



Analysis of Risk-Return of Equity Investment

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Abstract This research investigates the relationship between risk and returns of equity investment. Jupiter and BlackRock Companies' accumulation funds were used to carry out the analysis. Data were collected over a ten year period, ranging from January, 2003 to December, 2012. The objective of this research is to ascertain, if high risk leads to high returns in equity investment, using accumulation funds. Moving Average procedure was employed to estimate the risk and return of the respective funds in Excel spreadsheet. This research showed that, there is a positive correlation between the risk and returns, which is consistent over the randomly selected Moving Averages. Statistical significance test carried out using Minitab 16 also revealed a high significant relationship at 0.1% level of significance. The outcome of this research suggests that, high risk leads to high returns. This is in line with most of the results of other researchers.

Keywords Risks, returns, funds, equity, moving average and correlation

1. Introduction

The present position of economic crisis and uncertainty returns on market structures, stock prices and portfolio diversity in most countries have gained much attention that economist, investors, and financial experts are now more interested in understanding the underlining phenomenon of the relationship between risk and returns. In the evaluation of the relationship between risk and returns, the accumulation of funds is of great interest as it has the potentials of enhancing the efficiency of the participating companies' funds. Many authors like Fidelity [1] and Hargreaves Lansdown [2] have defined fund as a common financial purse from different individuals, controlled by a fund expert (manager) for investment purpose. Some researchers like Palisade [3] defined risk as an adverse occurrence in investment or as the possibility of having undesirable expectation in investment. Other authors like, Horcher [4] and McNeil *et al* [5] defined risk as the possibility of asset lose and the probability of yield in investment. Returns is defined as the expected yield on investment over a period of time.

Returns has been found to have positive correlation with risk in several studies,. Rao *et al*, [6] employed the method of Modern Portfolio Theory of mean variance optimisation to analyse sectorial portfolio, Similarly, Ortas and Moneva [7], adopted modified state-space market model to ascertain the performance of equity indexes, and their respective studies confirmed a positive correlation between the variables. On the contrary, the research by Ramanathan [8] showed that the effect of product risk on the relationship between customer's attitude and company's action, with regards to returning purchased goods revealed that the higher the product risk, the negatively it affect customers loyalty, which confirms that returns is negatively correlated with risk. However, studies have not investigated risk-returns relationship using accumulation funds, which is also known as growth fund. Most of the literatures reviewed focused their studies on income funds (distribution funds), which is the fund that issues dividend. An Equity is the actual asset an individual possess without any external debt (liability) attached to it. Rosly and Zaini [9] analysed the relationship between risk and returns by evaluating Islamic bank deposits and conventional bank capitals with regards to their differences, based on equity and debt.



This research is aimed at ascertaining if high risk leads to high returns in accumulation funds. The study will make researchers understand the current literature on the hypothetical relationship between risk and returns. The moving average method is used to ascertain the true relationship between risk and returns. This study will investigate the relationship between risk and returns, using two randomly selected companies' (Jupiter and BlackRock). Forty accumulation funds of Jupiter and BlackRock companies were selected to carry out the study over a period of ten years, based on their respective daily prices. This study will adopt the Moving Average (MA) approach to carry out the analysis of risk-returns relationship in equity investment. Pearson Correlation (r) will be used to check the degree of relationship between the two variables (Risk and returns). The probability (p) value will also be computed using Minitab 16 statistical software, the significance of the relationship between risk and returns, with a 0.1% level of confidence will also be calculated using Excel spreadsheet.

Section 2 explains the sources and method of data collection and Section 3 discusses the procedure and statistical technique used in the analysis of risk-return of equity investments. Section 4 presents the result from the investigation of the relationship between risk and returns of equity investment while Section 5 summaries and conclude the research.

2. Source of Data and Method of Data Collection

The variables used in this research are price and time of the respective funds. The data were extracted from the archives of Jupiter fund and BlackRock fund via the internet. It is mainly a secondary data, generated from the historical price of Jupiter [10] and BlackRock [11] respectively. It consists of selling (open) prices and Buying (closing) prices. The open prices are used to carry out this study. The data is collected over a period of ten years, based on their respective daily prices ranges from January 01, 2003 to December 31, 2012. The data obtained from the electronic archives of Jupiter Company and BlackRock Company is presented in Table 1.

Table 1 shows the two companies under study and their respective number of funds used for the analysis.

Table 1: Companies under study and their respective number of funds

Name of Company	Number of Funds
Jupiter	12
BlackRock	38

The names of each fund is presented with fund: 1, 2,, 40, respectively. The data elicited from the database of Jupiter funds and BlackRock funds are electronically processed using Excel package, the ten years daily prices are presented in days.

3. Methodology

Several methods have been used by different authors in the analysis of risk-return relationship. Eiling *et al.* [12] and Rao *et al.* [6] applied the mean-variance approach in analysing the importance of international stock returns. Bello and Adedokun [13], used the ordinary least square method to examine the risk-return dynamics of firms in Nigeria. In this research, we will adopt the Moving Average approach which is similar to the work by Bello *et al.* [13], Rao *et al.* [6] and Chris [14] where the return is calculated as simple return. The return and risk of the study will be calculated on a proportional bases.

The risk and return is measured based on the time series data. The time series data is used to produce a trend graph by plotting daily prices of the respective funds against the ten years period, presented in days (time). A randomly selected Moving Average in intervals of ten is used to generate trend values, based on the daily prices respectively. We have that the trend value TV is given by

$$TV = \sum_{i=1}^n \frac{x_a}{n} \dots\dots\dots (1)$$

where n is the chosen value of Moving average, i is the first daily price corresponding to the chosen trading day and $x_a = i$ to v (where v is the daily price corresponding to n).

We use the moving average approach because it is suitable in calculating the spread of time series data, on a trend graph over different chosen values. The trend values (average values) produced are used to plot against time on the trend graph to produce a trend line. We calculate the risk by first calculating the difference given by Difference = absolute value (trend price of fund – fund price)



We can calculate the risk for each day, as the ratio of the difference to the trend value, which is the Proportional Different. Summation of individual risk (Proportion Difference) gives the risk (total risk) of the fund, over the ten year period. Therefore, the risk is given as

$$RISK = \sum \text{Proportion Difference} \dots\dots\dots (2)$$

Return is then computed as, the ratio of the final trend price (value) minus first trend price to the first trend price. This is given by

$$RETURN = \frac{P_x - p}{p} \dots\dots\dots (3)$$

where, P_x and p are the final and first trend price respectively [14].

4. Results and Discussions

The data analysis carried out in ascertaining the relationship between risk and returns. The selected accumulation funds from the randomly chosen two companies were used to produce trend graphs, resulting from the plot of trading days (time) against daily prices and trend values. For convenience of potential readers, we have plotted four out of the forty funds and three out of the ten Moving Averages (MA) which were randomly chosen as sample to show the trend graphs. The sample for funds include: funds; 7, 20, 31 and 40, while the MA are over 15, 55 and 105 days.

Figure 1 shows the plot of trading days against daily price and trend of funds (average prices). For details of the respective funds daily prices and trading days, “see technical document held by Dr.SudPardeep”.

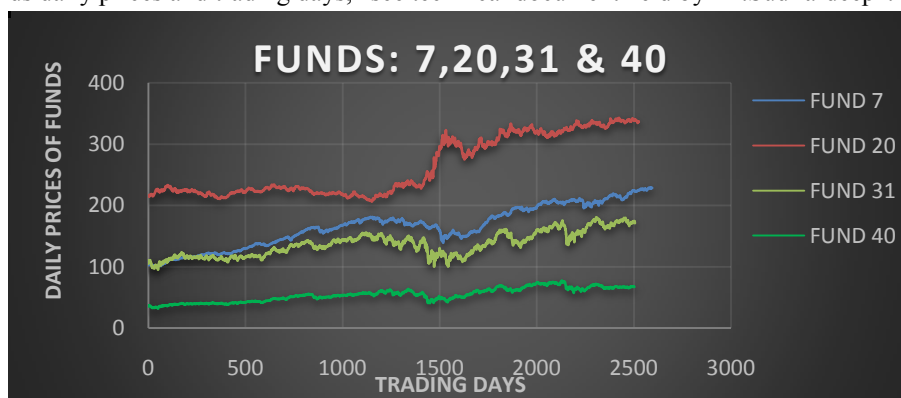


Figure 1: A plot of trading days against daily prices

Figure 1 is produced from using Equation (1). This represents the daily price performance of the stated funds over the ten years period under study. The figure also shows the volatility of the respective fund prices over a given time. The price of fund 20 exhibits high volatility from the early trading days to the last day. Visually inspecting the volatility of the different funds, fund 20 and fund 31 have the highest price volatility compared to the other three funds (7 and 40). The price of fund 40 is less volatile, showing unnoticeable volatility (linear behaviour) at the early stage of trading days and later changed after day 1000 of the trading days, with little volatility to the last day. The price volatility of fund 31 is small at the start of trading days but became more volatile after day 500, of the trading days. Also, funds 7 started the early trading days with minimal volatility and increased after day 1000 of the trading day to its last trading day. Funds 7 and 40 have the least volatility price trends respectively. The volatility of the respective fund prices will be compared with the graphs that will be presented next, with distinct Moving Averages, to check consistency of the result.

Figure 2 is the plot of trading days against daily prices and trend of fund (Average price), with a Moving Average of 15. In the graph, trend line is defined as TL. The trend line is the line showing the average of a fund price over the ten years trading period. It cuts across the middle of the spike. In this trend graph, funds 20 and 31, still have the highest volatility compared to fund 7 and 40.

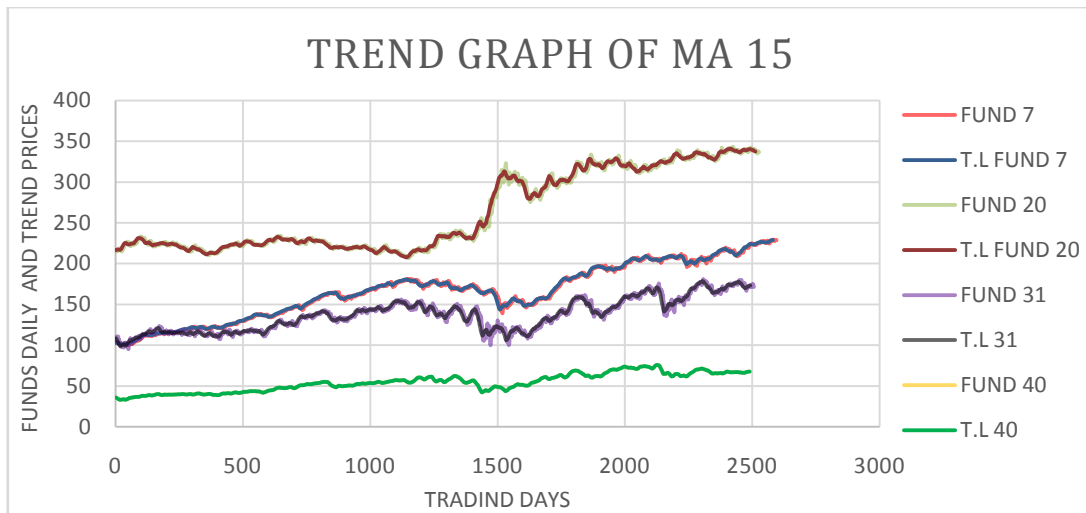


Figure 2: A plot of trading days against daily price and trend of fund (Average Prices)

Figure 3 shows a plot over the Moving Average of 55, with the respective chosen funds. The respective funds volatility is consistent with the trend graph of Figure 1 and that produced over MA 15. Fund 20 and Fund 31 exhibits higher volatility over Funds 7 and 40, by same visual inspection.

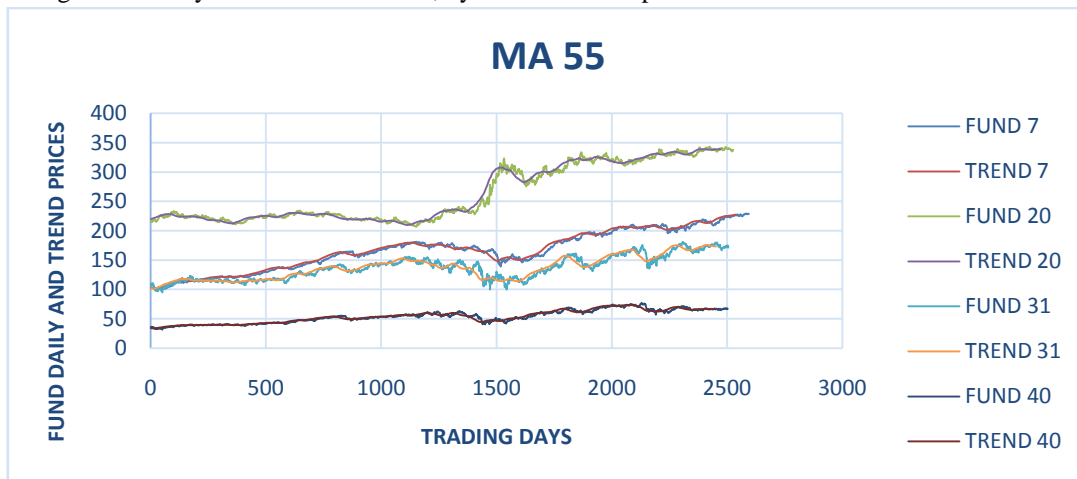


Figure 3: A plot over the Moving Average of 55



Figure 4: Trend Graph of Trading Days against Fund Prices and Trend Price of Fund

The trend graph produced over the MA of 105 is not different from the volatility of the previous, produced in Figure 1, 2 and 3 respectively. Fund 20 and fund 31 have the highest volatility. The volatility of funds over MA 105, is more visible compared to the previous over MA 15 and MA 31. The different trend graphs produced above respectively, shows the volatility of the funds prices and trend of funds (average values) over their respective trading days. The outcome of the trend graph of the funds over the three Moving Averages used as sample suggests that volatility of the trend is consistent with the different funds, for the period under study.

Table 2 presents the computed values of risk and returns. The risk values are calculated from Equation (2), while the returns values are obtained from Equation (3). The risk and return values are computed based on the Moving Average of 15, 55 and 105 respectively.

Table 2: Risk and Returns Values for MA 15 And 55

MA 15	RISK	RETURN		MA55	RISK	RETURN
FUND 1	0.124532	0.22882		FUND 1	0.14578	0.226176
FUND 2	6.834326	0.684188		FUND 2	13.96692	0.683726
FUND 3	34.34072	2.636888		FUND 3	67.9604	2.606744
FUND 4	24.29525	2.20141		FUND 4	44.93609	2.311317
FUND 5	12.97602	1.471398		FUND 5	25.39376	1.485755
FUND 6	17.70465	1.8519		FUND 6	34.03173	1.920889
FUND 7	9.283502	1.218082		FUND 7	18.3904	1.226497
FUND 8	20.25726	2.057529		FUND 8	32.2869	2.069172
FUND 9	20.60521	1.252881		FUND 9	36.27585	1.318624
FUND 10	22.80637	1.714378		FUND 10	41.35095	1.822402
FUND 11	19.28667	1.811527		FUND 11	39.92961	1.864309
FUND 12	19.21395	1.01456		FUND 12	35.53228	1.022952
FUND 13	20.57854	0.862669		FUND 13	38.2641	0.951303
FUND 14	17.29198	0.827564		FUND 14	32.39247	0.881607
FUND 15	0.325398	0.234553		FUND 15	0.433125	0.231991
FUND 16	26.98821	2.041929		FUND 16	47.97064	2.194145
FUND 17	6.296947	0.704241		FUND 17	13.34206	0.679354
FUND 18	29.2557	3.056774		FUND 18	57.36545	3.127832
FUND 19	27.0593	3.019091		FUND 19	48.91259	3.172116
FUND 20	10.66875	0.555925		FUND 20	19.76854	0.539407
FUND 21	23.0561	0.78732		FUND 21	43.71312	0.864002
FUND 22	41.76004	2.540894		FUND 22	80.47132	2.858725
FUND 23	22.70185	1.328817		FUND 23	39.75291	1.239172
FUND 24	23.65322	1.419532		FUND 24	42.75394	1.522545
FUND 25	22.88112	3.245763		FUND 25	41.65306	3.398411
FUND 26	22.60523	2.069789		FUND 26	40.46509	2.17593
FUND 27	25.09864	0.604098		FUND 27	46.06642	0.699103
FUND 28	29.39333	1.191439		FUND 28	53.63638	1.306948
FUND 29	22.98384	1.345979		FUND 29	40.79001	1.433447
FUND 30	23.18668	1.385783		FUND 30	40.93493	1.477901
FUND 31	24.19271	0.597461		FUND 31	43.14081	0.691034
FUND 32	23.5652	1.427078		FUND 32	41.03187	1.527613
FUND 33	27.92213	1.816804		FUND 33	49.46689	1.955918
FUND 34	12.60263	0.913915		FUND 34	20.71833	0.837033
FUND 35	22.99206	0.814115		FUND 35	42.43682	0.899139
FUND 36	27.11136	4.775712		FUND 36	45.57556	4.988776
FUND 37	13.9982	0.736804		FUND 37	24.36831	0.717166
FUND 38	7.513144	0.636371		FUND 38	13.40303	0.61948
FUND 39	22.3213	1.197672		FUND 39	40.13567	1.27015
FUND 40	22.86218	0.877785		FUND 40	42.7365	0.955929



Fund 1 has the smallest risk value of 0.125 in (three decimal places), with a return value of 0.229, when compared among the forty funds. The highest risk is recorded in fund 22, with a risk value of 41.760 and returns of 2.541. Also, the highest return of 4.776 is attained in fund 36, with a corresponding risk value of 27.111. From the sample, Fund 31 has the highest risk value of 24.193, followed by fund 40, with the value of 22.862. Fund 20 has risk of 10.669 and Fund 7 has the least risk among the four funds, with the value 9.284.

Fund 1 has the lowest risk over the different MA's, while fund 22 has the highest risk. Also, looking at the returns, Fund 1 has the lowest returns while fund 36 has the highest return over the ten different Moving Averages. This also suggests that there is a consistency in the values of risk and returns of the funds, over the different Moving Averages. This is similar to the result of volatility in the trend graph produced in Figures 1, 2, 3 and 4. Analysing the sample funds (7, 20, 31 and 40) over the three selected MA's (15, 55, and 105), Fund 31 have the highest risk of 24.193, 43.101 and 56.842 respectively, while it is followed by fund 40, with the respective risk values of 22.862, 42.737 and 57.286. Comparing this with the outcome of volatility, it shows that trend volatility does not define the level of risk. Fund 40 with the least volatility has a higher risk over fund 20 which is more volatile. The level of risk is ascertained by the proportional difference of the fund prices.

Table 3: Risk returns values for MA 105

MA 105	RISK	RETURN
FUND 1	0.208205	0.223004
FUND 2	22.0666	0.659525
FUND 3	97.09233	2.419889
FUND 4	62.8331	2.150524
FUND 5	36.90445	1.425915
FUND 6	47.47312	1.842636
FUND 7	27.46951	1.182392
FUND 8	47.853	1.973016
FUND 9	52.3668	1.30485
FUND 10	57.01685	1.721456
FUND 11	63.30624	1.756283
FUND 12	51.79452	0.899551
FUND 13	52.63682	0.886974
FUND 14	44.71808	0.822862
FUND 15	0.541997	0.22891
FUND 16	69.31969	2.003993
FUND 17	20.74963	0.638392
FUND 18	78.50566	3.044523
FUND 19	72.95302	2.895107
FUND 20	25.78361	0.515624
FUND 21	59.37879	0.815213
FUND 22	106.2842	2.977405
FUND 23	53.62972	1.116709
FUND 24	59.42052	1.414515
FUND 25	62.74197	3.217677
FUND 26	55.2935	2.049915
FUND 27	60.2845	0.663824
FUND 28	70.64873	1.210953
FUND 29	55.54632	1.343382
FUND 30	55.82075	1.383123
FUND 31	56.84215	0.656238
FUND 32	55.87513	1.426054
FUND 33	70.9625	1.780737
FUND 34	26.25872	0.829451
FUND 35	56.5698	0.856133
FUND 36	65.88628	4.755459
FUND 37	31.77262	0.733443
FUND 38	17.8108	0.623586
FUND 39	54.61923	1.199895
FUND 40	57.28635	0.903384



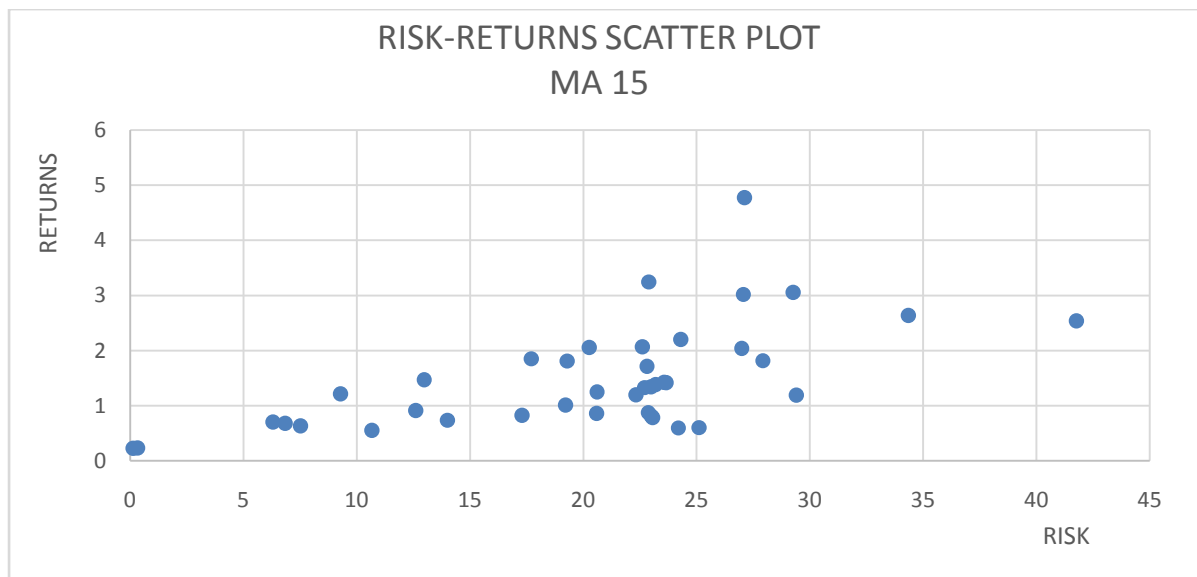


Figure 5: Scatter Plots of Risk against Returns

The scatter plots in Figure 5 exhibits a positive weak correlation, as stated by Scatter Diagram [15]; Laerd Statistics [16], thereby suggesting that there is a linear relationship between risk and returns. The values of the correlation coefficient (r) and significance test (p) of the risk and returns, over the ten MA's is given below.

Table 4: Correlation Coefficient (r) and the probability (p) values

Moving Average	Pearson coefficient (r)	Probability value (p)
15	0.6	0.000
25	0.597	0.000
35	0.529	0.000
45	0.579	0.000
55	0.61	0.000
65	0.625	0.000
75	0.635	0.000
85	0.641	0.000
95	0.65	0.000
105	0.66	0.000

The correlation of risk and returns from the table above, falls between the range of +0.50 to +1.0 Laerd Statistics [16]. This gives evidence that there is a correlation between the risk and returns of the different Moving Averages.

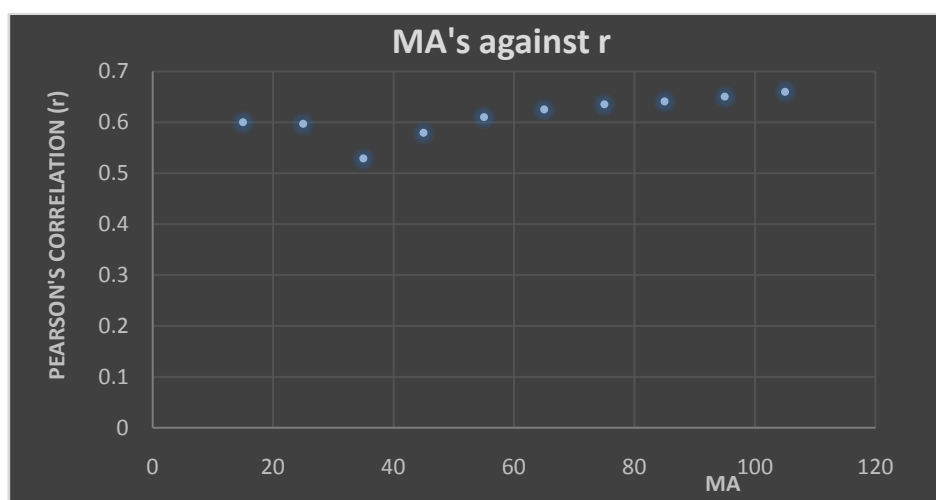


Figure 6: Graph of MA's against Correlation coefficient (r)

The graphical representation of Moving Averages (MA's) against Pearson's Correlation (r) of all the funds under consideration, shows that r of MA 15 is 0.6 indicating strong positive correlation of funds. Also, MA of 25 has a correlation value of 0.55, which is approximately 0.6, implying strong positive correlation. At MA 35, the r value falls to 0.53, which suggests relatively high correlation. At 45 MA, the r value raised to 0.58, also the MA's of 55, 65, 75 and 85 suggest nearly equal proportion of 0.6, indicating high correlation. In addition, 0.65 and 0.66 correlation (r) values were found at MA 95 and 105 respectively, showing that the correlation of the fund is very high.

This research shows that using trend graphs of the respective Moving Averages and Pearson's Correlation plot, there is an evidence of increasing correlation interaction among the funds within the Moving Average intervals. Relating this result and the scatter plot in Figure 5, we conclude that the relationship between risk and returns of the accumulation funds is relatively high, suggesting that higher risk results in high returns. This result is contrary to the finding of Cave et al. [17], in the study of risk-return relationship. The paper concluded that, low risk results in high returns. However, the result of this study is consistent with the study of Ortas and Moneva, [7]; Reo et al. [6] and Eiling et al. [12] that higher risk results in higher expected returns.

Investigating the significant relationship between risk and returns of accumulation funds under study, the probability (p) associated with the risk and returns of the respective Moving Averages are all less than 0.05, 0.01, and 0.001 respectively. This test result confirms that, there is sufficient evidence of a significant relationship, between risk and returns of the accumulation funds over the MA intervals, on a significant level of either 0.1%. It is therefore confirmed that, the relationship between risk and return ascertained by this result is not by chance.

5. Summary and Conclusions

The dynamics of risk and return relationship is a fundamental issue in investment. The aim of investors is to diversify assets in investments, in other to minimise risk and to maximise yield. Therefore, this research aims at understanding the present position of risk and returns dynamics. Accumulation funds were used as the basis of evaluating this relationship, which had not been applied before.

There are challenges encountered during this research. These include the data selection, the identification of accumulation funds and computational challenges. It was a difficult and time consuming task to get the funds that fell into this specific period under study. Most of the funds which were accumulation funds could not be selected because their daily prices available in their historical archives. Most of the funds of Black Rock Company were not specified as accumulation funds. In other to assert the accumulations funds of the company, the financial website of Bloomberg [18] was used to identify the different funds. This was achieved by checking the name of the funds and its dividend status. Despite these challenges encountered but overcome, the research was able to use only two companies' funds for the analysis and evaluation of the results. Also, this study concentrated only on a trading benchmark of pound sterling, so most companies trading in other currencies must have also incurred risk as a result of conversion of their currencies to pound, which was not considered in the study.

The Moving Average procedure was employed in calculating the risk returns relationship. Forty selected accumulation funds of Jupiter and BlackRock companies were used as the basis of the analysis, with their opening prices for a trading period of ten years (January 01, 2003 to December 31, 2012). The data set was presented in days. The funds were first analysed using their respective daily prices, trend values and trading days (time) to produce a trend graph, showing the volatility of the funds. Also, calculated risk and returns values were used to attain a scattered graph that showed the relationship between the risk and returns of the respective Moving Averages. Further, **Minitab 16 was used to compute the Pearson Correlation coefficients (r) of the respective funds. Finally, a significance test at 0.1% level was also carried out.

In conclusion, the volatility of the funds with the respective Moving Averages showed that there is a consistent behaviour of the fund price performance over the different Moving Averages. The result of the scatter plot and the Pearson's Correlation, revealed a positive correlation between risk and returns. This showed that high risk could lead to high returns, which is consistent with the results of reported in literature [6, 7, 12, 13] and



confirms the conventional wisdom. The significance test carried out also confirmed high significance level of the funds interaction, as their respective p values were less than 0.001, at 0.1% level of significance.

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