scientific research related to it to this day (Crawford et al, 2013).

2.4.2 The knowledge for hedging an efficient portfolio against inflation:

The hedging literature provides different definitions for hedging the portfolio against inflation. Greer defined it, in general, as the mechanism that enables the portfolio manager to maintain or enhance the purchasing power of his assets with the least possible risk (Greer,1978). Putra and Sukamulja went on to define an inflation-hedging portfolio, or, as it is also called, an inflation-proof portfolio, as "a portfolio that is built to reduce the exposure of the portfolio itself to inflation" (Putra and Sukamulja,2014). Other researchers define portfolio hedging against inflation as a portfolio-building mechanism that results in removing or at least reducing the possibility that its real rate of return will drop below a specified minimum value, for example, zero" (Arnold and Auer,2015). Other researchers believe that hedging the portfolio against inflation is a portfolio-building strategy that reduces the volatility of portfolio returns resulting from inflation in a way that ensures stable real returns (Yu et al.,2015)

Since hedging against inflation means reducing the uncertainty of real returns that arise from uncertainty about the future price level, the measure of hedge effectiveness is the relative reduction in the variance of the real return on the portfolio. Bodie suggested an inflation hedge strategy by determining portfolio weights that minimize the portfolio's expected real return variance (Camba-Mendez,2020). Bodie's approach is consistent with the mean-variance framework proposed by Markowtiz (1952) (Umar et al.,2020).

3.Discussion of results:

3.1 Building the nominal efficient portfolio:

This part presents the procedural steps for the process of building an efficient portfolio according to the mechanism of the simple ranking model of Elton et al. (1983) before it is hedged against the risk of expected inflation, as follows :

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3.1.1 Analyzing the investment characteristics of the shares :

Table 2 documents the results of the requirements for the first initiation point of the process of building an efficient portfolio according to the mechanism of the simple ranking model of Elton (1978), represented by calculating the return and risk of shares. The first step began with calculating the actual monthly rate of return on the shares of the research sample companies by applying [Eq. (1)] and then estimating the rate of return using the single index model by applying [Eq. (5)].

Table 2 : The Expected Monthly Rate of Return $\bar{R}_i$, Parameter β_i and σ_{ei}^2 for the Companies shares

No.	Company	$\bar{R}_i$	β_i	σ_{ei}^2
1	Commercial Bank of Iraq	0.009583317	0.924183339	0.086751815
2	Bank Of Baghdad	- 0.035910212	1.021544277	0.081745829
3	Iraqi Islamic Bank	0.005502221	0.400148953	0.082125388
4	Credit Bank Of Iraq	- 0.135828458	0.413946211	0.122498861
5	Investment Bank of Iraq	- 0.015650585	0.762245215	0.094092809
6	National Bank of Iraq	0.103730622	0.813413876	1.060603370
7	Gulf Commercial Bank	- 0.028412333	1.045821191	0.173725584
8	Ashur International Bank	0.052725720	- 0.101306581	0.232868440
9	Al-Mansour Bank	- 0.003708607	0.585552747	0.022751264
10	United Bank For Investment	- 0.049339710	0.428132933	0.029154806
11	Elaf Islamic Bank	- 0.017789340	0.698862755	0.087003899
12	Kurdistan International Bank	0.035439777	1.197732713	0.157858465
13	Iraqi Middle East Bank	0.086344262	1.615495118	0.823833338
14	Babylon Bank	- 0.024949059	0.551612879	0.092750993
15	Al-Ameen for Insurance	0.008224124	0.276162636	0.146397268
16	AL-Gulf for Insurance	0.006458293	0.061990063	0.015972639
17	Kharkh Tour Amuzement City	0.006311717	- 1.720047344	0.097346374
18	Mamoura Realestate Investment	0.036855635	0.694076216	0.114964924
19	Baghdad For General Transportation	0.072664416	2.358607933	0.364352981
20	AL-Nukhba for General Construction	0.096513551	3.142124754	1.076713633
21	Al-Mansour Pharmaceuticals Industries	0.028933523	0.435496531	0.125682379
22	Iraqi For Tufted Carpets	0.099373889	- 4.914351082	0.904544664
23	Modern Sewing	0.060227585	0.035180597	0.146031082
24	Baghdad Soft Drinks	0.024346438	0.784458779	0.029952545
25	Date Processing and Marketing	0.009161095	0.550525197	0.025456574
26	Chemical and Plastic Industries	0.223225131	0.431578822	5.752762730
27	Ready Made Clothes	0.056456454	- 1.473647215	0.189152261
28	AL- Kindi of Veterinary Vaccines	- 0.004413155	0.869660028	0.05097415
29	Metallic Industries and Bicycles	0.003042499	- 0.290875806	0.046397898
30	Babylon Hotel	0.055394351	0.808066026	0.146647865
31	Baghdad Hotel	0.390973259	6.416090206	12.97965295
32	National for Tourist Investment	0.011723497	0.113210949	0.073311166
33	Karbala Hotels	0.031207091	- 1.375687209	0.409199082
34	Mansour Hotel	0.011890754	0.360965903	0.089209175
35	Iraqi Products Marketing Meat	0.010731388	0.00037614	0.082061102
36	Iraqi for Agricultural Products	0.031447926	0.151617036	0.048335734
37	Middle East for Production- Fish	0.085772903	- 0.902673610	0.835421123

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3.1.2 Arranging the companies' shares according to the Treynor model:

The second step to build an efficient portfolio according to the simple ranking model mechanism is represented by calculating the Treynor ratio. Through this ratio, the desirability of any stock to be part of the efficient portfolio components is determined based on the descending order process of the values achieved by this ratio. Table 3 presents the results of calculating the ratio through applying [Eq. (6)].

Table 3 : Re-arrangement of Shares of Traded Companies according to the Treynor Index

Current Ranking	Company	Previous Ranking	Treynor Index
1	Iraqi Products Marketing Meat	35	19.40679672
2	Modern Sewing	23	1.614408994
3	National Chemical and Plastic Industries	26	0.509277581
4	Iraqi for Agricultural Products	36	0.184782752
5	National Bank of Iraq	6	0.12330612
6	National for Tourist Investments	32	0.07324189
7	Babylon Hotel	30	0.064304941
8	Baghdad Hotel	31	0.060401511
9	Al-Mansour Pharmaceuticals Industries	21	0.05855801
10	Iraqi Middle East Bank	13	0.051323306
11	AL-Gulf for Insurance	16	0.048823638
12	Mamoura Realestate Investment	18	0.048155982
13	AL-Nukhba for General Construction	20	0.029623852
14	Iraq Baghdad For General Transportation	19	0.029353205
15	Kurdistan International Bank	12	0.026723879
16	Baghdad Soft Drinks	24	0.026661344
17	Mansour Hotel	34	0.02343446
18	Al-Ameen for Insurance	15	0.017353583
19	Date Processing and Marketing	25	0.01040712
20	Commercial Bank of Iraq	1	0.006656259
21	Iraqi Islamic Bank	3	0.005174342
22	Metallic Industries and Bicycles	29	0.001338077
23	Kharkh Tour Amuzement City	17	- 0.001674375
24	AL- Kindi of Veterinary Vaccines	28	- 0.009020615
25	Al-Mansour Bank	9	- 0.012194153
26	Iraqi For Tufted Carpets	22	- 0.019522857
27	Karbala Hotels	33	- 0.020190184
28	Investment Bank of Iraq	5	- 0.025034329
29	Elaf Islamic Bank	11	- 0.030365122
30	Gulf Commercial Bank	7	- 0.030448843
31	Ready Made Clothes	27	- 0.035981977
32	Bank Of Baghdad	2	- 0.038512208
33	Babylon Bank	14	- 0.051450524
34	Middle East for Production- Fish	37	- 0.091219229
35	United Bank For Investment	10	- 0.123259433
36	Credit Bank Of Iraq	4	- 0.336420933
37	Ashur International Bank	8	- 0.486582475
* The Average Monthly Rate of Return (Interest) on Treasury Bills (R_f) for the Period Under Study = (0.0034317)			

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3.1.3 Determine the cut-off rate:

Based on the previous data and introductions, the process of building an efficient portfolio is initiated by calculating the cutoff rate for each share (C_i), [applied Eq. (7)], through which the number of shares constituting the efficient portfolio is determined. This is done by comparing the Treynor ratio with it, as any stock is accepted and included in the portfolio as long as the ratio of its expected excess return to its systemic risk is greater than the cut-off rate according to the following rule:

$$[(\frac{\bar{R}_i - R_f}{\beta_i}) > C_i]$$

It is revealed from Table 4 presents the results of calculating the reliable cut-off rate in the efficient portfolio formation, which is defined as the optimal cut-off rate (C_i*) that was documented in the Iraqi Islamic Bank with a value of 0.00231. Based on its value, the number of shares that formed the efficient portfolio of shares was determined by 21 shares, starting with the share of the Meat Production and Marketing Company and ending with the share of the Iraqi Islamic Bank.

Table 4 : The Results of Calculating the Cut-Off Rate according to the Simple Ranking Model Mechanism

No.	Company	$\frac{(\bar{R}_i - R_f) * \beta_i}{\sigma^2_{ei}}$	$\sum_{i=1}^{n} \frac{(\bar{R}_i - R_f) * \beta_i}{\sigma^2_{ei}}$	$\frac{\left[\sum_{i=1}^{n} \frac{(\bar{R}_i - R_f) * \beta_i}{\sigma^2_{ei}}\right]}{\sigma^2_{Rm}}$	β_i^2	$\frac{\beta_i^2}{\sigma^2_{ei}}$	$\sum_{i=1}^{n} \frac{\beta_i^2}{\sigma^2_{ei}}$	$1 + \left[\sigma^2_{Rm} \left[\sum_{i=1}^{n} \frac{\beta_i^2}{\sigma^2_{ei}}\right]\right]$	C_i
1	Iraqi Products Marketing Meat	0.000033459	0.000033459	0.000000029	0.000000141481	0.000001724	0.000001724	1.000000001	0.000000029
2	Modern Sewing	0.013682790	0.013716249	0.000011841	0.001237674377	0.008475417	0.008477142	1.000007318	0.000011840
3	Chemical and Plastic Industries	0.016489153	0.030205402	0.000026076	0.186260279485	0.032377535	0.040854677	1.000035270	0.000026075
4	Iraqi for Agricultural Products	0.087879812	0.118085214	0.000101943	0.022987725642	0.475584496	0.516439173	1.000445843	0.000101898
5	National Bank of Iraq	0.076922747	0.195007961	0.000168351	0.661642133463	0.623835594	1.140274767	1.000984402	0.000168185
6	National for Tourist Investments	0.012804608	0.207812568	0.000179405	0.012816718979	0.174826288	1.315101055	1.001135330	0.000179202
7	Babylon Hotel	0.286326996	0.494139564	0.000426592	0.652970702218	4.45264378	5.767744834	1.004979308	0.000424478
8	Baghdad Hotel	0.191569183	0.685708747	0.000591974	41.16621353300	3.171595858	8.939340692	1.007717354	0.000587441
9	Al-Mansour Pharmaceuticals Industries	0.088365211	0.774073958	0.000668260	0.189657228277	1.509020037	10.44836073	1.009020095	0.000662286
10	Iraqi Middle East Bank	0.162587277	0.936661235	0.000808622	2.609824476081	3.167903453	13.61626418	1.011754953	0.000799227
11	AL-Gulf for Insurance	0.011746206	0.948407441	0.000818762	0.003842767931	0.240584415	13.85684860	1.011962650	0.000809084
12	Mamoura Realestate Investment	0.201789801	1.150197243	0.000992968	0.481741793044	4.190337164	18.04718576	1.015580178	0.000977735
13	AL-Nukhba for Construction	0.271636522	1.421833764	0.001227472	9.872947970993	9.169520721	27.21670648	1.023496248	0.001199294
14	Iraq Baghdad For General Transportation	0.448171995	1.870005759	0.001614380	5.563031380908	15.26824721	42.48495369	1.036677362	0.001557264

15	Kurdistan International Bank	0.24285746	2.112863219	0.001824040	1.434563650995	9.087657443	51.57261114	1.044522758	0.001746290
16	Baghdad Soft Drinks	0.547757791	2.66062101	0.00229692	0.615375575416	20.54501818	72.11762932	1.062259321	0.002162297
17	Mansour Hotel	0.034227705	2.694848715	0.002326469	0.130296382912	1.460571554	73.57820087	1.063520236	0.002187518
18	Al-Ameen for Insurance	0.009040366	2.703889082	0.002334274	0.076265801717	0.520950991	74.09915186	1.063969974	0.002193928
19	Date Processing and Marketing	0.123903909	2.827792991	0.002441240	0.303077992310	11.90568658	86.00483844	1.074248182	0.002272511
20	Commercial Bank of Iraq	0.065534185	2.893327176	0.002497816	0.854114844679	9.84549822	95.85033666	1.082747824	0.002306923
21	Iraqi Islamic Bank	0.010088372	2.903415548	0.002506526	0.160119184536	1.949691662	97.80002832	1.084430997	0.002311374
22	Metallic Industries and Bicycles	0.002440045	2.905855593	0.002508632	0.084608734254	1.823546706	99.62357503	1.086005270	0.002309963
23	Kharkh Tour Amuzement City	-0.050887809	2.854967784	0.002464700	2.958562865971	30.39212186	130.0156969	1.112242861	0.002215973
24	AL- Kindi of Veterinary Vaccines	-0.133839771	2.721128013	0.002349156	0.756308565063	14.83710016	144.8527971	1.125051765	0.002088043
25	Al-Mansour Bank	-0.183771499	2.537356514	0.002190506	0.342872019842	15.07046005	159.9232571	1.138062129	0.001924768
26	Iraqi For Tufted Carpets	-0.521249589	2.016106925	0.001740510	24.15084656115	26.69945168	186.6227088	1.161111829	0.001499003
27	Karbala Hotels	-0.093378099	1.922728826	0.001659896	1.892515296720	4.624925566	191.2476344	1.165104538	0.001424676
28	Investment Bank of Iraq	-0.154585567	1.768143260	0.001526442	0.581017767563	6.174943394	197.4225777	1.170435381	0.001304166
29	Elaf Islamic Bank	-0.170459067	1.597684193	0.001379285	0.488409150155	5.613646724	203.0362245	1.175281656	0.001173578
30	Gulf Commercial Bank	-0.191699902	1.405984291	0.001213790	1.093741962764	6.295802472	209.3320269	1.180716837	0.001028011
31	Ready Made Clothes	-0.413105090	0.992879201	0.000857155	2.171636115706	11.48088902	220.8129160	1.190628316	0.000719918
32	Bank Of Baghdad	-0.491639991	0.501239210	0.000432721	1.043552710551	12.76582213	233.5787381	1.201649081	0.000360106
33	Babylon Bank	-0.168787403	0.332451807	0.000287006	0.304276768021	3.28057693	236.8593150	1.204481211	0.000238282
34	Middle East for Production-Fish	-0.088969763	0.243482043	0.000210199	0.814819646053	0.975340009	237.8346550	1.205323224	0.000174392
35	United Bank For Investment	-0.774938585	-0.531456542	-0.000458808	0.183297808332	6.287052962	244.1217080	1.210750852	-0.000378945
36	Credit Bank Of Iraq	-0.470585762	-1.002042304	-0.000865066	0.171351465944	1.398800478	245.5205085	1.211958440	-0.000713775
37	Ashur International Bank	-0.021444758	-1.023487062	-0.000883579	0.010263023353	0.044072195	245.5645807	1.211996487	-0.000729028

*The variance of the rate of return on the Iraq Stock Exchange portfolio (the variance of the return of the market index portfolio) for the research period has amounted to (0.000863302)

3.1.4 Determine investment weights of the efficient portfolio:

The process of distributing the wealth owned by the investor and the amount of each share's contribution to the efficient portfolio is the most crucial issue after determining the components of the efficient portfolio. It represents the end that presents a clear picture to the investor being an investment decision-maker. The contribution amount of each share is identified by calculating the value of (W_i), i.e. the investment weight of each share included in the portfolio through applying [Eq. (8)]. Table 5 presents the results of calculating these weights. It is clear from it that the lowest weight was in the share of the Islamic Bank of Iraq with a value of 0.004, while the highest weight was recorded in the share of Baghdad Soft Drinks Company with a value of 0.166.

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Table 5 : Investment Weights (W_i) of the Efficient Portfolio

No.	Company Name	$\frac{\beta_i}{\sigma_{ei}^2}$	$\frac{\bar{R}_i - R_f}{\beta_i}$	C^*	Z_i	W_i
1	Iraqi Products Marketing Meat	0.004583659	19.40679672	0.0023113739	0.088943553	0.023189354
2	Modern Sewing	0.240911703	1.614408994		0.388373183	0.101256618
3	National Chemical and Plastic Industries	0.075021141	0.509277581		0.038033183	0.009916008
4	Iraqi for Agricultural Products	3.136748404	0.184782752		0.572366803	0.149227416
5	National Bank of Iraq	0.766935028	0.12330612		0.092795109	0.024193532
6	National for Tourist Investments	1.544252470	0.07324189		0.109534624	0.028557856
7	Babylon Hotel	5.510247476	0.064304941		0.341599896	0.089061891
8	Baghdad Hotel	0.494319088	0.060401511		0.028715064	0.007486589
9	Al-Mansour Pharmaceuticals Industries	3.465056391	0.05855801		0.194897767	0.050813727
10	Iraqi Middle East Bank	1.960948948	0.051323306		0.096109896	0.025057763
11	AL-Gulf for Insurance	3.881015807	0.048823638		0.180514832	0.047063809
12	Mamoura Realestate Investment	6.037286785	0.048155982		0.276777047	0.072161284
13	AL-Nukhba for General Construction	2.918254824	0.029623852		0.079704770	0.020780620
14	Iraq Baghdad For General Transportation	6.473414678	0.029353205		0.175052988	0.045639798
15	Kurdistan International Bank	7.587383518	0.026723879		0.185227040	0.048292376
16	Baghdad Soft Drinks	26.19005452	0.026661344		0.637727035	0.166268130
17	Mansour Hotel	4.046286762	0.02343446		0.085470063	0.022283746
18	Al-Ameen for Insurance	1.886392012	0.017353583		0.028375504	0.007398058
19	Date Processing and Marketing	21.62605208	0.01040712		0.175079026	0.045646586
20	Commercial Bank of Iraq	10.65318731	0.006656259		0.046286873	0.012067909
21	Iraqi Islamic Bank	4.872414754	0.005174342		0.013949568	0.003636930

3.1.5 Determine the return and risk of an efficient portfolio:

The last step in building an efficient portfolio is embodied in determining the amount of expected return and risk for the portfolio to give a clear picture to investors in the financial market. They calculated through applying [Eqs. (26,27,28, and 29)]. From a review of the results in Table 6, it is clear that the formed efficient portfolio achieved an expected rate of return of 0.043, while its total risk amounted to 0.0123, and its systematic and unsystematic risks recorded values of 0.698 and 0.012, respectively. These results reflect the efficient trade-off between the two components of return and risk in the formation of the portfolio.

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Table 6 : The Return and Risk of an Efficient Nominal Portfolio

No.	Corporate Shares	Expected Return on an Efficient Portfolio $\bar{R}_p$			Systematic Efficient Portfolio Risk β_p		Unsystematic Efficient Portfolio Risk σ^2_{ep}		Total Efficiency Portfolio Risk σ^2_p
		Wi	$\bar{R}_i$	$Wi * \bar{R}_i$	β_i	$W_i * \beta_i$	σ^2_{ei}	$\sigma^2_{ei} * Wi$	$\beta^2_p * \sigma^2_{Rm} + \sigma^2_{ep}$
1	Iraqi Products Marketing Meat	0.023189354	0.010731388	0.000248854	0.000376140	0.000008722	0.082061102	0.000044128	0.012522506621
2	Modern Sewing	0.101256618	0.060227585	0.006098442	0.035180597	0.003562268	0.146031082	0.001497243	
3	Chemical and Plastic Industries	0.009916008	0.223225131	0.002213502	0.431578822	0.004279539	5.752762730	0.000565653	
4	Iraqi for Agricultural Products	0.149227416	0.031447926	0.004692893	0.151617036	0.022625419	0.048335734	0.001076380	
5	National Bank of Iraq	0.024193532	0.103730622	0.002509610	0.813413876	0.019679354	1.060603370	0.000620800	
6	National for Tourist Investments	0.028557856	0.011723497	0.000334798	0.113210949	0.003233062	0.073311166	0.000059789	
7	Babylon Hotel	0.089061891	0.055394351	0.004933526	0.808066026	0.071967889	0.146647865	0.001163214	
8	Baghdad Hotel	0.007486589	0.390973259	0.002927056	6.416090206	0.048034628	12.97965295	0.000727497	
9	Pharmaceuticals Industries	0.050813727	0.028933523	0.001470220	0.435496531	0.022129202	0.125682379	0.000324516	
10	Iraqi Middle East Bank	0.025057763	0.086344262	0.002163594	1.615495118	0.040480693	0.823833338	0.000517278	
11	AL-Gulf for Insurance	0.047063809	0.006458293	0.000303952	0.061990063	0.002917488	0.015972639	0.000035379	
12	Mamoura Realestate Investment	0.072161284	0.036855635	0.00265955	0.694076216	0.050085431	0.114964924	0.000598651	
13	AL-Nukhba for Construction	0.020780620	0.096513551	0.002005611	3.142124754	0.065295300	1.076713633	0.000464962	
14	Baghdad For Transportation	0.045639798	0.072664416	0.003316389	2.358607933	0.107646389	0.364352981	0.000758944	
15	Kurdistan International Bank	0.048292376	0.035439777	0.001711471	1.197732713	0.057841358	0.157858465	0.002700304	
16	Baghdad Soft Drinks	0.166268130	0.024346438	0.004048037	0.784458779	0.130430494	0.029952545	0.000828041	
17	Mansour Hotel	0.022283746	0.011890754	0.000264971	0.360965903	0.008043673	0.089209175	0.000044298	
18	Al-Ameen for Insurance	0.007398058	0.008224124	0.000060843	0.276162636	0.002043067	0.146397268	0.000008013	
19	Date Processing and Marketing	0.045646586	0.009161095	0.000418173	0.550525197	0.025129596	0.025456574	0.000053042	
20	Commercial Bank of Iraq	0.012067909	0.009583317	0.000115651	0.924183339	0.011152960	0.086751815	0.000012634	
21	Iraqi Islamic Bank	0.003636930	0.005502221	0.000020011	0.400148953	0.001455314	0.082125388	0.000001086	
		$\bar{R}_p = 0.042517152$			$=0.698041846\,\beta_p$		$\sigma^2_{ep} = 0.012101852$		

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3.2 Hedging an efficient portfolio against expected inflation risk:

This part of the research presents of the main procedural steps for efficient portfolio hedging against the expected inflation risk using the inflation-adjusted model of researchers (Chen and Moore, 1985).

3.2.1 Determine the order of the model ARMA(p,q):

At this stage, the best model for estimation has been chosen from among a set of models of order p,q = 0,1,2,..,5, and comparison among them using a set of well-known comparison measures, namely: Akaike's Criteria, Bayesian Criteria, and Hannan-Quinn Criterion, which are denoted according to the sequence (AIC, BIC, H.Q).Using the statistical program Gritl, the optimal significant model was ARMA (2,3), and the model equation was determined in the following form :

X_t = 1.63752X_{t-1} - 0.680214X_{t-2} + e_t + 1.67766e_{t-1} - 0.487744e_{t-2} - 0.263844e_{t-3} (35)

Where :

X_t : Inflation rate for time t

e_t : Error at time t

3.2.2 Results of estimating inflation rates:

To hedge the efficient portfolio against the risk of expected inflation, it is necessary to determine the realized rate or percentage of inflation in preparation for estimating the expected inflation rates. Accordingly, the achieved monthly inflation rates have been calculated for the period under study (2012 to 2021) based on the monthly consumer price indices issued by the Iraqi Ministry of Planning/Central Statistical Organization, which are documented in Appendix 1 and by applying [Eq. (25)]. As for the expected monthly inflation rates, they have estimated using the ARMA (2,3) model above [Eq. (35)]. Table 7 presents the results of calculating the realized monthly inflation rates and the results of estimating monthly inflation rates based on the actual values of inflation rates for the research period (2012 to 2021).

Table 7: Results of Estimating Monthly Inflation Rates for the Period (2012 to 2021)

Period	Real Values of Inflation	Estimated Values for Inflation	Error limit	Period	Real Values of Inflation	Estimated Values for Inflation	Error limit
2012:02	0.700000	0.0565778	0.643422	2017:01	0.100000	0.240351	-0.140351
2012:03	1.70000	0.187592	1.51241	2017:02	0.200000	0.0850800	0.114920
2012:04	1.10000	0.138341	0.961659	2017:03	0.400000	0.0196085	0.380392
2012:05	-1.30000	-0.233389	-1.06661	2017:04	0.600000	-0.0901802	0.690180
2012:06	-2.10000	-0.458162	-1.64184	2017:05	-1.10000	-0.246705	-0.853295
2012:07	0.300000	-0.0288643	0.328864	2017:06	-0.500000	-0.356743	-0.143257
2012:08	2.80000	0.576308	2.22369	2017:07	0.700000	-0.0459935	0.745993
2012:09	0.300000	0.423480	-0.123480	2017:08	0.500000	-0.0457615	0.545761
2012:10	-1.20000	-0.247264	-0.952736	2017:09	0.400000	-0.246054	0.646054
2012:11	-0.100000	-0.0907498	-0.0092502	2017:10	-0.600000	-0.316737	-0.283263
2012:12	0.000000	0.217814	-0.217814	2017:11	-0.100000	-0.328258	0.228258
2013:01	0.600000	0.209186	0.390814	2017:12	0.300000	-0.0990800	0.399080
2013:02	0.100000	0.227895	-0.127895	2018:01	-0.300000	-0.0769585	-0.223041
2013:03	0.800000	0.114640	0.685360	2018:02	-0.300000	-0.0755041	-0.224496
2013:04	1.10000	0.175710	0.924290	2018:03	-0.300000	0.0819300	-0.381930
2013:05	-1.30000	-0.0555372	-1.24446	2018:04	0.000000	0.185215	-0.185215
2013:06	-0.900000	-0.235951	-0.664049	2018:05	0.900000	0.281440	0.618560
2013:07	0.400000	0.197092	0.202908	2018:06	0.600000	0.254268	0.345732
2013:08	0.400000	0.314876	0.0851240	2018:07	0.700000	0.0448843	0.655116
2013:09	0.500000	0.175663	0.324337	2018:08	-1.00000	-0.0437549	-0.956245
2013:10	1.60000	0.147873	1.45213	2018:09	0.300000	-0.105390	0.405390
2013:11	-0.500000	0.00897864	-0.508979	2018:10	0.500000	0.210729	0.289271
2013:12	0.400000	-0.293822	0.693822	2018:11	-0.500000	0.0679021	-0.567902
2014:01	1.40000	0.0187837	1.38122	2018:12	-0.600000	0.0292014	-0.629201
2014:02	-0.900000	-0.123073	-0.776927	2019:01	0.400000	0.217856	0.182144

2014:03	-0.100000	-0.313447	0.213447	2019:02	-0.500000	0.301041	-0.801041
2014:04	0.500000	0.0992849	0.400715	2019:03	0.800000	0.179995	0.620005
2014:05	-1.40000	0.0785096	-1.47851	2019:04	-0.800000	0.265786	-1.06579
2014:06	-0.100000	0.0734922	-0.173492	2019:05	-0.600000	0.0111837	-0.611184
2014:07	0.500000	0.497260	0.00273963	2019:06	0.400000	0.240243	0.159757
2014:08	0.800000	0.430540	0.369460	2019:07	0.000000	0.223288	-0.223288
2014:09	-0.100000	0.299463	-0.399463	2019:08	0.300000	0.0214035	0.278596
2014:10	0.400000	0.137928	0.262072	2019:09	-0.300000	-0.0428787	-0.257121
2014:11	1.60000	0.228371	1.37163	2019:10	0.600000	-0.182274	0.782274
2014:12	-0.900000	0.0519392	-0.951939	2019:11	0.000000	-0.172343	0.172343
2015:01	-0.500000	-0.272270	-0.227730	2019:12	-0.200000	-0.388118	0.188118
2015:02	-0.100000	0.0812847	-0.181285	2020:01	0.800000	-0.344901	1.14490
2015:03	-0.300000	0.119316	-0.419316	2020:02	0.000000	-0.333542	0.333542
2015:04	0.800000	0.148205	0.651795	2020:03	0.400000	-0.497520	0.897520
2015:05	-0.300000	0.172045	-0.472045	2020:04	-1.10000	-0.396250	-0.703750
2015:06	0.400000	-0.0409271	0.440927	2020:05	-0.100000	-0.375362	0.275362
2015:07	0.100000	0.0695730	0.0304270	2020:06	-0.200000	0.0190737	-0.219074
2015:08	0.700000	-0.0603965	0.760397	2020:07	-0.200000	0.0530345	-0.253034
2015:09	-0.600000	-0.0748654	-0.525135	2020:08	0.400000	0.201362	0.198638
2015:10	-0.100000	-0.213452	0.113452	2020:09	0.200000	0.279155	-0.0791546
2015:11	1.00000	0.0232041	0.976796	2020:10	0.800000	0.221988	0.578012
2015:12	0.300000	-0.0052616	0.305262	2020:11	-0.900000	0.210116	-1.11012
2016:01	0.200000	-0.204183	0.404183	2020:12	3.30000	0.125122	3.17488
2016:02	0.100000	-0.151859	0.251859	2021:01	0.800000	0.320026	0.479974
2016:03	-0.700000	-0.134433	-0.565567	2021:02	0.700000	-0.497268	1.19727
2016:04	-0.100000	-0.0456241	-0.0543759	2021:03	0.600000	-0.335139	0.935139
2016:05	-0.300000	0.194476	-0.494476	2021:04	0.100000	-0.356943	0.456943
2016:06	-0.300000	0.223802	-0.523802	2021:05	0.000000	-0.246309	0.246309
2016:07	0.100000	0.338423	-0.238423	2021:06	0.700000	-0.0110432	0.711043
2016:08	0.800000	0.397187	0.402813	2021:07	0.600000	0.195902	0.404098
2016:09	0.200000	0.317337	-0.117337	2021:08	1.20000	0.242439	0.957561
2016:10	-0.300000	0.102180	-0.402180	2021:09	-0.700000	0.324097	-1.02410
2016:11	-0.700000	0.0831858	-0.783186	2021:10	0.400000	0.319175	0.0808246
2016:12	0.200000	0.148484	0.0515155	2021:11	0.500000	0.753016	-0.253016
				2021:12	0.300000	0.738004	-0.438004

3.2.3 Results of the analysis of the real investment characteristics of the shares :

Table 8 presents the primary data for the requirements of the initiation point for the process of building and hedging an efficient portfolio against the risk of expected inflation, which is represented by estimating investment characteristics at their real value at the level of return and risk. The first step started by calculating the real monthly realized rate of return on the shares of the research sample companies by applying [Eq. (10)] . Then the expected real rate of return was estimated using the two-factor model of the researchers Chen and Moore (1985) by applying [Eq. (24)].

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Table 8: The expected monthly real rate of return $\bar{R}_i$, , Parameters β_{1i}, β_{2i} ,and σ_{ei}^2 for companies sharing

No.	Company	$\bar{R}_i$	β_{1i}	β_{2i}	σ_{ei}^2
1	Commercial Bank of Iraq	-0.069449101	0.921786785	0.054470885	0.049431258
2	Bank Of Baghdad	-0.175092855	0.548156352	0.07488438	0.021394861
3	Iraqi Islamic Bank	-0.124431714	0.336803572	-0.011878463	0.03770847
4	Credit Bank Of Iraq	0.112489892	0.252242595	-0.248742405	0.189813087
5	Investment Bank of Iraq	0.755823675	1.251661362	0.136827492	0.182668689
6	National Bank of Iraq	0.022494381	0.860901778	0.041279372	0.042149811
7	Gulf Commercial Bank	-0.409164604	0.294792713	-0.053172967	0.022119582
8	Ashur International Bank	-0.291445599	-0.122739167	-0.119152733	0.044013838
9	Al-Mansour Bank	0.334233534	0.592626202	0.018301715	0.020684859
10	United Bank For Investment	0.058724694	0.553238154	-0.006585046	0.017881515
11	Elaf Islamic Bank	-0.173306955	0.348040028	0.011471875	0.017771875
12	Kurdistan International Bank	-0.188220053	0.403979272	-0.035459192	0.014573373
13	Iraqi Middle East Bank	-0.234259981	0.332402039	-0.075786352	0.057255559
14	Babylon Bank	-0.133019916	0.630136302	-0.081972637	0.029405634
15	Al-Ameen for Insurance	-0.165773252	0.31853943	-0.03219303	0.050269466
16	AL-Gulf for Insurance	0.057306378	0.10709305	0.018383357	0.0127468
17	Kharkh Tour Amuzement City	0.275868395	0.009692797	0.321466823	0.070176473
18	Mamoura Realestate Investment	-0.180114516	0.61844824	0.063672023	0.040256101
19	Iraq Baghdad For Transportation	-0.250498564	0.113508756	-0.127873425	0.058621209
20	AL-Nukhba for General Construction	-0.200606115	-0.048864304	-0.20092991	0.167891862
21	Al-Mansour Pharmaceuticals Industries	-0.114579473	0.421924242	-0.020296819	0.066095961
22	Iraqi For Tufted Carpets	0.001168986	-0.147897404	-0.257106631	0.128039547
23	Modern Sewing	0.411970223	0.880755184	0.056234332	0.034535211
24	Baghdad Soft Drinks	-0.008662047	0.420579062	0.010436794	0.016355186
25	Date Processing and Marketing	0.139226479	0.943652654	-0.001977716	0.020571528
26	Chemical and Plastic Industries	0.416196715	0.062547586	-0.008372304	0.130259853
27	Ready Made Clothes	-0.07324773	-0.801763844	0.096844366	0.050292859
28	AL- Kindi of Veterinary Vaccines	-0.085567113	0.765328747	0.007828665	0.029048602
29	Metallic Industries and Bicycles	-0.082746071	-0.500677388	-0.023148714	0.027314178
30	Babylon Hotel	-0.336271866	0.353666827	-0.016279995	0.01765496
31	Baghdad Hotel	-0.2547962	0.771323343	-0.020423971	0.577269649
32	National for Tourist Investment	-0.245147103	0.399275832	0.150048718	0.028764368
33	Karbala Hotels	-0.134663072	-0.129339097	-0.02847723	0.128528787
34	Mansour Hotel	-0.188671618	0.197693045	0.053483701	0.032472235
35	Iraqi Products Marketing Meat	-0.074055237	0.277928372	-0.003132349	0.036967156
36	Iraqi for Agricultural Products	0.392990659	0.206502787	-0.051664205	0.061301248
37	Middle East for Production- Fish	-0.072884989	-0.073825932	0.033691807	0.054528811

3.2.4 Calculating the common and particular parameters of the shares:

The second step to hedge the efficient portfolio against the risk of expected inflation according to the mechanism of the inflation-adjusted model is calculating the common parameters of the shares of the companies nominated to build and hedge the efficient portfolio, i.e. calculating the parameter values [A, B, C, D, E, F, and G] as well as calculating some unique parameters represented by the values of [Hi, Ii]. All the mentioned parameters have been calculated based on the results of estimating the real investment characteristics of the shares of the nominated companies, which are presented in Table 9 above. In addition to the values of some other statistical inputs, namely: the covariance between the real market portfolio return and the expected inflation rate $\sigma_{Rm\pi,}$ the variance of the real market portfolio returns σ^2_{Rm}, the variance of the expected inflation rate σ^2_{π}, and the real interest rate on treasury bills, RR_F. Table 9 shows the results of calculating those parameters after applying [Eqs. (11,12,13,14,15,16,17,18, and 19)] respectively.

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Table 9: Results of Calculating the unique and Common Parameters between the Shares of Companies according to the (Chen and Moore,1985) Model

No.	Company Name	A	B	C	D	E	F	G	H_i	I_i
1	Commercial Bank of Iraq	-1.375922058	0.052003481	0.012107895	-0.081306971	0.000715488	0.003073027	2.803528852	0.000649292	-0.000490163
2	Bank Of Baghdad	-4.597119238	0.108826381	0.009266143	-0.628018667	0.00126586	0.014866919		0.000361663	-0.000260108
3	Iraqi Islamic Bank	-1.150118708	-0.008195682	0.002282295	0.04056264	-8.04925E-05	0.000289047		0.000255525	-0.000202563
4	Credit Bank Of Iraq	0.143726523	-0.020334632	0.000437707	-0.141732133	-0.000431633	0.020052462		0.000329375	-0.000328805
5	Investment Bank of Iraq	5.149261587	0.052193515	0.005793295	0.562900293	0.000633304	0.005705623		0.000845479	-0.000619158
6	National Bank of Iraq	0.370894142	0.041256897	0.012498457	0.017784	0.000599288	0.001978227		0.000611925	-0.000464871
7	Gulf Commercial Bank	-5.510808503	-0.045440897	0.003308691	0.994007059	-0.000596802	0.00819636		0.000248266	-0.000208882
8	Ashur International Bank	0.824829472	0.020049711	6.15451E-05	0.80072798	5.97468E-05	0.019463859		-2.20699E-05	-1.73581E-05
9	Al-Mansour Bank	9.451661831	0.02218091	0.012235249	0.291889924	0.000377854	0.000685		0.000427056	-0.000327475
10	United Bank For Investment	1.682757045	-0.022263007	0.012755937	-0.020029407	-0.000151831	0.000264991		0.000412292	-0.000323188
11	Elaf Islamic Bank	-3.47890373	0.009767644	0.004903512	-0.114669417	0.000161626	0.000321955		0.000250387	-0.000191787
12	Kurdistan International Bank	-5.337707426	-0.066337412	0.008834341	0.468516095	-0.000775432	0.005822752		0.000318695	-0.000258627
13	Iraqi Middle East Bank	-1.385185741	-0.027920097	0.001678088	0.315816878	-0.000382597	0.006365672		0.000289047	-0.000247219
14	Babylon Bank	-2.943400453	-0.114805167	0.010981323	0.382898584	-0.001428529	0.014934677		0.000512449	-0.000423099
15	Al-Ameen for Insurance	-1.077916879	-0.013591542	0.001607784	0.108939136	-0.00016249	0.001373622		0.000253728	-0.000207054
16	AL-Gulf for Insurance	0.445039238	0.008893393	0.000575493	0.076394454	9.87879E-05	0.00152662		6.84984E-05	-4.80459E-05
17	Kharkh Tour Amuzement City	0.037504229	0.002704739	-2.45593E-05	1.243847874	-0.000814521	0.089704123		-0.000177811	0.000231789
18	Mamoura Realestate Investment	-2.833675145	0.054137207	0.006452654	-0.29173958	0.00066433	0.005573669		0.000420017	-0.000308832
19	Baghdad For General Transportation	-0.493437171	-0.015213716	0.000304755	0.555882236	-0.000343322	0.01713903		0.00015739	-0.000159731
20	AL-Nukhba for Construction	0.059647462	0.003555196	-2.31474E-05	0.245270232	-9.51821E-05	0.014618956		7.95317E-05	-0.000120248
21	Pharmaceuticals Industries	-0.759094163	-0.009444552	0.002063285	0.0365165	-9.92551E-05	0.000454334		0.000323221	-0.000257756
22	Iraqi For Tufted Carpets	0.003657472	0.017997804	-4.47373E-05	0.006358194	-7.77718E-05	0.0312876		3.87305E-05	-0.000104745
23	Modern Sewing	10.39595495	0.074463294	0.015760407	0.663759461	0.001006268	0.004754322		0.00061798	-0.000465252
24	Baghdad Soft Drinks	-0.334233114	0.010130649	0.007831452	-0.008294094	0.00019434	0.000251395		0.000304544	-0.000234289
25	Date Processing and Marketing	6.187695335	-0.030434734	0.03201469	-0.012968231	-6.70967E-05	6.37854E-05		0.000697917	-0.000544425
26	Chemical and Plastic Industries	0.197765712	-0.000262244	2.44897E-05	-0.02647192	-3.27806E-06	3.51026E-05		5.10015E-05	-4.2171E-05
27	Ready Made Clothes	1.23682233	-0.101428424	0.010326101	-0.149394707	-0.001247281	0.012251452		-0.000647733	0.000532833
28	AL- Kindi of Veterinary Vaccines	-2.368615229	0.000966051	0.014769914	-0.024228927	0.000151084	9.88189E-06		0.000560603	-0.000434579
29	Metallic Industries and Bicycles	1.596230074	0.020574793	0.006532431	0.073801363	0.000302026	0.000951271		-0.000356373	0.00027099
30	Babylon Hotel	-6.823095866	-0.023948243	0.005418888	0.314080825	-0.000249442	0.001102386		0.00027051	-0.000215516
31	Baghdad Hotel	-0.346240679	-0.00225585	0.000776689	0.009168152	-2.0566E-05	5.97329E-05		0.000581285	-0.00045889
32	National for Tourist Investment	-3.463045873	0.123723928	0.002893939	-1.3014201	0.001087548	0.046495719		0.000208483	-0.000118944
33	Karbala Hotels	0.139874766	0.001671265	7.96154E-05	0.030796921	1.75293E-05	0.000367971		-7.91166E-05	5.33928E-05
34	Mansour Hotel	-1.175038955	0.019148136	0.000701344	-0.317893995	0.000189741	0.00518032		0.0001152	-7.42584E-05
35	Iraqi Products Marketing Meat	-0.589360345	-0.002637259	0.001556432	0.006642296	-1.75415E-05	2.97228E-05		0.00020702	-0.000162229
36	Iraqi for Agricultural Products	1.30924575	-0.01100504	0.000613787	-0.327555584	-0.000153561	0.002753312		0.000182205	-0.000156967
37	Middle East for Production- Fish	0.104547769	-0.002836984	0.000100049	-0.047712276	-4.56593E-05	0.001294709		-7.38978E-05	6.7356E-05
Parameters Sum		**-6.705803587**	**0.125889513**	**0.207456232**	**3.7531250867**	**0.000280536**	**0.000280536**			

*The variance of the real rate of return on the market portfolio (the variance of the real market index return) σ^2_{Rm} for the research period was (0.000738385) while the variance in the expected inflation rate for the period was (0.060933383) while the covariance between the real rate of return on the market portfolio and the expected inflation rate $\sigma_{Rm\pi}$ for the period was It amounted to (-0.0005753865), Regarding the average real interest rate on treasury Bills, RR_f, it amounted to (0.004335378) for the period under research.

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3.2.5 Calculating the preliminary values of (Z_i):

The third step to hedging an efficient portfolio of expected inflation risk is to calculate the initial values of (Z_i) for all candidate shares to determine which stocks should be included in an efficient hedge portfolio. These values have been determined based on three fundamental factors: the amount of real expected surplus return for each share, the risk adjustment coefficient, and the risk related to the company or industry that is reflected by the residual variance of the share. Hence, the increase in the value of (Z_i) expresses the amount of contribution of the expected real return of a particular share in hedging the risk in general and the inflationary risk of the share in particular, which are reflected by the risk adjustment coefficient, as well as the company's sound management of its own risk. It is noted from the results of calculating the initial (Z_i) values of the companies' shares after applying [Eq.(20], which have presented in Table 10, that the highest value was in Al-Mansour Bank, as it amounted to (16.114), and accordingly, the company's share was nominated for the components of the efficient hedge portfolio, while it recorded the lowest value in Babylon Hotel, as it reached (-19,169), and only accordingly, the nomination of the company's shares was excluded from the hedged efficient portfolio.

Table 10: Preliminary Z_i Values of the Shares of the Research Sample Companies

No.	Company	$\bar{R}_i - R_f$	Φ_i	σ^2_{ei}	Z_i
1	Commercial Bank of Iraq	-0.073784479	-0.005169919	0.049431258	-1.388080414
2	Bank Of Baghdad	-0.179428233	-0.002843487	0.021394861	-8.253605772
3	Iraqi Islamic Bank	-0.128767092	-0.002061682	0.03770847	-3.360131303
4	Credit Bank Of Iraq	0.108154513	-0.002847327	0.189813087	0.584795504
5	Investment Bank of Iraq	0.751488297	-0.006678462	0.182668689	4.150501993
6	National Bank of Iraq	0.018159003	-0.00488057	0.042149811	0.546611528
7	Gulf Commercial Bank	-0.413499982	-0.002036956	0.022119582	-18.60175399
8	Ashur International Bank	-0.295780977	8.03556E-05	0.044013838	-6.722007117
9	Al-Mansour Bank	0.329898156	-0.003414636	0.020684859	16.11385382
10	United Bank For Investment	0.054389315	-0.003316307	0.017881515	3.227110451
11	Elaf Islamic Bank	-0.177642333	-0.00200143	0.017771875	-9.883082206
12	Kurdistan International Bank	-0.192555431	-0.002588145	0.014573373	-13.03523091
13	Iraqi Middle East Bank	-0.238595359	-0.002382843	0.057255559	-4.125582218
14	Babylon Bank	-0.137355294	-0.004181927	0.029405634	-4.528838458
15	Al-Ameen for Insurance	-0.17010863	-0.002063766	0.050269466	-3.342881408
16	AL-Gulf for Insurance	0.052971	-0.000535137	0.0127468	4.19761342
17	Kharkh Tour Amuzement City	0.271533017	0.001689301	0.070176473	3.845216287
18	Mamoura Realestate Investment	-0.184449894	-0.003321221	0.040256101	-4.49940926
19	Iraq Baghdad For Transportation	-0.254833942	-0.001367905	0.058621209	-4.323794054
20	AL-Nukhba for General Construction	-0.204941493	-0.000802057	0.167891862	-1.21589834
21	Al-Mansour Pharmaceuticals Industries	-0.118914851	-0.002612164	0.066095961	-1.759603536
22	Iraqi For Tufted Carpets	-0.003166392	-0.000520074	0.128039547	-0.020667973
23	Modern Sewing	0.407634845	-0.004917032	0.034535211	11.94583323
24	Baghdad Soft Drinks	-0.012997425	-0.002437188	0.016355186	-0.645681236
25	Date Processing and Marketing	0.134891101	-0.005606305	0.020571528	6.829702119
26	Chemical and Plastic Industries	0.411861337	-0.00041638	0.130259853	3.165040555
27	Ready Made Clothes	-0.077583109	0.005280433	0.050292859	-1.647620413
28	AL- Kindi of Veterinary Vaccines	-0.089902491	-0.004495615	0.029048602	-2.940137218
29	Metallic Industries and Bicycles	-0.087081449	0.002843072	0.027314178	-3.292228704
30	Babylon Hotel	-0.340607245	-0.002185593	0.01765496	-19.1686447
31	Baghdad Hotel	-0.259131579	-0.00468468	0.577269649	-0.440776506
32	National for Tourist Investment	-0.249482481	-0.001552248	0.028764368	-8.619352762
33	Karbala Hotels	-0.13899845	0.000612201	0.128528787	-1.086220868

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34	Mansour Hotel	-0.193006996	-0.000881638	0.032472235	-5.916604118
35	Iraqi Products Marketing Meat	-0.078390615	-0.001665047	0.036967156	-2.075506366
36	Iraqi for Agricultural Products	0.38865528	-0.001505227	0.061301248	6.364642146
37	Middle East for Production- Fish	-0.077220367	0.000620838	0.054528811	-1.427524331

3.2.6 Choosing stocks with positive weights:

This step is the decisive point in determining the stocks that should be included in a hedging portfolio against expected inflation risk according to the mechanism of the Chen and Moore model. In this step, the shares are arranged in descending order based on the Preliminary (Z_i) values calculated in the previous step. Then, stocks with positive weights, i.e. with positive values of (Z_i), are selected, and those with negative values are excluded. The selection mechanism is summarized by examining and evaluating each nominated share according to the initial (Z_i) values to verify the (Z_i) value signal. The verification process takes place by calculating the value of (Z_i) for the share again, that is, calculating what we will call the standardized value of (Z_i**). Based on the calculation results, the stock is accepted and included in the efficient hedge portfolio if its value (Z_i**) is greater than zero. The calculation process begins with the first-ranked share (the highest initial value of Z_i), then for the first and second highest-ranked share together, and then for the three highest-ranked shares, and so on. The process continues to verify the rest of the other nominated stocks until the stock whose addition to the efficient hedge portfolio leads to a negative value of (Z_i**) is reached.

From looking at the results of the calculation for the values of (Z_i**) presented in Table 12, it is clear that there are only 10 of the companies whose shares passed the selection criterion. Accordingly, the components of an efficient hedge portfolio against the expected inflation risk have determined with 10 shares, as shown in Table 11, starting with Al-Mansour Bank share and ending with a share of the Credit Bank of Iraq.

From what was previously shown, and by comparing the components of the efficient portfolio hedged against expected inflation risk with the components of the unhedged portfolio against that risk, which has been built using the simple ranking model in the previous section, it becomes clear that the significant difference between the two portfolios in terms of the number of shares, and the nature of companies whose shares have entered into the portfolio. The number of shares included in the hedge portfolio against expected inflation risk reached 10 shares. In contrast, it reached (21) shares in the unhedged nominal portfolio.

As for the nature of the entering companies, the efficient hedge portfolio against the expected inflation risk included the shares of five new companies that were not included in the nominal efficient portfolio, namely: Al-Mansour Bank, the Investment Bank, the United Bank, the Credit Bank, and the Karkh Tourist Games Company. The reason for including the shares of these companies in the hedged portfolio is due to their achieving expected positive real returns, in addition to the hedging ability of their shares against the market and inflationary risks. The shares of 16 companies that have been included in the efficient nominal portfolio have been excluded from the efficient hedge portfolio, namely: Meat Marketing Company, Tourism Investments Company, Babel Hotel, Baghdad Hotel, Al-Mansour Pharmaceutical Industries Company, Middle East Bank, Al-Mamoura Real Estate Company, Elite General Contracting Company, Baghdad Iraq General Transport Company, Kurdistan International Bank, Baghdad Soft Drinks Company, Al Mansour Hotel, Al-Ameen Insurance Company, the Commercial Bank of Iraq, the Iraqi Islamic Bank, and the National Bank of Iraq. The reason for this is the shares of these companies achieve expected negative real returns, in more precise terms, losses in real returns due to the effects of the inflation risk, as well as the weak hedging ability of their shares against the expected inflation risk. The reason for this is that the shares of these companies achieve expected negative real returns, in more precise terms, losses in real returns due to the effects of the inflation risk, as well as the weak hedging ability of their shares against the expected inflation risk.

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Table 11 : Components of an Efficient Hedge Portfolio against the Expected Inflation Risk according to the Chen and Moore Model

No.	Company	$Rank\ Z_i^*$	$A_{Gimulted}$	$B_{Gimulted}$	$C_{Gimulted}$	$D_{Gimulted}$	$E_{Gimulted}$	$F_{amulted}$	$G_{amulted}$	Φ_i	Z_i^{**}
1	Al-Mansour Bank	16.11385382	9.451661831	0.02218091	0.012235249	0.291889924	0.000377854	0.000684999	0.288166738	0.003890533	15.76068878
2	Modern Sewing	11.94583323	19.84761678	0.096644204	0.027995656	0.955649385	0.001384122	0.005439321	0.924020196	0.011447815	11.47197348
3	Date Processing and Marketing	6.829702119	26.03531212	0.06620947	0.060010346	0.942681153	0.001317025	0.005503107	0.905425034	0.016609392	5.749777641
4	Iraqi for Agricultural Products	6.364642146	27.34455787	0.05520443	0.060624133	0.61512557	0.001163464	0.008256419	0.580372982	0.004600939	6.265032984
5	AL-Gulf for Insurance	4.19761342	27.7895971	0.064097823	0.061199626	0.691520024	0.001262252	0.009783039	0.652135332	0.001759734	4.017578416
6	Investment Bank of Iraq	4.150501993	32.93885869	0.116291339	0.066992922	1.254420317	0.001895556	0.015488662	1.177902329	0.025262717	3.975643458
7	Kharkh Tour Amuzement City	3.845216287	32.97636292	0.118996078	0.066968362	2.49826819	0.001081035	0.105192786	2.23049412	-0.004934286	3.939601018
8	United Bank For Investment	3.227110451	34.65911996	0.09673307	0.0797243	2.478238783	0.000929204	0.105457776	2.215006134	0.012436871	2.346134876
9	Chemical and Plastic Industries	3.165040555	34.85688568	0.096470826	0.079748789	2.451766864	0.000925926	0.105492879	2.190929535	0.001544074	3.149990221
10	Credit Bank Of Iraq	0.584795504	35.0006122	0.076136195	0.080186496	2.310034731	0.000494293	0.125545341	2.038202626	0.00995505	0.517348224
11	National Bank of Iraq	0.546611528	35.37150634	0.117393092	0.092684952	2.327818731	0.001093581	0.127523568	2.033356257	0.01872982	-0.013542583
12	Iraqi For Tufted Carpets	-0.020667973	35.37516381	0.135390896	0.092640215	2.334176925	0.00101581	0.158811167	1.986121013	0.001036364	-0.032823884
13	Baghdad Hotel	-0.440776506	35.02892314	0.133135046	0.093416904	2.343345077	0.000995244	0.1588709	1.994789051	0.017565595	-0.479320494
14	Baghdad Soft Drinks	-0.645681236	34.69469002	0.14326595	0.101248356	2.335050983	0.001189583	0.159122295	1.982431114	0.009051617	-1.348137631
15	Karbala Hotels	-1.086220868	34.83456479	0.1449396	0.101327971	2.365847904	0.001207113	0.159490266	2.007767057	-0.002374322	-1.062984649
16	AL-Nukhba for Construction	-1.21589834	34.89421225	0.148492155	0.101304824	2.611118136	0.001111931	0.174109222	2.19418787	0.002232541	-1.233973057
17	Commercial Bank of Iraq	-1.388080414	33.51829019	0.200495637	0.113412718	2.529811164	0.001827419	0.177182249	2.102894733	0.01826971	-1.862266785
18	Middle East for Production- Fish	-1.427524331	33.62283796	0.197658652	0.113512768	2.482098888	0.00178176	0.178476958	2.0610925	-0.002065501	-1.378259757
19	Ready Made Clothes	-1.647620413	34.85966029	0.096230228	0.123838868	2.332704181	0.000534479	0.190728411	1.945208088	-0.018947279	-1.165887764
20	Al-Mansour Pharmaceuticals Industries	-1.759603536	34.10056613	0.086785676	0.125902153	2.369220681	0.000435224	0.191182744	1.9779545	0.009230391	-1.938775678
21	Iraqi Products Marketing Meat	-2.075506366	33.51120578	0.084148417	0.127458585	2.375862977	0.000417682	0.191212467	1.984121401	0.005800684	-2.277462147
22	AL- Kindi of Veterinary Vaccines	-2.940137218	31.14259055	0.085114468	0.142228499	2.35163405	0.000568766	0.191222349	1.961187095	0.014350483	-3.588915361
23	Metallic Industries and Bicycles	-3.292228704	32.73882063	0.105689261	0.14876093	2.425435413	0.000870792	0.19217362	2.013783732	-0.009544624	-2.838702468
24	Al-Ameen for Insurance	-3.342881408	31.66090375	0.092097719	0.150368714	2.534374549	0.000708302	0.193547243	2.107164079	0.006504106	-3.513320309
25	Iraqi Islamic Bank	-3.360131303	30.51078504	0.083902037	0.152651009	2.574937189	0.000627809	0.19383629	2.143021594	0.006289825	-3.581606939
26	Iraqi Middle East Bank	-4.125582218	29.1255993	0.055981941	0.154329097	2.890754067	0.000245212	0.200201961	2.403425128	0.006665264	-4.283612418
27	Baghdad For General Transportation	-4.323794054	28.63216213	0.040768224	0.154633852	3.446636302	-9.81104E-05	0.217340992	2.833273023	0.003434584	-4.405718146
28	Mamoura Realestate Investment	-4.49940926	25.79848698	0.09490543 1	0.161086506	3.154896722	0.000566219	0.22291466	2.569627119	0.008450662	-4.791834071
29	Babylon Bank	-4.528838458	22.85508653	-0.019899735	0.172067829	3.537795306	-0.00086231	0.237849337	2.871635594	0.008802652	-4.970406181
30	Mansour Hotel	-5.916604118	21.68004758	-0.000751599	0.172769173	3.219901311	-0.000672569	0.243029657	2.600368913	0.001936699	-6.003396339
31	Ashur International Bank	-6.722007117	22.50487705	0.019298112	0.172830718	4.020629292	-0.000612822	0.262493517	3.193961933	-0.000477769	-6.709326448
32	Bank Of Baghdad	-8.253605772	17.90775781	0.128124493	0.18209686	3.392610624	0.000653038	0.277360435	2.64835595	0.00468621	-8.60554532
33	National for Tourist Investment	-8.619352762	14.44471194	0.251848421	0.184990799	2.091190524	0.001740586	0.323856154	1.564030827	0.00228602	-8.752791038
34	Elaf Islamic Bank	-9.883082206	10.96580821	0.261616065	0.189894312	1.976521108	0.001902213	0.324178109	1.479868635	0.001942222	-10.10498634
35	Kurdistan International Bank	-13.03523091	5.628100781	0.195278652	0.198728653	2.445037203	0.001126781	0.330000861	1.834648186	0.000926553	-13.27640347
36	Gulf Commercial Bank	-18.60175399	0.117292278	0.149837756	0.202037344	3.439044262	0.000529978	0.338197221	2.569996616	-0.000592134	-18.66707266
37	Babylon Hotel	-19.1686447	-6.705803587	0.125889513	0.207456232	3.753125087	0.000280536	0.339299607	2.803528852	-0.002185593	-19.1686447

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3.2.7 Determine the weights of the hedged efficient portfolio:

After determining the shares companies that the investor must select to hedge an efficient portfolio against the risk of expected inflation, the most crucial issue arises, which is knowing the amount of financial allocation for each share, and this requires knowing the optimal real weights of the shares that maximize the real returns for the investor, so in this step, these weights have calculated, depending on the final set of common parameter values, i.e. the new parameters values for the stocks that passed the test required to be included in the hedge portfolio($Zi^{**} > 0$), Specifically, the sum of the parameter values for the last share that passed the test. Through these values, the new or final values of (Z_i) are calculated, and then the optimal real weights are calculated for the components of the efficient hedge portfolio by applying [Eq. (22)]. It is clear, by tracking the results of the calculation listed in Table 12, that the highest investment weight in the efficient hedge portfolio was in the shares of Al-Mansour Bank with a value of (0.272). This is a result of the high expected real return on the bank's share, and the ability of its share to hedge against the inflation risk. this is on the one hand, from the decrease in the variation of the return of this bank's share that is not related to the return of the market portfolio, that is, from the bank's superiority in managing its unsystematic risk on the other hand. On the other hand, the Iraqi Credit Bank recorded the lowest ratio of wealth allocated to investment in an efficient hedge portfolio with a value of 0.009. The reason for this is attributed to the weak hedging ability of the company's share against the expected inflation risk, in addition to the decline in the bank's efficiency in managing its unsystematic risk.

Table 12: Real Optimum Investment Weights (W_i) of the Hedged Efficient Portfolio

No.	*Company*	G	$\frac{A-GB}{1+C}$	Φ_i	Z_i***	W_i
1	Al-Mansour Bank	2.038203	32.25871768	0.013108808	15.3150355	0.272303378
2	Modern Sewing			0.01898696	11.25367032	0.200091762
3	Date Processing and Marketing			0.021404253	5.5166952	0.098087578
4	Iraqi for Agricultural Products			0.005557783	6.249424102	0.111115596
5	AL-Gulf for Insurance			0.002111742	3.989962983	0.070942075
6	Investment Bank of Iraq			0.026012106	3.971541012	0.07061453
7	Kharkh Tour Amuzement City			-0.005263511	3.944292399	0.070130046
8	United Bank For Investment			0.012641278	2.334703693	0.041511344
9	Chemical and Plastic Industries			0.00155929	3.149873407	0.05600517
10	Credit Bank Of Iraq			0.00995505	0.517348224	0.009198521

3.2.8 Analysis of the return and risk of an efficient hedged portfolio:

The last step in building and hedging an efficient portfolio is embodied in determining the amount of expected return and risk for the hedged portfolio to give a clear picture to investors in the financial markets to make their investment decisions. They calculated through applying [Eqs. (26,27,28, and 29)]. From a review of the results in Table 13, it is clear that the efficient portfolio that is hedged against the risk of expected inflation has achieved an expected real return of 0.334, while the expected rate of return on the unhedged portfolio was 0.043, meaning that the expected real rate of return on the efficient hedge portfolio increased by 0.291, which is approximately equivalent to seven times the return of the nominal efficient unhedged portfolio, It is also clear from the results of the analysis that the systemic risk of the hedged portfolio decreased by 0.119, i.e. 0.171, as the amount of this risk for the nominal portfolio was (0.698), while it amounted to 0.579 for the hedged portfolio. The hedged efficient portfolio recorded a significant decrease in the total risk of the portfolio by 0.0066, i.e. 0.529 from the total risk of the nominal portfolio, which amounted to 0.0125. In contrast, in the efficient hedged portfolio, it became 0.0059. These results clearly indicate the significant improvement in the performance of the efficient portfolio after hedging it against the risk of expected inflation, as well as reflect the correct trade-off of return and risk according to the real values adjusted to the risk of inflation and not the nominal, It is consistent with the propositions of contemporary financial

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management literature and applied financial studies that emphasize the need to take inflation risk into account when building and hedging an efficient portfolio.

Table 13: The Real Return and Risk of a Hedged Efficient Portfolio against Expected Inflation

No.	Company Shares	The Expected Real Return on a Hedged Efficient Portfolio $\bar{R}_p$			Systematic Hedged Efficient Portfolio Risk β_p		Unsystematic Hedged Efficient Portfolio Risk σ^2_{ep}		Total Hedged Portfolio Risk σ^2_p
		Wi	$\bar{R}_i$	$Wi * \bar{R}_i$	β_{i1}	$W_i * \beta_{i1}$	σ^2_{ei}	$\sigma^2_{ei} * Wi$	$\beta^2_p * \sigma^2_{Rm} + \sigma^2_{ep}$
1	Al-Mansour Bank	0.272303378	0.334233534	0.09101292	0.592626202	0.161374117	0.020684859	0.001533764	0.005893994487
2	Modern Sewing	0.200091762	0.411970223	0.082431848	0.880755184	0.176231857	0.034535211	0.001382676	
3	Date Processing and Marketing	0.098087578	0.139226479	0.013656388	0.943652654	0.092560603	0.020571528	0.000197922	
4	Iraqi for Agricultural Products	0.111115596	0.392990659	0.043667391	0.206502787	0.02294568	0.061301248	0.000756867	
5	AL-Gulf for Insurance	0.070942075	0.057306378	0.004065433	0.10709305	0.007597403	0.0127468	6.41518E-05	
6	Investment Bank of Iraq	0.07061453	0.755823675	0.053372134	1.251661362	0.088385479	0.182668689	0.000910861	
7	Kharkh Tour Amuzement City	0.070130046	0.275868395	0.019346663	0.009692797	0.000679756	0.070176473	0.000345144	
8	United Bank For Investment	0.041511344	0.058724694	0.002437741	0.553238154	0.022965659	0.017881515	3.08133E-05	
9	Chemical and Plastic Industries	0.05600517	0.416196715	0.023309168	0.062547586	0.003502988	0.130259853	0.00040857	
10	Credit Bank Of Iraq	0.009198521	0.112489892	0.001034741	0.252242595	0.002320259	0.189813087	1.60606E-05	
		$\bar{R}_p$ = **0.334334427**			β_p = **0.578563802**		σ^2_{ep} = **0.005646830416**		

3.2.9 Hedged efficient portfolio performance Evaluation:

The role of evaluating the performance of investment portfolios is to determine the best among them to achieve the best correct exchange between return and risk and to enlighten the investor on the level of performance of the portfolio in which he invested his money compared to other portfolios. In addition, the evaluation process is a continuous process, and this continuity comes from the changing nature of financial markets. And the renewable nature of the shares listed for trading in those markets.

Despite the significant improvement in the performance of the hedged efficient portfolio, which was evident from the results of the analysis and individual comparison of its investment characteristics with the nominal portfolio, to obtain more accurate results about the feasibility of the hedging process, and the extent of improvement in the performance of the hedged portfolio. There must be final measures to judge the quality of performance, linking the return and risk of the portfolio together. Therefore, some of financial models were used to evaluate the performance of the portfolio that is hedged against the risk of expected inflation. We have applied [Eqs.31,32,33, and 34)] respectively. Table 14 presents the results of the evaluation of the efficient hedge portfolio. It is clear from it that there has been a significant improvement in the performance of the efficient portfolio, as the values of the evaluation indicators and measures for the hedged portfolio have increased significantly compared to what they are in the nominal portfolio, and this is evidence of a better performance of the assortment that makes up the hedged portfolio.

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Table 14 : Hedged portfolio performance Evaluating Results

Models	Unhedged Efficiency Portfolio	Hedged Efficiency Portfolio	Performance Level
Sharpe	3.121216317	55.989032519	Best
Treynor	0.055992993	0.570376245	Best
Jensen	0.04089785622	0.375553468	Best
Modigliani and Modigliani (M^2)	0.0136941458	0.121137103	Best

4.Conclusions:

The building and hedging of an efficient portfolio for the investor against the risk of expected inflation leads to a difference in the components of the efficient hedged portfolio compared to the nominal portfolio that is not hedged against this risk in terms of the number of shares included in the portfolio and the nature of the companies whose shares are listed in it. In addition to the fact that the two portfolios have different amounts of investment weights, building an efficient hedge portfolio against the risk of expected inflation makes the performance of the efficient hedged portfolio much better than that of the nominal portfolio. Therefore, investors in the financial market should take the risk of expected inflation into account when building and hedging an efficient portfolio because ignoring it and not taking it into account leads to investors making decisions that do not reflect the proper trade-off of return and risk and leads to choosing a suboptimal portfolio, which thus does not meet the goals and tendencies of investors in the financial market. This is consistent with what was recommended by previous studies and proposals in contemporary financial literature.

Authors Declaration:
Conflicts of Interest: None
-We Hereby Confirm That All The Figures and Tables In The Manuscript Are Mine and Ours. Besides, The Figures and Images, Which are Not Mine, Have Been Permitted Republication and Attached to The Manuscript.
- Ethical Clearance: The Research Was Approved By The Local Ethical Committee in The University.

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تحويط المحفظة الكفوءة من مخاطرة التضخم المتوقع : بحث تطبيقي في سوق العراق للأوراق المالية *

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مستخلص البحث:
يهدف هذا البحث إلى تحويط المحفظة الكفوءة للمستثمر من مخاطرة التضخم المتوقع ، وتقويم مدى تحسن جودة أدائها ، واعتمد البحث المنهج الوصفي التحليلي ، وجرى تطبيقه على عينة قصدية من الشركات المتداول أسهمها في سوق العراق للأوراق المالية بلغ قوامها (37) شركة ، وبواقع (120) مشاهدة شهرية لكل شركة ، وللمدة من (2012-2021) ، وباستعمال أنموذج التدريج البسيط لـ Elton et.al.,1978 لبناء المحفظة الكفوءة الإسمية ، والأنموذج المعدل للتضخم (أنموذج العاملين) للباحثين Chen and Moore,1985 لتحويط المحفظة من مخاطرة التضخم المتوقع ، وأنموذج شارب Sharpe Model، وأنموذج ترينير Treynor Model، وأنموذج جينسن Jensen Model ، وأنموذج M^2 Model لتقويم جودة أداء المحفظة ، توصل البحث إلى عدة نتائج من أهمها وجود اختلاف كبير في مكونات المحفظة الكفوءة المحوَّطة قياساً بالمحفظة الإسمية غير المحوَّطة من حيث عدد الأسهم المتضمنه ، وماهية الشركات التي أدخلت أسهمها للمحفظة زيادةً على وجود اختلاف كبير في مقادير الأوزان الاستثمارية بين المحفظتين ، وتبين من نتائج التحليل أيضا التحسن الكبير في جودة أداء المحفظة الكفوءة المحوَّطة من مخاطرة التضخم المتوقع مقارنةً بالمحفظة الإسمية غير المحوَّطة ، وتكمن أصالة البحث وقيمته العلمية في كونه أول من تبنى الأنموذج المعدَّل للتضخم في تحويط المحفظة الكفوءة للمستثمرين من مخاطرة التضخم فضلاً عن كونه يعد أول إسهام معرفي بدليل تجريبي حول تحويط المحفظة الاستثمارية الكفوءة من تلك المخاطرة في سوق العراق للأوراق المالية.

نوع البحث : ورقة بحثية
المصطلحات الرئيسة للبحث : المحفظة الكفوءة ، مخاطرة التضخم المتوقع ، تحويط المحفظة الكفوءة ، الأنموذج المعدل للتضخم (أنموذج العاملين) ، نماذج تقويم المحفظة الكفوءة

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