American Journal of
Finance
(AJF)

THE EFFECT OF PORTFOLIO SIZE ON THE FINANCIAL PERFORMANCE OF PORTFOLIOS OF INVESTMENT FIRMS IN KENYA

Mbogo Peter Kimani, Dr. Josiah Aduda and Mr. Mirie Mwangi

American Journal of Finance
ISSN 2520-0445 (Online)

Vol.1, Issue 2 No.2, pp 1 - 15, 2017

www.ajpojournals.org

THE EFFECT OF PORTFOLIO SIZE ON THE FINANCIAL PERFORMANCE OF PORTFOLIOS OF INVESTMENT FIRMS IN KENYA

1* Mbogo Peter Kimani

[1*]Post graduate student, University of Nairobi

*Corresponding Author's Email: kmbogo@gmail.com

2* Dr. Josiah Aduda

Lecturer, University of Nairobi

3* Mr. Mirie Mwangi

Lecturer, University of Nairobi

ABSTRACT

Purpose: The purpose of this study was to determine the effect of portfolio size on the financial performance of portfolios of investment firms in Kenya.

Methodology: The research design was descriptive survey study in nature since it focused on all investment firms in Kenya. The population of the study was all the investment firms in Kenya. This implied that the total population of this study is 90 firms as given by the Kenya Association of Investment Groups (KAIG). For representativeness purposes, the current study took a sample size of 50% of the population. This was 45 firms. This sample size was justified since this study could not anticipate how good the response rate would be. The 45 firms must have been in existence for 5 years (2007 to 2011).

Results: The finding reveal that investments firms in Kenya had put the biggest allocation of funds in stocks, followed by real estate portfolio and the least holding was in bond and money market funds. The findings also reveal that that the stocks portfolio generated the highest returns followed by bond and money market returns while real estate portfolio generated the least returns. The first objective of the study was to establish the optimal portfolio size for investment firms in Kenya. The findings in this study indicated that an optimal portfolio should hold between 16 and 20 stocks.

Unique contribution to theory, practice and policy: It was recommended that investment managers should consider increasing the number of stocks from the current average of 13 stocks to between 16 to 20 stocks. Such a portfolio size would be optimal since approximately 91% of risk would have been diversified.

Key words: *Portfolio size, financial performance, investment firms*

1.0INTRODUCTION

1.1 Background of the Study

Economic agents save so as to take care of future expenses which can not be estimated with accuracy. The saving are usually put into some form of an investment. Murad (1964) defines the term investment as the purchase of any income-yielding asset, such as securities or real estate. Investment can also be defined as the addition to the value of the capital equipment which has resulted from the productive activity of the period. There is a variety of reasons why an economic agent such as a household or a firm can engage in investments. The primary reason for engaging in investment is to earn returns. Another reasons for investing is to increase some ones wealth. The only way to protect savings is to invest in products that have the ability to grow at a faster rate than that of inflation. Another reason to invest is to achieve the longer term financial goals such as retiring from work to live a life of leisure. Or it can be investing the money to provide a certain level of income during retirement (Pozen & Hamacher, 2011).

The number of stocks to be included and the method to allocate funds among the selected stocks are two important criteria in forming a stock portfolio. The concern about the number of stocks stems from the theorical arguments advanced by Markowitz (1952) and his famous portfolio theory of investment. The portfolio theory argues that the concern of the investment manager should not be the return of a particular stock but rather the return of the overall portfolio. This is because a portfolio may have a lower risk and may give superior returns in the long run. According to Markowitz (1952) higher risk call for higher returns. Therefore, an investor needs to take into consideration the risk-return relationship when constructing an optimal portfolio (Gupta, 2011).

1.2Statement of the Problem

According to Gupta (2011) putting all your eggs in one basket is a risky decision. Therefore, an important principle of investment is to diversify your portfolio. Spreading investments over multiple, unrelated products reduce the risk of a sudden, unexpected outcome. In a diversified portfolio, a loss (risk) in one product is offset by gains from another product. As such one can expect to get decent returns, though the returns would not be exceptionally high or exceptionally low. However, the question in the mind of investment managers has been as to how many individual stocks or investments are needed to compose an optimal portfolio. An optimal portfolio is preferred over a maximized portfolio due to the risk return tradeoff. Investments firms in Kenya have grown in count. In addition, the capital outlays and contributions of their members have increased. However, investment managers of investment firms in Kenya always have an uphill task of deciding the number of stocks to include in a portfolio as well as the composition of a portfolio.

The number of stocks to be included and the method to allocate funds among the selected stocks is two important criteria in forming a stock portfolio. Many of the studies conducted to find optimal portfolio size do not reach a consensus, and some even suggested that large portfolios with 30 stocks or more may not be well diversified (Domian, Louton and Racine, 2007, Statman 1987). Another dimension of problem to portfolio formation is that the unconstrained portfolio optimization as implied in the Markowitz's mean-variance approach introduces difficulty in arriving at an optimal solution that is practical (Chang, Meade, Beasley, and Sharaiha 2000).

Many studies Statman (1987) and Wagner and Lau (1971) compared the risk performance of portfolio in the context of the modern portfolio theory where risk (typically the variance) is minimized for a given level of expected return. Studies such as Ng. (2008) show that both mean returns and variance were shown to decline as portfolio size increases. Global studies indicate that the question of the optimal portfolio size is an elusive one and that empirical studies have always shown a difference in opinions.

1.3 Research Objectives

The main research objective was to investigate the effect of portfolio size on the financial performance of portfolios of investment firms in Kenya

1.3.1 Specific Research Objectives

i. To establish the optimal portfolio size for investment firms in Kenya.

ii. To determine the effect of portfolio risk on the financial performance of the investment firms.

2.0 LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Markowitz Portfolio Theory

Portfolio theory was first discovered and developed by Harry Markowitz in the 1950's. His work forms the foundation of modern Finance. The resulting theory as modified and extended by many researchers is often called Modern Portfolio Theory." In portfolio theory it is often assumed for the sake of simplicity that returns are normally distributed over the time period under analysis. With this assumption, portfolio efficiency is determined by simply compounding expected returns and the standard deviations of the compounded returns. The additional assumption of negative exponential utility leads to portfolio optimization problems that are linear in return and variance.

The assumption of normally distributed returns leads to problems when trying to extend the analysis to longer time periods or to multiple time periods, since long-term returns are far from normally distributed. Indeed, even over a single year, the lognormal distribution implied by the random walk model, while still not perfect, is a much better approximation to the distribution of observed historical returns for common financial assets like stocks and bonds. Lognormal returns are also consistent with the Central Limit Theorem and with limited liability, two theoretical issues which also cause problems if we assume normally distributed returns.

In the random walk model, portfolio efficiency is determined by instantaneous expected returns and the standard deviations of these returns. The additional assumption of iso-elastic utility leads to portfolio optimization problems that are linear in return and variance.

2.2 Empirical Studies

Grinblatt and Titman (1989) and Gorman (1991) found associations between portfolio size and both the average performance and systematic risk of US mutual funds, although their interpretations of the results differed. Grinblatt and Titman (1989) examined portfolio size-return

relationships for a sample of 274 funds divided into five portfolio size categories for the period 1975-1984. The study also investigated the relationship of expense ratios, management fees and fund turnover to asset size. Their results showed that, gross of expenses, the smallest funds achieved significantly better gross risk adjusted return performance (2.5%) than larger funds.

The concentration of aggressive growth funds among the small fund category may help to explain the inverse relationship between portfolio size and gross returns. But even with this factor removed, smaller funds still generated higher returns than larger funds. Consequently, the authors concluded that both net asset value and investment objective are determinants of abnormal performance. While smaller funds showed superior gross performance, they also incurred the highest transactions costs. The high transactions costs erode the superior returns, so that the net return to investors did not differ from that of the larger funds. Consequently, investors cannot take advantage of superior performance of these smaller fund managers by purchasing shares in their funds.

Gorman (1991) also found that smaller funds achieved higher returns. She then tested whether superior performance came from running portfolios with higher systematic risk profiles by modeling a fund manager's excess returns using the capital asset pricing model with a portfolio size variable added. The results showed that higher risk did not completely explain superior performance. Even after allowance for time related variations in beta (short-run versus long-run), the portfolio size effect remained. Using an historical beta of 0.8 and weighted least squares estimates, the estimated 12 year return for a $10 million fund was 40% higher than for a billion dollar fund.

3.0 RESEARCH METHODOLOGY

The research design was descriptive survey study in nature since it focused on all investment firms in Kenya. The population of the study was all the investment firms in Kenya. This implied that the total population of this study is 90 firms as given by the Kenya Association of Investment Groups (KAIG). For representativeness purposes, the current study took a sample size of 50% of the population. This was 45 firms. This sample size was justified since this study could not anticipate how good the response rate would be. The 45 firms must have been in existence for 5 years (2007 to 2011). The study used secondary data from the financial statements of the investments firms. The selected period was year 2007 to year 2011 (5 years). The researcher used frequencies, averages and percentages in this study. The researcher used Statistical Package for Social Sciences (SPSS) to generate the descriptive statistics and also to generate inferential results. Regression analysis will be used to demonstrate the relationship between the portfolio size and the performance of investment firms.

4.0 DATA ANALYSIS

4.1 Descriptive Results

4.1.1 Measures of Central Tendency

Results in table 1 indicate that the 36 investment firms had a minimum of 4 stocks and a maximum of 38 stocks. On average, the mean number of stock held by each firm was 12.72.

The mean equity portfolio holding for the 36 firms was ksh 42,502,242 while the mean bond and money market assets portfolio holding was ksh 14,167,414. The mean real estate portfolio holding was ksh 21,251,121 while the mean total portfolio holding was ksh 70,837,071.

The mean return on equity portfolio for the 36 investment firms was14.7506%. The average risk (standard deviation) of the equity portfolio for the 36 firms was 1.9798. The average bond and money market return for the 36 firms was 8.95%. The average real estate return for the 36 firms was 6.72%.

Table 1: Descriptive Statistics for Returns and Portfolio value

	N	Minimum	Maximum	Mean	Std. Deviation
Number of Stocks	36	4	38	12.72	8.703
Equity Value	36	2192251	184221553	42,502,242.78	4.544E7
Bonds and money market Assets	36	730750	61407184	14,167,414.26	1.515E7
Real Estate Value	36	1096126	92110777	21,251,121.39	2.272E7
Total Portfolio	36	3653752	307035922	70,837,071.30	7.574E7
Return on Equity Portfolio	36	7.14	32.28	14.7506	5.86445
Standard Deviation (Equity Portfolio Risk)	36	.35	4.36	1.9798	1.20537
Bond and Money Return	36	8.08	9.84	8.9529	.55560
Real Estate Returns	36	4.68	12.40	6.7297	2.33929
Valid N (listwise)	36				

Results in table 2 indicate that 5 firms had a stock portfolio size of 0 to 5 stocks with a mean return of 25.8494 and a risk (standard deviation) of 4.358. This category had diversified 45% of the unsystematic risk.

Results also indicate that 17 firms had a stock portfolio size of 6 to 10 stocks with a mean return of 15.6294 and a risk (standard deviation) of 2.253. This category of firms had diversified 69% of the unsystematic risk.

Table 4.2 also indicates that 5 firms had a portfolio of 11 to 15 stocks with a mean return of 12.168 and a risk (standard deviation) of 1.158. This category of firms had diversified 81% of the unsystematic risk away.

Results also indicated that 3 firms had a portfolio of 16 to 20 stocks with a mean return of 9.64 and a risk (standard deviation) of 0.99. This category of firms had diversified 91% of the unsystematic risk away.

Results also indicated that 2 firms had a portfolio of 21 to 25 stocks with a mean return of 8.32 and a risk (standard deviation) of 0.504. This category of firms had diversified 96% of the unsystematic risk away.

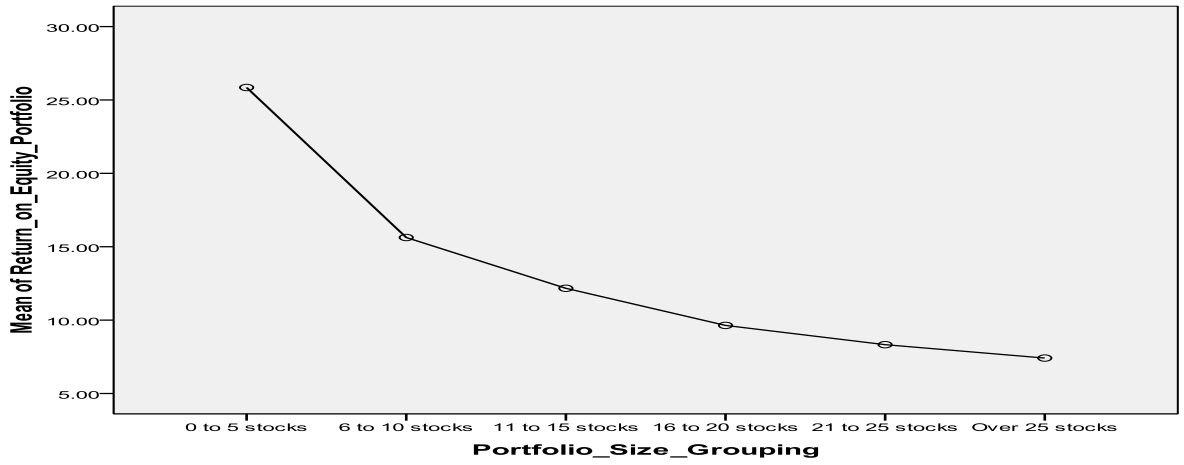
Results also indicated that 4 firms had a portfolio of over 25 stocks with a mean return of 7.14 and a risk (standard deviation) of 0.35. This category of firms had diversified 100% of the unsystematic risk away.

Table 2: Descriptive statistics for stock portfolio

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Minimum	Maximum	% Risk Diversified	Cumulative % risk diversified
0 to 5 stocks	5	25.8494	4.35852	1.94919	20.4376	31.2612	21.79	32.28	45%	45%
6 to 10 stocks	17	15.6294	2.25354	0.54656	14.4707	16.788	13.26	20.75	23%	69%
11 to 15 stocks	5	12.168	1.15835	0.51803	10.7297	13.6063	10.56	13.09	12%	81%
16 to 20 stocks	3	9.64	0.99081	0.57204	7.1787	12.1013	8.51	10.36	10%	91%
21 to 25 stocks	2	8.3265	0.50417	0.3565	3.7967	12.8563	7.97	8.68	5%	96%
Over 25 stocks	4	7.4153	0.3507	0.17535	6.8572	7.9733	7.14	7.88	4%	100%
Total	36	14.7506	5.86445	0.97741	12.7663	16.7348	7.14	32.28	100%	

Figure 1 presents the graphical relationship between portfolio size grouping and the mean return of Equity Portfolios. The figure indicates that there is a negative relationship between size of portfolio and the mean return. A portfolio of 0 to 5 stocks has the highest return (25.8494%) while a portfolio of over 25 stocks has the lowest returns (7.4153%).

Figure 1: Graphical relationship between portfolio size grouping and the mean return of Equity Portfolios



4.1.2 Annual Trends for Returns

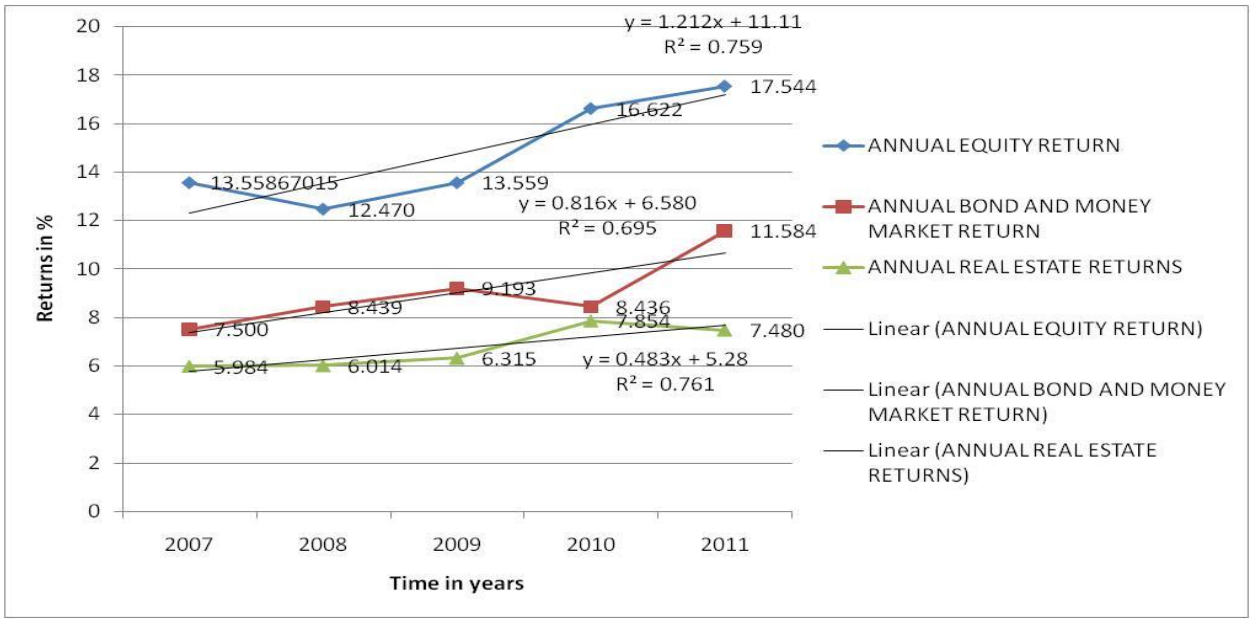
Figure 2 indicates that Equity portfolio returns for the 36 firms have gradually increased since year 2007. However, the trend also indicates that there was a drop in returns in the year 2008. This may be explained by the negative effect of 20007 post election violence.

Results also indicate that annual bond and money market returns for the 36 firms have gradually risen since 2007. However, there was a drop in returns in the year 2010 followed by a rise in returns in year 2011. The rise of returns in year 2011 may be explained by the increase in interest rates which could have boosted the money market returns.

Real estate returns trends also indicate that there has been a gradual increase in real estate returns since year 2007.

Overall, the equity returns were superior to bond and market returns and to real estate returns. The real estate portfolio offered the lowest returns.

Figure 2: Trend of Bond and Money Market Return and Real Estate Returns.



4.2 Model Results

4.2.1 Effect of Portfolio size on Risk

An inverse model was applied in determining the relationship between the effects of portfolio size on risk. Result in table 3 indicates that the goodness of fit of the model was satisfactory. This finding was supported by an r squared of 0.918. An r squared of 0.918 indicates that 91.8% of variation in portfolio risk is explained by portfolio size.

Table 3: Goodness of Fit for the Model

R	R Square	Adjusted R Square	Std. Error of the Estimate
.958	.918	.916	.349

An Analysis of Variance (ANOVA) results in table 4.4 indicates that the overall model was significant. This was supported by an f statistic of 383.114 (p value = 0.000). The ANOVA results demonstrated that the independent variable (portfolio size) is a good predictor of portfolio risk.

Table 4: Analysis of Variance

	Sum of Squares	df	Mean Square	F	Sig.
Regression	46.707	1	46.707	383.114	.000
Residual	4.145	34	.122		
Total	50.852	35			

Regression results in table 5 indicate that the inverse of portfolio size is positively related to portfolio risk. This was evidence by a regression coefficient of 18.565 (p value = 0.000). The relationship was significant at 0.05 critical value since the reported p value 0.000 was less that the critical value of 0.05. An increase in portfolio size by one unit leads to a decrease in return by 18.565 units.

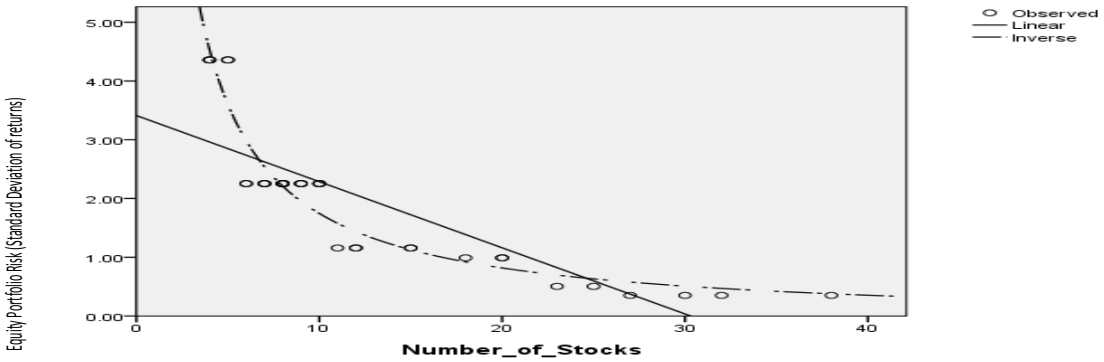
$$\text{Portfolio Risk} = -0.110 + 18.565\frac{1}{\text{Portfolio Size}}$$

Table 5: Regression Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
1 / Number_of_Stocks	18.565	.949	.958	19.573	.000
(Constant)	-.110	.122		-.908	.370

Figure 3 is a graphical illustration of the relationship between portfolio risk and portfolio size indicates that there is an inverse relationship. A linear trend superimposed on the inverse trend indicates a negative relationship between risk and portfolio size.

Figure 3: graphical illustration of the relationship between portfolio risk and portfolio size



4.2.2 Effect of Portfolio Risk on Return

The study also estimated the relationship between portfolio risk and return. Result in table 4.6 indicates that the goodness of fit of the model was satisfactory. This finding was supported by an r squared of 0.854. An r squared of 0.854 indicates that 85.4% of variation in portfolio return is explained by portfolio risk.

Table 6: Goodness of Fit of the Model

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.924[a]	.854	.850	2.27325

a. Predictors: (Constant), Standard Deviation (Equity Portfolio Risk)

An Analysis of Variance (ANOVA) results in table 4.7 indicates that the overall model was significant. This was supported by an f statistic of 198.932 (p value = 0.000). The ANOVA results demonstrated that the independent variable (portfolio risk) is a good predictor of portfolio return.

Table 7: Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1028.010	1	1028.010	198.932	.000[a]
	Residual	175.700	34	5.168		
	Total	1203.711	35			

a. Predictors: (Constant), Standard Deviation (Equity Portfolio Risk)

b. Dependent Variable: Return on Equity Portfolio

Regression results in table 8 indicate that there is a positive relationship between portfolio risk and return. This was evidence by a regression coefficient of 4.496 (p value = 0.000). The relationship was significant at 0.05 critical value since the reported p value 0.000 was less that the critical value of 0.05. An increase in portfolio risk by one unit leads to an increase in return by 4.496 units.

$$\text{Portfolio Return} = 5.849 + 4.496\text{Portfolio Risk}$$

Table 8: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	5.849	.736		7.946	.000
	Standard Deviation (Equity Portfolio Risk)	4.496	.319	.924	14.104	.000

a. Dependent Variable: Return on Equity Portfolio

4.3 Discussion of Results

This section summarizes the results of the study. Results indicate that 36 investment firms had a minimum of 4 stocks and a maximum of 38 stocks. On average, the mean number of stock held by each firm was 12.72. The finding implies that majority of firms had allocated their stock investments into approximately 13 stocks.

The mean equity portfolio holding for the 36 firms was ksh 42,502,242 while the mean bond and money market assets portfolio holding was ksh 14,167,414. The mean real estate portfolio holding was ksh 21,251,121 while the mean total portfolio holding was ksh 70,837,071. This finding implies that investments firms in Kenya had put the biggest allocation of funds in stocks, followed by real estate portfolio and the least holding was in bond and money market funds.

The mean return on equity portfolio for the 36 investment firms was14.75%. The average bond and money market return for the 36 firms was 8.95%. The average real estate return for the 36 firms was 6.72%. The findings imply that the stocks portfolio generated the highest returns followed by bond and money market returns while real estate portfolio generated the least returns.

Results indicate that 5 firms had a stock portfolio size of 0 to 5 stocks with a mean return of 25.8494 and a risk (standard deviation) of 4.358. This category had diversified 45% of the unsystematic risk. Results also indicate that 17 firms had a stock portfolio size of 6 to 10 stocks with a mean return of 15.6294 and a risk (standard deviation) of 2.253. This category of firms had diversified 69% of the unsystematic risk. Results also indicate that 5 firms had a portfolio of 11 to 15 stocks with a mean return of 12.168 and a risk (standard deviation) of 1.158. This category of firms had diversified 81% of the unsystematic risk away. Results also indicated that 3 firms had a portfolio of 16 to 20 stocks with a mean return of 9.64 and a risk (standard deviation) of 0.99. This category of firms had diversified 91% of the unsystematic risk away. Results also indicated that 2 firms had a portfolio of 21 to 25 stocks with a mean return of 8.32 and a risk (standard deviation) of 0.504. This category of firms had diversified 96% of the unsystematic risk away. Results also indicated that 4 firms had a portfolio of over 25 stocks with

a mean return of 7.14 and a risk (standard deviation) of 0.35. This category of firms had diversified 100% of the unsystematic risk away.

The findings in this study indicated that an optimal portfolio should hold between 16 and 20 stocks. Essentially, this implies that a properly diversified portfolio in Kenya should hold approximately 30% to 37% percent of the total number of stocks in the Nairobi Securities Exchange (16/54 and 20/54). This further implies that holding such a number of stocks diversifies approximately 91% of unsystematic risk.

The finding agree with those in Upson, Jessup, and Matsumoto (1975) who noted that managers should diversify among more than 16 stocks, and that diversifying among even 30 or more stocks can be worthwhile in terms of risk reduction. The findings agree with those in Wagner and Lau (1971) who concluded that most of the diversification is achieved at 15 stocks. The finding also agree with those in Zuqaier and Ziud (2011) who noted that diversification benefits can be obtained when the portfolio consists of 15-16 stocks.

The findings differ with those in Fisher and Lorie (F&L) (1970) who noted that approximately 80 percent of the achievable reduction in dispersion can be attained by holding eight stocks (the reductions range from 65 to 91 percent). The findings also contrast with Statman (1987) who argues that a well-diversified portfolio must include at least 30 to 40 stocks. The findings differ with those in Gupta, Koon and Shahnon (2001) who found that found out that on average, a well diversified stocks of the Malaysian funds consists of 27 randomly selected securities.

4.3.1 Portfolio size and Risk

Results indicated that the inverse of portfolio size is positively related to portfolio risk. This was evidence by a regression coefficient of 18.565 (p value = 0.000). The relationship was significant at 0.05 critical value since the reported p value 0.000 was less that the critical value of 0.05. An increase in portfolio size by one unit leads to a decrease in return by 18.565 units.

The findings agree with those in Elton and Gruber (2002) who conducted a study on risk reduction and portfolio size and concluded that an increase in portfolio size led to an decrease in unsystematic risk . The results also agree with those in Zuqaier and Ziud (2011) who noted that results assured the existence of a significant statistical relationship between portfolio size and the risk reduction. Their results revealed that diversification benefits increases with at a decreasing rate

4.3.2 Portfolio Return (ROA) and Risk

Results indicate that there is a positive relationship between portfolio risk and return. This was evidence by a regression coefficient of 4.496 (p value = 0.000). The relationship was significant at 0.05 critical value since the reported p value 0.000 was less that the critical value of 0.05. An increase in portfolio risk by one unit leads to an increase in return by 4.496 units. The findings are consistent with Portfolio Theory of Markowitz (1951) who empirically noted a risk return trade off in stocks. According to Markowitz theory, the higher the portfolio risk, the higher the portfolio return.

The findings agree with those in Grinblatt and Titman (1989) who examined the portfolio size-return relationships and concluded that the smallest funds achieved significantly better gross risk

adjusted return performance (2.5%) than larger funds. This implied that the small the size of funds (higher undiversified risk) the higher the average return.

The findings also agree with those in Gorman (1991) who also found that smaller funds achieved higher returns. The findings agree with those in Bird, Chin and McCrae (1983) who tested for a correlation between fund size and performance and concluded that the smaller funds generated higher returns but ran higher risk portfolios than larger funds.

5.0 RECOMMENDATIONS AND CONCLUSIONS

5.1 Conclusions

It is possible to conclude that equity returns have been consistently higher than bond and money market return and real estate returns since the year 2007. Equity investment offers the highest rate of returns while real estate investment offers the least returns.

From the study it was possible to conclude that investments firms in Kenya did not hold optimal portfolios. This is because they held 12.72 (approximately 13 stocks) while the optimal portfolio optimal portfolio should hold between 16 and 20 stocks. Essentially, this implies that a properly diversified portfolio in Kenya should hold approximately 30% to 37% percent of the total number of stocks in the Nairobi Securities Exchange (16/54 and 20/54). This further implies that holding such a number of stocks diversifies approximately 91% of unsystematic risk.

It was also possible to conclude that there was an inverse relationship between portfolio size and risk. Therefore, the bigger the portfolio, the lower the portfolios risk.

It was also concluded that there is a positive relationship between portfolio risk and return. An increase in portfolio risk by one unit leads to an increase in return by 4.496 units. Therefore, the higher the portfolio risk, the higher the portfolios return.

5.2 Recommendations

It was recommended that investment managers should consider increasing the number of stocks from the current average of 13 stocks to between 16 to 20 stocks. Such a portfolio size would be optimal since approximately 91% of risk would have been diversified.

Investment firms should also consider allocating more funds into equity portfolios as doing so would fetch a higher rate of return. However, this may increase the risk and the managers should therefore be guided by their risk appetite as stipulated in the individual firm investments strategy.

REFERENCES

Chang, Eric, and Wilbur Lewellen. 1984. "Market Timing and Fund Investment Performance."Journal of Business 57: 57-72.

Chang, T. J. Meade, N. Beasley, J.E. and Sharaiha Y.M.(2000). Heuristics for cardinality constrained portfolio optimisation. *Comput. Oper. Res.* 2000, 27(13): 1271-1302.

Domian, D.L.. Louton, D.A Racine. M.D. (2007). Diversification in portfolios of individual stocks: 100 stocks are not enough. *Financial Review* 2007, 42(4): 557-570.

Gorman, L. [1991], "A Study of the Relationship Between Mutual Fund Return and Asset Size, 1974-1987, Akron Business and Economic Review, Winter, Vol. 22, No.4, pp.53-61.

Grinblatt, M. and S. Titman, [1989a], "Mutual Fund Performance: An Analysis of Quarterly Portfolio Holdings", *Journal 0/ Business*, July, Vol. 62, No.3, pp. 393416.

Grinblatt, M., and S. Titman, [1995]], "Momentum investment strategies, portfolio performance, and herding: A study of mutual fund behavior", *American Economic Review*, December, pp. 1088-1105.

Gupta A. (2011). Diversification of portfolio important principle of investment. The economic Times Bureau.

Pozen, Robert C. The mutual fund business.Cambridge and London: MIT Press, 1998.

Statman. M. (1987). How many stocks make a diversified portfolio? *J. Financial Quantity Analysis.* 1987, 22(3): 353-363.