DETERMINING THE OPTIMAL INVESTMENT STRATEGY FOR EGYPTIAN INSURANCE COMPANIES WITHIN THE FRAMEWORK OF THE ENTERPRISE RESOURCE PLANNING SYSTEM AND FINANCIAL SOLVENCY CRITERIA II

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ABSTRACT

This study aims to determine the optimal investment strategy (OIS) for life insurance companies within the framework of applying the enterprise resource planning (ERP) system and solvency standards II by measuring the relationship between the application of the requirements of solvency standards II in light of market risks and determining the optimal investment ratios in light of those risks and also Knowing the impact of the application of the Enterprise Resource Planning (ERP) system on the investment performance of insurance companies. The study relied on a sample of Egyptian insurance companies (Misr Life Insurance, Al Mohandes Life Insurance & Allianz Life Insurance) during the period between 2010-2020. The results showed that Misr Company is characterized by the highest percentage of investment returns that achieve the highest possible return in light of the risks facing the company at a risk level of 12.5%, followed by Al Mohandes Company at a risk level of 30%, and finally Allianz Company at a risk level of 38%. It has been found that there is no significant difference between Misr and Allianz companies in terms of the impact of the application of the ERP system on investment performance, as well as between Misr and Al-Mohandes companies, while there is a significant difference between the two companies, Al-Mohandes and Allianz in terms of the impact of the application of the ERP system.

Keywords: Optimal Investment Strategy, Enterprise Resource Planning and Solvency Standards II.

INTRODUCTION

The investment activity of insurance companies plays an important role at the national level by Contributing to financing economic development plans and strengthening the state's economic balance to serve the economy. Contributing to reducing the unemployment rate by creating many job opportunities resulting from financing new projects or expanding projects. Insurance companies 'investments bring many benefits to the insureds. The insureds are assured of the ability of insurance companies to fulfill their obligations towards policyholders on their due dates, while ensuring that insurance companies continue to operate, as these investments are considered as the real guarantee for policyholders that they will obtain their rights when the risk is realized or maturity dates come. Reducing the cost of the insurance service provided as a result of achieving investment returns, which allows insurance companies to adjust the technical interest rate used in calculating premiums.

According to the level of insurance companies find that reducing losses resulting from compensation: investment returns are a general way to cover losses resulting from the deficit of insurance activity, and this is when the real technical loss rate exceeds the expected rate (the volume of compensation exceeds the sum of the collected premiums), especially since insurance companies are distinguished from other financial institutions by not knowing in advance. For the losses that they may face in the future. Their lack of knowledge of the amount of compensation amounts owed to the insured in the event that the risk is realized, which may exceed the total premiums obtained by the insurance companies, which affects their financial position. Therefore, insurance companies resort to investing their money so that they have liquidity and achieve returns that they face. Unexpected and sudden events.

Capital guarantee: Insurance is a major focus of investment in insurance companies' funds. In this context, the funds invested in insurance companies are characterized by a large degree of risks even if they achieve small returns. Investments are another way to finance insurance companies instead of bank loans that lead to high indebtedness due to high interest rates. Reducing taxes on profits, as the state grants exemptions from taxes in the event that capital is directed to investment. The possibility of acquiring shares of competing companies, and this enables insurance companies to implement their strategies in the best way and compete with other companies. Strengthening the financial position of insurance companies through achievable surpluses in the form of capital reserves or retained earnings. Using investment income to cover general and administrative expenses. Investment contributes significantly to avoiding insurance companies bearing the opportunity cost, through which funds do not remain frozen without achieving returns or profits.

Theoretical Background

The solvency system is prepared II As a reform of the solvency rules of insurance and reinsurance companies in the European Union, this reform came as a result of deficiencies in the solvency system I.

The effect implementing the Solvency System II to Manage Investment

The solvency system II showed that many of the changes to managing investment in insurance companies were as follows (Judith, 2008; Thierry, 2014; Pierre, 2013). According to valuation using fair value find that this principle is based on evaluating the assets on the balance sheet at their market value at the closing date, which helps to link the recorded value accounting to the actual values of the assets in the financial markets and thus the valuation difference is eliminated, and thus insurance companies provide a more accurate picture of the actual value. The assets retained would simplify the evaluation mechanisms, in addition to that this principle contributes to supporting market discipline. Valuation of insurance companies 'assets and liabilities on the basis of the fair value principle is better than the historical cost principle and is also more appropriate for users of financial statements.

Disclosure and transparency of the assets held, as well as all the information on their investments, and this is what was explained by the third pillar of the requirements of the system, and this type of requirements came to enable the supervisory and control bodies of the insurance sector to easily and quickly access the information on evaluation and risks associated with the various investment tools as well as the portfolio as a whole.

Also, the solvency framework II Imposing additional capital requirements based on the financial risks faced by insurance companies at the present time, it will also affect the financial markets and their balance in terms of demand for asset classes, as the demand for bonds will increase and decrease for stocks, but on the other hand, the freedom that the system gives in diversifying investments It constitutes a real opportunity for insurance companies to diversify and reduce investment risks. Insurance companies must understand the risks associated with investment and allocate appropriate tools to manage these risks, as well as enable them to use statistical methods that enable them to measure and monitor them quantitatively.

The Evaluation of Investment risk A Solvency system flew II

Many countries have adopted a set of systems to contribute significantly to preserving the solvency of insurance companies, by setting standards that help these companies to manage for both their funds and investments in a way that allows to face various risks such as investment risks. Financial solvency system. II aims to enable insurance companies to adopt a system to manage the risks with creating a new opportunity for growth and developing their systems to meet various challenges at the level of the insurance sector as a whole. The quantitative assessment of investment risk is one of the main foundations of the solvency system II In this context, there are many quantitative methods for measuring the risks related to investment, and among the methods that have been taken by the solvency system to measure the fluctuations of insurance companies' investments: Standard deviation and variance, Correlation and coefficient of variation, Value at risk (VAR). Market risk is one of the most important risks that the solvency system focuses on II Because of its extreme importance, six main market risk variables have been identified on the basis of which the market risk is calculated SCR It is represented in: equity, interest rate, concentration, exchange rate, real estate, and the risk of spreading the loan.

Enterprise Resource Planning system (ERP)

Most of the traditional technological information systems depend on having a special system for each job separately and working separately from the rest of the information systems for various jobs within the facility, which results in the existence of many problems as a result of the lack of integration between the different systems in the facility, so it was necessary to find a solution to such problems.

Many studies focus on the issue of the enterprise resource planning system, but there is no agreement on a unified definition of the system, "As a set of modern programs provided by information technology, which aims to have an integrated information system that facilitates the linkage and integration between the various jobs in the facility and then facilitates the provision and sharing of information related to performance, which leads to upgrading the level of business reporting systems, and achieving effective communication with stakeholders .

Enterprise resource systems consist of a group of applications, whereby each application is responsible for a special function within the facility. Establishments can purchase applications either completely for the system or purchase them individually on the basis of the facility's needs. The choice between ERP systems is one of the most difficult operations due to the availability of many suppliers of these systems (Callaway, 1999). The most prevalent ERP systems in the Arab world today are the (SAP) and (Oracle), and the facility can choose from among them, which is that the facility chooses a supplier to implement the appropriate system.

Many previous studies have sought to know what are the expected benefits of implementing the enterprise resource planning system, including (Etoz & Dugenci, 2015; Zeng & Skibniewski, 2013; Wah, 2000; Ben & Anastasia, 2004). Standardization of operating procedures and types of reports, by achieving integration between all functions during all stages of operation within the facility through ease of information flow and communication between various jobs, and thus the ability to meet the information needs of both workers and customers. Supporting the decision-making process via reducing the financial and accounting cycle and obtaining accurate and immediate information on all establishment activities. Facilitate e-commerce operations, speed and flexibility to adapt to external changes and keeping up with technological advances and facing competitors who have applied the enterprise resource planning system.

Shang & Seddon (2002) divides the benefits of an enterprise resource application (ERP) into five types that can be illustrated as follows:

1. **Operational benefits.** The application of the resource planning system leads to the performance of the company's operations in an automated manner and causes fundamental changes in the way its business is performed to comply with the application of this system, and this leads to reducing costs, improving productivity and quality, increasing the accuracy and reliability of information, reducing the operating cycle, and improving customer service.
2. **Administrative benefits** The resource planning system provides the necessary mechanisms for the administration to undertake planning requirements, support the decision-making process, and improve the performance of all departments in the facility through better utilization of resources, in addition to improving the process of monitoring performance at all levels in the enterprise.
3. **Strategic benefits:** ERP Information helps the organization to achieve a competitive advantage based on excellence in information technology by strengthening the relationship between suppliers, customers and other stakeholders, enhancing the commercial growth of the facility, introducing new products and services to the market, and supporting innovation and excellence.
4. **Benefits of an information system infrastructure:** ERP helps the organization to quickly respond to internal and external changes at the lowest cos through reducing information technology costs by excluding old separate systems with one integrated system.
5. **Organizational benefits**: Implementing ERP increase communication and internal integration between the various departments and departments in the facility, and also helps to support organizational changes within the facility, and the development of organizational communication and cooperation between individuals, which leads to the improvement of the organizational culture in the facility.

LITERATURE REVIEW

The Impact of Insurance companies risks on the Investment Portfolio

The solvency Financial II to finding entrance For value Mannequin to risk which relies On Requirements head Money (Gatzert & Kosub, 2017, Braun, et al., 2017, Escobar, et al., 2018) with knowledge of the impact of European initiatives regarding the treatment of infrastructure for investments in insurance companies under the solvency system II and the Improving the life insurance company's assets in the context of the traditional portfolio theory when the company resorts to adhering to the capital requirements of the solvency system II in view of market risk and impact of capital requirements of solvency system II on investment strategies in insurance companies using the expected benefit to achieve the optimality.

The success of implementing the enterprise resource planning system

Previous studies concerned with the impact of enterprise resource planning system ERP on companies (Nwankpa, 2015). Knowing the role of the ERP system ERP in support of decision making and its improvement and the benefits derived from its use, the study also focused on (Park, 2015) to check from efficiency Companies Insurance Korean, which adopts ERP to improve efficiency. Some studies analyzed the effect of planning resources on determinants Quality Reports Financial And its reflection On Decisions Investors (Leyh, 2014).

There is a continuous increase in the number of companies seeking to implement the solvency system II as well as enterprise resource planning systems in most countries of the world, as a result of its clear positive impact on countries 'economies, financial markets and investments, whether internally or externally. This research is an extension of the efforts of researchers and academics in this path, with the aim of highlighting the important and effective role of both the solvency system. II In light of market risks and its impact on the investment portfolio in insurance companies and the enterprise resource planning system which has a positive impact on the financial performance of companies in the short and long terms.

The diversity and difference of the results of previous studies related to investment in insurance companies and the pursuit of the application of the financial solvency system II. The success of this system, as well as for the enterprise resource planning system, in supporting and improving the performance of companies, whether at the local or global level. The researcher tries to determine the optimal investment strategy for insurance companies within the framework of implementing the enterprise resource planning system and financial solvency standards II.

Research Models

To calculate solvency capital requirements (SCR), the regulator provides insurance companies with standard formulas for different types of risks that are calibrated on the basis of historical data to reflect the value at risk at a confidence level of 99.5% and a period of time of one year,

Market risk is one of the most important categories of risk in the insurance industry. Among life insurance companies in Europe, market risk accounts for nearly 70% of the total life insurance ratio. The difference between the market values of the assets and liabilities of the insurance company is called the International Monetary Fund (BOF) and that the changes in the International Monetary Fund are factors caused by certain stress factors that reflect shocks from the financial markets. The total market risk capital requirement (SCR_Mkt) consists of several sub-modules, and in this regard, we will determine from our analysis the interest rate risk, equity risk, equity risk, and bond risk. Capital requirement for interest rate risk (Mkt_int) consists of two cases:

$$Mkt_{int}^{up} = \Delta BOF | up$$
$$Mkt_{int}^{Down} = \Delta BOF | \text{ down}$$
$$\Delta BOF \leftarrow Mkt_{int}^{Down} \text{ و } Mkt_{int}^{up}$$

ΔBOF represents the change caused by the rise and fall in the rate of interest, in both cases pressure factors are applied to the capital requirements of the prevailing yield curve

Capital requirements for equity risks as asset and liability positions that interact with changes in stock prices (Mkt_eq) and are calculated in two steps:

First: The capital requirements for each category are determined on the basis of pre-determined stress factors.

$$\text{Mkt}_{eq,i} = \max(\ \Delta BOF|\ equity\ shock, :0)$$

Mkt_{eq} denotes the capital requirements for the risky equity of two classes (global equities and other equities).

Second: The results are collected by means of a preset correlation matrix.

$$\text{Mkt}_{eq} = \sqrt{\sum_i \sum_j CorrIndex_{ij} . Mkt_{eq,i} . Mkt_{eq,j}}$$

i,j belong to world stocks and other stocks.
$\boldsymbol{CorrIndex_{ij}}$ indicates the correlation coefficient between global stocks and other stocks.

Capital requirements for equity risk reflect a limited decrease in real estate prices and this may have an impact on the asset and liability values of the insurance company.

$$\boldsymbol{\text{Mkt}_{prop} = \max(\ \Delta BOF|\ propert\ shock, :0)}$$

ΔBOF causes credit spread to widen and is captured by risk subunits.
Mkt_{sp} covers all other spread sensitive investments such as asset backed securities, structured products and credit derivatives. However, to simplify the analysis and ensure the availability of reliable data, we will be bound by corporate bonds and therefore a two-step approach is needed: First: The spread risk shock on bonds should be calculated as follows:

$$\text{Spread shock on bonds} = \sum_i^n Mv_i . duration . F^{up}(rating_i)$$
$$\text{Mkt}_{sp} = \max(\ \Delta BOF|\ spread\ shock\ on\ bonds, :0)$$

$$\text{SCR}_{Mkt} = max \left\{ \begin{array}{l} \sqrt{\sum_i \sum_j CorrMkt_{ij}^{up} . Mkt_i^{up} . Mkt_j^{up}}\ ,. \\ \sqrt{\sum_i \sum_j CorrMkt_{ij}^{down} . Mkt_i^{down} . Mkt_j^{down}} \end{array} \right\}$$

i , j = (int, eq, prop, sp) stands for interest rate risk, equity risk, equity risk, and spread risk.
(up, down) indicates the ups and downs of the interest rate risk sub-units.
CorrMkt^{down}, CorrMkt ^{up} refers to the corresponding correlation matrix.

RESEARCH METHODOLOGY

This research depends on a convivence sample of three insurance companies (Misr Life Insurance, Al Mohandes Life Insurance, Allianz Life Insurance) with the aim of determining the optimal investment strategy for them within the framework of solvency standards based on

market risks and ERP system. To determine the optimal portfolio of investment channels, the following equation is used:

$$P = \omega_1 R_1 + \omega_2 R_2 + \omega_3 R_3 + \omega_4 R_4 + \omega_5 R_5 + \omega_6 R_6$$

$\boldsymbol{\omega_i}$ is the percentage allocated to investment in the investment channel A_i. Sum of ω_i equals 1

R_i expected return, $i = 1,2,3 \ldots ,6$

Portfolio variance = $\omega_1{}^2\sigma_1{}^2 + \omega_2{}^2\sigma_2{}^2 + 2\,\omega_1\,\omega_2 \text{Cov.}$

Portfolio Risk =   Standard deviation of Variance

The researcher has used the Stochastic Efficient Frontier to obtain the best optimal ratios for investment in the investment portfolios of insurance companies using the RStudio program.

Empirical Results

Previous Table 1 shows that the average investment returns of the Misr Life Insurance Company increased, except for the return on loans and the return on real estate, as well as the return on bonds, respectively, where the average values were as follows (.011, .016, .071). The researcher will conduct the correlation matrix between returns investment and each other to show the extent of a positive or negative correlation between all returns, as shown in the following Table 1:

Table 1
DESCRIPTIVE STATISTICS OF MISR COMPANY

Variables	Mean	Standard Deviation	Min	Max
Return on cash	0.214	0.041	0.16	0.3
Return on stocks	0.316	0.106	0.15	0.47
Return on bonds	0.071	0.09	0.01	0.27
Return on real estate	0.016	0.013	0	0.05
Return on loans	0.011	0.003	0.01	0.02
Return on securities	0.454	0.146	0.21	0.64

Table 2
CORRELATION MATRIX OF MISR COMPANY

Variables	Return on cash	Return on stocks	Return on bonds	Return on real estate	Return on loans	Return on securities
Return on cash	1.000					
Return on stocks	-0.014	1.000				
Return on bonds	0.275	-0.188	1.000			
Return on real estate	0.330	-0.300	-0.033	1.000		
Return on loans	0.051	-0.119	-0.120	0.104	1.000	
Return on securities	-0.370	-0.718	0.088	-0.132	0.063	1.000

Correlation matrix shows that there is a negative correlation between return on cash and both of return on stocks and return on securities, while there is a positive correlation between

return on cash and other returns, such as: return on bonds, return on real estate, and return on loans, while there is a negative correlation between return on stocks and all the investment returns of the Misr Company, and there is also a negative correlation between return on bonds and both of return on real estate and the return on loans, but there is a positive correlation between the return on real estate and return on securities, and finally there is a positive correlation between the return on loans and the return on securities. To show the extent of discrepancy in returns of the investment channels of the Misr Company, the researcher conducted a variance matrix as in the following Table 2:

Table 3 COVARIANCE MATRIX OF MISR COMPANY						
Variables	Return on cash	Return on stocks	Return on bonds	Return on real estate	Return on loans	Return on securities
Return on cash	0.0154	-0.00054	0.00926	0.00166	0.00006	-0.02016
Return on stocks	-0.0005	0.10124	-0.0162	-0.00386	-0.00036	-0.10014
Return on bonds	0.00926	-0.01626	0.07369	-0.00036	-0.00031	0.01046
Return on real estate	0.00166	-0.0038	-0.0003	0.00164	0.00004	-0.00234
Return on loans	0.00006	-0.00036	-0.0003	0.00004	0.00009	0.00026
Return on securities	-0.0201	-0.1001	0.0104	-0.0023	0.0002	0.1922

The previous Table 3 shows the covariance matrix between the investment returns of the Misr Life Insurance Company, where there is a low variance in most of the matrix.

Table 4 THE OPTIMUM RETURNS FOR MISR COMPANY	
Returns	Ratios (%)
Return on cash	20%
Return on stocks	29%
Return on bonds	7%
Return on real estate	1%
Return on loans	1%
Return on securities	42%
Portfolio Return	%33
Variance	0.015
Portfolio Risk	%12.5

Previous Table 4 shows that the highest percentage of returns that achieve the highest possible return in light of the risks facing Misr Life Insurance Company is the return from securities, which amounted to 42%, followed by the return on stocks at 29%, followed by return on cash at 20%, followed by the return on bonds 7%, followed equally by the return on real estate and return on loans at 1% for each, and then achieving the highest possible return in light of the application of those ratios referred to in the Misr Life Insurance Company at a risk level of 12.5%.

Table 5 DESCRIPTIVE STATISTICS OF AL MOHANDES COMPANY				
Variables	Mean	Standard Deviation	Min	Max
Return on cash	.048	.023	.01	.08
Return on stocks	.034	.028	0	.1
Return on bonds	.864	.113	.58	.99
Return on real estate	0	0	0	0

Return on loans	.01	0	.01	.01
Return on securities	.01	.016	0	.04

Previous Table 5 shows that the average investment returns of Al Mohandes company increased, except for return on real estate and the return on loans, as well as the return on securities, respectively, where the average values amounted to (.01, .01, 0).

Table 6
CORRELATION MATRIX OF AL MOHANDES COMPANY

Variables	Return on cash	Return on stocks	Return on bonds	Return on real estate	Return on loans	Return on securities
Return on cash	1.000					
Return on stocks	0.155	1.000				
Return on bonds	-0.584	-0.205	1.000			
Return on real estate	0	0	0	0		
Return on loans	0	0	0	0	0	
Return on securities	0.574	0.097	-0.108	0	0	1.000

Correlation matrix Table 6 shows that there is a positive relationship between return on cash and both of return on stocks and return on securities, while there is a negative relationship between return on cash and return on bonds, and there is also a negative relationship between return on stocks and return on bonds, but there is a positive relationship between return on securities as there is a negative relationship between return on bonds and return on securities. Finally, there is no relationship between the return on real estate and all the investment returns of Al Mohandes company, and there is also no relationship between return on loans and all the investment returns of Al Mohandes company.

Table 7
COVARIANCE MATRIX OF AL-MOHANDES COMPANY

Variables	Return on cash	Return on stocks	Return on bonds	Return on real estate	Return on loans	Return on securities
Return on cash	0.00	0.00	-0.01	0.00	0.00	0.00
Return on stocks	0.00	0.01	-0.01	0.00	0.00	0.00
Return on bonds	-0.01	-0.01	0.12	0.00	0.00	0.00
Return on real estate	0.00	0.00	0.00	0.00	0.00	0.00
Return on loans	0.00	0.00	0.00	0.00	0.00	0.00
Return on securities	0.00	0.00	0.00	0.00	0.00	0.00

Previous Table 7 shows that the variance matrix between the investment returns of Al-Mohandes company is witnessing a very noticeable discrepancy between the investment returns to each other.

Table 8
THE OPTIMUM RETURNS FOR AL-MOHANDES COMPANY

Returns	Ratios (%)
Return on cash	5%
Return on stocks	4%
Return on bonds	89%
Return on real estate	0%
Return on loans	1%
Return on securities	1%

Portfolio Return	77%
Variance	0.09
Portfolio Risk	30%

Previous Table 8 shows that the highest percentage of investment returns achieved by Al-Mohandes Company in light of the risks facing Al-Mohandes Company is the return on bonds, which amounted to 89%, followed by the return on cash at 5%, followed by the return on stocks at 4%, and the lowest percentage of investment returns for Al-Mohandes Company, which is the return on real estate, where it does not achieve any return at all, while the return on securities and return on loans is 1% for each.

Table 9
DESCRIPTIVE STATISTICS OF ALLIANZ COMPANY

Variables	Mean	Standard Deviation	Min	Max
Return on cash	.028	.024	0	.07
Return on stocks	.473	.411	-.23	1.09
Return on bonds	.476	.255	.09	.82
Return on real estate	.017	.023	0	.07
Return on loans	.034	.02	.01	.08
Return on securities	.168	.054	.07	.25

Previous Table 9 shows that the average of most of the investment returns of Allianz Company has risen, respectively: return on bonds, followed by return on stocks, followed by return on securities, followed by return on loans, followed by return on cash, and finally the lowest average, which is return on real estate, where the average values reached, respectively (0.017, 0.028, 0.034, 0.168, 0.473, 0.473).

Table 10
CORRELATION MATRIX OF ALLIANZ COMPANY

Variables	Return on cash	Return on stocks	Return on bonds	Return on real estate	Return on loans	Return on securities
Return on cash	1.000					
Return on stocks	-0.511	1.000				
Return on bonds	0.734	-0.611	1.000			
Return on real estate	0.541	-0.740	0.827	1.000		
Return on loans	0.157	-0.124	-0.031	0.054	1.000	
Return on securities	0.057	-0.521	0.486	0.477	0.059	1.000

Correlation matrix Table 10 shows that there is a positive relationship between return on cash and both of return on bonds, return on real estate, return on loans and return on securities, while there is a negative relationship between return on cash and return on stocks, and also there is a negative relationship between return on stocks and all investment returns of Allianz, whether return on bonds, return on real estate, return on loans or return on securities. There is also a negative relationship between return on loans, but there is a positive relationship between return on bonds and both of return on real estate and the return on securities. Finally, there is a positive relationship between return on real estate and return on securities, and there is also a positive relationship between return on loans and the return on securities for Allianz.

Table 11 VARIANCE MATRIX OF ALLIANZ COMPANY						
Variables	Return on cash	Return on stocks	Return on bonds	Return on real estate	Return on loans	Return on securities
Return on cash	0.00	-0.04	0.03	0.00	0.00	0.00
Return on stocks	-0.04	1.51	-0.58	-0.06	-0.01	-0.11
Return on bonds	0.03	-0.58	0.59	0.04	0.00	0.06
Return on real estate	0.00	-0.06	0.04	0.00	0.00	0.00
Return on loans	0.00	-0.01	0.00	0.00	0.00	0.00
Return on securities	0.00	-0.11	0.06	0.00	0.00	0.03

Variance matrix Table 11 between the investment returns of Allianz company shows that there is a low variance between the investment returns with each other, except for the variance in return on stocks.

Table 12 THE OPTIMUM RETURNS FOR ALLIANZ COMPANY	
Returns	Ratios (%)
Return on cash	2%
Return on stocks	40%
Return on bonds	40%
Return on real estate	1%
Return on loans	3%
Return on securities	14%
Portfolio Return	40%
Variance	0.15
Portfolio Risk	38%

Previous Table 12 shows that the highest percentage of investment returns achieved by Allianz is return on bonds and return on stocks, which amounted to 40% for each, followed by return on securities at 14%, followed by return on loans at 3%, followed by return on cash at 2% Finally, the lowest percentage of investment returns for Allianz company is return on real estate at 1%. Therefore, we find that Allianz company, in the case of applying the mentioned percentages of investment returns, it achieves the highest possible return at a risk level of 38%

Table 13 OPTIMUM INVESTMENT RETURNS OF THE THREE COMPANIES			
Returns	Misr	Al Mohandes	Allianz
Return on cash	20%	5%	2%
Return on stocks	29%	4%	40%
Return on bonds	7%	89%	40%
Return on real estate	1%	0%	1%
Return on loans	42%	1%	3%
Return on securities	1%	1%	14%
Portfolio Return	33%	77%	40%
Variance	0.015	0.09	0.15
Portfolio Risk	12.5%	30%	38%

The previous Table 13 shows that Misr Life Insurance Company is the least risky company and thus becomes the best company compared to two companies: Al Mohandes and Allianz under study, where the risks of Misr Company amounted to 12.5% compared to the risks

of the two companies, Al Mohandes and Allianz, which amounted to 30% and 38%, respectively, and then Misr Company becomes the best ever, followed by Al-Mohandes Company and finally Allianz Company. We also find that Misr Company is witnessing diversification in investments compared to Al Mohandes and Allianz companies. However, the researcher also applied the legal ratios for all investment channels for all three insurance companies, as follows:

Table 14 RISK MATRIX FOR THREE INSURANCE FIRMS			
Period between 2010 to 2020	Misr	Al Mohandes	Allianz
Average interest rate risks	%20	%28	%39
Average real estate risks	%32	%40	%33
Average bonds risks	%88	%70	%64
Average stock risks	%60	%72	%29
Average other risks	%65	%44	%55

The previous Table 14 showed the average risks of the three insurance companies under study during the period from 2010 to 2020. In light of the return of each insurance company and the risks it is exposed to, the optimal ratios for all investment channels can be determined in light of the legal ratios set by Law (10) of 1981 and its amendments using the Stochastic Efficient Frontier, as shown in the following table (in case of compliance with legal ratios).

Table 15 THE OPTIMAL RATIOS OF THE INVESTMENT CHANNELS IN LIGHT OF THE LEGAL RATIOS			
Investment Channels	Misr	Al Mohandes	Allianz
Cash	%35	%27	%28
Stocks	%24	%10	%25
Bonds	%10	%24	%9
Loans	%22	%29	%26
Securities	%4	%2	%3
Real Estate	%5	%8	%9

Previous Table 15 shows that Misr Company is the best company compared to Al-Mohandes and Allianz companies in light of the legal ratios for distributing investment channels using the Efficient Frontier because it achieves the highest return and the lowest possible risk, and therefore it is the best investment portfolio like me, followed by Al-Mohandes then Allianz Company.

Table 16 CHANGE RATE IN THE LIABILITIES FOR MISR COMPANY			
Misr Company	Liabilities (first term)	Last term	Change rate ($\tilde{g}_L$)
2011/2010	11307303781	12278315366	0.086
2012/2011	12278315366	13181150811	0.074
2013/2012	13181150811	14462391814	0.097
2014/2013	14462391814	15615414286	0.08
2015/2014	15615414286	16899998161	0.082
2016/2015	16899998161	17850695646	0.056
2017/2016	17850695646	20071912127	0.124
2018/2017	20071912127	21635795166	0.078
2019/2018	21635795166	23240650550	0.074
2020/2019	23240650550	-	-

Previous Table 16 shows that the change rate in the liabilities of Misr Company fluctuates, whether it decreases during the years from 2011 to 2013, then rises during 2014, then begins to decline until 2017, then rises again during 2018, then begins to remain somewhat stable, to an average of 7% .

Table 17 CHANGE RATE IN THE LIABILITIES FOR AL-MOHANDES COMPANY			
Al-Mohandes	**Liabilities (first term)**	**Last term**	**Change rate ($\tilde{g}_L$)**
2011/2010	436969000	459431003	0.051
2012/2011	459431003	480537000	0.046
2013/2012	480537000	525145972	0.093
2014/2013	525145972	553277120	0.054
2015/2014	553277120	620441849	0.12
2016/2015	620441849	667805055	0.076
2017/2016	667805055	728849721	0.091
2018/2017	728849721	758602686	0.041
2019/2018	758602686	804779180	0.061
2020/2019	804779180	-	-

Previous Table 17 shows that the change rate in the liabilities of Al-Mohandes Company is fluctuating, whether it decreases during the years from 2011 to 2013 and then rises during the year 2014 to 2015 and then begins to decline in 2016 and then rises again during the year 2017 and then decreases immediately after the year 2018 and then settles at a rate of change of 6%.

Table 18 CHANGE RATE IN THE LIABILITIES FOR AL-MOHANDES COMPANY			
Allianz	**Liabilities (first term)**	**Last term**	**Change rate ($\tilde{g}_L$)**
2011/2010	1452335944	2045721458	0.41
2012/2011	2045721458	2589402237	0.27
2013/2012	2589402237	3329158634	0.29
2014/2013	3329158634	4322190842	0.3
2015/2014	4322190842	5098638334	0.18
2016/2015	5098638334	5814408432	0.14
2017/2016	5814408432	7035463464	0.21
2018/2017	7035463464	8194932892	0.16
2019/2018	8194932892	9688089659	0.18
2020/2019	9688089659	-	-

Previous Table 18 shows that the change rate in the liabilities of Allianz Company is fluctuating, whether it increases during the years from 2011 to 2013, then decreases during the year 2014 to 2016, then rises again during 2017, then decreases again in 2018 and then rises in 2019 at a rate of change of 18%.

Regarding to the evaluation of the Enterprise Resource Planning (ERP) system and its impact on determining the optimal investment portfolio for insurance companies, the net income from investments/total investments for each company will be divided separately. In addition, Allianz applies the system, and Al-Mohandes and Misr companies do not, and to show the extent of the difference in the application of the evaluation of the enterprise resource planning (ERP) system or not, a one-way analysis of variance is used in Table 19.

Table 19			
RATIO OF NET INCOME TO TOTAL INVESTMENTS FOR EACH COMPANY			
Years	Misr	Al Mohandes	Allianz
2011/2010	0.1	0.09	0.05
2012/2011	0.08	0.09	0.05
2013/2012	0.09	0.09	0.05
2014/2013	0.09	0.1	0.07
2015/2014	0.09	0.1	0.09
2016/2015	0.09	0.07	0.07
2017/2016	0.09	0.12	0.08
2018/2017	0.08	0.12	0.1
2019/2018	0.08	0.14	0.1
2020/2019	0.09	0.15	0.08

Table 20				
ONE WAY-ANOVA BETWEEN MISR AND AL MOHANDES COMPANY				
Differences	SS	Df	MS	F	Prob. > F
---	---	---	---	---	---
Between groups	.00011	4	.00002	0.35	0.8588
Within groups	.00025	5	.00006		

The previous Table 20 showed that there is no difference in the application of enterprise resource planning between the two companies, Misr and Al Mohandes because significant value is greater than 5%.

Table 21				
ONE WAY-ANOVA BETWEEN MISR AND ALLIANZ COMPANY				
Differences	SS	Df	MS	F	Prob > F
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Between groups	.00016	4	.00004	1	0.4857
Within groups	.0002	5	.00005		

The previous Table 21 showed that there is no difference in the application of enterprise resource planning between the two companies, Misr and Allianz because significant value is higher than 5%.

Table 21				
ONE WAY-ANOVA BETWEEN AL MOHANDES AND ALLIANZ COMPANY				
Differences	SS	Df	MS	F	Prob < F
---	---	---	---	---	---
Between groups	.00451	4	.00112	5.12	0.0412
Within groups	.0011	5	.0002		

The previous Table 21 showed that there is a difference in the application of enterprise resource planning between the two companies, Misr and Allianz because significant value is less than 5%.

Results refer to there is no statistically significant difference at a significant level of 5% between Misr and Allianz companies in terms of the impact of the application of the enterprise resource planning system on investment performance, while there is a statistically significant difference at a significant level of 5% between Al Mohandes and Allianz in terms of the impact of the application of the enterprise resource planning system.

To calculate the total capital requirement for market risk:

$$B\tilde{O}F_1 = \tilde{A}_1 - \tilde{L}_1$$

$$\Delta B\tilde{O}F = BOF_1 - BOF_0$$

$$\Delta B\tilde{O}F = (A_1 - A_0) - (L_1 - L_0) \sim N(mean\ A_0\omega^1 M - L_0\mu_L, Variance)$$

$$= A_0^2\omega^1 \sum \omega + L_0^2\sigma_L^2 - 2A_0L_0\omega^1 COV[(R_1\breve{g}_L)]$$

$$SCR_{Mkt} = |\mu_{\Delta BOF} + z_{.005}\sigma_{\Delta BOF}|$$

Table 22			
THE TOTAL CAPITAL REQUIREMENT FOR MARKET RISK (SCR_MKT)			
Firms	Mean	Standard Deviation	SCR
Misr	$3.8\ \wedge$	$3.5\wedge10^9$	$12.7\wedge10^9$
Allianz	$4.8\wedge10^8$	$3.02\wedge10^8$	$12.5\wedge10^8$
Al Mohandes	$0.09\wedge10^9$	$0.08\wedge10^9$	$3.05\wedge10^8$

Previous table 22 shows that Misr Company is the highest in terms of capital requirements, followed by Allianz Company, then Al-Mohandes Company.

CONCLUSION

The results of the statistical analysis to determine the optimal portfolio of companies under study within the framework of the application of the solvency system II in light of market risks were as follows:

1. As for the Misr Life Insurance Company, the highest percentage of investment returns that achieve the highest possible return in light of the risks facing the Misr Life Insurance Company is return on securities, which amounted to 42%, followed by return on stocks at 29%, followed by return on cash at 20 %, followed by return on bonds of 7%, then return on real estate 1%, then return on loans at 1%, so we find that in the case of applying the mentioned ratios for investment returns, it achieves the highest possible return at a risk level of 12.5%.
2. For Al-Mohandes Life Insurance Company, the highest percentage of investment returns that achieve the highest possible return in light of the risks facing Al-Mohandes Life Insurance Company is return on bonds, which amounted to 89%, followed by return on cash at 5%, followed by return on stocks at 4% . The lowest percentage of the investment returns for Al-Mohandes Company is return on real estate, where it does not achieve any return at all, while the return on securities and return on loans is 1% for each. The risk level is at a risk level of 30%.
3. For Allianz Life Insurance Company, the highest percentage of investment returns that achieve the highest possible return in light of the risks facing Allianz Life Insurance Company is return on bonds and the return on stocks, which amounted to 40% each, followed by return on securities at 14%, followed by return on loans is 3%, followed by return on cash at 2%, and then return on real estate by 1%. Therefore, we find that in the case of applying the mentioned percentages of investment returns, they achieve the highest possible return at a risk level of 38%.
4. There is no significant difference at the 5% significance level between Misr and Allianz companies in terms of the effect of applying the ERP system on investment performance, as well as between the two Misr and Al-Mohandes companies, while there is a significant difference at the 5% level between the two companies Al-Mohandes and Allianz in terms of the effect of applying the system Enterprise resource planning (ERP).
5. Misr Company is the highest in terms of capital requirements, followed by Allianz Company, then Al-Mohandes Company for Life Insurance.

RECOMMENDATIONS

1. Specialists in investment management in life insurance companies should give special attention to the investment function of these companies by focusing on how to make good selection of investment vessels and scientifically manage investment risks

2. The necessity of working to keep pace with global developments regarding the implementation of the solvency system II in light of market risks and interest in identifying indicators related to those risks.

3. The need to review investment policies continuously and effectively, taking into account the economic and political changes that the country is going through and taking into account their impact on the various investment channels.

4. The legislator must reconsider the legal ratios that govern the investments of life insurance companies so that there is a maximum and minimum limit for each investment channel, as obligating insurance companies to only make the investments of life insurance companies focus in some investment channels without other channels.

5. Giving greater freedom to the decision-maker in the areas of investment within companies, which increases the efficiency of investment activity.

6. The need to clarify the concept of the ERP system and its benefits and the benefits that accrue to companies from its application, both at the level of their financial and investment performance and the company as a whole.

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