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Portfolio Construction: A Case Study on High Market Capitalization Stocks in Bangladesh

Syeda Mahrufa Bashar [α] & Jubairul Islam Shaown [σ]

Abstract- Diversified investment of capital reduces the unsystematic risk for an investor. Desired maximization of return and minimization of risk can be achieved by assigning available capital into different assets in certain weights. This paper constructs that optimal portfolio for an investor using stocks of 12 companies which represent 8 different industries selected from DS30 index. After adjusting 2012-2017 monthly price data for right share, stock dividend, stock split and cash dividend, monthly returns are used to calculate the excess return per unit of risk of the constructed portfolio. In the equal weight case of all the 12 stocks, the annual excess return is 4.35% with a standard deviation of 0.22, leading to a Sharpe Ratio of 19.49%. The extent of diversification is demonstrated by optimizing the portfolio to maximize theta. In the optimal portfolio case, the excess return increases to 19.37% whereas the volatility decreases to 0.20 and this increased the Sharpe Ratio to 98.88%. The stocks included in the optimized portfolio are BRAC Bank Ltd, IFAD Autos Ltd., Olympic Industries Ltd., MJL Bangladesh Ltd., Beximco Pharmaceuticals Ltd., and Grameenphone Ltd. The impact of diversification is further established by constructing the global minimum variance portfolio.

Keywords: sharpe ratio, optimal portfolio, excess return, volatility.

I. Introduction

Making sound investment decisions in the equity market is a daunting task. Any rational investor wants to maximize return while minimizing risk of the investment he or she holds (Sarker, Optimal Portfolio Construction: Evidence from Dhaka Stock Exchange in Bangladesh, 2013). But selecting a set of investments which will help achieve this objective from a large set of available assets is a task of thorough analysis. Constructing an optimal portfolio that maximizes the return per unit of minimum risk can be done applying the theoretical model proposed by Harry Markowitz. This model optimizes the desired scenario by giving the analyst as output the individual weights that need to be given into the selected asset classes. This model is applied in this study on a selected set of stocks from Dhaka Stock Exchange.

According to Markowitz Portfolio Theory, an investor can reduce the amount of risk he or she is exposed to by holding combinations of assets where the assets are not perfectly positively co-related (Iyiola Omisore, 2012). Holding these combinations can make it possible for the investor to gain same level of return with reduced level of risk. Portfolio construction, in theory, is a very efficient way of maximizing return with reduced risk level. Although there have been many studies on the application of this theory in the developed markets, quite a few studies have been done on its application in the frontier markets. This study focuses on the applicability of this theory in a specific segment of the Dhaka Stock Exchange (DSE), DS30, which is an index made of high market capitalization stocks. This study tends to construct a portfolio which is optimized given the selected investment set. This application of the stated theory will help Bangladeshi retail and institutional investors realize the need and impact of portfolio construction in the equity market and thus make them understand the importance of passive portfolio construction.

II. Literature Review

Modern Portfolio Theory or MPT is a theory of investment attempting to maximize the return for any given level of risk. According to Markowitz, the portfolio selection is a two-step process: first step is observing and believing future performance of given stocks and the second step is selecting a combination of securities based on that belief of future performance (Markowitz, 1952). According to MPT, it is possible to construct an efficient frontier which offers maximum return for a given level of risk. In this combination of assets, it is not enough to look at the individual returns and risks only; the interplay or co-movement of the considered assets play a major role in quantifying the portfolio risk. This is a simplified model which have some assumptions made for the MPT to hold:

1. Market is efficient
2. Asset Returns are normally distributed
3. Correlations between assets are fixed
4. All investors want to maximize economic utility
5. All investors are rational and risk averse
6. There is no information asymmetry
7. Investors are price takers
8. There are no taxes and transaction costs
9. All investors can borrow or lend any amount at the risk-free rate

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According to this theory we can find an optimal or tangency portfolio on the efficient frontier where an investor can receive the highest reward to risk ratio possible.

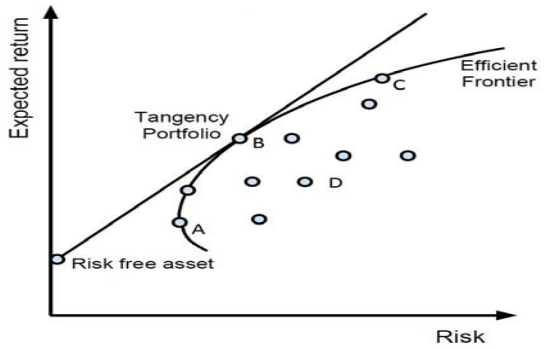


Fig. 1: Optimal Portfolio according to Modern Portfolio Theory

Studies show that the concept of optimization is crucial in order to get the maximum reduction in non-systematic risk diversification. This diversification concept through optimization hold true for the Zimbabwean equity market where the incorporation of skewness has shown better fit to the optimization model (Petros). There are researches done on the performance of portfolios of assets in the form of mutual fund. In Bangladesh, Mutual funds ensure higher returns than the market. The popular choices made by fund managers are high beta stocks which are currently undervalued (Das, 2016).

For 2007-2012 period a study was done on optimal portfolio construction where stocks from DSE were selected. The optimal return possible from this sample contained 33 stocks, offering an optimal return of 6.17% with a risk of 8.76% (Sarker, Markowitz Portfolio Model: Evidence from Dhaka Stock Exchange in Bangladesh, 2013). Another study suggests that although diversification of assets is achieved in the pharmaceutical industry of Bangladesh, it is done by sacrificing returns, which is poorer than the market return. (Chowdhury, 2015). To get the maximum return possible, optimization is needed combining stocks from outside this industry as well. The application of MPT in the real estate market of Malaysia has also been studied. The application of MPT has caused a shift from 'tactical and operational' to 'strategic and tactical' style of management in the real estate sector (Hishamuddin Mohd Ali). The increasing number of REITs in Bursa Malaysia can be further analyzed from behavioral perspective using advanced modules of MPT.

Further work on the MPT in the later stages has been done. It is established that avoiding the pursuit of alpha and maintain a globally indexed savings portfolio can lead to healthy returns by taking lower risk (Roche, 2016).

III. Research Methodology

a) Research Purpose

The purpose of this study is to apply the modern portfolio theory to construct an optimal portfolio of assets from the equity market so that retail investors, primarily, can easily replicate such a portfolio with the assigned weights and gain the maximized return from the constructed portfolio.

b) Objective of the Study

The broad objective of the study is to optimize the portfolio made of 12 selected stocks from DS30 index. Specifically, this study aims to:

1. Find out the portfolio return in an equally weighted scenario
2. Find out the weights to be given to the stocks in order to perform portfolio optimization
3. Maximize Sharpe Ratio restricting the short-sale of stocks

c) Methodology

The study starts with a judgmental sampling method where 12 stocks from a population of 30 is selected from DS30 index. The monthly returns are calculated as per below formula where It = month end price of the security and It-1 = previous month end price of the security:

$$R_t = [I_t / I_{t-1}] - 1$$

After the monthly return data is calculated, portfolios in two different scenarios are designed: the first one with equal weight in all the 12 selected assets and the later with optimized weights in selected securities to ensure maximum return and minimum risk.

The formula used for portfolio return is:

$$R_p = \sum w_i r_i \text{ where } w_i = 1$$

w represents the weights of each asset, and r represents the returns on the assets. Risk of the constructed portfolio is measured using the below

$$\sigma_p^2 = \sum w_i^2 \sigma_i^2 + \sum\sum w_i w_j \sigma_i \sigma_j \rho_{ij}$$

stated equation:

Where ρij is the correlation coefficient between the returns on assets i and j.

Finally, the maximum return per unit of risk attainable through portfolio optimization is calculated as peer the stated equation:

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$$\text{Sharpe Ratio} = (R_p - R_f)/ \sigma_p$$

The optimized portfolio's Sharpe ratio is the maximum given the set of 12 selected stocks.

d) Data Collection

The 12 stocks were picked according to judgmental sampling in order to ensure that all the industries are represented in the investment opportunity set:

Table 1: Sample Company List

Company Name	Ticker	Industry
BRAC Bank Ltd.	Bracbank	Banks
City Bank Ltd.	Citybank	
IDLC Finance Ltd.	Idlc	
BSRM Steels Ltd.	Bsrmsteel	Engineering
IFAD Autos Ltd.	Ifadautos	
Olympic Industries Ltd.	Olympic	Food And Allied Product
Summit Power Ltd.	Summitpower	Fuel & Power
MJL Bangladesh Ltd.	Mjlbd	
Square Pharmaceuticals Ltd.	Squrpharma	Pharmaceuticals And Chemicals
Beximco Pharmaceuticals Ltd.	Bxpharma	
Lafarge Surma Cement Ltd.	Lafsurceml	Cement
Grameenphone Ltd.	Gp	Telecommunication

The selected stocks are from DS30 index. DS30 is constructed with 30 leading companies which are considered investable companies. This index reflects about 51% of the total equity market capitalization. These stocks on DS30 have a floated market capitalization of more than BDT500 million.

The study is conducted using secondary data from DSE. Data from LankaBangla Stock portal is also collected.

e) Rationale

Bangladesh, as a frontier market has huge potential to grow its economy. The reflection of the economic prosperity ultimately be in the stock market which is yet to be a mature one. There have been numerous studies on the equity market in Bangladesh. Also, there have been studies on the investor behavior and stock market efficiency of this country. But there lies a gap on the studies regarding portfolio optimization given an investment opportunity set. For a country such as Bangladesh where the majority of the retail investors are yet to be educated investors, an optimization of a portfolio of blue chip stocks is necessary. Holding this portfolio for a long term in the assigned stock weights may lead to higher returns than that achieved in the current scenario.

f) Structure of the Article

The paper starts with the literature review in this field both in national and international context. Next, the objectives and the methodology of the study are elaborated. After enlisting the data collection method, findings of the study are focused on. Both the portfolio cases are explained with the Sharpe Ratio. In the conclusion part, the results implication of this research is explained with focus on further scopes of study.

g) Limitations of the Study

In calculating the return and risk of the assets the study uses historical rates of return. It is an assumption that the stock prices will come back to such prices in the future so that the historical rates are realized in the coming periods. For this to happen, it is to be assumed that historical prices are a better predictor of future price movements. This assumption may not hold true. It might be the case that in the future a company might not give the return that it has in the past 5 years on an average. Also, the results might change when companies from the rest 18 in the population are considered.

IV. Analysis and Findings

Monthly price data, after adjusting for stock & cash dividend, stock split and right share, is used to calculate the monthly returns for the 12 companies. The monthly price is for the period of 2012- 2017.

Table 2: Monthly Excess Return

	City	Brac	Idlc	Bs Steel	Ifad	Olym	Summit	Mjl	Square Pharma	Beximco Pharma	Lafarge	Gp
Monthly Return	0.006	0.016	- 0.006	0.004	0.035	0.015	-0.003	0.008	0.002	0.013	0.011	0.009

Using these monthly returns the excess returns are calculated where monthly return on 30-day T-bill of Bangladesh bank is used as the risk-free rate. In the equal weight scenario, all the assets were given 8% weight. The portfolio monthly excess return in this case is 0.36% which leads to an annual excess return of 4.35%. In order to calculate portfolio variance, the study performs a co-variance matrix utilizing all the asset returns. The matrix using monthly returns is below:

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Table 3: Covariance Matrix

Company	CITY	BRAC	IDLC	BS STEEL	IFAD	OLYMP	SUMMI	MJL	SQUARE	BEXIM	LAFARGE	GP
CITY	0.0110	0.0063	0.0070	0.0057	0.0018	0.0016	0.0062	0.0029	0.0013	0.0031	0.0029	0.0002
BRAC	0.0063	0.0087	0.0050	0.0037	-0.0002	0.0007	0.0032	0.0015	0.0009	0.0029	0.0007	0.0002
IDLC	0.0070	0.0050	0.0198	0.0103	-0.0007	0.0036	0.0103	0.0058	0.0018	0.0064	0.0041	0.0030
BS STEEI	0.0057	0.0037	0.0103	0.0140	0.0031	0.0039	0.0094	0.0062	0.0006	0.0057	0.0064	0.0050
IFAD	0.0018	-0.0002	-0.0007	0.0031	0.0145	0.0000	0.0047	-0.0016	-0.0001	0.0016	0.0058	0.0004
OLYMPIC	0.0016	0.0007	0.0036	0.0039	0.0000	0.0169	0.0010	0.0011	0.0021	0.0004	0.0037	0.0015
SUMMIT	0.0062	0.0032	0.0103	0.0094	0.0047	0.0010	0.0130	0.0054	0.0002	0.0059	0.0046	0.0019
MJL	0.0029	0.0015	0.0058	0.0062	-0.0016	0.0011	0.0054	0.0087	0.0006	0.0035	0.0055	0.0063
SQUARE	0.0013	0.0009	0.0018	0.0006	-0.0001	0.0021	0.0002	0.0006	0.0056	0.0005	0.0010	0.0015
BEXIMCO	0.0031	0.0029	0.0064	0.0057	0.0016	0.0004	0.0059	0.0035	0.0005	0.0081	0.0026	0.0017
LAFARGE	0.0029	0.0007	0.0041	0.0064	0.0058	0.0037	0.0046	0.0055	0.0010	0.0026	0.0137	0.0070
GP	0.0002	0.0002	0.0030	0.0050	0.0004	0.0015	0.0019	0.0063	0.0015	0.0017	0.0070	0.0422

The resultant portfolio standard deviation is 6.44% (monthly) leading to an annual standard deviation of 22.32%. Annual Sharpe ratio for the equal weight scenario is 0.19.

In the second scenario, where the study targets to maximize the Sharpe ratio, the same formula are used.

But in this case, the objective is to find out the weights that has to be put to individual securities in order to maximize the Sharpe ratio given the investment opportunity set of 12 stocks. According to the optimization function, the weights that need to be assigned to the securities are:

Table 4: Weight Allocation

Company	Weight
CITY	0.00%
BRAC	30.00%
IDLC	0.00%
BS STEEL	0.00%
IFAD	30.00%
OLYMPIC	15.52%
SUMMIT	0.00%
MJL	13.47%
SQUARE PHARMA	0.00%
BEXIMCO PHARMA	10.23%
LAFARGE	0.00%
GP	0.78%

The resultant annual portfolio excess return is 19.37% and annual standard deviation of 19.59% leading to the maximum Sharpe ratio of 0.98. The summary Sharpe ratio in the two cases is as per the below table:

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Table 5: Findings Summary

	Equal Weight Portfolio	Optimized Portfolio
Monthly Data		
Portfolio Excess Return	0.36%	1.49%
Portfolio Standard Deviation	6.44%	5.66%
Theta	0.055	0.26
Annualized		
Portfolio Annual Excess Return	4.35%	19.37%
Portfolio Standard Deviation	22.32%	19.59%
Theta (Annual)	0.19	0.98

As it can be seen from the above analysis, even though on stand-alone basis few stocks had negative excess returns, when combined as a portfolio, the return turns positive. In the optimized portfolio, not only the return increases to 19.37% but also the standard deviation goes down to 19.59% with a resultant theta of 0.98. Thus, maximum diversification benefit is achieved. In this case the short-sale of stocks are restricted.

V. Conclusion

Portfolio construction is the best way to reduce the risk of an investment. Given this set of investment opportunity, an investor can maximize the return while minimizing risk. In implementing this strategy, the investor has to keep in mind the strategy of passive investing. Trading on a frequent basis can wash out the level of profits suggested here. As most of the investors of Bangladesh do not possess superior investment prowess, this buy and hold strategy can be a solution to increasing investor confidence in the market.

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