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The Determination of Safe and Risk Portfolio by Using Portfolio Theory for Six Different Assets in 2015

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Abstract: This study investigates the performance of two portfolios; safe portfolio and a more risky portfolio of a company for six different assets (British pound Canadian dollar, London coffee, FTSE 350 electricity, Wolseley, UK-2 year bond yield, I share FTSE) over a period of 3 months before and after making the investments and examine how the investments performed and if the expected risks and returns were obtained. Statistical methods (mean, variance, standard deviation, co-variance, expected risk, expected return, probability) is used to conclude that the portfolio with the highest rate of expected return at 12.84% with the highest rate of expected risk at 5.85% then risk averse investors tend to invest in risk portfolios represented by portfolio 3 in this analysis and there are risk averse investors who will go for portfolio with the lowest expected risk and risk averse investors tend to invest in safe portfolios represented by portfolio

Key words: Safe and risk portfolio, investment management, FTSE, standard deviation, lowest expected, investors tend

INTRODUCTION

The paradox of investing is that more money is better than less, although, investors generally agree with this statement. Money managers often seek to generate attractive performance results by trying to identify undervalued securities with above average prospects for future growth or income portfolio management entails the management of a selection of securities and assets in order to meet an investment goal. Portfolio management is usually done by professional portfolio managers because it requires investment expertise and is also time consuming (Kevin, 2006). In coming up with a portfolio, the investment manager has to make sure the combination of assets that is best suited to give the investor the required returns. Before selecting an appropriate portfolio for an investor, the investment manager has to know the risk profiles of the investors. Investors are generally risk averse, they want little risk with every return that they get. The investment manager is expected to come up with a combination of assets that will maximize returns (Brentani, 2003).

The aim of this study is to analyse the performance of two portfolios, safe portfolio and a more risky portfolio of a company over a period of three months before and after making the investments and examine how the investments performed and if the expected risks and returns were obtained.

Literature review

Portfolio theory: Individual investors or financial planners rely on investment portfolio theories as a guide for their allocated money and other kind of capital assets within an investing portfolio where these theories aid them with tools to evaluate the expected risk and return of the investment (Omisore *et al*., 2011).

Markowitz was the first who processed the modern portfolio theory (also named as selective model) and got a noble prize for his electric theory. The optimal allocation of resources and capital has been described by Markowitz which maximizing return on investment fund is its main aim. This selective model was based on portfolio diversification as well as based on a number of assumptions, such as the aversion to risk and investors are looking for the standard deviation of expected return and expected risk as they are part of investment decisions (Spuchlakovaa *et al*., 2015). Another assumption for this model is that there is a fixed or a constant correlation between the stocks for a period of time (Choy, 2011). Similarly, Sharpe (1970) proved that it is possible to improve the risk return profile of a portfolio significantly

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by diversification and suggesting an algorithm for choosing the best portfolio for different investors. Likewise, Abramov *et al.* (2015) have found a rule in portfolio management practice which states that the asset allocation should receive the primary attention rather than active management.

Safe and risk portfolio: Empirically, many different ways has been used to analyse the consistency of different indexes as a measurement of portfolio performance. According to Tandelilin, (Cited in Suryani and Herianti, 2015) three parameters which is developed by Sharpe, Treynor and Jensen, named by them can be used to measure the performance of the portfolio. According to Jogiyanto, the total risk (standard deviation) is emphasized by Sharp Index, Jensen Index emphasize on systematic risk whereas, the difference between actual and expected rate of return is emphasized by Jensen index.

Based on that Suryani and Herianti (2015) three tools has been used these (Sharpe Index, Treynor Index and Jensebn) to analyse the consistency of these parameters as a measurement of risk adjusted performance and they conclude that there is no obvious difference between the three methods they have used. However, Sulistyorini (2009) showed different results in the portfolio performance measurement using the same three indexes. While this study investigates to analyse the performance of two portfolios safe portfolio and a more risky portfolio of a company over a period of three months before and after making the investments and also examines how the investments performed and if the expected risks and returns were obtained

Importance of variance and mean in the portfolio: A portfolio is normally constituted to maximize investor returns. In a portfolio, variance is used in the measurement of how the actual returns of a group of securities go up and down. Variance does this by examining the standard deviations of each asset in the portfolio and how each asset correlates with the other assets in the portfolio (Pajegopal, 2012). Variance makes use of diversification and aids in the selection of a risk level that is lower than the individual risk level of each of the assets in the portfolio. Portfolio variance examines covariance of the assets in a portfolio. The higher correlation between the assets in a portfolio leads to the higher the portfolio variance. Mean and variance portfolio construction lead to the capital asset pricing model which is vital in the analysis of investment returns. Investment managers use the capital asset pricing model to get the relationship between required return and risk (Brentani, 2003). Assume investors focus only on the expected return and variance (or standard deviation) of their portfolios: higher expected return is good, higher variance is bad f and also develop a method for constructing optimal portfolios (Lo, 2008).

MATERIALS AND METHODS

Data and estimation techniques

Data: The data have been taken from six different assets (British pound Canadian dollar, London coffee, FTSE 350 Electricity, Wolseley, Uk-2 year bond yield, I share FTSE) through investing web (www.investing.com) for 6 months daily in 2015. The data was divided into two parts. First part, taking the first three months and the other three months become the second parts then the both parts will be compared by using statistical methods (mean, variance, standard deviation, co-variance, expected risk, expected return, probability) to obtain final conclusion. Moreover, statistical software such as Excel and SPSS will be used to derive the final conclusion.

Variance and co-variance comparison: In this study, mean and variance were considered on returns to measure the expected utility between risky assets. It is obvious that asset returns follow only a normal distribution which mean and variance can be a part of this description. In addition, mean and variance of portfolio can be found by using the formula below:

$$E[X] = \sum_{i=1}^{N} p_i X_i$$

$$Var[X] = \sum_{i=1}^{N} p_i \left[X_i - E(X)\right]^2$$

Table 1 exhibits the variance and co-variance between different assets and it can be seen that variance and co-variance between 6 assets was used as a statistical method in order to find the main relationship between assents.

Compare expected return and expected risk between the first three months and the last three months: The assets to be analysed are British pound Canadian dollar, London coffee, FTSE 350 electricity, Wolseley, UK 2 year bond yield and I shares FTSE. In the first 3 months the expected returns on these assets were -0.013620885, 0.047420532, -0.018235733, 0.076388889, 0.217712177 and 0.103307087, respectively. This can be found as follows:

$$E[Return] = \sum_{i=1}^{n} x_i E[R_i]$$

Table 1: Variance and co-variance between different assets

Assets	British pound Canadian dollar	London coffee	FTSE 350 electricity	Wolseley	UK 2-year bond yield	I shares FTSE
British pound Canadian dollar	0.0000239					
London coffee	-0.0000130	0.0001845				
FTSE 350 electricity	0.0000124	0.0000037	0.0000733			
Wolseley	0.0000029	0.0000352	0.0000371	0.0001497		
UK 2-year bond yield	-0.0001360	-0.0000980	-0.0000360	0.0000390	0.0136957	
I shares FTSE	0.0000029	0.0000067	0.0000198	0.0000404	-0.0000740	0.0000539

Table 2: Expected return and risk of six assets amount of six months

	The first 3 months		The last 3 months	
Assets	E (return) (%)	E (risk) (%)	E (return) (%)	E(risk) (%)
British pound Canadian dollar	-1.3620885	0.4893874	0.1922000	0.4356604
London coffee	4.7420532	1.3586022	-0.8296730	1.1941105
FTSE 350 electricity	-1.8235733	0.8564461	8.0854618	0.6404686
Wolseley	7.6388889	1.2238464	6.2416555	1.4849579
UK 2-year bond yield	21.7712177	11.7028885	-3.4677560	10.6314957
I shares FTSE	10.3307087	0.7343705	5.1514294	0.8502941

E (Return) = The expected return on the portfolio
n = the number of assets on the portfolio
x_i = The probability of the portfolio invested in asset i
$E(R_p)$ = The expected return on asset i

The expected risk can be found by using variance and co-variance as follows:

$$V(R_p) = \text{var}(x_1R_1+x_2R_2+x_3R_3+x_4R_4+x_5R_5+x_6R_6)$$
$$= x_1^2V_1+x_2^2V_2+x_3^2V_3+x_4^2V_4+x_5^2V_5+x_6^2V_6+2x_1x_2Cov_{12}+2x_1x_3Cov_{13}+, ...,$$
$$E[\text{risk}] = \text{standard deviation} = \sqrt{V(R_p)}$$

Where:
$V(R_p)$ = The variance of asset i
x_i = The probability of the portfolio invested in asset i

It can be seen form the data in the Table 2 that The risks associated with these assets in the first three months were 0.004893874 for British pound Canadian dollar, 0.013586022 for London coffee, 0.008564461 for FTSE 350 electricity, 0.012238464 for Wolseley, 0.117028885 for UK 2 year bond yield and 0.007343705 for I shares FTSE. In the last 3 months, the return on British pound Canadian dollar had a positive return as opposed to the negative estimated return its risk also reduced by 0.0053. London coffee performed less than expected as it gave a negative return after the 3 months under analysis. However it riskiness decreased. The FTSE 350 electricity performed better than expected and showed reduced riskiness after three months. The Wolseley does not perform as expected and exhibited an increase in riskiness after three months. The UK 2 year bond yield had a negative re-turn after three months but experienced a reduction in its risk profile. The I shares FTSE underperformed which led to an increase in its riskiness.

RESULTS AND DISCUSSION

Portfolios: Investors are normally risk averse, meaning they expect returns from minimum risk taken. It is the work of investment managers to advice their clients depending on what the client wants, the investment mangers "expertise and the market trends (Bjornsson, 2012). Indifference curve represents investors" preferences for risk and return. Even though investors have different expected returns and risks, the indifference curve represents the investment desires of investors. In a sample of 31 portfolios, there are risk averse investors who will go for portfolio number 26 which has the lowest expected risk of 1.2/%. Portfolio number 26 represents an investment of 60% in both British pound Canadian dollar and I share FTSE equally and 10% in each of the other assets equally. Risk averse investors tend to invest in safe portfolios represented by portfolio 26 in this analysis.

As can be seen from the table above, it is clear that investors with high risk appetite will invest in portfolios that have high returns and high risks to. Portfolio 3 is the riskiest of all the 31 portfolios. It is also the portfolio with the highest rate of expected return at 12.84% with the highest rate of expected risk at 5.85%. However, most investors will not invest in such a portfolio because of their low risk appetite. The indifference curve represents the different levels of risk that an investor's exhibit. From the indifference graph, it can be seen that some of the investors do not mind taking an additional risk if there is a possibility that it will translate into higher returns. More than half of the portfolios are safe investments and since most investors are risk averse they go for safe investments. The neutral investment is investment 12 with an expected return of 8.26% and expected risk of 1.25%.

Table 3: Expected return and expected risk of all portfolios

Portfolios	E (return) (%)	E (risk) (%)	British pound, Canadian dollar (%)	London coffee (%)	FTSE 350 Electricity (%)	Wolseley (%)	UK 2-year bond yield (%)	I shares FTSE (%)
1	6.8830	1.9900	16.667	16.667	16.667	16.667	16.667	16.667
2	8.2600	1.2482	10	10	10	10	10	50
3	12.8400	5.8500	10	10	10	10	50	10
4	7.1850	1.3800	10	10	10	50	10	10
5	3.4000	1.2780	10	10	50	10	10	10
6	6.0265	1.4200	10	50	10	10	10	10
7	3.8500	1.7660	50	10	10	10	10	10
8	7.9600	2.3600	20	10	10	20	20	20
9	7.6779	2.3600	20	20	10	10	20	20
10	5.3200	1.2450	20	20	20	10	10	20
11	5.0490	1.2700	20	20	20	20	10	10
12	7.3600	2.3970	10	20	20	20	20	10
13	7.9200	2.3800	10	10	20	20	20	20
14	7.0670	2.3300	30	10	10	10	20	20
15	5.6590	1.3300	10	30	20	20	10	10
16	6.9700	2.3630	10	10	30	10	20	20
17	6.5500	1.2759	20	10	10	30	10	20
18	8.8210	3.5200	20	20	10	10	30	10
19	6.4877	1.2650	10	20	20	10	10	30
20	10.5500	3.5100	10	10	10	10	30	30
21	10.0100	3.5400	10	10	10	30	30	10
22	5.2900	1.3000	10	10	30	30	10	10
23	4.7000	1.3100	10	30	30	10	10	10
24	4.8000	1.2650	30	30	10	10	10	10
25	7.7200	1.2990	10	10	10	30	10	30
26	5.9200	1.2000	30	10	10	10	10	30
27	8.1100	3.5190	10	10	30	10	30	10
28	9.4300	3.5540	10	30	10	10	30	10
29	6.6000	1.3600	10	30	10	30	10	10
30	5.3800	1.2500	30	10	10	30	10	10
31	3.4900	1.2100	30	10	30	10	10	10

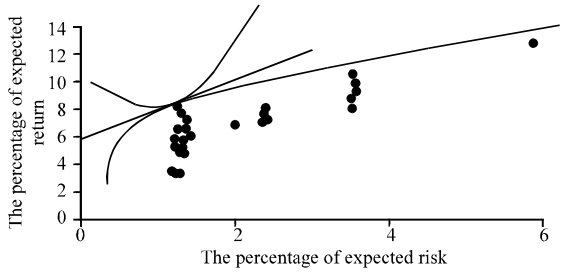

Fig.1: The relationship between the percentage of the expected return and the percentage of the expected risk

The indifference curve shows that even though the risk and return expectations of investors vary most investors do not like to take high risks. The number of investors decreases as the percentage of expected risk increase and there is a concentration of investors at the lowest level of expected risk.

Model specification: Figure 1 exhibits the curve of the relationship between the percentage of the expected return and the percentage of the expected risk. An efficient portfolio should be diversified. A diversified portfolio contains risky and risk free assets. In the construction of a diversified portfolio, the investment manager starts with risk free assets and then uses other risky assets to modify the asset allocation in order to achieve the required returns. UK 2 year bond is considered risk free and has been used in the composition of each of the 31 portfolios. Portfolio three which has the highest expected rate of return is composed of 50% risk free asset.

As can be seen from the Fig. 1, it is clear that the coloured points represented the results of 31 portfolios which are seen at the Table 3 with the title "Expected return and expected risk of all portfolios''. In addition, the graph shows us that there is a positive relationship between the percentage of the expected return and the percentage of the expected risk which is mean that when the risk is increased, the return will be raised. For example, in the Table 3, the higher risk is 5.85% in portfolio (3) and the higher return was in the same portfolio.

CONCLUSION

This study has explored that the assets were used to come up with 31 portfolios which were analysed over a period of three months. Most investors are risk averse

and chose to invest in less risky assets. Some assets did well after the three month period while others had negative performances. Some of the assets that performed well were British pound Canadian dollar, FTSE 350 electricity, Wolseley while the UK 2 year bond, London coffee and I shares FTSE underperformed. The 31 portfolios were put in an indifference curve which proved that most investors are risk averse and would go for the less risky investments.

It is also concluded that in a sample of 31 portfolios, there are risk averse investors who will go for portfolio number 26 which has the lowest expected risk of 1.2%. Portfolio number 26 represents an investment of 60% in both British pound-Canadian dollar and I share FTSE equally and 10% in each of the other assets equally.

It has also been evidenced that risk averse investors tend to invest in safe portfolios represented by portfolio 26 in this analysis. Additionally, it is the portfolio with the highest rate of expected return at 12.84% with the highest rate of expected risk at 5.8% then risk averse investors tend to invest in risk portfolios represented by portfolio 3 in this analysis.

RECOMMENDATIONS

Finally, it is recommended that although risk portfolio has higher risk and low return, safe portfolio should be chosen as it has higher return and less risk. In other words, risk portfolio has higher return in short term, however, safe portfolio is encouraged due to the long term benefit it has. Safe portfolio is also recommended as the probability of losing the capital is low compared to the high probability of losing the capital in risk investment.

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