HISTORICAL SIMULATION OF RISK AND RETURN IN MUTUAL FUNDS THROUGH VALUE AT RISK ANALYSIS

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Abstract

The study focuses on the financial distress of different mutual funds on their return and risk level by the help of Historical Simulation method that trade in volatile market environment. Value at risk explains that how a financial institution can estimate its risk level to mitigate its financial loss. With mutual fund application in mind, this paper proposes the Historical Simulation (HS) method and Value at risk (VaR) analysis, with developing funds performing better than old ones. In addition, statistical tests show that the larger potential loss the mutual fund currently is undertaking, the lower will be the return on mutual fund.

Keywords: Mutual Funds, Historical Simulation , Risk Management, Return, Emerging Funds.

JEL Classification: G200

Introduction

This study intends to measure mutual funds VaR through the Historical Simulation (HS) methodology. According to Jabeen and Dars (2014) Mutual funds are a source of indirect investment. Management of funds is very important in order to earn profit. Many researchers examine the aggregate fund flow and the market returns (Rakowski & Wang , 2009). In order to access the equity market investing in mutual funds is the cheapest way (Fama & French, 2002).

Ben-Rephael et al. (2012) concludes that investors of mutual funds earn lower return than the market as they have poor market timing ability and make poor investment decisions (Frazzini & Lamont, 2008). Mahmud and Mirza (2011) scrutinize Pakistan's Mutual Funds Performance during 2006-2010 and concludes that Islamic funds have more tendencies to move towards growth as compared to conventional funds. In order to invest in a safe security first of all we should consider the risk level of that security.

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Most of the covered workers partake different benefit plans where pension grant depends on years of service and level of reward. As it does not directly hinge on the funding status of the plan or the return on the funds which have been previously assimilated to fund the plan. (Chaudhry & Munir, 2016) VaR is defined as the maximum loss a portfolio can generate over a certain holding period, with a pre-determined likelihood level (Cabedo & Moya , 2003) .

Economic and financial structure has been disturbed due to the global crisis of 2008-09 worldwide. In 2008, global and domestic recession has less influence on the mutual fund industry as compared to the other financial sectors. (Nafees et al., 2011).

In financial market VaR has become a vital tool as it produces more comprehensive results in case of measuring market risk (Hartz et al., 2006). This article find out the relationship of risk and return by using Historical Simulation on Mutual fund industry in Pakistan. This develop as an HS methodology (the Historical Simulation), as this study is trying to improve the risk level and measure the return in Mutual funds by the help of HS standard approach. Zhang and Zhang (2013) compares different mutual funds in post crisis era in China with different models and this study is going to make a comparison among old and emerging funds on particular time period. Handoko (2015) examined that the best source to invest in the long term fund management which received influence from energetic participants such as employees and workers are the pension mutual funds. They pursued to exploit its revenue and the preparation for contentment of the long- term accountabilities. The author scrutinized that Pension funds practiced a speedy growth from the employer as an expense to withhold income tax. As the benefits paid to the beneficiaries can be paid after collected around 35 years (expected period of employment for a worker) . Bonds, Stocks and long term mortgage are the long term securities to invest in pension funds.

The aim of this article is to examine the usefulness of Historical Simulation in predicting VaR in mutual fund markets in Pakistan with respect to fund flow performance. The present scenario of Pakistani mutual fund industry with respect to return and risk is determined by this study . This paper surveys the research available on the Historical Simulation method to calculate VaR. Ali and Malik (2006) examine the role played by capital market in the economic progress of the country.
The Variables that are used in this research is risk and return so that we are able to find its impact on mutual funds by using Historical Simulation . Comparison is made between old and emerging mutual funds and evaluation of mutual funds is done relative to risk and return through Historical Simulation (VaR).

The remaining paper is ordered as follows. In section 2, we have discussed the literature review related to the mutual funds and Value at Risk. Section 3 discusses the model construction which in short is the methodology part. Section 4 shows empirical analysis and results. Section 5 presents conclusion . We present additional tablesas an appendix.

Literature Review

Value at risk –VaR

Jorion (2007) defines VaR as a "statistical measure of risk that approximates the dollar amount of potential loss from adverse market moves . At a given confidence interval these losses are measured over a fixed time-horizon of typically one or ten trading days" .

Historical Simulation is used by Perignon and Smith (2010) in order to measure the VaR disclosures from 1996-2005 of 60 US, Canadian and large international banks and reach to the conclusion that 73 percent of banks revealed their VaR methodology. Sheedy (2008) used data ranging from 16 to 30 years for five equity to measure to VaR. He concludes that Historical Simulation can better help to measure the VaR.

Historical Simulation

Lin (2014) concludes that Historical Simulation tell us about the future movements depends on the movements of past sample directly. However, it has limited disadvantages such as large loss sensitivity ,replying to asymmetric movements and that it accumulates the error due to lack of flexibility. We can easily understand Historical Simulation as distribution of returns is not statistically assumed Badík (2005).

International commercial banks were taken as a sample to highlight the level of VaR, disclosure and the accuracy of the disclosed VaR figure. Data was taken over the period 1996-2005. The result shows that the most popular VaR method is Historical Simulation but future volatility is not properly determined by this method. (Perignon & Smith, 2010).

The value at risk that was measured in oil market by applying different models. These models were compared to the performances of other modeling technique such as Historical Simulation (Marimoutou, Raggad & Trabelsi, 2009).

Historical Simulation is not the right option in calculating Value at risk if market is volatile. Assessing Value at risk in electricity market is a difficult task as compared to the financial markets as electricity returns ae volatile. Statistical tests shows Historical Simulation is not a right option for calculation of Value at risk in Electricity market (Chan & Gray, 2006).

Risk and Return in Mutual fund Industry

A research was conducted to inspect the Mutual fund's performance in Pakistan for the period of 2006-2010 (Nafees et al., 2011). Eleven close ended and eight open ended Equity and balanced mutual funds were taken as sample and open and close ended equity mutual funds were

taken as Variables. Some funds performed better and some underperformed.

A study was conducted to examine the fund flow performance relationship by using a sample of Chinese open ended equity funds that trade in volatile market environment. According to results the main thing that affects the incentives to manager is asymmetric flow performance relationship between funds that perform well and those that do not perform well (Juna, Li, & Shi, 2014).

Whitehouse (1999) scrutinized that the best source of private saving flows are Pension Funds that provides a main source such as capital to industry and plays a vital role in providing retirement income with mature funded pension system in different countries . In few countries such as the Netherland, Switzerland, The United Kingdom and The United States where mature funded system is established, they are worth an average of 85 % of GDP. The tax treatment of pension is an acute policy as it will promote pension savings that depends on the return and the tax handling.

Srivastava and Malhotra (2015) analyses the relationship of risk and return of particular open ended equity and debt funds by using different risk measuring techniques. The result shows in comparison with debt funds equity funds are performing much better. In 2009 a research was conducted to examine the return and risk associated with mutual funds from the perception of investors. After results, they concluded that interdependence relationship is determined after looking at the income level of investors and their perception of the return on investment.

A research was accompanied to inspect Pakistani mutual funds performance and explore the management's effectiveness for open-ended mutual funds in Pakistan (Afza et al., 2009) Rao et al. (2013) inspected that in Indian scenario performance of Mutual Funds were inspected on the relationship of risk and return model and other measures. 10 mutual funds were taken as sample data from the period April 2010- March 2013. Almonte (2013) examines the risk adjusted performance of mutual funds in Philippine. Both equity and balanced funds perform differently depending upon the % of bench mark based on the coefficient correlation results. In 2013 Performance of Equity mutual funds were scrutinized by Narayanasamy (2013). Various statistical tools were used in this study to investigate the risk adjusted performance of selected large cap equity mutual funds .five mutual funds schemes were used as sample from January 2010 – December 2012. After results it was concluded that in highly volatile market mutual funds performed well during the selected period . Tax handling and size of pension funds are correlated with each other, but have a number of exclusions. Austria and Portugal are too generous in terms of giving tax privileges to pensions but have smaller number of funds. On the other side, Finland and Japan have outsized pension funds but tax treats to pensions are better for Inclusive income tax than the expenditure tax (Whitehouse, 1999) .

In 2004 a research is done by Glenn and Patrick to examine the performance of close end and open end mutual funds . This study is done to evaluate their performances and measure the risk and return level of both type of funds. However, it is evident that in every type of security invested, the

return of closed-end equity funds is significantly higher in terms of Liquidity, redemptions, and resistance to "hot money" as compare to open ended funds (Glenn & Patrick, 2004).
Malhotra et al. (2003) concluded that close end bond fund experienced higher expense ratio as compare to open end bond fund of the same nature.

Methodology

This study is providing empirical evidence of Historical Simulation model: the study of mutual funds in Pakistan. Yamai and Yoshiba (2005) concludes that due to in financial risk management VaR has become a standard risk measure due to its simplicity, ease of computation and applicability. This is a causal study as the effect of risk is seen on return.

Therefore on the basis of previous researches, this study is based on mutual funds in Pakistan in order to measure the VaR with the help of Historical Simulation . The source of data for this study is MUFAP, State bank official site and KSE official site. To mitigate the financial risk quantitative method is used for the research. Old and Emerging mutual funds are taken presented in Pakistan over a certain time period. The knowledge is generated through gathering of data and then calculating Risk and Return through Historical Simulation .

Data Collection

Secondary data is being used in order to conduct the research on mutual funds in Pakistan presented in statistical form. Researcher has only taken the mutual funds that are founded over a specific time period. Panel data (Cross sectional-Time series) is being used by which involves data of different Variables over a certain period of time. The study will measure the mutual fund risk and return by making a comparison between old and emerging funds. 40 old mutual funds are taken founded in 2007 and data is taken for 15 months from Jan 2008 to March 2009 and 24 emerging funds are taken founded in 2013 and took financial data of 15 months from Jan 2014 to March 2015.

Model

In order to evaluate the performance of mutual funds, it is important to choose an appropriate risk measure. Researcher will compute the risk of the mutual funds using standard deviation as a risk measure and returns are also calculated.

As the VaR of the mutual funds is the loss in the market value over the particular time under a given confidence level. Different analyst use different confidence level like 90 %, 95% and 99%. The researcher has taken three of them as confidence level. VaR has become a popular risk measuring technique .It is very suitable for this paper to help the researcher to analyze the performance of funds. This study has taken Historical Simulation by taking the historical data through different web sites.

The rate of return corresponds to:

$$Rt = \ln (Pt / Pt\text{-}1) \quad \text{.....(1)}$$

Rt is the rate of return and pt the current asset value of the fund and P t-1 refers to one period before current period t.

Then mean of the return is calculated along with the standard deviation of all the funds. Standard deviation is calculated through following statistical formula:

$$\sigma = \sqrt{\frac{\sum (x - \bar{x})^2}{n}} \quad \text{.....(2)}$$

σ = standard deviation

$\sum$ = sum of

x = each value in the data set

$\bar{x}$ = mean of all values in the data set

n = number of value in the data set

Then at the end Value at risk is calculated for each confidence level in order to examine mutual funds performance by the help of following formula:

$VaR = \sigma + \bar{x} * C.L$

Where σ shows standard deviation

$\bar{x}$ is the cumulative mean of the funds

C.L is the confidence level

Findings and Analysis

Historical data has been collected and a number of calculations has been made in order to calculate Value at risk. The researcher has calculated the log return for every mutual fund for different time period and from those values mean and standard deviation is calculated. The standard deviation tells us how much the return on a fund is deviating from the expected returns based on its historical values. High the standard deviation high potential for volatility and risk is also high. The confidence interval tells the stability of estimate which means that if survey was repeated same results are acquired.

Different close and open ended, voluntary mutual funds are taken in order to make a comparison between old and new funds. This following study representing table 1 and 2 is going to make a comparison among old and emerging funds on particular time period. As the results are concerned, the old funds founded in 2007 and new funds founded in 2013 there is a little VaRiation in their values of mean, standard deviation and value at risk. See Appendix, table 1 for old funds and table 2 for new ones.

Table 1
Old mutual funds

Name of mutual fund	Mean Return	Standard deviatio n	Value at risk (Average)
Pak Oman advantage fund	-0.016%	3.02%	2.99%
HBL stock fund	-1.22%	6.49%	4.35%
NAFA stock fund	-2.67%	8.69%	4%
Alfalah GHP islamic fund	-0.10%	2.53%	2.35%
Alfalah GHP Income fund	-0.068%	1.76%	1.64%
Faysal saving growth fund	-0.05%	1.40%	1.30%
First habib income fund	-0.11%	1.95%	1.74%
HBL income fund	-0.25%	1.98%	1.53%
MCB DCF Income fund	-0.069%	1.71%	1.58%
Meezan Islamic Income fund (B)	-0.069%	1.92%	1.79%
Meezan Islamic Income fund ©	-0.75%	1.92%	1.78%
Al falah GHP Income multiplier fund	0.032%	2.24%	2.29%
BMA chundrigar road saving fund	-0.35%	2.81%	2.19%
NAFA Islamic aggressive income fund	-0.35%	3.03%	2.41%
Al ameen Islamic aggressive income fund growth	-0.13%	1.94%	1.70%
AL Ameen Islamic aggressive income fund	-0.13%	1.94%	1.70%
HBL multi asset fund	-0.91%	5.16%	3.55%
NAFA multi asset fund	-1.24%	5.38%	3.19%
Askari asset allocation fund (B)	-1.87%	6.42%	3.14%
Askari asset allocation ©	-1.87%	6.42%	3.14%
KASB asset allocation fund	-0.58%	3.69%	2.67%
Nafa Islamic Asset allocation fund	-0.66%	4.92%	3.75%
Meezan Tahaffuz pension fund	-1.67%	9.28%	6.35%
Atlas pension Islamic fund	-0.76%	6.63%	5.3%
Pakistan Islamic pension fund	-1.39%	9.29%	6.85%
Atlas pension fund	-1.40%	7.58%	5.12%
Js pension saving fund	-2.28%	6.10%	2.08%

(Table Continued...)

Pakistan pension fund	-2.04%	0.15%	0.82%
Meezan Tahaffuz pension fund	0.35%	0.29%	0.63%
Atlas pension Islamic fund	0.37%	0.13%	0.811%
Pakistan Islamic pension fund	0.12%	0.44%	1.17%
Atlas pension fund	0.38%	1.33%	1.58%
Js pension saving fund	0.42%	16.41%	17.02%
Pakistan pension fund	0.14%	0.14%	0.802%
Meezan Tahaffuz pension fund	0.35%	0.09%	0.49%
Atlas pension Islamic fund	0.37%	0.99%	1.59%
Pakistan Islamic pension fund	0.225%	0.19%	0.8%
Atlas pension fund	0.34%	0.16%	0.72%
Js pension savings fund	0.35%	7.24%	3.66%
Pakistan Pension fund	0.32%	0.62%	1.24%

Table 2
Emerging mutual funds

Name of mutual fund	Mean Return	Standard deviatio n	Value at risk (Average)
Atlas pension fund	0.14%	2.14%	2.33%
NAFA pension fund	1.25%	3.94%	6.13%
NAFA Islamic pension fund	1.27%	3.96%	6.19%
NAFA pension fund	0.60%	0.58%	1.63%
NAFA Islamic pension fund	0.26%	0.16%	0.62%
NAFA pension fund	0.33%	0.095%	0.66%
NAFA Islamic pension fund	0.29%	0.16%	0.66%
Abl Islamic stock fund	0.11%	4.32%	4.53%
UBL principal protected fund 2	0.08%	2.77%	2.91%
ABL Islamic principal preservation fund	0.31%	1.78%	2.32%
Meezan financial planning fund of funds	0.13%	2.77%	3.00%
Meezan financial planning fund of funds	0.188%	1.02%	1.35%
Meezan financial planning fund of funds	0.11%	1.95%	2.14%
AL Ameen Islamic principal preservative fund 1	0.00508%	3.65%	3.63%
AL Ameen Islamic principal preservation fund 2	0.012%	2.79%	2.81%
Atlas gold fund	0.044%	2.30%	2.38%
UBL gold fund	-0.119%	2.37%	2.16%
Faysal financial sector opportunity fund	0.17%	0.60%	0.90%
UBL financial sector bond fund	0.27%	0.67%	1.14%

(Table Continued...)

Js Islamic government securities fund	0.103%	0.59%	0.77%
PIML daily reserve fund	0.21%	0.46%	0.843%
Primus strategic multi asset fund	0.35%	2.56%	3.17%
AL-Ameen Islamic asset allocation fund	0.399%	1.37%	2.06%
UBL asset allocation fund	0.62%	1.53%	2.62%

Old mutual funds and Emerging mutual funds

40 old mutual funds are taken which are founded in 2007 and their performance is evaluated on the basis of mean, standard deviation and value at risk. 24 Emerging funds founded in 2013 are taken in order to make a comparison between old and new funds. As the funds taken fall into different categories. They are further divided into Debt, Equity and hybrid funds. Every mutual fund has its own principal objective of getting reasonable amount of return with respect to risk. Standard deviation shows potential for volatility and risk whereas value at risk shows the percentage of risk associated with each mutual fund.

Findings

The return for the old funds founded in 2007 is -0.48% and its risk level is 2.76% It means that researcher is confident that 2.76% risk is associated with the old mutual funds. . As the new funds founded in 2011 are concerned the mean is 0.30% and value at risk is 2.37%. As it has lowest value at risk which shows the fund has minimum risk. (Whitehouse, 1999) concludes that disbursement tax was the most applicable treatment for pension fund savings as it is unbiased in the distribution of consumption between the working life and retirement. The pensions are taxed once by the expenditure tax system, either when the assistances are made or when paybacks are withdrawn. Moreover, it is also stress-free to govern and burden of tax does not VaRy haphazardly with inflation.

The results shows that new funds are performing better as compare to old funds. As the return is high and risk is low for the new funds as compare to the old ones. As concluded the results analyzed by Cuthbertson, Nitzsche and O'Sullivan (2008) were the same as of my findings that old funds tend to underperform new funds. Nafa Islamic pension fund and Nafa pension fund are generating high returns among the funds founded in 2011.

Model analysis

Data has been presented in figures and taken from a site known as Mufap. First of all data is entered in excel in order to calculate the mean, standard deviation and value at risk through different confidence interval. Then average value at risk is taken in order to evaluate the results according the mentioned gap. The main data analysis techniques in my study are Regression and correlation. These

techniques being appropriate to general linear model and this model is helpful to evaluate the relation of one VaRiable to another VaRiable. So the mentioned techniques will be used to assess the influence of an independent Variables (Risk) on the dependent VaRiable (Return).

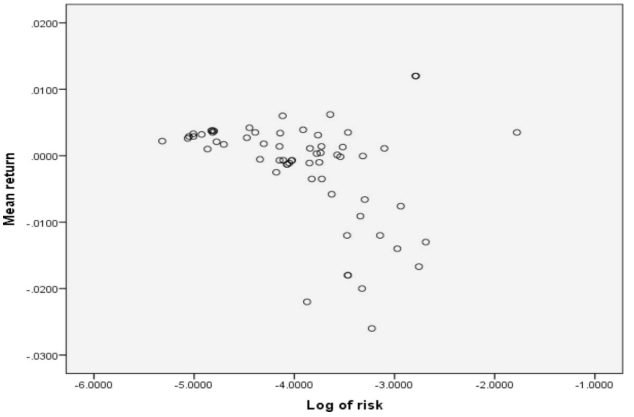

Figure 1

Negative correlation in a scatterplot

As the line gradually slang downwards, the researcher determine that there is a negative correlation between return and risk. Increases in one VaRiable are correlated with decreases in other VaRiable. The relationship of risk and return of mutual funds is displayed by the help of Scatter plot. A negative regression coefficient indicates a negative relationship between the Variables; the fit line will be downward sloping.

Table 3
Correlations

		Mean Return	Log of Risk
Mean return	Pearson Correlation	1	-.381**
	Sig. (2-tailed)		.002
	N	63	63
Log of risk	Pearson Correlation	-.381**	1
	Sig. (2-tailed)	.002	
	N	63	63

In this table the correlation between Risk and return is -0.381 and significance level is .002. Correlation between these two Variables is strongly negative which shows that when we can take more risk to invest in mutual funds return of the mutual fund will decrease. Sig (2-Tailed) value is 0.002. As the value is less than 0.01 that is 0.002 which depicts that there is statistical correlation between risk and return of the mutual fund.

Multiple regression analysis

Table 4
Model Summary[b]

Model	R	R Square	Adjusted R Square	Adjusted R Square	Durbin-Watson
1	.381[a]	.145	.131	.6652465	2.374

a. Predictors: (Constant), Mean return b. Dependent Variable: Log of risk

Table defines that multiple correlation coefficient (R) using risk and return is 0.381. It measures the proportion of the total VaRiation in Y about its mean explained by the regression of Y on X. The value of R square is 0.145 which shows that there is 14.5% contribution of independent VaRiable on dependent VaRiable. Durbin Watson test s 2.374 which means that there is a highly significant relationship between the funds.

Table 5
ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.571	1	4.571	10.329	.002[a]
	Residual	26.996	61	.443		
	Total	31.567	62			

Significance of model is determined by the help of ANOVA table. (Gelman, 2007) examines that the significance or insignificance of research model is determined by Significance value of the table. In this model the significance value is .002<.05. The outcome shows that the dependent Variables (Return) have a relationship with independent VaRiable that is risk.

Table 6
Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-3.966	.086		-46.166	.000
	Mean return	-34.730	10.806	-.381	-3.214	.002

A regression coefficient of the Independent VaRiable that fits into the model is determined by Regression coefficients (beta). The regression coefficient of promotion is -34.73 having a p value of .002.That demonstrate a negative and significant relationship of risk and return of mutual funds. This implies that the slope is statistically significant.

These coefficients are used to form the following linear regression equation:

$$y = -3.966-34.73x$$

Findings

In this study the researcher was supposed to do the analysis of mutual funds and as it's a causal study, the effect of risk on return and return on risk is also seen. The comparison is made among emerging and old funds. Same funds were taken with different time period and their performance is analyzed.

The outputs showed the following results:

- The correlation between the risk based on current VaR and return of mutual fund is negative. The larger potential loss the mutual fund currently is undertaking, the lower return of mutual fund will be.
- Emerging funds are making more progress as compared to the old mutual funds equity as their return level is high at a given level of risk. The return for the old funds founded in 2007 is -0.48% and its risk level s 2.76%. As the new funds founded in 2011 are concerned the mean s 0.30% and value at risk is 2.37%. The results shows that new funds are performing better as compared to old funds. The return is high and risk is low for the new funds as compared to the old ones.

With the expansion of Mutual fund industry Pakistani investors are getting Various opportunities and it also attracts foreign investors to invest in mutual fund which also help to raise the economies of scale.

Conclusion

Market risk is measured by one of the most popular method known as VaR . Value at Risk (VaR) technique has been accepted globally as a tool to identify and control exposure to financial market risk by risk managers and regulators. It is essential to evaluate the mutual funds which can be healthy for the investors to invest properly. The main objective of this thesis is to calculate risk and return with the help of Historical Simulation method in the purpose to determine the Historical Simulation approach. Expected risk and return are main measures to determine investment choices. These expectations depends on historical record of monthly returns, measured for a period of time. Investors are able to leverage in risk free assets by putting all their money in diversified funds.

Every VaR model forecast future portfolio performance by using historical market data. The thesis focuses on assessing the performance of mutual funds by adopting a sample of mutual funds marketed in Pakistan.

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