

Efficient Frontier and Perception of Investors: A Risk Analysis

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Article Info

Volume 82

Page Number: 1435 - 1443

Publication Issue:

January-February 2020

Abstract:

Purpose: Most of the investors today invest in random portfolios to earn expected return on their investment but they fail to follow a technical method to select a portfolio. Due to this the investors fail to meet their expectations. To help such investors the study has thrown a light on utilization of efficient frontier.

Design /methodology/Approach: The design tailed in this study are exploratory and descriptive research along with qualitative and quantitative data. These were done to understand the perception of the investors towards efficient frontier concept.

Findings: Majority of the investors understood and accepted the concept of efficient frontier which lead to a major shift in selecting finest portfolio. This brought a change in investors risk taking capability.

Originality/ Value: The novelty lies in connecting the primary data collected from investors to the secondary data of portfolios for performing pre and post evaluation.

Keywords: Efficient frontier, Perception, Efficient Portfolio, Portfolio Risk and Return, Expected Return.

Article History

Article Received: 14 March 2019

Revised: 27 May 2019

Accepted: 16 October 2019

Publication: 07 January 2020

I. INTRODUCTION

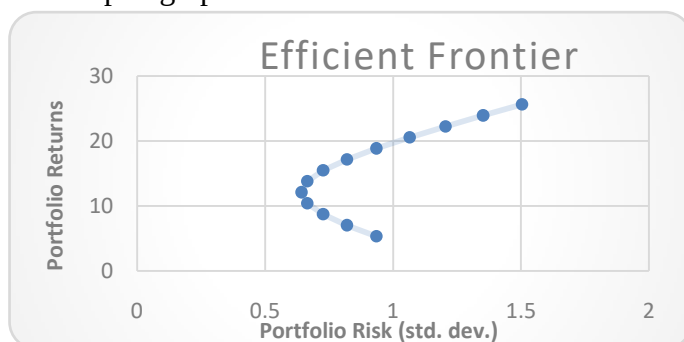
Most of the investors today, invest in financial assets without aiming for risk and return. Investments are made in order to expect some positive rate of return. The fundamental principle of Investment is to diversify funds into different financial assets (Koushal and Singh, 2017). Diversifying on different securities may reduce the volatility in the risk rate of a portfolio. However, investing in such way will not reduce the risk rate to zero because portfolios are pretentious by macroeconomic factors which influence the market (Bodie et al., 2004). Different

Financial assets are clubbed to make a portfolio and the important decision he/she must make is portfolio asset allocation. Portfolio asset allocation is a percentage of the amount invested in various financial assets available (Kaushal and Singh, 2017). Best portfolio can be designed to meet the requirements. Modern Portfolio Theory of Markowitz(1952) is used to achieve higher return from different portfolios and Investor can select a good one to maximize return and minimize risk (Andria et al., 2018, Simaan et al., 2018).

In portfolio optimization, investors invest in financial assets with the expectation of maximum

return with lesser risk (Kanagaraj and Kumar, 2017; Mani et al., 2018). There is no wrong in expecting such, but the investor should also know how to reduce the risk in order to maximize the return where most of them don't measure the risk and return efficiently but invest on well-diversified portfolio by just seeing and estimating with the help of few given figures on risk and return (Serban, Stefanescu and Dedu, 2011; Liang et al., 2018). But there is nothing called unpredictable. Every problem has a solution.

Supporting the above sentence, the efficient frontier concept can be used by the investor to estimate the risk and return of a portfolio. Efficient frontier can be said as an investor's friendly concept. As said in above Paragraph most of the investors calculate their return on risk without graphing it rightly. With the help of efficient frontier investors can see where exactly their return stand for the amount of risk taken by them. Ultimately efficient frontier helps in gaining a good amount of return, after which a lesser pain of risk (Serban, Stefanescu and Ferrara, 2017). One should know about efficient frontier concept, so that the investor gets a perfect idea on which portfolio he/she can invest to minimize the amount of risk and maximize the return (Kshma Kaushal and Singh, 2017). To estimate it perfectly historical data is obtained and is compared with the present data to see how well the portfolio is performing. Looking at the comparison the investor can select the best performing portfolio (Fulga, Dedu and Serban, 2009). This comparison and calculation are shown in further paragraphs.



Efficient frontier gives a clear-cut point why one should follow the concept and how beneficial it is for the investor is explained in detail (Haqiqi and

Kazemi, 2012). We know efficient frontier is a curve, which shows the return and risk that would occur when invested in a portfolio. Along with this we know that efficient frontier is used to obtain the maximum level of return by reducing the level of risk involved, which reduces the risk burden of the investor (Kendall and Su, 2005). For the better understanding of the investors efficient frontier constructs the theory of portfolio and valuation of the assets. The actual basis of the efficient frontier is nothing but to provide an overall return for giving amount of risk to the investor at different combinations of investment and also predict the future risk and return with the help of historical data for calculating the standard deviation and correlation to form a better asset allocation (D Li and WL Ng, 2000). With this we can manage the asset allocations through the risk tolerant by selecting investments that suits their risk or return which meets their expectations.

A minimum variance portfolio will tell us that it is a more diverse securities in a portfolio will include exclusively on an individual basis riskier asset, once it is hedged together those assets are been dealt collectively. This will result to earn good amount of expected return from the lowest possible risk (Khurshid and Kiani, 2011).

Most of the investor are not willing to lose money so the tangent portfolio is designed for these long-term investors to achieve twice more than the risk what they have taken in both good and bad times. Investing in long term bonds and stocks with modest and low maintenance cost (Sureshkumar and Elango, 2012). The Tangent portfolio will begin by way of enquiring their investor, what percentage they are willing or ready headed for losses in the most horrible situation without any refund from the market or any other institutions. The percentage might be like 20% or 25% or 30%, depending on the percentage of risk taken by the investor the tangent portfolio drive to create a high rate of return for the risk taken (Agarwal, 2014).

The CML (Capital market line) and SML (Securities market line) combines to form the CAPM (capital asset pricing model) and this will form the market portfolio of the efficient frontier. The CML will portrait the proportion of return is meant for the efficient portfolio is been focused to some extent of risk level or a standard deviation is being intend for a portfolio at market and the return earned from the risk-free securities (Dani, Ali, Simhadri and Murthy, 2012). The investments are valued at fair price in this model and then it is compared with the market value. If a projected value of a stock is more compared to market price than buy those stocks and if the projected value of the stock is lesser than the market price than it's not a good investment to invest in. Security market line (SML) is a crossing point between the returns earned from the securities with risk free and the returns earned from the total securities markets (Turcas, Dumiter, Brezeanu, Farcas & Coroiu, 2017).

We are using software's like Microsoft Excel, VisualMvo, MvoPlus and MCRetire to generate efficient frontier. To support this, we are using preferences about distribution approach as a tool which can estimate the return on risk easily that helps the investors to choose a portfolio accordingly (Sarykalin and Serraino, 2008).

In brief efficient frontier concept is a solution or an option for the investors who do not know how to maximize their return with lower risk (In simple words investors to be benefitted with lesser risk and more return). Where most of the investors are risk averse (who take insignificant risk have low potential-return). Most of the time for the same risk higher return can be earned on the other hand lower return can also be earned this completely depends on the investor's decision on selecting the portfolio. Hence, to help the investors who are risk averse and who expects a higher return with lower risk, efficient frontier is the best concept to select a portfolio.

II. LITERATURE REVIEW

Managing the financial instruments portfolio is one of the feature to increase the portfolio administration. This can be done on different criteria. Most frequently the portfolio risk criteria is used and observed. The investor's behavior is observed in divergence upon the rational and irrational type. This is done to observe the investors intension on the investment and analyzed. (Schalmerich, Leporacher, and Eu, 2015). When the share prices changes investor's choice also changes accordingly. This is because change in price (return and risk) influences the investor's mind regarding the decision on optimization of the portfolio management which helps in determining the efficient frontier (Farcas and Deac, 2010).

Modern portfolio theory and investment is one of the wide-ranging and complex studies. If special focus is maintained on the balance equilibrium the investors can meet their expectation on investment (Elton et al. 2014). Active investment strategy can be used to earn excess return if there is a perfect focus on the investment. This can be achieved by using capital asset pricing model which also gives a complete outline about the efficient portfolio optimization (Vollmer, 2015).

Modern portfolio theory was again overviewed by many to give a better understanding to the readers. Hence (Francis and Kim, 2013) Literature regarding the MPT was developed. The probability optimizing portfolio was more concentrated to see how far the investors would opt for the modern portfolio theory (Sironi, 2015).

The modern portfolio theory simplifies the process of selection of risky assets and reduces selection cost. It helps the investor to diversify their investment into different combination of financial assets such as stocks, bonds, commodities, intellectual properties, patents, land and building etc., (Markowitz, 1952). This theory helps the investor can make a better portfolio with the efficient diversification. These portfolios held by the investors are commonly handled by financial professionals (investment

company managers). The investors use standard deviation as the suitable measures because the portfolio on the efficient frontier risk are been used to generate effective returns they also can restrict the portfolio lying on the frontier.

Risk: The difference between actual out-come to expected outcome is known as risk. Major types of risk are business risk, market risk and interest rate risk. Business risk is based on performance of business. Interest rate risk is the risk due to change in interest rates. Market risk can be defined as the risk by volatility and fluctuation in stock prices (Chandra, 2010).

Return: Return is Reward earned for an investment. There are two types of return i.e., current and capital return. Current return is received in form of cash and cash equivalents such as dividend, interest etc., and capital return is appreciation or depreciation in the value of investment(Chandra, 2010).

Efficient portfolio: Efficient portfolio is combination of different financial assets that gives higher returns at defined risk level or lower risk with decent determined returns (Scott, 2003).

Portfolio expected return: portfolio expected return is weighted average return of all financial assets in a portfolio (Chandra, 2010).

Portfolio risk: Risk of an individual asset is measured by variance or standard deviation of its return. In the same way, portfolio risk is measured by variance or standard deviation of its return (Chandra, 2010)

Efficient frontier: The efficient frontier is a bunch of choicest portfolios that provides the highest or lower level of risk for the expected return. Portfolios that lie below the efficient frontier are sub-optimal, because they do not provide enough return for the level of risk (Harry Markowitz, 1952).

The capital allocation line is the tangent line lying on the efficient frontier which describes the combination of riskier assets with risk free asset by optimal expected return and standard deviation (Fulga, Dedu and Serban, 2009). The capital allocation line will become the capital market line, when all the investors share their same kind of

expectancies about the variance and covariance of assets and expected returns. The capital market line signifies that the case in which all the investors have the similar potentials and hold the same type of riskier portfolio as the tangency portfolio.

Though many researches are being made there are limitations to the researches which is again a clueless matter to the people. Few of the limitations are: only historical data is being used to plot the efficient frontier line which does not give the exact picture to the people who wants to invest on portfolio (Sarykalin, Serraino, 2008), the future loss cannot be predicted in advance, in case if there is any theft or fire accidents in the company which leads to the loss for the company. This is totally an unexpected factor which cannot be predicted (Dani, Ali, Simhadri, Murthy, Vikalpa, 2012),

The capital asset pricing model suggest that any assets as a direct function of its beta to the expected return from the components like risk free and market bearing risk (Kumar, Singh, Ranganath and Kaur,2014).In this method the investors only use the expected return to calculate the optimization of efficient frontier but they ignore the variances and covariance of returns.

Efficient frontier is one of the ways to predict the future. But from the above gaps we can notice that only historical data has been taken in account to calculate the risk and return in the portfolio which is not efficient to predict the future. On the other hand, even if the recent data is utilized to predict the future risk and return it might not happen the as estimated due to the chances of unexpected loss that occurs due to natural destruction, market price crashes and many more. All these should be evaluated to get an exact picture on return on investment. Hence the following are the objectives of the present study.

- To identify the risk bearing capacity of the investor.
- To evaluate the attitude and perception of investors towards the various investment opportunities and reorganize the finest optimal portfolio.

- To discriminate the approach of the efficient portfolio theory and use these principles in the practice of forming the savings in the portfolio creation.

III. METHODOLOGY

This study has come up with exploratory research and began to explore something new and then descriptive research was done to increase investors knowledge. Later these two methods were combined for an effective result. Both qualitative and quantitative methods have been used for collecting the data with some tools of investigation, sample size and sample techniques. The primary data has been collected by conducting a survey with help of 159 investors with various level of risk and return capabilities. The 36 different set of portfolios is created using a secondary data and formed an efficient frontier curve.

For the pre-data collection, we came up with 34 portfolios of different set of companies and

calculated risk, return and standard deviation of the portfolio using mean, average and standard deviation method and drew efficient frontier curve using the data. On the basis of this data 159 investors were asked to select a portfolio according to their expected return and risk capability. After getting the initial perception of the investor, the study took forward to analyze their risk-taking level, expected return and portfolio selection. This was done to understand the investor's perception on risk taking capability, return earned, and choice of portfolio made before awareness of efficient frontier method. After analyzing the primary data outcome, the study proceeded with post data collection in quantitative method, providing the same set of question to the investors to answer after explaining about the efficient frontier and its advantage personally to the investors in selecting a portfolio. The investors were interacted personally to know their actual risk-taking capacity and return they can earn to meet their expectation. Doing this, changes were seen in the perception of the investors while selecting their portfolio.

IV. DATA ANALYSIS

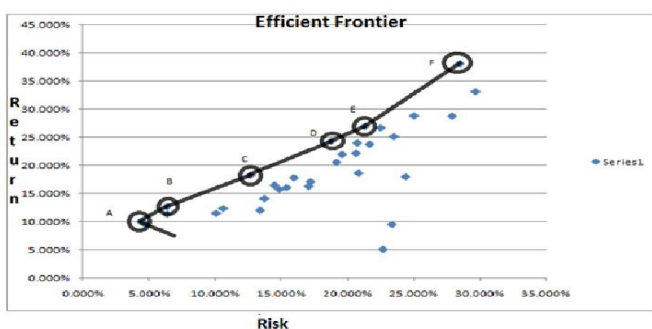
Table 1: List of Portfolios, Risk and Return

	Equity	Debt	Others	Expected return	Risk
Portfolio 1	0	87.620	12.380	9.896%	4.478%
Portfolio 2	0	78.170	21.830	9.838%	4.588%
Portfolio 3	0	83.600	16.400	9.603%	4.719%
Portfolio 4	24.680	66.570	9.620	11.357%	6.380%
Portfolio 5	24.790	46.180	29.050	12.709%	6.393%
Portfolio 6	30.880	61.640	7.480	11.495%	10.091%
Portfolio 7	23.480	64.380	12.120	12.350%	10.615%
Portfolio 8	65.860	20.740	13.400	18.273%	12.679%
Portfolio 9	99.760	0.000	0.240	12.008%	13.409%
Portfolio 10	97.580	0.000	2.420	14.109%	13.727%
Portfolio 11	86.220	1.570	12.210	16.485%	14.500%
Portfolio 12	97.190	0.000	2.810	15.745%	14.867%
Portfolio 13	94.430	0.000	5.570	16.072%	15.406%
Portfolio 14	86.810	0.590	12.600	17.818%	15.958%
Portfolio 15	91.610	0.000	8.390	16.302%	17.079%
Portfolio 16	95.750	0.020	3.970	17.114%	17.223%
Portfolio 17	86.720	0.000	13.730	24.297%	18.777%
Portfolio 18	91.660	0.000	8.340	20.582%	19.177%

Portfolio 19	96.750	0.000	3.250	21.968%	19.590%
Portfolio 20	87.700	0.580	11.720	22.173%	20.645%
Portfolio 21	80.390	9.610	10.000	24.009%	20.744%
Portfolio 22	99.370	0.000	0.620	18.651%	20.843%
Portfolio 23	99.640	0.000	0.360	26.961%	21.316%
Portfolio 24	90.510	0.840	8.650	23.783%	21.659%
Portfolio 25	93.900	0.000	6.100	26.705%	22.491%
Portfolio 26	92.180	0.000	7.820	23.371%	22.674%
Portfolio 27	96.930	0.000	3.070	9.495%	23.371%
Portfolio 28	90.720	0.000	9.280	25.146%	23.509%
Portfolio 29	98.500	0.000	1.500	18.001%	24.391%
Portfolio 30	96.630	0.000	3.370	28.849%	25.022%
Portfolio 31	90.390	0.000	9.610	28.811%	27.903%
Portfolio 32	93.430	0.000	6.570	38.140%	28.481%
Portfolio 33	92.090	0.000	7.920	33.141%	29.664%
Portfolio 34	97.890	0.470	1.640	34.829%	31.749%

Source: Moneycontrol

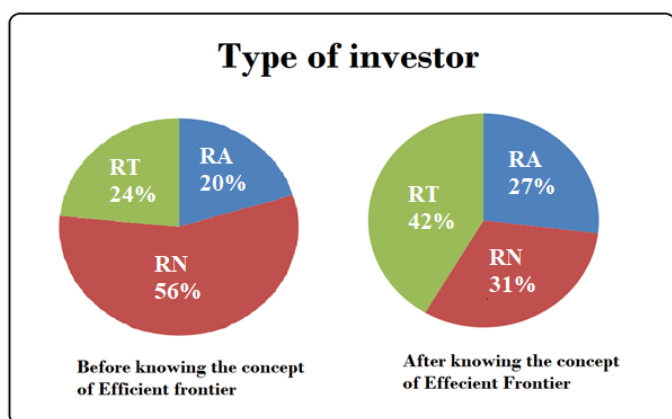
Present study selected 34 portfolios with different combination of Debt, equity and other instruments like money market instruments and call money. For the above portfolios, expected return and Risk is been calculated respectively. Expected return is calculated by using Mean-average method and Standard Deviation is calculated to find the risk of the portfolios. The above portfolios give a clear picture about the risk and return for the respective portfolio. This helps the investors to select the portfolio based on their risk capability. With the help of the above calculated data, portfolios from 1 to 7 were assumed to be risk averse because major portion is comprised of debt compared to equity and other instruments. Portfolios from 8 to 21 are risk neutral as it consists of low risk equity, debt and other instruments and the Portfolios from 22 to 34 are considered as risk seeking portfolios, as it consists of high risk equity with lower portion of debt and other investments.



After plotting the 34 portfolios on the graph with X-axis as risk and Y-axis as return, the efficient frontier curve was drawn joining the top layer of portfolios. The top Portfolios consist of higher return with optimal risk involved in it. The portfolios on the efficient frontier curve indicate efficient portfolios for the investor to invest. The portfolios below the efficient frontier curve are inefficient. If the Investor has opted for an inefficient portfolio previously, he can move out of it and select a best portfolio that suits him to maximize his return. Most of the investors who are not aware of the efficient frontier curve might select a portfolio which gives him less return for his risk. Seeing the graph, the investor can understand that the investment can be made more efficiently, where the investor can opt for higher return for the same risk or same return with less risk involved.

To bring the awareness of efficient Frontier to the investors we made use of all the above data. Once this concept is understood by the investors, the investors would prefer to change their decision. As this was our main intension, 159 investors were approached regarding this. After analyzing their perception in the primary data, efficient frontier concept and its advantages were explained in detail with few examples among. This brought some

interest among the investors which even changed their perception in selecting their portfolio. To analyze their change perception in numbers we post data collection and compared it with pre-data collection. Doing this, shift was observed in investors perception. The shift is observed in the below graph.



From the above the shift is observed in the perception of the investors in selecting the portfolio. The risk averse is moved higher in post research from 20% to 27%, risk neutral investors have decreased from 56% to 31% because the investors identified that they earn expected return by taking lower risk and also the investors can expect higher return by taking more risk which does not make much difference in their risk-taking capacity. As investors shifted their trend from risk neutral to risk seeking, the percentage increased from 24% to 42%.

V. DISCUSSION

Most of the people invest in portfolios randomly using different methods even if it is inefficient or tough to earn return as expected. But if they follow a proper method, they can earn even more than they expect. People follow blind suggestions and advices given by their friends or analyst, but this might not meet their expectation because the investors would be interested in taking considerable risk to earn better return or he might be interested to take lower risk to be on safe side. Hence to help the investors we first analyzed their risk-taking capability through passing few questions to the investors.

After analyzing their risk-taking capability, awareness about efficient frontier concept was given to the investors and demonstrated by taking few portfolios to show how risk categories are plotted

and how much return can be earned on their risk pattern. To support the data, efficient frontier curve was drawn based on the data, for better understanding of the risk and return which could be earned.

To identify the difference before and after knowing the concept of efficient frontier, we came up with pre and post data research. Doing this way shift in their decision was observed. Where in the pre-data research we came to know that most of investors did not know that they could earn higher return with less risk involved nor they knew that with the same risk, higher return could be earned and hence they ended up in enjoying inappropriate return on their risk. But after knowing about efficient frontier investors could identify the difference and changed their way of investing, this was identified in post data research. Following efficient frontier, they earned more return on less risk involved.

The shift in the nature of investors is shown in the pie chart which tells that, before knowing the concept of Efficient Frontier, 20% of the investors were risk averse in nature, 56% of investors were risk neutral and 24% of the investors were risk seekers. After knowing about Efficient Frontier, 27% of investors were risk averse, 31% of investors were risk neutral and 42% of the investors were risk seekers. Considering post data collection, shift in type of the investor decision on risk capability was observed, where they could analyze that they can earn higher return with same risk involved and they can also earn same return with lower risk involved. In pre-data collection we can see the investors invested more in risk neutral portfolios. But after knowing efficient frontier method the investors changed their opinion which brought a change in selecting their portfolio, which is observed in post data collection. Same way when comparison is made between risk taking investors in pre and post data collection, the number of investors changed their trend towards higher return with same or little more risk involved is seen. Comparing both the data we can identify that the risk takers have increased which is clear that the investors are more profit oriented and hence they are ready to take high risk.

According to the survey done, Risk averse investors selected Portfolio1 (Portfolio Risk – 4.5 Portfolio Return- 9.89%) and Portfolio5 (Portfolio Risk – 6.4, Portfolio Return- 12.7%), Risk neutral investors selected portfolio8 (Portfolio Risk – 12.68, Portfolio

Return-18.3%) and Portfolio17 (Portfolio Risk – 18.78, Portfolio Return-24.3%) and Risk seeking Investors selected portfolio23 (Portfolio Risk – 21.3, Portfolio Return-27%) and Portfolio 32 (Portfolio Risk – 28.48, Portfolio Return- 38.14%). Observing this it is understood that Risk Averse investors are willing to take risk less than 7%, Risk Neutral investors are capable of taking 12 to 19 percent of risk and Risk seekers are taking risk above 19%

By this survey we could see that 91.54% of investors could understand the concept of Efficient Frontier (Markowitz Theory) tells us that this method is easier to understand and to use it. Using all these data the fund managers can help the future investors to select a better portfolio. This would change the decision pattern among the investors on whole which makes the investors bring fortune.

VI. CONCLUSION

The research concentrated on the perception of investors on their risk-taking capability to earn return on the same using efficient frontier method. To find out this perception among the investors pre and post data surveys were conducted. In this survey a shift in investor's decision was observed. The number of risk averse investors increased after knowing about efficient frontier same way in pre-data survey the number investors who preferred to be risk neutral decreased in post data survey and the number high risk-taking investors increased in post data survey compare to pre-data survey. The major was seen in risk neutral and risk takers because the investors could analyze their capability of risk to earn return hence most of the risk neutral investors shifted to high risk investors. This signifies that the investors are more profit oriented and hence they are ready to take little higher risk comparatively. Overall it is understood that the investors are accepting efficient frontier method to invest or select a portfolio is shown in the shift during post data survey.

Efficient frontier is useful for the investors as it is very easy to understand and apply the same while selecting a portfolio. The graph itself gives a very clear picture about the return on risk that the investor is willing to take. Apart from investor the fund managers or brokers who help the investors to choose the portfolio to invest in by explaining the efficient frontier concept which builds up concept in investors as the return on risk involved can be

portrait on a graph. Doing this the number of investors would increase because the concept is easy and applicable.

The future findings related to the paper are: This paper lacks to predict the future growth of the portfolio. As historical data is taken into account, actual may be inaccurate and Transaction costs are not included while calculating return of the Portfolio.

Acknowledgement

The satiation and euphoria that accompany the successful completion of this research would be incomplete without the mention of the people who made it possible. We thank the research team of Accendere Knowledge Management Services, CL Educate Ltd. for their unflinching guidance, continuous encouragement and support to successfully complete this research work.

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