Practices of Financial Mathematics in Security Analysis of Textile and RMG Sector

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Abstract: *Continuing over the acquaintance with financial practices in every sector around the world, Bangladesh, a developing nation, is adapting financial mathematics to make business decisions for the investors of home and abroad. Because of having a lot of human resources, business tycoons are eager to consider the largest exporting sector of Bangladesh for investments. With the cooperation of government and greatest enthusiasm of people, the demand for textile and garments sector is growing well and due to higher acceptance of locally produced cloths in the western world, the export is upward sloping, the result of which is the increasing trend of foreign currency reserve. The market participants are now looking for projects added by the capital fund according to their financial positions. For that reason it is exigent to reveal that financial mathematics efficiently manages the investment decisions evaluating the financial health of a firm and to critically examine how these are working out in the textile and ready-made garments (RMG) sector of Bangladesh.*

Keywords: *Risk-Return, CAPM, Portfolio, Cost of Common Stock, Discounted Cash Flow Valuation, Stock Valuation.*

1. Introduction

The mathematical outfit for financial management is the way of taking business decisions, the implication of which is noticed in many types of business, and Bangladesh is not out of this practices. For the investors, this mathematics is the focal issue to measure the financial position of a company. To judge the financial soundness, various models can be used as the indicators. Financial sustainability gets the first priority to the firms doing business with Bangladeshi entrepreneurs (Mizan & Hossain, 2014). One of such a place using financial mathematics is textile and ready-made garments sector.

There are a total of 1,57,758 units of production surrounded by seven sub-sector of Textile Industry in Bangladesh. Lack of proper information the efficient investment is still out of our reach in the textile industry. The foreign ministry has to look into the reasons for which the investors are reluctant to expand their business into the resourceful country like Bangladesh. Textile and RMG sector has been an enormous growth since 1997-1998 when Garment sector covered more than 73 percent of total export (BOI, 2014). The growth occurred only for the high demand of cloths in the western

countries, which converted them to search for investment region. The result of which includes the financial mathematics like risk-return analysis, valuation of stock, capital budgeting, portfolio management and the presence of money market instruments as well as financial derivatives for business decisions, that opens a venue for the corporate leader to capital investment for ventures.

An entrepreneur wants to be safe at any cost in doing business. Textile and RMG sector is a unique one that enhances the inflow of foreign investment only by the means of garments production. The contribution of this sector was US$ 21,516 million in FY 2012-2013 that was accounted for 79.6 percent of export in that fiscal year and expected to account for 81.4 percent of total export in FY 2013-2014, which crosses the 80 percent of landmark to export (Bangladesh Economic Review, 2014). Although, the Rana Plaza Tragedy in 2013 was an obstacle to lose giant importers, the life of 1135 people took the future partially, and the fire in Tazreen Fashion Factory in 2012 was also the reason. To ensure safety and security in garments industry the government of Bangladesh signed an accord with BUET and EU to reconfigure the factories with deficient facilities. And government

also strengthened the Department of Inspection for Factories and Establishments to take initiatives (Budget Speech 2014-2015). A group of spendthrift and corrupted people are still playing with the lives of lower incoming people. Bangladesh lost the GSP facilities to export in USA, so is under consideration of European Union, which is the biggest market of RMG export. But the sector is sustaining. For the expansion of textile and RMG business, the innovation of some financial techniques and mathematical sophistication work out to analyze the financial soundness of that business. This paper briefly discusses the financial innovations and the underlying mathematical applications to identify the business condition for making decisions whether to invest or not.

1.1 Literature Review

Financial mathematics is the combination of some methods and formulas to make business decisions. And financial decisions comprise of financing, investment as well as dividend decisions. To invest in textile and garments sector, a person definitely thinks of the reasons that show him to provide fund for initiating or expansion of a firm as investment. The route he will get by the blessings of financial mathematics.

Ahmed Nazri Wahiduin noted that, for the purpose of taking real responsibility in business, interest rates for financial derivatives and security valuation are the two big issues. Discounted cash flow analysis is the another organ that covers cash flow recognition and asset pricing analysis for business evaluation. Financial mathematics and interest rates are the main computational aspects of financial analysis. According to him financial math are comprised of six parts as, single principle sum, multiple stream of cash flow, rate of returns, security valuation, cost of capital and capital budgeting.

Mathematical models always steer the investors' choice. Marek Capinski and Tomasz Zastawniak bespeak that Black–Scholes arbitrage pricing of derivative securities and options, Markowitz portfolio optimization and the Capital Asset Pricing Model as well as no arbitrage pricing models are the

three major areas of mathematical finance that impact on the modern financial markets operate.

Sandeep Juneja shows the history that tells the application of financial computation. At the time of industrial revolution in Europe, people were eagerly looking for setting up various industries. People thought about the investment, the outcome of which the joint stock company. They purchased shares or stocks of a firm, for trading those shares they facilitated a stock exchange. From that revolution the analysis of firm to invest was crying need to the real investors. Financial sector has a fruitful growth around the past 30 years. A lot of financial products, bonds, derivatives, insurgence of prices etc were the matter of discussion. These encouraged the investor to analyze the securities. And the final outcome was financial mathematics.

Canan Saricam and Nazan Erdumlu stated that textile and apparel industry is significant for investment especially for the country in the early stage of development. For the developed nation it is the arena of value addition to their economy. The efficiency of this sector is an emergent issue for investments. They used the DEA, a part of mathematics, for benchmarking in measuring efficiency.

According to I-Liang Chern of Taiwan National University, a saver can get the higher income and the borrower can optimize his profit using the savers money, financial market play an intermediation role between them. But to decide about profitable investment, financial mathematics is the aggregation of models and methods including, asset pricing model, Black–Scholes models, numerical methods, options, derivatives and stochastic calculus.

1.2 Objectives of the study

Textile and Ready Made Garments (RMG) business is growing well and financial mathematics added a new era for the investment in this sector. So, the objectives of the study are:

- To evaluate risk-return of firms and

- To construct a portfolio

- To observe discounting in cash flow by NPV method

- To identify the way of stock valuation

- To determine the cost of common stock or equity

- And overall to identify how to make decisions for stock investment

1.3 Rationale of the study

Mathematical Finance strictly discusses about using models and methods in making investment decision. Despite the verbal dispute over the complications of using mathematical model, regardless of economical analysis it is hard to say that the investment is fruitful. The investors inflow and project choice are not only the cause to raise capital. Company performances and outcome analysis are the subjects depending on which an entrepreneur moves for business. For that reason, using of mathematical computations is needed to ensure the appropriate scenario of investment arena of textile and RMG business.

2. Data

The report has been conducted based on the secondary data available from the annual report of two randomly selected Textile and RMG sector participants, and data available in several institutions such as Dhaka Stock Exchange Limited, Ministry of Finance, Ministry of Planning, Board of Investments, Bangladesh Bureau of Statistics, data of yearly budgets in Bangladesh, published articles of renowned journals, newspapers and books as well.

2.1 Research Methodology

The data has been possessed with key indicators of financial mathematics. For the analysis, two firms, Alhaj Textile Mills Ltd. and Desh Garments Limited, operated in the textile and ready-made garments industry of Bangladesh have been selected through the random sampling method. The data in the annual report of these two firms have been taken into consideration for the purpose of evaluating the firms' position to draw the strength of the sector. And a group of secondary data from relevant sources has been considered for the identification of models for financial mathematics. The applied mathematics of finance includes, risk-return analysis to identify the expected return ($\bar{R}$), variance (σ^2), standard deviation (σ), coefficient of variation (CV), capital asset pricing model (CAPM), and for the portfolio measurement covariance (σ_{AD}) and correlation (ρ_{AD}), portfolio return ($\bar{R}_P$), portfolio variance (σ_P^2), portfolio standard deviation (σ_P) and portfolio beta (β_P) have been calculated. Stock valuation method has also been applied that includes the measurement of growth rate (g), market price calculation (P_o). By the discounted cash flow method of capital budgeting, net present value (NPV), Internal Rate of Return (IRR) and to identify the cost of common stock zero growth rate model (Dividend Model) and constant growth rate model (Gordon Model) have been applied.

3. Discussion

Financial mathematics is the most effective way for the measurement of health of textile and ready-made garment sector to encourage FDI. The two strong market participant of textile and ready-made garments industry are the Alhaj Textile Mills Ltd. enlisted in 1983 and Desh Garments Limited enlisted in 1989 in Dhaka Stock Exchange, first share market of Bangladesh, have been analyzed to identify the scenario of this sector. The practice of financial mathematics to company analysis for the investment into this sector is in the way following.

3.1. Risk-Return Analysis:

3.1.1 Return: Return refers to the outcome from an investment. If anyone invests in any project, he does this for the purpose of some intensions. These include-

1. Inflation adjusted value creation

2. Risk return matching

3. Hedge against loss

Return is termed as **R**, and the expected return is termed as **R̄**. An economy normally goes through four kinds of states and according to present scenario of textile industry, the probability of occurring the states can be assumed, which can be categorized into-

States of Economy	Probability Distribution
• Boom	0.20
• Normal	0.40
• Depression	0.25
• Recession	0.15
Total	1.00

According to net profit after tax included into the financial report, 2012-2013 of Alhaj Textile Mills Ltd. and Desh Garments Limited, the possible outcome can be as follows-

FIRM	*BOOM*	*NORMAL**	*DEPRESSION*	*RECESSION*
Alhaj Textile Mills Ltd.	30%	22.2%	7%	2%
Desh Garments Limited	15%	8.8%	2.2%	-3%

* Normal return has been taken from the financial statements of the two selected firms.

Then the Expected Return will be:

$$\bar{\mathbf{R}} = \sum_{i=1}^{n} R_i \times P_i$$

So, $\bar{\mathbf{R}}_A$ = (.20*30) + (.40*22.2) + (.25*7) + (.15*2) = 16.93%

$\bar{\mathbf{R}}_D$ = (.20*15) + (.40*8.8) + (.25*2.2) + (.15*-3) = 6.62%

3.1.2 Risk: Risk is the term that is used for measuring the deviation of actual return from the expected return. Risks are of two basic types from the investors' point of view. This are-

- Systematic Risk

- Unsystematic Risk

The systematic risk is generally non-diversifiable and market oriented risk. The presence of which depends on the country's economic situation, that is mentioned as **β**. And the risk that illustrates the company position about the deviation of return, and which is diversifiable if some measures are taken for the specific firm is unsystematic risk. For firm specific analysis the risk is termed as Variance **σ²** and Standard Deviation, **σ** that indicates the variability of return of individual stock.

And the firm specific risk or Variance will be:

$$\sigma^2 = \sum_{i=1}^{n} (R_i - \bar{R})^2 \times P_i$$

$\sigma^2_A = 103.336\%$ So, **SD** or $\sigma_A = 10.1654\%$

$\sigma^2_D = 34.7117\%$ So, **SD** or $\sigma_D = 5.8917\%$

From the above calculated result (Appendix-1.1 and Appendix -1.2), it can be concluded that, the return of Alhaj Textile Mills Ltd. is higher than that of Desh Garments Limited. The Risk is also higher of Alhaj Textile. This viewpoint indicates, there is a positive relationship between risk and return (Table – 1).

Firm	Return (%)	Risk (%)
Alhaj Textile Mills Ltd.	16.93	10.1654
Desh Garments Limited	6.62	5.8917

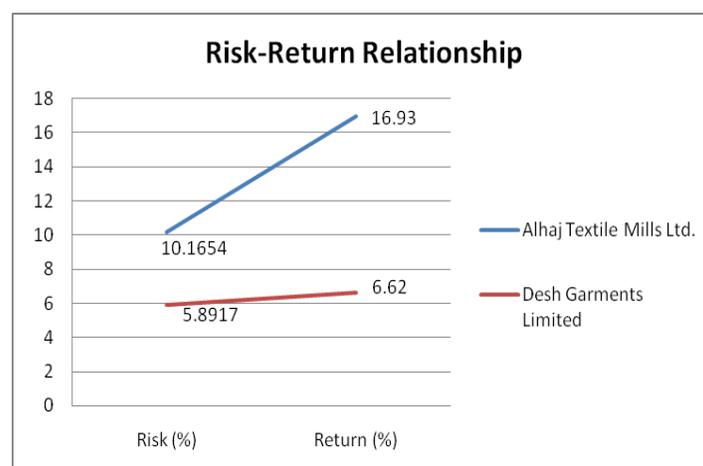Table-1: Expected returns and risks of two selected firms.

Figure – 1: Risk-return relationship of Alhaj Textile Mills Ltd. and Desh Garments Limited.

As a golden rule, everyone knows that, the higher return contains the higher risk. In figure 1, the relationship between the selected two firms also shows that. But, from the perspective of efficiency Alhaj Textile Mills Ltd. is one step ahead. The risk is almost double in Alhaj Textile compare to Desh Garments, But the return is

almost triple than that of Desh Garments. Since investment in Alhaj Textile will give more return, the risk taker will go for investment in Alhaj Textile and the risk averse will go for investment in Desh Garments.

3.1.3 Coefficient of Variation (CV): Coefficient of variation is a measure of relative focus of comparing the risk to the return from a security of a firm. The lower the CV, the lower the risk. And higher CV indicates higher risk of a firm's return.

Coefficient of Variation can be calculated by:

$$\text{Coefficient of Variation (CV)} = \sigma \div \bar{R}$$

So, $CV_A = 10.1654 \div 16.93 = 0.60$

$CV_D = 5.8917 \div 6.62 = 0.89$

From the calculation it can be said that there is greater risk of Desh Garments Limited than that of the risk of Alhaj Textile Mills Ltd. as coefficient of variation of Desh Garments shows 0.89 which is 0.29 higher than the coefficient of variation of Alhaj Textile Mills Ld.

3.2 Capital Asset Pricing Model (CAPM):

Generally risk averse investors take into consideration Variance and Standard Deviation as the proper measure of risk, but the risk seekers rationally choose the securities beta as a proper measure of risk. From that viewpoint there is a method of return calculation known as capital asset pricing model of CAPM.

$$\bar{R} = R_f + (R_m - R_f)\ \beta_i$$

For the measurement of return in this method we need:

R_f = Risk free rate of return, 5%

R_m = Market average return, 1.677%

β_i = Beta of individual stock, Alhaj Textile Mills Ltd. 0.8923

Desh Garments Limited 1.0103 (Source: Stock Bangladesh Limited, 2014)

$\bar{R}_A = .05 + (.01677 - .05)\ 0.8923 = .02035$ or 2.035%

$\bar{R}_D = .05 + (.01677 - .05)\ 1.0103 = 0.01643$ or 1.643%

Above calculation also shows the higher return of Alhaj Textile Mills Ltd. than that of the return of Desh Garments Limited. So, to invest in Alhaj will be the choice that got first priority.

3.3 Diversification and Portfolio:

There are a lot of stocks in a market. But, it is not possible for everyone to invest in the entire available securities with the limited resources. Financial specialists always suggest not putting one's money in one basket. And invest in a firm with higher return contains the probability of facing higher risk that can result in even the giving away of all invested fund. That's why there is no alternative of investing money in several projects, so that the risk can be diversified, is the portfolio.

3.3.1 Correlation and Covariance: For making efficient portfolio, sometimes it is needed to identify the relationship between the two stocks of a sector. Correlation and covariance are the measurements of getting relations between two random variables. The covariance and correlation between the stocks are elaborately shown in Appendix-1.3.

$$\sigma_{AD} = \sum_{i=1}^{n} (R_A - \bar{R}_A) \times (R_D - \bar{R}_D) \times P_i = 0.59017$$

$$\rho_{AD} = \sigma_{AD} / \sigma_A \times \sigma_D = 0.9854$$

This indicates there is a strong positive relationship between the two stocks. That means the market movement of both the security will be in the same direction. The return of one stock will influence so much on other's return.

3.3.2 Portfolio Return and Risk: By the combination of two available projects we can make a portfolio. Suppose, we put 60% weight to Alhaj Textile and 40% weight to Desh Garments. The expected portfolio return then will be:

$$\bar{R}_p = \sum_{i=1}^{n} \bar{R}_i \times W_i$$

So, $\bar{R}_p = (16.93*0.60) + (6.62*0.40) = 12.806\%$

Because of combining the two variables for investment, the portfolio return is a little bit lower than the return of Alhaj Textile, but approximately twice than the return of Desh Garments Limited.

Now the portfolio risk (portfolio variance) of two stocks will be:

$$\sigma_p^2 = W_A^2 \sigma_A^2 + W_D^2 \sigma_D^2 + 2 W_A W_D \sigma_{AD}$$

$$= (0.60^2 * 103.336) + (0.40^2 * 34.7717) + (2 \times 0.60 \times 0.40 \times 59.017)$$

$$= 71.09\%$$

Or, $\sigma_p^2 = W_A^2 \sigma_A^2 + W_D^2 \sigma_D^2 + 2 W_A W_D \rho_{AD} \sigma_A \sigma_D$

$$= (0.60^2 * 103.336) + (0.40^2 * 34.7717) + (2 \times 0.60 \times 0.40 \times 0.9853 \times 10.1654 \times 5.8917)$$

$$= 71.09\%$$

So, Portfolio Standard Deviation, SD, $\sigma_p = \sqrt{\sigma_p^2} = 8.83\%$

Investing in only Alhaj Textile will take 10.1654%. But, diversifying the return with the combination of two stocks provides the risk to be lower as 8.83%.

3.3.3 Portfolio Beta: Risk seekers do not believe in the risk of a firm with standard deviation. They are relatively market oriented that made them to take beta is the proper measure of risk. Beta judges the responsiveness of a security to movement in the market portfolio (Ross et el. 2010). So, the beta of a portfolio with the two selected firm will be the summation of individual beta with its respective weight, which is as follows:

$$\beta_p = \sum_{i=1}^{n} W_i \; x \; \beta_i$$

$$= (0.60 \times 0.8923) + (0.40 \times 1.0103)$$

$$= 0.9395$$

The portfolio beta comprised of the two securities is 0.9395, which is nearest to market beta 1.0. Since the portfolio beta is lower than the market beta, the portfolio can be accepted.

From this point of view, an investor can identify the company position and the choices of the projects in his portfolio. Though the two selected companies are from the same sector, making a portfolio with the two stocks can diversify the risk between the securities.

3.4 Cost of Common Stock:

Cost of common stock equity refers the rate at which the investors discount the expected cash flow of the company to determine the value of the stock in the market (Gitman, 2006). Normally it is measured in the perspective of company, not for investors. But, it must be measured to take decision after calculating internal rate of return (IRR). If the IRR is higher than the cost of common stock, investors can choose the project.

According to Constant Growth Model, known as Gordon Model, the cost of common stock can be expressed by,

$$P_o = D_1 \div (K_{cs} \text{ - } g)$$

$$\Rightarrow \; K_{cs} - g = D_1 \div P_o$$

$$\Rightarrow \; K_{cs} = (D_1 \div P_o) + g$$

Here, P_o = Current Market Price of Stock

D_1 = Dividend expected for next year, $[D1 = Do \times (1+ g)]$

g = constant growth rate of that stock, (Table – 1.4)

K_{cs} = Cost of common equity of the firm

So, cost of common stock of Alhaj Textile Mills Ltd. is,

$K_{cs \; for \; A} = (1.0033 \div 151.60) + 0.0846 = 0.0912$ or 9.12%

Since, there is no growth of Desh Garments Limited; it will follow the Dividend Model, which is expressed by,

$$P_o = D \div K_{cs}$$

$$\Rightarrow\ K_{cs} = D \div P_o$$

And, $K_{cs\ for\ D} = (0.70 \div 94) = 0.00745$ or 0.745%

The lower the cost the higher the chances to get more returns. In that sense, there is lower cost of common stock of Desh Garments Limited than that of the cost of Alhaj Textile Mills Limited's share. But efficient decisions can only be made after getting the internal rate of return.

3.5 Discounted Cash flow Method (NPV and IRR):

A cash flow when is taken into consideration for the identification of the value at present time by discounting is known as discounted cash flow. To choose the right project to invest, one has to evaluate the cash flow of the selected project, that is a part of capital budgeting. Net Present Value (NPV) and Internal Rate of Return (IRR) are two methods of evaluating the stock value at a discounting rate, that helps us to take decisions whether to invest into a particular company's stock or not.

3.5.1 Net Present Value (NPV): The value of all the future cash flow at now is known as the present value (PV) of net cash flow. And the difference between the present value of net cash flow (NCF) or net cash benefit (NCB) and the present value of net cash outlay (NCO) is the Net Present Value.

So, **NPV = PV of NCB – PV of NCO**

$$= \sum_{i=1}^{n} \left[CF_i \div (1+R)^{n} \right] - CF_o$$

Assume that, the investment is planned for 3 year's period. According to financial report of Alhaj Textile Mills Ltd. the cash flow was Tk. 3.65 per share in 2013. Since the market price on September 17, 2014 was Tk 151.60 (DSE, 2014). So, the CF_o is TK. 151.60. Let, we will get Tk. 230 after 3 years in 2017. The cash flow through the next 3 years is,

$CF_1 = CF_o (1+g)^{1} = 3.65 \times (1+0.0846)^{1} = 3.9588$

$CF_1 = CF_o (1+g)^{2} = 3.65 \times (1+0.0846)^{2} = 4.2937$

$CF_1 = CF_o (1+g)^{3} = 3.65 \times (1+0.0846)^{3} = 4.6570$

So, $NPV_A = \left[\{3.9588 \div (1+0.1693)\}^{1} + \{4.2937 \div (1+0.1693)\}^{2} + \{(4.6570+230) \div (1+0.1693)\}^{3} \right] - 151.60 = $ Tk. 1.7022

Since the NPV shows the positive result, so we may invest money into this stock. If it showed negative result, we should reject the project.

Now, the cash flow of Desh Garments Limited in 2013 was Tk. 2.30. Since the market price on September 17, 2014 was Tk 94 (DSE, 2014). So, the CF_o is TK. 94. Let, we will get Tk. 110 after 3 years in 2017. Since there is no growth rate of this firm, the cash flow through the next 3 years is equal, Tk. 2.30.

So, $NPV_D = \left[\{2.30 \div (1+0.0662)\}^{1} + \{2.30 \div (1+0.0662)\}^{2} + \{(2.30+110) \div (1+0.0662)\}^{3} \right] - 94$

= Tk. 2.8344.

Here, the NPV shows the positive result, so the project can be taken.

3.5.2 Internal Rate of Return (IRR): Internal rate of return is the minimum rate of return or required rate of return. It is the rate that equals the NPV to 0, which indicates the present value of net cash flow and the present value of net cash outlay will be equal.

If the IRR is greater than the cost of capital, accept the project

If the IRR is lower than the cost of capital, reject the project (Gitman, 2006)

When it is in reject condition, investors should not go for investment into that stock. This will cause him to face loss from that investment. One can estimate the minimum rate of return by the following formula:

$$\textbf{IRR} = \textbf{A} + \{\textbf{C} \div (\textbf{C-D})\} \times (\textbf{B-A})$$

   Here, A = Lower Discounting Rate

      B = Higher Discounting Rate

      C = Net Present Value at Lower Discounting Rate

      D = Net Present Value at Higher Discounting Rate

As we have already got a net present value and got a positive result of Alhaj Textile Mills Limited, so the rate is lower discounting rate. We should take a higher discounting rate to get the positive NPV.

Let's, the discounting rate is 0.20 or 20%

$NPV_A = \left[\{3.9588 \div (1+0.20)\}^1 + \{4.2937 \div (1+0.20)\}^2 + \{(4.6570+230) \div (1+0.20)\}^3\right] - 151.60$ = Tk. − 9.2260

So, Internal Rate of Return of Alhaj Textile Mills Ltd. will be,

$\quad\quad\quad IRR_A = 0.1693 + [1.7022 \div \{1.7022 - (- 9.2260)\} \times (0.20 - 0.1693)$

$\quad\quad\quad\quad = 0.1741$ or 17.41%

And, as we have got a net present value with positive result of Desh Garments Limited, it is the lower discounting rate. To get negative value we should take a higher discounting rate.

Let's, the discounting rate is 0.15 or 15%

$NPV_D = \left[\{2.30 \div (1+0.15)\}^1 + \{2.30 \div (1+0.15)\}^2 + \{(2.30+110) \div (1+0.15)\}^3\right] - 94$

$\quad\quad = $ Tk. − 16.4218

So, Internal Rate of Return of Alhaj Textile Mills Ltd. will be,

$$\text{IRR}_D = 0.0662 + [2.8344 \div \{2.8344 - (-16.4218)\} \times (0.15 - 0.0662)$$

$$= 0.0785 \text{ or } 7.85\%$$

Since, both the Internal Rate of Return (IRR) are greater than the Cost of Common Stock (K_{cs}) of Alhaj Textile Mills Ltd. and Desh Garments Limited, the both projects can be accepted. It will not incur loss. An investor can undoubtedly choose any of these stocks for investment.

3.6 Stock Valuation:

Stock valuation is the identification of present market price or present value of any stock. There are two types of cash flow, the first one is a firm when give cash flow on a regular basis known as dividend. And the second one is the extra money from selling price a stockholder gets when selling the stock (Ross et el, 2010), but it is also the growth which is mentioned as capital gain. Here we will value the stock using capital gain and dividend of firms.

A company may be of zero growth, or constant growth (Gordon Model), or differential growth oriented. Mathematical computation of growth rate of two selected firms is in Appendix 1.4, the implication of which is,

Growth Rate = Retention Rate × Return on Equity (ROE)

= (Retained Earnings ÷ Earnings after Tax) × (EAT ÷ Stockholders Equity)

Growth Rate of Alhaj Textile Mills Limited, $g_A = 0.63 \times 0.1343 = 0.0846$

Growth Rate of Desh Garments Limited, $g_D = 0$, (since the last 4 years' dividend is equal)

Present Market Price for constant growth, $\mathbf{V_s = D_1 \div R\text{-}g}$

Here, $D_1 = D_o \times (1+g)$

Present Market Price for zero growth, $\mathbf{V_s = D \div R}$

Here, V_s = Current Market Price of Stock

D_o = Dividend of current year

D_1 = Dividend expected for next year (Appendix – 1.5)

g = constant growth rate of that stock

R = required rate of return

So, $V_{s\,A} = 1.0033 \div (0.1741 - .0846) = \text{Tk } 11.21$

$V_{s\,D} = 0.70 \div 0.0785 = \text{Tk. } 8.92$

Now, if the market price is more than the calculated or intrinsic value, we should not go for investment. And if the market price was lower than calculated value, the stock could be purchased. Since the market price is more than the intrinsic value of both of the stock. To invest any of these stocks will be risky for investor.

4. Decisions and Recommendations

Expected return shows the better position of Alhaj Textile Mills Ltd according to risk than that of Desh Garments Limited, the risk averse investor will choose the Desh Garments, because of lower risk and the risk seeker will choose the Alhaj Textile. If the risk seeker follows the CAPM method, then he will also choose the Alhaj Textile. Portfolio of these two stocks is good, but for the diversification of risk, it is better to seek the stocks with negative correlation, then the portfolio will surely follow the diversification principle. According to Cost of Common Stock method, the Desh Garments Limited's cost of common stock is lower than that of Alhaj Textile Mills Ltd. NPV of both are positive, since the difference between IRR and cost of common stock of Alhaj Textile Mills Ltd. is (17.41% - 9.12%) = 8.29%, and Desh garments is (7.91% - 0.745%) = 7.165%, the greater difference will be better investment, so we should accept Alhaj Textile Mills Ltd. The valuation of stock also shows the higher value of Alhaj Textile Mills Ltd. than that of Desh Garments, and since the book value of both the share is Tk. 10. So, we should choose Alhaj Textile for individual project investment.

As a final choice of Individual project, after measuring by all of six methods of financial mathematics into the common stock of firms of textile and ready-made garments sector, the stock of Alhaj Textile Mills Ltd. will be more beneficial to invest than that of Desh Garments Limited.

5. Concluding Remarks

Bangladesh is a developing country with huge manpower, which can be utilized only by the creation of employment opportunity. That's why there is no substitute for investment in the several sectors. Textile and ready-made garments has a noteworthy performance for the value creation in the production of Bangladesh that contribute more than 80 percent of export as a driver of the country's balance of payment. To get investment in this sector is the alarming issue now-a-days. The mathematical uses to identify firms and make portfolio for investment is a crying need of investors. The consequences of which is the way of practicing financial mathematics to evaluate the positions of this market participants. Participatory process can bring the strength of the sector. The government of Bangladesh is on the way of making a perspective plan to encourage FDI. Because of poor governance, high transaction costs, weak infrastructure and weak property right regime there is a lower confidence of investors. Although net FDI rose from 0.31 percent in 1991 to 3.0 percent in 2001, but fell to 1.4 percent in 2008 (Outline Perspective Plan of Bangladesh 2010-2021). The above way is the root for financial analysis to measure the performance of a sector. Although some reasons are showing the concomitant of negative outlook, but investor should invest their fund coming through a participatory process in the industry for the development of the country.

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APPENDIXES

Appendix-1.1 The Calculation of Variance and Standard Deviation for Alhaj Textile Mills Ltd.

States of Economy	Return (Ri)	Exp. Return ($\bar{R}A$)	$(Ri-\bar{R}A)^2$	Probability (Pi)	$(Ri-\bar{R}A)^2$ x Pi
Boom	30%	16.93%	170.8249	0.20	34.165%
Normal	22.2	16.93	27.77	0.40	11.108
Depression	7	16.93	98.6049	0.25	24.6512
Recession	2	16.93	222.9049	0.15	33.4357
$\sigma^2A = \sum_{i=1}^{n} (Ri-\bar{R}A)^2$ x Pi =					103.336%
$\sigma A = \sqrt{\sigma^2A}$ =					10.1654%

Source: Calculated by author

| Appendix-1.2 | The Calculation of Variance and Standard Deviation for Desh Garments Limited. |

States of Economy	Return (R_i)	Exp. Return $(\bar{R}_D)$	$(R_i\text{-}\bar{R}_D)^2$	Probability (P_i)	$(R_i\text{-}\bar{R}_D)^2$ x P_i
Boom	15%	6.62%	70.2244	0.20	14.0449%
Normal	8.8	6.62	4.7524	0.40	1.9010
Depression	2.2	6.62	19.5364	0.25	4.8841
Recession	-3	6.62	92.5444	0.15	13.8817
$P_i =$	$\sigma^2{}_D \;=\; \displaystyle\sum_{i=1}^{n} (R_i - \bar{R}_D)^2 \; x$				34.7117%
$\sqrt{\sigma^2{}_D} \;=$	$\sigma_D \qquad =$				5.8917%

Source: Calculated by author

| Appendix-1.3 | The Calculation of Covariance and Correlations between Alhaj Textiles Mills Ltd. and Desh Garments Limited. |

States of Economy	Return (R_A)	$(R_A\text{-}\bar{R}_A)$	Return (R_D)	$(R_D\text{-}\bar{R}_D)$	Probability (P_i)	$(R_A\text{-}\bar{R}_A)$ x $(R_D\text{-}\bar{R}_D)$ x P_i
Boom	30%	13.07%	15%	8.38%	0.20	21.9053%
Normal	22.2	5.27	8.8	2.18	0.40	4.5954
Depression	7	-9.93	2.2	-4.42	0.25	10.9727
Recession	2	-14.93	-3	-9.62	0.15	21.5440
$\sigma_{AD} = \displaystyle\sum_{i=1}^{n} (R_A\text{-}\bar{R}_A) \text{ x } (R_D\text{-}\bar{R}_D) \text{ x } P_i =$						59.017%
$\rho_{AD} = \sigma_{AD} / \sigma_A \text{ x } \sigma_D$			$\rho_{AD} \; = 59.017 / 10.1654 \text{ x } 5.8917$ $=$			0.9853

Source: Calculated by author

Appendix-1.4 The Calculation of Growth Rate of Alhaj Textiles Mills Ltd. and Desh Garments Limited.		
Alhaj Textiles Mills Ltd.		Desh Garments Limited
Added Retained Earnings (Tk)	14279450.17	
EAT	22544370.83	
Stockholders' Equity	167873916.70	Zero Growth Rate firm (since the last 3 years' dividend is equal)
Retention Rate = Retained Earnings ÷ EAT	0.63	
ROE = EAT ÷ Stockholders' Equity	0.1343	
Growth Rate = Retention Rate × ROE	0.0846	

Source: Calculated by author

Appendix-1.5 Information of Individual Beta, Risk Free Return, Market Return, Dividend and Market Price.		
	Alhaj Textile Mills Ltd.	Desh Garments Limited
Risk Free Rate of Return, R_f	5%	
Average Market Return, R_m	1.677%	
Individual Beta, β_i	0.8923	1.0103
Dividend Per Share of Current Year, D_o	0.925	0.70
Dividend Per Share of Next Year, $D_1 = D_o \times (1 + g)$	$0.925 \times (1+0.0846)$ = 1.0033	$0.70 \times (1+0)$ = 0.70
Market Price, as of September 17, 2014	Tk 151.60	Tk 94

Source: Dhaka Stock Exchange Limited and Stock Bangladesh Limited